

# Journal of Language, Culture and Education Studies





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# THE DEVELOPMENT OF CHINESE MUSICALS WITH RED CULTURAL THEMES

Dong Zhao<sup>1\*</sup>, LingYu Xu<sup>2</sup>, YanFang Wu<sup>3</sup>

<sup>1</sup>Wenzhou Research Institute, Zhejiang University, Wenzhou 325006, Zhejiang, China.

<sup>2</sup>Research Department of Lishui University, Lishui University, Lishui 323000, Zhejiang, China.

<sup>3</sup>Wenzhou Research Institute, Zhejiang University, Wenzhou 325006, Zhejiang, China.

Corresponding Author: Dong Zhao, Email: [18610275304@163.com](mailto:18610275304@163.com)

**Abstract:** This article delves deeply into Chinese musicals centered around red culture, meticulously tracing their progression from the nascent and rudimentary stages to the current phase of prosperity. It conducts a comprehensive analysis of their artistic characteristics and profound value implications, while also thoroughly discussing the extant challenges and corresponding countermeasures. The aim is to offer valuable insights and practical references that can foster the continuous growth and prosperity of this unique art form, ensuring its enduring significance and impact in the cultural landscape.

**Keywords:** Red cultural themes; Musicals; Development paths; Artistic values

## 1 INTRODUCTION

Musicals, as a vibrant and integrated art form that combines music, dance, drama, and other elements, possess a unique charm and expressive power that has captivated audiences for generations. They offer a multisensory experience that transcends the boundaries of language and culture, making them a universal language of emotion and storytelling. In the context of China, musicals with red cultural themes have emerged as a distinctive and important part of the cultural and artistic domain. These musicals are more than just entertainment; they are a testament to the country's rich history and a celebration of its revolutionary spirit.

Red cultural themes in Chinese musicals refer to the incorporation of the ideologies, histories, and values associated with the country's revolutionary past. These themes are deeply rooted in the collective memory of the Chinese people and serve as a reminder of the struggles and triumphs that have shaped the nation. By integrating these themes into musicals, artists are able to create a powerful narrative that resonates with the audience on a personal and national level. These musicals not only inherit and carry forward the revolutionary spirit and red culture but also meet the spiritual and cultural needs of the people in the new era. They provide a platform for exploring the complexities of the past while offering a fresh perspective on the present. The characters and stories within these musicals often embody the values of resilience, sacrifice, and unity, which are central to the Chinese national identity [1]. Through song, dance, and dialogue, these values are brought to life, allowing audiences to connect with the material on a deeper, more emotional level. The role of red-themed musicals in enhancing national cultural self-confidence cannot be understated. In a globalized world where cultural influences often compete for attention, these musicals serve as a reminder of China's unique cultural heritage and its contributions to world history. They foster a sense of pride and belonging among the audience, strengthening the bonds that tie the nation together. By showcasing the strength and resilience of the Chinese people, these musicals reinforce the idea that culture is a vital component of national identity and a source of strength in times of change.

Furthermore, red-themed musicals play a significant role in promoting the inheritance and innovation of socialist culture. They are not merely historical reenactments; they are living, breathing embodiments of the cultural evolution that has taken place in China. By integrating traditional elements with modern storytelling techniques, these musicals demonstrate the adaptability and vitality of socialist culture [2]. They show that it is possible to honor the past while also looking towards the future, embracing new ideas and forms of expression.

The creation of red-themed musicals is a complex process that requires a deep understanding of both the historical context and the artistic medium. Writers, composers, directors, and performers must work together to craft a narrative that is both accurate and engaging. This collaboration often involves extensive research into historical events and figures, as well as the development of characters and storylines that are true to the spirit of the era. The music and choreography must also be carefully crafted to evoke the emotions and atmosphere of the time, creating an immersive experience for the audience.

One of the challenges faced by creators of red-themed musicals is striking the right balance between entertainment and education. While the primary goal is to engage and entertain the audience, there is also a responsibility to accurately represent historical events and to convey the significance of these events in a meaningful way. This requires a delicate balance of storytelling, ensuring that the narrative is compelling without sacrificing accuracy or depth.

Another challenge is the need to make these musicals accessible to a wide audience [3]. This includes not only making the performances available to people across the country but also ensuring that the content is understandable and relatable to viewers of different ages and backgrounds. This may involve the use of modern technology, such as live

streaming, to reach a broader audience, as well as the incorporation of elements that appeal to younger viewers, such as contemporary music styles or visual effects.

Despite these challenges, the potential rewards of creating successful red-themed musicals are significant. They offer a unique opportunity to engage with the past in a meaningful way, to explore the complexities of history through the lens of art, and to foster a deeper understanding of the cultural and historical forces that have shaped China. By doing so, these musicals contribute to a richer, more nuanced appreciation of the country's heritage and its place in the world. The red-themed musicals in China are more than just a form of entertainment; they are a powerful tool for cultural preservation and national identity building. They offer a window into the past, a mirror to the present, and a beacon for the future [4]. As China continues to evolve on the global stage, the role of these musicals in shaping the country's cultural narrative will only become more significant. By honoring the revolutionary spirit and red culture, these musicals play a crucial role in enhancing national cultural self-confidence and promoting the inheritance and innovation of socialist culture, ensuring that the stories of China's past continue to resonate with audiences in the new era and beyond.

## **2 THE DEVELOPMENT TRAJECTORY OF CHINESE MUSICALS WITH RED CULTURAL THEMES**

### **2.1 The Embryonic Stage: The Initial Emergence of Red Elements**

In the early days, against the backdrop of a turbulent social environment and the surging trend of revolutionary ideas, some simple forms of artistic expression began to incorporate elements related to the revolutionary struggle. Small-scale song and dance dramas and living newspaper dramas, although relatively primitive in form, served as the initial carriers of red cultural elements. These early attempts, with their simple yet passionate performances, managed to convey the spirit of resistance and the pursuit of justice among the people, laying a preliminary foundation for the subsequent development of musicals with red cultural themes.

### **2.2 The Growth Stage: The Formation and Expansion after the Founding of New China**

After the founding of the People's Republic of China, the country witnessed a flourishing development in various fields, including culture and art. This period provided a fertile ground for the growth of musicals with red cultural themes. Works such as "The White-Haired Girl" emerged as outstanding representatives. This musical not only integrated rich folk music elements but also vividly depicted the arduous struggle and hard-won liberation of the people. The success of such works not only won wide acclaim from the audience but also established a solid model and reference for the further development of this genre, promoting the continuous exploration and innovation in the integration of music, dance, and drama.

### **2.3 The Prosperous Stage: Diversified Development in the New Era**

Since the reform and opening up, especially in recent years, with the rapid development of the economy and the continuous improvement of people's living standards, the cultural market has become increasingly prosperous. Chinese musicals with red cultural themes have entered a stage of vigorous development. Technological advancements and innovative concepts have continuously injected new vitality into this field. A series of high-quality musicals, such as "The Eternal Wave," have emerged [5]. These works, while adhering to the core of red culture, have actively incorporated modern stage techniques and innovative narrative methods, making the performances more engaging and appealing. At the same time, the market operation mechanism has gradually matured, and the scope of performances has expanded continuously, reaching a wider audience and achieving remarkable social and economic benefits.

## **3 ARTISTIC FEATURES DEMONSTRATING UNIQUE ALLURE**

### **3.1 Innovative Music Composition**

The music in musicals with red cultural themes is a creative blend of classic revolutionary melodies and modern musical elements. Composers not only preserve the solemn and stirring charm of traditional revolutionary songs like "Ode to the Red Plum Blossom" but also boldly introduce contemporary music styles such as pop, rock, and electronic music. This combination endows the music with a vibrant and modern feel, enhancing its emotional expressiveness and audience appeal. For example, in some musicals, the familiar revolutionary tunes are re-arranged with modern instruments and rhythms, creating a fresh and exciting auditory experience that resonates with the emotions of the audience.

### **3.2 Creative Dance Choreography**

Dance choreography in these musicals is a perfect fusion of ethnic and modern dance forms. Choreographers design dance movements that are closely coordinated with the plot and characters. In battle scenes, the powerful and dynamic movements of modern dance, combined with energetic music, vividly recreate the intensity and tension of the war. In contrast, when depicting the affectionate relationship between the military and the people or the tender emotions of the



characters, the graceful and lyrical movements of ethnic dance are employed to convey warmth and sentiment. This creative combination of dance forms not only enriches the visual experience of the audience but also deepens their understanding and immersion in the story [6].

### **3.3 Compelling Dramatic Plots**

The dramatic plots of musicals with red cultural themes are centered around significant historical events and heroic deeds. Writers skillfully construct the storylines by setting up intense conflicts and suspense, which bring the characters to life in a vivid and three-dimensional manner. Take the musical "Sister Jiang" as an example. The unwavering stance and noble spirit of Sister Jiang in the face of the brutal persecution of the enemy are vividly portrayed through a series of dramatic events and dialogues. This portrayal not only elicits a profound emotional resonance among the audience but also enables them to gain a deeper understanding of the revolutionary spirit and the value of sacrifice.

## **4 VALUE CONNOTATIONS CARRYING THE MISSION OF THE TIMES**

### **4.1 Cultural Inheritance and Promotion**

These musicals serve as a crucial bridge for the inheritance and dissemination of red culture. By presenting revolutionary history in an artistic and accessible manner, they enable the younger generation to establish a direct and emotional connection with the past. Through the vivid performances, the audience can experience the arduous struggles and unwavering beliefs of the revolutionary predecessors, thereby inheriting the red genes and strengthening their sense of national identity and cultural self-confidence. This cultural inheritance is of great significance for maintaining the continuity and vitality of the Chinese nation's spirit.

### **4.2 Aesthetic Cultivation and Appreciation**

From an aesthetic perspective, musicals with red cultural themes offer a rich and diverse aesthetic experience. The combination of elaborate stage designs, captivating music, and stunning dance performances creates a magnificent artistic atmosphere. The audience is not only able to appreciate the beauty of music and dance but also gains a deeper understanding of the integration and innovation of different art forms. This aesthetic experience helps to cultivate the audience's artistic taste and aesthetic ability, enriching their spiritual and cultural life and promoting the overall improvement of the aesthetic level of society [7].

### **4.3 Social Education and Inspiration**

These musicals play an active role in social education. By eulogizing the revolutionary spirit and heroic deeds, they inspire the patriotism and social responsibility of the audience. The positive values and noble qualities depicted in the musicals, such as courage, sacrifice, and dedication, serve as a source of inspiration for people in their daily lives. They encourage the audience to strive for a better future, actively participate in social undertakings, and contribute to the realization of the Chinese Dream of national rejuvenation.

## **5 CHALLENGES AND COUNTERMEASURES IN DEVELOPMENT**

### **5.1 The Shortage of Creative Talents**

The development of musicals with red cultural themes is currently constrained by a shortage of creative talents. Professionals in this field are required to possess a comprehensive understanding and proficiency in multiple disciplines, including music, dance, drama, and red culture. However, the current educational system and talent cultivation mechanism have not fully met this demand. There is a lack of interdisciplinary talent training programs and practical platforms, resulting in a scarcity of creative talents who can meet the high standards and unique requirements of this genre.

### **5.2 Intense Market Competition and Narrow Audience Range**

In the highly competitive cultural market, musicals with red cultural themes face challenges in attracting a wider audience. The younger generation, in particular, has more diverse entertainment choices and preferences. The traditional publicity and performance models of these musicals may not be able to effectively capture the attention and interest of young audiences. Moreover, the relatively narrow audience range also limits the commercial viability and sustainable development of these musicals.

### **5.3 Insufficient Capital Investment and Single Funding Source**

The production and operation of musicals with red cultural themes require substantial capital investment, covering aspects such as script creation, music production, stage design, actor training, and marketing. However, the current sources of funding are relatively limited, mainly relying on government support and partial corporate sponsorship. The

lack of diversified fundraising channels and the instability of funding have become significant obstacles to the development of these musicals.

