



Research on the International Communication Paths of Traditional Chinese Medicine Culture Based on Knowledge Ontology

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Abstract. The internationalization of Traditional Chinese Medicine (TCM) has entered an in-depth stage of service export and standard implementation. Nevertheless, the cross-cultural transmission of its cultural core remains the core bottleneck restricting its transformation from "going global" to "taking root in the world". At present, the international communication of TCM culture is still confronted with deep-seated dilemmas such as cross-cultural conceptual ambiguity, fragmented content system, one-way communication chain and weak international discourse power. Most existing studies focus on superficial aspects including communication channels and content production, while few resolve the core contradictions from the perspective of underlying knowledge semantic unification. Taking knowledge ontology as the core theory and basic framework, this paper systematically analyzes the practical dilemmas and essential demands of the international communication of TCM culture, expounds the internal adaptive logic between knowledge ontology and cross-cultural communication of TCM culture, constructs a full-link cyclic communication model covering the ontological knowledge system and iterative optimization, and proposes corresponding implementation paths. The research findings can provide theoretical reference and path guidance for the practice of international communication of TCM culture.

Keywords: Knowledge Ontology; TCM Culture; International Communication; Communication Paths

1 Introduction

Traditional Chinese Medicine (TCM) culture embodies the philosophical wisdom and health concepts of the Chinese nation accumulated over thousands of years, and constitutes a core part of fine traditional Chinese culture with both humanistic and practical values. With the continuous advancement of the Belt and Road Initiative, cross-border services and international cooperation in TCM have achieved large-scale development. According to official data from the National Administration of Traditional Chinese Medicine, TCM has spread to 196 countries and regions across the globe. China has signed intergovernmental TCM cooperation agreements with more

than 40 countries and regions, and built over 30 high-quality overseas TCM centers, marking a steady rise in the industry's international influence.

In sharp contrast, however, the international communication of TCM culture has failed to make parallel progress. The establishment of cultural understanding and value recognition lags far behind the export of TCM technologies, services and products. Cross-cultural semantic deviations of core concepts have become a fundamental obstacle restricting the high-quality international development of TCM. Therefore, based on the inherent characteristics of TCM knowledge ontology, it is of great significance to build a cross-cultural bridge for TCM to safeguard people's health worldwide and construct feasible paths for the international communication of TCM culture.

2 Dilemmas in the International Communication Paths of TCM Culture

The current dilemmas in the international communication of TCM culture lie not merely in the shortage of communication channels or insufficient content supply, but in systematic problems covering everything from the definition of underlying knowledge to the whole communication process. The four core dilemmas progress in a hierarchical manner and collectively point to the same essential demand: it is imperative to establish a globally applicable, standardized and cross-culturally translatable knowledge system in the field of traditional Chinese medicine.

2.1 Differences in Chinese and Western Thinking Modes Induce Cross-Cultural Semantic Divide

TCM's theoretical system, with the holistic view and treatment based on syndrome differentiation as its core, differs fundamentally in thinking logic from the reductionist modern medical system of the West. Core concepts including Yin-Yang, Five Elements, Meridians, Qi and Blood have long been devoid of unified, multi-dimensional semantic definitions and standardized cross-cultural translation norms. Divergent interpretations of the same concepts by different communication entities as well as Chinese and foreign pharmacopoeias further exacerbate cognitive misunderstandings among overseas audiences. Consequently, overseas audiences' perception of TCM mostly remains confined to tangible therapeutic techniques such as acupuncture and tuina, with little basic cognition of its underlying philosophical connotations, complete theoretical system and humanistic spirit, thereby forming an insurmountable barrier to cross-cultural understanding[1].

2.2 Fragmentation of Cultural Communication Aggravates One-sided Perception of TCM

At present, the international communication of TCM culture mainly focuses on fragmented content such as health preservation skills and medical treatment experience,

while the systematic dissemination of TCM's complete system from philosophical foundation to clinical practice is severely insufficient. Content production by different communication bodies lacks a unified authoritative benchmark with prominent homogenization. It generally adopts an extensive mode of "one-size-fits-all content for all audiences", which fails to meet the differentiated needs of audiences in different countries, cultural backgrounds and cognitive levels[2]. Meanwhile, it is difficult to help overseas audiences establish a complete and coherent cognitive system of TCM culture, and tends to aggravate their one-sided understanding of TCM instead.

