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Design and Function Construction of Cross-cultural Communication Platform: Exploring the Path to Promote Global Dialogue

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Abstract

In the context of deep integration of globalization and digitalization, cross-cultural communication has become a key driver for international understanding and cooperation. However, issues such as language barriers, cultural differences, and information asymmetry severely limit the effectiveness of cross-cultural communication. This study focuses on the "cultural silhouette" cross-cultural communication platform, exploring the implementation path of an intelligent cross-cultural communication platform through theoretical construction and practical innovation. The study first proposes a hybrid multi-source cultural data collection framework, integrating government open data, academic literature, social media, and other multimodal data to construct an ontology-based cultural knowledge graph, addressing the heterogeneity and fragmentation of cultural data in countries along the "Belt and Road." Secondly, it innovatively introduces microservices architecture theory, designing multilingual real-time translation algorithms and personalized recommendation systems to achieve modularization and dynamic optimization of platform functions. Furthermore, it proposes an intelligent service optimization theory driven by cultural sensitivity, enhancing the precision and inclusiveness of cross-cultural interactions through multi-level evaluation matrices and adaptive dialogue management models. Finally, it constructs a multidimensional evaluation system that integrates technical performance, functional integrity, user experience, and cultural dissemination effects, incorporating ethical risk prevention mechanisms to ensure the sustainable development of the platform. The theoretical contribution of this study lies in breaking through the limitations of traditional static cultural research, providing new technical approaches and methodological support for cross-cultural communication; its practical value is reflected in significantly lowering the barriers to cross-cultural exchange, offering intelligent tools for "Belt and Road" people-to-people connectivity. In the future, research can integrate emerging technologies

such as the metaverse and generative AI to further deepen computational models of cultural intelligence and expand global application scenarios on platforms. This study not only provides a systematic theoretical framework for building cross-cultural communication platforms but also offers interdisciplinary paradigm references for humanities and social sciences research in the digital age.

I. INTRODUCTION

1.1 Research background

Under the background of economic globalization, exchanges between countries are becoming more and more frequent, with the depth and breadth of these interactions continuously enlarging[1]. In the context of the current "Belt and Road" initiative, China has provided policy, financial, institutional, and talent support for cultural exchange under "Belt and Road," opening new strategic opportunities for Chinese culture to go international and enlarge its global influence[2]. With the advancement of the "Belt and Road" initiative, economic, social, and cultural ties among countries along the route are growing tighter. However, due to language barriers, cultural differences, and information asymmetry, cross-cultural communication still faces numerous challenges. Such traditional methods of cultural exchange as offline exhibitions and language training, usually have limitations in time, space, and cost, thus making it difficult to meet the growing demands of global interaction. At the same time, with the development of emerging technologies such as artificial intelligence, big data, and cloud computing, new opportunities are offered for building efficient and intelligent platforms for intercultural communication. In AI-driven simulation scenarios of cultural differences and situational interactive training, by experiencing various communication scenarios across different cultural backgrounds, students can naturally acquire the communication styles, etiquette, and different expressions of different cultures as if they were there[3]. AI technology has made enormous progress in natural language processing, speech recognition, and machine translation, and it now largely have the ability to support language training and talent development[4].

Currently, digital cultural platforms tend to focus on the display of a single language or regional culture, short of systematic integration of cultural diversity along the "Belt and Road" countries. Human communication is the result of both linguistic and non-linguistic interactions[5]. The criteria for evaluating intercultural communication skills are unclear, making them difficult to quantify and specify[6]. What's more, existing platforms generally use static text for interaction, failing to engage users deeply and usually lacks intelligent cultural matching and recommendation capabilities. Consequently, how to make good use of advanced technology to build a multimodal, dynamically optimized cross-cultural communication platform has become a study focus shared by both academia and industry.

1.2 Research significance

This study mainly focuses on the construction and optimization of the "cultural silhouette" cross-cultural communication platform, which has significant theoretical value and practical significance. In terms of theory, this research is innovative since it introduces digital technologies such as artificial intelligence and knowledge graphs into the field of cross-cultural communication, breaking the limitations of traditional static cultural studies and offering new technical pathways for cross-cultural communication research. Meanwhile, the technical framework proposed in the study can effectively address ethical risks in digital cultural dissemination, offering meaningful references for relevant research. By constructing a clear and structured knowledge graph of countries along the "Belt and Road," this study also fills the gap in systematic regional cultural research, providing new data foundations and

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analytical tools for cross-cultural comparative studies.