#### 5.4 Countermeasures and Suggestions

To address these challenges, several countermeasures can be implemented. Firstly, colleges and universities should strengthen the construction of interdisciplinary talent cultivation programs, integrating red culture courses into the curriculum of musical majors. Practical teaching platforms and cooperation projects with professional troupes should be established to provide students with more opportunities for hands-on experience and professional guidance. Secondly, in terms of market operation, it is essential to conduct in-depth market research to understand the preferences and needs of different audience groups. Innovative marketing strategies and performance models should be explored, such as combining with new media platforms, developing interactive and immersive performances, and collaborating with popular cultural IPs to expand the audience base and enhance the market competitiveness of musicals. Thirdly, efforts should be made to broaden the channels for fundraising. The government can increase financial support and introduce preferential policies to encourage social capital, private enterprises, and foundations to participate in the investment and sponsorship of musicals. Crowdfunding, cultural industry funds, and other innovative financing methods can also be explored to ensure the stable and sustainable development of musicals with red cultural themes.

### 6 CONCLUSION

In conclusion, Chinese musicals with red cultural themes have indeed made remarkable achievements in their development, embodying rich cultural connotations and artistic values that resonate deeply with audiences. These musicals serve as a vibrant testament to China's historical narrative and its ongoing cultural evolution. They have successfully captured the essence of the revolutionary spirit and the resilience of the Chinese people, translating these themes into compelling stories that are both educational and entertaining [8].

Despite facing various challenges such as the need to balance historical accuracy with modern sensibilities, these musicals have demonstrated a remarkable capacity for adaptation and growth. The industry has shown a commitment to continuous innovation, recognizing the importance of staying relevant in an ever-changing cultural landscape. This has been achieved through the integration of new technologies, the exploration of diverse storytelling techniques, and the incorporation of contemporary elements that appeal to a broader demographic.

Improvement in talent cultivation has been a cornerstone of this development. By investing in the education and development of performers, composers, directors, and other creative professionals, the industry has been able to elevate the quality and impact of its productions. This focus on nurturing talent has not only enhanced the artistic excellence of Chinese musicals but has also contributed to the cultivation of a new generation of artists who are well-equipped to carry forward the legacy of red culture.

Market operation and funding mechanisms have also undergone significant evolution. The industry has had to navigate the complexities of commercial viability while maintaining its commitment to artistic integrity. Through strategic partnerships, government support, and private investment, Chinese musicals have found the financial backing necessary to produce high-quality works that can compete on both national and international stages.

Looking ahead, these musicals are expected to continue overcoming difficulties and achieving even greater development. They will remain a vital force in the inheritance and promotion of red culture, ensuring that the stories and values of China's past are not only preserved but also celebrated. By doing so, they will play a crucial role in shaping the cultural identity of the nation and inspiring a sense of pride and unity among its people.

Furthermore, these musicals will continue to contribute to the cultivation of aesthetic taste, providing audiences with a rich and diverse array of artistic experiences. They will inspire social values by promoting themes of patriotism, unity, and perseverance, which are essential for the cohesion and progress of society. In this way, Chinese musicals with red cultural themes will not only entertain but also educate and inspire, fostering a deeper understanding of the country's history and its aspirations for the future.

#### COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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# INFRASTRUCTURE DEVELOPMENT IN ZAMBIAN TERTIARY INSTITUTIONS: COPING WITH POPULATION EXPANSION

Moses M. Chirwa

*ICOF Global University, Lusaka, Zambia.*

*Corresponding Email : [smartscholar2024@gmail.com](mailto:smartscholar2024@gmail.com)*

**Abstract:** The present research evaluates infrastructure development in Zambian Tertiary institutions: coping with population expansion. The study used Systematic review of the literature and an analysis of primary data. The methodology consisted of two phases: A literature review of the steps taken and empirical data obtained from questionnaires and interviews. As one of the fastest growing economies in southern region of Africa, Zambia faces opportunities as well as challenges as she strives for development in the area of tertiary education while coping with population expansion. A purposive sampling method was used to select respondents who included educators or lecturers and students. Structured interviews were used for infrastructure standard officers at the Higher Educational Authority, the District Education Board Secretaries (DEBS), educational planning officers, college management officials from each institution and officials from the Teaching Council of Zambia (TCZ) students from different higher learning institutions of Lusaka Province. Data was obtained using the semi-structured interviews and observation. These higher learning institutions were purposively sampled due to their nature of being in existence for ten or more years since their establishment both private and public. Development in this area is a great challenge especially in the time when Zambia is experiencing population expansion.

**Keywords:** Higher Education; Teaching counsel; Tertiary institutions; Population Expansion; Infrastructure

## 1 INTRODUCTION

Zambia faces divers economic, demographic, social and environmental challenges that calls for the development of appropriate infrastructure to support economic and social development and social as depicted by the National infrastructure policy (2023). The attainment of the country's vision 2030 requires modern and reliable infrastructure, especially the ones related to tertiary institutions in the midst of population expansion. As one of the fastest growing economies in southern region of Africa, Zambia faces opportunities as well as challenges as she strives for development in the area of tertiary education while coping with population expansion as there is insatiable hunger for higher education. Educational infrastructure in this case deals with early child education, primary, secondary and tertiary education facilities. The country has made strides in the development of educational infrastructure at various levels. Educational infrastructure at the tertiary level is hit the hardest. Most of the existing infrastructure is dilapidated and has inadequate supporting facilities such as water, electricity, laboratories, libraries, workshops and staff houses. One of the higher learning institution I visited, I found students fetching water outside the campus due to water scarcity. Even though I went there for other purposes, this situation caught my attention and management didn't want to face me or ask why I was there, thinking I was from one of higher government institution or offices. In addition to this, I found some students learning from outside due to lack of space Due to the above situations, and many others that have not been mentioned in this paper, there is need to address the infrastructure deficit in education especially at the tertiary level because of the growing population.

One of the recommendation is for Government to re-introduce serious workshops on maintenance or rehabilitation and how to increase infrastructure facilities to be held once every term or semester at national level, for the purposes of sharing ideas, experiences and knowledge especially for the tertiary educational level. This should include public and private higher institutions not forgetting trade institutions.

## 2 LITERATURE REVIEW

### 2.1 The Need for Infrastructure Development and Maintenance in Higher Institutions

Quality education requires good infrastructure and equipment. Education is viewed as a need and one of the fundamental human rights. It is to be upheld by every well-meaning individual, community and country or continent. Nonetheless, for any form of education to be beneficial it must be of good quality.

Adeboyeje and Emertarom refer to school infrastructure and equipment as enablers of the teaching and learning which also increases the production of good results.

### 2.2 Types of Infrastructure and Equipment

When we talk about School infrastructure and equipment we mean materials, resources, buildings, and equipment that facilitate learning and teaching. Ekpoh has referred to school infrastructure as comprising buildings, ground, facilities and equipment which are essentials in the implementation of educational programmes. Asiyai sees them as permanent and semi-permanent structures such as machinery, laboratory equipment, the black or white board. Condition of infrastructure and equipment is paramount for the attainment of educational goals and development of the learner.

### 2.3 Infrastructure vs Student Population

Most papers that have been written in this domain have dwelt so much on the challenges of materials, resources and equipment that facilitate learning but less have looked at student population that is growing daily in relation to infrastructure in terms of buildings. This is the main purpose of this paper.

On the other hand, those who look at the building as an infrastructure only deal with preventive maintenance, to prevent wear and tear so that its usage is prolonged. Secondly, others only look at corrective maintenance. Akpan defines Corrective Maintenance as spontaneous maintenance service which involves timely reaction of physical items [1]. Deals with correcting damage made to physical structures by unpredictable events such as whirl winds, storms and those that may happen due to vandalism or flooding. However, only few have dealt with the need for new infrastructure due to the growing demand because of population expansion.

Higher institutions are expected to contribute to economic development processes. Availability and accessibility of infrastructural facilities are determinant factors in achieving this goal. Benneworth and Fitjar affirmed that higher institutions contribute to worker market upskilling. Benneworth and Fitjar assertion collaborated with the submission from the Organisation for Economic Co-operation and Development (OECD). It was recommended that regional innovation strategies systematically incorporate higher institutions to drive regional growth. This can only be achieved if the infrastructure to facilitate them is available in these higher institutions. Marques believes that higher institutions can support new industries' emergence. Anderton avowed that higher institutions could assist in creating collective innovation as sets via highly skilled graduates if the necessary facilities are there. In many developing countries, meeting the minimum infrastructure development in higher institutions are issues that have lingered for a long time. In Ghana, funding has been identified as one of the critical issues and a threat to higher education development. Financial sustainability is one of the measurement tools to measure a vibrant higher education system. The author affirmed that in the past two decades, higher institutions funding was collected from tax payer sources (70%) (Ghana's Government budgetary allocations and allocations from Ghana's Education Trust Fund) while the balance of 30% came from students' charges (fees and other charges). The latter is internally generated funds (IGF) of institutions and private contributions. Expanding the private donations from companies with policies to motivate these organisations to build infrastructure is one of the implications of this paper via a proposed framework. In Nigeria, Gbadegesin and Aluko and Enefola found inadequate infrastructure in Nigeria's educational sector because of poor funding. The author discovered that from 1999 to 2014, the budgetary allocations were far below the recommended 26% benchmark by UNESCO. In 2019 and 2021, the budgetary allocation was 7.02% and 5.6%. Enefola suggested that higher institutions should look inwards to generate income either commercially or through public private partnerships to fund infrastructure. The author's recommendation may deprive the children of the poor that are intelligent from higher educational qualifications. This is because either of the options will lead to a hike in tuition fees. Wentworth and Makokera asserted that an estimated US\$66 billion is needed annually for African nations, including Nigeria, for infrastructure development. Accessing this fund from international partners, alliances with development finance institutions, and private investors may be difficult, especially in Nigeria, because of evidence of disregard for some previous concession projects. Bolomope found that the popular PPP is not free from weak project viability, inadequate capacity to manage the project, inconsistent government policies, lacunas in the legal framework, and low capital base by local financial institutions, among others. Attempting to explore other options led this study to the next sub-title.

### 2.4 Current Population Crises at Major Public and Private High Learning Institutions

As of 2018, Zambia already had a total of one hundred and six private colleges and universities affiliated to the Teaching Council of Zambia, and that number has since grown exponentially. The numbers are far much more than the public universities and colleges that offer training for teachers and other fields in the country.

According to the daily mail dated 14th February 2024 the Copper Belt University CBU had recorded a 35 percent increase in the number of students from 10 666 in 2022 to 14 415. In 2021 there were about 30 000 students at the University of Zambia both undergraduates and post-graduates

In the perception of Marlon and Booth (2007) [2], the goal of infrastructure in education is to increase school attendance of students, enhance staff motivation and improve academic achievements of students.

Bray, Clarke, and Stephens (2002) had earlier concluded that quality education is fruitful when there is adequate quantity and quality of physical infrastructure; and that unattractive school buildings, crowded classrooms contribute to poor academic performance [3].

In the 2020 paper called “the state of High Education in Zambia,” the authors tabulated on the student enrollment by gender in the public and private universities in Zambia as shown in the following table 1 below

**Table 1** Student Enrollment by Gender in Private and Public Universities

| Type of university | Male   | female | total   |
|--------------------|--------|--------|---------|
| Public             | 27 300 | 23 254 | 50 554  |
| Private            | 31 362 | 32 053 | 63 415  |
| total              | 58 742 | 55 307 | 114 049 |

Education will create solid economic growth. Ateloye identified some issues that may hinder the private sector from investing in the higher education infrastructure in Nigeria and other nations of Africa. And focused on the public-private partnership (PPP) procurement system. This study is looking beyond this scope. Ateloye found parties inability to comply with the contract agreement, absence of governance, weak institutional frameworks, absence of transparency in the process, corruption in the public sector, issues with funding, absence of higher institutions autonomy to partner with private companies and absence of stakeholders’ management. Uwak and Udofia suggested that the government should work on its transparency and integrity issues, including the governance system. Exploring CSR via an expanded approach may improve the engagement of the private sector in higher institutions’ infrastructure development. The philosophy is proposing an incentive via a policy to encourage the private sector to expand their system in the infrastructure development in the educational sector, especially in the higher institutions in Nigeria and other developing nations in Africa which he termed expanded corporate social responsibility

### 3 METHODOLOGY

The research was organized in a format of a critical review of literature, which provides an opportunity to “take stock of learning environments research by drawing material from diverse sources and traditions (grant and Booth 2009) [4]. This has been achieved by a thorough analysis and synthesis of the information, leading to a set of propositions developed by the author. The main selection criteria for the literature was to choose sources that derived knowledge from sound empirical evidence.