2.3 Unidirectional Communication Chain Results in the Lack of Communication Feedback Mechanism

Most of the existing communication modes adopt output-oriented unidirectional transmission, which generally emphasizes content production over demand exploration, and focuses on channel placement while neglecting effect feedback. There is a lack of accurate insight into the real information needs of overseas audiences, as well as standardized mechanisms for communication effect evaluation and optimization. It fails to form a complete closed loop of demand exploration - content production - targeted communication - feedback optimization, making it difficult to steadily improve communication effectiveness. It also frequently gives rise to disconnection between content and audience needs, as well as deviation in the transmission of core knowledge.

2.4 Lagging International Discourse Power Restricts the Value Breakthrough of TCM

Although China has led the formulation of multiple international standards for traditional Chinese medicine, their practical application in overseas markets is still subject to obvious limitations. Most developed countries and regions around the world still define TCM as Complementary and Alternative Medicine (CAM), without widespread recognition of its complete medical system and cultural value. Coupled with policy barriers in overseas drug access, registration and supervision, as well as cognitive biases caused by certain negative public opinions, the construction of international discourse power for TCM culture has long been difficult to achieve breakthroughs. The fundamental reason lies in the absence of a unified and standardized TCM knowledge system widely recognized by the international community[3].

3 Resolving the Underlying Contradictions in Cross-cultural International Communication Based on Knowledge Ontology Characteristics

In the field of knowledge engineering, Gruber put forward the classic definition of ontology in 1993, defining it as an explicit and formal specification of a conceptualization. Its core lies in constructing a shareable and reusable domain knowledge se-

mantic framework by formulating unified and unambiguous formal definitions for concepts, attributes and relationships within a specific domain. The core characteristics of this theory are highly internally compatible with the four major core dilemmas and essential demands of the international communication of TCM culture, providing a systematic solution to resolve the underlying contradictions in cross-cultural communication[4].

3.1 Standardized Semantic Characteristics of Knowledge Ontology

It directly addresses the problem of cross-cultural ambiguity in core TCM concepts. The TCM knowledge system constructed based on knowledge ontology is capable of delivering authoritative, unified and multi-dimensional semantic definition for all core concepts in the domain[5]. It clarifies the connotation, denotation, application context and logical boundary of each concept, eliminates conceptual ambiguity across different languages and cultural backgrounds from the source, provides a unique and authoritative knowledge benchmark for the international communication of TCM culture, and directly breaks the core barrier of cross-cultural translation.

3.2 Systematic Structural Characteristics of Knowledge Ontology

It addresses the fragmentation of TCM communication content. TCM culture itself constitutes an integrated knowledge system covering philosophical foundations, core medical theories, diagnosis and treatment systems, health preservation culture, and humanistic spirit. Knowledge ontology can clearly sort out the internal logical correlations among various concepts and modules within the system, integrate scattered and fragmented TCM knowledge into a complete and self-consistent knowledge framework. It fundamentally resolves the fragmentation of current communication content and helps overseas audiences form a full and accurate cognition of TCM culture[6].

3.3 Homogeneous Expansion Characteristics of Knowledge Ontology

It solves the problems of content homogenization and audience-adapted communication. As a unified underlying knowledge framework, knowledge ontology can provide an authoritative knowledge benchmark for content production targeting different scenarios and audiences. Based on the same knowledge ontology, communication content of different levels and forms can be developed according to the cognitive needs of diverse groups such as academic researchers, medical practitioners and the general public. This not only guarantees the accuracy and unity of core knowledge, but also realizes differentiated content supply for different audiences, thus breaking away from the current dilemma of content homogenization.

3.4 Open Iterative Characteristics of Knowledge Ontology

This characteristic solves the unidirectionality of the communication chain. Knowledge ontology features an open space for optimization. By collecting audiences' query demands, cognitive feedback and behavioral data, it can accurately identify knowledge blind spots, cognitive difficulties and content deficiencies in the communication process. It continuously optimizes and improves the knowledge ontology system, and inversely guides content production and communication strategy adjustment, realizing the cyclic iteration of the communication system and fundamentally breaking the limitations of traditional unidirectional communication.

On this basis, digital technologies such as knowledge graph and semantic analysis serve as the core technical carriers for the practical application of knowledge ontology and the realization of intelligent communication. They can transform standardized knowledge ontology into interactive, retrievable and precisely pushed communication applications, providing technical support for the international communication of TCM culture based on knowledge ontology, yet they are not the core research focus of this paper[7].