In practical applications, the intelligent platform of this study greatly reduces the barriers to cross-cultural communication through features such as multilingual support and personalized recommendations, since it provides an effective tool for enhancing mutual understanding among people in "Belt and Road." As artificial intelligence develops with fast pace, its technology is widely applied across various fields, especially in cultural dissemination, where AI holds significant advantages[7]. AI technology uses methods like natural language processing and big data analysis to achieve personalized learning path planning, intelligent assessment, and feedback[8]. The application of AI technology in cross-cultural communication has surpassed simple language translation[9]. The multimodal interaction and AI technology of the platform will greatly boost user experience, setting new benchmarks for digital cultural dissemination. The user behavior data accumulated can also support decision-making for government agencies and businesses, playing an important role in cultural cooperation and tourism promotion. This research applies AI technology to the humanities and social sciences, providing replicable technical solutions for interdisciplinary studies.

1.3 Research content

This study aims to lay emphasis on the theoretical construction and optimization of the "cultural silhouette" cross-cultural communication platform, and systematically explore it from four core theoretical dimensions. First, with regards to cultural data representation theory, the study analyzes the collection and integration methods of multi-source cultural data from countries along the "Belt and Road" route, putting forward a hybrid collection theoretical framework. It explores structured representation models for multimodal cultural data, stressing the construction theory of ontology-based cultural knowledge graphs and cross-lingual alignment mechanisms.

Secondly, in terms of platform architecture, the study researches on the applicability of microservices architecture in cross-cultural platforms, constructs algorithmic models for multilingual real-time translation, develops theoretical frameworks for personalized recommendations, and systematically studies design theories for multimodal interaction interfaces. These theoretical studies provide adequate support in methodology for the technical implementation of cross-cultural communication platforms.

Regarding platform optimization theory, the study focuses on constructing a hierarchical theoretical model for user behavior analysis, researching knowledge representation and reasoning theories in cultural intelligent question-answering systems, aiming to construct a theoretical framework for cultural sensitivity detection, and building up a theoretical system for platform performance monitoring. These theoretical studies aim to address key issues such as intelligent services and conflict avoidance in cross-cultural communication.

Lastly, at the theoretical level of evaluation, this study aims to construct a multidimensional assessment theory model for cross-cultural platforms, combining quantitative with qualitative research methods. In addition, a theoretical framework is to be established for evaluation from dimensions such as technical performance, functional integrity, user experience, and cultural dissemination effects. Special attention is paid to the theoretical discussions on ethical issues like privacy protection and cultural bias, forming theoretical recommendations for the sustainable development of cross-cultural platforms.

These theoretical research contents are interconnected with one another, jointly forming the theoretical research system of a cross-cultural communication platform. The study lays emphasis on theoretical innovation and methodological construction, aiming to provide a copyable theoretical framework and research paradigm for intelligent cross-cultural communication. Through theoretical exploration and methodological

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innovation, this study is dedicated to advancing the development of cross-cultural communication theory in the digital age.