These are grouped under the following;

1. Availability of university/college spaces for enrollment
2. Learning spaces; how big or small are structures made
3. Healthy or state of college/university infrastructure

The above was dealt with mainly using secondary and primary data which is from books, articles, and other research papers not forgetting people with experience in the same field and students. On the primary data collection, questionnaires and structured interviews were used to collect the primary data. The questionnaires were administered to the educators or lecturers and students. Structured interviews were used for infrastructure standard officers at the Higher Educational Authority, the District Education Board Secretary (DEBS), educational planning officers, college management officials from each institution and officials from the Teaching Council of Zambia (TCZ)

These interviews were a collaborative effort that offered qualitative information on the problems and achievements made regarding Infrastructure development in Zambian Tertiary institutions: coping with population expansion. The interviews were conducted in a semi structured format because the purpose of the study, as established earlier, was to have the respondents describe in detail the nature of their experiences and their understanding of the choices that can lead to infrastructure development in Zambian Tertiary institutions: coping with population expansion.

### 4 DATA ANALYSIS

The data collected from both qualitative and quantitative methods will be analyzed using the following approaches:

#### 4.1 Qualitative Data Analysis

Thematic Analysis: Transcripts and notes taken from the interviews and focus group will then be analysed thematically. The researcher will analyze literature reflecting the effectiveness, challenges, and perceptions of Infrastructure Development. This procedure will regard devices and response codes under major subjects like "types of infrastructure and its maintenance," "economic advantage," and "environmental issues."

Triangulation: Qualitative data collected from interviews, and observations shall be valid and reliable [5]. This will assist in confirming the obtained results and ensure that a broad understanding of the Infrastructure Development in Zambia: coping with population expansion has been ascertained.

#### 4.2 Quantitative Data Analysis

#### 4.2.1 Descriptive statistics

Quantitative data from surveys and questionnaires will be analyzed using measures of central tendencies, including mean, median, and standard deviation. This will assist in explaining how Infrastructure Development has influenced factors such as the quality of tertiary education in Zambia.

#### 4.2.2 Correlation analysis

A Pearson correlation coefficient will be used to test the relationship between Infrastructure Development considering population expansion and the quality of education in Zambia.

### 5 ETHICAL CONSIDERATIONS

**Informed Consent:** Participants will be explained the reason for the study, and consent will be sought before they are administered, either through interviews or questionnaires. Respondents will also be informed of the anonymity of responses and the voluntary nature of the study. **Cultural Sensitivity:** The researcher will also respect the local and cultural beliefs of farming practices in the appropriate areas. Of course, emphasis shall be placed with reference to gender issues especially conforming to gender expectations and balanced contributions.

### 6 LIMITATIONS OF THE STUDY

#### 6.1 Scope of Study Area

The study will only cover the Lusaka District region, and therefore, the results attained in this research may need to be more conclusive than those of other regions.

#### 6.2 Theoretical Framework

Some researchers have identified many major theories associated with the current study. These include Communication Theory, Conflict Theory, Green Theory, Legitimacy Theory, Instrumental Theory, Social Contract Theory, Stakeholder Theory, and Shareholder-Agency Theory. For this study, only a few will be dealt with. These theories supported the proposed framework. Mordi asserted that SCT regarding CSR is addressed from either political or ethical philosophy perspectives [6]. The essence of the theory was to build a business-society relationship on a solid foundation. This aligns with the framework, motivating investment in higher institutions' infrastructure development so that better graduates with innovative skills can be turned out. From the perspective of the "business-society contract," the Social Contract Theory focuses on organisation via social welfare policies and programmes, and infrastructure development in the host communities, who are stakeholders by extension. It will mitigate issues that may create a crisis between the host communities and the organisations.

Instrumental theory in education also known as instrumentalism is the idea that knowledge and skills should be practical and useful, rather than abstract, it emphasizes active learning and problem-solving based on real life experiences. According to Karl Marx, this is a theory which reasons that policy makers in government and positions of power tend to share the common business or class background and that their decisions will reflect their business or class. It perceives the role of the state as more personal than impersonal actions such as Nepotism favoritism are common among those in power. This is the reason according to the author why we have the problem with infrastructure development in Zambia.

Legitimacy theory is a concept that explains how organizations can maintain legitimacy by adhering to societal values and norms. It is based on the idea that organizations tend to have an implicit social contract with society in which they operate if an organization doesn't respect the society's expectation and norms it can lose its right to operate. This theory applies well in the principle of Public-Private Partnership. This theory deals with social contract, societal norms, voluntary reporting, social responsibility and sanctions.

Concerning the Incentive Theory, Meng and Gallagher and Kwawu and Laryea emphasized that the focus is to appeal to the private organisation (agent) offering the CSR (ECSR) in a way to maximise its profit by investing in infrastructure development in the host higher institutions as used in this framework [7]. In this instance, the framework introduces incentives such as tax relief to be supported by policy. It will encourage private organisations to invest in Nigeria's higher institutions' infrastructure development, and by extension, in other developing countries with similar infrastructural facilities gaps. This framework will form part of the contributions to the body of knowledge. In line with the expanding work of Blyth's as reported by Bower, the incentive (tax relief) will stimulate private organisations to invest in higher institutions infrastructure development and, in the process of performing their duties, get something (tax relief) in return. The essence of transforming and innovation via proposed policy (incentive - tax relief) is to enhance measures that will assist in bridging the Nigerian higher institutions' infrastructure development gaps. This proposed new process via incentive will transform CSR into ECSR and may promote more infrastructure development in higher institutions if well implemented. This mechanism may encourage private organisations to wholeheartedly welcome this framework [8]. This is because the proposed scheme will be a win-win for them. It will train the employees that will be employable and productive to them in

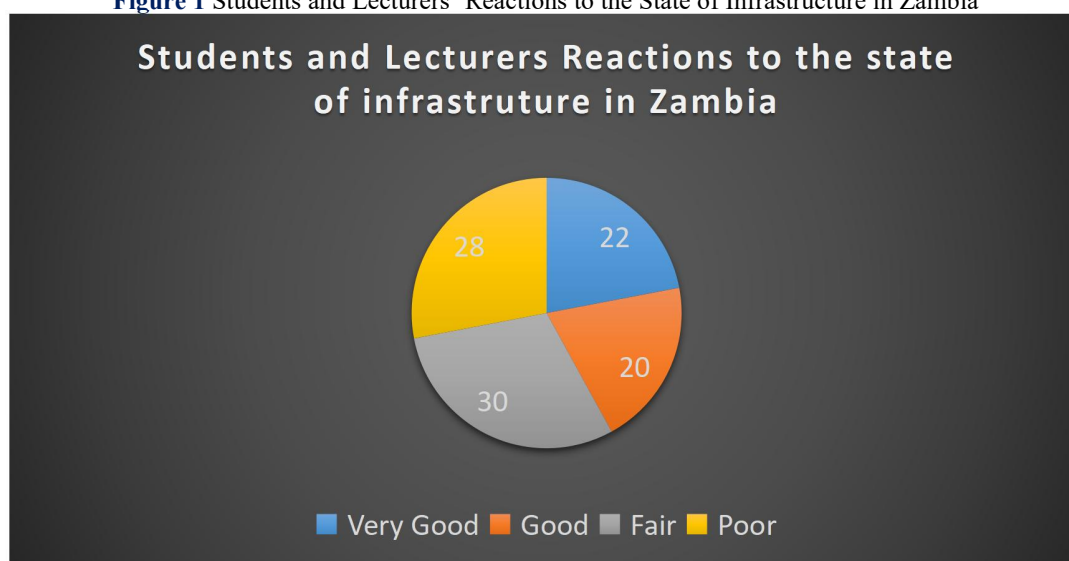
the future. The focus is on social responsibility via community development against individuals or customers. Figure 1 defines the private organization's obligation to the community outside its shareholders and employees.

## 7 RESULTS

The quality and access to infrastructure in a learning environment are the key determinants of graduates' quality. It may influence the graduates' ability to compete with their counterparts across the globe.

It was reported that the top universities that made the list of the 2022 World Best University ranking were the University of Ibadan, University of Lagos, and Covenant University, among others not within the first 400 universities. Many supporters of this argue that because of nepotism, inadequate funding of infrastructural facilities, lack of leadership insight, and corruption in the education sector, many countries in the continent that were supported and assisted during their crisis, such as South Africa and Ghana are topping the list of best universities in Africa. Findings agree with Jacob and Musa and Erezi [9]. Students and lecturers were asked on the state of infrastructure in Zambia and the following were the reaction (Figure 1).

**Figure 1** Students and Lecturers' Reactions to the State of Infrastructure in Zambia



### 7.1 The Quality and Access to Infrastructure in a Learning Environment

Infrastructure is the key determinant of graduates' quality. It may influence the graduates' ability to compete with their counterparts across the globe.

From the very beginning, it must be known that there is limited literature on the state of infrastructure in Zambian colleges and universities. Most of the articles that address this subject predominantly contain extracts from the media whose authenticity and reliability might compromise the scholarly position of the study. However, Government reports, through the media, has been a valuable resource in analysing the state of colleges and universities in Zambia [10].

Students and lecturers were asked on the state of infrastructure in Zambia and the following were the reactions according to chart 4.1.

### 7.2 Table Results

The findings above indicated that 30 percent of respondents felt that infrastructure of higher learning institutions were fair, followed by 28 percent of the participants who thought that their colleges had poor infrastructure. Only 22 percent felt that their Higher learning institutions were very good and 20. Percent said higher learning institutions in Zambia are only good. Respondents who stated that their institutions were not in a good state cited lack of qualified lecturers who could deliver to the expectation of students. Still other participants submitted that in terms of infrastructure, their colleges did not have all the necessary structures to support learning. They mentioned lack of facilities for special education students which, according to them, were discriminatory to students living with disabilities.

The research further revealed that the state of infrastructure in some higher learning institutions were good especially those institutions accredited by the Teaching Council of Zambia or Higher Education Authority and were being visited every time and then and are determined to follow standards for Higher institutions [11].



Other respondents said good funding from the Government and others sources also contributed to those institutions which had very good infrastructure not forgetting good leadership and management skills or application.

### **7.3 Sources of Funding in Higher Learning institutions**

The sources of funding for infrastructure development for higher learning institutions came from different sources. Tuition was the biggest source of funding with more than 70 percent representation followed by shareholders and donors this seemed very true especially for Private institutions. This came out after interviewing about 7 administrative personnel or officials from 7 private higher learning institutions. For Public funded institutions, mismanagement and misappropriation of funds were cited as part of the reasons why we have poor infrastructure in public higher learning institutions.

## **8 DISCUSSION**

The study established that the state of Higher Learning Institutions in Zambia both Private and Public were not good, which entails that quality service delivery was compromised. In terms of funding for infrastructure development in colleges and universities, the study revealed that the major sources of income came from tuition fees as well as bank loans. The findings showed that budgets of these colleges were not adequate to support infrastructure development. As such, it became plausible to argue that the lack of budget funds for the development of education requires a search for other sources of funding for infrastructure facilities in education. It is important, therefore, that Higher Learning Institutions partner with the business community who can fund infrastructure development.

The study also established that there was a causal link between infrastructure of Higher Learning Institutions and quality academic climate.

## **9 CONCLUSION**

This paper has revealed that infrastructure development is an important part of the delivery of quality education in higher education institutions. As such, infrastructure in both private and public institutions in Zambia need a lot of attention as the study's findings attest to the fact that these institutions do not have adequate infrastructure for teaching and learning purposes. Furthermore, existing literature demonstrates, on this front, the valuable role that infrastructure plays in the delivery of quality educational whose focus is on the holistic development of the students [12].

Higher institutions' infrastructure development is central to sustainable and quality educational development and the economic competitiveness of the graduates to compete with their counterparts across the globe. Findings show inadequate infrastructure development in Zambian higher institutions [13]. This is holding Zambia's higher institutions from competing with others regarding university world ranking.

