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A Comparative Analysis of Political Legitimacy in the Great Learning and Plato's Republic

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Abstract

Political legitimacy constitutes a foundational problem in political philosophy, concerning the justification of authority and the conditions under which power is recognized and obeyed. This paper offers a comparative analysis of political legitimacy as articulated in two classical texts of the Axial Age: The Great Learning in the Confucian tradition and Plato's Republic in ancient Greek philosophy. Situating both works within their respective historical and intellectual contexts, the study argues that they present distinct yet structurally comparable models of legitimacy. Confucian political legitimacy is grounded primarily in moral virtue and the Mandate of Heaven, emphasizing internal moral cultivation, ethical governance, and popular support as manifestations of Heavenly will. By contrast, Platonic legitimacy derives from external transcendence, locating political authority in the philosopher-king's grasp of eternal truth and the Form of the Good. Through textual analysis and conceptual comparison, this paper examines how virtue, wisdom, justice, and truth function as sources of political legitimacy in the two traditions. By highlighting both their shared rejection of coercive power and their divergent transcendental foundations, this study seeks to contribute to comparative political philosophy and to reflect on the contemporary relevance of classical legitimacy theories for modern governance, leadership ethics, and education.

Keywords

political legitimacy, the great learning, Plato's Republic, Confucianism, comparative political philosophy

1. Introduction

The issue of legitimacy runs through the history of political philosophy and is central to the justification of power. Only when the reasons and basis for political power are legitimate can the authority held by a political subject and its exercise in governing society gain widespread recognition and support from the people, thereby achieving social stability. In the seminal sociological work of Max Weber, *Economy and Society* [1], he first systematically defined political legitimacy as a core sociological concept: The legitimacy of a system of domination is to be regarded sociologically only as the probability that there will exist a corresponding degree of appropriate attitudes and of practical conduct in compliance. He also used this concept to classify and compare social and political phenomena. In the Second Treatise of Government by John Locke [2], he provided a classic definition centered on the consent of the governed, arguing that government is not legitimate unless it is carried on with such consent. Together, their work established the fundamental theoretical framework for modern discussions of political legitimacy. An analysis of the two

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classical texts, The Great Learning [3] and The Republic [4], suggests that in the West, reason and deliberation underpin legitimacy, while in China, the Mandate of Heaven and virtue serve as its foundation. These respectively constitute the typical paradigms of rational legitimacy and moral legitimacy. Research on such classical political thought not only helps re-examine these foundational texts but also aids in reflecting on and building a more harmonious society. However, within the study of Confucian political legitimacy, existing scholarship has predominantly focused on Mencius and Xunzi, while the pivotal value of The Great Learning as a systematic text has long been relatively neglected. Moreover, although preliminary comparative studies between China and the West exist, there remains a gap in both the quantity and depth of systematic comparative research that focuses specifically on the concept of political legitimacy itself between The Great Learning and The Republic. This review primarily adopts the methods of textual analysis and comparison. It aims to classify and explore the ideological content and practical paths of power legitimacy articulated in these two classical texts.

2. Axial Age Context and Textual Background

2.1 The Axial Age and Political Crisis

The concept of the Axial Age was first proposed by Karl Jaspers in his 1949 German work Vom Ursprung und Ziel der Geschichte (*The Origin and Goal of History*) [5]. As he articulated, the axis of world history seems to lie around 500 BC, in a spiritual process that took place between 800 and 200 BC. There lies the deepest turning point in history. It was then that the humans with whom we still live today appeared. We can call this era the Axial Age. Both The Great Learning and The Republic were composed during this pivotal period.

2.2 The Great Learning: Authorship, Transmission, and Political Orientation

Mainstream scholarship dates The Great Learning to the early Warring States period (475–221 BC). This era witnessed momentous political upheavals, such as the Tian clan's usurpation of the Qi state and the partition of the Jin state by the Three Clans. The enfeoffment system and ritual order established in the Western Zhou Dynasty (c. 1046–771 BC) had collapsed entirely, and the aristocratic wars between states gradually evolved into wars of annexation. In contrast, The Republic was written in 4th-century BCE Athens, Greece—toward the end of the Classical period—when the city-state's democratic system was declining, and Athens itself was entering a phase of gradual decay. Both texts emerged amid political chaos, profound social transformations, and ideological transitions, addressing the shared epochal question: How to establish a new order and ensure the legitimacy of the new regime? This common historical context provides a foundational basis for their comparative analysis. The author of *The Great Learning* remains unconfirmed. Nevertheless, it is universally acknowledged that The Great Learning preserves the legacy of Confucius, reflecting Confucian ideas of China's classical period and closely aligning with the teachings of Confucius and Xunzi. Traditional scholarly interpretations of The Great Learning have predominantly focused on individual self-cultivation, with relatively little attention paid to its nature as a political text exploring state governance. Zheng Xuan, a Confucian scholar of the late Eastern Han Dynasty, noted: The Great Learning is so named because it records extensive knowledge applicable to governing the state [6], highlighting the text's inherent political function. Throughout The Great Learning, emphasis is placed on why and how rulers should cultivate their moral character, alongside the imperative for rulers to align with the Mandate of Heaven. This reflects the Confucian assertion that political legitimacy derives from both the Mandate of Heaven and the ruler's personal virtue, with virtue as the decisive factor. Only by embodying virtue can a ruler conform to the Mandate of Heaven and gain the acceptance of the people, a perspective that also embodies people-oriented thought.

2.3 Plato's Republic: Philosophical Aims and Political Concerns

In *The Republic*, Plato employs a dialogic form, speaking through Socrates to explore the isomorphic relationship between justice and soul order. He divides the individual soul into three components—reason, spirit, and desire—and examines the four cardinal virtues: wisdom, courage, temperance, and justice. Plato advocates for the ideal city-state to be governed by philosopher-kings who possess these noble virtues, constructing the polity based on the Form of the Good. For Plato, political legitimacy originates from the

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grasp and application of the Form of the Good—i.e., eternal truth—differing fundamentally from Confucianism's focus on the Mandate of Heaven and ethical virtue. Western scholarship on The Republic has centered primarily on political philosophy and ethical philosophy.

3. Comparative Analysis of Political Legitimacy

3.1 Interpretations of Political Legitimacy in the Two Texts

3.1.1 The Great Learning

Rulers were required to demonstrate Heavenly approval through personal virtue, which gave rise to the Confucian concept of governing by virtue. The Great Learning opens with the assertion: The way of great learning consists in illuminating one's bright virtue (mingde), in renewing the people, and in abiding in the highest good. Mingde (illuminating virtue) refers to the cultivation and manifestation of inherent moral goodness, while abiding in the highest good signifies the attainment of universally admired moral perfection. The text emphasizes that to govern the state and regulate the family, one must first cultivate oneself, underscoring the primacy of virtue. The theme of virtue has long been a focal point of scholarly inquiry. Beyond securing Heavenly approval, virtue was even more crucial for gaining the acceptance of the people, as popular will (minyi) was regarded as a manifestation of Heavenly will (tianyi). This gave birth to Confucianism's original people-centered thought. The term qinnin (renewing the people) in The Great Learning—as interpreted by Han Dynasty Confucian scholars such as Zheng Xuan and Kong Yingda—means treating the people like family. In contrast, Neo-Confucian scholars, represented by Zhu Xi, reinterpreted it as the ruler's duty to help the people purify themselves of selfish desires [7]. Regardless of interpretation, both emphasize the ruler's obligation to benefit the people, embodying the spirit of governing for the people. This thought was further developed and enriched by the Mencian school. Lou Yanli's Heaven's Mandate and Popular Support: An Analysis of Mencius' Discourse on the Legitimacy of Monarchical Power argues that only a virtuous ruler who practices benevolent governance possesses legitimate authority [8]. Thus, Confucian legitimacy emphasizes ethical cultivation as the foundation of political authority.

3.1.2 The Republic

In Plato's *The Republic*, political legitimacy originates from the wisdom inherent in the philosopher-king. Only when a philosopher-king who grasps truth rules can the city-state's governance be considered legitimate. The paper *Plato on the Rule of Wisdom* elaborates the author's perspective on the principle of rule by wisdom advocated by the philosopher Plato, arguing that rule by wisdom is not equivalent to rule by law [9]. In Li Yonggang's *The Debate on Three Political Models in Plato's The Republic*, he states: Truth refers to the pursuit of eternal and unchanging things, namely the Forms, while the constantly changing world of reality is an ocean of opinion. A philosopher is one who has emerged from the cave of opinion and has beheld the highest Form, that of the Good [10]. Furthermore, understanding the Form of the Good constitutes the highest knowledge or skill, which is the knowledge comprehended and mastered by the philosopher-king. In Plato's framework, knowledge constitutes authority; thus, the philosopher-king's comprehension of truth confers political legitimacy. Some scholars also point out that Plato's theory of political legitimacy establishes legitimacy upon the interdependent relationship between justice and temperance (*Plato as a Theorist of Legitimacy*) [11]. Therefore, the two crucial elements of political legitimacy are justice and temperance. The American philosopher John Rawls argues: Justice is the first virtue of social institutions [12]. Liu Danchen, in his *A Comparative Study of the Governing Thoughts of Confucius and Plato*, summarizes that the souls of citizens in *the Republic* should possess four virtues: first, wisdom; second, courage; third, temperance; and fourth, justice. Among these, justice and the good constitute the foundation of Plato's political philosophy [13].

4. Core Conceptual Differences between Plato and Confucian Thought

4.1 Confucian Foundations of Political Legitimacy

To date, there is no systematic literature review dedicated to the Confucian concept of political legitimacy. However, numerous related concepts have been extensively studied, such as the Mandate of Heaven,

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governing with virtue, and people-centered thought. In essence, Confucianism identifies two fundamental sources of the legitimacy of political power: the Mandate of Heaven and the Dao Tong (The theoretical system of inheritance and legitimacy in Confucianism). The concept of the Mandate of Heaven, a traditional Chinese political ideology rooted in the earliest sacrificial practices of Chinese civilization, is closely intertwined with the Five Elements (Wuxing) theory, forming an elaborate sacrificial system. Scholarly discussions on the synthesis and summary of the Five Elements theory are abundant. As a document dating back to the Shang Dynasty, The Book of Documents (Shangshu) [14] records Jizi's exposition of the Nine Categories of the Great Plan to King Wu of Zhou, asserting that Heaven bestowed upon Yu the Nine Categories of the Great Plan. This text frames the Five Elements as manifestations of Heavenly Dao and links the Five Elements system to the legitimacy of imperial rule: the Xia Dynasty obtained the Mandate of Heaven by aligning with the Five Elements, while Gun incurred Heavenly wrath for disrupting the order of the Five Elements during his flood control efforts. This laid the ideological foundation for subsequent dynasties to justify their rule through the Five Elements theory. Gu Jiegang's Discourses on Ancient History (Gushi Bian) [15] delves into the interplay between the Five Elements theory and the construction of ancient historical narratives, with multiple essays focusing on how the historical accounts of the Xia, Shang, and Zhou dynasties interpenetrated with the Five Elements and the theory of the Cycle of Five Virtues (Wude Zhongshi). A recent scholarly contribution to the study of the Five Elements theory is Wang Ping and Sheng Xianrong's *An Exploration of the Origins of Zou Yan's Theory of the Cycle of Five Virtues* [16]. The authors argue that Zou Yan, with Confucianism as the core, integrated Yin-Yang and Five Elements thought, endowing the three dynasties with specific virtues (de) and framing dynastic transitions as a cosmic process governed by the mutual generation and conquest of the Five Elements. This transformation of political change into a manifestation of Heavenly Dao conferred legitimacy upon ruling dynasties. Following the collapse of the patriarchal clan system and ritual order of the Western Zhou Dynasty, and continuing until the early Han Dynasty, the new political order secured its legitimacy by shifting from Heavenly bestowal to the concept of the unity of Heaven and humanity (Tianren Heyi). Wang Mengxi and Wang Zhenzhong's *The Formation and Development of the Concept of the Unity of Heaven and Humanity in the Pre-Qin Period* [17] elaborates in detail on the evolution of the relationship between Heaven and humanity from a one-way connection to bidirectional interaction during the Shang Dynasty and the Pre-Qin period.

4.2 Greek and Platonic Conceptions of Political Legitimacy

In ancient Greece, political legitimacy was derived from natural justice. As said in *Dialogues on Political Legitimacy: Ancient and Modern, Chinese and Western* [18], some scholars argue that political order not only originates from the natural cosmic order but is also subordinate to it. Initially, the moral justification for human political order necessarily came from another transcendent realm—the cosmic order. This represents a path of external transcendence. Ancient Greece practiced democratic politics, and democracy inherently belongs to a typical form of rule by law. Since laws were established for the people or even by the people, individuals were expected to possess an unprecedented motivation to sincerely obey the laws—that is, the commands of the community. This resembles Max Weber's later notion of Legal-Rational Authority. In contrast, within the philosophical system constructed by Plato, which regards the world of Forms as a crucial concept, political legitimacy follows the path of external transcendence. The rule of the philosopher-king is legitimate precisely because only the philosopher-king possesses the truth derived from the external world. As Wang Jikui points out in *The Logical Starting Point of Politics: A Comparative Analysis of The Analects and The Republic* [19], since the essence of philosophy is the love of wisdom, *The Republic* pursues the unity of intellectual authority and political authority. Knowledge is power, and since truth represents the highest level of knowledge, the philosopher-king who masters truth possesses the authority to rule. This reflects a trend toward the ethicalization of politics. In contrast to Confucian internal transcendence, Platonic legitimacy derives from external, metaphysical sources.

5. Theoretical Frameworks and Methodological Approaches in Existing Research

Regarding the theories of political legitimacy commonly employed by contemporary scholars, they include: Niccolò Machiavelli's theory of power efficacy (an amoral political perspective), which introduces the concept of reason of state, with his representative work being *The Prince* [20]; John Locke's theory of limited government and natural rights, with his representative work being *Two Treatises of Government*;

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Jean-Jacques Rousseau's theory of the general will, with his representative work being *The Social Contract* [21] (Zhang Zhen's On the Legitimacy of Political Power: An Exploration Based on Rousseau's 'Social Contract Theory' provides a detailed account of previous studies on Rousseau's theories [22]), Max Weber's tripartite typology of authority—traditional, legal-rational, and charismatic—with his representative work being *Economy and Society*; Jürgen Habermas's discourse ethics and deliberative political theory, with his representative work being *Legitimation Crisis* [23]; and Alfred Edward Taylor's related theories on Plato and Aristotle [24]. Concerning the political interpretation of *The Republic*, the two most influential and divergent schools in contemporary Western academia are the dramatic school represented by the American scholar Leo Strauss [25] and the analytical school represented by the British scholar Karl Popper [26]. The primary research methods are documentary analysis and conceptual comparison. This involves analyzing traditional and classical texts, incorporating relevant scholarly theories, comparing the similarities and differences between Chinese and Western perspectives, and exploring their respective views on political legitimacy—that is, the issues of domination and subordination, and the relationship between rule and obedience.

6. Recent Developments in Comparative Studies

In the process of comparative research, previous scholars have become more cautious about whether to apply Western theories directly, with the primary goal being to establish China's own discourse and a systematic philosophy (as discussed in Ren Jiantao's *The Question of Legitimacy in the Comparative Study of Chinese and Western Political Thought* [27]). This issue has gradually evolved into a problem of the comparability of specialized terminology and concepts. For example, generally speaking, traditional Chinese thought does not question the legitimacy of a father's authority. If the state is an extension of the family, then we may not necessarily question the legitimacy of the state either. Therefore, the issue of comparability forms the foundation for conducting cross-cultural research. Furthermore, in current comparative research, greater emphasis is placed on perspectives from translation studies and lexicology. This involves, firstly, focusing on the accuracy of specialized terminology during translation, and secondly, emphasizing the analysis and differentiation of specialized terms and concepts. For instance, the concept of legitimacy faces confusion from two directions: first, it is increasingly equated with justification; and second, it tends to become blurred with legality. This often leads to changes in terminology during translation, resulting in conceptual confusion.

7. Conclusion

In summary, both works can be interpreted from a political perspective, focusing on the issue of political legitimacy. However, the paths they emphasize are not entirely the same. Although they indeed share common ground—both hold that legitimacy cannot rely solely on power or coercion. They each emphasize the importance of the ruler's personal virtue. For example, Confucianism's Sage-King and Plato's Philosopher-King. The former relies on benevolence, righteousness, ritual propriety, and wisdom, while the latter relies on wisdom, courage, temperance, and justice. Yet, Western philosophy, represented by Plato, follows a path of external transcendence, attributing political legitimacy to the existence of an external, transcendent world (truth). The Philosopher-King is innate, and the capacity to attain truth is inherent. It was not until the modern era, beginning with Machiavelli, that political legitimacy in the West acquired a realistic and secular character. In contrast, Confucianism follows a path of internal transcendence. The sage attains the transcendent character of the Heavenly Way through human nature and innate moral consciousness (liangzhi). Anyone can carry the Heavenly Way. Furthermore, ethical morals have long been deeply embedded in the traditional Chinese political system, where politics and family ethics are inextricably linked. Analyzing the different Chinese and Western perspectives on political legitimacy helps us understand the complementarity of virtue and reason in Chinese and Western political philosophy and promotes mutual learning between Eastern and Western civilizations. Simultaneously, political legitimacy is significant not only for answering questions about the legitimacy of ancient political rule but also holds reference value for modern governance, leadership ethics, and education. Future research will place greater emphasis on the analysis, translation, and comparison of specialized terminology and concepts. Therefore, learning foreign languages will be key to advancing cross-cultural research. Furthermore, whether it is appropriate to simply compare Chinese and Western cultures under the framework of modern Western theories (such as those of Machiavelli and Max Weber) warrants further investigation. Additionally, interpreting *The Great Learning*

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as a political text rather than solely a text of personal cultivation represents an important direction for future research on political legitimacy, and even for re-reading Confucian classics. Future studies should further explore the translation accuracy of key concepts and investigate the applicability of classical legitimacy frameworks to contemporary governance.

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The Impact of Persuasion Mechanisms in Douyin's "Red-Black List" Videos on Consumer Purchase Intention

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Abstract

Against the backdrop of Douyin e-commerce's rapid growth, the polarized narratives in "Red-and-Black List" videos have become key factors influencing consumer decision-making. In these types of videos, bloggers typically categorize similar products into a "Red List" of recommended items and a "Black List" of products to avoid, based on their subjective experiences, and highlight the pros and cons through strong contrasts. This paper focuses on the dual persuasive effects of list content and comment section sentiment and constructs a "dual stimulus--cognitive transformation--purchase intention" model based on SOR theory. This study employed a questionnaire survey to collect 202 valid samples and conducted empirical testing using regression analysis. The results show that "Red List" videos are more effective than "Black List" videos in stimulating purchase intention; the emotional atmosphere in the comment section positively moderates this relationship; and perceived usefulness and perceived value exert a chained mediating effect. The study reveals the synergistic influence mechanism of "content plus comments", providing a theoretical basis for creators to optimize their narrative strategies and for brands to conduct targeted marketing.

Keywords

Douyin e-commerce, "Red-and-Black List" videos, SOR model, sentiment in comment sections, purchase intention

1. Introduction

This study focuses on the context in which the "Red-and-Black List" in short videos influence consumer decision-making and is of great significance for clarifying the dual persuasion logic of "content plus comments" and guiding marketing practices [1]. Zhao Wei and Qin Zhili (2023) [2] point out that the content characteristics of promotional short videos significantly influence consumers' purchase intentions [2], while existing research has paid little attention to the interactive effects between video content and the sentiment in the comments section. This study primarily examines how the interaction between the polarity of the lists and the sentiment in the comments section influences purchase intention through perceived usefulness and perceived value [3]. Literature reviews are employed to identify theoretical gaps that strengthen the theoretical foundation and subsequently conduct an empirical test using 202 valid samples collected via a questionnaire survey. This study aims to uncover the persuasion mechanisms of "Red-and-Black List" videos. In addition, it

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empirically analyzes chain mediation and moderation effects to provide a basis for content optimization and targeted marketing.

2. Literature Review

In the paper *A Study on the Impact of Short Video Content Characteristics on Consumer Purchase Intentions*, Zhao Wei and Qin Zhili (2023) [2] examined the mechanisms through which short video content characteristics influence consumer purchasing decisions, confirming the significant role of content attributes and emotional expression in driving purchase intentions; Shi Lu(2020) [4], in studies such as "The Mechanism of How the Emotional Orientation of Online Reviews Influences Purchase Intention" analyzed the transmission pathways through which the emotional tone of online reviews influences consumer behavior; and Zhang Xiaojuan (2017) [5] explored the specific effects of review valence. These studies provide important support for enriching our understanding of the relationship between external cues and consumer behavior. However, there is little existing research specifically examining vertical content formats with highly polarized narratives such as "Red-and-Black List" within the Douyin e-commerce ecosystem, and most studies focus solely on the unidimensional impact of either video content or the comment section [6]. Research that treats "list polarity" as a primary stimulus and "comment section sentiment" as a secondary stimulus to explore their interactive effects remains incomplete, failing to fully reveal the black-box mechanism of "content plus comments" synergistic persuasion in short-video contexts. This paper adopts the SOR theory perspective to construct a "dual stimulus--cognitive transformation--purchase intention" model, integrating list polarity and comment sentiment into a unified framework. It focuses on investigating the chained mediating effects of perceived usefulness and perceived value, as well as the moderating effect of comment sentiment, to conduct an empirical study on the persuasive effects of "Red-and-Black List" videos [7]. This research aims to fill existing gaps in the study of the interactive mechanisms of polarized content and provide a theoretical basis for content creators and brand marketers.

3. Research Methods

3.1 Theoretical Models and Research Hypotheses

Based on SOR theory [8], this study constructs a chain model of "List Polarity(S1) -- Comment Sentiment(S2)--Perceived Usefulness(O1)--Perceived Value(O2)--Purchase Intention(R)" and poses the following research questions: First, which type of video which is about the "Red List" or the "Black List" is more effective at stimulating consumer purchase intention? Second, does the emotional tone of comments play a positive moderating role between list polarity and purchase intention? Finally, do perceived usefulness and perceived value play a chained mediating role between list polarity and purchase intention? Specifically, SOR theory [8] emphasizes that environmental stimuli(S) are transmitted through the mediation of organism's internal states(O), ultimately triggering behavioral responses(R). In the context of this study, "list polarity" serves as the core independent variable, representing the stance of recommendation or warning conveyed by the video content; "comment sentiment" acts as a secondary stimulus, reflecting the social identity and peer pressure generated by group interaction. Together, they constitute a composite stimulus source. At the Organism level, "perceived usefulness" represents consumers' initial assessment of the decision-support value of the information they receive, while "perceived value" constitutes a comprehensive utility evaluation built upon perceived usefulness; the two are logically sequential. Ultimately, "purchase intention", as the dependent variable, represents the overt behavioral tendency resulting from prior cognitive and emotional processing. The first research question focuses on the main effect of content polarity; The second research question explores the situational moderation of social cues; and the last research question delves into the internal pathways of cognitive transformation. This model not only expands the applicability of the traditional SOR model [8] to short-video e-commerce but also provides a theoretical framework for understanding how the dual stimuli of "content plus comments" synergistically influence consumer decision-making, demonstrating strong practical explanatory power and academic innovation value.

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3.2 Questionnaire Design

This study employs a questionnaire survey method to empirically test the theoretical model and research hypotheses. This method effectively captures consumers' psychological processes and behavioral intentions in real-world social media environments and is capable of handling complex multivariate relationships, making it suitable for conducting path analysis of the chained mediation and moderation effects in the SOR model [8].

This survey was conducted via a professional online questionnaire platform. After excluding invalid samples with excessively short response times or repetitive responses, a total of 202 valid questionnaires were collected. The survey participants spanned most provinces in China and represented all age groups. In terms of questionnaire design, this study strictly adhered to the "Stimulus --Organism--Response" theoretical paradigm [8] to structure the item logic. On the stimulus side(S), the question "What do you think is the overall bias of this video?" was included to distinguish between "Red List" recommendations and "Black List" warnings, to investigate the main effect in the first research question; the questions "Based on what you saw in the comments section and the bullet comments at the time, please select the option that best fits" and "To what extent did you browse the comments section at the time?" were included to measure the emotional atmosphere of the comments section and user engagement, serving as moderating variables for the second research question. On the organizational side (O), perceived usefulness is measured using the statements "I believe the information provided in this video was very helpful for my purchasing decision" and "This video gave me a clearer understanding of the product's strengths and weaknesses"; perceived value is measured using the statements "I think the product recommended/warned against in this video offers high/low value for money" and "Overall, it was worth taking this video's advice into account." Together, these two variables form a chained mediation path used to investigate the answer to the third research question. On the response side(R), set "Based on this video and the comments section, what is your actual intention to purchase?" as the final dependent variable to complete the logical loop.

4. Data Analysis and Results

4.1 Analysis of Sample Structure and Content Involvement

In terms of sample composition, the sample exhibits typical characteristics of being "young, highly educated, and highly engaged," which closely aligns with the core audience profile of Douyin's "Red-and-Black List" videos. Demographically, women accounted for 56.44%, slightly higher than the 43.56% for men, reflecting the current market reality where female users are more active in making purchasing decisions in social e-commerce scenarios. The age distribution is highly concentrated in the 18–35 age range, accounting for a combined 63.86% of the sample, with the 18–25 age group making up 35.64% and the 26–35 age group 28.22%. This indicates that young people are not only digital natives but also the primary consumers of this type of polarizing content. Furthermore, 66.83% of respondents hold a bachelor's degree or higher, and 43.53% have a monthly disposable income of 5,000 yuan or more. This demonstrates that the sample possesses a strong educational background and significant spending power, enabling them to make rational judgments about product value. More crucially, behavioral data supports these findings: as many as 45.05% of respondents stated that they "always" watch such videos, and 54.95% have actively searched for related products based on video content. These figures not only confirm that "Red-and-Black List" videos' content has become a key reference for users' daily information gathering and consumption decisions but also indicate that the sample exhibits a high level of psychological engagement with the research context. This active, rather than passive, approach to information reception effectively ensures the authenticity and validity of subsequent measurements of perceptions and intentions [9].

4.2 Videos Tend to Perceive the Value Transformation Mechanism

"Red List" and "Black List" videos disrupt users' cognitive balance through polarized narratives, thereby driving perceived value through perceived usefulness and forming a complete conversion chain from external stimuli to internal cognition [10]. Data analysis shows that whether it's the "positive recommendations" of the "Red List" or the "negative warnings" of the "Black List", their extreme presentation of information can trigger a strong psychological impact and effectively capture users' attention [11]. Survey results indicate that the vast majority of respondents recognize the value of such videos in providing assessments of a product's strengths,

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weaknesses, and cost-effectiveness. A very high percentage of respondents agreed with statements such as "the information provided in this video was very helpful for my purchasing decision" and "it gave me a clearer understanding of the product's strengths and weaknesses". This perceived usefulness goes beyond superficial information transmission and significantly and positively predicts perceived value: in the "Red List" videos' context, usefulness manifests as helping users discover great products and improve their quality of life; in the "Black List" context, it manifests as helping users avoid pitfalls and minimize losses and ensure consumer safety. Users internalize video content as their own cognitive capital; the more useful they find the information, the more likely they are to believe that referring to the video was worthwhile. This psychological shift from "information acquisition" to "value judgment" lays a solid cognitive foundation for subsequent purchasing decisions.

4.3 Purchase Intention and Behavioral Conversion Efficiency

As the final output of the model, purchase intent demonstrated a high conversion rate in the sample and effectively translated psychological intent into actual behavior. Data shows that more than half of the respondents developed a clear purchase intention after watching the videos, and this intention was significantly evident in both the "Red List" videos and "Black List" videos—the "Red List" videos primarily stimulates users' desire to try new products by evoking their aspiration for high-quality goods, while the "Black List" facilitates alternative purchases driven by risk avoidance by eliminating information asymmetry. It is worth noting that purchase intent did not remain merely a psychological fluctuation; 54.95% of actual search behaviors strongly demonstrated the efficient conversion from awareness to action. This indicates that "Red-and-Black List" videos not only possess emotional appeal but also exert a powerful influence on behavior. Once users confirm that the information is useful and its value is clear, they can rapidly shorten the decision-making process, reduce information-searching costs, and proceed directly to the point of purchase. This high conversion rate profoundly demonstrates the marketing effectiveness of short videos, where "content is the gateway", and validates that within the Douyin e-commerce ecosystem, the "Red-and-Black List" videos serve as a unique persuasive tool that exerts a substantial influence on consumer behavior [12].

5. Discussion

First, based on the SOR theoretical framework [8], this study reconstructed the "dual stimulus—cognitive transformation—purchase intention" model in the context of short-video e-commerce and refuted the limitation of previous studies that examined video content and comment section information in isolation. The study confirms that "Red List" and "Black List" videos not only directly influence consumer decisions through "list polarity," which is the primary stimulus, but also generate a significant synergistic persuasion effect in conjunction with the "emotional atmosphere of the comment section," which is the secondary stimulus. Specifically, "Red List" videos, backed by positive comments, significantly amplify the persuasive effect; conversely, and "Black List" videos accompanied by negative comments reinforce the buy-off effect. This finding reveals that short-video platforms constitute a complex information field where user decisions result from the combined influence of content information and social cues, providing new evidence for understanding consumer psychology in the new media environment.

Second, the study conducted an in-depth analysis of the underlying cognitive transformation pathway from external stimuli to internal decision-making, confirming the validity of the chain-mediation mechanism linking perceived usefulness to perceived value. The study indicates that external stimuli do not directly translate into purchase intention but must instead pass through the consumers' internal cognitive processing pathways. Among these, the evaluation of information helpfulness—perceived usefulness—serves as the initial stimulus that promotes purchase intention, while the comprehensive assessment of a product's cost-effectiveness—perceived value—is the critical link influencing the final purchase behavior. This chain-like pathway corroborates the findings in related studies that the sentiment of online reviews influences purchase intention through dual perceptual variables and successfully extends this framework to the context of "Red-and-Black List" videos, indicating that users only complete the transition from information acquisition to value judgment after internalizing video content as their own cognitive capital.

Finally, the theoretical contribution of this study lies in expanding the scope of the SOR model's application to short-video e-commerce. Specifically, this study extends the single stimulus in the traditional SOR model

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to a dual stimulus comprising the polarity of video content and the subjective sentiment in the comment section, and focuses the organismic level(O) on the chain reaction between perceived usefulness and perceived value, thereby enriching the explanatory power of the SOR model in digital consumption contexts. At the same time, the findings provide empirical support in the short-video domain for the "multidimensional stimulus – psychological mechanism–behavioral response" analytical framework proposed by relevant scholars. On a practical level, the study suggests that content creators should emphasize the synergy between "content polarization" and "comment section guidance" when producing "Red List" and "Black List" videos: "Red List" videos can proactively highlight positive user feedback, while "Black List" videos can guide users to share experiences on what to avoid. Furthermore, companies can dynamically adjust their advertising strategies by monitoring sentiment trends in comment sections to maximize the marketing effectiveness of recommendations or deterrents.

6. Conclusion

The findings of this study, based on an empirical analysis of 202 valid samples, confirm that "Red List" videos are more effective than "Black List" videos at stimulating consumers' purchase intent; the emotional atmosphere in the comments section plays a significant positive moderating role between the list's polarity and purchase intent; perceived usefulness and perceived value exerted a chained mediating effect between the list's polarity and purchase intention. Consequently, the study concluded that Douyin's "Red List" and " Black List" videos, through the dual stimulation created by content polarization and comment resonance, effectively drive consumers' cognitive leap from perceived usefulness to perceived value, ultimately achieving effective intervention in consumers' purchasing decisions. This conclusion not only clarifies the differentiated persuasion logic of "Red-and-Black List" videos but also reveals the interactive mechanism between "informational cues" and "social cues" on short-video platforms, providing marketing insights for merchants on e-commerce platforms.

This study provides valuable insights into future research in this field, primarily influencing both the theoretical and practical aspects of short-video marketing. On the theoretical level, this study expands the scope of the SOR model's application to research on polarized content, validates the rationale for incorporating "list polarity" and "comment sentiment" as dual stimuli into a unified framework, and offers new perspectives and analytical paradigms for future scholars exploring consumer psychological mechanisms in the new media environment. On the practical level, the study's findings guide content creators to prioritize emotional guidance and management in comment sections, leveraging positive feedback to enhance the persuasiveness of their videos. At the same time, it advises brands to precisely align their "Red List" and "Black List" advertising strategies with specific marketing objectives—such as promoting products or warning against pitfalls—to maximize marketing effectiveness. Future research should focus more on in-depth exploration across all scenarios and using multiple methodologies. For example, researchers could further expand the age range and occupational backgrounds of the sample to investigate differences in how consumers of different generations perceive "Red-and-Black List" content; or introduce neuroscientific methods such as eye-tracking and EEG experiments to capture consumers' moment-to-moment psychological changes while watching videos. Additionally, with the development of generative AI, the impact of "Red-and-Black List" videos posted by virtual influencers on consumer trust mechanisms warrants continued attention.

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From Dependency to Independence: On the Paradigm Transformation of Criminal Protection of Privacy Rights in China

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Abstract

The extensive application of big data and artificial intelligence technologies has led to the ongoing erosion of privacy protection; however, the safeguards for the right to privacy under China's Criminal Law have clearly lagged behind. Judicial practice has relied on the crime of infringing upon citizens' personal information as the primary regulatory tool; however, privacy rights and personal information rights differ fundamentally in the legal interests they protect: the former protects personal dignity and the peace of one's life, while the latter upholds the order of information flow and self-determination. As evidenced by Guiding Case No. 265 of the Supreme People's Court and a number of representative cases of cyber violence, a considerable amount of conduct that directly undermines the dignity of privacy can only be prosecuted through the legal framework of personal information crimes, which creates a displacement in the evaluation of the protected legal interests. Meanwhile, the Civil Code has explicitly established the right to privacy as an independent and prioritized specific personality right, yet criminal legislation has consistently failed to establish dedicated provisions, leading to structural contradictions within the legal system. Through an analysis of legal interests and normative frameworks, this paper identifies three limitations in the current dependent protection model—regarding the evaluation of legal interests, the scope of protection, and constitutionality—and proposes the establishment of a "crime of infringement of citizens' right to privacy" to construct a dual-track paradigm combining direct and indirect protection. This transformation is not merely the addition of a new criminal offense but also a profound adjustment to the definition of legal interests, evaluation mechanisms, and systemic coordination, with the aim of providing comprehensive and effective criminal law safeguards for the right to privacy in the digital age.