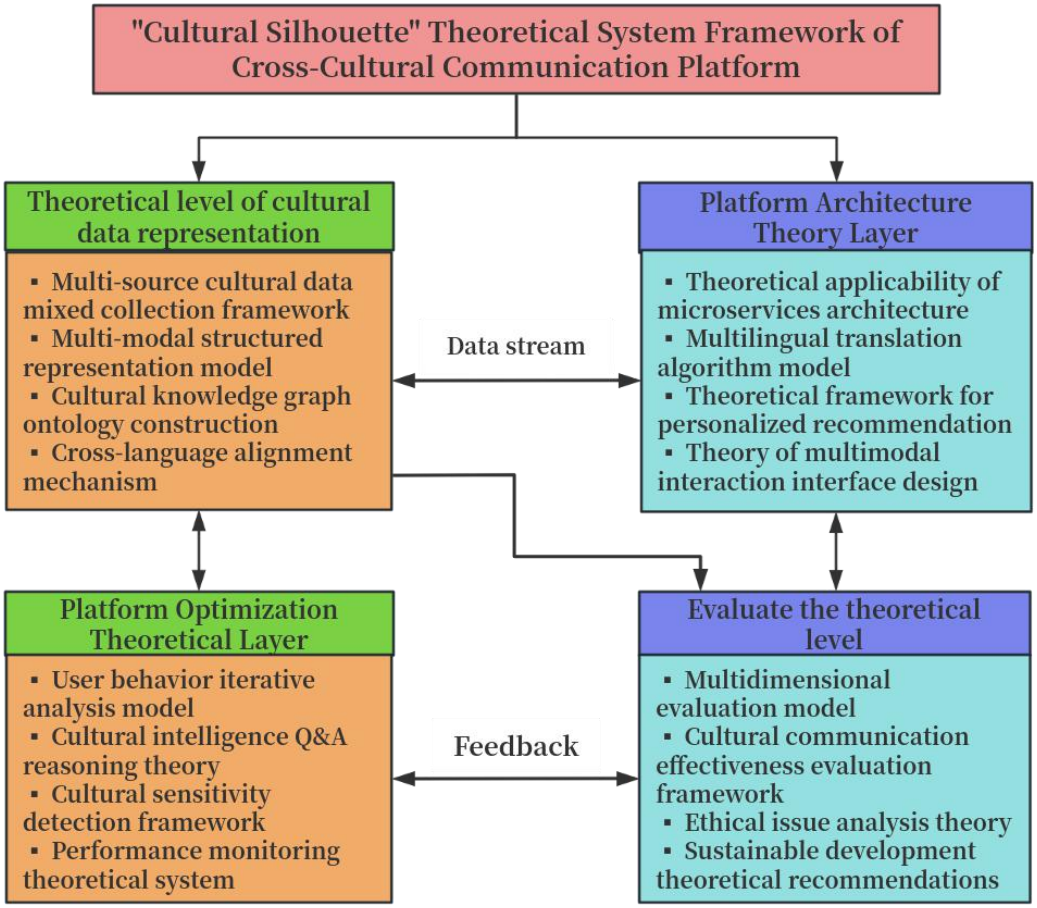

Fig.1 "Cultural Silhouette" Theoretical System Framework of Cross-Cultural Communication Platform

1.4 Innovation points

First, at the level of cultural data representation theory, an innovative hybrid multi-source cultural data collection framework is proposed to break through the limitations of traditional single data sources. By constructing a structured representation model for multimodal cultural data, especially the cross-lingual alignment mechanism based on ontological cultural knowledge graphs, it addresses the challenge of cultural data heterogeneity in countries along the "Belt and Road," providing a new theoretical paradigm for cross-cultural understanding.

Secondly, in terms of platform architecture design, the innovative application of microservices architecture theory to cross-cultural communication scenarios has led to the construction of an integrated theoretical model that combines multilingual real-time translation algorithms, personalized recommendations, and multimodal interactions. This theoretical framework transcends the functional boundaries of traditional platforms, achieving a theoretical coupling between technical architecture and cultural dissemination needs.

In terms of platform optimization theory, the research innovation point is reflected in the establishment of a theoretical framework of cultural sensitivity detection and conflict avoidance, the combination of user behavior analysis iterative model and knowledge representation theory of cultural intelligent question answering system, and the formation of a systematic theoretical solution for

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intelligent service in cross-cultural communication.

Finally, in the construction of the evaluation system, an innovative multi-dimensional assessment theoretical model has been proposed that balances technical performance with cultural dissemination effects. This model incorporates ethical dimensions such as privacy protection and cultural bias into its theoretical framework, providing innovative theoretical guidance for the sustainable development of cross-cultural platforms. These theoretical innovations collectively form a new paradigm in the study of cross-cultural communication in the digital age.