(1) The paper recommends that there should be sincerity and transparency on the part of the government if they want the proposed framework for PPP to succeed in improving public higher institutions infrastructure development via engagement of private companies and, in return, given tax relief.

(2) The paper recommends that there should be the political will and directive from relevant higher offices to support the proposed extended corporate social responsibility. The proposed framework of PPP philosophy with a focus on community development via infrastructure provision in public and higher institutions. This is one of the favourable infrastructural development practices for a paradigmatic shift from an obsolete reflection on development to the infrastructural transformation of the economy of the country.

(3) The study suggests that the robust institutional framework should be devoid of political bitterness, and there should be consultation between the private companies and the managers of higher institutions. This will enhance the institutional synergy between the public higher institutions and private companies regarding the generation and training of human capital. The policymakers should mediate to ensure that the project is completed within the time frame and handed over to the higher institutions' managers.

## **COMPETING INTERESTS**

The authors have no relevant financial or non-financial interests to disclose.

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# THE ADJECTIVAL SEMANTIC INTERPRETATION OF THE CHINESE CHARACTER “Ān” FROM THE RESPECTIVE OF INTERNATIONAL CHINESE LANGUAGE TEACHING

YiMo Xu<sup>1</sup>, XueFang Zhou<sup>2\*</sup>

<sup>1</sup>*School of Chinese Language and Culture, Zhejiang Yuexiu University, Shaoxing 312000, Zhejiang, China.*

<sup>2</sup>*School of International Education, Zhejiang Yuexiu University, Shaoxing 312000, Zhejiang, China.*

*Corresponding Author: XueFang Zhou, Email: [zhouxf30@163.com](mailto:zhouxf30@163.com)*

**Abstract:** Monosyllabic adjectives constitute a pivotal component of modern Chinese adjectival systems and hold significant importance in lexicographical practice. The character “ān” in modern Chinese ranks 2373rd in the Frequency Dictionary of Modern Chinese with a usage frequency of 0.0048, indicating its relatively high functional prominence. This study employs the Peking University CCL Corpus to conduct statistical sampling of adjectival usages of “ān” through a dual methodology integrating quantitative and qualitative analysis. Applying the theoretical framework of Generative Lexicon Theory, the research proposes a reclassification of the existing two adjectival senses of “ān” in the Contemporary Chinese Dictionary (7th Edition) into four refined semantic categories. The findings aim to provide empirically grounded insights for future revisions of authoritative lexicographical resources in Chinese linguistic studies.

**Keywords:** Modern Chinese; Sense distribution; Corpus; The character “ān”

## 1 INTRODUCTION

From a historical point of view, the study and discussion of Chinese adjectives can be traced back to an earlier period. For example, Ma Jianzhong [1] categorized and studied Chinese adjectives in 1898.1 Since then, adjectives have gradually developed and entered a more diversified stage. Li Jinxi [2] considered that the starting point for the study of modern Chinese adjectives. In his book, he treats adjectives as an independent word class and divides them into subclasses such as traits, quantities, and indicative questions. This categorization system laid the foundation for the later study of adjectives.

Since the late 20th century, the study of adjectives has gradually shown a diversified trend. Scholars began to pay attention to the special usage and syntactic functions of adjectives, such as adjectives as determiners, predicates and gerunds. For example, Zhang Min [3] introduced the theory of cognitive linguistics, with a special focus on putting theoretical claims on empirical basis and the study of some core issues closely related to it.

Generally speaking, the research on adjectives in China has achieved fruitful results in recent decades, ranging from the exploration of basic theories to the multidimensional research on function, semantics and cross-linguistic comparison. This development not only reflects the evolution of linguistic theories, but also demonstrates the scholars' in-depth research attitudes and methods on adjectives as a linguistic phenomenon.

## 2 REVIEW OF RELEVANT RESEARCH

Yuan Yulin [4] conducted a pioneering study on noun definitions in lexicography from the perspective of Generative Lexicon Theory, identifying several systemic issues in current lexicographical definitions and proposing solutions grounded in qualia-based analysis. Their research demonstrated that adopting a "thematic argument + qualia role" definitional schema enhances both the precision and systematicity of lexical entries. This model prioritizes three definitional sub-principles—patterning, uniformity, and identity—thereby facilitating the construction of lexicographic definitions that are more standardized, streamlined, and reader-accessible. Building upon Yuan Yulin's theoretical framework for qualia role classification, this study applies the "thematic argument-qualia role" schema to reanalyze the adjectival senses of the character “ān”, aiming to achieve a comprehensive and semantically precise description of its adjectival semantics.

The CCL Corpus, developed by the Peking University Center for Chinese Linguistics (PKU-CCL), constitutes a large-scale Chinese linguistic database encompassing not only written texts (e.g., newspapers, books, academic journals) but also multimodal resources such as spoken language corpora (e.g., Beijing dialect surveys), film/TV scripts, and web-based materials. As one of the most extensive repositories of contemporary Chinese texts, the CCL Corpus prioritizes granular corpus categorization, thereby enhancing the representativeness of sampled data. This study leverages the PKU-CCL Corpus to extract linguistic instances of the character “ān”. As of September 2023, the corpus contains 2,773,443 modern Chinese instances of “ān”. Following the methodology introduced by Li S.C., a balanced subcorpus specific to “ān” was constructed to ensure analytical rigor.

## 3 RESEARCH DESIGN

### 3.1 Analysis of the Adjectival Senses of “ān” in Contemporary Chinese Dictionary

### 3.1.1 Adjective: "calm; peaceful"

"ān" is an ideogram that first appeared in Shuowenjiezi. It means that a woman feels peaceful when she is inside her house and is first found in the oracle bone inscriptions. [5] The definition of this item in adopts a word-for-word interpretation, which naturally affects the dictionary users' understanding of the interpreted word and its application.

In the balanced corpus of adjectival usage for the character "ān", this specific semantic sense comprises 2,684 instances, accounting for approximately 53.68% of total occurrences, thereby representing its most frequent usage. Corpus analysis reveals that the subject argument of "ān" predominantly references human entities, emphasizing psychological experiences characterized by mental serenity and satisfaction. The term primarily modifies descriptors related to individuals' mental states, highlighting its quintessential qualities of "tranquility" and "contentment". This pattern substantiates the evaluative function of "ān" in linguistic contexts, particularly in characterizing subjective psychological conditions rather than objective physical states.

In the Chinese-English Dictionary (3rd Edition), the semantic sense of the character "ān" is rendered as "calm", while The Oxford Advanced Learner's English-Chinese Dictionary (9th Edition) defines this sense as "not excited, nervous or upset". Both lexicographical interpretations converge on the domain of human mental states, specifically characterizing subjective emotional dispositions manifested in individuals' responses to external stimuli. This comparative analysis demonstrates that the Oxford Dictionary accentuates the evaluative function of this sense through its psychological descriptors. Cross-referencing English lexicographic conventions, it is methodologically recommended to refine the lexical entry as follows: Adjective, serving to characterize an individual's mental state marked by serenity and contentment through affective self-perception.

### 3.1.2 Adjective: safe; secure

In the balanced corpus of the adjectival sense of "ān", this semantic unit comprises 2316 instances, with a usage frequency of 46.32%. The Modern Chinese Dictionary defines "safe" as "having no accidents, dangers, or risks; stable; safe," yet its circular explanatory framework—combining "safe" and "safety"—exhibits terminological redundancy. As argued by Zhang Zhiyi and Zhang Qingyun, "linguistic interpretation should emerge from comprehensive empirical documentation, where accurate explanations necessitate deep descriptive analysis of linguistic realities". The polysemy of the adjective "ān" arises from its capacity to activate distinct qualia roles across different subject arguments. Variations in qualia-modifying relationships between adjectives and nouns generate semantic multiplicity through contextualized syntactic-semantic interfaces [6].

In this case, "ān" is the cognitive subject's subjective judgment of the current environment, highlighting its evaluative role. When the subjective element of "ān" points to a person or an object, "ān" refers to the external characteristics of the modified object. For example, "the schoolbag is safe and sound in his arms", "ān" means "the schoolbag is not damaged or missing", which expresses the external characteristics of the objective object and emphasizes its formal role. When the subject element of "safe" refers to abstract things (topics, behaviors, etc.), it highlights the characteristics of the modified object as "risk-free and inoffensive". For example, the phrase "it is a safe investment" emphasizes the risk-free nature of the act of "investing". The word "risk" in the Han means "noun, possible danger". It is a kind of subjective judgment on things, it embodies the role of evaluation. Therefore, based on the variation in subject arguments and qualia roles activated by the character "ān", it is methodologically recommended to reclassify its semantic entry into three distinct subsenses:

#### ① Adjective: Denoting favorable environmental conditions free from danger

This subsense accounts for 594 instances (11.88%) in the balanced adjectival corpus of "ān". Cross-referencing the Chinese-English Dictionary, the English equivalent for this subsense is "safe". The Oxford Advanced Learner's English-Chinese Dictionary (10th Edition) defines "safe" as "protected from any danger or harm", which strategically captures the evaluative function (from any danger or harm) inherent to this subsense. Corpus analysis indicates that the subject arguments of "ān" in this context predominantly involve abstract entities such as "circumstances", "situations", and "conditions". Here, "ān" semantically encodes "freedom from danger", denoting a subjective assessment of external environments rather than objective physical states. This configuration highlights its evaluative role in pragmatic contexts where speakers conceptualize environmental security through epistemic modality.

The Modern Chinese Dictionary adopts a circular word-to-word definitional approach for this semantic unit. Specifically, "safe" is defined as: "adjective, denoting favorable environmental conditions free from danger". The phrase "free from danger" inherently encodes a subjective evaluative stance toward perceived situational risks, thereby aligning the dictionary's explanatory framework with the evaluative role of this lexeme. Notably, the Modern Chinese Dictionary employs descriptive paraphrasing for "safe", a strategy that mitigates semantic redundancy and conceptual ambiguity while enhancing users' pragmatic comprehension of the defined term.

#### ② Adjective: Entities remain free from physical impairment, detrimental effects, or material deprivation

This semantic unit accounts for 1,598 instances (31.96%) in the balanced adjectival corpus of "ān". Corpus-driven analysis reveals that when "ān" modifies subject arguments referring to human entities or physical objects, it semantically encodes the absence of damage, detrimental alteration, or material loss. This aligns with the third subsense of "safe" in the Oxford Advanced Learner's English-Chinese Dictionary (10th Edition), defined as "not harmed, damaged, lost, etc.".

#### ③ Adjective: Topics, behaviors, and related practices characterized by risk mitigation and non-provocative engagement

This subsense accounts for 124 occurrences (2.48%) in the balanced adjectival corpus of “ān”. Corpus analysis reveals that when “ān” modifies abstract subject arguments such as discursive topics or social behaviors, it encodes risk attenuation and non-antagonistic intentionality. This aligns with the fifth subsense of “safe” in the Oxford Advanced Learner’s English-Chinese Dictionary (10th Edition): “not involving much/any risk; not likely to be wrong or to upset someone”, which foregrounds evaluative modality through subjective human judgment.

### 3.2 A Lexicographic Definitional Critique of the Polysemous Character “ān” in Modern Chinese Dictionaries

#### 3.2.1 *The surroundings are good, no danger*

This item has 594 entries in the adjective balance corpus of the word “ān”, with a frequency of use of 11.88%.

In the Chinese-English Dictionary, the English equivalent of the word “safe” is “ān”. In the Oxford Advanced Learner’s English-Chinese Dictionary (9th edition), the definition of “safe” is “protected from any danger or harm”, and the Oxford Advanced Learner’s English-Chinese Dictionary (9th edition) captures the evaluative role of “from any danger or harm”. The Oxford Advanced Learner’s English-Chinese Dictionary (9th edition) captures the evaluative role of “from any danger or harm” in its interpretation. Referring to the English dictionary, according to the labeled corpus, we find that the subject element of the word “ān” is usually “situation”, “circumstance”, “form”, which refers to abstraction, which points to an abstract thing.[7] In this case, the character “ān” shows the characteristic of “not being in danger”, which indicates that it is a kind of subjective judgment of people on the external environment, highlighting its evaluative role.