Keywords

big data, right to privacy, right to personal information, dual-track system, crime of violating the personal information of the citizens

1. Introduction

The massive application of big data and artificial intelligence technologies has certainly altered the nature of the connection between the individual and the society. People as consumers, their health status and mobility patterns, as well as their social behavior, are continuously being turned into digital data that is further analyzed

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by the algorithm to produce useful information resources. Privacy is gradually losing its position behind the screen of convenience provided by such technologies, and the uneasiness over the invasion of privacy is not just an imaginary concept anymore but a common concern in real life.

To address these crimes triggered by this phenomenon, the Chinese judiciary, basing its criminal practice on the crime of violation of individual privacy, has revealed a chain of contradictions over time: the meaning of the legal interests ensured by the right to privacy and by the right to personal information are substantially dissimilar. A criminal offense developed to maintain the order of information flow may also be displaced in itself to achieve the purpose of maintaining personal dignity. The invasion of personal information of a citizen, whether in the case of Wu** and Chen** [1]or in the case of Wang Qiang [2], in a criminal justice system, once the court determines that the actions constituted an invasion of the right to privacy of citizens, it is bound to restrict itself to the current roster of criminal offenses and thus forced to always categorize these acts as crimes that constitute infringement of the right to personal information of citizens. Nevertheless, the Personal Rights chapter of the Civil Code has already explicitly identified the right to privacy as one of the special and independent types of personal rights that must be prioritized. The difference between the protection of the right to privacy and the right to personal information has been expounded further by the Supreme People's Court in Guiding Case No. 265, the case of Luo *., a certain technology Co., Ltd., concerning the clash of the right to privacy and the protection of personal information, which says that even when the act of collecting user profiling data might be viewed as a breach of the rights to personal information, they should be viewed separately in contrast to the breaches of the right to privacy. Such disparity in which the legislative advancement has made great steps forward, but criminal law security lags far behind is still a dilemma that should be resolved immediately.

The right to privacy is one of the basic rights of individuals, and it should not be understood solely as the right to personal information under criminal law. Rather, it must turn the indirect safeguard into a dualistic system that is comprised of both direct and indirect safeguards, which is more than the implementation of new criminal laws but is rather the change of the concept of legal interest, the assessment systems, and the systematic integration. The present study will begin with the examination of the limits of the legal interests protected by the right to privacy and the right to personal information, the drawbacks of the current dependent protection model, and the threats to the constitutionality it poses, lastly, the research will provide the suggestion of a systemic restructuring model that will aim to introduce an offense of the violation of the citizens' right to privacy.

2. The Erosion of Privacy Protection in the Big Data Era

2.1 The Trend Towards the Over-expansive Application of the Crime of Infringing Upon Citizens' Personal Information

The invasion of personal data of citizens has turned into an international phenomenon in the modern criminal justice system. It starts with professional underworlds that conduct illegal trade in massive amounts of personal information of citizens, then it proceeds to individuals who place miniature cameras in hotel rooms in order to covertly film other individuals and extends to other individuals who use web scraping technology to obtain contact information of corporate legal representatives online and sell the info to others; despite the fact that these two groups can be extremely different depending on their targets, their methods as well as the damage they cause to society, they often wind up being categorized as one crime.

In the criminal case of Wu **, Chen **, et al. (Case No. (2020) Su 0508 Criminal 714), which is an example of online violence, the criminals got the personal information of their victims through the unlawful approaches of doxxing and subsequently published defamatory content regarding the victims online with the total number of views and reposts reaching over 2 million. Subsequently, the court finally convicted and sentenced the accused individual to the charge of infringement of the personal information of citizens as per the provision concerning the other serious conditions specified in the judicial interpretation. Moreover, in the case of Wang Qiang, who had violated the privacy of citizens (Case No. (2020) Qian 04 Criminal Appeal 155), various offenders utilized a personalized data scraper tool and a super administrator account and password to which they had access to the Good Data online lending traffic generation system to scrape personal information of citizens over the internet and then sell it to others for a profit. It was made clear in the judgment in the appeal

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that what the perpetrators did in infringing upon the personal information of citizens also violated the right to privacy of citizens. Nonetheless, the problem of privacy rights was only raised during the supplemental civil lawsuit and accused of the identical crime of breaking the privacy of citizens' information.

The general view of the cases that can also be regarded as a catch-all solution can be seen as adding to the efficiency of courts, but it hides a major problem. The core of the crime of violating the personal information of the population is to regulate the flow of information and individual rights to have access to their own information, but the main harm caused by the violation of privacy is the personal damage to the internal peace and dignity of a human being. In case a person experienced the private body exposure, spatial movements, or the private talks of other people and this happened without the permission of the person involved the purpose of this attack would be the degradation of personal dignity and the collapse of the inner feeling of order in the person - not just loss of control over information. It is like weighing the weight with the help of a thermometer as the attempt to quantify this qualitative infringement of personal dignity with quantitative measures, i.e., the total volume of information, or even illegal profits: the measure is wrong compared to the thing to be measured. This bias in the assessment of the law interest has been institutionalized and extended due to the long-term judicial inactivity, which can eventually lead to the death of the idea of basic fairness in the creation of criminal responsibility regardless of the guise of exact criminal liability and punishment [3].

2.2 The Mismatch Between Independent Protection under Civil Law and Supplementary Protection under Criminal Law

Privacy is a right that is currently recognized by legislation. There is a stark discrepancy between the manner of protecting privacy in civil society and the manner of protecting privacy in criminal law, where privacy protection is subsumed under the cover of other criminal offences. In sections, the Personal Rights sections of the Civil Code list consecutive chapters to the right to privacy and the protection of personal information. This contrast alone is a very strong normative message: despite being very close, they are disconnected regarding the legal interests that they protect and the rules of protection that they have. Most importantly, civil law has also developed laws to address conflicts between them. Article 1034, paragraph 3 of the Civil Code is very clear in stating that when a piece of information possesses both the quality of personal information (identifiability) and the quality of the privacy of the personal life, the law gives precedence to applying the rules of privacy protection and the rules of personal information protection are only applied as supplementary measures [4], which means that the hierarchy of values of civil law places the right to privacy higher up on the list of fundamental and prioritized legal interests. Moreover, according to the Interim Provisions on Disclosure of Complaints by the Market Supervision and Administration, the release of complaint information to the public should also be agreed upon by the consumer and it should not expose sensitive information about personal privacy; Article 1 of the Provisions of the Supreme People's Court on Certain Issues on the Application of the Law in the Civil Cases of Infringement of Personal Rights by Information Networks states directly: Civil cases of infringements of personal rights by information networks, referred to in this provision, mean those civil cases caused by the infringement of another person's personal rights, such as the right to a name, right to a trade name, right to reputation, right to honor, right to one's likeness, and right to privacy by information networks; Article 2 of the Regulations on the Protection of Minorities in Beijing stipulates: Ensure the privacy rights of minors and their personal data... There are a series of laws and regulations that specifically focus on the protection of personal privacy as opposed to the ambiguous concept of personal information.

It is clear that the legal system has an inherent unity, and therefore, it would be right to say that the different branches of law should cover similar types of legal interests in about the same way. Nevertheless, the concept of privacy is not explicitly mentioned as part of the Criminal Code concerning criminal law; it can only be guaranteed by twisting the criminal laws or basing its existence on the body of criminal offences, including the crime of revealing information relating to citizens, the crime of illegal intrusion into a flat, and defamation. It is shocking to see that only 48,656 criminal cases are found when using the keyword of privacy to search judicial cases in the database of the Peking University Law, which is much less than 307,899 civil cases. In the opinion of the Supreme People's Court entitled Six Typical Cases of Infringement on Personality Rights Using Internet and Information Technology, illegal access to the control of smart home devices is an excessive infringement of the right of people to privacy and protection of their private information, which suggests that in reality, courts have already reached the understanding that personal privacy and personal information can

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be treated as two different legal interests and that criminal law has always been lacking particular protective regulations concerning the right to privacy. A contrary case, where civil law has taken a very high level of independence and criminal law has greatly lagged behind, cannot be viewed as a reasonable structural contradiction in the legal system.

2.3 The Independent Value of Criminal Protection of the Right to Privacy

The observations mentioned above, based on judicial and normative views, lead to one general conclusion: that privacy as a human right should be provided with a separate and non-substitutable position in criminal law. The problem is that the existing criminal law does not provide protection of privacy, but this protection will not take place unless it is based on other parts of the law. To illustrate, unlawful invasions of homes are covered by the peace of the home, insults to social reputation, and attacks on the personal information of citizens by the right to informational self-determination or information security order. Even though these legal interests are very closely connected to the rights of privacy and can overlap in terms of protection in particular cases, all of them cannot fully and accurately cover the special character of unlawful privacy violations.

Article 3 of China's Law on Public Security Administration Punishments also leaves legislative room to protect the right to privacy using criminal law. "If any of the personal rights, including the right to privacy, are violated, it should be as follows: if these actions are criminal offenses under the Criminal Code of the People's Republic of China, criminal responsibility shall be imposed by law; otherwise, administrative punishments must be administered to them under this Law by the police." [5] This implies that when someone greatly violates the personal privacy of another individual, there is no way to punish such a violation with just one administrative measure, and criminal law is required to plug this loophole. There is an idea of a personal life not being intruded upon and a personal area not being spied upon that is an independent interest which ought to be safeguarded by criminal law rather than being considered as a derivative of other rights or an incidental consequence of protecting them [3]. To solve this problem in reality, it is supposed to begin with the creation of the legal environment of independence in the right to privacy, since only thereafter any further institutionalization would have a sufficient basis.

3. Distinguishing the Legal Interests of the Right to Privacy and the Right to Personal Information

3.1 The Right to Privacy: "Negative Liberty" Grounded in Human Dignity

Privacy as a right is the establishment of a personal space in a person where outsiders can be allowed to interfere to a minimal degree. It has the quality of privacy as the central element and has various dimensions, such as the peace of private life, private areas, private actions, and private data. The final aim of this protection is the individual himself, that is, his/her honor and desire to grow and form the character in this very atmosphere where it is not interrupted [6].

The reason why this right can be viewed as a practical issue is that of passive protection; the rights holder is not required to act but allowed the space to inform the other people in the world that they should leave the rights holder alone. Privacy in the digital age is taking different shapes, but its meaning remains the same. By integrating the fragmented data, which are the history of the web browser, consumption patterns, and social interactions of a particular individual, algorithms may build extremely personal profiles that are sensitive in nature. The derived information could be more precise and close to the data that the rights holder has purposely given. Such derived privacy data keep on attacking the person who does not want to be examined by the eye of technology - they hit the core of his personality [7]. The shift in environmental conditions brought by technological innovations does not lead to the loss of the right to privacy independence, it needs to be expanded to cover the emergent types of invasion.

3.2 The Right to Personal Information: "Active Control" Based on Data Circulation

In contrast to the right to privacy, the main feature of the right to personal information is substantially different since it is based on the concept of information identifiability, i.e., the possibility of identifying and locating one particular natural person in a population by using certain information and should be treated as one of the kinds of individual civil rights [8]. The right is not to imply that the information must be a secret but

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that the person with the right can choose to make independent decisions and positively manage information that might be used to identify them, such as the sovereignty over the entire life cycle of the information, which includes the gathering, holding, and use through the processing, transfer, provision, and disclosure of the information [9].

The object of protection under the right to personal information possesses an inherent dual nature. On the one side, it protects personal interests, and information leakage and abuse may cause a sequence of violations of personal safety, property, and in some cases even personal dignity. On the other side, it also protects property interests and the common good since smart information circulation and exchange help to facilitate the sound development of the digital economy; otherwise, this will increase the negative externalities of digital technology on social governance and individual rights. The result would be that the institutional structure of personal information rights needs to be balanced along the lines of protection and control and exclusivity and sharing. Any social media profile created by an individual which is no longer private is also part of personal information rights as it is identifiable and is not a form of public information which can be accessed randomly. It indicates the main issues of the right to personal information and the right to privacy, taking different paths since they were created: the first one is about who holds the power over information, and the second one is about what information should be hidden.

3.3 The Dual Nature of Private Information and the Attribution of Legal Interests

Privacy and the right to personal information are not two separate and non-related concepts, but rather are combined into the notion of what is sometimes called private information. Medical and health records, sexual orientation records, religious beliefs records, financial account passwords records, etc. share these properties: identifiability, i.e., the ability to use them to identify a particular person, and privacy, i.e., the sensitivity of the content because they contain highly sensitive information, which is frequently the boundary between these rights.

As concerns the essence of this gray area, the official position is expressed clearly and confidently: the legislation on the right to privacy is more important. The civil law has already established enough of the normative ground on this bias; the legal justification of this rationality of prioritization is the fact that human dignity is more important than the order of use and distribution of information. It ought to be extrapolated to criminal law in these contexts: when a criminal is purchasing, selling, or revealing other people's information improperly, the criminal law should start by disregarding the amount of information sold by the criminal or the amount of money he/she made and instead consider the level of damage and seriousness of the damage caused by the criminal actions to the individual dignity of the data subject. One of the mechanisms that might serve as a perfect illustration of such an evaluative role is the case of a standalone crime of invading privacy.

3.4 The Personal Information Framework Cannot Comprehensively Protect Privacy

Privacy and personal information intersect in the sense of exclusion. Because the model of personal data protection is based on the idea that identifiability may be just a few conditions, or perhaps even the only condition, it does not address all the aspects associated with privacy rights.

It has become apparent that there are huge volumes of private information which could not be seen as information as they were part of a typical day. The dynamism of private actions, the privacy of the private environment, and spoken utterances in the course of private discourse are what form the core of the right to privacy, not necessarily that they should be kept on a computer or in any other way and not necessarily that they should be identifiable to a particular person. This may be stated as a hotel room, but it is not possible to describe in what manner the human dignity can be violated in this hotel room when the spy activity takes place in terms of recognizability. The creators of the Criminal Code in Germany have definitely understood such a differentiation between the targets of protection. They have laid down, in Chapter 15, different offenses of intrusive behavior in personal space including specific prohibitions concerning photographing individuals in the home or in very secluded spaces or different punishments in the presence of recording or listening to private conversations. These legislative instances indicate that in addition to the sphere of information, there is also another sphere of privacy, namely space and activity, that also needs separate elements of crime to protect them.

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4. Limitations and Crises of the Current "Dependent" Protection Model

4.1 The Shift from "Personal Rights" to "Rights to Public Order"

It should be mentioned that the distinction between personal information and personal privacy was already present in Chinese civil law and administrative law. According to the principle of unity of the legal order, criminal law must also distinguish between personal privacy and personal information, rather than confusing them. The most serious consequence of such a view on conduct that violates the privacy as a crime of violating the population's personal information is the substitution of the legal interests related to the right to privacy with the ones related to the right to personal information as part of their assessment by the law in the process inadvertently.

It is discussed in the criminal law literature whether there are specific legal interests that are protected by the crime of infringing on citizens' personal information or not, but two theories, the right to informational self-determination theory, which builds on individual legal interests, and the information security order theory, which builds on supra-individual legal interests, treat the issue of information circulation as such. The first instance is when a person sees the fact that he has lost the control over the information, and the second case is when a person sees the fact that the balance between the information order has been upset. According to the people who oppose this sentence, this law defends the legal interests of the group due to the fact that it is not just about one person but also about the benefit to all people and sometimes the safety to the country [10]. Nevertheless, the one thing that is beyond dispute is that none of these legal interest ideas can adequately represent the actual pain points of privacy violations, i.e., that stabbing of personal dignity, that unrest of inner peace, and that feeling of humiliation that takes place when someone is forcefully intruded upon their private space.

The fact that a camera is present in the bedroom of a person and that this video is not shared with others publicly is not considered to be a disorder in the information flow order, and it may even be ignored as an offense of infringement of the information of citizens because the illegal acquisition, sale or delivery of such information is missing. Nevertheless, it is a very serious infringement of the right to privacy and leads to irreparable psychological damage to the victim. In these circumstances, the existing Criminal Law will either leave the jury deadlocked due to its inability to determine whether there were any proper charges they could have brought against them, or it will leave it biased as they were forced to bring other charges. Regardless of how it is presented, it reveals the excessive malfunctioning of the concept of dependent protection in the realm of legal interest evaluation.

4.2 The Exclusion of Pure Privacy under the "Identifiability" Standard

Identifiability acts as a necessary part of invading the privacy of citizens by criminalizing their personal data. The stated threshold is used as a filtering mechanism to reduce the identity theft and the illicit sale of information but simultaneously it erases the majority of unlawful intrusions into privacy that are not addressed by the criminal law.

The common scenario is to invade a person and their activities. As a particular case, placing hidden cameras in other people's homes, hotel rooms, changing rooms, or bathrooms (as long as the assailant is not recording but merely watching the view) could not be viewed as an illegal invasion of private information without significant difficulty. There is a legal loophole in the criminal law because no individual has been identified, and no data is being entered. Currently, artificial intelligence technology development is becoming even more relevant: the large language models may process and generalize very large volumes of information that are originally completely non-identifiable and provide extremely sensitive personal profiles. These assumptions have done damage since they involve very personal information instead of the fact that the initial information is identifiable [11]. When this happens, traditional guidelines almost cease to be effective, and it results in a terrifying result: the criminal law safeguards the data formats marked as identifiable (that is, the form) but fails to cover the real impact of the breach of privacy.

4.3 Non-compliance with the "Principle Prohibiting Insufficient Protection"

This is evident in most of the dilemmas highlighted above on the level of the substantive law, but it is not just a mistake in the criminal law doctrine, but it causes extremely serious issues on the constitutional plane

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regarding the responsibility of the state to protect. Fundamental rights are understood by the state as not only a negative non-intervention duty but also a positive duty to ensure protection. It is necessary to ensure the functioning of the institutional guarantees of the implementation of fundamental rights through different mechanisms: legislative, judicial, and executive. Such a state-based responsibility of protection is not unlimited; its constitutional monitoring system is the concept of insufficient protection. According to this concept, the protective measures taken by the legislature in order to protect fundamental rights should have a certain degree of effectiveness; they should not be just an announcement or ceremony, but must involve real constraints on possible violators, and consequently, overall, a minimal level of protection of fundamental rights [12]. If the impact of technology on privacy becomes particularly acute (in such cases when the use of civil remedies is ineffective and the administrative liability is insufficient) the inability of the state to meet its positive obligation to create criminal laws may be viewed as an infringement upon the positive obligation of the state to protect human dignity as stipulated in Article 38 [13] and Article 40 [14] of the Constitution and thus is a violation of the principle of insufficient protection.

The use of this criterion in the evaluation of the right to privacy protection by means of the existing Criminal Code reveals that, in terms of formality, the entire Code does not contain any specific articles or offenses relating to the right to privacy, thereby rendering it rather inconspicuous. Actually, most of the intrusion of privacy that results in serious psychological damage is not chargeable as a crime (it cannot be defined as an invasion of privacy because it does not have the characteristic of identifiability or it cannot be defined under the existing types of offenses) and therefore, the need to turn to civil damages and administrative penalties as the last resort is created and thus, a criminal accountability gap is formed. The fact that the criminal law is clearly lacking in all the major areas of its functioning when it comes to the protection of fundamental rights makes it reasonable to consider carefully whether the protection offered by the laws still corresponds to the minimal requirements of the Constitution. It is exactly in this context that the statement that can be found in this article is formulated: a change should be implemented at the level of the legislative theory.

5. Constructing a Dual-Track Model for the Criminal Protection of Privacy Rights

5.1 The Necessity and Feasibility of Introducing the Crime of Infringing Upon Citizens' Privacy Rights

In order to break the existing impasse, it is necessary to alter the traditional attitude that considers the right to privacy as subordinate to other rights and provide the direct safety by creating a personalised offense of violation of the right to privacy of citizens.

Privacy is a legal interest that is independent; the subject matter of peace of mind, private space, private life, and confidential data that it protects are a group of interrelated interests that cannot be replaced by any other legal interests. Despite the fact that there could be some resemblance between the right to privacy and the right to personal information, essentially they cover different spheres of protection. The control gives the cause to shield personal information but the secrecy and calmness give the cause to shield the right to privacy. This inconsistency in the character of the legal interests indicates that the first cannot completely displace the second one [6]. Criminal offenses against individual privacy and the private sphere [15], including the violation of privacy of speech and the invasion of individual privacy and personality rights through photography or other pictures, etc., are included in the list of crimes against privacy in the German Criminal Code, Article 15. This law also shows that the criminal offense system may be unified and strict, when it comes to the successful introduction of the offenses against the private life and the secrecy zone into an integrated and consistent criminal offense system, offering selective and direct protection to different types of privacy, such as the private space, private conversations, and private images. These are not mere hypotheses but practical solutions that have successfully stood up to judicial review because of their capacity to withstand judicial review. In reality, the extent of the new crime is unequivocally clear and unambiguous: it is exactly meant to cover the infringement of privacy without having recourse to the existing crimes that are incompetent to cover the infringement. It also creates a companion and supplemental relationship with the crime of intruding on the personal data of citizens, which does not mean the vagueness of the statutory correspondence, but enhances the degree of completeness and complexity of the protection system.

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5.2 Clarifying the Threshold for Criminal Liability Regarding Private Spaces, Activities, and Information

Not only does a single criminal act have relevance because it was reported, but also because it gives the judge an unmistakable and functional list of factors, which he or she can consider in his or her job. The novel crime of Invasion of Citizens' Right to Privacy should be incorporated into Chapter 4 of the special section of the Criminal Law, that is to say, Crimes against the Personal Rights of Citizens and their Democratic Rights. This is all about securing the personal rights of people, and its position in the legal system will be determined by what type of legal interest the new offense protects.

To determine the offense, it may be useful to take into account three aspects of parallelism in a core structure, namely: private space, private action, and private information. The main components of the offense are: illegal access to, intrusion into, shooting of, filming of, or any other invasion of another person's private space or activities; and illegal accumulation, manipulation, sharing, distribution, or provision of another person's private information to other people. As all these three categories are considered to be protected objects to the same extent, the offense includes all privacy rights so that the loopholes in the existing legal framework in terms of what can be referred to as non-information-based privacy and violation of privacy without spreading information are filled [16].

The separation between the serious situations and the criminal responsibility is one of the fundamental guarantees of the principle of restraint in the criminal legislation. The conditions of this border must be not just different than those of the quantitative approach, which is aimed at the volume of information and illegal benefits, i.e., infringement of personal information of citizens, but they must also be different than the administrative penalties set out in Article 50, Clause 6 of China's Law on Public Security Administration Punishments [17]. Administrative offenses are offences that have individual, specific and material characteristics and are committed in the private sphere, but the criminal offence of violating the right to privacy of the citizen should include harassing privacy through online and media outlets with the help of modern information technologies and technologies, focusing on the practical effect of the conduct on the dignity of the victim, state of mind, and emotional health of the victim. Serious circumstances should be determined considering such important factors as the level of intrusiveness of the methods used, the frequency and frequency of the infringing actions, the extent of dissemination, whether the victim underwent serious psychological repercussions or even committed suicide because of it, or if the methods used were particularly dehumanizing to the dignity of the victim and had negative social repercussions on him/her during his lifetime. This hierarchical model of evaluation that relies on harm to personal dignity does indeed represent the natural harm caused by privacy violations and is an important step in shifting the evaluation to the essence [18].

5.3 The Rule of Concurrent Offenses Between the New Offense and the "Crime of Invasion of Citizens' Personal Information"

The dual-track protection system needs to have a clear structure so that neither of the violations could induce another level of confusion in practice.

In case an act also turns out to be unlawful in respect of two legal interests, it is recommended to view it through the prism of imaginary concurrence. For instance, imagine that a perpetrator purchases and sells a large amount of medical records that contain very detailed medical history, genetic information, and sexual preferences of other people. This is extremely sensitive personal data which has the properties of identity of personal information and privacy protection. It is a breach of the right to informational self-determination and the right to privacy and should be punished more severely to ensure that the overall negative assessment of such mass compound crimes is right.

In case an act involves only one legal interest, the difference between these two offences can be quite easily determined. The act of merely looking into a hotel room might also be penalized as an offense of invasion of the privacy of a resident; the act of simply printing non-private information of another person, which had been obtained legally, might also be penalized as an offense of invasion of the personal data of a resident. These two crimes do not influence one another, but allow evaluating the violation of various types and levels of legal interests in different and accurate ways [19]. Such an approach, which could be defined as well-defined separation of duties and systematic coordination, is actually the structural benefit of the dual system over the single and interconnected one.

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5.4 Complementary Defense Mechanisms under the Dual-Track System

Also, it should be noted that before the independent legislation is completed, it would be better to protect some types of personal data (which are in the grey zone) indirectly with the help of judicial interpretation, which would serve as the institutional safety net in the creation of new criminal offenses. As an example, it would be reasonable and feasible to modify the definition of the concept of the personal information of citizens in the context of the current judicial interpretations to a much more practical concept of privacy.

To be more exact, one could suggest using an integrative evaluation standard that would involve incorporating the two concepts of weak identifiability and privacy into it. There are some kinds of information that cannot be regarded as indicating a particular person directly but can still be categorized as personal information protection because the combination of that information with any other technical means or situational factors will probably identify a specific person, and the nature of this information is so private that its presence is expected by each member of society. One instance of this scenario can be observed in the medical sector in which medical records are highly confidential and once they are disclosed they could inflict significant damage to the individual's rights. Although these pieces of information are already partially de-identified, criminal law must treat them as equally important because of the higher probability of privacy violation risks [20]. This interpretative approach is valuable because it offers a solution to multilayered protection of privacy that can be achieved by improving the court practice without substantially changing the Criminal Law articles.

6. Conclusion

Privacy is the ultimate barrier of human dignity. The individual finds himself in a new dilemma of openness on this very day, when digital technology has entered the lives of each person, and algorithms are silently rearranging the social order. The borders of personal space have completely altered with the massive gathering of information, constant profiling of users, and advanced intrusion systems whereby an invasion is now a kind of erosion.

Criminal legislation of China opted to include privacy among the areas of protection of personal information and other criminal offenses. Although this dependent system has maintained the formal efficacy of reducing crime during a short time, it is by nature susceptible to defects, such as the misalignment between the evaluation of legal interests and the narrowness of their protection, and can be observed as a legitimacy crisis due to the constitutional duty to protect the fundamental rights. It is evident under the current conditions that the right to privacy should be recognized in civil law and personality rights should be accepted, but also in practice and incorporated in criminal law as the final form of protection, where it ought to be regarded as a separate kind of legal interest that is provided with specific criminal protection.

The paradigm shift in the relationship between dependence and independence does not lie in the mere addition of another crime to the list of crimes, but rather in the termination of conceptual renewal and reorientation in relation to the position of the right to privacy in the criminal law. It has become an instant response of criminal laws to the autonomous value of the right to privacy as codified in the Civil Code, and the structural vulnerability of criminal law to the most intimate freedoms and dignity of a person when there is a sharp rise in the strength of information. The only way criminal law can really be effective in making sure major breaches of privacy are not evading the law is by adopting a dual track approach that includes direct and indirect protection and at the same time creating enough institutional space to innovate in technology and information flow in the era of big data.

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Research on the Design Process of the Digital Regeneration of Miao Embroidery Patterns Under the Perspective of Human-machine Collaboration based on AIGC

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Abstract

The fast growth of digital technology and generative artificial intelligence (AIGC) has put the digital preservation and adaptation of traditional cultural resources under high-profile consideration. At present, most of the design of Miao embroidery cultural and creative products can be regarded as monotonous pattern applications, lack of innovative expression and poor conversion efficiency, and thus there is an urgent necessity to develop new design processes. The investigation of the methods of the contemporary adaptation of the traditional patterns supported by AI is a considerable value. The current research paper will discuss the digital revival of Miao embroidery forms and will attempt to develop a human-machine coordinated design system that would ensure the conservation of traditional culture on the one hand and modern adaptation on the other. On one side, this paper is cataloging traditional Miao embroidery patterns and isolating typical pattern elements and gathering consumer preferences related to pattern content, colors, and other aspects using a questionnaire survey. On the other side, when introducing generative AI tools, it creates new patterns based on semantic guidance and, together with human curation, it creates a human-machine cooperative design process consisting of: pattern feature extraction - user needs analysis - semantic-guided generation - human optimization and adjustment - design application validation. The findings have created a new AIGC-enabled human-machine partnership framework, and its practicality in visual representation and design implementation was confirmed by the cultural and creative product design practices, which have helped to promote the further integration of generative AI tools with the digitization of Miao embroidery patterns.

Keywords

AIGC, human-machine collaboration, digital regeneration, miao embroidery cultural and creative design

1. Introduction

Due to the fast growth of digital and artificial intelligence technologies, the Internet has opened up new ways of preserving and transmitting intangible cultural heritage (ICH). Simultaneously, the digital preservation and innovative diffusion of ICH has become an inevitable area of research in the discipline of design studies [1].

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On one side, there are a number of present-day Miao embroidery culture and creativity goods that simply mix Miao ethnic factors along with contemporary goods in an over-simplified way to get innovative representation; on the other side, such goods are highly homogenous and the conversion efficiency of product designs is low and disconnected from the modern aesthetic [2].

The next generation of generative artificial intelligence applies text-based semantic processes to produce an enormous quantity of design proposals quickly, increasing design efficiency and decreasing design costs. Nevertheless, AIGC is an approach to the generation of digital content that includes interaction between humans and machines [3]. It is difficult to ensure that the proposals generated by AIGC are not only aesthetically pleasing but also culturally significant. The emphasis in this regard is thus on creating a human-machine collaborative design system that balances cultural heritage and design innovation, which is one of the research priorities in the sphere of AIGC-assisted design.

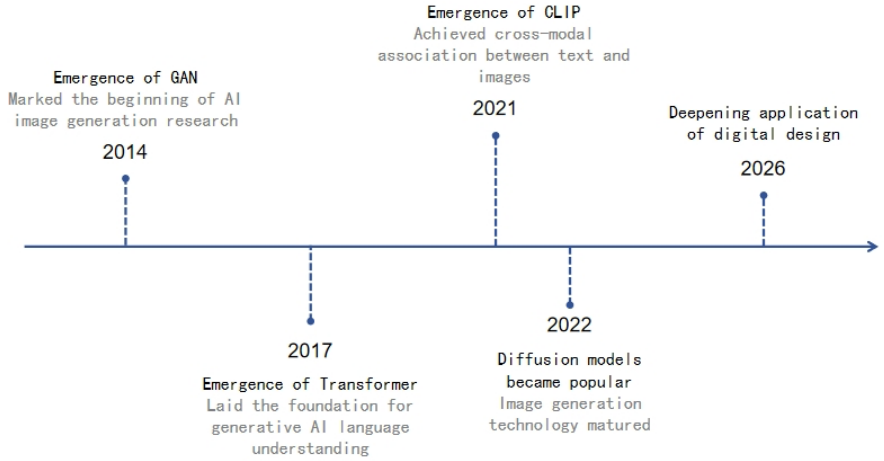
According to this, the research is aimed at the digital revival of Miao embroidery designs with an aim to investigate the human-machine collaboration in the design process which can be facilitated by the use of AIGC. It sets up a collaborative approach to design which includes the steps of pattern feature extraction, analysis of user requirements, semantics-based generation, human optimization and adjustment as well as validation of design application, thus offering a new paradigm of innovative design of Miao embroidery cultural and creative goods.

2. Overview of AIGC-Assisted Design

2.1 Current State of AIGC Research in Digital Design

The history of AIGC has been that of a technological progression starting with the Generative Adversarial Networks (GANs) that were developed in 2014 and culminating with the Diffusion Models that started gaining popularity in 2022 [4]. Existing AIGC models can generate good quality images and will eventually move towards generative creative models (figure 1).

Figure 1: Timeline of AIGC Development



The change has helped AIGC to make pioneering advances in the sphere of artistic production. The use of artificial intelligence technologies will transform the sphere of artistic creation and will lead to the emergence of three basic types of artistic production: autonomous creation by humans, autonomous works of art generated by artificial intelligence, and the creation of art through collaboration between humans and machines [5]. However, as AIGC also expands its presence into design, the current literature on AIGC and digital design has mostly been devoted to commercial images or image synthesis in general. The systematic study of how to use such a mechanism in the regeneration of traditional intangible cultural heritage patterns, which are highly culturally authentic, is still very narrow.

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2.2 Overview of Human-AI Collaborative Workflows Based on Generative AIGC

Human-AI cooperation in AIGC-assisted design processes is a process that has over time developed into a more or less constant functioning system. The designers give semantic direction to the AI according to the design objectives, and the AI produces and expands design proposals. The proposals are subsequently filtered and modified by the designers, and finally produce a solution that will satisfy the design objectives. At this moment, generative AI cannot be considered as an autonomous creator because generative image art still depends upon the judgment, correction, refinement, and interpretation of humans [6]. Although existing AIGC is able to generate high-quality images, the outputted results are highly random, and human designers need to guide and select.

Although AIGC-based design has already developed a fairly mature human-machine collaboration flow, when it comes to the realm of traditional cultural design, especially in the process of digital reconstruction of Miao embroidery motifs, design proposals should take into account all cultural connotations, visual aspects, and current design demands.

3. Design Characteristics and Issues of the Digital Regeneration of Miao Embroidery Patterns Analyzed

3.1 Extraction of Design Characteristics from Miao Embroidery Patterns

It is expected that in order to make the design suggestions developed by AIGC balanced in terms of cultural importance and aesthetic value, it must select characteristics of Miao embroidery motifs according to what is depicted in them, color combinations, and composition.

Miao embroidery patterns are mostly inspired by nature and ethnic culture and have a particular auspicious significance, e.g., the fish motif, which is a figurative depiction of an object, denotes fertility and prosperity. Rich and brilliant hues are used in Miao embroidery, and a combination of vermilion, peach pink, navy blue, and black is often used to highlight the decorative as well as cultural value of the colors. The compositions may be divided into four groups: perfectly symmetrical, imperfectly symmetrical, radial-curvilinear, and hybrid. Nevertheless, the composition of Miao embroidery designs is practically altered depending on the form and dimensions of the embroidered piece. Such flexible composition requires particular care to be taken during the AIGC generation stage so that the ethnic purity of the patterns cannot be compromised due to the divergence of the essential compositional features of Miao embroidery.

