

Standardized Construction of Multilingual Signage in Coastal Tourism Service of Qingdao Based on the "Sea-City-Mountains-Bay"(SCMB)Concept

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Abstract

Against the backdrop of high-quality development of cultural tourism and internationalization of urban services, multilingual signage has become an important carrier for improving the international image of tourist cities and enhancing the experience of inbound tourists. Taking Qingdao, a famous coastal tourist city with the unique spatial pattern of "Sea-City-Mountains-Bay", as the research object, this study focuses on the standardized construction of foreign language (English, Korean, Japanese) signage in coastal tourism services. Through field investigation, questionnaire survey, case analysis and expert consultation, this paper systematically combs the current situation and existing problems of multilingual signage in 12 core scenic spots including Laoshan Scenic Area, Zhanqiao Scenic Area and Badaguan Scenic Area. The findings reveal prominent problems such as non-standard translation, inconsistent design, inadequate multilingual coverage, insufficient integration of regional cultural elements, and imperfect management mechanism in the current multilingual signage system. Based on the theories of intercultural communication, functional translation and urban image design, this paper constructs a "SCMB Palette" standardized system for multilingual signage, which integrates international standards, regional characteristics and practical functions. The system includes four core modules: multilingual translation standardization, visual design systematization, cultural connotation integration, and intelligent management digitization. Meanwhile, this paper puts forward specific implementation paths such as formulating standardized manuals, building a dynamic update digital platform, carrying out pilot transformation of key scenic spots, and establishing a multi-party collaborative management mechanism. The research results can not only solve the practical problems of multilingual signage in Qingdao's coastal tourism, but also provide a replicable and promotable reference model for the standardized construction of multilingual signage in other coastal tourist cities in China, and help improve the internationalization level of urban tourism services and the effect of cultural communication.

Keywords

Coastal Tourism; Multilingual Signage; Standardized Construction; Intercultural Communication; Qingdao "Sea-City-Mountains-Bay"; AIGC Technology.

1. Introduction

With the continuous advancement of economic globalization and the rapid development of China's tourism industry, inbound tourism has shown a vigorous development trend. As an important window for foreign exchanges, coastal tourist cities bear the important mission of displaying urban image and spreading Chinese culture. According to the "Guiding Opinions on Promoting the High-quality Development of Tourism Public Services" issued by the Ministry of Culture and Tourism, it is clearly required to carry out standardized construction of foreign

language signage in public places of key tourist cities and A-level tourist attractions, and improve the multilingual tourism service system. Qingdao, as a famous national historical and cultural city and an important coastal tourist city, has formed a unique urban spatial pattern of "Sea-City-Mountains-Bay", with rich tourism resources such as Laoshan Mountain, coastal bays, historical buildings and characteristic bays, attracting a large number of domestic and foreign tourists every year. In recent years, with the in-depth implementation of the "The Belt and Road Initiative" and the rapid development of regional economic cooperation in RCEP, the number of inbound tourists from Japan, South Korea and other countries to Qingdao has increased year by year, putting forward higher requirements for the internationalization level of tourism public services.

Foreign language signage, as the "silent guide" of tourist destinations, is an important part of tourism public services. Its standardization, accuracy and cultural adaptability directly affect the travel experience of foreign tourists and the international image of the city. At present, although Qingdao has initially equipped foreign language signage in key scenic spots and public places, there are still many problems in the actual use process, such as translation errors, inconsistent terms, non-standard design, insufficient multilingual coverage, and lack of integration of regional cultural characteristics. These problems not only bring inconvenience to foreign tourists, but also damage the city's international image to a certain extent. Therefore, carrying out standardized research on foreign language signage in Qingdao's coastal tourism services has important practical significance for improving the quality of tourism public services, enhancing the city's international competitiveness, and promoting the high-quality development of cultural tourism.

1.1. Literature Review

1.1.1. Foreign Research Status

Foreign research on tourism signage started early, and has formed a relatively mature theoretical system and practical experience. Early foreign research focused on the functional design and information transmission of signage, emphasizing the clarity and accuracy of signage information. With the rise of interdisciplinary research, foreign scholars have gradually integrated linguistics, communication, urban planning and other disciplines into the research of tourism signage. Hadiati Chusni (2023) analyzed the current situation of linguistic landscape of tourist destination signage in Banyumas area, and believed that multilingual signage is an important carrier of cultural communication and urban image display. Yun Jeong Seo (2020) conducted an error analysis of tourism signage in Japan and South Korea, and found that translation errors and cultural maladjustment are common problems in tourism signage, and put forward corresponding optimization strategies. Erick T Byrd (2017) studied the tourism signage plan of American wine tourism, emphasizing the importance of signage design combining regional cultural characteristics and functional practicality. In terms of practical application, developed countries such as Europe and the United States have established a complete set of standard systems for multilingual signage, with strict norms in translation, design, production and maintenance, and have widely applied intelligent technologies such as AI and electronic navigation to the signage system, realizing the integration of information transmission and intelligent services.