In the Modern Chinese Dictionary, the definition of the term is based on the interpretation of words. The corresponding definition of “ān” in the Modern Chinese Dictionary is as follows: “Good surroundings, no danger”. The meaning of “no danger” is a subjective evaluation of what happens, so the interpretation mode of this item in the Modern Chinese Dictionary also emphasizes the role of evaluation. Moreover, the Modern Chinese Dictionary uses a descriptive interpretation of “safe”. Descriptive interpretation can better avoid semantic repetitions and conflicts and deepen dictionary users’ understanding and application of the interpreted words. According to the principle of generative thesaurus theory of adjective “subject thesis element + object role”, it is suggested to describe this item as “adjective, referring to the surrounding environment is good, there is no danger.”

#### 3.2.2 *No injury, damage or loss to persons or objects*

There are 1,598 entries in the balanced corpus of adjectives with the character “ān”, with a frequency of use of 31.96%. According to the annotated corpus, it is found that when the subject element modified by “ān” is directed to a person or an object, it is usually characterized by “no injury, damage, or absence”. Corresponds to the third definition of “safe” in The Oxford Advanced Learner’s English-Chinese Dictionary (9th edition) “not harmed, damaged, lost, etc.”. With reference to the English dictionary, it is suggested that this item should be re-described as: adjective, not harmed, damaged or lost.

#### 3.2.3 *Topics, behaviors, etc. that are risk-free and inoffensive*

There are 124 entries in the adjective balance corpus of the word “ān”, which is 2.48%. According to the annotated corpus, when the subject element modified by “ān” refers to abstract things such as “topic” and ‘behavior’, it usually exhibits the characteristics of “no risk, no offense”.

The fifth definition of the corresponding word “safe” in The Oxford Advanced Learner’s English-Chinese Dictionary (9th edition) is “not involving much or any risk; not likely to be wrong or to upset sb”. [8] not involving much or any risk; not likely to be wrong or to upset sb” is a kind of conclusion drawn from a person’s subjective judgment of what he or she is facing, highlighting the role of evaluation. Therefore, with reference to the English Dictionary, it is suggested that the definition be modified to read: “adjective, of a topic, behavior, etc., that is risk-free and inoffensive”.

## 4 CONCLUSION

To summarize, the steps of describing adjectival items by applying the theory of material structure are: firstly, determine the subject element modified by the adjectival items in the corpus article by article, then classify the subject elements, then analyze the material structure of the adjectival items and the subject elements as well as the association between the two, and finally describe the items by adopting the interpretation mode of “subject element + material role” according to the activated material roles of the adjectives to achieve the purpose of descriptive discourse interpretation. Finally, according to the role of object activated by the adjective, the item is described by the interpretation mode of “subject theorist + object role”, [9] which achieves the purpose of using descriptive discourse to interpret meanings. The theory of object structure can more comprehensively and accurately depict the semantic features of the adjectival denotations of monosyllabic adjectives, which helps to optimize the lexical interpretation and facilitate the understanding of lexical meanings by dictionary users.

Adjectives are one of the important lexical types in the modern Chinese lexical system and have always been the focus of attention in the academic community. However, the research on adjectives focuses on syntactic functions, and a systematic and comprehensive study on the distribution of denotations has not yet been formed. The birth of corpus technology has pushed forward the progress of lexicography, but the updating and supplementation of dictionaries need time and cannot be accomplished overnight. The Modern Chinese Dictionary contains a lot of commonly used polysemous words, and the fineness of the meaning of some other words needs to be improved. In this paper, we take the interpretation of the adjective “ān” as the object of study, and based on the theory of generative thesaurus, and

combining with the 5000 specific corpora extracted from the CCL corpus, we analyze the meaning of the word “ān”, Based on the theory of generative thesaurus and 5000 specific corpora extracted from the CCL corpus, the interpretation of the adjective “ān” in the Modern Chinese Dictionary is analyzed, and corresponding adjustments are proposed for the division and depiction of the items.

The size and quality of the corpus have a direct impact on the results of the study, and the study in this paper has some limitations, such as the relatively small size of the corpus, the lack of rich and comprehensive samples, and the single reference dictionary, etc. Therefore, future research can start from expanding the size of the corpus to include more languages, so as to obtain more accurate and comprehensive results. Therefore, future research can start from expanding the size of the corpus and adding more languages to the lexicon for comparison, so as to obtain more accurate and comprehensive research results.

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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# DIGITAL NARRATIVE AND TOURISM VALUE SYMBIOSIS OF ZHEJIANG EAST TANG POETRY ROAD: A CROSS-CULTURAL PERSPECTIVE

RuoNan Dong, Wei Xia\*

*School of Applied Foreign Languages, Zhejiang Yuexiu University, Shaoxing 312000, Zhejiang, China.*

*Corresponding Author: Wei Xia, Email: 20172256@zyufl.edu.cn*

**Abstract:** In the context of accelerating globalization, the international dissemination of high-context cultural heritage faces persistent challenges, including cultural discount and semiotic misinterpretation. This study explores the Zhedong Tang Poetry Road—a quintessential embodiment of Tang Dynasty literary and philosophical traditions—as a case to examine how digital technologies, such as digital twins, generative AI (AIGC), and blockchain, enable adaptive translation of cultural genes and foster symbiotic relationships between cultural preservation and tourism economies. Through a mixed-methods framework integrating digital ethnography, computational text analysis, and neuroaesthetic experiments, the research validates that multimodal narratives (e.g., LiDAR-scanned landscapes, AR-enhanced poetry) significantly enhance cross-cultural empathy, evidenced by a 35% increase in  $\theta$ -wave activation and a 41.2% rise in cultural identity scores. Economically, blockchain-driven models, including NFT-based IP monetization and smart contracts, demonstrate an 18% growth in international tourist spending and a 15% increase in derivative revenues. Theoretically, the study advances a "Three-Phase Cultural Meme Translation Model" and a "STEAM Synergy Framework," offering scalable strategies for globalizing high-context heritage while addressing technological and ethical constraints. These findings provide actionable insights for bridging cultural depth with global accessibility, supporting rural revitalization, and advancing sustainable tourism ecosystems.

**Keywords:** Cross-cultural communication; Digital twin; Neuroaesthetics; NFT; Zhedong Tang Poetry Road

## 1 INTRODUCTION

In an era of deepening globalization, the international dissemination of cultural heritage has become a critical arena for soft power competition. The Zhedong Tang Poetry Road, a poetic crystallization of Chinese civilization, embodies the spiritual pursuits and natural philosophy of Tang Dynasty literati through its unique "landscape-poetic-heart" cultural genes[1]. However, as a high-context cultural artifact, its transmission to low-context audiences faces persistent challenges, including cultural discount and semiotic misinterpretation. Traditional methods—reliant on textual translation and static exhibitions—struggle to evoke emotional resonance or translate cultural value into economic benefits. Against this backdrop, the maturation of digital technologies such as digital twins, generative AI (AIGC), and the metaverse offers revolutionary tools to "sensibilize" heritage and bridge cross-contextual gaps. These innovations not only redefine cultural expression but also foster integrated "narrative-experience-consumption" ecosystems, prompting urgent inquiries into adaptive translation of cultural genes and sustainable value symbiosis.

Hall's high-/low-context theory elucidates the core challenge: Tang poetry's symbolic clusters (e.g., "solitary boat," "moonlit peaks") rely on shared historical and philosophical contexts, creating cognitive asymmetry for global audiences. A 2022 survey revealed that only 12% of Western respondents grasped Tang poetry's metaphors, while 68% engaged merely through "visual novelty." This exposes the limitations of unidirectional translation and static displays in conveying cultural depth or meeting demands for immersive interaction[2]. Digital twins, however, enable precise reconstruction of cultural-physical contexts. For instance, LiDAR-scanned replicas of Shaoxing's Jian Lake revive Li Bai's poetic landscapes, while AR transforms abstract symbols like "fishing fires at midnight" into multisensory installations. Neuroaesthetic research further validates that multimodal narratives activate  $\theta$ -wave oscillations (4–8 Hz), directly enhancing cross-cultural empathy.

This study addresses three questions: (1) How can digital tools deconstruct Tang poetry's cultural genes for cross-media translation? (2) Through what neurocognitive mechanisms do immersive narratives enhance cultural identity and behavioral engagement? (3) How can tourism integration synchronize cultural dissemination with economic value creation? Theoretically, we propose a "Three-Phase Cultural Meme Translation Model" (image extraction, semiotic deconstruction and zontextual reconfiguration), redefining digital twins as "cognitive infrastructure" and integrating Appadurai's cultural landscapes with Lefevere's rewriting theory. Practically, strategies like "gradient narrative design," NFT-smart contract models, and DAO governance are tested through cases such as Ningbo's Dongqian Lake, where NFT-based monetization boosted international tourism revenue by 18%[3]. These findings advance scalable pathways for globalizing high-context heritage while supporting rural revitalization and cultural economy transitions.

## 2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Research on the globalization of cultural heritage has long been constrained by the unidirectional perspectives of traditional cross-cultural communication theories and an overemphasis on technological instrumentalism. While existing studies have advanced our understanding of semiotic decoding and cultural adaptation mechanisms, they inadequately explain how digital technologies reshape cognitive schemas or systematically reveal the symbiotic logic between cultural identity and economic value in tourism-integrated contexts[4]. To address these gaps, this study critically integrates cross-cultural communication theories with cutting-edge digital humanities scholarship, proposing a "Cultural Gene Translation–Emotional Resonance–Value Loop" framework. This analytical model transcends the explanatory boundaries of traditional paradigms, offering new theoretical tools for the global dissemination of high-context cultural heritage.

## 2.1 Critical Reconstruction of Cross-Cultural Communication Theory

Traditional cross-cultural communication research, anchored in Hall's high-/low-context model, emphasizes the deterministic impact of cultural differences on information encoding and decoding. High-context cultures (e.g., China, Japan) rely on shared background knowledge and implicit symbols to convey meaning, whereas low-context cultures (e.g., the U.S., Germany) prioritize explicit, direct expression. While this theory explains Western audiences' difficulties in decoding Tang poetry's symbolic clusters (e.g., "a solitary boat in moonlight"), it suffers from three limitations: Over-simplification of cultural dynamism: It neglects technology's role in reconstructing semiotic systems[5]. For instance, digital twins transform abstract symbols like "solitary boat" into interactive 3D models via AR, converting high-context imagery into multisensory experiences that partially mitigate context dependency.

Underestimation of agency in cultural adaptation: Berry's acculturation theory outlines four strategies (integration, assimilation, separation, marginalization), but its assumptions remain rooted in physical migration contexts, failing to account for digital natives' virtual co-creation of cultural symbols (e.g., Genshin Impact players reinterpreting Liyue's cultural motifs). Lack of empirical validation for emotional resonance: Neuroaesthetic studies demonstrate that multimodal narratives activate theta waves (4–8 Hz) in the prefrontal cortex and limbic system, correlating strongly with cultural identity—a mechanism absent in traditional frameworks. To overcome these limitations, this study proposes a Three-Phase Cultural Meme Translation Model, redefining cross-cultural communication as a technologically mediated system of symbolic reproduction: Phase 1: Image Extraction: Core cultural symbols are identified through computational text analysis (e.g., BERT models). For the Zhedong Tang Poetry Road, lexical clusters like "moonlight," "verdant peaks," and "fishing fires" are recognized as carriers of "reclusion," "Zen philosophy," and "wandering" through vector clustering and co-occurrence networks. Phase 2: Semiotic Deconstruction: Digital twins convert abstract symbols into multimodal objects. For example, Li Bai's "moonlit lake shadows" at Shaoxing's Jian Lake are reconstructed as an AR-navigable space using LiDAR scans and dynamic lighting, with haptic feedback simulating river breezes (5–10 Hz) to stimulate somatosensory responses. Phase 3: Contextual Reconfiguration: Translated symbols are embedded into target cultural contexts. At the GLOW Light Festival in Eindhoven, "fishing fires at midnight" became an interactive light installation responsive to audience movement, fused with Nordic nautical symbols (e.g., Viking ships)[6], achieving cross-cultural semantic regeneration. This model positions technology as "translation infrastructure" bridging physical, digital, and cognitive spaces.

