Research Article

From TCM Food-Medicine Homology to DTC Conversion: Digital Branding and IP Governance

Haoran Lin[1,*]

[1] School of Management, Beijing University of Chinese Medicine, Beijing 100029, China
* Corresponding author: Haoran Lin
Email: HaoranLin@outlook.com

***Abstract*:** The globalization of Traditional Chinese Medicine health consumer goods faces persistent tensions between culturally embedded therapeutic epistemology and Western digital retail ecosystems. While "food-medicine homology" (yaoshi tongyuan) offers compelling preventive health narratives, cross-border Direct-to-Consumer brands frequently encounter fragmented consumer trust, rising acquisition costs, and severe intellectual property infringement risks. Through an integrative socio-technical analysis, this study examines how cross-border health enterprises can construct a closed-loop digital branding and IP governance architecture. Specifically, it bridges empirical TCM formulation knowledge with short-video and live-streaming conversion chains, public-private domain retention, and proactive overseas IP archive management. The findings suggest that sustainable brand equity requires aligning top-level marketing informatization with granular regulatory compliance, though regional regulatory disparities indicate further research is needed.

Keywords: *Cross-border e-commerce, Direct-to-Consumer, Traditional Chinese Medicine, food-medicine homology, digital brand governance.*

1. Introduction

The international expansion of health consumer products rooted in Traditional Chinese Medicine (TCM) represents a complex intersection of cultural translation, regulatory negotiation, and digital retail innovation. Unlike standardized biomedical nutraceuticals, TCM-derived consumer goods—particularly those grounded in the doctrine of "food-medicine homology" (yaoshi tongyuan)—rely on holistic diagnostic frameworks such as constitution classification, syndrome differentiation, and multi-herb synergy. However, when enterprises attempt to commercialize these formulations through cross-border Direct-to-Consumer (DTC) channels, they frequently confront a profound epistemological gap: international consumers, accustomed to reductionist, single-ingredient efficacy claims, often struggle to comprehend the nuanced preventive logic of classical Chinese wellness traditions. This cognitive barrier is further complicated by uneven global awareness of herbal therapeutics; for instance, empirical investigations into domestic and international public perceptions of Chinese herbal treatments for chronic functional conditions, such as constipation, have demonstrated substantial disparities in acceptance and comprehension across cultural contexts [22]. Methodologically, such cross-regional cognitive surveys highlight the utility of comparative questionnaire designs in mapping baseline consumer skepticism, yet

they also reveal a critical limitation insofar as static perception data cannot fully capture how dynamic digital media interventions might reshape user mental models over time.

Beyond cultural and cognitive friction, cross-border health brands operate within an increasingly volatile digital marketing landscape where customer acquisition costs continue to escalate and platform-dependent traffic yields diminishing returns. Many emerging enterprises enter overseas markets with fragmented digital infrastructures, lacking a cohesive top-level architecture capable of synchronizing brand storytelling, consumer relationship management, and compliance verification. Recent scholarship examining the current status and top-level architecture design of enterprise brand marketing informatization has underscored that disconnected data silos and reactive operational workflows severely constrain long-term brand scalability [8]. While this architectural perspective provides a valuable macro-level diagnostic framework for enterprise digital transformation, its generalizability to specialized cross-border health verticals remains somewhat constrained by the unique regulatory scrutiny applied to ingestible wellness products, where marketing claims intersect directly with public health statutes.

Simultaneously, the intangible assets that underpin a cross-border health brand—ranging from proprietary herbal extraction processes and formulation ratios to distinctive packaging trade dress and localized digital content—are exposed to heightened risks of cross-jurisdictional misappropriation. In rapid-turnover e-commerce environments, counterfeiters and opportunistic competitors frequently exploit delays in overseas trademark registration or gaps in evidentiary documentation to hijack brand equity. Consequently, intellectual property governance can no longer be treated as a peripheral, post-hoc legal formality; rather, it must be embedded as a foundational pillar of the digital branding lifecycle. Considering the above factors, this study explores an integrative framework that connects the empirical and clinical foundations of TCM food-medicine homology with closed-loop DTC conversion mechanisms and proactive digital IP archive management, seeking to illuminate how cross-border health enterprises might achieve sustainable competitive advantage amidst regulatory and market uncertainty.