3.2 Analysis of Challenges in the Digital Transformation of Miao Embroidery Patterns

The new developments in digital technology over the past few years have led to the innovative spread of Miao embroidery designs, but their digitalization as a part of contemporary culture and creativity products remains associated with various obstacles.

3.2.1 Difficulties in Digital Adaptation

Many researchers and projects have examined novel methods to the digitalization of conventional designs, but most of them concern the visual design of the designs and very little attention is paid on the loss of textural quality and stitching logic in the digitization process of Miao embroidery patterns, which are of great cultural importance [7, 8]. Therefore, the question of what to do to ensure digital expression without losing the traditional cultural features is the key problem in the digital revival of Miao embroidery patterns.

3.2.2 Low Efficiency in Transforming Traditional Designs

Other scholars have also investigated other forms of redesigning and implementing intangible cultural heritage (ICH) through the analysis of the connection between ICH and cultural and creative products [9]. However, the existing innovative frameworks of conversion of Miao embroidery patterns to cultural and creative products are highly dependent on human expertise, which leads to long design periods and, to a certain degree, restricts the effectiveness of the innovations and the pace of the products' development. Introduction of AIGC is an attempt to create an extremely efficient mechanism of transformation based on semantic processing as a way of improving design efficiency.

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3.2.3 Lack of Modern Aesthetic Adaptation

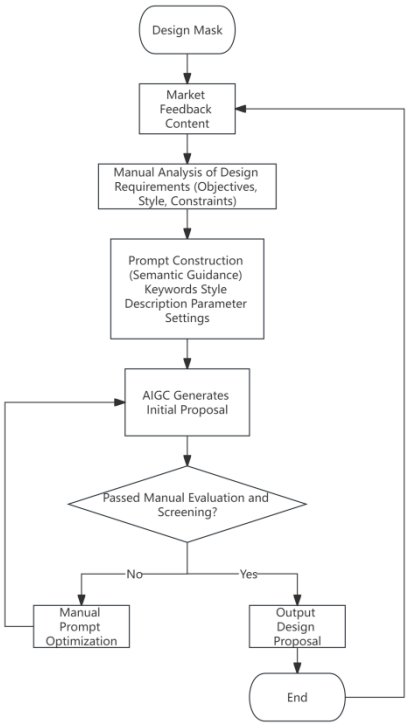
The future of ethnic minority products in the modern market will depend significantly not only on the cultural requirements, consumer behavior, aesthetic preferences and appreciation patterns of modern society but also on the competitiveness and sustainability of the ethnic minority products themselves [10]. The conflict of aesthetics is present between the new tendencies of the cultural and creative market, i.e. The preference for minimalism, low saturation, and functionality, and the natural features of Miao embroidery, such as intricacy, high saturation, and ornamentality. It is thus a major issue in the contemporary aesthetic adaptation of Miao embroidery to achieve this balance in these different aesthetics.

4. Development of an AIGC-Based Human-Machine Coordination Design Process for Miao Embroidery Patterns

4.1 Development of a User-Feedback-Driven Human-Machine Collaborative Design Model

The research created a human-machine cooperative design model that is driven by user feedback (refer to Figure 2). With the use of AIGC-based design software, a collaboration design system was introduced involving the following steps: market feedback- semantic input (prompt)- AIGC output- result filtering-manual optimization- feedback iteration wherein the critical step is putting the role of the designer in making decisions at the center. In order to reduce the discrepancies between the ethnic culture core and what is generated by the randomness of AIGC content, designers apply cultural encoding in accordance with the feature library derived out of Miao embroidery as previously stated to build prompts and cultural decoding in accordance with aesthetic judgment when AIGC design proposals are made. The model is more efficient than the conventional design processes in terms of design efficiency of Miao embroidery patterns during their digitization.

Figure 2: A User-Feedback-Driven Model for Human-Machine Collaborative Design



The study chose 20 design students who have design skills (n=20) and adopted a within-group controlled experiment to compare the design efficiency of traditional design and design that will be informed by this model (refer to Figure 3). The SUS survey was performed after the experiment (refer to Table 1).

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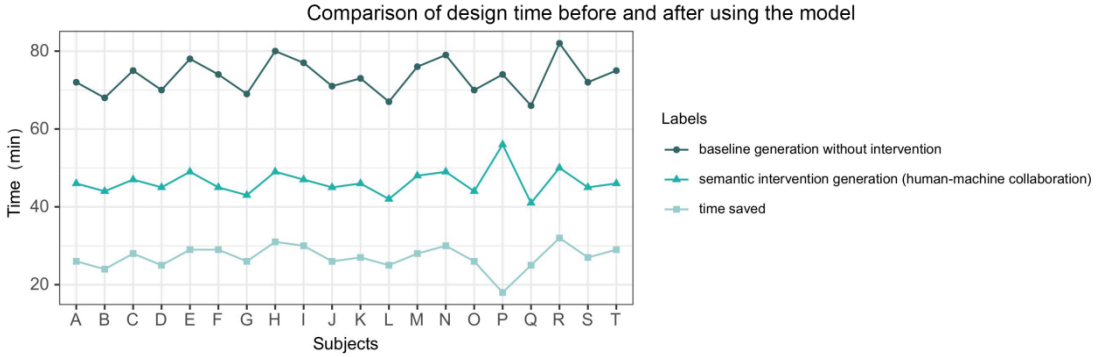
Figure 3: Comparison of Design Time Before and After Using This Model



Following the implementation of the human-machine collaborative design model that is recommended in this research, the mean design time of the experimental group was found to be 37.7 percent higher than that of the control group ($p < 0.01$) and the average design time decreased by 27.5 minutes.

Table 1: Average Scores from the SUS System Usability Survey

Question No.	Content	Average Score
Q1	Willing to use this design process frequently	4.4
Q2	The using process is relatively complex	1.9
Q3	The process is easy to operate	4.5
Q4	Requires professional support	2.0
Q5	The various stages are well-integrated	4.3
Q6	There are many inconsistencies	1.8
Q7	Most people can master it easily	4.4
Q8	The process is cumbersome	2.1
Q9	I feel confident using it	4.5
Q10	The learning curve is steep	2.0
Total	Average Final SUS Usability Score	81.7

The SUS average score was 81.7, meeting the benchmark for excellent usability.

Designers tend to take a lot of time during the process of concept generation during traditional design processes. The change in the position of AI as an intern to being a partner implies that designers are required to learn successful collaboration with AI. The combination of the intuition and professional judgment of designers and the data-driven decision-making capability of AI may be able to maximize the results of designs [11]. This model presents AIGC-assisted tools to come up with first proposals, enabling the designers to eliminate unnecessary repetitive labor and rather concentrate on the end assessment and choice. This change in the process improved the efficiency of the design conversion rate by 37.7 percent ($p < 0.01$). The outcome is similar to what has been reported in recent studies about the efficiency of AIGC collaboration systems, as they have been found to be very helpful in increasing work efficiency [12].

4.2 A Semantically-Guided Human-Machine Collaborative Generation Intervention Mechanism

The concept of generation quality is very much related to semantic guidance in AIGC. By implementing a semantic-guided human-machine interaction to produce the generation process intervention mechanism, it takes the form of a response to user feedback on current trends in aesthetics, including but not limited to minimalist and low-saturation, which are transformed into particular style prompts that can be utilized by AIGC generation models. Parameters are employed to limit the produced content, and allow optimizing the initial prompts in order to match the authenticity of Miao embroidery patterns with the contemporary aesthetic taste.

The experiment included 30 participants. First of all, a survey on Miao embroidery pattern preferences among the 30 participants was carried out to be analyzed (see Table 2). The users showed clear preference for the minimalist and low saturation as it was highly frequent.

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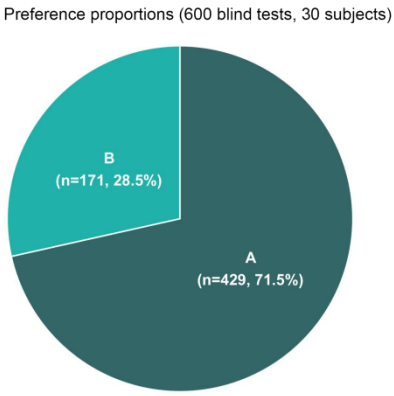
Table 2: Frequency Table of User Preferences for Miao Embroidery Patterns

Rank	Preferred Term	Frequency	Relative Percentage (%)
1	Minimalist Style	28	20.3
2	Low Saturation	25	18.1
3	Symmetrical Composition	15	10.9
4	Floral Patterns	13	9.4
5	White space	12	8.7
6	Modern Aesthetic	10	7.2
7	Flat Design	9	6.5
8	Butterfly Patterns	8	5.8
9	Clean Lines	7	5.1
10	Fresh Color Palette	5	3.6
11	Traditional Chinese Style	3	2.2
12	Geometric Patterns	3	2.2

Following manual optimization of the prompts to indicate style parameters of the AIGC generation model, Group A produced illustrations of the Miao embroidery styles with these restrictions in mind, whereas Group B applied the default prompts. Thereafter, a double-blind experiment was carried out to evaluate the preference of the participants (Figure 4).

Figure 4: Preference distribution based on 600 blind test evaluations conducted by 30 participants



Miao embroidery patterns created in the absence of this mechanism have a tendency to maintain the intricate, saturated, and decorative qualities that are commonly associated with traditional Miao embroidery. Human beings have an extremely sophisticated emotional system and a distinct sense of aesthetics, whereas AIGC has no way of precisely depicting and comprehending the delicate emotions of customers and their aesthetic tastes [13]. This mechanism, however, analyzes the user preferences and uses semantic guidance provided by humans so as to recreate design suggestions and makes Miao embroidery designs more consistent with the user preferences on minimalism, low saturation, and functionality of colors, composition, and pattern combinations. Out of 30 participants, 71.5 percent indicated a preference for Group A (the restricted group) ($p < 0.01$).

As of now, generative AI is only an instrument to help people with their work and daily routine [14]. Designers can take on a dominant position during the entire design process by giving particular semantic directions to users through their feedback, which will effectively limit the generated material to ensure that Miao embroidery patterns are more consistent with contemporary tastes.

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5. Application of AIGC-Assisted Design of Cultural and Creative Products Featuring Miao Embroidery Patterns

5.1 Practical Implementation of Regenerative Design for Themed Miao Embroidery Cultural and Creative Products

A practical application of the proposed human-machine collaborative design model in the current paper will be to implement regenerative design in practice in relation to the themed Miao embroidery cultural and creative goods.

To begin with, the typical Miao embroidery designs are created involving butterfly and flower designs. By adding the outcomes of a user preference survey to this, conversion of user preference terms is performed, e.g., minimalist style, low saturation, symmetrical composition into semantic constraints that can be used by Midjourney to create prompts (refer Table 3).

Table 3: Midjourney Pattern Generation Positive Prompt Control Parameters Table

Control Dimension	Design Requirements	Prompt
Cultural Elements	Preserve the ethnic cultural characteristics of Miao embroidery	Miao embroidery pattern, butterfly motif, floral ornament, traditional ethnic pattern
Composition Control	Modernize traditional pattern structures while maintaining visual order	geometric symmetry, balanced composition, decorative pattern
Color Control	Meet users' preference for low-saturation aesthetics	Morandi color palette, low saturation, soft colors, muted tones
Style Control	Achieve a blend of ethnic style and modern aesthetics	Modern Chinese style, contemporary design, cultural creative design
Product Adaptation (Pillow)	Aligns with the square display structure of pillows	Square cushion pattern, central composition, balanced visual hierarchy
Product Adaptation (Scarf)	Aligns with the characteristics of continuous patterns on scarves	seamless pattern, border decoration, repeating floral layout

Prompt adapts its operations to different cultural and creative products so that the created patterns would be very suitable to each product.

Meanwhile, through the use of negative prompts to manage variables like color and image quality, increased controllability of the generated results is obtained (Table 4).

Table 4: Negative Prompt Control Parameters for Midjourney Pattern Generation

Control Objective	Negative Prompt	Filtering Effect
Color Control	high saturation, over saturated color	Avoid generating overly vivid colors that deviate from aesthetic needs.
Image Quality Control	blur, noisy background, low quality	Reduce blur and noise, improve pattern clarity.
Composition Control	asymmetrical composition, chaotic layout	Avoid chaotic structure and disorder in the pattern.
Style Control	photo realistic, 3D rendering	Avoid generating photorealistic images.
Detail Control	excessive details, distorted pattern	Prevent excessive complexity of pattern details.

The process of pattern generation is performed in Midjourney. Once the generation is done, manual screening is done to make sure that the generated patterns have both cultural value and a contemporary aesthetic sense (refer to Figure 5). In this case, the creation of scarf design patterns is used as an example. The last generated Miao embroidery patterns are used on cultural and creative products like scarves (see Figure 6) to conclude the design practice.

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Figure 5: AIGC-generated pattern



Figure 6: Application of the generated pattern on a silk scarf



5.2 Design Scheme and Efficiency Analysis

5.2.1 Pattern Generation Efficiency

Pattern generation in the design practice was done by AIGC, and semantic organization and aesthetic screening by designers, which minimized repetitive drafting and saved time. The mechanism of human-machine cooperative generative intervention grounded on semantic direction guaranteed that cultural aspects, composition, color, and style of patterns were limited during the Prompt development process, which made the process of generating results more controllable and took less time. Subsequently, the introduction of the suggested model improved the general efficiency of the design practice.

5.2.2 Visual Style Consistency

AIGC outputs are quite random; hence, they need restrictions in Prompt development to enhance the accuracy of the results. Within the design process, positive prompts like Miao embroidery patterns, geometric symmetry, and Morandi color palette were used to limit the style, composition, and color of the produced patterns. At the same time, negative prompts like blur, noisy background, and high saturation were used to regulate the quality of the produced patterns and minimize the presence of patterns with high-saturation noise. The resulting patterns had the same qualities that could be achieved through the restriction of Prompts in various dimensions, including low-saturation colors and short lines, thus creating a visual impression that combines a modern sense of beauty with traditional aesthetic characteristics of ethnic style.

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5.2.3 Cultural Recognizability

At Prompt construction, the descriptive attributes of Miao embroidery patterns, i.e., the Miao embroidery pattern, butterfly motif, floral ornament, traditional ethnic pattern, were used to make sure that the results produced had kept their ethnic quality of the Miao embroidery. A user perception analysis was done using twenty subjects (n = 20) to determine how well the generated patterns performed in terms of cultural recognizability. The outcome revealed that the collective estimation of the ethnic cultural expression of the design schemes was high (see Table 5), where more than 90% of participants rated themselves as satisfied. Manual refinement process also enhanced the cultural recognizability of patterns, allowing the final design results to not only reflect the ethnic uniqueness of Miao embroidery but also meet the aesthetic demands of modern consumers.

Table 5: Statistics of User Cognitive Evaluation Results

Indicator	Average Score	Satisfaction Rate (score ≥ 4)
Cultural Recognition	4.45	90%
Retention of Traditional Elements	4.35	90%
Integration of Modern Aesthetics	4.30	95%

6. Conclusion

6.1 Research Summary

This paper investigates a human-machine cooperative design strategy which is supported by AIGC. With the help of user responses, a design framework of the form “market feedback - semantic input (Prompt) - AIGC generation - result screening - manual optimization - feedback iteration” is developed. The validity of the model in enhancing the efficiency of designs and conforming them to current standards of aesthetic taste is tested by experiment. In design practice, the model is practically feasible, hence providing a new direction towards strengthening the intangible cultural heritage (ICH) creative design using AIGC.

6.2 Research Limitations

There are a few limitations to this study. To begin with, the sample size of the user survey is small, and the results of the research should be confirmed by a bigger number of respondents. Also, the paper mainly uses Midjourney as the means of generating patterns, and the selected AI tools used have their constraints. Besides, the design practice has concentrated more on cultural and creative goods and has not been applied to other areas of life like fashion design.

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Conflicts of Interest

The authors declare no conflict of interest.

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Heterogeneous Effects of Socioeconomic Status on Health Outcomes among Middle-Aged and Older Adults: Evidence from Five Waves of CHARLS

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Abstract

This paper uses data from five waves of the China Health and Retirement Longitudinal Study (CHARLS) (N = 37,710) to measure the health of middle-aged and older adults from the four dimensions of Activities of Daily Living (ADL), self-rated health, mental health, and the number of chronic diseases. It uses principal component analysis to construct a comprehensive socioeconomic status (SES) index, and uses negative binomial regression model, generalized ordered logit and linear regression model to test the impact of SES on health and its urban-rural and gender heterogeneity. The study found that SES has a significant positive protective effect on health. High-SES groups have stronger Activities of Daily Living (ADL), better mental health, and better self-rated health, but it is positively related to the number of chronic diseases, mainly reflecting the higher detection rate of high-SES groups; There are significant urban-rural and gender differences in this effect, which has a greater impact on rural and female groups, especially in the mental health dimension. The conclusion of the robustness test is established. This article provides vertical evidence for understanding the health inequality of middle-aged and older adults in China, and then puts forward suggestions in terms of improving rural health security, formulating gender differentiation strategies, and improving screening fairness to promote healthy aging.

Keywords

socioeconomic status, health of middle-aged and older adults, health inequality, urban–rural disparities, gender differences

1. Introduction

Health is the basic condition for economic and social development. At present, the aging of China continues to deepen, and the population aged 60 and above has increased from 264 million in 2020 to 323 million in 2025, accounting for 23.0%. The “Healthy China 2030” Planning Outline and related implementation guidelines both place health as a strategic priority, emphasizing the gradual reduction of health disparities among populations and promoting healthy aging and sustainable development.

Socioeconomic status (SES) reflects individuals' access to multidimensional resources, including income, education, and occupation [1]. Studies have confirmed that there is a stable positive correlation between SES and the health of middle-aged and older adults [2]. From the perspective of human capital, the health capital

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theory regards health as a capital stock that can be depreciated with age, and individuals can maintain health through resource investment [3]; Social stratification theory emphasizes that SES determines the ability of individuals to access "flexible resources" to respond to health threats. SES may not only directly affect health, but also indirectly play a role through health behavior, access to medical services and other pathways [4].

Although existing studies have provided important references for understanding the relationship between socioeconomic status and health, there is still room for further exploration in data application and moderating effect testing. Based on this, based on the theory of health capital and social stratification theory, this study uses CHARLS multi-period tracking data to empirically analyze the relationship between SES and the health of middle-aged and older adults, aiming to provide empirical supplements for understanding health inequality in the Chinese context and provide a reference basis for the formulation of differentiated health promotion policies.

2. Literature Review

2.1 Literature Review

The relationship between socioeconomic status and health has been confirmed by a large number of studies. Health capital theory regards health as a capital stock that can be depreciated with age, and individuals can maintain and improve it through health investment [1, 3]. The theory of social stratification emphasizes that the unequal distribution of resources leads to health inequality and has a cumulative effect [4].

In terms of income, higher income is conducive to access to quality medical care and a healthy lifestyle, which is positively related to self-assessment of health, and low-income groups are at higher risk of chronic diseases and restricted daily activities [5]. As a core indicator of socioeconomic status, education not only affects the acquisition of health knowledge, but also reflects the development of health behavior. People with higher education are more inclined to active health management [6, 1]. SES can also indirectly affect health by improving sleep and promoting exercise [7, 2]. But the relationship between the two is not always linear. Chinese older adults with higher socioeconomic status are longer in terms of "disability life expectancy" [8, 3]. Sometimes it is also associated with a higher risk of dyslipidemia, indicating that the influence mechanism is shaped by cultural background and disease spectrum changes [4, 9]. In general, the positive health effects of socioeconomic status remain the mainstream conclusion, but their relationship is situationally dependent and needs to be examined in different social environments.

The dual structure of urban and rural areas is one of the basic characteristics of Chinese society. This structural difference deeply affects the intensity of the relationship between socioeconomic status and health. Urban seniors usually have better health status [5, 10]. In rural areas, medical care and security resources are relatively weak, and the impact of socioeconomic status on health is more significant in groups with low socioeconomic status [6, 5]. Urban infrastructure and security systems buffer the negative effects of low socioeconomic status, and the decisive role of rural individual resource endowment on health is more prominent [7, 11]. The promotion of equal resources has a greater effect on improving the health of the rural elderly [12]. In summary, the differences in the distribution of urban and rural resources can regulate the impact of socioeconomic status on health to a certain extent.

With the gradual coverage of rural revitalization and medical insurance and old-age care system, the gap between urban and rural security has narrowed [8, 13]. From the perspective of social stratification, the dual structure of urban and rural areas is an institutional stratification mechanism, and the institutional arrangement shapes the rules of resource allocation. The study found that the health inequality of the elderly in urban and rural areas exists objectively, and the use of the Internet plays a partial intermediary role in it [9, 14]. It shows that the impact mechanism of urban and rural differences on health in the digital era is further complicated. Existing research generally supports the judgment that socioeconomic status has a stronger effect on the health of middle-aged and older adults in rural areas, but its intensity is adjusted with changes in the policy environment.

As an important dimension of social stratification, gender also regulates the relationship between socioeconomic status and the health of middle-aged and older adults. Studies show that socioeconomic status has a more significant impact on women's health than men, especially in terms of mental health and self-rated

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health [10, 15]. However, the direction of the moderating effect may vary depending on the health indicators [16].

Domestic studies have found that Chinese women are at a disadvantage at all ages because their health returns from education and income are lower than those of men [11, 17]. In addition, the impact of education level, endowment insurance and medical insurance on the health of men and women shows different patterns [12, 1]. It is worth noting that the gender gap in old age may narrow, which may be related to selective survival - individuals with poorer health die early, resulting in a weakening of the health differences between different sexes in the elderly group [13, 18]. These findings show that women are more sensitive to the health effects of economic resources due to the division of labor and the unequal status of the labor market [14, 19].

2.2 Literature Evaluation

Through the combing of existing literature, the positive relationship between socioeconomic status and the health of middle-aged and older adults has been widely verified. Secondly, urban-rural and gender differences, as an important social structural factor, have attracted the attention of the academic community. Most studies support that this effect is more prominent in rural areas and female groups.

However, there is still room for deepening the existing research. First, in terms of data application, most studies are limited by cross-section or short-term span, and it is difficult to capture long-term dynamics and separate age, period and cohort effects [17, 20]. Second, in terms of moderating effect, most scholars focus on single-dimensional analysis and rarely include the two in the same analytical framework for systematic comparison. Third, in terms of content design, the measurement standards of socioeconomic status and health are different for different studies. Differences in indicator measurement and model setting may lead to heterogeneity of conclusions, and a more unified and stable analytical framework is needed for comprehensive testing.

Finally, this study is based on the five-phase tracking data of CHARLS, integrates the theory of health capital and the theory of social stratification, and uses multi-phase panel data regression to systematically test the dual adjustment effect of urban and rural areas and gender.

3. Theoretical Framework and Hypotheses Development

3.1 Theoretical Foundations

This research takes the theory of health capital and the theory of social stratification as the common interpretation framework. The theory of health capital was proposed by Grossman in 1972 [1]. He regarded health as a capital stock that can be depreciated with age. Individuals can slow down the depreciation through health investments such as medical services and a healthy diet, so as to achieve health capital accumulation to obtain health output and economic returns [3, 21, 15, 22, 16]. The theory reveals that SES affects health stock through differences in investment capacity: those with higher education have stronger health production efficiency, and those with higher income have more abundant investment resources [3]. This mechanism is especially important in middle-aged and elderly age - the health depreciation rate increases significantly with age, and the difference in investment capacity granted by SES directly determines the health differentiation between groups.

The theory of social stratification further explains how such differences arise systematically between groups. The “Fundamental Cause Theory of Health” proposed by Link and Phelan points out that SES determines the ability of individuals to acquire “flexible resources” such as knowledge, money, power and social connections to cope with changing health threats. Therefore, health inequality is deeply rooted in the social hierarchy [4, 17, 23]. The two theories complement each other. The former focuses on individual health investment behavior, while the latter is good at revealing the differences in health effects in different social situations. According to the theory of social stratification, individuals' own resource endowment in resource-scared fields is almost the only source of health investment, and the protective effect of SES is amplified; Public resources in resource-sufficient fields partially offset the advantage of personal resources [18, 24, 19, 26]. This logic also provides an analytical basis for understanding the heterogeneity effect of urban and rural areas and gender dimensions.

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3.2 Hypotheses Development

Both the theory of health capital and the theory of social stratification point out that socioeconomic status has a positive impact on health, but the former focuses on the differences in individual health investment capacity, while the latter is better at explaining the changes in the strength and weakness of the effect in different social situations. Accordingly, the main effect hypothesis of this study is derived from the two theories, and the adjustment effect hypothesis is mainly based on the theory of social stratification.

Health capital theory points out that individuals with high SES have stronger health investment capacity and productivity, and can more effectively slow the depreciation of health capital and accumulate health capital through high-quality medical care, a healthy diet and exercise [20, 3]. The theory of social stratification emphasizes that SES determines the ability of individuals to access “flexible resources” [4], enabling them to prevent and respond to health threats more effectively. Based on this, this study puts forward the following assumptions:

H_1: The higher the socioeconomic status of middle-aged and older adults, the better their health.

Under the dual structure of urban and rural areas, the accessibility of medical resources, health information dissemination channels and infrastructure are relatively weak, and the buffering effect of external public resources on individual health is limited. According to the theory of social stratification, the endowment of individual resources plays a decisive role in health in resource-scarce environments - people with high SES can still obtain necessary services, while those with low SES fall into health disadvantages, and the SES effect is “amplified”; and the relatively perfect security system in cities partially offsets the negative impact of low SES. Accordingly, it is proposed that:

H_2: Compared with urban middle-aged and older adults, socioeconomic status has a more significant impact on the health status of rural middle-aged and older adults.

Traditional gender roles are expected to put women at a disadvantage in access to health resources; women have a lower average income, an earlier retirement age, limited disposable resources in old age, and more dependent on SES. Studies have shown that women’s health returns from education and income are lower than men's [17, 21]. Its health disadvantages run through the whole life course. Accordingly, it is proposed that:

H_3: Among the middle-aged and elderly, the socioeconomic status has a more significant impact on the health of middle-aged and elderly women.

3.3 Theoretical Framework

See Figure 1.

4. 4 Research Design

4.1 4.1 Data Source

The data in this article comes from the China Health and Elderly Care Tracking Survey (CHARLS). The project is hosted by the National Development Research Institute of Peking University. It is aimed at the middle-aged and older adults aged 45 and above. Multi-stage stratified probability sampling is adopted. The sample is representative in the country and provides a data basis for interdisciplinary research on aging problems [27]~[29]. This study selected the five survey data of 2011, 2013, 2015, 2018 and 2020. After screening and eliminating abnormal and missing values, 37,710 effective tracking samples were finally obtained, and Stata 18.0 software was used for data analysis.

4.2 Variable Design

4.2.1 Dependent Variable

The explained variable in this article is the health status of middle-aged and older adults. Referring to existing studies, it is comprehensively measured from the four dimensions of Activities of Daily Living (ADL), self-rated health, mental health and the number of chronic diseases [30]~[32]. The Activities of Daily Living (ADL) of life is combined by ADL (6 items) and IADL (5 items). Each “difficult” is counted as 1 point, and

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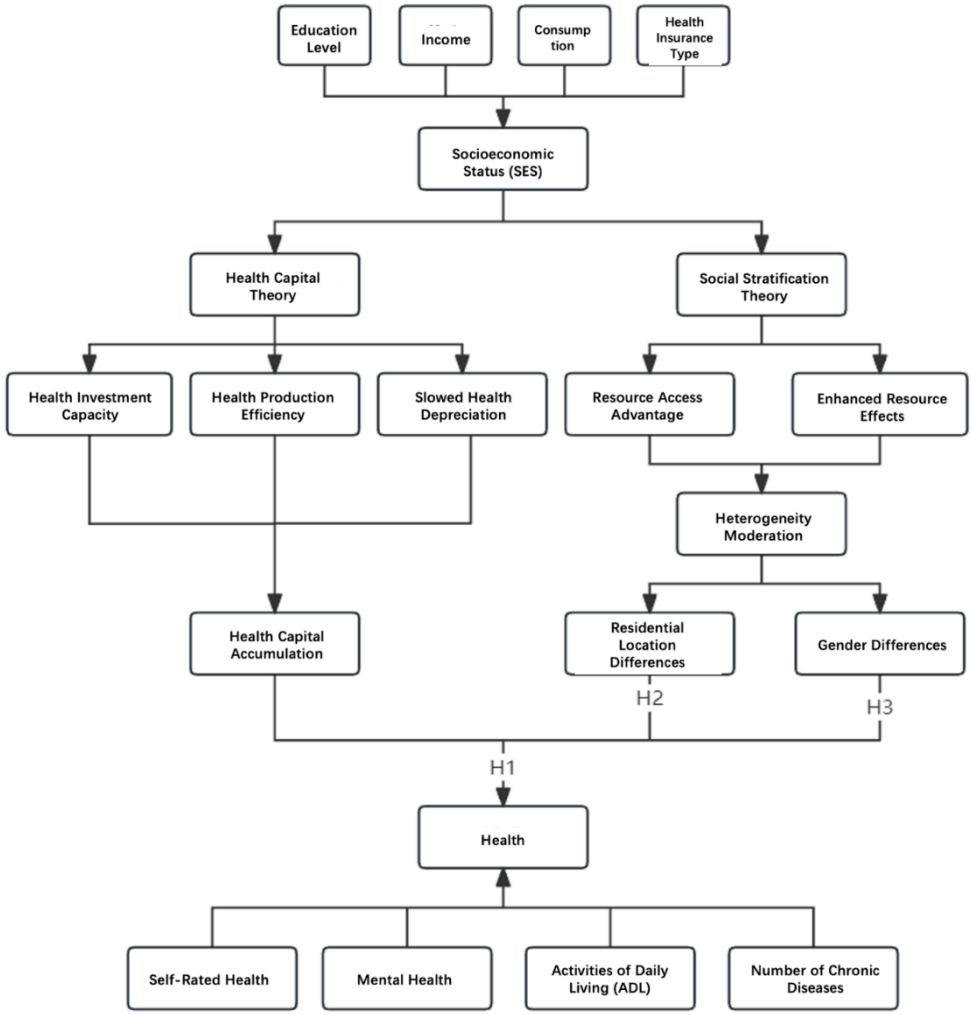
the total score is 0-11 points. The higher the score, the worse the ability, and the standardized processing is carried out during analysis. Self-assessment of health adopts a five-level score (1 = very bad to 5 = very good), and the higher the score, the better the self-assessment. The CES-D10 depression scale (0-30 points) is used for mental health. The higher the score, the worse the psychological condition. The number of chronic diseases summarizes the number of 14 common diseases such as hypertension and diabetes, ranging from 0 to 14, and the greater the number, the heavier the burden.

Figure 1: Theoretical Framework



4.2.2 Independent Variable

The key independent variable of this article is socioeconomic status. Referring to the practice of existing studies, this paper adopts Principal Component Analysis to integrate multiple related variables into a comprehensive indicator to more comprehensively measure the socioeconomic status of middle-aged and older adults [2], [32]. Integrate the four variables of family per capita income, family per capita consumption, education level (1 = lower than junior high school to 4 = higher education) and medical insurance type (0 = no insurance to 3 = public expense/commercial medical insurance) into comprehensive indicators. In terms of variable processing, because the original data of family per capita income and family per capita consumption have obvious right-biased distribution characteristics, this paper takes the natural logarithm of the two to improve their normality and facilitate subsequent analysis. Standardize the four variables before analysis.

The results of the KMO test and Bartlett's test for sphericity are shown in Table 1. The KMO measure of sampling adequacy is 0.685, falling within the 0.6 to 0.7 range; this indicates a moderate degree of correlation among the variables, making the data suitable for principal component analysis. The χ^2 value for Bartlett's test of sphericity was 19,852.784 ($p < 0.001$), leading to the rejection of the null hypothesis that the variables are independent and further confirming the suitability of factor analysis.

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Table 1: Results of Factor Analysis

Test Type	Statistical Indicator	Result
Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy	KMO Value	0.685
Bartlett's Test of Sphericity	Approximate Chi-square	19852.784
	Degrees of Freedom (df)	6
	Significance (p-value)	0.000

As shown in Table 2, the characteristic values of the first three main components are greater than 0.6, and the cumulative variance interpretation rate reaches 85.58%, indicating that these three main components can better summarize the information contained in the original four variables. Therefore, this article selects the first three main components for follow-up analysis.

Table 2: Statistical Results of Principal Component Analysis (PCA)

Principal Component	Eigenvalue	Variance Explained (%)	Cumulative Variance Explained (%)
Principal Component 1	1.90994	47.75	47.75
Principal Component 2	0.84497	21.12	68.87
Principal Component 3	0.66813	16.7	85.58
Principal Component 4	0.57695	14.42	100

Table 3 reports the load matrix of each variable on the main component. Based on the above load matrix, this paper uses the variance interpretation rate weighting method to calculate the comprehensive score of socioeconomic status. The method takes the variance interpretation rate of each principal component as the weight for weighted average, which can make full use of the information contained in the three main components. The calculation formula is as follows:

$$SES = (47.75 \times Comp1 + 21.12 \times Comp2 + 16.70 \times Comp3)/85.58 \quad (4\text{-}1)$$

Table 3: Component Loading Matrix

Variable	Principal Component 1	Principal Component 2	Principal Component 3
Logarithm of Household Per Capita Income	0.5417	-0.3192	-0.2259
Logarithm of Household Per Capita Consumption	0.4819	-0.6091	0.3917
Education Level	0.4573	0.6452	0.599
Health Insurance Type	0.515	0.3328	-0.6609

In order to facilitate model estimation and coefficient interpretation, the calculated comprehensive score is standardized, so that the final SES indicator obeys the standard normal distribution with a mean of 0 and a standard deviation of 1. The higher the standardized SES score, the higher the socioeconomic status of the individual. The value range of SES in the sample is -2.716 to 5.155, covering a complete continuous spectrum from lower socioeconomic status to higher socioeconomic status.