II. ANALYSIS OF THE CURRENT SITUATION OF CROSS-CULTURAL COMMUNICATION PLATFORM "CULTURAL SILHOUETTE"

"Cultural Silhouette," as a comprehensive information platform dedicated to the classification, analysis, and sharing of cross-cultural cases, demonstrates strong practicality and potential for development in today's global context. The platform initially constructs an information hub for cross-cultural communication through features such as case libraries, cultural toolkits, and community support, meeting users' basic needs for case searching, cultural knowledge learning, and interactive discussions. However, from the perspective of theoretical innovation and future development, there is still considerable room for improvement in areas like cultural data representation, architectural design, intelligent services, and evaluation systems. It has not yet fully achieved deep intelligence and theoretical breakthroughs in the field of cross-cultural communication.

Currently, while the platform's case library provides three-dimensional classification views such as map mode, timeline mode, and matrix mode, its data collection still primarily relies on user submissions and public materials. A systematic multi-source cultural data collection framework has yet to be established. The heterogeneity of cultural data, especially when dealing with cases involving diverse cultural backgrounds along the "Belt and Road" countries, is a significant challenge. The platform lacks an ontology-based knowledge graph cross-lingual alignment mechanism, making it difficult to achieve deep semantic correlation analysis in cultural contexts. Additionally, although the platform's intelligent recommendation function can suggest popular cases based on user browsing history, the recommendation algorithm has not been integrated with cultural sensitivity detection theories, failing to accurately identify and avoid potential cultural biases or conflict risks.

In terms of technical architecture, the platform adopts a mobile-friendly design to ensure accessibility of basic functions. However, its underlying architecture remains relatively traditional and fails to fully integrate microservices theory to support advanced features such as real-time translation in multiple languages and personalized dynamic recommendations. For example, when users use scenario simulators involving non-native language scenarios, the platform cannot provide real-time language assistance, which limits the practicality of the tool. Additionally, while community support features include points incentives and case co-creation mechanisms, they lack an intelligent iteration model based on user behavior analysis, making it difficult to dynamically optimize cultural topic settings in discussion areas or accurately match expert resources.

In terms of commercial operations, the resource mall offers paid services such as cultural assessment tools and customized training, but has yet to establish a multi-dimensional evaluation system that balances technical performance with the effectiveness of cultural dissemination. For example, the platform fails to systematically evaluate the actual improvement in users' cross-cultural adaptability, nor does it incorporate ethical dimensions like privacy protection and cultural inclusiveness into its core product design considerations. The lack of this theoretical framework may lead to sustainability challenges for the platform in its long-term development, especially against the backdrop of

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increasingly fierce global competition.

Overall, the "cultural silhouette" platform has established a basic functional framework and clear market positioning, capable of providing support for intercultural learners, enterprises, and researchers. However, to elevate from a tool-based platform to an intelligent and theoretical hub for cross-cultural communication, deep innovations are still required in data representation theory, architectural design optimization, intelligent service iteration, and ethical evaluation systems. Future improvement directions include building a hybrid multi-source cultural data collection framework, introducing microservices architecture to enhance multimodal interaction capabilities, establishing cultural sensitivity detection models, and refining the multidimensional evaluation theory system. These upgrades will drive the platform to form more forward-looking and influential solutions in the field of cross-cultural communication.

Comparison of the current status of the 'Cultural Silhouette' platform and the theoretical upgrade framework.

Core Dimension	Current limitations	Direction of theoretical upgrade
Cultural data representation	▪ Single data source ▪ Insufficient capabilities for processing heterogeneous data ▪ Lack of cross-language alignment mechanisms	▪ Mixed multi-source collection framework ▪ Ontology-driven knowledge graph construction ▪ Multimodal structured representation model
Platform Architecture Design	▪ Traditional monolithic architecture ▪ Lack of real-time translation functionality ▪ Static recommendation system	▪ Microservices transformation ▪ Multi-language algorithm model integration ▪ Dynamic personalized recommendation framework
Intelligent services	▪ Cultural sensitivity detection blank ▪ Community iteration relies on human input ▪ Limitations of scenario simulator features	▪ Cultural conflict risk reasoning model ▪ User behavior analysis feedback loop ▪ Multimodal interaction enhancement (AR/VR)
Cultural data representation	▪ Single dimension for effect assessment ▪ Ethical considerations are not systematized ▪ Homogenization of commercial services	▪ Multi-dimensional evaluation system ▪ Privacy protection and culturally inclusive design ▪ LTV-based user value model

Existing problem transmission path	The path of empowering theoretical innovation
Data fragmentation → weak semantic associationRigid architecture → difficult functional expansionLack of intelligence → bottleneck in user experienceMissing evaluation → sustainability risks	Knowledge Graph → Deep Cultural AnalysisMicroservices → Agile IterationAI Integration → Adaptive ServicesEthical Design → Long-term Competitive Advantage

Fig.2 Comparison of the current status of the 'Cultural Silhouette' platform and the theoretical upgrade framework.