2. Grounding Digital Health Narratives in Empirical TCM Knowledge

A critical prerequisite for mitigating consumer skepticism in overseas DTC health markets is the rigorous translation of traditional herbal knowledge into scientifically legible and clinically credible product narratives. Rather than relying on abstract metaphysical terminology, contemporary brand positioning increasingly draws upon empirical clinical observations and computational data mining of classical medical lineages to substantiate product efficacy. For example, prospective cohort investigations into food-medicine homologous interventions for individuals experiencing chronic fatigue based on TCM constitution classification provide a structured evidentiary bridge between traditional constitutional theory and measurable lifestyle outcomes [3]. The methodological rigor of prospective cohort tracking offers longitudinal validity that strengthens health product credibility, although the inherent complexity of multi-component dietary interventions makes it difficult to isolate single active variables to the satisfaction of strict biomedical reductionism. Similarly, clinical observations evaluating auricular acupoint stimulation combined with constitution-differentiated dietary therapy for managing tobacco dependence and withdrawal reactions illustrate how personalized, non-pharmacological regimens can address specific behavioral health challenges [7]. While such combined clinical protocols demonstrate promising integrative utility, translating multi-modal clinical practices into standalone cross-border consumer goods requires careful adaptation so that product narratives remain compliant with overseas dietary supplement regulations.

To enrich formulation authenticity and differentiate products within crowded digital marketplaces, brands also leverage computational analyses of classical medical schools, particularly the renowned Menghe medical lineage. Data-mining studies investigating the medication rules of the Four Famous Families of Menghe in treating insomnia have systematically uncovered core herb-pairing regularities and foundational prescription architectures [16]. Likewise, association-rule and cluster analyses of Menghe School prescriptions for damp-heat warm diseases [17] and general febrile conditions [18] demonstrate how classical clinical wisdom can be formalized into reproducible algorithmic patterns. These data-mining methodologies are exceptionally effective for identifying high-frequency core herb combinations suitable for modern product development; however, an over-reliance on frequency statistics risks overlooking rare but clinically decisive sovereign-minister-assistant-courier (jun-chen-zuo-shi) interactions that define therapeutic safety. Furthermore, foundational pharmacological inquiries comparing different Chinese herbal compounds in experimental models of senile dementia underscore the necessity of verifying biological mechanisms alongside classical textual mining [15]. Although animal-model comparisons provide essential preclinical justification for neuroprotective or anti-aging product positioning, extrapolating murine pharmacological outcomes directly to human consumer wellness claims introduces significant translational caveats that responsible brands must navigate transparently.

Crucially, the capacity to sustain this pipeline of empirical translation depends on the broader academic and professional ecosystem cultivating interdisciplinary TCM talent. Research examining the employment characteristics and strategic SWOT profiles of graduate students at the China Academy of Chinese Medical Sciences has revealed structural mismatches between traditional academic training and emerging industrial demands in global health commerce [21]. Complementary pedagogical analyses emphasizing the cultivation of socialist core values [19] and targeted moral education among TCM postgraduates [20] highlight the institutional importance of instilling scientific integrity, cultural confidence, and ethical accountability in future researchers and industry practitioners. While these educational and workforce studies primarily reflect domestic institutional contexts and rely heavily on qualitative policy synthesis rather than longitudinal career tracking, they point toward a vital reality: the credibility of cross-border TCM digital branding is ultimately anchored in the ethical rigor and interdisciplinary competence of the professionals who bridge clinical science and commercial communication.

3. Mechanics of the Closed-Loop DTC Conversion System in the Short-Video and Live-Streaming Era

Once TCM health formulations are grounded in credible empirical narratives, cross-border enterprises must deploy sophisticated digital communication mechanisms to convert passive overseas viewers into loyal, repeat consumers. During our analytical synthesis of contemporary DTC operational models, an initial assumption that high-frequency advertising alone drives cross-border health sales proved overly simplistic; consumer hesitation toward unfamiliar herbal remedies necessitated a far more nuanced, multi-stage trust-building trajectory. Investigating the path through which short-video content narratives shape user mental models for DTC health-consumption brands reveals that scenario-based storytelling and visual metaphor translation are instrumental in lowering cognitive resistance [2]. This cognitive-linguistic approach effectively illuminates how micro-narratives restructure consumer perceptions of preventive health, though its reliance on qualitative content interpretation leaves open questions regarding how algorithmic recommendation shifts across different geographic regions might alter narrative reception. To scale these culturally resonant micro-narratives without incurring prohibitive production costs, brands have also begun experimenting with algorithmic visual synthesis to translate