4.2.3 Control Variables

In order to reduce the bias of missing variables, this article refers to existing studies to select control variables from the three dimensions of individual characteristics, health behavior and marital status. Individual characteristics include age, gender, marital status, and residential location; healthy behaviors include drinking, smoking and sleep time; social participation is measured by participating in social activities at least once a month.

4.3 Model Specification

The explained variables in this paper cover count variables (total difficulties in Activities of Daily Living (ADL), the number of chronic diseases), ordinal variables (self-rated health status) and continuous variables (mental health). According to the data characteristics of different dependent variables, the negative binomial regression model, the generalized ordered logit model and the linear regression model are used for estimation respectively.

(1) Activities of Daily Living (ADL) and the number model of chronic diseases. The total number of difficulties in Activities of Daily Living (ADL) (ADL_IADL_total) and the number of chronic diseases (chronic_num) are both non-negative count variables. It has been verified that the variance of both variables

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is greater than the mean value (ADL variance/mearance = 3.90, chronic disease variance/meriance = 1.61), and there is an excessive dispersion phenomenon. The negative binomial regression model is more suitable than Poisson regression. The model settings are as follows:

$$\ln\left(E(y_i|\boldsymbol{X}_i)\right) = \alpha + \beta_1 SES_i + \beta_2 Age_i + \gamma \boldsymbol{Controls}_i + \varepsilon_i \quad (4\text{-}2)$$

Here, y_i represents the total number of difficulties in activities of daily living or the number of chronic diseases, and SES_i represents the composite indicator of socioeconomic status; Age_i represents age; $\boldsymbol{Controls}_i$ represents a vector of control variables. Regression results are reported as incidence rate ratios (IRRs); an IRR < 1 indicates a negative association between SES and the dependent variable.

(2) Self-rated health status model. Self-rated health status (srh) is an ordered classification variable with values 1-5. The results of the parallel line test show that there are significant differences in the coefficients of some variables at different points ($p<0.05$), so the generalized ordered logit model (gologit2) is used for estimation, which allows the difference in the coefficients of the variables on different cumulative probabilities. The model settings are as follows:

$$\log\left(\frac{P(srh_i \le j \mid \boldsymbol{X}_i)}{1 - P(srh_i \le j \mid \boldsymbol{X}_i)}\right) = \alpha_j + \beta_{1j} SES_i + \beta_{2j} Age_i + \gamma_j \boldsymbol{Controls}_i + \varepsilon \quad (4\text{-}3)$$

Here, srh_i represents the self-rated health level, where a higher value indicates better health status; j is the cut-off point for cumulative probability (j =1 corresponds to the comparison between health levels ≤1 and >1, and so on); α_j is the intercept term corresponding to the j-th split point; β_{1j}, β_{2j} and γ_j are the coefficients to be estimated for the respective explanatory variables at the split points; the meanings of the remaining symbols are the same as before. When $\beta_{1j} > 0$, it indicates that a higher SES is associated with a greater probability of an individual being in a higher health category.

(3) Mental health model. After standardized treatment, the mental health score (cesd10) is approximately subject to the normal distribution, and the linear regression model is used to estimate by the heteroskedasticity-robust standard errors. The model settings are as follows:

$$cesd10_i = \alpha + \beta_1 SES_i + \beta_2 Age_i + \gamma \boldsymbol{Controls}_i + \varepsilon_i \quad (4\text{-}4)$$

Among them, $cesd10_i$ is the standardized mental health score, where a higher value indicates poorer mental health; The meanings of the symbols remain the same as previously defined. The coefficient β_1 represents the change in the standardized mental health score for each one-unit increase in SES and can be directly interpreted as the effect size.

5. Empirical Results

5.1 Descriptive Statistics

As shown in the descriptive statistical results of each variable in Table 4, from the core variables, the average value of the comprehensive socioeconomic status indicator (SES) constructed by our research institute is -0.004 after standardized processing, the standard deviation is 0.994, and the value range is -2.716 to 5.155. The value range covers the complete spectrum from low to high, and the overall distribution is close to the standard normal.

In terms of health indicators, the average value of the total difficulty of Activities of Daily Living (ADL) is 0.771, with a variance of 3.004, which is excessively dispersed; More than 70% of the respondents did not have any difficulties, indicating that the overall body function of the sample was in good condition. The average self-rated health status value is 3.023, and the overall subjective evaluation is positive; The average value of mental health CES-D10 is 8.364, which varies greatly from person to person. The average value of chronic diseases is 2.001, and more than a quarter suffer from 3 or more chronic diseases, reflecting the prevalence of chronic disease comorbidity in middle-aged and elderly groups. The distribution characteristics of the control variables are in line with the basic structure of the middle-aged and elderly population in China. The average age of the sample is 61.69 years old, 47.9% are male, 61.7% of rural residents, and 13.3% without spouses; drinkers and smokers account for 34.7% and 27.1% respectively, with an average sleep of 6.34

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hours/night, 47 .4% participate in social activities at least once a month. The above sample characteristics provide a descriptive reference for the basic structure of the middle-aged and elderly population in China.

Table 4: Descriptive Statistics of Variables for the Full Sample

Variable Type		Variable	Definition	Minimum	Maximum	Mean (Standard Deviation)
Independent Variable		Socioeconomic Status (SES)	A composite index constructed from four variables: household per capita income, household per capita consumption, education level, and health insurance type. The index is standardized based on principal component analysis.	-2.716	5.155	-0.004 (0.994)
Dependent Variable		Activities of Daily Living (ADL)	Total number of difficulties in ADL and IADL (0–11 items)	0	11	0.771 (1.733)
		Self-Rated Health	1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = very good	1	5	3.023 (0.978)
		Mental Health	CES-D10 score (0–30; higher scores indicate poorer mental health)	0	30	8.364 (6.276)
		Number of Chronic Diseases	Number of diagnosed chronic diseases among 14 types (0–14 types)	0	14	2.001 (1.793)
Control Variables	Individual Characteristics	Age	Respondent's age (years)	45	101	61.687 (9.306)
		Gender	0 = female, 1 = male	0	1	0.479 (0.500)
		Marital Status	0 = married, 1 = unmarried	0	1	0.133 (0.339)
		Residential Location	0 = urban, 1 = rural	0	1	0.617 (0.486)
	Health Behaviors	Alcohol Consumption	0 = no, 1 = yes	0	1	0.347 (0.476)
		Smoking	0 = no, 1 = yes	0	1	0.271 (0.444)
		Sleep Duration	Sleep duration per night (hours)	3	12	6.337 (1.727)
	Social Participation	Social Participation	0 = no, 1 = yes (at least once per month)	0	1	0.474 (0.499)

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

5.2 Baseline Regression Results

Table 5: Results of Baseline Regression Analysis

Variable	(1) ADL	(2) Mental Health	(3) Number of Chronic Diseases
Socioeconomic Status (SES)	-0.273***	-0.817***	0.043***
	(0.018)	(0.03)	(0.005)
Age	0.046***	0.006*	0.018***
	(0.001)	(0.003)	(0.001)
Gender	-0.155***	-1.361***	0.009
	(0.031)	(0.077)	(0.011)
Marital Status	0.151***	1.462***	-0.024*
	(0.033)	(0.102)	(0.014)
Residential Location	0.217***	1.203***	-0.023**

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Variable	(1) ADL	(2) Mental Health	(3) Number of Chronic Diseases
	(0.028)	(0.068)	(0.010)
Alcohol Consumption	-0.323***	-0.606***	-0.117***
	(0.030)	(0.070)	(0.011)
Smoking	-0.131***	0.333***	-0.096***
	(0.034)	(0.079)	(0.012)
Social Participation	-0.346***	-0.718***	0.023**
	(0.025)	(0.062)	(0.009)
Sleep Duration	-0.114***	-0.803***	-0.067***
	(0.007)	(0.019)	(0.003)
Constant	-2.395***	13.247***	0.049
	(0.098)	(0.254)	(0.038)
lnalpha	1.234***	-	-1.380***
	(0.017)	-	(0.023)
Observations	37710	37710	37710

Standard errors in parentheses.
** p<0.10, ** p<0.05, *** p<0.01*

The results of Table 5 show that for every additional standard deviation in SES, the expected ADL difficulty score decreases by about 24% (IRR=0.761, p<0.01); The mental health score decreased by 0.817 (p<0.01); the number of chronic diseases increased by 0.043 (p<0.01), which may reflect the higher medical accessibility and health screening awareness of high-SES groups, and the detection rate is higher than the higher risk of actual disease. This explanation is supported in existing literature [9].

In terms of self-rated health status (as shown in Table 6), SES has a significant positive impact on the four cumulative probability comparisons, and the improvement effect on groups with poorer health is more prominent. In summary, H1 has been verified, but it should be noted that there are differences in the performance of this positive effect on different health indicators.

Table 6: Regression Results of the Generalized Ordered Logit Model

Variable	(1) Very Poor	(2) Poor	(3) Fair	(4) Good
Socioeconomic Status (SES)	0.225***	0.240***	0.183***	0.081***
	(0.031)	(0.016)	(0.013)	(0.018)
Age	-0.010***	-0.017***	-0.012***	-0.014***
	(0.003)	(0.001)	(0.001)	(0.002)
Gender	-0.104**	-0.053*	0.063**	0.076*
	(0.051)	(0.029)	(0.031)	(0.041)
Marital Status	0.206***	-0.059	0.120***	0.031
	(0.062)	(0.036)	(0.039)	(0.056)
Residential Location	0.216***	0.309***	0.126***	-0.096**
	(0.053)	(0.028)	(0.028)	(0.038)
Alcohol Consumption	0.507***	0.567***	0.289***	0.297***
	(0.057)	(0.030)	(0.029)	(0.04)
Smoking	0.036	0.036	0.036	0.036
	(0.026)	(0.026)	(0.026)	(0.026)
Social Participation	0.265***	0.217***	0.071***	-0.015
	(0.047)	(0.025)	(0.025)	(0.035)
Sleep Duration	0.169***	0.169***	0.169***	0.169***
	(0.006)	(0.006)	(0.006)	(0.006)
Constant	2.381***	1.038***	1.691***	2.514***
	(0.168)	(0.096)	(0.098)	(0.131)

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

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5.3 Heterogeneity Analysis

5.3.1 Urban–Rural Heterogeneity Analysis

Table 7: Heterogeneous Effects of Health Outcomes by Urban–Rural Stratification

Variable	Urban			Rural		
	Activities of Daily Living (ADL)	Mental Health	Number of Chronic Diseases	Activities of Daily Living (ADL)	Mental Health	Number of Chronic Diseases
Socioeconomic Status (SES)	-0.267***	-0.763***	0.029***	-0.286***	-0.888***	0.077***
	(0.022)	(0.036)	(0.006)	(0.028)	(0.057)	(0.009)
Age	0.050***	-0.007	0.020***	0.044***	0.014***	0.017***
	(0.002)	(0.005)	(0.001)	(0.002)	(0.005)	(0.001)
Gender	-0.004	-1.040***	0.016	-0.240***	-1.563***	-0.001
	(0.055)	(0.116)	(0.017)	(0.036)	(0.103)	(0.015)
Marital Status	0.168***	1.311***	-0.056***	0.153***	1.586***	0.002
	(0.058)	(0.154)	(0.022)	(0.040)	(0.135)	(0.018)
Alcohol Consumption	-0.383***	-0.711***	-0.141***	-0.281***	-0.549***	-0.101***
	(0.056)	(0.106)	(0.017)	(0.035)	(0.092)	(0.014)
Smoking	-0.071	0.540***	-0.067***	-0.152***	0.238**	-0.114***
	(0.060)	(0.123)	(0.020)	(0.040)	(0.102)	(0.016)
Social Participation	-0.482***	-0.930***	0.017	-0.271***	-0.588***	0.027**
	(0.045)	(0.096)	(0.015)	(0.029)	(0.080)	(0.012)
Sleep Duration	-0.123***	-0.839***	-0.080***	-0.109***	-0.785***	-0.060***
	(0.014)	(0.031)	(0.005)	(0.008)	(0.024)	(0.003)
_cons	-2.583***	14.254***	0.035	-2.082***	13.867***	0.042
	(0.176)	(0.392)	(0.059)	(0.111)	(0.322)	(0.047)
lnalpha	1.435***		-1.427***	1.133***		-1.356***
	(0.030)		(0.038)	(0.020)		(0.030)
N	14450.000	14450.000	14450.000	23260.000	23260.000	23260.000
Pseudo R^2	0.041	0.033			0.021	0.016
Adjusted R^2			0.120	0.100		

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

As shown in Table 7, on the whole, the impact of socioeconomic status on the health of middle-aged and older adults in rural areas is generally greater than in urban areas. Specifically, the SES coefficient for mental health in rural areas (-0.888) is about 16% larger in absolute value than that in urban areas (-0.763); the positive correlation of chronic diseases in rural areas (0.077) is also stronger than urban areas (0.029). In terms of self-rated health status, as shown in Table 8, the rural SES coefficient is stable and significant (0.155~0.266) at each segmentation point, while the urban area decreases from 0.277 to not significant, indicating that rural areas show a more inclusive promotion effect. In summary, compared with urban middle-aged and older adults, the socioeconomic status has a more significant impact on the health status of rural middle-aged and older adults. The study assumes that H2 has been effectively verified.

Table 8: Urban–Rural Heterogeneity Analysis of Self-Rated Health

Variable	Very Poor		Poor		Fair		Good	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Socioeconomic Status (SES)	0.277***	0.155***	0.215***	0.266***	0.164***	0.236***	0.018	0.223***
	(0.043)	(0.044)	(0.021)	(0.025)	(0.015)	(0.022)	(0.021)	(0.027)
Age	-0.014***	-0.011***	-0.014***	-0.018***	-0.014***	-0.009***	-0.014***	-0.011***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Gender	-0.204**	0.005	-0.122**	0.005	0.063	0.005	0.049	0.005
	(0.091)	(0.032)	(0.051)	(0.032)	(0.048)	(0.032)	(0.065)	(0.032)
Marital Status	-0.116	-0.239***	-0.091	-0.041	0.150**	0.096*	0.013	0.022
	(0.108)	(0.076)	(0.060)	(0.045)	(0.059)	(0.051)	(0.084)	(0.074)
Alcohol Consumption	0.517***	0.473***	0.655***	0.510***	0.350***	0.273***	0.343***	0.302***
	(0.102)	(0.065)	(0.054)	(0.035)	(0.046)	(0.036)	(0.063)	(0.048)
Smoking	-0.022	0.068**	-0.022	0.068**	-0.022	0.068**	-0.022	0.068**
	(0.043)	(0.033)	(0.043)	(0.033)	(0.043)	(0.033)	(0.043)	(0.033)
Social Participation	0.264***	0.266***	0.326***	0.163***	0.087**	0.059*	-0.018	-0.008
	(0.083)	(0.056)	(0.043)	(0.030)	(0.040)	(0.033)	(0.056)	(0.045)
Sleep Duration	0.203***	0.153***	0.203***	0.153***	0.203***	0.153***	0.203***	0.153***
	(0.011)	(0.007)	(0.011)	(0.007)	(0.011)	(0.007)	(0.011)	(0.007)
_cons	2.498***	2.258***	0.642***	0.902***	-1.773***	-1.827***	-2.703***	-2.641***
	(0.146)	(0.197)	(0.134)	(0.114)	(0.135)	(0.124)	(0.140)	(0.163)
N	14450	23260	14450	23260	14450	23260	14450	23260
r2_p	0.031	0.022	0.031	0.022	0.031	0.022	0.031	0.022

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

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5.3.2 Gender Heterogeneity Analysis

It can be seen from Table 9 that in terms of Activities of Daily Living (ADL), the coefficient of SES for female samples is -0.297 ($p<0.01$) and for male samples is -0.265 ($p<0.01$), and the absolute value of the female effect is greater. In terms of mental health, the gap is particularly prominent: the coefficient of SES for women is -0.983 ($p<0.01$) and for men is -0.717 ($p<0.01$), and the protective effect of socioeconomic status on women's mental health is about 37% higher than that of men. In terms of the number of chronic diseases, the coefficient of SES is 0.054 ($p<0.01$) for women and 0.036 ($p<0.01$) for men.

Table 9: Gender Heterogeneity Analysis of Health Effects

Variable	Female			Male		
	Activities of Daily Living (ADL)	Mental Health	Number of Chronic Diseases	Activities of Daily Living (ADL)	Mental Health	Number of Chronic Diseases
Socioeconomic Status (SES)	-0.297***	-0.983***	0.054***	-0.265***	-0.717***	0.036***
	(0.024)	(0.050)	(0.007)	(0.024)	(0.038)	(0.006)
Age	0.045***	-0.008	0.018***	0.047***	0.017***	0.017***
	(0.002)	(0.005)	(0.001)	(0.002)	(0.005)	(0.001)
Marital Status	0.087**	1.318***	-0.018	0.280***	1.810***	-0.042*
	(0.040)	(0.134)	(0.017)	(0.057)	(0.158)	(0.024)
Residential Location	0.310***	1.351***	-0.008	0.092**	0.964***	-0.034**
	(0.035)	(0.098)	(0.014)	(0.046)	(0.093)	(0.015)
Alcohol Consumption	-0.160***	-0.108	-0.106***	-0.406***	-0.835***	-0.125***
	(0.043)	(0.121)	(0.017)	(0.040)	(0.086)	(0.014)
Smoking	0.193***	0.907***	0.105***	-0.196***	0.292***	-0.143***
	(0.058)	(0.216)	(0.027)	(0.040)	(0.085)	(0.014)
Social Participation	-0.293***	-0.738***	0.027**	-0.412***	-0.685***	0.016
	(0.030)	(0.089)	(0.012)	(0.041)	(0.084)	(0.014)
Sleep Duration	-0.127***	-0.899***	-0.068***	-0.094***	-0.687***	-0.065***
	(0.009)	(0.026)	(0.004)	(0.012)	(0.027)	(0.004)
_cons	-2.347***	14.538***	0.006	-2.567***	10.700***	0.154***
	(0.121)	(0.372)	(0.051)	(0.168)	(0.366)	(0.059)
lnalpha	1.031***		-1.427***	1.497***		-1.342***
	(0.022)		(0.032)	(0.026)		(0.034)
N	19650.000	19650.000	19650.000	18060.000	18060.000	18060.000
Pseudo R^2	0.036		0.018	0.036		0.019
Adjusted R^2		0.113			0.097	

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

Judging from the results of the generalized and ordered logit of self-rated health status (Table 10), the improvement effect of SES on women is greater than or equal to that of men at all four points, and in the high-level comparison of “better vs very good”, the female coefficient (0.115) is still significantly higher than that of men (0.063). It shows that even at a higher health level, SES has a stronger marginal improvement effect on women.

Table 10: Gender Heterogeneity Analysis of Self-Rated Health

Variable	Very Poor		Poor		Fair		Good	
	Female	Male	Female	Male	Female	Male	Female	Male
Socioeconomic Status (SES)	0.241***	0.219***	0.245***	0.239***	0.172***	0.192***	0.115***	0.063***
	(0.043)	(0.041)	(0.024)	(0.022)	(0.020)	(0.016)	(0.027)	(0.021)
Age	-0.008**	-0.010**	-0.014***	-0.019***	-0.004*	-0.019***	-0.007**	-0.021***
	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Marital Status	-0.198**	-0.237**	0.001	-0.180***	0.079	0.119**	-0.081	0.122
	(0.080)	(0.103)	(0.047)	(0.059)	(0.051)	(0.060)	(0.077)	(0.082)
Residential Location	-0.271***	-0.138*	-0.332***	-0.274***	-0.139***	-0.115***	-0.115**	-0.070
	(0.070)	(0.081)	(0.038)	(0.042)	(0.040)	(0.039)	(0.057)	(0.054)
Alcohol Consumption	0.415***	0.538***	0.422***	0.625***	0.247***	0.301***	0.240***	0.315***
	(0.099)	(0.071)	(0.050)	(0.037)	(0.048)	(0.036)	(0.068)	(0.050)
Smoking	-0.303**	0.164**	-0.173**	0.114***	-0.074	0.002	0.162	-0.039
	(0.125)	(0.071)	(0.074)	(0.037)	(0.084)	(0.035)	(0.113)	(0.048)
Social Participation	0.308***	0.206***	0.233***	0.192***	0.047	0.090**	-0.063	0.031
	(0.062)	(0.070)	(0.033)	(0.037)	(0.036)	(0.035)	(0.051)	(0.049)
Sleep Duration	0.185***	0.151***	0.185***	0.151***	0.185***	0.151***	0.185***	0.151***
	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.009)
_cons	2.240***	2.273***	0.785***	1.158***	-2.255***	-1.068***	-3.018***	-1.955***
	(0.223)	(0.265)	(0.133)	(0.150)	(0.141)	(0.147)	(0.187)	(0.188)
N	19650	18060	19650	18060	19650	18060	19650	18060
r2_p	0.025	0.030	0.025	0.030	0.025	0.030	0.025	0.030

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

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It can be seen from the above that in the middle-aged and elderly group, the socioeconomic status has a more significant impact on the health of middle-aged and elderly women, assuming that H3 has been verified.

5.4 Robustness Checks

5.4.1 Robustness Check Using an Alternative Measure of the Key Independent Variable

In order to avoid the impact of the weighting method of principal component analysis on the results, this study uses the simple addition method (Comp1+Comp2+Comp3) to reconstruct the socioeconomic status index (SES_simple) and re-estimate all models.

Table 11: Robustness Check Using Alternative Measures of Socioeconomic Status (SES)

Variable	Activities of Daily Living (ADL)	Self-Rated Health				Mental Health	Number of Chronic Diseases
		Very Poor	Poor	Fair	Good		
SES	-0.273***	0.225***	0.240***	0.183***	0.081***	-0.817***	0.043***
	(0.018)	(0.031)	(0.016)	(0.013)	(0.018)	(0.030)	(0.005)
SES_simple	-0.208***	0.177***	0.172***	0.137***	0.008	-0.576***	0.020***
	(0.018)	(0.030)	(0.016)	(0.012)	(0.017)	(0.028)	(0.004)
N	37710	37710	37710	37710	37710	37710	37710

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

As shown in Table 11, the direction and significance level of the regression coefficient of SES_simple are highly consistent with the main analysis. There is no substantial change in the core conclusion after replacing the socioeconomic status index, indicating that the research results are insensitive to the construction method of SES.

5.4.2 Alternative Estimation Models for Self-Rated Health

Because the generalized ordered logit model (gologit2) allows the coefficient to change across equations, although it is more suitable for the data characteristics, the model is more complex. In order to test the robustness of the results, this study adopts the traditional ordered logit model (ologit) to re-estimate the self-rated health model. As shown in Table 12, the coefficient of SES is 0.180 (p<0.01), which is between the four division point coefficients of the main analysis (0.081~0.240). The results of the control variables are basically consistent with those of the main analysis, and the core findings remain robust.

Table 12: Robustness Check Using Alternative Estimation Models for Self-Rated Health

Variable	Self-Rated Health				Self-Rated Health
		Poor	Fair	Good	
Socioeconomic Status (SES)	0.225***	0.240***	0.183***	0.081***	0.180***
	(0.031)	(0.016)	(0.013)	(0.018)	(0.010)
Age	-0.010***	-0.017***	-0.012***	-0.014***	-0.014***
	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)
Gender	-0.104**	-0.053*	0.063**	0.076*	-0.003
	(0.051)	(0.029)	(0.031)	(0.041)	(0.025)
Marital Status	-0.206***	-0.059	0.120***	0.031	0.001
	(0.062)	(0.036)	(0.039)	(0.056)	(0.031)
Residential Location	-0.216***	-0.309***	-0.126***	-0.096**	-0.215***
	(0.053)	(0.028)	(0.028)	(0.038)	(0.022)
Alcohol Consumption	0.507***	0.567***	0.289***	0.297***	0.414***
	(0.057)	(0.030)	(0.029)	(0.040)	(0.023)
Smoking	0.036	0.036	0.036	0.036	0.041
	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Social Participation	0.265***	0.217***	0.071***	-0.015	0.140***
	(0.047)	(0.025)	(0.025)	(0.035)	(0.020)
Sleep Duration	0.169***	0.169***	0.169***	0.169***	0.170***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
_cons	2.381***	1.038***	-1.691***	-2.514***	-
	(0.168)	(0.096)	(0.098)	(0.131)	-

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

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5.4.3 Excluding Extreme Values

In order to avoid the potential interference of extreme values to the regression results, this study removes the extreme value samples above and below 1% of the socioeconomic status index (a total of 755 observations were excluded) and then re-regressed. As shown in Table 13 and Table 14, after excluding the extreme value, the direction, significance and effect of each model coefficient are highly consistent with the main analysis. The main conclusions of the following results is not extreme value-driven and has good robustness.

Table 13: Robustness Check by Excluding Extreme SES Values

Variable	Baseline Analysis			Excluding Extreme Values of SES		
	Activities of Daily Living (ADL)	Mental Health	Number of Chronic Diseases	Activities of Daily Living (ADL)	Mental Health	Number of Chronic Diseases
Socioeconomic Status (SES)	-0.273***	-0.817***	0.043***	-0.276***	-0.902***	0.043***
	(0.018)	(0.030)	(0.005)	(0.019)	(0.035)	(0.005)
N	37710	37710	37710	36955	36955	36955

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

Table 14: Robustness Check Using 1% Winsorization at Both Tails of SES Indicators (Self-Rated Health Model)

Variable	Baseline Analysis				Excluding Extreme Values			
	Very Poor	Poor	Fair	Good	Very Poor	Poor	Fair	Good
Socioeconomic Status (SES)	0.225***	0.240***	0.183***	0.081***	0.213***	0.254***	0.193***	0.102***
	(0.031)	(0.016)	(0.013)	(0.018)	(0.032)	(0.017)	(0.014)	(0.019)
N	37710				36955			

Standard errors in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

6. Discussion and Recommendations

6.1 Discussion of Findings

Based on five waves of CHARLS data, this paper systematically examines the impact of SES on the health of middle-aged and older adults and urban–rural and gender heterogeneity from four dimensions, forming a consistent study. First of all, SES significantly protects Activities of Daily Living (ADL) functioning, mental health and self-rated health status, which is consistent with the expectations of health capital theory; Its positive correlation with chronic diseases is more likely to reflect the difference in detection rate. Secondly, there is a significant difference between urban and rural areas in the SES effect, and the rural effect is stronger, which verifies the judgment of the social stratification theory that individual advantages are amplified in resource-scarce areas. Thirdly, SES has a higher effect on women's mental health protection than men, reflecting women's weak access to resources and higher dependence on SES under traditional gender roles.

6.2 Recommendations

Based on the above findings, this study puts forward three macro-strategic proposals aimed at promoting health equity.

First, implement resource-oriented health interventions, and focus on strengthening the rural health support system. Given the higher health return of SES in rural areas, policies should focus on improving the basic environment for rural health improvement. It is recommended to give priority to improving the capacity of rural grass-roots medical services and the access to health information. By enhancing the supply of public health resources in rural areas, we should build a basic health security network for low-SES groups, so as to more effectively transform the achievements of economic development into national health and well-being.

Second, build a "gender-responsive" guarantee system and focus on alleviating women's health vulnerabilities. In view of the decisive impact of SES on women's mental health, it is recommended to introduce a gender mainstream perspective in social security policies. Specifically, we can explore to moderately improve the replacement rate of women's pensions, and establish a psychological support and empowerment network for middle-aged and elderly women at the community level, so as to make up for their historical disadvantages in resource acquisition by structural means and break the vicious circle of "low resources-high dependence".

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Third, optimize the "multi-dimensional and accurate" health assessment to ensure the fairness and scientificity of health monitoring. Given that there is a deviation in the diagnosis rate of chronic disease indicators, policymakers need to be alert to the policy blind spots that a single health indicator may lead to. We should promote the integration of multi-dimensional indicators such as functional health and subjective well-being into the routine health monitoring system, and encourage low- and middle-income groups to participate in health examination through financial subsidies and other means to narrow the gap in health screening rates and ensure the real reliability of health inequality assessment.

7. Research Limitations

There are several limitations in this study. First, limited by the characteristics of panel data, it is difficult for the model to completely eliminate missing variables and reverse causal interference. Subsequently, it can be instrumental variable method or natural experiments. Second, although the positive relationship between SES and chronic diseases can be explained by the "detection rate hypothesis", this article does not empirically test the mediating pathway of health screening behavior. Subsequently, it can be included in the verification of variables such as physical examination frequency and health literacy. Third, this article focuses on the analysis of static heterogeneity, and the inter-period dynamic trajectory of health is insufficient. In the future, growth curve model and other methods can be used to deeply reveal the shaping mechanism of SES on health depreciation rate and trajectory differentiation.

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How Does the New Rural Social Pension Insurance Affect Family-Based Elderly Care? A Literature Review Based on the Debate over Crowding-in and Crowding-out Effects

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Abstract

The deepening aging of the rural population and the weakening of the traditional family support function for older adults have attracted wide attention to the institutional effect of the New Rural Social Pension Insurance (NRPS). The core controversy over whether the NRPS generates a crowding-in effect or a crowding-out effect on family intergenerational support, the existing research has not reached a consensus. This article constructs a three-path theoretical framework of "income effect", "pension substitution" and "intergenerational interaction", and systematically sorts out the empirical evidence of more than 30 studies in the four fields of economic well-being, intergenerational support, production factor allocation and health outcomes. The study found that the NRPS has improved the economic situation and multi-dimensional welfare of the elderly through economic empowerment, institutional substitution and intergenerational interaction, but there are significant group and regional heterogeneity in its impact. On the core issue of intergenerational support, empirical evidence presents the coexistence of the crowding-in effect and the crowding-out effect. This article believes that the impact of the NRPS on family-based elderly care model is not one-way. Its net effect is conditional, depending on the specific situation such as family structure, support type and research methods. Future research can seek breakthroughs in the construction of interdisciplinary frameworks, the introduction of new data and new methods, and the expansion of cutting-edge issues such as psychological well-being and digital integration.

Keywords

new rural social pension insurance, family-based elderly care, intergenerational support, crowding-in effect, crowding-out effect.

1. Introduction

1.1 Research Background

The aging of China's rural population continues to deepen, and the function of the traditional family-based elderly care model continues to weaken. As an institutional arrangement aimed at ensuring the basic old-age life of rural residents, the New Rural Social Pension Insurance (hereinafter referred to as "NRPS") has become

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an important part of the rural old-age security system since its pilot implementation [1, 2]. Focusing on the implementation effect of the NRPS, the existing research has formed a core debate: whether the NRPS produces a crowding-in effect or a crowding-out effect on family intergenerational support.

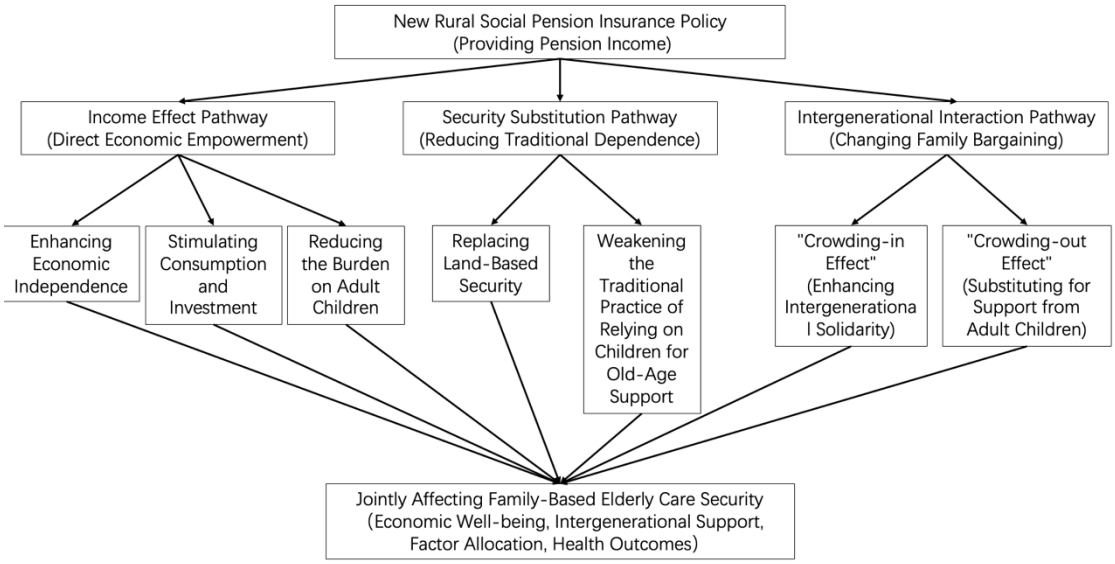
On the one hand, the income represented by the pension increases the economic autonomy of the elderly and reduces the need to support their children, so it is possible to replace intergenerational economic transfer in some way [3, 4]; However, pensions can be regarded as family public resources, which is conducive to the formation of intergenerational feedback in promoting intergenerational care or sharing family expenses, that is, the Crowding-in Effect [5, 6]. The resulting differences just show that the effects of NRPS are highly context-dependent. Its positive or negative effects should be judged according to the conditions of the pension, family structure and subsidy form.

Despite the rapid accumulation of literature, the existing reviews mostly focus on the induction of single-dimensional effects, and the systematic combing of the theoretical logic and situational conditions behind the controversy is not sufficient. In view of this, this article takes crowding-in effect and crowding-out effect as the main controversial points, puts forward three types of analysis paths of "income effect", "pension substitution" and "intergenerational interaction", summarizes, compares and comments on more than 30 important studies, promotes the interpretation of the relationship between the NRPS and the family-based elderly care model to gain a unified foothold, and rewrites the "direction dispute" mentioned by the previous research into a verifiable "condition identification" problem.

1.2 Theoretical Analytical Framework

The policy effect of the NRPS is mainly transmitted through three core paths that are interrelated but different from each other. Among them, the income effect path and the pension substitution path mainly point to the logic that pensions "replace" traditional pension resources, thus producing a crowding-out effect. The intergenerational interaction path accommodates both the possibility of a crowding-out effect and a crowding-in effect. The three paths together constitute an integrated analysis framework to explain the complex impact of the NRPS. Its core logic and transmission path are shown in Figure 1.