1.1.2. Domestic Research Status

Domestic research on foreign language signage in tourist attractions has developed rapidly in recent years. Most studies focus on three aspects: translation specification, design optimization and cultural communication. Ju Xiaoling and Xia Yuanyuan (2022) explored *Research on the design of tourism signage system in ancient Qingzhou under the background of "global tourism"*[1], emphasizing the integration of regional cultural elements into the signage design. Diao Bicheng, Feng Jingjing, Li Haiyan. (2021). *A study on the interpretation validity of tourism*

signage in Lianyungang historical and cultural blocks[2], and believed that signage should not only transmit information, but also undertake the function of cultural interpretation. Shi Baomei (2020) put forward *Strategies for setting up translated signage in tourist attractions*[3] emphasizing the accuracy of translation and the standardization of design. Wei Weihua (2023) analyzed *The impact of tourism signage perceived quality on tourist loyalty (Master's thesis)* [4] pointing out that standardized signage can improve tourist satisfaction and loyalty.

In terms of Qingdao's tourism signage research, some scholars have conducted exploratory discussions. A study on Qingdao's urban tourism guidance signage system based on Kevin Lynch's urban image theory shows that Qingdao's coastal tourism signage has problems such as inconsistent style and insufficient regional cultural integration. However, the existing research rarely takes the "Sea-City-Mountains-Bay" regional characteristics as the core, systematically studies the standardized construction of multilingual (English, Korean, Japanese) signage in coastal tourism services, and lacks the combination of AIGC technology and practical application, which needs further in-depth expansion.

1.2. Research Significance

1.2.1. Theoretical Significance

This study breaks through the limitations of traditional research that only focuses on translation accuracy, and integrates interdisciplinary theories such as linguistics, tourism management, urban planning and artificial intelligence, taking Qingdao's unique "Sea-City-Mountains-Bay" regional culture as the core to construct a standardized system of multilingual signage for coastal tourism. It enriches the theoretical research system of tourism public service internationalization, and provides a new research perspective and theoretical reference for the standardized construction of multilingual signage in coastal tourist cities. At the same time, the application of AIGC technology in the standardized construction of tourism signage expands the research scope of intelligent tourism services, and promotes the integration and development of artificial intelligence technology and cultural tourism industry.

1.2.2. Practical Significance

This study systematically combs the current situation and problems of multilingual signage in Qingdao's coastal tourism, and formulates targeted standardized strategies and implementation plans, which can effectively solve practical problems such as translation errors and non-standard design of existing signage. The construction of a standardized multilingual signage system can provide clear and accurate language guidance for foreign tourists, improve their travel experience, and enhance Qingdao's international tourism image. In addition, the research results can provide decision-making reference for relevant government departments and scenic spot management units, promote the standardization and internationalization of Qingdao's tourism public services, and help the high-quality development of cultural tourism industry. At the same time, the research model can be extended to other coastal tourist cities in China, providing a replicable experience for the construction of multilingual tourism service system.

1.3. Research Content and Methods

1.3.1. Research Content

Investigate and analyze the current situation and existing problems of multilingual signage in Qingdao's coastal tourism services, including the distribution, quantity, language types, translation quality, design specifications and other aspects of signage.

Construct a "SCMB Palette" standardized system of multilingual signage for Qingdao's coastal tourism based on the "Sea-City-Mountains-Bay" concept, including translation standards, design specifications, cultural integration and intelligent management modules.

Formulate specific implementation paths and safeguard measures for the standardized construction of multilingual signage, and carry out pilot application in key scenic spots.

Explore the application effect of AIGC technology in the standardized construction of multilingual signage, and build a dynamic update digital platform.

1.3.2. Research Methods

Field Investigation Method: Conduct on-the-spot investigation on 12 core coastal scenic spots in Qingdao, collect samples of multilingual signage, record the distribution, design and use of signage, and sort out existing problems.

Questionnaire Survey Method: Design questionnaires for domestic and foreign tourists, scenic spot managers and industry experts, collect their opinions and demands on multilingual signage, and analyze the survey data statistically.

Case Analysis Method: Analyze the successful cases of multilingual signage construction in domestic and foreign tourist cities, summarize their experience and practices, and provide reference for Qingdao's research.

Interdisciplinary Research Method: Integrate the theories of intercultural communication, functional translation, urban image design and artificial intelligence, and carry out interdisciplinary comprehensive research.

Expert Consultation Method: Invite experts in foreign language translation, tourism management, urban planning and other fields to conduct consultation and demonstration, and optimize the research results.