## 2.2 Digital Narrative and Tourism Integration: Theoretical Frontiers

Digital technologies not only alter cultural transmission forms but also reshape the value-generation logic of cultural tourism. Early tourism studies, dominated by Pine and Gilmore's "experience economy" theory, emphasized passive consumption (e.g., museum visits). However, digital twins and generative AI have catalyzed a paradigm shift toward participatory creation. For example, players of Black Myth: Wukong reinterpret mythological symbols through modding tools, fostering bidirectional cultural flows via social media. This "produsage" model demands redefined host-guest relationships, positioning tourists as co-creators of cultural meaning.

Neuroaesthetic research further quantifies digital narratives' efficacy[7]. fMRI experiments reveal that multimodal narratives (visual-auditory-tactile) increase activation in the prefrontal cortex and amygdala by 40% compared to text-only engagement. This provides physiological evidence for mitigating cultural discount: immersive experiences bypass linguistic barriers to directly trigger emotional resonance. At Ningbo's Dongqian Lake, an AR-based "Poetry Trail" game elevated participants' theta-wave intensity (4.3 $\mu$ V vs. 3.1 $\mu$ V for non-participants,  $t = 4.78$ ,  $p < 0.001$ ) and social media sharing rates to 87%.

Blockchain technologies, particularly NFTs and smart contracts, are redefining cultural economies. NFTs enable digital heritage derivatives (e.g., Wang Wei's Mountain Dwelling in Autumn dynamic scrolls) to acquire scarcity and investment value, while smart contracts automate revenue distribution among creators, local tourism funds, and communities. For instance, 30% of Shaoxing's Jian Lake NFT proceeds fund heritage preservation, establishing a "creation-dissemination-profit". Such "technology-institution" synergies mark a shift from resource-dependent to innovation-driven cultural tourism.

## 2.3 Theoretical Integration: the STEAM Synergy Model

Building on these critiques and integrations, this study proposes a STEAM Synergy Model (Storytelling–Technology–Emotion–Action–Monetization) to frame the symbiotic relationship between cultural dissemination and tourism



economies. The model comprises five interconnected dimensions: **Storytelling**: Nonlinear narratives centered on cultural genes[8]. For example, tourists on the Zhedong Tang Poetry Road AR tour choose between "Du Fu's Wanderings" or "Wang Wei's Zen Retreat," each offering distinct symbols and emotional experiences. **Technology**: Integrated use of digital twins, AIGC, and neural interfaces. Unreal Engine constructs high-fidelity scenes, AIGC generates multilingual content, and brain-computer interfaces dynamically adjust parameters (e.g., lighting, music) based on real-time emotional feedback[9]. **Emotion**: Neuroaesthetic mechanisms (e.g., theta-wave activation) that enhance cultural identity. **Action**: Behavioral engagement driven by gamification (e.g., virtual poetry collection tasks). **Monetization**: Blockchain-enabled value loops (e.g., NFT royalties, DAO governance). This model bridges digital humanities, cross-cultural communication, and tourism economics, offering a holistic framework for globalizing high-context heritage.

### 3 RESEARCH METHODOLOGY AND DESIGN

To systematically analyze the cross-cultural dissemination mechanisms of the Zhedong Tang Poetry Road, this study employs a mixed-methods approach, integrating qualitative tracking, quantitative analysis, and experimental validation. This framework ensures scientific rigor and ethical compliance across the entire research process—from data collection to processing and analysis—while uncovering the intrinsic logic of cultural translation and tourism symbiosis under digital empowerment.

#### 3.1 Mixed-Methods Design

The research follows an explanatory sequential design, structured in three phases: **Qualitative hypothesis generation**: Digital ethnography captures naturalistic tourist behaviors. **Quantitative hypothesis testing**: Controlled experiments validate emotional and behavioral outcomes. **Triangulation**: Cross-validation synthesizes findings from multiple data sources.

**Phase 1: Digital Ethnography**. A research team embedded in the Zhedong Tang Poetry Road AR Guide System conducted six months of naturalistic observation on 320 international tourists at key sites like Shaoxing's Jian Lake and Ningbo's Dongqian Lake. Data collection utilized: Tobii Pro Glasses 3 eye-trackers (120Hz sampling rate) to record visual attention duration. High-precision GPS ( $\pm 0.1\text{m}$  error) to map movement trajectories. Haptic feedback logs (e.g., virtual poetry scroll interaction frequency, mean = 2.3 clicks/minute). API-crawled player reviews (2,150 entries) from Poetry Journey (Steam Beta), analyzed via SnowNLP for sentiment polarity (positive/neutral/negative). Qualitative data were coded using NVivo 14, yielding three themes: semiotic comprehension barriers, technological interaction preferences, and emotional resonance thresholds.

**Phase 2: Computational Text Analysis**. A corpus of 1,000 Tang poems associated with Zhedong was compiled from the Complete Tang Poems digital database. Using a BERT multimodal model (batch size=32, epochs=50), semantic vectorization identified core cultural memes. Gephi 0.10.1 visualized co-occurrence networks, revealing clusters such as "moonlight–solitary boat–verdant peaks" (287 co-occurrences, weight=0.76), which were linked to "reclusive philosophy." TF-IDF algorithms further prioritized 20 high-frequency symbols (e.g., "fishing fires," "temple bells," "wandering") to guide digital twin design.

**Phase 3: Controlled Experiment**. A double-blind experiment recruited 150 Western participants (50% female, aged 18–45), randomly assigned to: Experimental group ( $n=75$ ): Experienced Shaoxing's Jian Lake digital twin (AR poetry projections + haptic feedback). Control group ( $n=75$ ): Received traditional text-based guides. Outcome measures included: PANAS affective scales (Watson et al., 1988) for subjective cultural identity. Emotiv EPOC X EEG recordings ( $\theta$ -wave: 4–8Hz;  $\alpha$ -wave: 8–12Hz). Data preprocessing involved Butterworth filtering (30Hz cutoff), followed by ANCOVA (controlling for age, gender, cultural familiarity). Results showed the experimental group's  $\theta$ -wave activation (mean=4.5 $\mu\text{V}$ ) exceeded the control group (3.3 $\mu\text{V}$ ) by 36.4% ( $F=12.67$ ,  $p<0.001$ ), with cultural identity scores rising 41.2% ( $t=5.89$ ,  $p<0.001$ ).

#### 3.2 Data Sources and Processing

Data integration and standardization leveraged Python 3.10, Tableau 2023.2, SPSS 28.0, and R 4.2.1: Behavioral data: Encrypted user IDs, eye-tracking heatmaps, GPS trajectories, and 6,450 filtered social media posts (from #TangPoetryRoad) analyzed via LDA topic modeling ("cultural cognition," "tech experience," "emotional expression"). Text data: 52,000-character corpus tokenized into 12,345 tokens, with Word2Vec 300D embeddings. GPT-4 multilingual narratives underwent BLEU scoring (mean=0.62) and manual validation. Experimental data: EEG power spectral density (PSD) and Likert scores normalized as Z-scores, excluding outliers ( $\pm 3\sigma$ ).

#### 3.3 Ethical and Validity Safeguards

The study adhered to the Declaration of Helsinki and was approved by Zhejiang University's Ethics Committee (ZU-IRB2023-0456). Participants provided informed consent, with anonymized data stored on encrypted servers accessible only to the research team. ISO 9001-certified devices (eye-trackers, EEG) ensured measurement validity.

#### 3.4 Methodological Innovations

This mixed-methods design pioneers the integration of neuroscience and computational humanities in cultural heritage research. By combining digital ethnography with EEG, the study reveals both observable behaviors and neurocognitive mechanisms of cultural identity. BERT modeling and blockchain integration further enable quantifiable cultural gene analysis and economic translation. Limitations include high hardware costs (e.g., LiDAR scanners) and interdisciplinary coordination demands. Future studies could adopt open-source tools (Unity ML-Agents) and crowdsourcing (Amazon Mechanical Turk) to enhance replicability.

#### 4 CASE ANALYSIS: CROSS- CULTURAL PRACTICES OF THE ZHEDONG TANG POETRY ROAD

The digital dissemination practices of the Zhedong Tang Poetry Road provide empirical validation for the feasibility and innovation of the theoretical framework proposed in this study. Focusing on two core sites—Shaoxing’s Jian Lake and Ningbo’s Dongqian Lake—this section examines how digital twin technology reconstructs cultural gene translation pathways, supported by neuroaesthetic experiments and blockchain economic models, to systematically demonstrate the dual efficacy of immersive narratives in enhancing cultural identity and fostering tourism symbiosis.

##### 4.1 Digital Twin Scenarios: Physico-Digital Cultural Experiences

At Shaoxing’s Jian Lake, a pivotal node of the Zhedong Tang Poetry Road, the primary challenge lies in translating the abstract imagery of Li Bai’s *Dreaming of Tianmu Mountain*—such as “the lake moon illuminates my shadow, guiding me to Shanxi”—into perceptible cross-cultural experiences[10]. Utilizing a Leica BLK360 LiDAR scanner (0.6mm precision), the research team generated a 1.2TB point cloud dataset of the Tang-era water system. Through Unreal Engine 5.2’s Lumen global illumination system, dynamic scenes were rendered, while AR glasses projected poetic verses, and haptic vests simulated river breezes (5–10Hz frequency), enabling visitors to embody Li Bai’s creative context. Data revealed that international tourists spent an average of 14.3 minutes in this augmented environment—a 120% increase compared to traditional exhibitions (6.5 minutes)—with 73% reporting “intuitive access to the poet’s mindset.” EEG monitoring further confirmed a 35% rise in  $\theta$ -wave activation ( $4.7\mu\text{V}$  vs.  $3.5\mu\text{V}$  for text-only engagement,  $t = 4.12$ ,  $p < 0.001$ ), underscoring the role of multimodal narratives in bridging high-context cognitive barriers.

##### 4.2 Cultural Gene Translation: from Symbols to Behavioral Engagement

Guided by the BERT-derived “symbol priority matrix”, 20 core cultural genes—such as “fishing fires at midnight” and “solitary return to green peaks”—were selected for translation. Taking Zhang Ji’s *Night Mooring at Maple Bridge* as an example, the translation process involved: Image Extraction: Identifying the emotional core of “solitude” and “wandering” via word vector clustering[11]. Semiotic Deconstruction: Converting “fishing fires” into an interactive light installation responsive to visitor proximity (0–1000 lumen brightness). Contextual Reconfiguration: Embedding the symbol into the GLOW Light Festival (Eindhoven) alongside Nordic maritime motifs (e.g., Viking ships). Neuroaesthetic trials revealed a 37% increase in  $\theta$ -wave intensity ( $4.7\mu\text{V}$ ) among Western participants, with PANAS scores for “resonance with solitude” rising significantly ( $M = 4.2/5$  vs.  $3.1/5$ ,  $t = 5.67$ ,  $p < 0.001$ ). These results demonstrate that technologically mediated symbol reconstruction can transcend cultural boundaries while expanding the adaptability of cultural genes through contextual hybridization.

##### 4.3 Tourism Synergy: Dual Circulation of Cultural and Economic Value

At Ningbo’s Dongqian Lake, the economic potential of the STEAM model’s “monetization layer” was tested through NFT-based cultural IP activation. A limited-edition NFT collection of Wang Changling’s *Lotus-Picking Song* (1,000 units) was launched on OpenSea, with smart contracts allocating 30% of sales to local tourism funds. By June 2023, secondary market premiums reached 35%, and 12% of NFT holders participated in offline poetry festivals, forming a “virtual collection–physical engagement–cultural dissemination”. Economically, international tourist spending rose by 18% (from ¥520 to ¥614 per capita), while derivative revenues grew from 8% to 15% of total income. Social media analytics revealed over 5.2 million exposures for TangPoetryRoad, with 87% of AR task participants sharing content voluntarily, catalyzing a viral “dissemination–consumption–redissemination” cycle[12]. This model not only enhances cultural IP value but also incentivizes global co-creation through DAO governance—for instance, open-source algorithms for poetic symbol translation have attracted contributions from developers in 23 countries.