Figure 1: Theoretical Mechanism Framework of the Impact of the New Rural Social Pension Insurance on Rural Family-Based Elderly Care



As shown in Figure 1, stable pension income is the starting point of the policy, which triggers three major mechanisms at the same time. The income effect path lays the material foundation for family-based elderly care and provides an economic premise for the emergence of the crowding-out effect by improving their own economic independence, releasing the consumption and investment potential at the family level, and reducing the direct maintenance burden of children. The security substitution pathway reduces the family's dependence

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on the two traditional pillars of "land" and "children", reduces the family's pension risk expectations, provides institutional conditions for land flow and intergenerational resource restructuring, and constitutes the structural support of the crowding-out effect. The intergenerational interaction path is the most complex. Pension income changes the bargaining power and interaction mode within the family, which may produce both the crowding-in effect and the crowding-out effect, and the net effect depends on the specific family situation. These three paths are not isolated, but intertwined and work together, ultimately shaping the multi-dimensional final output of family endowment security in terms of economic well-being, intergenerational support, production factor allocation and health outcomes.

1.2.1 Income Effect Pathway

The income effect is the most basic mechanism of the NRPS. The NRPS provides fixed-term pension income for eligible rural elderly people, which essentially provides financial transfer payments to the elderly or their families, significantly increasing their disposable income [7]. This new income has a chain reaction through multiple channels.

First of all, it directly enhances the economic independence and personal well-being of the elderly. If the economy is relatively abundant, the elderly's right to choose independently in basic life, health care, etc. will be enhanced, and they will no longer be completely dependent on children's support, so that they can more actively influence the direction of decisions in the family [8].

Secondly, it effectively alleviates the liquidity constraints of families and stimulates productive and developmental investment. From the perspective of preventive savings, after the NRPS reduces the uncertainty of old-age care, consumption is likely to rise, especially development and enjoyment consumption [8]. What's more noteworthy is that now disposable cash allows families who were short of money in the past to start various investments: either to buy capital for agriculture [9], or use part of the money to do relevant skills training to improve the quality of the workforce, that is, to improve the level of human capital [10].

Thirdly, it reconstructs the division of labor in the family by reducing the burden of child support. Children's original obligation to contribute money to help their parents is now replaced by pensions, so their personal finances are less tight, and they can freely use resources for occupation, non-agricultural labor or various attempts for labor migration [11].

In general, from the perspective of income effect, the mechanism discussed is the idea that the elderly gain more economic freedom and the pressure of children is alleviated, that is, the phenomenon is explained by the crowding-out effect, but it does not exclude the possibility of crowding-in effect - when pensions are reconfigured as family-shared resources, it may also indirectly promote intergenerational cooperation.

1.2.2 Pension Substitution Pathway

The discussion on the alternative path is to compare the NRPS with the traditional informal old-age method represented by "land" and "children", and points out the behavioral adjustment and resource allocation changes caused by it over a long period of time [12].

At the level of "land security", the NRPS weakens older adults' dependence on land-based old-age support. The stable income brought by the NRPS separates the two functions of production and security undertaken by the land, so that the elderly do not have to rely so much on land to maintain their lives, and do not have to use heavy labor to make a living. Therefore, it is easier to give up land cultivation and use less land resources, thus driving land circulation and promoting a wider range of business forms in agriculture [13].

At the level of support from adult children, the NRPS weakens the economic contract on which "relying on children for old-age support" is based to a certain extent, and does not fully maintain the exchange relationship between generations with the economy as a link. Parents' dependence on their children's economic support is reduced, and the flow of internal family resources can be rearranged [4].

The path of pension substitution provides a structural institutional basis for the occurrence of the crowding-out effect - pensions replace land and children as safeguards, the elderly can live more freely, and the dependence on intergenerational support within the family is correspondingly weakened.

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1.2.3 Intergenerational Interaction Pathway

The analysis of intergenerational interaction should discuss the impact of pension income on the power, feelings and interaction of the family. According to this point of view, the impact discussed is not unilateral, but its complexity should be summarized by the crowding-in effect and the crowding-out effect. The conclusions obtained should be examined in combination with social reality and family details [6].

The "crowding-out effect" is mainly based on the exchange motivation of economics. The financial support of children can be regarded as a "payment" for providing services to their parents. The NRPS pension increases the non-working income of parents and reduces the "price" of financial support provided by children, resulting in a decrease in child transfer payments [3, 4].

However, China's profound family ethics and altruistic tradition make the crowding-in effect equally common. First of all, we should consider whether the pension can be regarded as a "family sharing fund". When parents use their income to supplement the daily needs of the family and do things such as intergenerational care, the benefits involved are holistic, which is more likely to promote the gratitude and reciprocity psychology of their children, so they repay them with feelings or money [5]. Secondly, the NRPS promotes intergenerational unity through the "time release effect". It relieves the burden of the elderly to cultivate, so that families have more time to take care of each other, especially children. It is a rear guarantee for children to go out to work, and also encourages children to repay their parents by economic means [14].

The intergenerational interaction path accommodates the two opposite mechanisms of crowding-out effect and crowding-in effect. The so-called intergenerational interaction path takes into account the two opposing mechanisms of crowding-out effect and crowding-in effect, and its final effect should be judged according to how family resources are allocated and whether intergenerational reciprocity exists. In terms of inherent contradictions or undeterminedness, intergenerational interaction is the basic and core hub for examining the impact of the NRPS on family-based elderly care.

2. Progress in Empirical Research

Under the guidance of the theoretical framework, this part will thoroughly sort out the research progress of the NRPS in four key empirical areas, carefully present the rich experience findings, and identify the consensus and differences.

2.1 Research on Economic Well-being and Poverty Alleviation

From the current empirical research, it can be found that the positive effect of NRPS in promoting economic improvement or poverty reduction for the elderly in rural areas has been confirmed. However, the welfare improvement promoted by this policy is not a universally consistent phenomenon, but is combined with social and economic factors in a more complex way, with obvious group and regional heterogeneity.

From the perspective of income and consumption, the "open source" and "promoting consumption" of the NRPS are dual effects. Hong Li and Yin Kang [15] have pointed out that joining the NRPS is a driving factor for the elderly to increase their pension income significantly. Ma Jiujie et al. [9] analyzed that for middle-aged farmers who are not eligible for it at present, the NRPS will help alleviate the worries about future old-age care, and can also encourage agricultural investment in the current period, so that family income can grow in the long term. In the discussion on consumption, Li Yaqing and Cai Liqi [8] proposed that the NRPS not only raises the total amount of rural consumption, but also makes the consumption structure reasonable. The development or enjoyment consumption is much more than the survival consumption, that is, the policy has successfully lifted the consumption suppression, and the increased consumption is of positive significance to life and development.

At the level of poverty alleviation, the research perspective has expanded from income poverty to multidimensional poverty. After analyzing the FGT index, Lv Jie et al. [7] believe that the NRPS can better reduce the relative poverty, depth and intensity of poverty encountered by families. Ji Jiangming [16] established multi-dimensional relative poverty indicators on health, education level and living conditions, which also proved that the NRPS has obvious significance for alleviating the multi-dimensional poverty of the elderly in rural areas. Huang Juanjuan and Guo Chunna [17] thought about the problem according to the idea

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of common prosperity, and gave an estimate of about 14% of the new agricultural basic pension to increase the income of low-income people, that is, the embodiment of its supporting role. Tang Zhidong et al. [18] pointed out that the alleviation of income inequality in the NRPS is generally promoted by pension receipt, and the contribution itself is not a key factor.

The heterogeneity of the effect is one of the most solid consensus in this field. As far as the NRPS is concerned, the economic benefits involved are more obvious in low-income households, families of female heads or elderly members, and in the eastern regions [7, 15, 17], which is not only a manifestation of the policy's ability to better meet the needs of the vulnerable, but also an explanation of the difference in the actual effect of the policy when the region is not completely balanced.

As far as the core controversy is concerned, the improvement of economic well-being is the prerequisite for understanding the subsequent controversy. It is associated with crowding-out effect in a way that the elderly have more money autonomy, and can also promote crowding-in effect through the overall increase of family resources. The question of which of the two effects is more important should be answered by examining the actual evolution of intergenerational support.

2.2 Research on Intergenerational Support and CARE Arrangements

This point is the most active and has the most differences in the research on the NRPS, and the empirical materials have clearly shown that the two effects of the crowding-in effect and the crowding-out effect exist at the same time.

The research on the crowding-in effect examines the NRPS as an element of "lubricant" and "catalyst" of family relations. According to Wang Xiaozeng et al. [6], after parents get the NRPS, the emotional connections held by adult children have increased significantly, and pensions may promote intergenerational emotional attachment. Dong Ying et al. [5] proposed the mechanism chain of "intergenerational overflow": the NRPS pension makes the elderly more willing to take care of them from generation to generation, and the children give back more money in the form of compensation and gratitude. This chain intermediary phenomenon just explains why the introduction of social old-age care in most Chinese families did not weaken the intergenerational economic bond, but strengthened it. Lin Yuchan and Luo Mingzhong [19] extended this idea to intergenerational fertility, pointing out that the NRPS pension of the father's generation will increase the probability of childbirth in rural children by 34.2%. The mechanism lies in the improvement of family economic capacity and the alleviation of the healthy economic pressure of children. The pension support referred here applies to both the existing father-son relationship and the upbringing of the third generation. Guo Linke et al. [20] have made relevant analysis on "livelihood resilience", and the results are exactly in line with the above view, that is, the NRPS enhances the overall ability of families to cope with risks by affecting expenditure on entertainment and health care consumption, which may include the contribution of intergenerational cooperation.

On the other hand, the research that supports the crowding-out effect adheres to the basic logic of economics. Yue Ximing and Fan Xiaohai [3] found that under the background that the current level of NRPS pension is still low, it still has a significant alternative effect on the economic transfer of children. Hao Chunhong et al. [4] further found that the NRPS may not only generate a crowding-out effect on intergenerational support, but also have a significant crowding-out effect on the labor supply of the elderly themselves. Guo Lin and Wang Feng [21] found from the perspective of fertility decision-making that parents' access to the NRPS will significantly inhibit children's fertility decision-making. The mechanism lies in the fact that the NRPS increases the participation of parents' intergenerational care, resulting in a relative reduction in the role of parents' sharing the cost of children's fertility.

In the face of seemingly contradictory evidence, the understanding of the academic community is deepening and integrating. Yang Ruilong et al. [14] have given a basic insight that the impact of the NRPS on various forms of intergenerational support is different - receiving pensions crowding-in children's help for economic purposes, but also crowding-out the time help (accompanying) given by children. It can be judged that when the parents have improved financially, children may arrange different types of supportive behaviors in an alternative way. The opposition result of Lin Yuchan and Luo Mingzhong [19] and Guo Lin and Wang Feng [21] is exactly in line with this judgment: The focus of the former is on how economic resources are passed on (crowding-in effect) between generations, and the focus of the latter is on the sharing of care time or cost

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(crowding-out effect). These two mechanisms can coexist in the same family, and different studies draw different conclusions due to different mechanisms of focus.

2.3 Research on Production Factor Allocation

By changing the risk expectations and time allocation of families, the NRPS deeply affects its allocation decision-making on core production factors such as labor and land. Changes in the allocation of production factors can reflect the profound impact of pensions on family decision-making from the side, which is an important extension of evidence for understanding the crowding-out effect.

In terms of labor supply for the elderly, the research consensus has shifted from "whether to retire" to "how to adjust". Given that the current pension level is not enough to support full retirement, the main effect of the NRPS is to lead to "labor restructuring" rather than "labor participation withdrawal". The elderly will reduce the participation rate and working time of agricultural labor with high labor intensity and relatively low income, especially the reduction of land management area, but at the same time, they may increase the time investment in non-market activities such as family care and community activities [22]. Zhang Zhengyu and Cao Sili [23] introduced the concept of "policy benefit ratio" and further refined the findings: The NRPS has an inhibitory effect on the labor supply of low-labor supply groups, so that they can enjoy more leisure; However, for groups with high labor supply, it has a promoting effect by easing credit constraints and improving health status. Sun Linlin et al. [24] found that the NRPS has significantly improved the labor productivity and total factor productivity of elderly farmers. The path is to increase machinery input and health care expenditure, indicating that pensions have improved production efficiency through capital replacement labor.

In terms of adult children's behavior, the NRPS has significantly promoted the non-agriculturalization and migration of the labor force. Zhang Ye and Cheng Lingguo [11] revealed their mechanism: Parents' receive pensions, on the one hand, relieves the credit constraints of children and provides start-up funds for migration; On the other hand, parents can withdraw from high-intensity labor and have more time to take care of their grandchildren, which reduces the psychological burden and opportunity cost of child migration.

In terms of land resource allocation, some studies support the prediction of the alternative path, believing that the NRPS will reduce the dependence of farmers on land and promote land transfer [13]. Li Cuizhen and others [25] also confirmed that the NRPS can strengthen the role of aging in promoting the separation between rural households and agricultural land. However, Wang Shengsheng et al. [26] found the opposite evidence: the land rental rate of insured farmers decreased by an average of 2.4 percentage points. The mechanism is that pension income reduces the marginal utility discount rate of the family, making it more important to the long-term stability of self-run agriculture, thus reducing land lease. The impact of the NRPS on land transfer is not linear, but is regulated by multiple factors such as regional non-farm employment opportunities, farmers' risk preferences, and the emotional value of land [12].

2.4 Research on Medical Services and Health Outcomes

As a social policy, one of the ultimate goals of the NRPS is to improve people's livelihood and well-being, and health is its core dimension. Research has confirmed that the NRPS has played a positive role in promoting the health behavior and health outcomes among older adults through economic empowerment and psychological protection. Improvements in health outcomes may be achieved through the strengthening of intergenerational support, so evidence in this area can be an important supplement to the understanding of the crowding-in effect.

In terms of the utilization of medical services, the NRPS has significantly improved the probability of medical treatment and medical access for the elderly. Chen Feng and Yu Min [27] used a regression discontinuity design to find that receiving NRPS significantly improved the utilization of medical services for the elderly in rural areas, and the impact on the utilization of hospitalization services was much greater than that on outpatient services. The study also found that there is a synergistic effect between NRPS and intergenerational economic support in promoting the use of medical services, indicating that there is a complementary relationship between pension and intergenerational support. There is also a synergistic effect between the NRPS and the new rural cooperative medical treatment. Lv Jie et al. [7] pointed out that the pension income of the NRPS can reduce the occurrence of "poverty due to disease" together with the new agricultural cooperative, and the interactive effect of the two is better than that of a single insurance.

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In terms of health outcomes, the research horizon has expanded from physical health to cognitive ability and mental health. After examining the connection between the NRPS and the cognitive ability of the elderly, Du Xingyan et al. [28] pointed out that participation in the NRPS is conducive to improving cognitive ability. Among them, the pension allows the elderly to have the resources and conditions to do more social or cultural things, so the transition from "economic support" to "cognitive health" is a feasible path. Zhang Yuyang and Chen Dong [29] used the "opportunity inequality" method to analyze the problem, believing that the NRPS has an effect on alleviating the inequality of opportunities for elderly health caused by urban and rural household registration. According to subjective feelings, Liu Guanghui and others [30] and Zhao Yifan and Zhou Jin'e [31] have both proved that the NRPS has significantly improved the happiness of the rural elderly according to the "wealth effect" and the "labor–leisure substitution effect". The "livelihood resilience" proposed by Guo Linke et al. [20] is a systematic view of welfare, which includes health, and points out that recreational health care consumption can enable the NRPS to help elderly families overcome difficulties.

3. Research Review and Future Prospects

3.1 Consensus and Controversies in Existing Studies

After systematically combing the existing literature, it can be found that the academic community has reached significant consensus at multiple levels, but there are also some core controversies that need to be explored in depth.

In terms of consensus, studies generally confirm that the NRPS has significantly improved the economic welfare of the elderly in rural areas as a whole, and has a positive effect on alleviating income poverty and multi-dimensional poverty. At the same time, there is a profound heterogeneity in its impact, and the policy effect is more prominent in low-income families, female head families, the elderly and the central and western regions, which not only reflects the function of policy support, but also reveals the imbalance of regional development. In addition, the study generally agrees that the impact of the NRPS is multi-dimensional and multi-path. It is not only an economic policy, but also a social policy that deeply disturbs family decision-making and social relations [2].

In terms of disputes, the focus is mainly on three points. The first is the battle between the core mechanism, that is, the "income effect" and the "pension substitution effect" are more important in explaining family behavior (such as labor supply and land flow). Different studies have drawn different conclusions due to differences in samples and situations. The second is the struggle for intergenerational influence, that is, whether the NRPS has a crowding-in effect or crowding-out effect on intergenerational support. The coexistence of empirical evidence shows that its net effect is conditional and highly dependent on the bargaining power within the family, altruism and the complex game of exchange motivation. The third is the struggle for long-term effects. Most of the existing studies are based on medium- and short-term data. There is still a lack of time and strength to track and verify the continuous impact of policies on the subjective happiness, health trajectory, cognitive ability and other long-term well-being of the elderly.

Further examination of the above controversy can be found that the root cause lies mainly in three levels. First, the difference in research methods. The identification strategies adopted by different studies (such as difference-in-differences (DID), regression discontinuity design (RDD), and fixed-effects models) have different assumptions for causal inference, and there are also differences in sample composition for studies using different databases, which may lead to inconsistency in conclusions. Second, the difference in the types of intergenerational support. The impact of the NRPS on economic support, time support and emotional support may be differentiated. Studies have shown that pensions crowding-in children's economic support, but at the same time crowding-out children's time support [14]. Focusing on the study of different types of support, it is natural to draw seemingly contradictory conclusions. Third, the differences in family situations. Whether there is a need for intergenerational care and whether children go out to work may determine the direction of the net effect of the pension. This shows that the impact of the NRPS is inherently conditional, not one-way.

3.2 Limitations of Existing Research

Despite the fruitful results, there are still several obvious limitations in the existing research. First of all, there is indirectness in the mechanism test. The vast majority of studies are satisfied with establishing a

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correlation between policy investment and the final result, but rarely go deep into the "black box" to directly measure the core intermediary variables that really drive behavioral changes, such as "old-age risk expectations" and "psychological sense of security". Therefore, the argument of the causal chain is mechanical and weak. Secondly, the data base faces the challenge of timeliness. A large number of influential empirical studies in this field are based on survey data from 2018 and before. However, with the integration of NRPS and urban insurance and the continuous improvement of pension standards, the institutional environment has undergone profound changes, and the applicability of old data conclusions may be limited. Finally, the research perspective presents a single nature. Most of the existing literature focuses on the allocation efficiency of resources and time from the perspective of economics, while relatively ignoring the analysis of sociology, psychology and other dimensions, and insufficiently explores the social connotation of the non-economic level of the NRPS.

3.3 Directions for Future Research

Based on the above comments, future research can seek breakthroughs in the following three directions.

First, it is necessary to expand the theory. Economics should avoid being dominated by research alone, but should incorporate the discourse on the evolution of family and power in sociology, the happiness or behavior patterns proposed by psychology, and the reflection on the causes of a healthy society in public health to form a multidisciplinary analysis method.

Second, we should put forward new ideas on the method. The multi-period tracking data used should be sorted out relatively completely, and the quasi-experimental method can be appropriately improved. The relevant scale should be designed and used based on the credibility and validity, so as to directly analyze the basic concepts such as "risk perception" and "negotiation power" and carry out an investigation of the "black box".

Third, the content should be expanded. It can explore the interaction mechanism between the NRPS and emerging service models such as "combination of medical care and nursing" and "mutual assistance for old-age care"; Pay more attention to the impact of policies on the management of chronic diseases, cognitive decline and depressive symptoms of the elderly; Examine the relationship between pension and the "digital divide" and social integration of the elderly; And put the NRPS under the strategy of "rural revitalization" and "common prosperity" to evaluate its long-term contribution to narrowing the welfare gap between urban and rural areas [32] and promoting inclusive growth.

4. Conclusion

This article systematically sorts out the empirical evidence of the impact of NRPS on family-based elderly care by building a three-path framework of "income effect", "pension substitution" and "intergenerational interaction". The study found that the field of intergenerational support presents a situation of crowding-in effect and crowding-out effect. The impact of the NRPS on family-based elderly care is not one-way, but conditional.

The conclusion itself has shown that if the NRPS generates a crowding-in effect or a crowding-out effect without considering the actual situation, such questions may not be answered directly. Instead of arguing about the direction, it is better to identify the conditions - for the support involved in various families, generations, and various studies, when is the crowding-in effect or crowding-out effect established respectively. Taking the "strife for direction" as the starting point and thinking with "condition identification", it is probably a more suitable academic analysis method for the relationship between NRPS and family-based elderly care model.

Of course, this analytical framework itself also has limitations. At present, it basically starts from the perspective of economics, and the thinking about non-economic factors such as intergenerational emotions or dignity has not been sufficiently developed; At the same time, limited by the coverage of existing literature, the discussion on the long-term effect of the policy needs to be deepened after accumulating more evidence.

The above findings also have certain policy implications. The institutional optimization of the NRPS should pay attention to the diversity of family structure, and take into account the function of economic security and

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the function of intergenerational relationship adjustment in the setting of the pension level, so as to avoid a simple "standard increase" and have an unexpected impact on the intergenerational relationship of families.

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Household and community level vulnerability to disaster in Bangladesh: An exploratory study on the flash flood 2022 in Sylhet district

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Abstract

This study explored the household and community level vulnerability of flash flood 2022 affected people of Sylhet district in Bangladesh. However, this study was conducted in three unions namely *Barhal, Biroshree, Kajalsar* of Zakiganj upazila of Sylhet district. Both quantitative and qualitative methods were applied to collect data from the field. To achieve the objectives of this study 360 respondents were surveyed from the flash flood 2022 affected area and 3 KIIs were conducted. The results of this study show that the households were rather often considered as low-to-moderate vulnerable to socioeconomic and disaster category (an average of mean value 2.08). Besides, the average of all mean value 1.49 highlights that there was a medium degree of social and structural vulnerability at community level. The Composite Social Vulnerability Index (SVI=1.54) shows that the social vulnerability was medium in the study area. However, the results of this study show that vulnerability to flash flood was multidimensional including socio-demographic factors, exposure to environmental factors, unstable economic conditions and institutional limitations in the study area. The results of this study would help every stakeholders to formulate own policy to lessen the vulnerability of flash flood affected people in Bangladesh.

Keywords

Household, Community, Vulnerability, Flash Flood, Bangladesh

1. Introduction

Bangladesh frequently experiences flooding and the ways in which it is managed are gaining notice on a global scale. This country is more vulnerable to hydrological disasters like floods because of its geographic location in the downstream of India. Although, the flash flood in Sylhet region should not limiting in a hydrological even but also it considered as a challenge due to the multi-dimensional vulnerability, coping strategies and institutional capacities [1]. In June 2022 an extraordinary rainfall in the upstream in India caused a mid-June 2022 flash flood that submerged most of the parts of Sylhet district. About 7 million people are affected and this devastating flash flood reveals serious physical and socioeconomic vulnerability and destroys dwelling places, agriculture and

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infrastructure [2]. Because of the geophysical location of this district and heavy rainfall in the upstream creates the flash flood 2022 and it damages household, crops, infrastructure, communication channels and disrupts health system and livelihood options of the entire community and which is reflected an institutional preparedness gaps [3]. Researchers [4, 2] identified the underlying causes of the flash flood of this area is located in the low-lying *Haor* basin where living millions of people with exposure to environmental and socioeconomic vulnerability and this vulnerability exposed to the most disadvantaged group like poor, women, elderly people and people with disabilities. However, the economic vulnerability of the population depends on the over dependence on the unstable livelihood options such as, agriculture and fishing where physical vulnerability prompted due to poor housing and infrastructure, environmental issues and deforested hilly areas. Environmental disasters that negatively affect human health, well-being, livelihood substitutes and the environment of natural resources are more likely to affect the disadvantaged and poor communities. Since all of the sources are flooded under water, flash floods lead to pollute drinking water which spreads cholera, diarrhea and other waterborne diseases. Prohaska & Peters argued that exposure to floods and wildfires make treat to cancer diseases [5]. Similarly, Datar et al. investigated the exposure of natural disaster to chronic diseases for children such as, diarrhea, fever and breathing illness [6]. Moreover, livelihood options and assets are extremely exaggerated and damaged due to environmental disaster like flash flood that reduces the income level of the farmers [7]. Kawasaki et al. identified that people with poverty have tend to live in flood prone area that enhances poverty among them [8]. People are the potential exposure to the impacts of climate change because of flood exposed extra burden to fisherman and they remain endless poverty [9]. Moreover, flash flood induced vulnerability to individual and community depends on various factor such as, poor physical infrastructure [10-13] and structural provisions [14-16]. However, this study focused on assessing the people's vulnerability to flash flood in the context of household and community.

1.1 Research objectives

- to analyze household level vulnerability to flash flood; and
- to analyze community level vulnerability to flash flood.

1.2 Research questions

RQ1: What was the household level vulnerability to flash flood?

RQ2: What was the community level vulnerability to flash flood?

2. Review of literature

2.1 Flash flood in Sylhet region

Some studies conducted by the researchers focusing on flash flood in Sylhet regions. For instance, Akter et al. mapped the spatiotemporal rainfall variability and its relationship to flash flood [17]; Howlader et al. assessed flash flood through GIS-MCDM tool [18]; Islam et al. quantified inundation due to flash flood using satellite earth observations [19]; Shafiq focused on the frequency and impacts of flash flood [20]; Tuli et al. analyzed the impacts of flash flood in Sylhet and Sunamganj using Google Earth [21]; Sium et al. assessed the multilayer impacts of flash flood on land and land cover [22].

2.2 Factors of vulnerability to flash flood

Recent studies on Sylhet have donated to knowledge about the hazard of flash floods but is unequal in relation to the tow objectives of this study [23- 29].

Geospatial and multi-criteria studies offer a comparatively good evidence of physical exposure to vulnerability and it also depends on rainfall, density in drainage system, geomorphology, slope, topographic dampness and land-use [30- 42]. The worth of this figure of work is that it has clear the areas of concentration of flash flood vulnerability but households and community level various socioeconomic and demographic condition induces

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flash flood related vulnerability [43-63, 1]. Moreover, the study on hazards is progressively ascribing flash-flood severity to change in using of land, congestion in drainage system and pressures on river flow systems as opposed to rainfall. The literature reviewed above indicates that flash floods are not a naturally occurring event like others but are a process that occurs at a basin scale and whose effects are influenced by the socio economic and demographic characteristics of the population.

2.3 Research gap

The literature reviewed above indicates that most of the prior studies are not directly related to the present study with regard to study area, study population, study objectives and analytical approach. The absence of research work that is specifically related to Sylhet is not only the large gap in literature but also there is a gap of research between different geographical and thematic aspects. Empirical studies conducted in Sylhet region have been conducted at either district level (Sunamganj) or basin level rather than at the district level of Sylhet, with resulting significant gaps in research.

3. Materials and methods

Existing studies on Sylhet and northeastern regions of Bangladesh on flash flood provide a suitable methodological perception to conduct this study. However, this study applied a triangulation of quantitative and qualitative methods for data collection.

3.1 Study area

Three unions namely-*Barhal, Biroshree, Kajalsar* of Zakiganj upazila of Sylhet district were purposively selected as study area due to geographical location, rainfall and river estuaries that make this area vulnerable to flash flood. Among 9 unions, 3 unions were selected which were severely affected by flash flood 2022.

3.2 Participants

For quantitative data 360 flash flood 2022 affected male and female were selected as participants. Considering the age (18-70+ years), gender (male, female and other) and experience of flash flood, the participants of this study were selected from the *Barhal, Biroshree, Kajalsar* unions of Zakiganj upazila of Sylhet district.

3.3 Data collection

For quantitative data randomly selected 360 respondents from the study area were surveyed through a semi-structured questionnaire. The sample population was selected by the help of local leaders, community leaders and community people. Moreover, to strengthen quantitative data 3 KIIs were conducted through a well-organized checklist linked to the objectives of the study.

3.4 Primary and secondary data

The primary data for both quantitative and qualitative methods were collected from direct field study from December 2023 to January 2024 whereas secondary data were collected through a rigorous desk review of related documents during the study period.

3.5 Prepare, analyze and presentation of data

The collected data were sorted manually, analyzed by using SPSS software and presented in table in accordance with research objectives.

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4. Results and analysis

4.1 Household level vulnerability

The data shows the multidimensional features that indicates the vulnerability to flash flood in Table 1 and 2. The mean value of total average means 2.08 shows that households were in the low to moderate vulnerability range although it had a number of structural faults. Regarding the issue of family composition data indicate that nuclear family (M=1.10) and male-headed household (M=1.25) were predominant. The average household size (M=3.38) indicates moderate dependence which increases food demand at the post disasters situation. There was recurrent exposure to flash floods and experience of households to expose to flash floods more than once previous past ten years (M=1.79). Although death rates due to previous flash floods were relatively low (M=1.99) but the number of injured people (M=1.78) indicates the middle level of physical vulnerability. The accessibility to early warning systems (M=1.84) was partly covered which indicates the deficiency of communication provision. The housing structures (M=2.47) were mostly semi-*pucca* which supports that the people of the study area had moderate resilience and continue to face the occurrence of structural harm. Receiving treatment from medical center cause delay in emergency situation due to the distance to medical facilities as the access barriers (M=2.61). There was high breakability in economic indicators. The monthly income (M=2.31) was also low-to-moderate and there was low income diversification opportunity (M=1.31). The majority of households had only one earning member (M=1.48) which indicates the limitation of adaptation capacity. The low ability of household savings (M=1.31) and low amount of savings (M=1.15) specify a weak financial cushioning capacity. The level of education of household head (M=2.60) indicates limited diversification of employment opportunity outside the area and occupation of household head (M=2.64) shows that the two biggest sectors were agriculture and informal labor which were highly vulnerable to climate change. Household land ownership (M=1.21) remarks to small scale ownership of land which was prone to be affected by flash floods and induces vulnerability for household. The variables of social capital reflected moderate outside networks such as, having relatives outside of the affected areas (M=1.56) and relatives working or with outside of area (M=1.75). The institutional dependency (M=1.93) was indicated by the households that seek the help of the local authorities. The health vulnerability persisted high due to the presence of chronic illnesses/disabilities (M=4.53) indicates supplementary risks associated with nutrition and rehabilitation.

Table 1: Household level vulnerability (N = 360)

Sl.	Variable	Category	%	Mean	SD
1	Type of family	Single	92.5	1.1056	0.3949
		Nucleus	4.4		
		Extended	3.1		
2	Experiencing injury by family member	Yes	25.0	1.7806	0.4828
		No	71.9		
		Not sure	3.1		
3	Losing family member	Yes	1.7	1.9944	0.1668
		No	97.2		
		Not sure	1.1		
4	Type of house structure	Jhupri	13.6	2.4750	0.8984
		Katcha	39.4		
		Semi-pucca	32.8		
		Pucca	14.2		
5	Receiving any form of warning about flash flood	Yes	16.4	1.8472	0.3900
		No	82.5		
		Not sure	1.1		
6	Size of household	2 members	4.4	3.3833	0.9279
		3 members	6.7		

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Sl.	Variable	Category	%	Mean	SD
		4 members	46.1		
		5 members	31.7		
		More than 5 members	11.1		
7	Experiencing flash by household in last 10 years	1 time	40.3	1.7972	0.8008
		2 times	43.6		
		3 times	12.2		
		More than 3 times	3.9		
8	Household head	Husband	83.1	1.2500	0.6098
		Wife	10.0		
		Son	5.8		
		Daughter	1.1		
9	Number of disable and injured member in the family	1	7.8	4.5306	1.2101
		2	4.2		
		3	1.4		
		More than 3	.6		
		None	86.1		
10	Household head's monthly income	Tk. 5000-10000	28.9	2.3111	1.2278
		Tk. 10001-15000	35.6		
		Tk. 15001-20000	20.0		
		Tk. 20001-25000	8.9		
		Tk. 25001-30000	4.4		
		Tk. 30000+	2.2		
11	Distance of medical center	1-2 km	7.2	2.6167	0.6180
		3-4 km	23.9		
		5 km	68.9		
12	Living time in the area	5-10 years	5.0	4.1778	1.1667
		11-15 years	5.8		
		16-20 years	13.1		
		21-25 years	18.6		
		More than 25 years	57.5		
13	Level of education of household head	Primary education	26.1	2.6028	1.4203
		Secondary education	32.5		
		Higher secondary education	13.9		
		Tertiary education	10.0		
		No formal education	17.5		
14	Occupation of household head	Business	13.1	2.6417	1.3065
		Cultivation	53.1		
		Public service	7.8		
		Private service	8.9		
		Service in informal sector	17.2		
15	Number of income sources of the household	1	75.6	1.3111	0.5904
		2	17.8		
		3	6.7		
16	Number of earning member in the family	1	65.3	1.4889	0.7312
		2	20.6		
		3	14.2		
17	Savings of household	Yes	71.9	1.3111	0.5256
		No	25.0		
		Not sure	3.1		
18	Monthly amount of savings	No savings	25.0	1.1556	0.9635

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Sl.	Variable	Category	%	Mean	SD
		Tk. 1000-2000	46.7		
		Tk. 3000-5000	18.6		
		Tk. 6000-10000	7.2		
		Tk. 10000+	2.5		
19	Household with land	Yes	83.1	1.2139	0.5077
		No	12.5		
		Not sure	4.4		
20	Having relatives outside the affected area	Yes	46.9	1.5611	0.5552
		No	50.0		
		Not sure	3.1		
21	Having member/relatives with jobs outside the affected area	Yes	29.2	1.7556	0.5291
		No	66.1		
		Not sure	4.7		
22	Meet with local authority for assistance	Yes	15.8	1.9361	0.4994
		No	74.7		
		Not sure	9.4		
23	Having own or rent farming	Yes	56.4	1.5389	0.6748
		No	33.3		
		Not sure	10.3		
			Average	2.08	0.74

An average mean of 2.08 indicates that the households were rather often considered as low-to-moderate vulnerable to socioeconomic and disaster category.