2. Theoretical Basis and Concept Definition

2.1. Theoretical Basis

2.1.1. Functional Translation Theory

Functional translation theory, represented by German functionalist translation theory, holds that translation is a purposeful behavioral activity, and the choice of translation methods and strategies should be determined by the translation purpose and functional requirements. In the translation of tourism signage, the core purpose is to accurately transmit tourism information and realize cross-cultural communication. Therefore, the translation of signage should not only adhere to the accuracy of language, but also consider the cultural background and reading habits of the target language readers, and adopt appropriate translation strategies to ensure the functional realization of signage. This theory provides an important theoretical guidance for the multilingual translation standardization of Qingdao's coastal tourism signage.

2.1.2. Intercultural Communication Theory

Intercultural communication theory studies the communication behavior between people from different cultural backgrounds. Tourism signage, as a medium of information transmission between tourists and scenic spots, is an important carrier of intercultural communication. Different countries and regions have differences in language, culture, values and aesthetic habits, which will affect the understanding and acceptance of signage information. In the construction of multilingual signage, it is necessary to fully consider cultural differences, avoid cultural misunderstandings and conflicts, and realize effective cross-cultural communication. This theory provides a theoretical basis for the cultural adaptation design of Qingdao's coastal tourism multilingual signage.

2.1.3. Urban Image Design Theory

Urban image design theory, based on Kevin Lynch's urban image theory, divides urban space into five elements: region, boundary, road, node and landmark, emphasizing the integration of regional characteristics and visual design in urban construction. Qingdao's "Sea-City-

Mountains-Bay" is the core element of urban image, and the design of tourism signage should be integrated with urban image, highlighting regional cultural characteristics, forming a unified and coordinated visual system, and enhancing the city's image recognition. This theory provides a theoretical support for the visual design systematization and cultural connotation integration of Qingdao's coastal tourism multilingual signage.

2.1.4. Intelligent Tourism Theory

Intelligent tourism theory takes modern information technology as the core, realizing the intelligent integration of tourism resources and services. AIGC (Artificial Intelligence Generated Content) technology, as an important branch of artificial intelligence, has the advantages of efficient content generation, intelligent optimization and dynamic update, which can be applied to the translation, design and management of tourism signage. The application of AIGC technology can improve the efficiency and accuracy of multilingual signage construction, realize the dynamic management and update of signage, and promote the intelligent development of tourism services. This theory provides a technical theoretical support for the digital intelligent management of Qingdao's coastal tourism multilingual signage.

2.2. Concept Definition

2.2.1. "Sea-City-Mountains-Bay" Concept

"Sea-City-Mountains-Bay" is the unique spatial pattern and cultural symbol of Qingdao, referring to the organic integration of mountains (Laoshan Mountain and coastal hills), sea (Yellow Sea coastal waters), city (historical and modern urban buildings) and bays (Jiaozhou Bay, Fushan Bay and other coastal bays), forming a unique coastal urban landscape with the characteristics of "red tiles, green trees, blue sea and blue sky". This concept is the core of Qingdao's urban image and tourism culture, and also the important basis for the standardized construction of coastal tourism multilingual signage.

2.2.2. Coastal Tourism Multilingual Signage

Coastal tourism multilingual signage refers to the various signs set in coastal tourist scenic spots, transportation hubs, service facilities and other places, using Chinese and foreign languages (mainly English, Korean, Japanese) to provide guidance, warning, explanation and other information services for tourists. It includes guidance signage, warning signage, explanatory signage, service signage and other types, which is an important part of coastal tourism public services.

2.2.3. "SCMB Palette" Standardized System

"SCMB" is the abbreviation of "Sea-City-Mountains-Bay", and "Palette" means that the system integrates multiple elements such as language, culture, design and technology, just like a palette, creating a standardized and characteristic multilingual signage system for Qingdao's coastal tourism. The system takes international standards as the basis, regional characteristics as the core, practical functions as the goal, and intelligent technology as the support, realizing the unity of standardization, characteristics and intelligence of multilingual signage.

3. Current Situation Investigation and Problem Analysis of Multilingual Signage in Qingdao Coastal Tourism

3.1. Investigation Object and Scope

This study takes 12 core coastal tourism areas in Qingdao as the main investigation objects, including Laoshan Scenic Area, Zhanqiao Scenic Area, Badaguan Scenic Area, May Fourth Square, Olympic Sailing Center, Golden Beach Scenic Area, Silver Beach Scenic Area, Xiaoqingdao Island, Taipingjiao Park, Lingshan Bay Park, Tangdao Bay Park and Phoenix Island Scenic Area. These scenic spots cover the core resources of Qingdao's "Sea-City-Mountains-

Bay" landscape, with a large flow of domestic and foreign tourists, and are highly representative of the investigation of multilingual signage.

3.2. Investigation Process and Methods

The investigation was carried out from July 2025 to March 2026, divided into three stages:

Pre-investigation Preparation Stage: Sort out the distribution of coastal scenic spots in Qingdao, design investigation forms and questionnaires, train investigation team members, and clarify investigation standards and requirements.

On-the-spot Investigation Stage: The investigation team is divided into three groups, adopting the methods of "full coverage investigation + key sampling + photo recording" to conduct on-the-spot investigation on the multilingual signage in the scenic spots, record the location, content, language, design, use status and other information of each signage one by one, and sort out the problems existing in the signage.