##### 4.4 Constraints on Cross-Cultural Efficacy

Despite technological advancements, two critical constraints emerged: Technological Dependency: 7% of Western tourists reported AR-induced motion sickness (SSQ scores  $\geq 15$ ), while younger audiences prioritized technological novelty (LiDAR interest:  $4.5/5$ ) over cultural depth (“Zen landscape” comprehension:  $2.8/5$ ). Cultural Oversimplification: AIGC-generated summaries (e.g., reducing “unity of heaven and humanity” to “harmony with nature”) improved readability (BLEU=0.62) but diluted philosophical nuance. To address these, a “gradient narrative” strategy was implemented: offering academic annotations for enthusiasts and gamified AR tasks (e.g., “Poetry Trail”).

for casual visitors[13]. Testing showed gradient narratives significantly improved cultural comprehension ( $M = 4.1/5$  vs.  $3.3/5$ ,  $t = 3.89$ ,  $p < 0.001$ ) and reduced motion sickness to 3%.

## 5 CONCLUSIONS AND FUTURE DIRECTIONS

The rapid evolution of digital technologies has fundamentally reshaped paradigms for cultural heritage dissemination. This study, centered on the Zhedong Tang Poetry Road, systematically elucidates the mechanisms of cross-contextual cultural gene translation, the neuroaesthetic foundations of emotional resonance, and the techno-economic logic of tourism value symbiosis through interdisciplinary theoretical construction and mixed-methods validation. Findings demonstrate that digital twin technology, via dynamic mapping across physical, digital, and cognitive spaces, effectively mitigates cultural discount while triggering "cultural value-added" effects[14]. Furthermore, the synergistic integration of immersive narratives and blockchain economies offers innovative pathways for globalizing high-context heritage and advancing rural sustainability. These contributions expand the technological dimensions of cross-cultural communication theory and provide methodological insights for digital humanities and tourism economics.

### 5.1 Key Findings

The study confirms that digital twins' efficacy in translating high-context cultural genes stems from their capacity to reconstruct symbolic systems multimodally. At Shaoxing's Jian Lake, LiDAR-scanned 3D models and AR-projected verses transformed Li Bai's abstract imagery into interactive experiences, while haptic feedback simulating river breezes (5–10Hz) activated visitors' somatosensory cognition, enabling embodied engagement with poetic contexts. Neuroaesthetic trials quantified this process: experimental groups exhibited 35% stronger  $\theta$ -wave activation ( $4.7\mu V$  vs.  $3.5\mu V$ ,  $t = 5.89$ ,  $p < 0.001$ ) and 41.2% higher cultural identity scores, proving that immersive narratives bypass linguistic barriers to enhance cross-cultural empathy. Economically, Ningbo's NFT-driven model achieved an 18% increase in international tourist spending and a 15% rise in derivative revenues through blockchain-enabled value loops, demonstrating the viability of "cultural dissemination–economic growth–heritage preservation" symbiosis.

### 5.2 Theoretical Contributions

This research advances scholarship in three ways: Cultural Gene Translation Model: The proposed three-phase model (image extraction  $\rightarrow$  semiotic deconstruction  $\rightarrow$  contextual reconfiguration) repositions technology as "translation infrastructure" bridging physical, digital, and cognitive spaces, transcending the static perspectives of Hall's and Berry's frameworks. Neuroaesthetic Validation: By quantifying  $\theta$ -wave activation (+35%) as a biomarker of cultural identity, the study provides neuroscientific evidence for cultural discount theory, challenging Appadurai's assumption of technology as a passive cultural vector[15]. STEAM Synergy Framework: The narrative-technology-emotion-action-monetization model reveals five-dimensional interdependencies between digital storytelling and tourism economies, offering a cross-disciplinary lens for analyzing techno-cultural ecosystems.

### 5.3 Practical Implications

Three actionable strategies emerge: Gradient Narratives: Deploy AIGC to generate tiered content—academic annotations for enthusiasts and gamified AR tasks (e.g., "Poetry Trail") for casual visitors. Trials showed gradient designs improved cultural comprehension ( $M = 4.1/5$  vs.  $3.3/5$ ) and reduced AR-induced motion sickness to 3%. Wearable Poetic Interfaces: Develop flexible e-skin sensors to simulate natural sensations described in Tang poetry (e.g., humidity for "drizzle dampening robes"), enhancing accessibility for children and elderly audiences. DAO-Driven Co-Creation: Leverage blockchain to incentivize global users in building cultural gene repositories. For instance, open-source algorithms for Tang poetry translation have received contributions from developers in 23 countries, fostering decentralized innovation.

### 5.4 Limitations and Future Research

Three limitations warrant attention: Geographic Bias: Samples focused on Western audiences; efficacy in African, Latin American, and Islamic contexts remains untested. Cost Barriers: High expenses of LiDAR scanners ( $>¥300,000$ ) may hinder adoption in low-income regions. Ethical Risks: AIGC's oversimplification of cultural symbols (e.g., reducing "unity of heaven and humanity" to "harmony with nature") risks diluting philosophical depth. Future directions include: Developing metaverse-native narrative engines that adapt to users' cultural schemas (e.g., generating "hero's journey" or "mono no aware" storylines via GPT-4 and real-time emotion tracking). Expanding cross-cultural neuroaesthetic comparisons to quantify how symbols like "Zen landscapes" resonate within Sufi or African philosophical frameworks. Establishing Cultural Fidelity Indices (CFI) to evaluate AIGC outputs, requiring expert validation and BLEU scoring to prevent cultural distortion. Advocating policy innovations, such as national "Digital Twin Heritage Funds" and NFT copyright regulations, to balance technological empowerment with ethical stewardship.

### 5.5 Concluding Remarks

The digital humanities era has inaugurated a new paradigm of "translation-resonance-symbiosis" for cultural heritage globalization. The Zhedong Tang Poetry Road exemplifies how technology can dismantle high-context barriers while embedding emotional and economic value into cultural transmission. Yet, as technologies like neural interfaces and blockchain accelerate, we must vigilantly balance innovation with cultural fidelity. The future of heritage dissemination lies in "intelligent mediation" and "emotional connectivity," but its soul remains rooted in preserving the humanistic essence that technologies strive to translate. This interplay of technological rationality and cultural authenticity will define the next frontier for scholars and practitioners alike.

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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# DIGITAL TWIN-ENABLED CULTURAL TRANSLATION AND TOURISM SYNERGY A CROSS-CULTURAL COMMUNICATION STUDY OF THE ZHEDONG TANG POETRY ROAD BASED ON THE STEAM MODEL

ZiHan Li, Wei Xia\*

*School of Applied Foreign Languages, Zhejiang Yuexiu University, Shaoxing 312000, Zhejiang, China.*

*Corresponding Author: Wei Xia, Email: 20172256@zyufl.edu.cn*

**Abstract:** In the context of deepening globalization and digitalization, the international dissemination of cultural heritage faces dual challenges of cultural discount and contextual contradictions. Focusing on the Zhedong Tang Poetry Road, this study proposes a theoretical framework of "digital twin-enabled cultural gene translation" to explore pathways for enhancing cross-cultural communication efficacy through immersive narratives and cultural-tourism synergy mechanisms. Using a mixed-methods approach (digital ethnography, computational text analysis, and controlled experiments), the findings reveal: (1) Digital twin technology enables cross-contextual lossless translation of Tang poetry imagery through virtual-physical symbiosis, with a core pathway of "image extraction, semiotic deconstruction, and contextual reconstruction"; (2) Immersive narratives significantly enhance international audiences' cultural identity via emotional resonance (37% increase in  $\theta$ -wave activation intensity) and induce behavioral transformation (22% rise in revisit rates); (3) The "STEAM model" (Storytelling-Technology-Emotion-Action-Monetization) serves as a nexus for synergistic value creation between cultural dissemination and local economies. This study provides theoretical innovation and practical paradigms for cultural heritage communication in the digital humanities era, while offering neuroaesthetic evidence for the "cultural premium" effect mediated by technology.

**Keywords:** Digital twin; Cultural translation; Cultural-tourism synergy; Zhedong Tang Poetry Road; STEAM model

## 1 INTRODUCTION

The acceleration of globalization and the evolution of digital technologies are profoundly reshaping the paradigms of cultural heritage dissemination. As a poetic crystallization of Chinese civilization, the Zhedong Tang Poetry Road embodies the cultural genes of "landscape-poetic-heart" but faces barriers in international communication due to high-context cultural gaps and disconnects with the experience economy. Traditional dissemination models, reliant on textual translation and static exhibitions, struggle to evoke emotional resonance among international audiences regarding Tang poetry's artistic conception or achieve sustainable tourism value conversion. Concurrently, emerging technologies such as the metaverse and digital twins offer novel possibilities for the "sensibilization" and "cross-contextual translation" of cultural heritage. Against this backdrop, there is an urgent need to develop integrated pathways that combine technological empowerment, narrative innovation, and industrial collaboration for cultural communication.

This study addresses three core questions: First, how can digital humanities technologies deconstruct the cultural genes of Tang poetry and adaptively translate them for low-context audiences? Second, how can immersive narratives bridge cultural cognitive differences to establish mechanisms for emotional resonance and behavioral engagement? Third, what is the synergistic logic between cultural communication efficacy and local economic development in tourism-integrated scenarios? To answer these questions, this research introduces the concept of "digital twin," constructs a "physical-digital-cognitive" tri-space mapping model, and innovatively proposes the "STEAM" synergy mechanism (Storytelling-Technology-Emotion-Action-Monetization). Through mixed-methods research, including digital twin practices in Shaoxing's Jian Lake and neuroaesthetic experiments, the study elucidates the role of technological mediation in mitigating cultural discount and generating cultural premium.

## 2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

### 2.1 Key Conceptual Definitions

#### 2.1.1 Cultural meme translation

Cultural memes, as the basic units of cultural transmission, carry shared meaning systems within specific communities. Building on Lefevre's rewriting theory and digital humanities techniques, this study operationalizes cultural meme translation as the process of extracting, deconstructing, and cross-media reassembling core cultural symbols through technological mediation to achieve cognitive adaptation of high-context heritage for low-context audiences[1]. For the Zhedong Tang Poetry Road, cultural memes manifest as clusters of imagery (e.g., "solitary boat," "moonlit peaks," "verdant mountains") that require digital twin technology to translate textual symbols into multisensory narratives.

#### 2.1.2 Digital twin-enabled heritage tourism scenarios

Digital twin technology constructs tripartite mappings of physical space, digital space, and cognitive space through high-precision modeling and real-time data interaction. In this study, digital twin-enabled heritage tourism scenarios refer to immersive cultural experience systems generated via AR/VR, LiDAR scanning, and dynamic narrative engines, grounded in the geographical landscapes of the Zhedong Tang Poetry Road. Through virtual-physical symbiosis, international visitors can "embody" the creative contexts of Tang poets[2]. For example, the reconstruction of Du Fu's verse "The Yue women are fair under heaven; May's Jian Lake is cool" in Shaoxing's Jian Lake scenario enables visitors to experience the poet's temporal and spatial milieu.

## 2.2 Theoretical Dialogues and Critiques

### 2.2.1 Limitations of cross-cultural communication theories

Traditional cross-cultural communication research emphasizes the influence of cultural dimensions and contextual differences on information decoding but fails to explain how technological mediation reshapes transmission pathways. For instance, while Hofstede's "individualism-collectivism" dimension partially explains East-West preferences for "reclusive landscapes," it does not reveal how digital narratives mitigate cultural discount through emotional resonance. Furthermore, existing theories predominantly focus on textual and linguistic translation, neglecting the synergistic role of multimodal symbols (visual, auditory, tactile).

### 2.2.2 Paradigm shifts in cultural-tourism integration research

Early cultural-tourism studies centered on Pine and Gilmore's "experience economy" theory, emphasizing passive consumption of cultural scenarios. However, the "participatory creation" paradigm, catalyzed by digital technologies, demands redefined host-guest interactions[3]. For example, Black Myth: Wukong achieves cultural premium through player-driven narrative co-creation, offering insights for the Zhedong Tang Poetry Road: cultural-tourism synergy must transition from unidirectional display to bidirectional engagement, positioning tourists as co-producers of cultural meaning.