Table 2: Composite vulnerability index by household indicators (N = 360)

Dimension	Variable	Mean	Normalized CVI (0–1)
Exposure	Experiencing flash by household in last 10 years	1.7972	0.22
	Type of house structure	2.4750	0.38
	Receiving any form of warning about flash flood	1.8472	0.24
	Experiencing injury by family member	1.7806	0.21
	Losing family member	1.9944	0.29
Sensitivity	Size of household	3.3833	0.56
	Number of disable and injured member in the family	4.5306	1.00
	Distance of medical center	2.6167	0.42
	Type of family	1.1056	0.00
	Household head	1.2500	0.05
Adaptation	Household head’s monthly income	2.3111	0.36
Capacity	Number of income sources of the household	1.3111	0.06
	Number of earning member in the family	1.4889	0.13
	Savings of household	1.3111	0.06
	Monthly amount of savings	1.1556	0.00
	Household with land	1.2139	0.02
	Having relatives outside the affected area	1.5611	0.12
	Having member/relatives with jobs outside the affected area	1.7556	0.21
	Meet with local authority for assistance	1.9361	0.27
	Having own or rent farming	1.5389	0.11
	Level of education of household head	2.6028	0.44
	Occupation of household head	2.6417	0.45
	Living time in the area	4.1778	0.87

4.2 Community level vulnerability

The calculated average of all mean value 1.49 highlights that there was a medium degree of social and structural vulnerability at the community level. The factors that relate to identity impacts of individual, identity impacts of

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individual in community, availability of employment and livelihood, environmental and climate change factors and access to basic services all combine to determine the social status and living conditions of individual in the community. Some of the dimensions, including employment and livelihood opportunities (Mean=1.70) had a comparatively stronger impact which indicates economic limitations and poor job diversification. Characteristics of identity also contributed greatly in the determination of both individual (Mean=1.57) and individual status in the community (Mean=1.55). The problems of environment and climate change had moderate impacts on the social interaction, agriculture and livelihood (Mean=1.31) and the access to basic services such as, healthcare, education and financial institutions were also somewhat limited (Mean=1.33). These results suggest that exposure to the environment and access to institutional services were combined with individual and community identity structures and economic opportunities to induce vulnerability to flash flood in the community. Table 3 and 4 present the results.

The Composite Social Vulnerability Index (SVI mean=1.54) in Table 4 shows that the communities under the study were considered by the moderate degree of social vulnerability. Of the four dimensions, livelihood and employment vulnerability (Mean=1.70) carried the highest level of vulnerability that indicates the social vulnerability in the study area were affected by employment opportunities, occupational diversification and employment and livelihood opportunities for women. Job opportunities were limited and seasonal in the study area which compels members of the community to find employment and livelihood opportunities outside the area results to induce vulnerability. The social identity dimension (Mean=1.65) was also found to be significant, meaning that identity categories like race, ethnicity, religion and marital status had a moderate influence to people regarding their social status in the community indicates that the social stratification and identity-based difference may affect the access to resources and decision making power. Community status dimension (Mean=1.47) indicates the moderately low hitherto significant impacts of identity based factors regarding the status of individuals in the community environment. However, notwithstanding the differences in identity but their impact seems to be less significant than livelihood-related vulnerabilities in the community. Lastly, environmental and service related vulnerability dimension (Mean=1.32) carries the lowest mean score. Nonetheless, difficulties like crop damage due to climatic conditions, livelihood turbulences, displacement of people, lack of accessibility to health care, financial services and shelter were also significant factors to induce vulnerability to flash flood. Widely, the composite index indicates that livelihood uncertainty, employment unpredictability and social stratification were all factors that define the vulnerability profile of households in the study area. These vulnerabilities exacerbate food insecurity and nutritional risks, especially in marginalized households regarding economic condition in flash flood prone areas.

Table 3: Community level vulnerability (N = 360)

Dimension	Indicators	Mean Range	Average Mean Value
Identity Impacts on Individual Status	Race; Ethnic; Religious; Language; Sex; Gender; Social class; Socioeconomic condition; Job status; Marital status; Educational status; Familial/kinship linkage; Age structure.	1.0944 – 2.0861	1.57
Identity Impacts on Community Status	Racial and individual in community; Ethnic and individual in community; Religious and individual in community; Language and individual in community; Sex and individual in community; Gender and individual in community; Social class and individual in community; Socioeconomic condition and individual in community; Job and individual in community; Marital status and individual in community; Educational status and individual in community; Familial/kinship linkage and individual in community; Age structure and individual in community.	1.0944 – 2.0861	1.55
Employment and Livelihood Opportunities	Opportunity of decent work for all in the community; Availability work for all in the community; Opportunity to move for work outside the community; Opportunity	1.4861 – 1.9056	1.70

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	for diversified occupation in the community; Opportunity for women to work outside the family; Opportunity for women to work within the community; Opportunity for women to work within the community; Opportunity for work over the year.			
Environmental and Climate Impacts	Disruption of social interaction and climatic issue, Climatic issue and damages of crops, Climatic issue and disruption of livelihood, Climatic issue and displacement of people.	1.1833 1.4333	–	1.31
Access to Basic Services	Access of children to education; Access to health care services; Access to financial services; Access to decent housing; Access to social services; Access to public places.	1.1528 1.5806	–	1.33
Average				1.49

Table 4: Composite Social Vulnerability Index

Dimension	Average Mean	Normalized SVI (0–1)
Social Identity Vulnerability	1.65	0.56
Community Status Vulnerability	1.47	0.37
Livelihood & Employment Vulnerability	1.70	0.51
Environmental & Service Vulnerability	1.32	0.54
Composite Social Vulnerability Index	1.54	0.90

5. Discussion

5.1 Household level vulnerability

The analysis of 360 households of this study shows that range of vulnerability of households was normally low-to-moderate although structural and socioeconomic vulnerabilities existed in the study area. Households were mostly nuclear and male headed with moderate vulnerability that reflects dependence and affected by flash flood in terms of food demand. Repeated exposure to floods, *Katcha* (39.4%) semi-*pucca* (32.8%) house and imperfect reporting of early warning signals were the sings of the lack of physical accessibility. Adaptation capacity was constrained by economic fragility such as, low income (35.6% household earned monthly Tk. 10001-15000), solo earning member (65.3% of the household had one earning member), lack of income diversification opportunity (75.6% of the household had sole earning sources) and low savings (46.7% of the household saved Tk. 1000-2000 per month) which increase level of household vulnerability. Furthermore, household vulnerability was revealed through dependence on cultivation (53.1% of the households depended on cultivation) and service in the informal sector (17.2%) and by not having any relatives outside the affected area (50%). Inadequate access to help from the community was also showed in moderate social networks. Households were vulnerable in terms of exposure, sensitivity and adaptation capacity. However, exposure was moderate due to frequent floods, *Katcha* and semi-*pucca* housing and imperfect early warning signals resulting cumulative risk. The highest sensitivity was due to size of household (46.1% of the household consisted of 4 members), chronic disease (7.8% of the household had 1 disable and injured member), low access to healthcare (68.9% of the household were 5km away from medical center) and decisions were made by male member increase sensitivity as the aftermath of the flood. There was a low adaptation capacity due to low-to-moderate income, dependence on solo sources of income, savings limitation, dependence on cultivation and small landholding limits coping and recovery. External support somewhat accompaniments resilience but cannot counter vulnerabilities completely. This results align with the study of Lee et al., where authors found recurrent flood exposure and increasing risk due to post flood effects [64] and Haque et al. observed that structural characteristics of housing become the source of different loss and disruption [65]. Moreover, Al-Mueed et al. highlighted imperfect early warning signals restrict the people to act in uneven preparedness and exposure continuation [66].

5.2 Community level vulnerability

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The results reveal that the community had an average vulnerability in the context of social and structural issue. For example, the lack of diversification in income sources and opportunities in employment and livelihood (Mean=1.70) whereas factors of identity impacts on individual status (Mean=1.57) and identity impacts on community status (Mean=1.55), access to basic services (Mean=1.33) and environment and climate impacts increase community level vulnerability. Vulnerability level reflects condition in the community in the context of disaster affected individuals and communities though community is the main concern in vulnerability literature and its dynamic characteristics is important [67]. However, researchers [68- 71 cited in 67] identified that due to dynamic-systematic interaction as a result of the characteristics of community level vulnerability in community changes.

The Composite Social Vulnerability Index (SVI=1.54) shows that the social vulnerability was medium in the study area. Livelihood and employment insecurity was the most influential factor, caused by a lack of job diversification and seasonal work reduces economic resilience to flash flood. Access to resources and decision-making power was also resulted by social identity factors such as, ethnicity, religion and marital status although the differences in status in the community was minor and it was less than livelihood restraints. Lack of access to services and environmental issues were also some causes of vulnerability. Susan L. Cutter and co-authors introduced the Social Vulnerability Index technique for measuring vulnerability based on multi-level socioeconomic and demographic variables [72]. Tasnuva et al. identified that low-medium, medium, and medium-high to high household level social vulnerability [73].

6. Conclusion

The results of this study show that vulnerability to flash floods was multidimensional which was affected by socio-demographic factors, exposure to environmental factors, unbalanced economic conditions and institutional limitations in the study area. Mid aged respondents, extended family and moderate-to-low levels of education were the largest limitation to adaptation capacity and strengthening dependence. The household resilience was impaired due to the gender based decision making process where the women were excluded in disaster preparedness process. The study also shows that there was large dependence on agriculture and single sources of income which limits the economic diversity and as a result the household was highly exposed to the risk of flash floods. These represent severe vulnerability by being exposed to flash floods more than once every decade and had more than one occurrence of exaggerated household. Recurrent submerges and inundation rates affect livelihoods, damage property and food security that this study revealed. The overall food crises, illness and unemployment were the strongest indicators of sensitivity in flash floods. These realities illustrate that even moderate floods may had severe nutritional and health-related strain in the case of disregarded groups those had limited access to healthcare system and safe drinking water. Although households employ borrowing, selling of valuable assets and depending on relief as coping strategies and most of these were generally reactive and untenable. Household were severely vulnerable due to the lack of structural preparedness, medical preparedness although some the household used to saving money, preservation of seed indicates the middle adaptation capacity. The vast spread of housing damage and self-reconstruction further stressed disaster recovery due to the lack of institutional supports. The results show that crop diversification, sanitation and presence of disaster management committees at the community level indicate some levels of resilience. The Composite Social Vulnerability Index (SVI) shows a moderate vulnerability which was mainly due to livelihood insecurity, inadequate access to basic services and social inequalities.

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Conflicts of Interest

The authors declare no conflict of interest.

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Constructing an Adaptive Training Model for Electronic Information Postgraduates Using Causally Interpretable Artificial Intelligence

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Abstract

The cultivation of innovation capability in electronic information postgraduates faces multiple obstacles, including complex and nonlinear interactions among influencing factors and consistently delayed evaluation feedback. As a result, conventional training models cannot adapt dynamically to individual characteristics. To address this limitation, this paper proposes an adaptive training model grounded in causally interpretable artificial intelligence. First, a three-dimensional feature set encompassing individual endowments, training process support, and the external ecological environment is constructed. Subsequently, a neural acyclic directed mixed graph learning method extracts the causal network structure among these features, identifying critical pathways and potential confounders. Finally, this causal structure is incorporated as prior information into an XGBoost-SHAP framework, which produces a dual-output evaluation model that simultaneously generates personalized student innovation capability reports and supervisor effectiveness reports. The model achieves adaptive evolution through a dual closed-loop mechanism, in which causal discovery drives iterative feature set updates and evaluation feedback drives dynamic adjustments to training strategies. This research offers a new pathway that fuses causal mechanisms with interpretable artificial intelligence for cultivating innovation capability in electronic information postgraduates.

Keywords

innovation capability cultivation, electronic information postgraduates, causal discovery, interpretable artificial intelligence, adaptive training model

1. Introduction

Graduate education supplies high-level talent for an innovation-driven nation. The electronic information industry is strategic, foundational, and pioneering. Its rapid technological iteration, deep interdisciplinary integration, and short knowledge renewal cycles demand higher continuous learning and original innovation than other engineering fields. Current training confronts three interlocking constraints. First, a structural gap persists between training objectives and industrial technology evolution; some curricula adhere to traditional frameworks and fail to address emerging directions such as AI chips and intelligent sensing. Second, practical training lacks depth and breadth, with experimental projects emphasizing verification tasks and offering

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inadequate exposure to unstructured engineering problems. Third, the evaluation system relies heavily on singular quantitative indicators like publication counts, neglecting innovative behaviors such as technical breakthroughs and original solutions. These constraints form systemic barriers. Precisely identifying key influencing factors and implementing differentiated training has become an urgent reform question.

Scholars have explored training model reform and innovation capability evaluation. Ma et al. [1] examined cultivation paths for integrated circuit design postgraduates using a demand-capability-process-evaluation system. Luo et al. [2] constructed a four-in-one model integrating case courses, engineering practice, mentoring, and feedback. Chen et al. [3] proposed an AI-empowered multimodal innovation practice reform. Shi et al. [4] emphasized pedagogical innovation and university-industry cooperation. Bai et al. [5] introduced a "1234" model with dual-supervisor teams and a triple PDCA cycle. Wan [6] developed an IPSO-LSTM evaluation model to classify innovation capability. Hou et al. [7] analyzed entrepreneurial competence through awareness, skills, and practice. Luo et al. [8] built a talent cultivation system stressing industry-education and science-education integration. Sun et al. [9] designed an integrated through-curriculum system for local universities. Zhou et al. [10] explored a multi-level model incorporating an experimental innovation center. Zhang et al. [11] reported on university-enterprise cooperation through joint bases and industry projects. Ouyang et al. [12] revealed how disciplinary ecology constrains capability cultivation. Mo et al. [13] discussed reform paths in professional-degree programs in the AI era. In evaluation, Wang et al. [14] applied AHP and entropy weight to build an index system. Zhang et al. [15] used fsQCA to identify multiple equivalent paths, showing innovation capability emerges from condition configurations. Zhou et al. [16] analyzed digital literacy's impact on innovation capability.

Existing reforms concentrate on structural aspects. A systematic framework that accurately identifies key factors shaping individual innovation capability and implements differentiated training remains absent. Because electronic information postgraduates face exceptionally fast knowledge renewal, innovation often manifests as rapid responses to cutting-edge directions including AI chips, 6G, and intelligent sensing. Existing evaluation methods remain at correlation-based prediction, failing to reveal causal influence. Three shortcomings stand out. First, analyses rely on linear associations and cannot capture nonlinear causal structure. Bai et al. [5] focused on process standardization without causal inference. Zhang et al. [15] identified multi-path equivalence but not causal direction. Second, training schemes and feedback are static. Wan's [6] model offers unidirectional feedback without a closed loop. Third, evaluation outputs lack interpretability. Wang et al. [14] quantified capability but could not reveal differential impact pathways, leaving postgraduates and supervisors unable to devise targeted plans.

To address these gaps, this paper proposes an adaptive model based on causally interpretable AI. First, a three-dimensional feature set encompassing individual endowments, training process support, and external ecological environment is constructed. Second, the neural ADMG method [17] mines the causal network structure, handling nonlinearity and latent confounders. Third, this structure enters the XGBoost-SHAP framework [18] as prior information, generating dual-output evaluation. Finally, a dual closed-loop mechanism drives adaptive evolution: causal discovery updates the feature set, and evaluation feedback adjusts training strategies.

The remainder of the paper is organized as follows: Section 2 describes the construction of the feature set for innovation capability cultivation. Section 3 analyzes the principles and advantages of causal network structure mining based on neural ADMG. Section 4 presents the personalized evaluation and feedback model based on XGBoost-SHAP. Section 5 discusses the support mechanisms for model implementation, and Section 6 concludes the paper.

2. Construction of the Feature Set for Innovation Capability Cultivation

Following the technology-organization-environment framework [15] , this study divides the factors influencing innovation capability into three dimensions, namely individual cognition and ability endowments, training process support, and external ecological environment.

2.1 Individual Cognition and Ability Endowment Dimension

This dimension covers knowledge reserves, tool utilization, thinking quality, and psychological states.

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(1) Specialized knowledge reserves form the foundation. The electronic information knowledge system spans semiconductor physics, circuit theory, signals and systems, communication principles, and computer architecture, updating far faster than traditional engineering. Shi et al. [4] noted that interdisciplinary knowledge breadth and depth shape innovative thinking. Sun et al. [9] stressed the foundational role of frontier course content. Postgraduates must integrate knowledge across levels, merging device physics with algorithm optimization in chip design or co-designing hardware and protocols in communication systems. This feature is quantified through course grades, concept mastery tests, and knowledge graph coverage.

(2) AI tool application ability has emerged as a new essential factor. R&D increasingly relies on AI-assisted toolchains for automated code generation, intelligent testing, and literature analysis. Chen et al. [3] argued that this capacity constitutes a core variable for research efficiency and innovation quality. Mo et al. [13] found that AI toolchain training significantly improved high-level problem-solving. The tool ecosystem includes hardware description languages, embedded environments, signal processing platforms, and AI tools. This feature is assessed through tool-use diversity, task completion time, and tool selection appropriateness.

(3) Innovative thinking quality reflects the cognitive capacity to identify scientific problems and construct novel solutions, often manifesting as breakthroughs challenging existing technical routes. Luo et al. [8] characterized it as involving divergent thinking, critical thinking, cross-domain associations, and the acumen to distill questions from practice. Ma et al. [1] noted that in IC design it appears as insight and courage to question established designs. Technological sensitivity to spot promising directions distinguishes innovative talent. This feature is measured through topic novelty, technical proposal originality, and innovation contributions in papers.

(4) Learning engagement and self-efficacy capture psychological energy and belief in innovative ability. Rapid iteration demands continuous tracking, making sustained engagement critical. Zhang et al. [15] demonstrated their significant positive prediction of innovation capability. Shi et al. [4] noted self-efficacy influences strategy choices and persistence. Frequent setbacks such as tape-out failures and non-convergent simulations render self-efficacy a key factor determining perseverance. This feature is quantified through research time investment, task completion rates, and self-efficacy scale scores.

2.2 Training Process Support Dimension

This dimension focuses on organizational support, divided into mentoring frequency and depth, mentoring style and strategy, and project resources and research platforms.

(1) Mentoring frequency and depth capture the temporal density and cognitive intensity of supervisor-postgraduate interactions. Electronic information training involves multiple engineering stages, each demanding specific technical decisions requiring high mentoring frequency. Bai et al. [5] observed that heavy workloads under the single-supervisor model often prevent adequate guidance. Ouyang et al. [12] found dual faculty constraints in local normal universities. Quality interactions transmit knowledge and internalize innovative methods. This feature is measured through meeting density, feedback detail and timeliness, and average session duration.

(2) Mentoring style and strategy concern educational philosophy. Innovation requires heuristic guidance rather than standard answers. Luo et al. [2] advocated a dual-supervisor system combining academic planning and industry practice. Ouyang et al. [12] recommended small supervisor teams from complementary areas. Team-based mentoring offsets individual limitations in engineering experience. This feature is captured through student evaluations, supervisors' self-reported philosophies, and peer reviews.

(3) Project resources and research platforms reflect the projects, equipment, and exchange opportunities supervisors can allocate. Research depends on advanced equipment and tools; tape-out costs are high, and testing requires specialized instruments. Zhang et al. [15] established innovation resources as a core organizational precondition. Luo et al. [8] proposed that high-level platforms and major projects create authentic research contexts. Access to tape-out opportunities, testing equipment, and EDA tools determines whether postgraduates complete the full innovation chain. This feature is assessed through project level and number, per capita equipment usage, and exchange opportunity frequency.

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2.3 External Ecological Environment Dimension

This dimension addresses macro-conditions beyond the university, covering academic exchange, industry-education integration, and institutional culture.

(1) The academic exchange and competition environment includes campus forums, conference participation, and competition traditions. Short technology cycles demand continuous frontier tracking. Zhang et al. [15] confirmed innovation culture as a core environmental factor. Wang et al. [14] assigned academic exchange an 18% weight. Top conferences serve as initial platforms for frontier achievements, enabling timely learning of new directions. This feature is quantified through annual presentations, conference attendance per capita, competition participation rates, and award levels.

(2) Industry-education integration depth measures university-enterprise synergy in talent cultivation and technology development. Industrial demand steers innovation direction. Bai et al. [5] identified integration as a key pathway for enhancing practice capability. Luo et al. [8] noted it enables engagement with authentic application scenarios. Zhang et al. [11] demonstrated that collaborative projects significantly improve practice levels. This feature is measured through joint laboratory numbers, enterprise supervisor proportions, and average enterprise project hours.

(3) Innovation culture and institutional support involve value climates, IP protection, and achievement recognition. Electronic information outputs are diverse, including chips, protocol stacks, patents, and papers. Compared with other disciplines, the pathway to application is shorter and demands flexible institutional support. Ma et al. [1] argued for a demand-oriented, competence-centered system. Zhang et al. [15] showed innovation culture as a core condition across multiple paths. A failure-tolerant atmosphere and reasonable ownership rules affect willingness to engage in high-risk research; the chip design cycle often exceeds one year, requiring long-cycle outcome safeguards. This feature is assessed through innovation activity participation, project approval rates, and supportive policy completeness.

Together, these three dimensions encompass ten core features, constructing a framework from individual cognition through organizational support to ecological conditions. Figure 1 presents the feature set.

Figure 1: Construction of the feature set for innovation capability cultivation of electronic information postgraduates



3. Causal Network Structure Mining Based on Neural ADMG

After feature set construction, the causal structure must be uncovered. Conventional correlation analysis cannot distinguish causality from spurious correlations. This study adopts the neural ADMG method [17] for causal discovery, which identifies nonlinear relationships and handles latent confounders.

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3.1 The Necessity of Causal Discovery

Relationships among variables exhibit nonlinearity and strong coupling. Zhang et al. [15] showed innovation capability emerges from condition combinations. A bidirectional causal relationship may exist between AI tool ability and innovative thinking [13] A latent confounder, such as intrinsic motivation, may jointly influence mentoring frequency and learning engagement, and ignoring it would overestimate mentoring effects [12] . Traditional models cannot differentiate these from confounding effects. Chen et al. [3] noted that deep learning models remain opaque regarding causal direction. Causal discovery aims to infer causal direction and structure from observational data, providing a causally interpretable foundation for personalized evaluation.

3.2 Basic Principles of the Neural ADMG Method

Ashman et al. [17] proposed modeling ancestral relationships with directed acyclic mixed graphs, where directed edges represent direct causal effects and bidirected edges indicate latent confounders. The method proves latent confounding is identifiable under bow-free ADMG and nonlinear additive noise assumptions and uses autoregressive flows for learning. It offers three advantages over traditional methods: it handles nonlinearity without presupposing linearity, explicitly models latent confounders to avoid omitted variable bias, and adopts gradient-based optimization with good scalability.

3.3 Application of Causal Networks in Postgraduate Innovation Capability Cultivation

Applying neural ADMG to electronic information postgraduate data achieves three objectives. First, it identifies critical causal pathways from individual endowments, training support, and external environment to innovation capability. For instance, AI tool ability may shorten simulation cycles and enable more tape-out attempts, or industry-education integration may enhance technological sensitivity. Second, it detects latent confounders; if intrinsic motivation jointly affects learning engagement and mentoring frequency, increasing frequency alone would not suffice. Third, it drives iterative feature set updates by revealing missing features, such as frontier tracking habits.

3.4 Transferring the Causal Network to the Evaluation Model

The mined causal directions and pathways are transferred via three mechanisms. Parent node features pointing to innovation capability receive higher prior attention weights in XGBoost. Mediating mechanisms supply causal chain contexts for SHAP explanations, elevating interpretation from statistical association to causal action. Latent confounders indicated by bidirected edges are flagged as variables to be controlled, enhancing evaluation robustness. Figure 2 illustrates this transfer logic, embedding causal discovery outcomes as prior structural information within the XGBoost-SHAP framework.

4. Personalized Evaluation and Feedback Model Based on XGBoost-SHAP

The causal structure enters the evaluation model as prior information. This study employs the joint XGBoost-SHAP approach [18] with the feature set and causal network as combined inputs to achieve high-precision dual-output prediction and individualized interpretation.

4.1 The XGBoost Dual-Output Evaluation Model

XGBoost sequentially builds decision trees fitting residuals, modeling complex nonlinear relationships with high accuracy. Xian et al. [18] verified its superior performance in educational prediction. Its advantages include automatic handling of nonlinear interactions, regularization to prevent overfitting in small samples, and high training efficiency. The model combines the three-dimensional feature set and the causal network as inputs. The feature set supplies raw variables, and the causal network supplies prior constraints to distinguish causal from spurious associations. Two outputs are specified, namely a personalized innovation capability profile and a supervisor effectiveness report. Training data from historical records including grades, outputs, awards, and evaluations enable multi-task supervised learning of both mappings.

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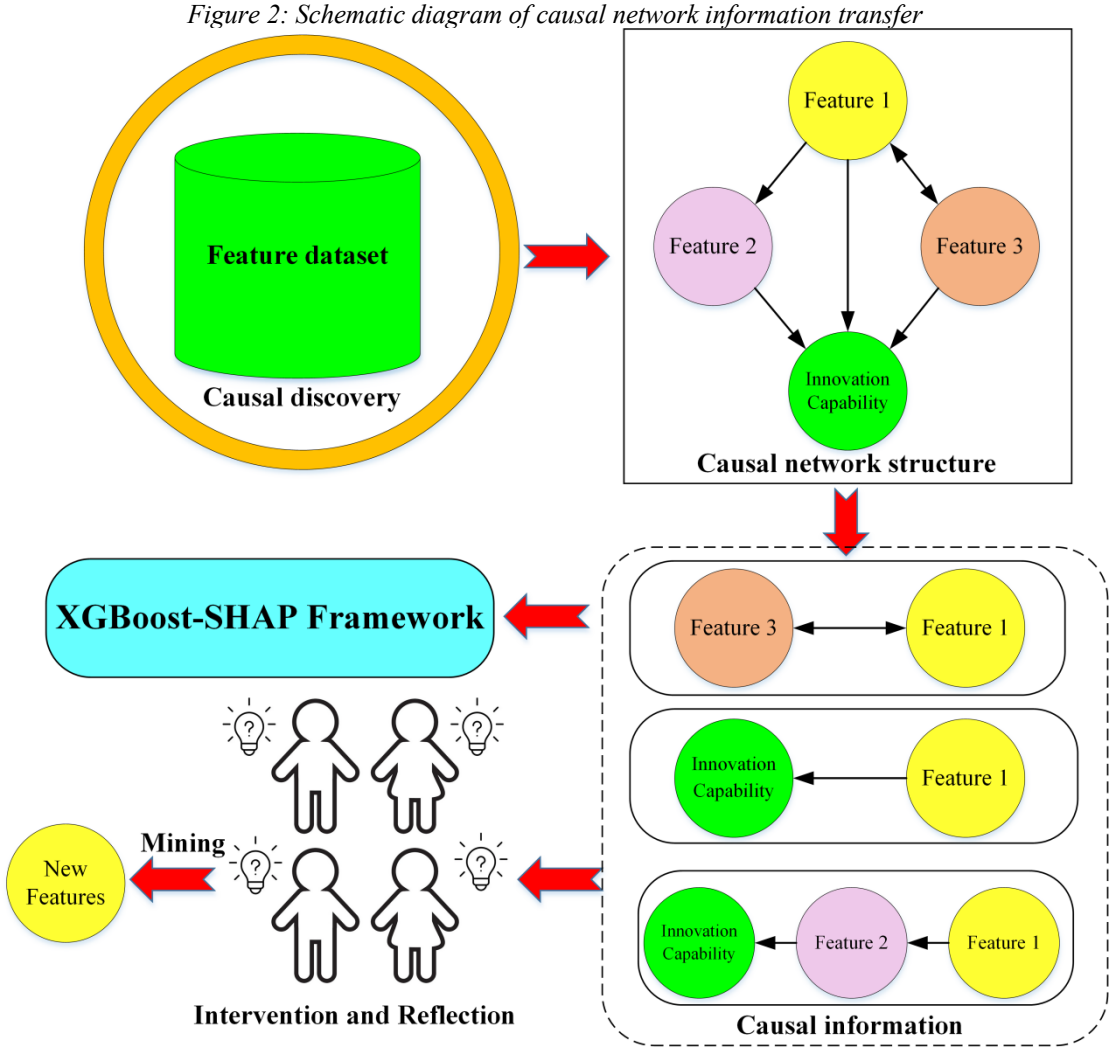
Figure 2: Schematic diagram of causal network information transfer



4.2 SHAP-Based Causal Interpretability Analysis

The black-box nature of XGBoost is addressed by SHAP, which computes marginal contributions via Shapley values [18] . This study further introduces the causal network as a prior constraint. Causal SHAP analysis fulfills three functions. First, it ranks causal feature contributions, distinguishing direct contributions from parent nodes and indirect contributions through mediating paths. AI tool ability may contribute directly by improving coding efficiency and indirectly by enabling broader simulation exploration. Second, it generates individualized causal explanations, showing which features exerted direct or indirect driving effects and which acted as constraints, upgrading diagnosis from correlation to mechanism. Third, it reveals directional effects, identifying positive promoters and negative constraints, with causal direction corroborating the directionality.

4.3 Personalized Feedback Reports and Supervisor Effectiveness Reports

The postgraduate innovation capability profile includes a composite score and grade, a causal network visualization displaying key pathways, and a SHAP causal contribution analysis identifying strengths and weaknesses. This forms a feedback loop of diagnosis, attribution, and targeted improvement. The supervisor effectiveness report aggregates postgraduate capability distribution, group-level causal patterns, and peer comparisons. Luo et al. [2] noted strong supervisor influence yet uneven knowledge updating. These reports enable supervisors to identify high-impact mentoring components and deficiencies for targeted adjustment.

4.4 The Dual Closed-Loop Mechanism for Adaptive Cultivation

Figure 3 illustrates the two interlocking loops. In the inner loop, evaluation feedback drives individual strategy adjustments. Postgraduates address weaknesses and supervisors optimize mentoring, and after

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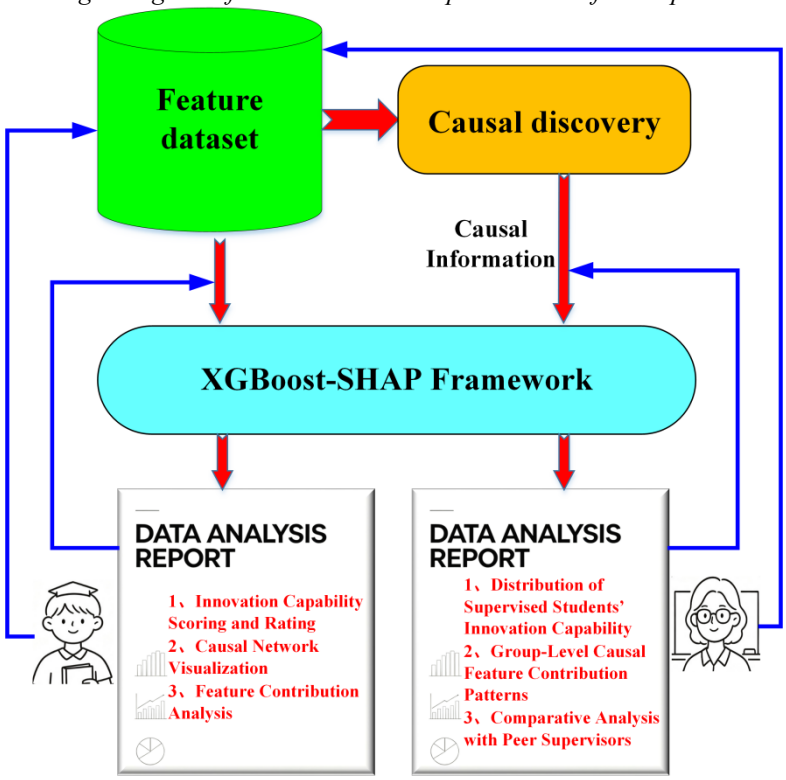
intervention new data produce updated evaluations, forming an iterative cycle. In the outer loop, causal discovery reruns on accumulated data, potentially revealing new pathways or confounders from emerging directions such as large language model-assisted chip design, driving feature set updates and model retraining. This transforms the training model from a static design into a dynamically evolving adaptive system with cognitive-level evolutionary capacity.

Figure 3: Logic diagram of the dual closed-loop mechanism for adaptive cultivation



5. Support Mechanisms for Model Implementation

The implementation of the adaptive training model described above requires corresponding support mechanisms.

(1) Data infrastructure requires a specialized multivariate collection system for electronic information postgraduates, incorporating tape-out experiences, EDA tool usage logs, simulation cycle lengths, and co-design completion status alongside conventional metrics. Bai et al. [5] emphasized using AI and big data to capture practical teaching resources. Experiment reports, design documents, and simulation logs contain rich process-oriented data and should be systematically collected.

(2) Faculty capacity building demands that supervisors accurately interpret discipline-specific features in evaluation reports and translate diagnostics into concrete strategies. Luo et al. [8] proposed career-long development through thematic training. Differentiated modules for IC design, communication systems, and signal processing should be designed. A dual-supervisor system with academic and enterprise supervisors is essential [2] , and enterprise supervisor feedback from internship observations is vital for iterative model optimization.

(3) Institutional safeguards must accommodate the discipline's research cycles. Simulation verification can be short-term, while chip design from tape-out to testing often exceeds one year. Sun et al. [9] recommended an evaluation system benchmarked on objectives, centered on process, and evidenced by outcomes. Mid-term checkpoints for long-cycle projects should be set, and evaluation results should inform training adjustments, supervisor appraisals, and resource allocation.

(4) Ethics and privacy protection require strict standards because cultivation data involve specific technical solutions and IP. Data use must follow informed consent, minimum necessity, and purpose limitation.

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Processing transparency must be maintained, and for sensitive data such as core algorithms and chip layouts, graded usage and de-identification mechanisms should protect postgraduates' IP rights and academic priority.

6. Conclusion

Cultivating innovation capability in electronic information postgraduates is a complex systems problem with numerous interacting factors and large individual differences. The proposed model integrates three-dimensional feature set construction, neural ADMG causal discovery, and XGBoost-SHAP personalized evaluation into a closed loop where causal understanding drives precise evaluation, precise evaluation drives personalized intervention, and intervention feedback drives model evolution. The core contribution lies in advancing from correlation analysis to causal mechanisms, upgrading from standardized scoring to personalized diagnosis, and transforming static schemes into a data-driven adaptive system. Future research may conduct longitudinal tracking across sub-disciplines to verify the dual closed-loop mechanism, combine causal discovery with large-scale cultivation data to improve generalization, and extend the model to related disciplines such as electronic science and technology, information and communication engineering, and integrated circuit science and engineering, adjusting the feature set according to research paradigm characteristics.