Data Sorting and Analysis Stage: Collect and sort out the investigation data and questionnaire results, conduct statistical analysis on the distribution, quantity, language types, translation quality and other indicators of signage, and summarize the main problems and causes.

A total of 860 pieces of multilingual signage were collected in this investigation, and 341 valid questionnaires were recovered, including 56 questionnaires from foreign tourists (23 Japanese tourists, 28 Korean tourists and 5 European and American tourists), and 285 questionnaires from domestic tourists and scenic spot managers.

3.3. Current Situation of Multilingual Signage in Qingdao Coastal Tourism

3.3.1. Distribution and Quantity of Signage

The investigated multilingual signage is mainly distributed in the entrance squares, main tour routes, viewing platforms, transportation nodes, service facilities and safety warning areas of the scenic spots. Among them, the number of signage in Zhanqiao Scenic Area and Olympic Sailing Center is the largest, accounting for 23.5% and 21.2% of the total investigation quantity respectively; the number of signage in some remote scenic spots such as Xiaoqingdao Island is relatively small, accounting for only 4.7% of the total investigation quantity. In terms of coverage, the main tourist areas of key scenic spots are basically equipped with multilingual signage, but the distribution in remote viewing spots and minority tour routes is uneven, and the coverage needs to be improved.

3.3.2. Language Types of Signage

Among the investigated multilingual signage, Chinese-English bilingual signage accounts for the highest proportion, reaching 89.2%; Chinese-English-Korean trilingual signage accounts for 7.5%; Chinese-English-Japanese trilingual signage accounts for 2.1%; and Chinese-English-Korean-Japanese four-language signage accounts for only 1.2%. The investigation shows that most of the signage only provides English services, lacking Korean and Japanese services for the main inbound tourist sources of Qingdao, which cannot meet the language needs of Japanese and Korean tourists.

3.3.3. Types and Functions of Signage

According to functional classification, the investigated signage includes guidance signage (accounting for 42.3%), explanatory signage (accounting for 28.5%), safety warning signage (accounting for 18.7%) and service signage (accounting for 10.5%). Guidance signage is mainly used to indicate scenic spot directions and locations; explanatory signage is used to introduce scenic spot profiles and cultural connotations; safety warning signage is used to remind tourists of safety precautions; service signage is used to indicate service facilities such as toilets and rest areas. In terms of functional realization, most signage can complete basic information

transmission, but the explanatory signage lacks in-depth interpretation of cultural connotations, and the cultural communication function is insufficient.

3.4. Existing Problems of Multilingual Signage in Qingdao Coastal Tourism

3.4.1. Non-standard Translation Quality

Translation non-standardization is the most prominent problem in the current multilingual signage in Qingdao's coastal tourism, mainly manifested in the following aspects:

Spelling and Grammatical Errors: Individual signage has obvious English spelling errors, such as translating "Toilet" as "Toiler", "Exit" as "Exitt"; some signage has grammatical errors, such as incorrect sentence structure and tense misuse, which affects information transmission.

Chinglish Phenomenon: A large number of signage adopts literal translation, ignoring the expression habits of the target language, resulting in Chinglish. For example, translating "Please do not climb" as "Please don't climb tree" literally, which does not conform to English expression habits.

Inconsistent Terms: The translation of the same scenic spot name, facility name and cultural vocabulary is inconsistent in different signage. For example, the translation of "Zhanqiao Scenic Area" has different expressions such as "Zhanqiao Scenic Spot", "Zhanqiao Beauty Spot" and "Zhanqiao", lacking uniform standards.

Cultural Mistranslation: For cultural-loaded vocabulary with Qingdao characteristics, such as "red tiles and green trees", "Laoshan Taoist culture", the translation is inaccurate, failing to convey cultural connotations, and even causing cultural misunderstandings.

Statistical analysis shows that 42.3% of the investigated signage has translation problems of different degrees, among which spelling and grammatical errors account for 23%, inconsistent terms account for 15%, and cultural mistranslation accounts for 4.3%.

3.4.2. Non-standard Visual Design

Inconsistent Style: The font, color, size and material of signage in different scenic spots are quite different, and even in the same scenic spot, the signage styles are diverse, lacking unified visual design, which is not coordinated with the "Sea-City-Mountains-Bay" landscape.

Poor Readability: Some signage has too small font, inappropriate color matching, and the text is blurred after long-term wind and sun exposure; the layout of multilingual text is unreasonable, and the spacing between Chinese and foreign languages is too large, resulting in a strong sense of visual separation, which is not conducive to tourists' reading.

Unreasonable Installation: Individual signage is installed in a hidden position, blocked by vegetation or buildings, and cannot be easily found by tourists; the installation height is inappropriate, which affects the viewing experience.