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III. THEORETICAL CONSTRUCTION AND INNOVATION OF INTELLIGENT SERVICE-DRIVEN CROSS-CULTURAL COMMUNICATION PLATFORM

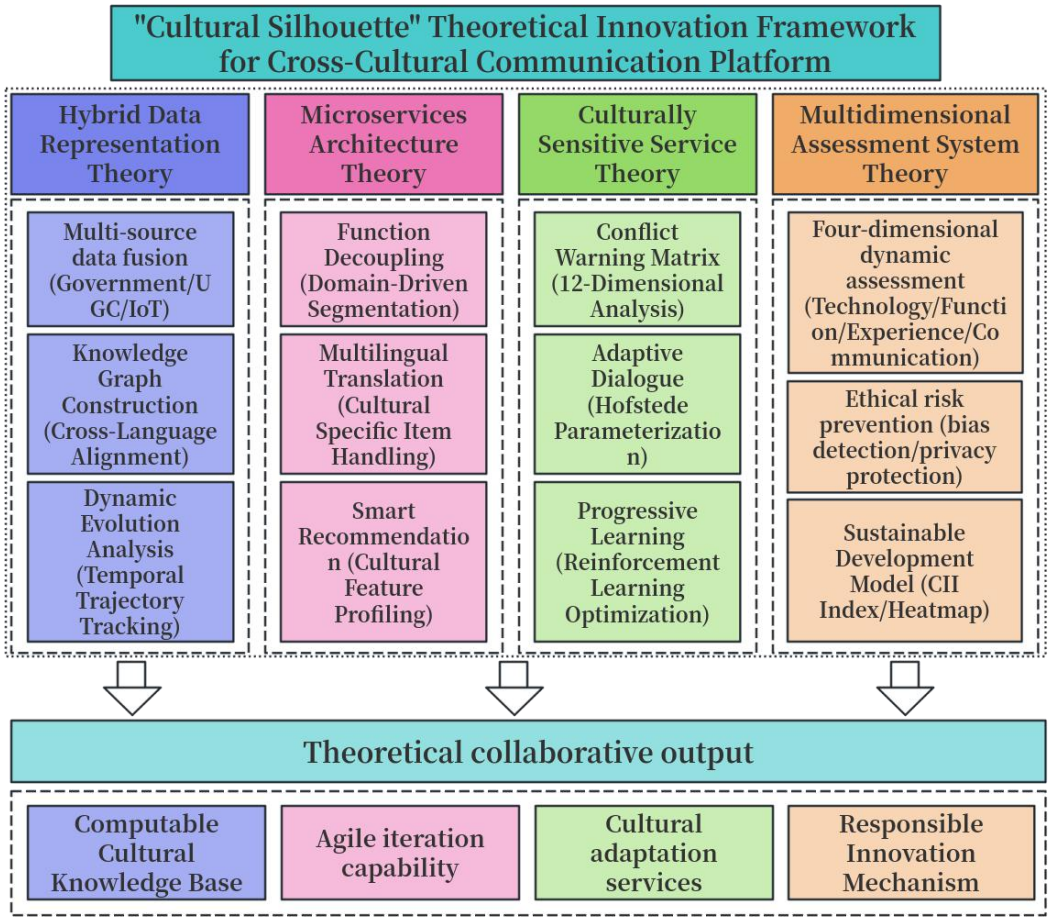

Fig.3 "Cultural Silhouette" Theoretical Innovation Framework for Cross-Cultural Communication Platform