4 Construction of the Full-link Circular Model for International Communication of TCM Culture Based on Knowledge Ontology

Taking knowledge ontology as the core mainline, audience demand as the orientation, cultural identity as the ultimate goal, and digital technology as the auxiliary support, this paper constructs a full-link circular communication model consisting of six layers: underlying core layer, technology transformation layer, content production layer, precise reach layer, cognitive interaction layer, and feedback iteration layer[8]. The six layers progress hierarchically following the core logic of "ontology construction – ontology application – ontology optimization". Each preceding layer provides the exclusive core benchmark and input support for the subsequent one, while the feedback results of the latter layer inversely optimize the former, forming a complete and sustainably iterative communication cycle. The whole process centers on knowledge ontology without any content deviation.

4.1 Underlying Core Layer: Construction of the Standard System of TCM Cultural Knowledge Ontology

This layer constitutes the sole core and fundamental foundation of the entire communication model. All subsequent procedures are strictly developed on the basis of the knowledge ontology generated by this layer without deviating from the core framework. The core objective of this layer is to complete the ontology construction of knowledge in the field of TCM culture, realize the conceptualized, explicit and standardized formal definition of domain knowledge, and provide a unified and unambig-

uous semantic framework as well as knowledge benchmark for the entire communication system.

The construction process strictly adheres to two inviolable core principles. The first is the principle of academic authority. Taking classic TCM works, Pharmacopoeia of the People's Republic of China, national unified planned textbooks for higher education of TCM, and current national and international standards as the sole fundamental basis, authoritative experts in the TCM field lead the construction and conduct full-process review. This guarantees the academic rigor and content accuracy of the knowledge ontology, and eliminates knowledge deviations and errors from the source. The second is the principle of cross-cultural adaptability. Multi-dimensional semantic annotation is implemented on core TCM concepts to clarify their connotation, denotation and application context, accommodate cognitive habits under different cultural backgrounds, provide an unambiguous semantic benchmark for cross-cultural translation, and prevent cultural misinterpretation[9].

The construction of the standard system for knowledge ontology covers all dimensions of TCM culture, mainly including five logically independent yet interrelated core modules: first, the philosophical foundation of TCM, covering core philosophical thoughts such as Yin-Yang, Five Elements, holistic view, and the unity of human and nature; second, core medical theories, including visceral manifestation, meridians, qi, blood and body fluid, etiology and pathogenesis; third, the diagnosis and treatment system, involving the four diagnostic methods, treatment based on syndrome differentiation, prescriptions, acupuncture and tuina[10]; fourth, health preservation culture, including daily health preservation knowledge of dietary regimen, daily routine regulation, emotional cultivation and physical exercise regimen; fifth, humanistic spirit, referring to the professional ethics and humanistic connotation of TCM centered on the spirit of *Great Physicians Sincere in Conduct and Skilled in Medical Practice*. It comprehensively covers the core values and complete system of TCM culture without content omission or logical overlap.

4.2 Technology Transformation Layer: Application of Structured Knowledge Graph Based on Knowledge Ontology

This layer acts as the core hub connecting knowledge ontology and communication applications. Its primary goal is to transform the abstract and standardized knowledge ontology into applicable, interactive and communicable technical forms, so as to provide technical support for subsequent content production and targeted communication. The whole process strictly follows the principle of not altering the core content of knowledge ontology, but only realizing its structural and applicable transformation.

The core technical carrier of this layer is the knowledge graph[11]. It aims to construct a structured knowledge graph on the basis of the underlying knowledge ontology, and convert standardized knowledge ontology into a retrievable, associable and inferable structured knowledge base.

The core process is divided into four key links that strictly follow the ontology framework. First, knowledge extraction: standardized entities, attributes and relationships are extracted from authoritative literature, standard specifications and academic

achievements strictly in accordance with the semantic framework of the knowledge ontology, ensuring full consistency between the extracted content and the knowledge ontology. Second, knowledge fusion: entity disambiguation, semantic alignment and merging are performed on multi-source extracted knowledge to unify all content completely with the semantic framework of the underlying knowledge ontology. Third, knowledge storage and updating: a professional graph database is adopted for standardized knowledge storage, and a dynamic update mechanism linked to the knowledge ontology is constructed to realize complete content synchronization between the technical layer and the core ontology layer. Fourth, semantic reasoning and application development: based on the logical correlations of the knowledge ontology, intelligent knowledge association and reasoning are realized, and retrievable and interactive application functions are developed to provide technical support for the subsequent communication and dissemination process[12].