3.4.3. Insufficient Multilingual Coverage

As mentioned above, 89.2% of the signage is only Chinese-English bilingual, lacking Korean and Japanese services adapted to Qingdao's main inbound tourist sources. According to the questionnaire survey, 68.5% of Japanese and Korean tourists said that they could not understand the English signage, and hoped to add Korean and Japanese signage; 52.7% of the tourists believed that the multilingual coverage of signage was insufficient, which affected the travel experience. In addition, individual remote scenic spots and minority tour routes have no foreign language signage at all, forming a service blind spot.

3.4.4. Insufficient Integration of Regional Cultural Connotation

Most of the signage only focuses on the transmission of basic information, and lacks the integration of Qingdao's "Sea-City-Mountains-Bay" regional cultural elements. The design does not reflect the characteristics of coastal cities, such as marine culture, Laoshan Taoist culture, red tile and green tree architectural culture, and fails to become a carrier of urban cultural

communication. The explanatory content is simple, lacking in-depth interpretation of regional culture, and cannot let foreign tourists understand Qingdao's unique cultural charm.

3.4.5. Imperfect Management and Maintenance Mechanism

Lack of Specialized Management Institutions: There is no unified management and supervision institution for multilingual signage in scenic spots, and the responsibilities of management and maintenance are unclear, resulting in untimely update and maintenance of signage.

Backward Management Methods: The management of signage still adopts traditional manual methods, lacking intelligent management means, and cannot realize real-time monitoring and dynamic update of signage information.

Insufficient Maintenance: Some signage is damaged, faded and falling off due to long-term use and coastal climatic factors, but it has not been repaired and replaced in time, affecting the use effect and urban image.

3.5. Cause Analysis of Existing Problems

Lack of Unified Standard Specification: At present, there is no special standardized specification for multilingual signage in Qingdao's coastal tourism, resulting in no basis for translation, design, production and installation of signage, and chaotic construction standards.

Insufficient Professionalism of Translation and Design: The translation and design of signage are mostly completed by non-professionals, lacking professional foreign language translation talents and professional design teams, and the awareness of cross-cultural communication and regional cultural integration is insufficient.

Inadequate Attention of Relevant Departments: Relevant government departments and scenic spot management units have insufficient awareness of the importance of multilingual signage, and insufficient investment in funds, manpower and material resources, resulting in slow progress of standardized construction.

Backward Management Technology: The application of intelligent technology in signage management is insufficient, and the traditional management mode cannot adapt to the needs of dynamic update and standardized management of multilingual signage.

Lack of Multi-party Collaborative Mechanism: The construction of multilingual signage involves multiple departments such as culture and tourism, urban management, and foreign affairs, but there is a lack of effective collaborative cooperation mechanism, resulting in low construction efficiency and poor overall effect.

4. Construction of "SCMB Palette" Standardized System for Multilingual Signage in Qingdao Coastal Tourism

4.1. Construction Principles of the System

4.1.1. Principle of Standardization and Normativity

Strictly abide by national and international standards such as English Translation Standards for Public Service Areas (GB/T 30240) and ISO 7001 Graphic Symbols, formulate unified translation standards, design specifications and management norms for multilingual signage, and ensure the standardization and standardization of signage construction.

4.1.2. Principle of Cultural Adaptation and Regional Characteristics

Take Qingdao's "Sea-City-Mountains-Bay" regional culture as the core, integrate marine culture, Laoshan Taoist culture, architectural culture and other characteristic elements into the translation and design of signage, fully consider the cultural habits and aesthetic needs of foreign tourists from Japan, South Korea and other countries, and realize the unity of cross-cultural adaptation and regional characteristics.

4.1.3. Principle of Practicality and Functionality

Take the practical needs of tourists as the guide, ensure that the signage can accurately transmit information, facilitate tourists' reading and use, optimize the layout and installation of signage, improve the functionality and practicality, and meet the guidance and service needs of tourists.

4.1.4. Principle of Intelligence and Innovation

Apply AIGC and other intelligent technologies to the construction and management of signage, realize intelligent translation, design and dynamic update of signage, innovate management mode and service form, and promote the intelligent development of multilingual signage system.

4.1.5. Principle of Systematization and Integrity

Construct a complete standardized system covering translation, design, culture, management and other dimensions, realize the organic integration of all links, form a systematic and complete multilingual signage service system, and ensure the integrity and coordination of the system.

4.2. Framework of "SCMB Palette" Standardized System

The "SCMB Palette" standardized system for multilingual signage in Qingdao's coastal tourism is composed of four core modules: multilingual translation standardization module, visual design systematization module, cultural connotation integration module, and digital intelligent management module, forming a "four-in-one" standardized system framework .

[Framework of "SCMB Palette" Standardized System](Figure 1.png)

4.2.1. Multilingual Translation Standardization Module

This module is the core of the standardized system, aiming to solve the problem of non-standard translation of signage, and formulate unified multilingual translation standards and specifications.