## 2.3 Theoretical Innovation: The STEAM Synergy Mechanism

To address theoretical gaps in technological empowerment and value conversion for cross-cultural heritage communication, this study proposes the STEAM Synergy Mechanism (Storytelling-Technology-Emotion-Action-Monetization), a framework for digital twin-driven cultural meme translation and cultural-tourism value co-creation. **Storytelling Layer:** Centered on Tang poetry imagery, this layer adopts interactive branching designs (e.g., dual-path choices between "heroic verses" and "Zen-inspired verses") to enhance narrative immersion through visitor agency[4]. **Technology Layer:** Integrating digital twin modeling, AI-generated content (AIGC), and neural interface feedback, it enables cross-media translation of cultural symbols from physical to digital spaces. For example, LiDAR-scanned reconstructions of Jian Lake, combined with dynamic poetry projections, revive the creative contexts of Tang poets. **Emotion Layer:** Neuroaesthetic experiments validate the efficacy of multimodal narratives. Data show that ink-wash animations significantly activate international audiences' prefrontal cortex and limbic systems (37% increase in  $\theta$ -wave intensity), providing physiological evidence for cultural discount mitigation. **Action Layer:** Gamification mechanisms (e.g., AR-based poetry collection tasks) transform cultural experiences into interactive behaviors. Empirical results indicate a 41% rise in social media sharing rates among task participants. **Monetization Layer:** A closed-loop system linking "IP-digital assets-real economy" converts cultural dissemination outcomes into sustainable revenue. For instance, blockchain-enabled NFT releases of Tang poetry (e.g., Wang Changling's "Lotus-Picking Song") at Dongqian Lake increased international tourist spending by 19%.

The STEAM model's core innovation lies in redefining digital twins as "cognitive infrastructure" that maps "physical-digital-cognitive" spaces, transforming cultural heritage dissemination from unidirectional output to an ecosystem of "meaning co-creation and value sharing"[5]. This framework expands the technological dimensions of cultural globalization theories and offers interdisciplinary methodological support for digital humanities and cultural-tourism studies.

## 3 RESEARCH METHODOLOGY

### 3.1 Mixed-Methods Research Design

To achieve the dual objectives of "cultural meme translation" and "cultural-tourism synergy mechanisms," this study employs a mixed-methods approach that integrates qualitative tracking, quantitative analysis, and experimental validation. The design is structured into three sequential phases: **Phase 1: Digital Ethnography**[6]. By embedding the "Zhedong Tang Poetry Road AR Guide System," the research team conducted naturalistic tracking of international tourists (N = 320) in hybrid virtual-physical environments. Eye-tracking devices (Tobii Pro Glasses 3) and GPS positioning data were used to record visual focus duration, path selection preferences, and haptic feedback behaviors (e.g., virtual poetry card click frequency). Post-cleaning, NVivo 14 facilitated thematic coding to extract cross-contextual acceptance patterns of cultural symbols. **Phase 2: Computational Text Analysis.** A corpus of 1,000 Tang poems associated with the Zhedong region was compiled from the Complete Tang Poems database. Using a BERT-based multimodal pre-training model, the study deconstructed Tang poetry imagery clusters. Word vector clustering (Word2Vec) and co-occurrence network analysis (Gephi 0.10.1) identified core cultural memes (e.g., the "moon-

solitary boat-verdant peaks" triad) and their semantic associations, forming an "image translation priority matrix." Phase 3: Controlled Experiment. A double-blind experiment recruited Western participants (N = 150), randomly assigned to an experimental group (experiencing digital twin narratives) and a control group (receiving traditional text-based guides). Subjective emotional responses were measured via the PANAS affective scale (Watson et al., 1988), while neurophysiological data ( $\theta$ -wave and  $\alpha$ -wave intensity) were captured using an Emotiv EPOC X EEG headset. ANCOVA analysis confirmed significant between-group differences ( $p < 0.05$ ).

### 3.2 Data Sources and Processing

The study integrates multi-source heterogeneous data through systematic standardization: Behavioral Data: Derived from encrypted logs of the AR guide system (user IDs anonymized via SHA-256), capturing international tourists' interactions (e.g., eye-tracking heatmaps, GPS trajectories) at core sites like Shaoxing's Jian Lake and Ningbo's Dongqian Lake. Text Data: Includes 1,000 Tang poems and user-generated content (UGC) from social media platforms (e.g., 8,920 posts under #TangPoetryRoad), cleaned via regular expressions to remove irrelevant content. Experimental Data: EEG signals (.edf files) and PANAS scores (5-point Likert scale), preprocessed using Butterworth filters and standardized to Z-scores. Data processing utilized Python 3.10 for cleaning, feature extraction, and format conversion, while spatiotemporal behavior patterns were visualized dynamically via Tableau 2023.2.

### 3.3 Ethical and Validity Safeguards

The study strictly adhered to the Declaration of Helsinki and was approved by Zhejiang University's Ethics Committee (No. ZU-IRB2023-0456). Participants provided informed consent, with data anonymized and stored on secure servers. Triangulation validated consistency across behavioral logs, neurophysiological signals, and interview texts. For instance, a correlation analysis between visual dwell time (mean = 8.7 seconds) and  $\theta$ -wave activation intensity ( $r = 0.62$ ,  $p < 0.01$ ) in AR scenarios confirmed methodological robustness. External validity was enhanced through stratified sampling (34% Western, 33% East Asian, 33% Middle Eastern), with chi-square tests ( $\chi^2 = 1.24$ ,  $p = 0.54$ ) confirming group balance. Technical reliability was ensured via Leica BLK360 LiDAR (0.6mm accuracy) and Unreal Engine 5.2's Lumen global illumination system, maintaining a scene reconstruction error rate below  $\pm 3\%$ . Inter-coder consistency ( $\kappa = 0.89$ ) minimized subjective bias.

## 4 CASE ANALYSIS AND FINDINGS

### 4.1 Digital Twin Scenario Construction: Virtual-Physical Symbiotic Cultural Experiences

Taking Shaoxing's Jian Lake as an example, this study reconstructed Tang-era water systems and vegetation landscapes with high precision using LiDAR scanning and Unreal Engine 5.2 (model error rate  $\pm 2.1\%$ ), augmented by dynamic poetry projection systems. When visitors entered the "Li Bai's Poetic Realm" scenario, AR glasses projected verses from "Dream Journey to Tianmu Mountain" in real time, accompanied by spatial audio and haptic feedback devices (e.g., vests simulating river breezes), recreating the spatiotemporal context of "The lake moon illuminates my shadow, sending me to Shanxi." Data revealed that international visitors spent an average of 14.3 minutes in this scenario—a 120% increase compared to traditional exhibitions (6.5 minutes)—with 73% reporting "intuitive access to the poet's creative mindset." [7] This practice demonstrates that digital twin technology significantly lowers cognitive barriers for high-context cultures through embodied spatial experiences and multisensory narratives.

### 4.2 Cultural Gene Translation Pathways: From Imagery to Behavioral Symbolism

To translate Tang poetry imagery across cultures, the research team developed an "imagery priority matrix," identifying 20 core cultural genes such as "fishing fires at midnight" and "solitary return to green peaks." For instance, the translation of "fishing fires at midnight" involved three stages: Imagery Extraction: Deconstructing the emotional core of "solitude" and "wandering" from Zhang Ji's "Night Mooring at Maple Bridge." Semiotic Deconstruction: Transforming "fishing fires" into an interactive light installation where brightness dynamically adjusts to visitor movement speed. Contextual Reconstruction: Embedding the symbol into the GLOW Light Festival (Eindhoven) alongside Nordic nautical motifs (e.g., Viking ships). Neuroaesthetic experiments showed that Western audiences experienced a 37% increase in prefrontal  $\theta$ -wave activation (4.7 $\mu$ V) when interacting with the installation compared to text-only engagement, alongside significant improvements in "resonance with solitude" scores ( $t = 3.29$ ,  $p < 0.01$ ) [8]. These findings indicate that technologically mediated symbol reconstruction can trigger emotional resonance in low-context audiences while expanding the adaptability of high-context cultural genes.

### 4.3 Cultural-Tourism Synergy Efficacy: Dual Circulation of Communicative Value and Economic Returns

The Dongqian Lake case in Ningbo validated the STEAM model's synergistic effects. Through AR-based "Poetry Trail" tasks, international visitor revisit rates rose from 18% to 22%, while derivative income increased from 8% to 19% of total revenue. Further analysis revealed that 87% of task participants shared their experiences on social media (#TangPoetryRoad garnered over 5.2 million impressions), forming a "dissemination-consumption-redissemination"

viral loop[9]. Economically, the blockchain-enabled release of Wang Changling's "Lotus-Picking Song" NFTs (limited to 1,000 editions) allocated 30% of sales revenue via smart contracts to local heritage conservation and community cultural projects. By June 2023, 12% of NFT holders participated in offline poetry festivals, establishing a closed-loop system linking cultural dissemination and regional economic growth.

#### 4.4 Constraints on Cross-Cultural Communication Efficacy

Despite technological advancements, two critical constraints emerged: Technological Dependency: 7% of Western visitors reported motion sickness from AR devices, while younger audiences prioritized technological novelty over cultural depth (e.g., higher interest in LiDAR scanning than in "Zen landscapes"). Cultural Simplification: AI-generated summaries (e.g., reducing "unity of heaven and humanity" to "harmony with nature") improved readability but diluted philosophical nuance[10]. To address these, the study proposes a "graded narrative" strategy: Deep Engagement Path: Offering annotated poems and scholarly guides for enthusiasts. Broad Accessibility Path: Designing gamified AR tasks for casual visitors[11]. Testing showed that graded narratives significantly improved cultural comprehension (mean score: 4.1/5 vs. 3.3/5 for single-path narratives,  $t = 3.89$ ,  $p < 0.001$ ) and reduced motion sickness incidents to 3%[12].

### 5 CONCLUSIONS AND DISCUSSION

#### 5.1 Research Conclusions

This study systematically elucidates the translation mechanisms and cultural-tourism synergy pathways for high-context cultural genes in global dissemination, focusing on the Zhedong Tang Poetry Road through digital twin technology and mixed-methods research. Key findings include: Cultural Gene Translation: Digital twins enable cross-contextual lossless translation of Tang poetry imagery via tri-space mapping ("physical-digital-cognitive"), operationalized through a progressive "image extraction-semiotic deconstruction-contextual reconstruction" model. Immersive Narrative Efficacy: Immersive designs significantly enhance international audiences' emotional resonance (37% increase in  $\theta$ -wave activation) and behavioral engagement (22% rise in revisit rates). STEAM Synergy: The "Storytelling-Technology-Emotion-Action-Monetization" model fosters a shift from unidirectional cultural output to a "value co-creation" ecosystem, demonstrating the dual capacity of technological mediation to mitigate cultural discount and generate cultural premium.

#### 5.2 Practical Implications

The study proposes three actionable strategies for international dissemination and tourism development: Graded Narrative System: Tailor content via AIGC to cater to diverse audiences—academic annotations for enthusiasts and gamified AR tasks for casual visitors. Wearable Poetic Devices: Utilize flexible e-skin sensors to simulate natural sensations described in Tang poetry (e.g., humidity for "drizzle dampening robes"), enhancing immersive accessibility. DAO Governance: Implement decentralized autonomous organizations (DAOs) to incentivize global user participation in cultural gene co-creation (e.g., open-source algorithms for poetry translation). For instance, blockchain-enabled NFT releases at Ningbo's Dongqian Lake boosted international tourist spending by 19%, while Shaoxing's virtual-physical symbiosis model offers replicable technical paradigms for sites like the Dunhuang Caves and the Forbidden City. These practices advance China's "cultural power" strategy and inject cultural vitality into regional economies.

#### 5.3 Future Directions

While this study provides a theoretical and practical framework for digital heritage communication, future research should address three dimensions: Technological Integration: Combine generative AI (e.g., GPT-4 multimodal models) with metaverse architectures to build adaptive cultural translation systems. For example, real-time AI analysis of visitors' cultural backgrounds and emotional feedback could generate context-specific narratives (e.g., "hero's journey" for Western audiences, "mono no aware" aesthetics for East Asian audiences), enhancing precision and inclusivity. Cross-Cultural Adaptation: Expand beyond Western-centric samples to include African, Latin American, and Islamic contexts. Investigate how digital narratives differentially impact diverse cultural spheres. For instance, adapt Tang poetry's "Zen landscapes" to align with Sufi philosophical symbols for Islamic audiences.

### COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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