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On the Compensation for the Loss of Transaction Opportunity in Culpa in Contrahendo: From the Perspective of Chinese Judicial Practice

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Abstract

The compensability of the loss of transaction opportunity under the doctrine of culpa in contrahendo (contracting negligence) has long perplexed Chinese legal theory and judicial practice. From the perspective of judicial practice, the Supreme People's Court explicitly ruled in the Shenzhen Biaobang case that an 'objectively reasonable loss of transaction opportunity' falls within the scope of compensation. Conversely, many local courts reject such claims on the grounds of the 'uncertainty of transaction opportunities' or their 'exclusion from reliance interests'. These two opposing stances reflect a profound tension between reliance interest and expectation interest, as well as between the requirement of certainty and the compensatory function of damages. Awarding limited compensation for the loss of transaction opportunity can reduce opportunity-capturing costs and deter opportunistic behavior, thereby possessing efficiency justification from a law and economics perspective. In terms of institutional construction, the foreseeability of the opportunity loss by the party at fault should serve as the threshold condition for application. Courts should differentiate among four scenarios involving variables of third-party conduct and comprehensively weigh factors such as the probability of realizing the opportunity, the degree of reliance investment, and the benefits gained by the at-fault party to achieve a flexible and dynamic compensation mechanism.

Keywords

liability for culpa in contrahendo, loss of transaction opportunity, reliance interest, contractual disputes

1. Introduction

Since Rudolf von Jhering introduced the doctrine of culpa in contrahendo, its core function has been to protect parties from losses suffered due to their reliance on the performance of pre-contractual obligations during the negotiation phase. Articles 500 and 501 of the Civil Code of the People's Republic of China carry forward the provisions of Articles 42 and 43 of the former Contract Law. However, the legislation remains silent on the exact scope of damages, particularly regarding whether the loss of a transaction opportunity is compensable.

This legislative omission has resulted in a severe split in judicial practice. In Shenzhen Biaobang Investment Development Co., Ltd. v. Anshan Finance Bureau, an equity transfer dispute, the Supreme People's Court explicitly held that 'the objectively reasonable loss of transaction opportunity suffered by a party should fall

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within the scope of compensation under the liability for contracting negligence' and discretionarily awarded damages equivalent to 10% of the price differential from the resale of the equity[1]. Conversely, in Ding Yuzhi v. Hubei Xijiang Weiye Real Estate Development Co., Ltd., a commodity house pre-sale contract dispute, the High People's Court of Hubei Province rejected the claim for damages on the grounds that 'the scope of compensation for contracting negligence is limited to the loss of reliance interest (i.e., inherent interest), whereas the loss resulting from real estate price appreciation essentially falls under the category of expectation interest'[2] .

Such inconsistent adjudication of similar cases not only undermines judicial authority but also prevents market participants from forming stable expectations. Compounding the complexity is the inherently high level of uncertainty and aleatory nature of transaction opportunity loss: is it an extension of reliance interest or a variant of expectation interest? Will compensating it open the 'floodgates of litigation' and lead to unbounded liability? These queries urgently demand a theoretical response that transcends the traditional binary framework of 'certainty versus foreseeability' found in legal dogmatics.

This paper posits that the core of the issue regarding compensation for the loss of transaction opportunity is not whether to compensate, but rather under what conditions and how to compensate. To achieve this, it is necessary to first conduct a typological categorization of the diverging stances in Chinese judicial practice; second, analyze the limitations of traditional doctrinal debates; and finally, attempt to construct a dynamic compensation mechanism that balances both the scope of application and the calculation of damages.

2. Divergence in Chinese Judicial Practice

2.1 Affirmative Judicial Stance Welcoming Compensation for Transaction Opportunity Loss

2.2 Shenzhen Biaobang v. Anshan Finance Bureau: A Breakthrough Ruling by the Supreme People's Court

Factual Background: In April 2012, Biaobang entered into an Equity Transfer Agreement with the Anshan Finance Bureau, agreeing to acquire 225 million shares of Anshan Bank at RMB 2 per share. The agreement stipulated that it would 'take effect upon approval by the competent regulatory authorities'. Thereafter, Biaobang paid the deposit and submitted the required materials. However, the Anshan Finance Bureau terminated the transaction on the pretext of 'appreciation of state-owned assets' and subsequently transferred the shares to a third party at RMB 2.5 per share in 2014. Biaobang filed a lawsuit seeking damages for lost expectation interests totaling RMB 112.5 million (the price differential of RMB 0.5 multiplied by 225 million shares).

The court of first instance held that the contract was formed but had not taken effect, and that the Anshan Finance Bureau should bear liability for contracting negligence; however, it supported only direct losses (transaction fees and interest on the deposit) and rejected expectation damages. On appeal, the Supreme People's Court reversed the judgment in part, awarding a discretionary sum of RMB 11.25 million (10% of the price differential) for the loss of transaction opportunity in addition to the direct losses.

The core logic of the judicial summary rests upon three pillars: first, the scope of compensation for contracting negligence is not strictly restricted to direct losses under Article 42 of the former Contract Law, and transaction opportunity loss constitutes an indirect loss; second, since both parties had executed the contract and entered the regulatory approval phase, their mutual reliance had reached an advanced level, making Biaobang's prospect of acquiring the shares a realistic probability; third, the Anshan Finance Bureau maliciously obstructed the contract from taking effect and resold the shares at a premium; thus, failing to compensate for the loss of transaction opportunity would result in a severe imbalance of interests between the parties and violate the principle of good faith[1] .The retrial court subsequently affirmed this ruling.

2.2.1 Zhou Fang v. Xi'an Xincheng Haixiang Eye Hospital Co., Ltd.: Opportunity Loss Compensation in Real Estate Leasing

In a case adjudicated by the Hanzhong Intermediate People's Court of Shaanxi Province, the defendant, Haixiang Eye Hospital, engaged in prolonged negotiations with the plaintiff, Zhou Fang, regarding a

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commercial lease. Relying on the defendant's repeated assurances and the official address published by the local Health Bureau, the plaintiff turned down multiple other prospective commercial tenants. Subsequently, the defendant unilaterally terminated the negotiations, leaving the property vacant for 13 months.

The court of second instance held that the defendant's behavior was 'sufficient to create a reasonable expectation of reliance in Zhou Fang that the lease agreement would be concluded... thereby causing the plaintiff to forfeit transaction opportunities over a certain period'. Consequently, the court held that reliance damages ought to be compensated. Factoring in the negotiation process, the duration of vacancy, the floor area, the location, and the inherent uncertainty of transaction opportunities, the court discretionarily determined a rental loss compensation of RMB 523,365.60[3].

These two affirmative cases share a salient feature: the at-fault party and the injured party had entered into substantive negotiations or even executed a formal contract. Based on a reasonable reliance on the contract's formation, the injured party engaged in tangible performance or forbearance, such as rejecting third-party offers or leaving the premises vacant for an extended duration. At this juncture, the transaction opportunity has transformed from a purely speculative expectation into a 'reasonable expectation' with a high probability of realization.

2.3 Negative Judicial Stance Rejecting Compensation for Transaction Opportunity Loss

2.3.1 Ding Yuzhi v. Xijiang Weiye Co.: Liability for Contracting Negligence Confined to Reliance Interest

In a dispute handled by the High People's Court of Hubei Province, Ding Yuzhi entered into a commodity house pre-sale contract (essentially an entrustment construction agreement) with a developer. The contract was subsequently declared void because the developer failed to obtain a pre-sale permit and resold the property to a third party. Ding Yuzhi demanded compensation for the loss resulting from the appreciation of the property price (i.e., loss of transaction opportunity).

The retrial court explicitly ruled: 'As the contract involved in this case is void, the at-fault party who caused the invalidity shall bear liability for contracting negligence. The scope of compensation for contracting negligence is strictly limited to the loss of reliance interest (i.e., inherent interest)...' The loss caused by the appreciation of real estate prices actually falls within the realm of expectation interest and does not constitute a loss of reliance interest'[2]. This ruling equated 'transaction opportunity loss' with 'expectation interest loss' and entirely excluded it from compensation on that basis.

2.3.2 Beijing Chengda Co. v. Green Co.: Failure to Execute a Contract Post-Winning a Bid; Indirect Losses Unsupported

In a case adjudicated by the Beijing Third Intermediate People's Court, Green Co. had won a bid for a wood veneer project issued by Chengda Co. Although Chengda Co. had confirmed the successful bid (which remained in an unreleased status), Green Co. structured its production plan accordingly and declined other potential projects. Chengda Co. subsequently refused to execute the formal contract due to internal personnel changes.

The court of first instance held that the scope of damages for contracting negligence 'shall be strictly limited to the loss of reliance interest... restoring the party to the position they would have occupied had the contract never occurred', thereby rejecting indirect losses such as transaction opportunity loss. The court of second instance affirmed the judgment[4] .

The underlying logic shared by these negative cases is that the scope of compensation under contracting negligence should, in principle, be restricted to reimbursing actual out-of-pocket expenditures and should not extend to speculative opportunity interests. Allowing otherwise, they argue, would render the calculation of damages boundless and overwhelm the judiciary.

2.4 Preliminary Reflections on the Conflict of Judicial Stances

Behind these two diametrically opposed camps lies a divergence in understanding the fundamental function of the doctrine of culpa in contrahendo. The affirmative approach emphasizes the proactive protective function

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of the good faith principle, maintaining that when an advanced level of trust is established, compensating for opportunity loss serves to penalize bad-faith conduct and restore equitable equilibrium. Conversely, the negative approach strictly adheres to classical doctrinal boundaries, asserting that liability for contracting negligence aims to restore the injured party to the position they would have enjoyed 'had the contract never been contemplated', rather than the position 'had the contract been fully performed'. Thus, opportunity loss, which is essentially a type of 'profit that could have been obtained', is deemed uncompensable.

The crux of this debate lies in whether the loss of a transaction opportunity falls within reliance interest or expectation interest, or whether it constitutes an independent, intermediary form of interest. Traditional conceptual jurisprudence fails to provide a satisfactory resolution, necessitating the introduction of an external lens, an efficiency analysis rooted in law and economics to re-examine the dilemma.

3. Theoretical Disputes and Law and Economics Analysis

3.1 Focus of Traditional Doctrinal Controversies

Chinese academia is similarly fractured over the status of transaction opportunity loss. Proponents of the affirmative view argue that the compensatory scope of contracting negligence encompasses both direct and indirect losses, the latter including losses resulting from the forfeiture of alternative contracts with third parties[5] . Conversely, proponents of the negative view maintain that protection is strictly limited to direct out-of-pocket expenditures, namely negotiation expenses, preparatory costs, and interest[6] .The debate between the two sides has long remained at the doctrinal level of 'certainty-foreseeability': the negative view argues that opportunity loss is too 'aleatory' and compensation will open the floodgates of litigation; the affirmative view emphasizes that practical operational difficulties should not become a reason for refusing protection. However, neither side has fully responded to a fundamental question: is the judicial cost saved by refusing compensation inevitably greater than the resulting increase in other social costs?

3.2 Efficiency Analysis from the Perspective of Law and Economics

From the perspective of law and economics, whether a specific type of damage should be compensated depends on whether the social benefits of doing so exceed the social costs. Some commentators (such as William Bishop) argue that the loss of a transaction opportunity is merely a 'transfer payment', where Party A's lost opportunity equals Party B's gained opportunity, and thus creates no net social loss, rendering compensation economically inefficient[7] .

However, this assertion suffers from two fatal flaws.

First, it overlooks the opportunity-capturing costs incurred by market actors. When negotiations collapse due to a party's pre-contractual negligence, the counterparty must seek an alternative transaction partner. If other market participants are already operating at peak capacity, satisfying this sudden demand requires additional capital investment (such as expanding storefronts or hiring more personnel). These supplementary investments represent real and deadweight social costs, rather than a mere redistribution of wealth[8] .

Second, a blanket refusal to compensate fosters opportunistic behaviors and moral hazards. In Shenzhen Biaobang, for instance, the Anshan Finance Bureau maliciously broke off negotiations due to asset appreciation and resold the equity at a premium. If the legal framework does not compel the at-fault party to internalize the opportunity loss, they face no penalty and instead capture the entire windfall of the price differential. This structures a pernicious incentive for market actors to exploit information asymmetries or negotiation intervals to hold out for better bids . The systemic consequence is a collapse of pre-contractual trust, a surge in monitoring costs, and a sharp spike in aggregate transaction costs across the economy.

Consequently, awarding limited compensation for lost transaction opportunities, despite incurring some judicial administrative costs, is economically efficient because it suppresses opportunism and reduces total social costs. The pivotal inquiry is not whether to compensate, but rather under what parameters and to what extent, meaning the formulation of precise threshold conditions and calculation metrics to prevent speculative or excessive claims.

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4. Structuring a Dynamic Compensation Mechanism

4.1 Scope of Application: A Foreseeability-Centric Standard

Not all losses of transaction opportunities warrant compensation. Liability should attach only when the at-fault party could have reasonably foreseen that its conduct would cause the counterparty to forfeit a specific transaction opportunity. Borrowing the analytical framework from the English landmark case Allied Maples Group Ltd. v. Simmons & Simmons, variables regarding third-party conduct can be categorized into four distinct typologies to ascertain the presence or absence of foreseeability:

Category 1: Scenarios where the third party's volition is effectively constrained, such as by established trade usages, commercial customs, or robust historical empirical data. In these circumstances, the at-fault party is deemed to have foresight, and damages are due.

Category 2: Scenarios where the third party's behavioral variables align with its own economic self-interest (e.g., executing a substitute transaction in a buyer's market). Such outcomes are reasonably foreseeable and compensable; conversely, if the variation cuts against the third party's economic rationale (e.g., selling at an anomalously depressed price), it is unforeseeable and non-compensable.

Category 3: Scenarios where, despite the absence of an explicit behavioral track record, the third party's conduct can be reasonably inferred via objective systemic factors (e.g., standard claims-settlement practices in the insurance industry). Under such conditions, foreseeability is legally presumed.

Category 4: Scenarios where the third party’s conduct is completely unconstrained and devoid of any objective predictable parameters, typical in illiquid markets like fine art or antiquities. Here, foreseeability is entirely lacking, and compensation must be denied.

Under this taxonomy, Shenzhen Biaobang falls within a compensable tier (lying between Categories 1 and 3 due to the executed contract and pending regulatory approval), whereas in Ding Yuzhi, the real estate appreciation was a product of broad market volatility. It cannot be established that the developer could ‘specifically foresee’ the exact future price surge at the time of negotiation; thus, the court’s rejection of expectation damages retains a degree of doctrinal rationality.

4.2 Factors Governing the Calculation of Damages

Once the compensability of transaction opportunity loss is established, the central difficulty shifts to quantifying the exact award. Unlike direct losses, opportunity losses cannot be precisely calculated via documentary receipts or invoices. Accordingly, courts must weigh multiple factors to exercise a flexible and contextual discretion on a case-by-case basis. Drawing from judicial practice, the critical parameters are structured below.

4.2.1 Degree of Maturity in the Negotiation Phase

The stage reached in negotiations directly determines the intensity of the injured party’s ‘reasonable reliance’. A higher level of negotiation maturity enhances the justification for the injured party’s forbearance from alternative dealings, corresponding to a higher percentage of supported compensation. The metrics for assessing maturity comprise:

Completeness of the negotiations: This analyzes whether the parties have achieved consensus on essential terms such as subject matter, price, quantity, and method of performance. In Shenzhen Biaobang, the parties had executed a formal contract detailing the transfer target, consideration, payment schedules, and breach clauses, exhibiting an exceptionally high degree of maturity. In Zhou Fang, although no formal lease was signed, consensus was reached on core terms including location, rental rates, and preparatory milestones, and the defendant formally appointed the plaintiff as the project director, pushing the maturity to an advanced stage. By contrast, in Beijing Chengda Co., although Green Co. had won the bid’, it was kept in an ‘unreleased’ status without a formal contract, demonstrating low maturity.

Actual reliance expenditures or performance investments: This checks whether the injured party has paid deposits, sought regulatory permits, or injected capital/labor. Biaobang paid an RMB 13.5 million deposit and

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submitted approval files; Zhou Fang repeatedly coordinated with the Health Bureau and turned down alternative tenants; these substantive inputs fortified the reasonableness of their reliance.

Subjective state of the at-fault party: Courts look to whether the party maliciously delayed negotiations to hold out for a better price, or whether performance collapsed due to objective hurdles (such as the developer's failure to secure a pre-sale permit in Ding Yuzhi). The more flagrant the bad faith, the more inclined the court should be to award a higher proportion of damages.

4.2.2 Reality and Evidentiary Proving of the Opportunity Loss

Although transaction opportunities are inherently contingent, they are not entirely incapable of proof. Courts must scrutinize whether the injured party can proffer evidence demonstrating the existence of a 'real and substantial' alternative transaction opportunity. In Zhou Fang, the plaintiff conclusively proved that 'during the relevant period, multiple prospective tenants contacted the plaintiff to execute lease contracts, all of whom were rejected due to the prior engagement with the defendant'. This proves the alternative opportunity was tangible, not hypothetical. Conversely, in Ding Yuzhi, the plaintiff submitted only promotional brochures and screenshots of chat logs, failing to establish the existence of any concrete substitute buyer, which justified the court's refusal to compensate for real estate appreciation.

In Shenzhen Biaobang, although the plaintiff did not identify a specific alternative transaction it passed up, the fact that the Anshan Finance Bureau immediately resold the equity to a third party at a premium established that the underlying asset possessed higher market value, indirectly proving that Biaobang lost the opportunity to capture that value at the original price. The Supreme People's Court leveraged this exact baseline to benchmark the award at 10% of the resale price differential. Thus, the specificity of the injured party's burden of proof directly dictates the quantification of damages. Where a concrete alternative offer can be proven, the court can calculate the price differential; where no specific substitute offer is recorded, estimation can proceed by reference to the at-fault party's subsequent actual resale price or the prevailing market average price.

4.2.3 Assessment of the Probability of Realizing the Opportunity

Even a proven alternative opportunity is rarely an absolute certainty. Courts must evaluate the mathematical probability of the opportunity's ultimate realization and utilize it as a discount coefficient to adjust the quantum of damages. In Shenzhen Biaobang, even if the equity transfer contract had been approved, Biaobang faced a five-year lock-up period restricting share transfer, and any subsequent transfer remained contingent upon regulatory clearance. Consequently, Biaobang could not immediately liquidate the equity at market value; the realization of the price differential was subject to significant temporal delay and regulatory headwinds. The Supreme People's Court's decision to peg damages at 10% represents a balanced compromise reached after discounting for this realization probability.

In Zhou Fang, real property functions as a standard commodity with a broad pool of prospective alternative lessees, making the probability of executing a substitute lease significantly higher than that of a heavily regulated equity transfer. Although the court did not explicitly detail its mathematical formula, the awarded sum closely approximated the full rental loss for the 13-month vacancy, indicating that the court assessed the realization probability as highly elevated. Factors relevant to this assessment include the fungibility of the subject matter, market liquidity, the injured party's own financial capacity and credentials, the presence of third-party competition, and macroeconomic or regulatory risks.

4.2.4 Gains Realized by the At-Fault Party

Where the at-fault party derives an actual economic windfall from its unconscionable conduct, referencing its unjust gains not only aligns with the principle of equity but also serves as a pragmatically convenient proxy to measure the lost opportunity. In Shenzhen Biaobang, the Anshan Finance Bureau resold the shares at RMB 2.5 per share, clearing a premium of RMB 0.5 per share over the contract price. The Supreme People's Court explicitly noted: 'the price differential gains derived by the Anshan Finance Bureau from selling the equity were obtained at the cost of Biaobang forfeiting the opportunity to purchase said equity... failing to compensate for the loss of transaction opportunity would precipitate a severe imbalance of interests between the parties'. Consequently, the court adopted the resale profit as the calculation baseline and applied a 10% ratio.

In Zhou Fang, the defendant hospital reaped no direct financial gain from breaking off negotiations (as it ultimately left the premises unused); hence, the court bypassed the 'gains of the at-fault party' metric and

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measured damages against the plaintiff's actual rental loss from vacancy. Thus, the at-fault party's gains constitute an important reference parameter but not an exclusive benchmark. When the breaching party derives no actual profit, assessment must remain tethered to the objective opportunity loss sustained by the injured party.

4.2.5 Interplay Between Direct Losses and Opportunity Losses

When computing the total award, care must be exercised to prevent double recovery. The direct losses already indemnified, such as negotiation expenditures, interest on deposits, and preparatory costs, are inherently the costs incurred to capture the transaction opportunity in the first place. Overlap may occur between these historical costs and the value of the opportunity itself.

In Shenzhen Biaobang, the Supreme People's Court awarded RMB 11.25 million for opportunity loss alongside separate compensation for transaction costs and deposit interest. These items coexist harmoniously because the transaction costs and interest constitute 'sunk costs' already incurred out-of-pocket, whereas the opportunity loss represents compensation for a 'future expectancy interest'. Because their legal natures differ, no double counting occurs. However, if the opportunity loss claimed by the plaintiff already captures or absorbs those historical expenditures (for instance, if deposit interest is embedded as a sub-component of the opportunity valuation), such sums must be netted out to respect the rule against double recovery.

5. Conclusion

The issue of compensating transaction opportunity loss under culpa in contrahendo superficially manifests as a doctrinal puzzle of distinguishing reliance interests from expectation interests; at a deeper level, it represents a challenge of legal engineering: how to afford certain remedies within an inherently uncertain framework. Chinese judicial practice has accumulated an array of conflicting judgments. Although the Supreme People's Court carried out a groundbreaking exploration in Shenzhen Biaobang, this breakthrough has yet to crystallize into a stable and uniform rule of adjudication.

This paper concludes that, on the basis of recognizing the 'limited compensability' of transaction opportunity loss, the legal system should establish a remedial mechanism balancing both efficiency and equity, using foreseeability as the threshold condition and multi-factor contextual balancing as the primary methodology. This framework honors the affirmative camp's commitment to the principle of good faith while absorbing the negative camp's rational anxiety regarding the 'floodgates of litigation', thereby facilitating a meticulous and flexible equilibrium of interests in individual cases.

Naturally, the framework of parameters advanced in this paper remains subject to verification and refinement through broader judicial practice. A more fundamental question lingers: where exactly should the boundary be drawn between pre-contractual opportunity damages and contractual expectation damages? This awaits further research leveraging empirical analysis of larger datasets to proffer a more precise delineation.

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The Cross-Border Circulation of Frames: Corporate Narratives and International Media Representations of China's AI Health Product "Ant Afu"

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Abstract

Artificial intelligence (AI) health products represent a significant technological advancement; however, the construction of their global image and its interaction with corporate narratives remain unclear. Employing the Chinese AI health product "Ant Afu" as a case study, this research draws on interpretive package theory and a framing-interaction perspective to identify the dynamics between corporate and international media frames. It further examines the interaction patterns and influencing factors between corporate official narratives and the reporting frameworks adopted by mainstream international media. Through a mixed-methods analysis of 90 media samples from Chinese, U.S., and international outlets, this study identifies distinct patterns of frame reinforcement, reconstruction, and transformation. Findings indicate that international media reliance on conflict and economic consequences frames drives media bias, while the integration of corporate inclusive frames and causal attribution elements serves as a key predictor of positive coverage. This study provides empirical evidence regarding the construction of meaning in the transnational dissemination of health-tech products within non-Western contexts, offering critical insights for the global communication of such innovations.

Keywords

AI health products, Ant Afu, framework interaction, interpretive package, inclusive frame

1. Introduction

In recent years, the worldwide AI industry has been rapidly transitioning from general-purpose large language models to domain-specific applications. The healthcare sector, characterized by its data-intensive nature and essential societal function, has emerged as a primary focus of this shift and is increasingly framed within the discourse of the "global AI race" [1]. Since 2025, the global market for AI-driven healthcare products has witnessed a surge in commercial deployments. As illustrated in Table 1, international media outlets have begun conducting comparative assessments of national AI competitiveness. Furthermore, Gartner projections indicate that by 2027, over 50% of enterprise generative AI models will evolve into domain-specific implementations.

The geographic distribution of these healthcare AI solutions remains uneven, with significant variation in their functional positioning. Driven by tech conglomerates and established healthcare firms, the U.S. accounts

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for over 50% of the global market share with its comprehensive service platforms. In contrast, Europe and select Asian economies prioritize niche applications targeting specific disease areas or diagnostic stages, exhibiting distinct "point-specific tool-based" characteristics. Meanwhile, China - exemplified by versatile health assistants such as "Ant Afu" - has rapidly emerged as a significant market force in Asia.

Table 1: A List of Major Global Health-Related Artificial Intelligence Products (2025–2026)

No.	Product Name	Release Date	Product Positioning	Manufacturer	Manufacturer's Location
1	olivia	2025-01-21	Personal Health AI Agent	Tempus AI	Chicago, USA
2	Healthy4U	2025-06-09	Preventive Healthcare AI Assistant	Healthy4U	Tel Aviv, Israel
3	Vocca	2025-09-25	AI Administrative Assistant for Healthcare Organizations	Vocca	Paris, France
4	Nia	2025-10-14	Cardiac Health AI Assistant	Hello Heart	California, USA
5	Ello	2025-10-22	Mental Health AI Companion	HelloBetter	Berlin, Germany
6	Dot	2025-12-11	Health Insurance AI Assistant	Included Health	California, USA
7	AQ /Ant Afu/ 蚂蚁阿福	2025-06-26 2025-12-15	General AI Health Assistant	蚂蚁集团	Hangzhou, China
8	ChatGPT Health	2026-01-07	General AI Health Assistant	Open AI	California, USA
9	Claude for Healthcare	2026-01-11	AI Security Platform for Healthcare Organizations	Anthropic	California, USA
10	Amazon Health AI /One Medical Health AI	2026-03-10	Personal Health AI Agent	Amazon / One Medical	Washington State, USA
11	Barti & Quinn	2026-04-06	AI Operations Platform for Ophthalmology Clinics	Barti	California, USA
12	Medipal AI	2026-04-23	AI Operations and Management Platform for Healthcare Organizations	Medipal	Seoul, South Korea

Ant Group, a prominent entity in this area, launched its AI health assistant, AQ, in June 2025, subsequently rebranding it as "Ant Afu" in December of the same year. The regional pilot version, "Anzhen'er," debuted at the World Health Assembly in May 2026, marking it as one of China's inaugural health-focused AI products to garner international recognition. Following the launch of ChatGPT Health by OpenAI in early 2026, international media intensified their scrutiny of this vertical sector. This development elevated the profile of "Ant Afu" relative to other domestic digital health offerings and established a comparative analytical framework alongside concurrent coverage of ChatGPT Health.

While existing scholarship has identified a pervasive "threat narrative" in international media coverage of Chinese technology [2, 3], it has largely neglected the specific narrative ecology emerging within the health-tech domain. Addressing this gap, the present study investigates how international media construct narratives around Chinese AI health products within a sensitive socio-technical context that intersects professional and public spheres. Drawing on interpretive package theory and a framing-interaction perspective, this research analyzes the reporting frameworks and examines their dynamic interplay with corporate official narratives. Utilizing "Ant Afu" as a case study, this paper addresses three central research questions:

1) What frames has Ant Group established through its corporate official narrative concerning "Ant Afu"?

2) What frames have international media employed in their reportage of "Ant Afu"?

3) What are the underlying mechanisms and factors driving the transnational circulation and interaction of these frames?

This study aims to integrate the framing-interaction perspective into the field of digital health, foregrounding the process of meaning-making in international media representations of non-Western health-tech products. By elucidating the interactional mechanisms between media discourse and corporate narratives, this research addresses key limitations in the current literature -- specifically, its static analytical stance and lack of transnational comparative scope. Ultimately, the findings seek to map the international communication landscape for Chinese AI health products, offering strategic insights for technology firms in non-Western

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contexts to optimize external narratives and enhance cross-cultural communicative efficacy amidst complex geopolitical and cultural environments.

2. Literature Review and Theoretical Framework

2.1 Corporate Strategic Communication and Global Media Representations of Chinese Technology Firms

Strategic communication is an overarching paradigm encompassing micro-level practices -- such as interpersonal, organizational, and media engagement -- as well as macro-level dimensions, including political economy, security, and social governance [4]. Within the domain of international communication, strategic communication is inextricably linked to national strategies and global geopolitics. Consequently, corporate strategic communication has evolved beyond a narrow, profit-centric orientation focused solely on short-term sales. Contemporary practice seeks to cultivate a sustainable operational ecosystem through the coordination of internal and external resources, positioning corporate actors as contributors to the construction of China's national image [5]. Surveying the literature, Qin et al. [6] observe that while international scholarship predominantly approaches this topic through a strategic marketing lens, recent Chinese research has emphasized the role of enterprises in mediating national identity and soft power. Focusing on Huawei, Zheng et al. [7] employed the framework of "substance, spirit, form, and image" to demonstrate how corporate strategy facilitates national cultural policy. Nevertheless, these studies largely conceptualize corporate narratives as unidirectional outputs of external promotion, failing to situate them within the complex, dialogic ecology of transnational communication or to examine their interactive dynamics with the international public sphere.

Digital platform enterprises have rapidly consolidated their position within the global market [8]. As China's economic and industrial influence has expanded, the global visibility and strategic salience of its technology firms have increased [9], establishing them as critical agents in global strategic communication. However, Western media representations of Chinese technology frequently exhibit a pronounced "securitization" bias. Current research indicates that international coverage prioritizes narratives of geopolitical rivalry, economic contestation, and uncertainty, leading to the undue politicization of technological development [2]. Analyzing coverage in *The New York Times*, Zheng [3] identified persistent misrepresentations rooted in the "technology threat theory." These framing tendencies are attributable to structural factors, including anxieties regarding China's rise, U.S.-China trade tensions, ideological divergence, and institutional biases within news reporting. While the politicization and stigmatization of Chinese tech firms pose significant challenges to corporate strategic communication, systematic analysis of the mechanisms shaping corporate official narratives -- and their interaction with international media frames -- remains limited.

The transnational circulation of corporate narratives necessitates their recontextualization via international media, rendering them susceptible to the influence of prevailing media reporting frameworks. Consequently, a framing analysis is indispensable for deconstructing how international media organize and present official narratives concerning Chinese technology firms. Rooted in the sociology of news, framing theory posits that media construct public understandings of social reality through the "selection, emphasis, and presentation" of events [10]. Building on this, Tuchman [11] conceptualizes frames as byproducts of standardized news production routines, while Gamson & Modigliani [12] advanced the "interpretive package" approach, delineating frames into two core components: the "framing devices," which include symbolic representations like metaphors and imagery, and the "reasoning devices," which refer to the underlying logic and attributional chains. This theory provides robust analytical tools for examining the interaction between corporate narratives and media frameworks across multiple levels, thereby elucidating the mechanisms of meaning construction inherent in transnational communication.

Employing the Chinese AI health product "Ant Afu" as a case study, this research adopts Gamson & Modigliani's [12] interpretive package framework while integrating Entman's [13] classification. Specifically, Entman's model disaggregates "reasoning devices" into four dimensions: problem definition, causal interpretation, moral evaluation, and treatment recommendation. Based on this integrated theoretical synthesis, the study proposes the following hypotheses:

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H1: *International media coverage will concurrently employ positive frames centered on "health and inclusivity" and negative frames represented by "conflict".*

H2: *The degree of congruence between international media frames and corporate official narratives is positively correlated with the likelihood of favorable coverage.*

2.2 Health Disparities and Framework Interaction Mechanisms in Digital Health Communication

While no singular definition of health communication commands universal consensus, scholarly discourse broadly characterizes it as the strategic dissemination of health information across diverse media platforms to modulate public perceptions and behaviors regarding illness and wellness [14]. With the deepening integration of digital technologies, the field has shifted from an initial focus on information diffusion to an examination of the socio-technical dynamics between technology and society. Current literature reveals a divided focus: Chinese scholarship tends to foreground the "digital divide" and technology adoption barriers among older adult populations [15, 16, 14, 17], whereas international research emphasizes the risks of digital health products, particularly insufficient clinical validation and the potential for exacerbating health inequities [18, 19]. Collectively, these studies suggest that the proliferation of digital health constitutes a complex process of meaning construction involving multiple stakeholders -- including technologists, users, and regulatory bodies -- mediated by ethical considerations and power asymmetries. Yet, despite this progress, existing research remains largely confined to problem identification.

In response to these challenges, scholars have expanded their analytical purview to address the structural inequalities inherent in digital health communication, offering critiques grounded in governance logic and the political economy of data. Cross et al. [20] argue that contemporary health communication often functions as an instrument of neoliberal governance, obscuring the socio-economic determinants of health by privileging individual responsibility. Complementing this, Lupton [21], through the lens of data political economy, exposes the "commodified" nature of patient data in the Web 2.0 era, wherein such data are appropriated and monetized by platforms without equitable compensation. Building on these critiques, Richardson et al. [22] introduced the concept of Digital Determinants of Health (DDoH), incorporating variables such as technological access, digital literacy, and community infrastructure into a holistic analytical framework aimed at addressing equity concerns. Nevertheless, while current research has identified various hazards related to techno-power and health ethics across disparate national contexts, relevant debates remain circumscribed within single-country analytical frameworks. Consequently, global health communication scholarship remains limited, and robust explications of the underlying transnational communication mechanisms are deficient.

While Zhou & Gong [23] acknowledge health communication as a conduit for transcending ideological barriers, the majority of Chinese scholarship remains reliant on Western theories, lacking original theoretical frameworks for global discourse. Only a nascent body of work has begun to explore pathways for constructing a global discourse system centered on health. Chen & Lian [24], for instance, advocate leveraging the "inclusive" attributes of Chinese health narratives alongside digital twin technologies to steer global health governance toward a "proactive health" paradigm. However, such proposals often presuppose technological universality, neglecting critical variables such as cultural incompatibility and divergent data privacy regimes encountered during transnational technology transfer. This study contends that a rigorous examination of these impediments to the transnational diffusion of corporate narratives necessitates a dynamic analytical perspective. This perspective necessitates conceptualizing frames not as static entities, but as emergent outcomes of interaction, negotiation, and strategic maneuvering among heterogeneous actors, thereby illuminating the process of meaning-making.