3.1 Cultural representation theory innovation based on hybrid multi-source data collection

The module aims to construct a systematic, multi-dimensional cross-cultural data integration framework to address the heterogeneity and fragmentation of cultural data in countries along the "Belt and Road." This theoretical innovation first breaks through the limitations of traditional single-source data by integrating government open data, academic literature, social media content, user-generated content (UGC), and multi-modal cultural data collected from IoT devices, establishing a dynamically updated cultural data ecosystem. This hybrid collection method not only expands the coverage of cultural data but also significantly enhances the accuracy and timeliness of cultural representation through cross-validation of data sources. During the data integration process, the research particularly focuses on the value extraction of unstructured cultural data, such as the digital transformation of implicit knowledge like folk tales and ceremonial customs, providing a richer semantic foundation for cross-cultural understanding.

At the level of data representation, this module innovatively proposes a structured representation model for multimodal cultural data. The model employs an ontological approach to systematically organize dispersed cultural elements (such as values, behavioral norms, and communication methods) according to semantic relationships, constructing a hierarchical cultural knowledge graph. In response to the linguistic diversity along the "Belt and Road"

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route, a cross-linguistic alignment mechanism has been designed. Through concept mapping and semantic disambiguation techniques, it achieves equivalent associations between cultural terms in different languages. For example, the Chinese concept of "face" is semantically linked to "dignity" (Karama) in Arab culture, providing a precise conceptual reference for cross-cultural communication. This ontology-based knowledge representation method not only addresses the standardization issue of cultural data but also provides a computable cultural knowledge foundation for subsequent intelligent services.

In terms of theoretical application, the innovation of this module lies in deeply integrating cultural representation theory with practical scenario needs. By designing a cultural dimension calculation model, it quantitatively analyzes differences among various cultural groups in dimensions such as power distance and uncertainty avoidance, providing a theoretical foundation for cultural sensitivity detection and conflict early warning. At the same time, the research explores the dynamic evolution patterns of cultural representations, using time series data analysis techniques to track the trajectory of cultural changes, enhancing the platform's adaptability to cultural dynamics. These theoretical innovations collectively form a complete system of cultural data representation, laying a solid foundation of data and knowledge for intelligent services on cross-cultural communication platforms, and offering new methodological support for cross-cultural studies in the digital age.

3.2 Theoretical breakthroughs in cross-cultural platform design with integrated microservice architecture

The theory of cross-cultural platform design that integrates microservices architecture breaks through the module, aiming to build a flexible and scalable technical framework to meet complex functional requirements in cross-cultural communication scenarios. This theoretical innovation deeply embeds the concept of microservices architecture into cross-cultural platform design, achieving modular reorganization of core platform capabilities through functional decoupling and service encapsulation. The study first analyzes the limitations of traditional monolithic architecture in cross-cultural applications, especially the scalability bottlenecks when facing differentiated needs such as multilingual processing and personalized recommendations, leading to the proposal of domain-driven microservice partitioning principles. The platform is deconstructed into over ten functionally independent microservice units, including cultural data services, multilingual processing services, and user profiling services. Each service unit can be independently developed, deployed, and scaled, significantly enhancing the platform's ability to handle high concurrency and multi-regional access, while also providing a flexible technical foundation for subsequent feature iterations.

In terms of theoretical innovation in multilingual real-time translation algorithms, this module breaks through the limitations of traditional machine translation's universality by designing special processing mechanisms for cultural-specific items (culture-specific items) in cross-cultural communication. It constructs domain dictionaries that include cultural background knowledge, deeply coupling the translation model with a cultural knowledge graph. This allows culturally specific terms like "dragon" to automatically select the most appropriate translations based on the target cultural context. Additionally, a microservices architecture enables the deployment of specialized translation engines for different language pairs, such as the customized translation services for key language pairs like Chinese-Arabic and Chinese-Russian under the Belt and Road Initiative. This will significantly enhance the accuracy and fluency of cross-cultural communication. This innovative approach, which combines language technology with cultural intelligence, provides a new technical pathway to eliminate semantic barriers in cross-cultural communication.