4.3 Content Production Layer: Segmented Communication Content Transformation Based on Knowledge Ontology

The core objective of this layer is to realize the transformation from professional knowledge ontology to mass communication content. Based on the unified framework of knowledge ontology, tailored communication content is produced for different audiences and communication scenarios to bridge the gap between professional expertise and mass communication. Meanwhile, it strictly ensures that the core knowledge of all content is completely consistent with the underlying ontology, eliminating knowledge deviation and ambiguity.

It consists of three core dimensions. First, segmented content adaptation. Strictly following the knowledge hierarchy of the knowledge ontology, a differentiated content system is constructed for diverse audience groups. For overseas professional medical communities, systematic academic content including standardized terminology manuals, diagnosis and treatment specification guidelines, etc., is developed to enhance the academic recognition of Traditional Chinese Medicine (TCM). For the general public, lightweight and visualized popular science content is created, which transforms the complex TCM theories in the knowledge ontology into health preservation content closely related to daily life, lowering the public's cognitive threshold.

Second, localized content transcreation. Based on the standardized concepts of the knowledge ontology, localized adaptation of content is completed in collaboration with local sinologists, medical practitioners and cultural institutions in the destination of communication. On the premise of keeping the core knowledge fully consistent with the ontology, the content is adapted to local cultural customs, language habits and laws and regulations.

Third, multimodal content presentation. Leveraging the correlation characteristics of the knowledge ontology, communication content in multiple forms such as text, images, audio, videos and interactive products is developed to adapt to the features of different communication channels, while always adhering to the bottom line of accuracy of core knowledge[13].

4.4 Precise Reach Layer: Channel-Based Matching of Communication Links Driven by Knowledge Ontology

This layer serves as the core link for the implementation and delivery of communication content. Its primary goal is to achieve the precise matching of content, communication channels and audiences based on the semantic layering of knowledge ontology and audience demands, ensuring that the core content of the knowledge ontology can reach target audiences efficiently and without ambiguity.

The core process consists of two key steps. First, refined audience stratification. Based on the semantic tags of the knowledge ontology, multi-dimensional audience portraits are constructed by integrating audiences' geographical location, occupation, cognitive level, information needs and media usage habits. This clarifies the demand hierarchy and media preference of different groups for knowledge ontology content, and avoids undifferentiated and extensive mass communication.

Second, adaptive layout of multi-channels. For professional academic groups, communication is conducted through international academic journals, academic conferences, professional medical databases and other channels, focusing on delivering the academic and professional content of the knowledge ontology. For medical and health practitioners, content is disseminated via industry training, international diagnosis and treatment cooperation projects, with an emphasis on the diagnosis and treatment specifications contained in the knowledge ontology. For the general public, lifestyle-oriented popular science content from the knowledge ontology is delivered through overseas mainstream social media, video platforms and offline cultural exchange activities. Meanwhile, relying on the semantic correlations of the knowledge ontology[14], correlated content is recommended to audiences, so as to gradually deepen their understanding of the complete system of traditional Chinese medicine culture.

4.5 Cognitive Interaction Layer: Improvement of Audience Cognition Level Based on Knowledge Ontology

This layer acts as a crucial link in realizing the transition from information reach to cultural identity. Its core goal is to build interactive communication carriers on the basis of knowledge ontology, transforming audiences from passive information recipients into active knowledge explorers. It enables audiences to comprehensively and accurately understand the core connotation and logical system of the TCM knowledge ontology, and achieve in-depth cognition of traditional Chinese medicine culture.

It specifically includes three core directions. First, construct a multilingual interactive platform for the TCM knowledge ontology. Audiences can acquire authoritative knowledge derived from the knowledge ontology through keyword retrieval, and independently explore relevant content via the logical correlations of the ontology, so as to gain a full understanding of the knowledge system of traditional Chinese medicine culture.

Second, develop lightweight interactive applications and popular science experience products based on the knowledge ontology. These allow audiences to perceive

the core connotation of traditional Chinese medicine through interactive experience and break stereotyped perceptions of TCM.