classical Chinese botanical aesthetics into contemporary digital formats. Advances in artistic neural style transfer algorithms incorporating activation smoothing demonstrate how visual rendering pipelines can harmonize traditional ink-wash or herbal illustration motifs with modern packaging and short-video aesthetics while suppressing visual artifacts [24]. However, although activation smoothing enhances perceptual coherence across stylized frames, an over-reliance on automated aesthetic transfer risks standardizing visual identity and diluting the bespoke craftsmanship that discerning international wellness consumers often associate with authentic heritage formulations.

To operationalize this mental-model transformation at scale, brands increasingly integrate Key Opinion Leader (KOL) ecosystems with interactive live-streaming commerce. Analytical frameworks examining the empowering path of KOL influencer matrix marketing demonstrate that tiered influencer collaborations—combining authoritative health professionals with relatable lifestyle creators—create synergistic social proof that accelerates user conversion [10]. Building upon this foundation, mixed empirical research focusing specifically on cross-border DTC health consumer products has mapped the application and optimization pathways of live-streaming e-commerce and KOL collaboration, showing how real-time Q&A interactions resolve immediate consumer doubts regarding herbal taste, dosage, and safety [13]. While mixed-method empirical designs strengthen causal inference by combining behavioral metrics with consumer surveys, cross-border live-streaming remains vulnerable to cultural misinterpretations, time-zone friction, and fluctuating platform moderation policies governing health-related speech. Moreover, as cross-border enterprises increasingly deploy automated conversational agents to handle high-volume post-stream inquiries regarding herbal contraindications and constitution matching, reconciling classical TCM textual knowledge with strict Western dietary supplement compliance creates acute semantic tensions. Recent computational research on mitigating knowledge conflicts in language model-driven question answering offers a valuable technical pathway for resolving discrepancies between parametric model memory and retrieved regulatory context [23]. Nevertheless, while conflict-mitigation architectures substantially reduce factual hallucinations in standardized question-answering benchmarks, adapting such frameworks to nuanced cross-cultural health consultations remains challenging when traditional diagnostic concepts lack direct biomedical equivalents.

Examining the structural evolution of these digital touchpoints, recent scholarship on the "Content-Seeding-Conversion" closed-loop model illustrates how short videos initiate algorithmic discovery ("seeding") while live streams harvest high-intent transactional demand [11]. Complementing this evolutionary perspective, research grounded in media affordances and multi-stage conversion chains clarifies how specific platform features—such as embedded shopping carts, real-time bullet comments, and algorithmic retargeting—orchestrate seamless consumer progression from awareness to purchase [14]. Nevertheless, acquiring first-time buyers through public social media platforms remains prohibitively expensive unless enterprises retain those users within owned digital ecosystems. Studies on the digital operation mechanisms of brand marketing under public-private domain linkage emphasize the necessity of migrating traffic from public platforms into private communities, independent DTC storefronts, and personalized membership programs [12]. For small and medium-sized enterprises (SMEs) constrained by limited capital, adopting a lightweight path to digital branding—prioritizing modular SaaS tools and agile content iteration over heavy custom IT builds—offers a pragmatic entry strategy [6]. Furthermore, establishing a three-dimensional standard framework for brand marketing informatization allows firms to calibrate their technological investments across diverse industry verticals [5], while insights from B2B marketing automation evaluation and dynamic optimization suggest that automated lead-scoring and

lifecycle nurturing protocols can be productively adapted to manage high-value cross-border distributor and wholesale relationships alongside retail DTC flows [4]. Taken together, these studies reveal a sophisticated conversion architecture, yet they also underscore a recurring operational tension: increasing automation and algorithmic targeting can inadvertently homogenize brand voice, potentially eroding the authentic cultural resonance that distinguishes TCM health products in the first place.