In the theoretical breakthrough of personalized recommendation systems, this module proposes a

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multi-dimensional cultural feature user profiling model. By integrating multi-source data such as users' cultural background, language proficiency, and historical interaction behaviors, it establishes a three-dimensional user representation that includes both explicit cultural characteristics and implicit cultural preferences. Based on a microservices architecture, the platform can dynamically combine recommendation algorithm components, such as collaborative filtering, knowledge graph reasoning, and deep learning models, to generate customized content recommendations according to different cultural scenario needs. Of particular note is the cultural sensitivity assessment layer, which can real-time detect potential cultural conflict risks associated with recommended content, ensuring that the recommendations not only align with user interests but also respect cultural differences. This theoretical framework, which deeply integrates recommendation systems with cultural intelligence, will provide crucial support for intelligent services on cross-cultural platforms.

3.3 Theory of intelligent service optimization driven by cultural sensitivity

This module constructs a dynamically evolving cross-cultural intelligent service system, with its core innovation lying in the organic integration of machine learning's predictive capabilities and cultural anthropology's deep insights. The module first establishes a multi-level cultural sensitivity assessment framework, quantitatively analyzing cultural feature markers in user interaction behaviors, such as language preference, topic avoidance tendencies, and sensitivity to non-verbal cues, to build a cultural sensitivity assessment matrix comprising 12 dimensions. This theoretical breakthrough will enable the platform to monitor potential conflict risks in cross-cultural interactions in real time. When it detects that users may violate taboos or norms of the target culture, the system automatically triggers a cultural conflict warning mechanism. For example, in business communication scenarios, the system will alert users to the indirectness of communication methods based on the high-context characteristics of the other culture; during discussions on religiously sensitive topics, it provides moderate content filtering suggestions, thereby achieving preemptive prevention of cultural friction.

In the optimization of intelligent interaction, the theoretical module innovatively proposes a culturally adaptive dialogue management model. This model can transform cultural dimension theories (such as Hofstede's cultural dimensions) into computable dialogue strategy parameters, enabling smart customer service systems to dynamically adjust their responses based on different users' cultural backgrounds. For users from high power distance cultures, the system automatically adopts more formal titles and respectful language; for groups emphasizing collectivism, it focuses more on relationship maintenance rather than directly solving problems. The study also introduces a cultural context understanding engine that analyzes implicit cultural assumptions in user input, such as time concepts (monotiminal/multitiminal) and communication styles (direct/indirect), to generate responses that align with the other party's cultural expectations. This deeply culturally adaptive dialogue management theory significantly enhances the acceptance and effectiveness of cross-cultural intelligent services.

In the realm of knowledge services, this module proposes a progressive learning framework for cultural intelligence. The system continuously analyzes user feedback data on the adoption of cultural recommendations and interaction satisfaction to build a dynamic user profile that adapts to cultural contexts. Leveraging reinforcement learning algorithms, the platform can continuously optimize its cultural sensitivity thresholds and service strategies, forming a virtuous cycle of "service-feedback-optimization." Notably, this theoretical innovation also includes mechanisms for detecting and correcting cultural biases, ensuring the fairness and inclusiveness of intelligent services by regularly reviewing cultural tendencies in system decisions. This theoretical framework, which deeply

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integrates cultural sensitivity throughout the entire service lifecycle, not only enhances the intelligence level of cross-cultural platforms but also provides a crucial methodological reference for culturally adaptive services in the age of artificial intelligence.

3.4 Construction of multidimensional evaluation system and ethical consideration of cross-cultural platform

This module breaks through the limitations of traditional technical platforms with single performance indicators, establishing a comprehensive evaluation framework that integrates quantitative and qualitative methods. The assessment system comprises four interrelated dimensions: the technical performance dimension focuses on hard metrics such as response speed, system stability, and multilingual processing accuracy; the functional completeness dimension evaluates cultural knowledge coverage, tool usability, and scenario adaptability; the user experience dimension measures the platform's actual utility through indicators like cultural adaptability improvement and interaction satisfaction; the cultural dissemination effect dimension emphasizes deep impacts such as cross-cultural understanding promotion and reduction of cultural bias. The study specifically designs a dynamic weight adjustment algorithm to automatically optimize indicator weights based on different development stages and regional characteristics, for example, during the initial promotion phase in countries along the "Belt and Road," the weight of multilingual support capability is appropriately increased, while in the mature operation phase, more attention is paid to the profound impact of cultural dissemination.