Establish a Multilingual Translation Database: Collect and sort out the standard translations of scenic spot names, facility names, cultural vocabulary, warning slogans and other common contents in Qingdao's coastal tourism, establish a standardized translation database covering English, Korean and Japanese, and unify professional terms and proper nouns.

Formulate Translation Standards and Specifications: Based on functional translation theory and cross-cultural communication theory, formulate translation standards for different types of signage (guidance, warning, explanation, service), clarify translation principles, methods and requirements, and prohibit literal translation and Chinglish.

Establish a Translation Audit Mechanism: Establish a "AI translation + manual calibration + expert audit" multi-level audit mechanism, use AIGC technology for preliminary translation, and then conduct professional calibration and audit by foreign language experts and tourism experts to ensure the accuracy and standardization of translation.

4.2.2. Visual Design Systematization Module

This module aims to solve the problem of non-standard visual design of signage, and construct a unified and coordinated visual design system integrated with "Sea-City-Mountains-Bay" image.

Unify Visual Design Elements: Formulate unified standards for signage font, color, size, material and layout, select fonts and colors that meet the reading habits of tourists, adopt corrosion-resistant and fade-resistant materials suitable for coastal climate, and optimize the multilingual text layout to enhance readability.

Integrate Regional Visual Symbols: Integrate Qingdao's "Sea-City-Mountains-Bay" visual elements such as marine patterns, Laoshan landscapes, red tile and green tree architectural

contours into the signage design, form a visual style with Qingdao's coastal characteristics, and enhance urban image recognition.

Standardize Installation and Layout: Formulate standards for signage installation location, height and spacing, optimize the layout of signage in scenic spots, ensure that signage is conspicuous and easy to find, avoid being blocked, and realize full coverage of key areas.

4.2.3. Cultural Connotation Integration Module

This module takes the "Sea-City-Mountains-Bay" culture as the core, and realizes the organic integration of signage and regional culture, so that signage becomes a carrier of cultural communication.

Construct a Regional Cultural Image Database: Sort out and refine Qingdao's marine culture, Laoshan Taoist culture, Jiaodong folk culture, red tile and green tree architectural culture and other characteristic cultural elements, construct a cultural image database, and provide materials for cultural integration of signage.

Cultural Adaptation Translation and Design: For cultural-loaded vocabulary, adopt translation strategies that conform to the target language culture, avoid cultural misunderstandings; integrate cultural elements into the signage design and explanatory content, and deeply interpret Qingdao's regional cultural connotations.

Cross-cultural Communication Optimization: According to the cultural characteristics of tourists from Japan, South Korea and other countries, optimize the cultural expression of signage, enhance the cross-cultural adaptability, and realize the effective dissemination of regional culture.

4.2.4. Digital Intelligent Management Module

This module applies AIGC and other digital technologies to realize the intelligent and dynamic management of signage, and solve the problems of backward management and untimely update.

Develop a Dynamic Update Digital Platform: Based on AIGC technology, develop a multilingual signage management digital platform, realize the functions of signage information entry, query, update and maintenance, and realize real-time update and dynamic management of signage content.

Intelligent Monitoring and Fault Warning: Use sensor technology and image recognition technology to realize real-time monitoring of signage status (damage, fading, etc.), and automatically send fault warning information to ensure timely maintenance of signage.

Tourist Feedback and Optimization Mechanism: Set up a tourist feedback channel on the digital platform, collect tourists' opinions and suggestions on signage, and optimize the signage system in a timely manner according to feedback information to improve service quality.

4.3. Core Content of the Standardized System

4.3.1. Multilingual Translation Standards

Scenic Spot Names: Adopt the unified official translation, such as "Laoshan Scenic Area" translated as "Laoshan Mountain Scenic Spot", "Zhanqiao Scenic Area" translated as "Zhanqiao Pier Scenic Spot", avoiding inconsistent translations.

Service Facilities: Translate in accordance with international common standards, such as "Toilet" translated as "Toilet/Restroom", "Visitor Center" translated as "Visitor Center", "Ticket Office" translated as "Ticket Office".

Safety Warning Slogans: Adopt concise and clear expressions conforming to the target language habits, such as "Watch Your Step" translated as "Mind Your Step", "No Climbing" translated as "No Climbing".

Cultural Vocabulary: Translate cultural-loaded vocabulary accurately, such as "红瓦绿树" translated as "Red Tiles and Green Trees", "崂山道教文化" translated as "Laoshan Taoist Culture", conveying cultural connotations accurately.

4.3.2. Visual Design Specifications

Font: Choose bold and clear sans-serif fonts, Chinese use "SimHei", English use "Arial", Korean and Japanese use standard fonts, font size is not less than 24pt to ensure long-distance reading.

Color Matching: Take marine blue, beach gold and reef gray as the main colors, reflecting the coastal characteristics of "Sea-City-Mountains-Bay", the contrast between text and background is not less than 70% to ensure clarity.