4. Proactive Intellectual Property Governance and Digital Asset Security Across Jurisdictions

As cross-border DTC health brands achieve commercial visibility through short-video seeding and KOL-driven live streaming, their intangible assets become prime targets for bad-faith trademark squatting, packaging imitation, and unauthorized cross-channel diversion. A major challenge encountered in cross-border brand governance is that traditional legal protection mechanisms operate on protracted timelines that lag far behind the viral velocity of social media commerce. Consequently, contemporary enterprises must transition from reactive litigation to proactive, digitized intellectual property lifecycle management. Research on digital archive management practices for IP assets in cross-border DTC brands demonstrates that systematically cataloging trademark certificates, design patents, copyright registrations for original video assets, and formula trade secrets within centralized digital repositories significantly enhances evidentiary readiness during platform takedown disputes [1]. Methodologically, this archival management perspective offers actionable operational taxonomies for enterprise compliance teams, though its effectiveness in practice depends heavily on the interoperability of internal corporate databases with external e-commerce platform IP protection portals. Beyond passive archival cataloging, protecting original short-video creatives, localized product infographics, and proprietary packaging visuals against unauthorized cross-platform replication requires embedding verifiable ownership markers directly into digital media assets. Developments in multi-modal steganography that improve text-image matching through adversarial learning and circle loss provide a promising technical mechanism for imperceptibly binding brand provenance metadata to promotional imagery and accompanying copy [25]. Even so, while adversarial training strengthens embedding stealth and cross-modal alignment under controlled experimental conditions, real-world social media re-encoding and aggressive image compression across heterogeneous cross-border platforms can still degrade watermark recoverability, suggesting that steganographic protection must be paired with institutional archive verification.

Expanding this operational lens to encompass the entire cross-border lifecycle, investigations into the digital construction, operation, and maintenance of overseas intellectual property archives for consumer brands highlight the importance of continuous monitoring, automated renewal alerts, and dynamic risk-scoring across multiple jurisdictions [9]. By integrating overseas IP archive maintenance directly into the top-level marketing informatization architecture, enterprises can verify territorial trademark clearance prior to launching localized KOL campaigns or shipping inventory to overseas bonded warehouses. However, interpreting the role of digital IP governance requires acknowledging multiple strategic dimensions and potential organizational biases. From a defensive legal perspective, comprehensive digital archiving minimizes litigation costs and deters counterfeiters; from a commercial valuation perspective, audited IP archives strengthen enterprise attractiveness to cross-border investors and institutional partners. Conversely, an overly rigid or bureaucratic approach to IP documentation may slow down agile marketing teams, creating internal friction when brands need to rapidly localize product names or visual packaging to respond to fleeting social media trends. Moreover, regional variations in intellectual property law—particularly concerning whether traditional herbal formulations or natural-origin ingredients qualify

for patent protection versus trade-secret retention—mean that a uniform global archiving template may prove insufficient without localized legal calibration. Further research is therefore needed to determine how emerging technologies, such as blockchain-based timestamping and AI-driven infringement detection, can balance stringent cross-border asset security with the creative agility required in fast-moving DTC health markets.

5. Conclusion

Considering the above factors, constructing a resilient cross-border DTC ecosystem for TCM food-medicine homology consumer goods demands far more than isolated excellence in either herbal formulation or digital traffic acquisition; rather, it requires a deeply synchronized socio-technical paradigm wherein empirical clinical credibility, public-private closed-loop conversion, and proactive digital IP governance mutually reinforce one another. Theoretically, this synthesis bridges the persistent divide between traditional medical epistemology and modern digital commerce scholarship, demonstrating that cultural heritage products can achieve global scalability when their cognitive translation and intangible asset protection are engineered as unified organizational capabilities rather than sequential afterthoughts. Practically, these insights provide cross-border health enterprises, regulatory compliance officers, and digital strategists with a structured roadmap for mitigating customer acquisition volatility while safeguarding proprietary formulations and brand equity across heterogeneous international markets. Looking ahead, as artificial intelligence continues to reshape both personalized constitutional health diagnostics and cross-border platform moderation algorithms, future scholarship should investigate adaptive, real-time governance frameworks capable of dynamically aligning localized health-claim compliance, cross-cultural consumer education, and automated multi-jurisdictional intellectual property enforcement.

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Conflicts of Interest

The author(s) declare no conflicts of interest.

Ethical Approval and Consent to Participate

Not applicable.

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