In terms of ethical considerations, the module proposes an "ethics-culture" dual-dimensional framework for risk prevention and control. On the technical ethics level, it focuses on addressing user privacy protection, data security, and algorithm transparency issues. By establishing a cultural data classification protection mechanism, it implements encrypted storage and restricted access to sensitive information such as religion and ethnicity. On the cultural ethics level, it aims to prevent algorithmic bias and cultural hegemony, innovatively proposing the construction of a cultural fairness detection tool to regularly scan potential biases in core functions like platform content recommendations and machine translation. For example, the system will monitor whether certain dominant cultural content is over-recommended or if there is any cultural devaluation during translation processing. The study also recommends establishing a cross-cultural ethics committee mechanism, inviting anthropologists, ethicists, and community representatives to participate in platform governance, ensuring that technological development aligns with the value orientation of multicultural coexistence.

The practical value of this theoretical module lies in its development of an operational evaluation toolkit. The study proposes using the Cultural Impact Index (CII) to analyze changes in cultural awareness through user-generated content via natural language processing technology; developing an ethical risk heat map to visually highlight high-risk areas in platform operations; and constructing a sustainability assessment model to predict the social impacts of long-term cultural interactions. These innovative tools not only serve the optimization and iteration of the platform itself but also provide a paradigm for evaluation practices across the entire digital cultural dissemination field. Ultimately, the formed evaluation theory system ensures technological innovation while safeguarding cultural diversity, laying the theoretical foundation for building a responsible digital cross-cultural communication ecosystem.

IV. RESEARCH OUTLOOK

In the future, the intelligent development of cross-cultural communication platforms will face more opportunities and challenges. With the rapid evolution of emerging technologies such as the metaverse and generative AI, intercultural interaction forms will break through the limitations of existing text, images, and videos, moving towards immersive and scenario-based directions. Research

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can explore the application of virtual reality (VR) technology in cultural scene simulation to create more realistic cross-cultural training environments; at the same time, agent (Agent) technology based on large language models is expected to achieve deeper cultural understanding and adaptation, enabling machines to capture subtle differences in cultural contexts. These technological breakthroughs will bring more natural and intelligent interactive experiences to the platform, but they also impose higher demands on the quality of cultural data and the fairness of algorithms.

In terms of theoretical research, it is necessary to further deepen the computational model of cultural intelligence. Current cultural sensitivity detection still primarily relies on static cultural dimension theories. In the future, cognitive science and affective computing can be integrated to establish a dynamic model of cultural cognitive evolution. Additionally, research on cultural diversity along the "Belt and Road" countries needs to be strengthened, particularly in the digital protection and dissemination of minority groups and marginal cultures. This requires platforms to develop more inclusive data collection and representation methods. Long-term tracking studies of cross-cultural communication effects will also become a focus, using big data analysis to reveal the deep impact of digital platforms on cultural identity.

In practical applications, the platform needs to build a more comprehensive global operation system. Considering the differences in digital infrastructure across different countries and regions, research should explore lightweight, offline functional modules to enhance accessibility in underdeveloped areas. At the same time, as the user base expands, how to balance commercial needs with cultural public welfare attributes and establish a sustainable operating model will be key focuses of future research. The platform can also expand cooperation with governments, educational institutions, and multinational corporations to develop targeted cultural training solutions, maximizing social value.

V. CONCLUSION

This study constructs the theoretical framework of the "cultural silhouette" cross-cultural communication platform, systematically addressing key technical challenges in cross-cultural communication through four innovative modules. The hybrid multi-source data collection and knowledge graph representation theory breaks through the bottleneck of cultural data heterogeneity; the microservices architecture design achieves technical coupling of platform functions; the intelligent optimization theory driven by cultural sensitivity enhances service adaptability; and the multidimensional evaluation system ensures sustainable development. The research findings not only provide an innovative paradigm for cross-cultural communication in the digital age but also make significant theoretical contributions to human-machine collaborative cultural dissemination mechanisms and algorithmic ethical governance. In the future, this platform is expected to become a crucial digital infrastructure for promoting "Belt and Road" cultural exchange, providing technological support for building a community with a shared future for mankind.

VI. FUND

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