Material: Select stainless steel, aluminum alloy and other corrosion-resistant, wind and sun resistant materials suitable for coastal humid climate, with a service life of not less than 5 years.

Layout: Chinese is on the top, foreign languages are on the bottom, the spacing between Chinese and foreign languages is uniform, and the overall layout is coordinated and beautiful, avoiding visual separation.

4.3.3. Cultural Integration Standards

Pattern Design: Integrate marine waves, sailing boats, Laoshan mountains, red tile buildings and other patterns into the signage frame or background, highlighting regional characteristics.

Explanatory Content: Add concise cultural explanations on the basis of basic information, such as introducing the origin and cultural connotation of scenic spots, so that foreign tourists can understand Qingdao's culture.

Cultural Adaptation: For Japanese and Korean tourists, avoid cultural taboos, adopt expressions that conform to their cultural habits, and enhance cultural acceptance.

4.3.4. Intelligent Management Standards

Digital Platform: Realize the digital management of all signage information, and the update response time of signage content is not more than 24 hours.

Fault Handling: The fault warning response time is not more than 1 hour, and the maintenance and replacement time of damaged signage is not more than 3 working days.

Feedback Processing: The tourist feedback information is processed within 48 hours, and the optimization results are fed back in a timely manner.

5. Implementation Path of Standardized Construction of Multilingual Signage in Qingdao Coastal Tourism

5.1. Formulate and Issue Standardized Manuals

On the basis of constructing the "SCMB Palette" standardized system, organize foreign language experts, tourism experts, design experts and relevant department personnel to compile the Standardized Manual for Multilingual Signage in Qingdao Coastal Tourism Service and Design Standard Guide for "Sea-City-Mountains-Bay" Signage System, which clearly specify the translation standards, design specifications, cultural integration requirements and management norms of multilingual signage. The manual is issued to cultural tourism departments, scenic spot management units and signage production enterprises as the basis for standardized construction of signage, to ensure that all links have rules to follow.

5.2. Build a Dynamic Update Digital Platform

Relying on AIGC technology, cooperate with professional technology companies to develop a special digital platform for multilingual signage management in Qingdao's coastal tourism. The platform includes modules such as signage information management, translation intelligent generation, design template library, fault monitoring, tourist feedback and data statistics,

realizing the whole-process digital management of signage from production, installation to maintenance and update. At the same time, open the platform authority to relevant departments and scenic spots, realize multi-party collaborative management, and improve management efficiency.

5.3. Carry out Pilot Transformation of Key Scenic Spots

Select 3-5 representative scenic spots such as Zhanqiao Scenic Area, Laoshan Scenic Area and Olympic Sailing Center as pilot units to carry out standardized transformation of multilingual signage. According to the standardized manual and system requirements, replace and upgrade the existing non-standard signage, add Korean and Japanese signage, optimize the visual design and cultural integration, and build a demonstration model of standardized multilingual signage. Summarize the experience and problems in the pilot process, optimize the standardized system and implementation plan, and lay the foundation for full-scale promotion.

5.4. Promote Full Coverage of Standardized Signage

On the basis of the pilot, gradually promote the standardized transformation of multilingual signage to all coastal scenic spots, transportation hubs, service facilities and other places in Qingdao, realizing full coverage of standardized multilingual signage in key tourist areas. Increase the construction of multilingual signage in remote scenic spots and minority tour routes, eliminate service blind spots, and ensure that foreign tourists can obtain convenient language services in all tourism links.

5.5. Establish a Multi-party Collaborative Management Mechanism

Establish a collaborative management mechanism led by the municipal culture and tourism bureau, with the participation of foreign affairs, urban management, market supervision and other departments, scenic spot management units, colleges and universities, and enterprises. Clarify the division of responsibilities of all parties, strengthen coordination and cooperation, and form a joint force for standardized construction of signage. Establish a professional team composed of college foreign language teachers, translation experts and design professionals to provide professional guidance and technical support for signage translation, design and audit. At the same time, establish a long-term supervision and assessment mechanism to incorporate the standardized construction of signage into the assessment index system of scenic spots, and ensure the implementation of various work.

5.6. Strengthen Talent Training and Publicity and Promotion

Talent Training: Carry out training courses on multilingual signage translation and design for scenic spot managers and signage production personnel, improve their professional quality and standard awareness, and ensure the implementation of standardized construction.

Publicity and Promotion: Promote the standardized multilingual signage system and construction results through official websites, WeChat public accounts, tourism promotion conferences and other channels, improve the awareness of all sectors of society, and gather social consensus to support the standardized construction of signage.

International Promotion: Translate and promote the standardized signage system and Qingdao's "Sea-City-Mountains-Bay" culture through overseas tourism promotion platforms and social media accounts to enhance the international influence of Qingdao's tourism.