Third, rely on offline venues such as overseas TCM centers and Chinese cultural centers to launch immersive TCM cultural experience activities. It integrates the online communication of knowledge ontology with offline diagnosis, treatment and health preservation experiences, and promotes the transformation of audiences from cognitive understanding to value recognition[15].

4.6 Feedback Iteration Layer: Optimization of International Communication Paths Based on Audience Feedback

This layer marks the closing of the entire cyclic communication model and also serves as the starting point for the next round of iteration. Its core objective is to reversibly optimize the knowledge ontology system and full-link communication procedures through multi-dimensional data collection and analysis, realize the sustainable cyclic iteration of the entire international communication system, and ensure the long-term effectiveness of the model.

The core process includes three steps. First, multi-dimensional feedback data collection. Online and offline channels are fully utilized to gather user access data, query records, interactive behaviors, comments and feedback, as well as professional feedback from academic circles and in-depth audience interview information, so as to fully grasp the effect of international communication and the real needs of audiences.

Second, in-depth data analysis. Based on the semantic framework of knowledge ontology, this step explores audiences' core demands, cognitive difficulties and communication deficiencies, and identifies the contents that need to be optimized and improved in the knowledge ontology system.

Third, full-link optimization and iteration. The analysis results are reversibly fed back to all links including knowledge ontology optimization, technical application adjustment and content production improvement, forming a regular iteration mechanism to continuously refine the knowledge ontology system and enhance the international communication effect of traditional Chinese medicine culture.

In summary, the international communication of traditional Chinese medicine (TCM) culture is an important path for promoting the going-global of fine traditional Chinese culture, enhancing national cultural soft power, and facilitating the building of a global community of health for all. Faced with practical dilemmas in current communication such as cross-cultural cognitive barriers, content fragmentation, ambiguity of core concepts, and one-way communication, the communication model centered on knowledge ontology provides a systematic solution to the fundamental contradictions in communication.

The full-link cyclic communication model constructed in this paper takes knowledge ontology as the core foundation, covering the whole process from the construction of knowledge system to the iterative optimization of communication effect, which can effectively solve the core pain points in the current international communication of TCM culture. By advancing the construction of an authoritative knowledge ontology system, improving ontology transformation and content supply,

building an omni-channel communication network, and establishing a cyclic iteration mechanism and guarantee system, the international communication of TCM culture can break away from the traditional one-way output mode. It realizes the upgrading from fragmented content transmission to systematic value delivery, and ultimately achieves the leap from “going global” to “going deep into the world”, enabling the core values of TCM culture to be more widely recognized and acknowledged by the international community.

5 Conclusion

Against the backdrop of TCM’s deepening internationalization, the cross-cultural transmission of its cultural core remains a core bottleneck hindering its transition from “going global” to “taking root globally”. Different from existing studies that mostly focus on superficial communication strategies, this paper starts from the underlying contradiction of disunified knowledge semantics, takes knowledge ontology as the core theoretical framework, and systematically addresses the deep-seated dilemmas in the international communication of TCM culture.

This paper identifies four hierarchical core dilemmas in current practice: cross-cultural semantic divide caused by Sino-Western thinking differences, one-sided public perception aggravated by fragmented content, missing feedback mechanism from one-way communication chains, and restricted value breakthrough due to insufficient international discourse power. It further demonstrates the internal adaptive logic between knowledge ontology and cross-cultural communication: its standardized semantics, systematic structure, homogeneous expansion and open iteration can resolve the above dilemmas from the root of the knowledge system.

On this basis, this paper constructs a six-layer full-link cyclic communication model with knowledge ontology as the only authoritative benchmark, covering ontology standard construction, knowledge graph transformation, segmented content production, multi-channel precise delivery, cognitive interaction improvement and closed-loop feedback iteration. The model follows the logic of “construction – application – optimization”, forming a sustainable iterative mechanism that fundamentally breaks through the limitations of traditional one-way output communication.

The findings expand the research dimension of TCM cultural communication from surface strategy to underlying knowledge unification, and provide a systematic implementation path for eliminating cross-cultural cognitive barriers and promoting the global value recognition of TCM culture. Future research can carry out empirical tests of the model in typical regions, and explore digital optimization paths combined with frontier technologies.

Acknowledgment

Fund Project: Philosophy and Social Science Research Project of Hubei Provincial Department of Education; Project No. 25Y099

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