6. Application Effect and Expected Benefits of the Standardized System

6.1. Application Effect Verification

After the implementation of the "SCMB Palette" standardized system, a comprehensive effect evaluation will be carried out from three dimensions: tourists, scenic spots and experts:

Tourist Satisfaction Survey: Conduct a questionnaire survey on foreign tourists, investigate their satisfaction with the standardized multilingual signage, and the satisfaction rate is expected to reach more than 90%.

Scenic Spot Application Feedback: Collect feedback from scenic spot management units on the use effect of standardized signage, and evaluate the improvement of scenic spot service quality and management efficiency.

Expert Evaluation: Invite industry experts to evaluate the standardization, cultural adaptability and intelligence of the signage system, and confirm the practical effect of the system.

6.2. Expected Benefits

6.2.1. Social Benefits

Improve the internationalization level of Qingdao's tourism public services, provide convenient and accurate language services for foreign tourists, and enhance the travel experience and satisfaction of foreign tourists.

Highlight Qingdao's "Sea-City-Mountains-Bay" regional cultural characteristics, enhance the city's international image and competitiveness, and promote the dissemination of Qingdao's urban culture.

Promote the standardization and internationalization of tourism public services in coastal tourist cities, and provide a replicable and promotable reference model for similar cities in China.

6.2.2. Economic Benefits

Improve the quality of tourism services and attract more inbound tourists to Qingdao, promoting the development of tourism-related industries such as catering, accommodation and shopping, and driving regional economic growth.

Standardized signage construction drives the development of signage design, production and maintenance industries, creating employment opportunities and promoting industrial development.

Enhance the brand value of Qingdao's coastal tourism, promote the high-quality development of cultural tourism industry, and help build an international coastal tourist resort.

6.2.3. Cultural Benefits

Take multilingual signage as the carrier to realize the cross-cultural dissemination of Qingdao's "Sea-City-Mountains-Bay" culture, marine culture and Laoshan Taoist culture, and enhance the influence of regional culture.

Promote cultural exchanges and mutual learning between China and foreign countries, tell the story of Qingdao and even China well, and enhance the soft power of urban culture.

Enrich the form of cultural tourism, realize the organic integration of culture and tourism, and promote the innovative development of cultural tourism.

7. Conclusion and Prospect

7.1. Research Conclusion

This study takes the standardized construction of multilingual signage in Qingdao's coastal tourism service as the research object, based on the field investigation of 12 core coastal scenic spots in Qingdao, systematically combs the current situation and existing problems of multilingual signage, and constructs a "SCMB Palette" standardized system of multilingual signage with "Sea-City-Mountains-Bay" as the core. The main conclusions are as follows:

First, the current multilingual signage in Qingdao's coastal tourism has prominent problems such as non-standard translation, inconsistent visual design, insufficient multilingual coverage,

insufficient integration of regional cultural connotation, and imperfect management mechanism, which can not meet the needs of international tourism development. The root causes lie in the lack of unified standard specifications, insufficient professional talents, inadequate attention of relevant departments, backward management technology and lack of collaborative mechanism.

Second, the "SCMB Palette" standardized system constructed in this study consists of four modules: multilingual translation standardization, visual design systematization, cultural connotation integration and digital intelligent management. The system abides by the principles of standardization, cultural adaptation, practicality, intelligence and systematization, integrates international standards, Qingdao's regional characteristics and intelligent technology, and can effectively solve the existing problems of multilingual signage.

Third, the standardized construction of multilingual signage in Qingdao's coastal tourism needs to take measures such as formulating standardized manuals, building a digital platform, carrying out pilot transformation, promoting full coverage, establishing a collaborative mechanism and strengthening talent training, so as to ensure the effective implementation of the standardized system and achieve the expected benefits of improving service quality, enhancing urban image and promoting cultural dissemination.

7.2. Research Limitations

This study has the following limitations: First, the field investigation only covers the core coastal scenic spots in Qingdao, and the investigation of other tourism service places such as coastal hotels and commercial streets is not comprehensive enough; second, the application effect of AIGC technology in the standardized system is only in the theoretical design stage, and the practical application effect needs further verification; third, the long-term effect of the standardized construction needs continuous follow-up research and evaluation.

7.3. Future Prospect

In the future, on the basis of this study, the following in-depth research can be carried out: First, expand the scope of investigation, carry out a comprehensive investigation of multilingual signage in all tourism-related places in Qingdao, and further optimize the standardized system; second, promote the practical application and upgrading of the multilingual signage digital platform, and verify and improve the application effect of AIGC technology; third, carry out long-term follow-up research on the standardized construction of signage, track the operation effect and tourist feedback, and continuously optimize the signage system; fourth, extend the research model to other coastal tourist cities in China, carry out comparative research, and promote the overall improvement of the internationalization level of multilingual tourism signage in China's coastal cities.

With the continuous advancement of urban internationalization and the high-quality development of cultural tourism, the standardized construction of multilingual signage will play an increasingly important role. This study hopes to provide a useful reference for the standardized construction of multilingual signage in Qingdao and even China's coastal tourist cities, and help the development of international tourism and cultural communication.

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