The interactive essence of framing theory is rooted in the symbolic interactionist tradition pioneered by Goffman, who emphasized the centrality of "situational definitions" in interpersonal communication, defining a frame as "a cognitive schema through which individuals define situations" [25]. This context-bound interaction perspective demands a nuanced analysis of how frames evolve across disparate contexts and intersect with contingent variables in news production. Synthesizing insights from sociology and frame semantics, international scholars conceptualize framing as a dynamic process of negotiation, co-construction, and contestation [26, 27]. Chinese communication scholars have made significant contributions to this

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discourse, notably through the concepts of "frame interaction" among networked actors [28, 29], as well as detailed examinations of frame dynamics within a constructivist paradigm [25].

Despite growing scholarly interest in technological inclusion and health safety, the intersection of corporate narratives and global media frames in digital health remains under-theorized. Addressing this gap, this study delineates three modes of interaction: frame reinforcement, frame reconstruction, and frame transformation. Drawing on Benford and Snow's [26] seminal concepts of "frame amplification" and "frame transformation," this study defines frame reinforcement as the media's clarification and validation of existing corporate frames. Conversely, frame transformation involves the creation of novel framing structures through the introduction of new information and causal attributions. Situated between these poles, frame reconstruction entails the strategic rearrangement and reinterpretation of original frame elements. Based on this typology, the study proposes the following hypotheses:

H3: *The interaction mechanisms between corporate frames and international media frames comprise three distinct categories: reinforcement, reconstruction, and transformation.*

H4: *Higher congruence between international media and corporate narratives regarding the "inclusive frame" increases the likelihood of frame transformation, rather than mere reinforcement.*

3. Study Design and Methods

3.1 Sample Data Sources

The study's sample spans from January 1, 2025, to May 1, 2026, encompassing the complete product release cycle of "Ant Afu." Data were retrieved from the LexisNexis professional database and the Google search engine. The final sample consists of 90 items, comprising one core sample and three reference samples.

3.1.1 Core Sample

The core sample consists of 30 items, categorized into two primary data sources: (1) Corporate Official Releases (n=10): Utilizing keywords "AQ" and "Ant Afu," a search was conducted on Business Wire -- the official news release platform of Ant Group. This yielded 10 English-language press releases pertaining to Ant Group's AI health initiatives, all of which were included in the analysis. (2) International media reports (n=20): Searches were executed via LexisNexis and Google using keywords such as "Ant Afu," "Ant AQ," and "China AI health." Inclusion criteria required articles to: (a) originate from major international media outlets headquartered outside mainland China; (b) maintain a substantive focus on the target products; and (c) demonstrate significant audience reach and journalistic influence. Duplicate entries and syndicated content were excluded, resulting in a final selection of 20 articles.

3.1.2 Reference Sample

To facilitate comparative analysis and validate the observed framework interaction mechanisms across varied geopolitical contexts, three reference samples totaling 60 articles were compiled: (1) International media coverage of ChatGPT (Health) (n=29); (2) U.S. media coverage of ChatGPT (Health) (n=12); (3) Chinese media coverage of Ant Afu (n=19)

3.2 Methodology

This study adopted a mixed-methods design, integrating quantitative content analysis with qualitative framing analysis to systematically investigate the mechanisms of interaction and meaning construction between international media and corporate official narratives.

For the quantitative phase, individual news reports serve as the unit of analysis. Descriptive statistics were computed using SPSS to characterize the structural attributes of the sample. Subsequently, correlation analyses were conducted to examine the relationships among key variables and empirically test the study's hypotheses. During the qualitative analysis phase, the analysis focused on the coding categories of "reasoning devices" and "frame interactions." Through sampling of representative cases, this study reconstructs narrative logic chains via close textual reading. This approach clarifies how international media shape perceptions of Chinese AI health products through dynamic interactions with corporate framing strategies.

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Given the nascent global presence of "Ant Afu" as an AI health innovation, comprehensive international coverage remains limited. To mitigate selection bias and enhance the robustness of the findings, the study initially performed descriptive and correlational analyses on the pooled dataset (n = 90), which integrates both core and reference samples. This macro-level analysis establishes a baseline overview of the international public opinion landscape, providing essential contextual grounding for the subsequent, in-depth investigation of frame interaction mechanisms, which is conducted on the international media subset of the core sample that focuses specifically on Ant Afu (n = 16).

3.3 Coding Scheme Development and Reliability Testing

Guided by framing theory and tailored to the specific research questions and sample characteristics, a multi-tiered, systematic coding schema was developed.

3.3.1 Theoretical Foundations and Structural Dimensions.

The coding framework synthesizes established typologies from the literature. First, it incorporates the "general frames" [30, 31], encompassing conflict, human interest, economic consequences, attribution of responsibility, and morality frames. Second, building upon De Vreese's [32] distinction between general frames and issue-specific frames, this study introduced two secondary-level categories pertinent to the health-tech domain: "health and safety" and "inclusive" frames, drawing on extant digital health communication research. Finally, the schema integrated Gamson & Modigliani [12] "interpretive package" model, establishing two primary categories: "framing devices" and "reasoning devices."

Synthesizing these theoretical frameworks, the final coding protocol comprised six dimensions (see Appendix for the full coding scheme), including (1) basic information; (2) content characteristics; (3) sources; (4) general frames; (5) framing devices; and (6) reasoning devices.

3.3.2 Coder Reliability Test

Coder reliability was assessed using Cohen's Kappa (κ). The majority of coding categories achieved a κ coefficient of 0.81 or higher, indicating excellent inter-coder agreement. While certain categories exhibited lower, yet acceptable, levels of consistency—specifically "secondary themes" (κ=0.470), "media journalist sources" (κ=0.440), and "solutions" (κ=0.533) -- these values were deemed tolerable given the complexity of the categories. Post-hoc analysis attributed the reduced reliability in "secondary themes" and "solutions" to their nature as multi-coded variables with diffuse conceptual boundaries. The low frequency of "media journalist sources" in the sample resulted in a marginal distribution, naturally depressing the Kappa statistic. All discrepancies identified during the reliability test were resolved through consulting the original text and re-evaluating the coding definitions.

Table 2: Kappa Coefficients and Consistency Test Results among Content Analysis Coders

Node Name		Kappa Coefficient	Agreement Rate
Content	Core Theme	0.826	85.7%
Characteristics	Secondary Themes	0.470	50.0%
	Media Tone	1.000	100.0%
	Dimensions of Bias	0.669	71.4%
Sources	Official Corporate Sources	1.000	100.0%
	Academic Sources	1.000	100.0%
	Government and Regulatory Sources	1.000	100.0%
	Third-party Organization Sources	0.851	92.8%
	User and Patient Sources	1.000	100.0%
	Media Iournalist Sources	0.440	85.7%
	Primary Sources	0.780	85.7%
	Proportion of Corporate Sources	0.724	78.5%
General Frame	Conflict Frame	1.000	100.0%
	Human Interest Frame	1.000	100.0%
	Economic Consequences Frame	1.000	100.0%
	Morality Frame	1.000	100.0%
	Attribution of Responsibility Frame	1.000	100.0%
	Health and Safety Frame	0.641	78.5%
	Inclusive Frame	0.776	85.7%

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Node Name		Kappa Coefficient	Agreement Rate
Framing Devices	Core Metaphors	0.908	92.8%
	Iconic Examples	0.904	92.8%
	Core Descriptors	1.000	100.0%
	Visual Imagery	0.920	92.8%
Reasoning Devices	Problem Definition	0.659	78.5%
	Causal Attribution	0.607	71.4%
	Moral Evaluation	1.000	100.0%
	Treatment Recommendations	0.533	71.4%
Frame Interaction Measurement	Acceptance of the Company's Core Frame	1.000	100.0%
	Acceptance of the Company's Frame Elements	0.774	81.25%
	Types of Frame Interaction	0.901	93.75%

4. Results

4.1 Analysis of the Overall Sample

This study subjected the 90 valid samples to a multi-dimensional coding procedure, followed by descriptive statistical analyses of their fundamental attributes, content distribution, and structural characteristics.

4.1.1 Distribution of Fundamental Attributes

With the exception of corporate press releases -- exclusively sourced from Business Wire -- the sample was predominantly composed of comprehensive news reports, with business and financial media constituting the second-largest category. Notably, in the U.S.-based samples concerning ChatGPT Health, political opinion outlets (e.g., The Hill, New York Observer) emerged as the secondary dominant source, a trend absent in the core sample of "Ant Afu." Coverage of Ant Afu in the U.S. press remained largely influenced by business-oriented reporting.

Geographically, U.S. media outlets produced the highest volume of reports on Ant Afu, followed by media from other regions; conversely, coverage of ChatGPT Health exhibited greater geographic diversity, marked by a significant proportion of reports originating from the United Kingdom and other international outlets. Regarding political orientation, coverage in Chinese media and certain non-Western outlets displayed no discernible partisan bias. In contrast, international reporting on Ant Afu predominantly adopted neutral or conservative stances, whereas coverage of ChatGPT Health maintained a generally neutral tone.

Table 3: Distribution of Media Types, Location and Political Orientation in the Sample

Category		Core Sample		Reference Group 1		Reference Group 2		Reference Group 3	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Media Type	General	7	35%	25	86.21%	8	66.67%	13	68.42%
	Business and Finance	5	25%	3	10.34%	1	8.33%	6	31.58%
	Technology	4	20%	0		0		0	
	Health and Medicine	3	15%	0		0		0	
	Political Commentary	1	5%	1	3.45%	3	25%	0	
Location	China	/		0		/		100%	
	United States	7	35%	/		100%		/	
	United Kingdom	2	10%	10	34.48%	/		/	
	EU countries	5	25%	5	17.24%	/		/	
	Other	6	30%	14	48.28%	/		/	
Political Orientation	No clear political orientation	6	30%	4	13.79%	0		100%	
	Liberal	2	10%	14	48.28%	8	66.67%	/	
	Conservative	4	20%	2	6.9%	0		/	
	Neutral	8	40%	9	31.03%	4	33.33%	/	

Significant variations emerged in genre composition across regions. U.S. media favored news analysis, supplemented by news reports. International media prioritized news reports, with analysis occupying a secondary role. Chinese media focused almost exclusively on news reports, with limited inclusion of feature stories. Across all datasets, news commentary and editorials constituted a marginal fraction. Structurally, the length distribution of news samples was largely uniform: medium-length reports dominated all categories, followed by long-form pieces, while short-form content remained minimal.

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Table 4: Distribution of Sample Article Types and Lengths

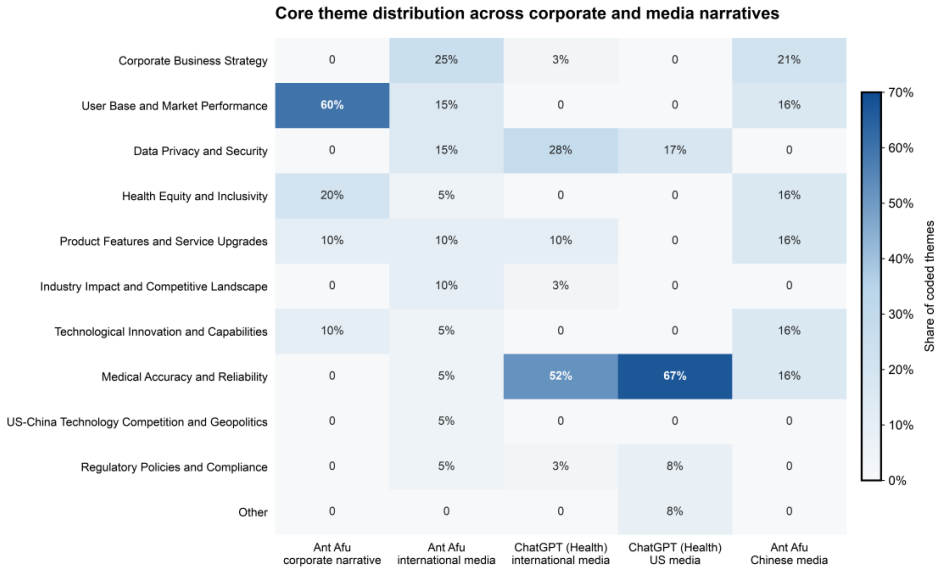
Category		Core Sample		Reference Group 1		Reference Group 2		Reference Group 3	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Article Type	News Report	7	35%	13	44.82%	3	25%	14	73.68%
	News feature	3	15%	2	6.89%	0		3	15.79%
	News Analysis	6	30%	11	37.93%	5	41.67%	1	5.26%
	Editorial/Column	1	5%	0		2	16.67%	0	
	News commentary	3	15%	3	10.34%	2	16.67%	1	5.26%
Length	Short (<300 words)	0		1	3.45%	0		2	10.53%
	Medium (300–1,000 words)	15	75%	20	68.97%	7	58.33%	15	78.95%
	Long (>1,000 words)	5	25%	8	27.59%	5	41.67%	2	10.53%

4.1.2 Content Distribution and Framing Emphasis

Corporate official media reports prioritized "user base and market performance," frequently deploying quantitative indicators and industry rankings within headlines and leads to establish corporate dominance. In contrast, international and Chinese media focused predominantly on "corporate business strategy." International media emphasized financial investment in healthcare and global expansion, whereas Chinese media highlighted state-led initiatives to leverage AI for optimizing local healthcare delivery.

Although "health equity and inclusivity" constituted a marginal theme in corporate official discourse, it emerged as a substantial narrative component within the main text of both international and Chinese media coverage. Furthermore, Western media foregrounded "data privacy and security" concerns, alongside "medical accuracy and reliability," with the latter being particularly salient in reports concerning ChatGPT (Health).

Figure 1: Thematic Distribution of the Core and Reference Samples



Significant tonal disparities were observed across samples. Coverage of "Ant Afu" originating from corporate and Chinese media was overwhelmingly favorable. International media coverage of Ant Afu was predominantly positive (70%). Conversely, coverage of ChatGPT (Health) by international and U.S. media was largely unfavorable, accounting for 58% and 59% of reports, respectively; corresponding positive coverage amounted to only 17% and 16%.

Sourcing patterns revealed distinct dependencies. Corporate press releases exhibited high internal reliance, with proprietary information comprising between 76% and 100% of content. International media demonstrated lower dependency on corporate sources (0 - 25%), favoring cross-verification through independent channels.

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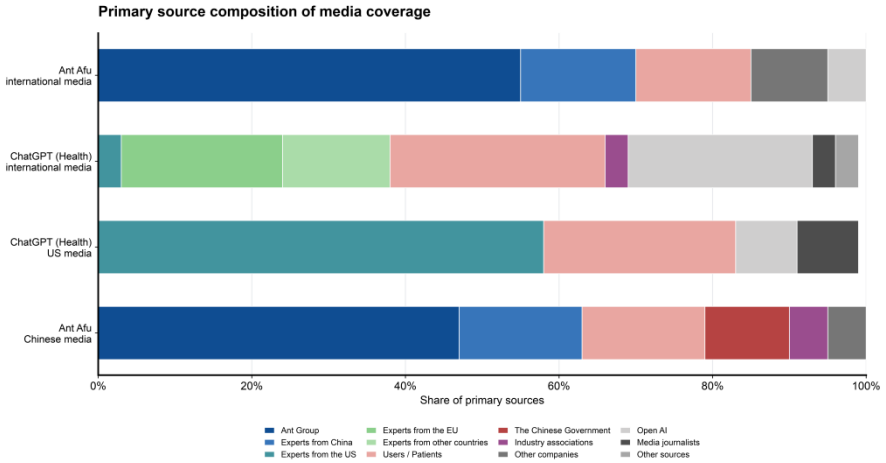
Chinese media occupied a median position, with corporate-derived information ranging from 51% to 75%, indicating a greater propensity to reproduce official narratives. While international reporting on ChatGPT (Health) similarly relied on corporate disclosures, it markedly increased the utilization of user and patient sources. U.S. media, however, relied predominantly on domestic expert sources, maintaining a low proportion of corporate sourcing, not exceeding 25% in either category.

Figure 2: The Primary Source Distribution of the Core and the Reference Sample



4.1.3 Statistical Analysis of Frames and Biases

The sample exhibited a predominant reliance on the health and safety frame (46%), primarily within coverage of ChatGPT (Health). This was followed by the conflict, economic consequences, and inclusive frames (13% each), whereas the morality and attribution of responsibility frames constituted a comparatively minor share.

Media tone functions as a critical indicator of the value judgments embedded within journalistic practice, significantly shaping audience perceptions. To quantify these relationships, this study first employed a chi-square test (χ^2) to assess the correlation between specific frame types and media tone. This was supplemented by Spearman's rank-order correlation coefficient (ρ) to evaluate the monotonic association between these variables. As illustrated in Table 5, with the exception of the health and safety frame, all other frame types demonstrated statistically significant associations with media tone ($p<0.05$). These results confirm that editorial frame selection is a substantial determinant of the valence of coverage regarding AI health products.

Table 5: Results of the Chi-squared Test and Correlation Analysis for the Overall Sample

Category		Media Tone			
		χ2	p	Correlation Coefficient	Cramer *V*
General Frame	Conflict Frame	31.206	0.000**	0.579**	0.442
	Human Interest Frame	23.510	0.003**	-0.281*	0.383
	Economic Consequences Frame	23.024	0.003**	-0.525**	0.379
	Morality Frame	36.843	0.000**	0.642**	0.480
	Attribution of Responsibility Frame	41.390	0.000**	0.635**	0.509
	Health and Safety Frame	8.738	0.365	0.207	0.234
	Inclusive Frame	49.868	0.000**	-0.728**	0.558

Subsequently, ordered logistic regression was conducted to model the influence of individual frames on media tone, which served as the dependent variable. The variable was reverse-coded such that lower scores indicated a more favorable media stance. Findings indicate that the conflict, human interest, morality, and attribution of responsibility frames significantly predicted increased bias scores, corresponding to a higher propensity for negative coverage. Conversely, the inclusive frame emerged as a significant negative predictor, substantially diminishing bias and enhancing the likelihood of positive coverage.

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Table 6: Results of the Regression Analysis for the Overall Sample

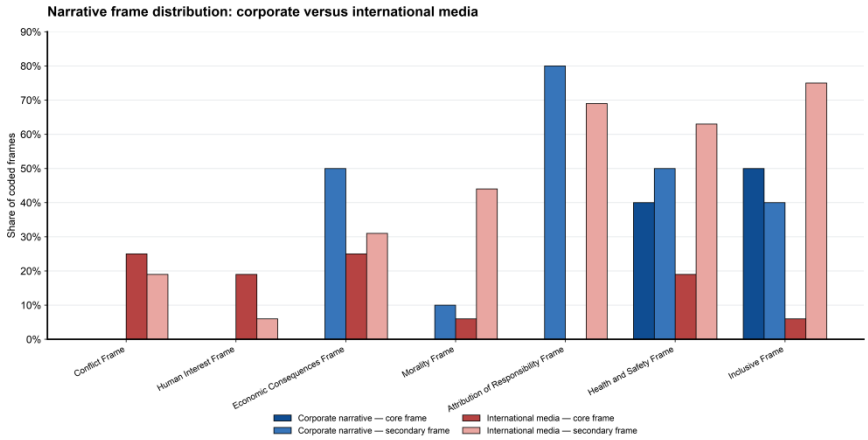
Category	Independent Variable	Dependent Variable: Media Tone				
		Regression coefficient	Standard error	p	OR	95% CI for OR
General Frame	Conflict Frame	1.784**	0.441	0.000	5.952	2.508 ~ 14.129
	Human Interest Frame	1.213**	0.428	0.005	3.364	1.453 ~ 7.791
	Economic Consequences Frame	-0.142	0.492	0.772	0.867	0.331 ~ 2.274
	Morality Frame	2.054**	0.684	0.003	7.802	2.041 ~ 29.824
	Attribution of Responsibility Frame	1.555*	0.636	0.015	4.736	1.361 ~ 16.476
	Health and Safety Frame	1.018	0.596	0.087	2.769	0.861 ~ 8.904
	Inclusive Frame	-2.522**	0.606	0.000	0.080	0.025 ~ 0.263

4.2 Core Sample Frame Identification and Analysis

4.2.1 Corporate Official Narratives and Their Presentation Within International Media Frames

Corporate official narratives centered predominantly on an inclusive frame (50%), emphasizing the deployment of technology to advance healthcare accessibility. These narratives highlighted product affordability and their societal significance in mitigating healthcare disparities between urban and rural locales, as well as across affluent and impoverished populations. Official documents often showcase technological advancements as prime examples, utilizing metaphors such as "health manager" or "assistant" to delineate the functional role of "Ant Afu." as physician's aid. These depictions were reinforced by affirmative lexical choices and visual components like product screenshots and the corporate logo to cultivate a professional and credible image as a "health partner." At the level of reasoning devices, however, official narratives lacked a precise problem definition. They attributed prevailing conditions to systemic inefficiencies within the conventional healthcare infrastructure or to extant health disparities. Implicitly, the corporate treatment was framed as an internal technology enhancement by the corporation, with all ethical assessments being favorable.

Figure 3: Core and Secondary Frames Presented by Corporate Official Narratives and International Media



International media coverage of "Ant Afu" was characterized predominantly by conflict (25%) and economic consequences frames (25%), supplemented by human interest, health and safety, inclusive, and morality frames. This distribution substantiates Hypothesis 1, confirming that global media concurrently deploy negative frames alongside positive frames.

The conflict frame centered on market competition among global technology leaders, frequently employing adversarial metaphors such as "killer application" and "battle." It characterized the core issue as the risk of health inequity or regulatory deficiencies potentially disadvantaging competitors. Causal attribution typically implicated adverse actions by external firm, while moral evaluations remained predominantly neutral; notably, the frame failed to propose a definitive treatment.

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Conversely, the economic consequences frame prioritized corporate valuation and commercial potential, utilizing industry comparisons as characteristic illustrations. It employed metaphors such as "global aspirations" and "transformative power" to characterize corporate ambition. Unlike the conflict frame, this frame did not foreground a specific problem definition; instead, it situated prevailing conditions within the context of neutral consumer demand, technological evolution, or proactive corporate strategy, typically accompanied by affirmative moral assessments.

4.2.2 Frame Interaction Types and Their Predictive Influence on Reporting Bias

International media coverage of "Ant Afu" predominantly manifested three distinct interaction patterns: frame reconstruction (44%), frame transformation (38%), and frame reinforcement (19%). These distributions substantiate Hypothesis 3, confirming that the interplay between corporate and international media frames operates through these three modalities. Subsequent chi-square tests and correlation analyses revealed that both overall media tone and the degree of congruence between media and corporate inclusive frames were significantly associated with the type of frame interaction. This supports Hypothesis 4, which posited that the nature of frame transformation is contingent upon the level of alignment regarding inclusivity.

Table 7: Results of the Chi-squared Test and Correlation Analysis for the Core Sample

Category		Types of Frame Interaction			
		$\chi 2$	p	Correlation Coefficient	Cramer *V*
Content Characteristics	Media Tone	12.813	0.046*	0.644**	0.633
General Frame	Inclusive Frame	10.444	0.034*	-0.648**	0.571

To isolate the predictive effects of specific variables, a series of regression analyses was conducted. Given the stringent credibility requirements for this analysis, the sample was meticulously vetted to include only verified reports from mainstream international media concerning "Ant Afu," resulting in a reduced sample size of n = 16. Acknowledging that infrequent category occurrences can destabilize parameter estimates in ordered logistic regression, this study followed Norman's [33] assertion regarding the robustness of parametric statistics in small-sample contexts. Consequently, the five-level ordinal variable "media tone" was treated as a continuous measure, and linear regression was employed for the final modeling. The results are summarized in Table 8.

Table 8: Results of the Regression Analysis for the Core Sample

Category	Independent Variable	Dependent Variable: Media Tones						
		Unstandardised Coefficient		t	p	R^2	Adjusted R^2	F
		B	Standard error					
General Frame	Inclusive Frame	-0.967	0.307	-3.153	0.007**	0.415	0.374	9.944
Frame Interaction	Types of Frame Interaction	0.379	0.131	2.888	0.012*	0.373	0.329	8.339
Measurement	Acceptance of the Company's Core Frame	0.607	0.244	2.483	0.026*	0.306	0.256	6.168
	Acceptance of the Company's Frame Elements	0.891	0.344	2.587	0.022*	0.323	0.275	6.691
	Acceptance of Corporate Metaphors	-0.3	0.393	-0.764	0.458	0.004	-0.029	0.583
	Acceptance of Corporate Problem Definitions	-0.567	0.371	-1.527	0.149	0.143	0.081	2.331
	Acceptance of Corporate Causal Attributions	-0.891	0.344	-2.587	0.022*	0.323	0.275	6.691
	Acceptance of Corporate Treatment Recommendations	-0.683	0.346	-1.972	0.069	0.217	0.162	3.889

The analysis yielded three principal findings. First, the inclusive frame exerted a substantial negative predictive effect on media tones ($B = -0.967$, $p = .007$), indicating that greater adoption of the corporate inclusive frame by international media corresponded to significantly more favorable coverage. Second, the degree of acceptance of the corporate core frame significantly enhanced positive tones. This finding corroborates Hypothesis 2, demonstrating that higher congruence between international media and corporate official narratives increases the likelihood of favorable reporting. Third, the incorporation of the firm's causal attribution elements -- specifically, references to systemic healthcare characteristics or extant health inequities -- positively influenced media tone. International media that integrated these specific causal logics were more inclined to endorse the corporate narrative at a foundational level, effectively reinforcing it. In contrast, the

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assimilation of other frame devices -- such as corporate metaphors, problem definitions, or treatment recommendations -- did not significantly predict the dependent variable.

5. Conclusions and Discussion

This study employed a mixed-methods design to analyze the framing strategies and interaction mechanisms characterizing international media coverage of AI health products from 2025 to the present. While health and safety constituted the predominant frame in global reporting on AI health products generally, coverage of "Ant Afu" prioritized corporate commercial agendas, primarily manifesting as conflict and economic consequences frames. Quantitative analyses confirmed that the deployment of an inclusive frame served as a significant negative predictor of media tone, whereas conflict, human interest, morality, and attribution of responsibility frames correlated positively with unfavorable coverage. Regarding interaction patterns, frame reconstruction emerged as the modal category (44%), followed by frame transformation (38%) and frame reinforcement (19%). Crucially, the nature of frame transformation -- particularly the incorporation of corporate causal attribution elements -- exerted a considerable influence on media tone.

Media tone is a crucial aspect in the assessment of framing bias [34]. Within the techno-scientific and health domains, such bias often emerge as a departure from equitable stakeholder representation, disproportionately amplifying the experiences of users or patients, legal disputes, or particular products. This compels the media to privilege human interest or conflict frames, thereby exacerbating media tone. Entman [35] asserts that framing bias largely arises from interactions with interplay of real-world events, cultural norms, and journalistic practices; in this context, these dynamics are mediated by product-specific characteristics and the structural constraints of media systems.

Regarding product characteristics, while ChatGPT (Health) attracted extensive international scrutiny regarding health and safety -- largely due to its broad user base and potential security risks [36, 37], this factor alone does not directly dictate media tone. Instead, its impact was contingent upon its integration into conflict or human interest frames. Conversely, reporting on "Ant Afu" was primarily mediated by the adoption of the inclusive frame, with significant cross-national variations in frame selection reflecting divergent sociocultural contexts and media ecologies.

Western media systems, anchored in liberal pluralist traditions and professionalized journalistic norms and significantly shaped by the commercial imperatives of Anglo-American press systems [38], demonstrate varied reporting perspectives. In contrast, the Chinese media system operates under a government-centric paradigm, where political instrumentalism and commercial logics are deeply interwoven [39]. The inclusive frame, institutionally rooted in China's "inclusive finance" policy agenda, thus orients both state and corporate official narratives toward affirmative coverage.

This study delineates three distinct modalities of frame interaction: reinforcement, reconstruction, and transformation. Causal attribution emerged as a foundational mechanism for elucidating these interactions within non-Western contexts, insofar as it clarifies underlying causality and assigns responsibility. The research indicates that international media frequently begin with framing elements and employ a multi-tiered adoption strategy:

(1) Frame Reconstruction: Business media, such as *Bloomberg*, utilized metaphors like "Doctor avatars" to characterize physician assistants, thereby offering a novel viewpoint on market competition and expansion challenges, and recontextualizing the product within the broader industrial discourse of AI-driven healthcare advancement.

(2) Frame Transformation: Technology media, exemplified by *Tech Times*, established a novel causal attribution about regulatory structures of the Chinese and U.S. governments by incorporating new information, including AI regulations and user experiences in both nations.

(3) Frame Reinforcement: The technology and healthcare media field, shown by *HealthTechAsia*, typically adhered to the conventions of corporate press releases on fundamental messaging, metaphorical language, and causal attribution, merely augmenting and expanding upon this basis.

Notably, the core sample yielded no evidence of outright "frame conflict," meaning there were no entirely exclusive narratives. This absence is attributable to Ant Afu's current market confinement to mainland China;

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international media lack direct product experience and localized case studies, necessitating reliance on reconstruction and transformation strategies. Moreover, international coverage of Ant Afu remained quantitatively sparse relative to ChatGPT (Health) and was predominantly positioned within a neutral register, underscoring the filtering effect of media political orientations on news selection.

This study is subject to several limitations. First, given Ant Afu's nascent presence in global markets, the core sample size was constrained. While robustness checks and the mixed-methods design partially mitigated this limitation, future longitudinal research should expand the sample as the product's global footprint widens. Second, this research prioritized textual production; subsequent studies should integrate audience reception surveys to empirically substantiate the differential impacts of these frames on international public perception.

Furthermore, concerning the categories of frame interactions, subsequent research could explore their formation mechanisms and influencing factors in greater depth, aiming to generalize the findings to wider studies of technology-health narratives in non-Western contexts, thus enhancing the generalizability of the theory and explanatory capacity.

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Appendix Coding Scheme

Level 1 Heading	Level 2 Heading	Level 3 Heading	Operational Definition
Basic Information	News ID	Format: PR-01, INT-01, etc.	Corporate Press Release (PR), International Media (INT), Chinese External Publicity (CHN), US Media (USA)
	News Title	Fill in directly	
	News Category	1 = Corporate Press Release 2 = International Media Report on "Ant Aluf" 3 = Chinese Media Report on "Ant Aluf" 4 = US Media Report on "ChatGPT (Health)" 5 = International Media Report on "ChatGPT (Health)"	
	Media	Fill in directly	
	Location	1 = Mainland China; 2 = Hong Kong/Taiwan, China; 3 = United States; 4 = United Kingdom; 5 = EU Countries; 6 = Other Countries	
	Media Type	1 = General News Media;	

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Level 1 Heading	Level 2 Heading	Level 3 Heading	Operational Definition
		2 = Business & Financial Media; 3 = Technology Media; 4 = Medicine Media; 5 = Political Commentary Media	
	Media Political Orientation	0 = No clear political orientation; 1 = Liberal; 2 = Conservative; 3 = Neutral	
	Publication Date	Fill in directly	
	Reporting Timeframe	1 = Within 7 days of product launch/upgrade; 2 = 7–30 days; 3 = Over 30 days	
	Article Type	1 = News Report; 2 = News Feature; 3 = News Analysis; 4 = Editorial/Column; 5 = News Commentary	
	Length	1 = Short (<300 words); 2 = Medium (300–1000 words); 3 = Long (>1000 words)	
	Title Prominence	0 = Not mentioned; 1 = Secondary mention; 2 = Core mention	
Content Characteristics	Core Theme	1 = Product Features & Service Upgrades; 2 = Technological Innovation & Capabilities; 3 = User Base & Market Performance; 4 = Data Privacy & Security; 5 = Medical Accuracy & Reliability; 6 = US-China Technology Competition & Geopolitics; 7 = Regulatory Policy & Compliance; 8 = Health Equity & Inclusivity; 9 = Corporate Business Strategy; 10 = Industry Impact & Competitive Landscape; 11 = Other	
	Secondary Themes (Multi-select)	1 = Product Features; 2 = User Feedback; 3 = Industry Trends; 4 = International Markets; 5 = Capital Financing; 6 = Corporate Partnerships; 7 = Litigation; 8 = Government Policy or Regulation; 9 = Corporate Social Responsibility;	

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Level 1 Heading	Level 2 Heading	Level 3 Heading	Operational Definition
		10 = Doctor-Patient Relations; 11 = Healthcare System; 12 = Social Ethics; 13 = Other	
	Media Tone	1 = Positive; 2 = Slightly Positive; 3 = Neutral; 4 = Slightly Negative; 5 = Negative	
	Dimensions of Bias (Multi-select)	1 = Technological Level; 2 = Product Level; 3 = Corporate Level; 4 = Industry Level; 5 = National Level	
Sources	Official Corporate Sources	0 = Not present; 1-1 = Ant Group; 1-2 = OpenAI; 1-3 = Other Corporations	
	Academic Sources	0 = Not present; 2-1 = Chinese Experts; 2-2 = US Experts; 2-3 = EU Experts; 2-4 = Experts from Other Countries; 2-5 = Chinese Industry Analysts; 2-6 = US Industry Analysts; 2-7 = EU Industry Analysts; 2-8 = Analysts from Other Countries	
	Government and Regulatory Sources	0 = Not present; 3-1 = Chinese Government; 3-2 = US Government; 3-3 = EU Government; 3-4 = Governments of Other Countries	
	Third-party Organization Sources	0 = Not present; 4-1 = International Organizations; 4-2 = Industry Associations	
	User and Patient Sources	0 = Not present; 5 = Present	
	Media Journalist Sources	0 = Not present; 6 = Present	
	Other	0 = Not present; 7 = Present	
	Primary Sources	1-1 = Ant Group; 1-2 = OpenAI; 1-3 = Other Companies; 2-1 = Experts from China; 2-2 = Experts from the US; 2-3 = Experts from the EU; 2-4 = Experts from Other Countries; 2-5 = Chinese Industry Analysts; 2-6 = US Industry Analysts; 2-7 = EU Industry Analysts;	

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Level 1 Heading	Level 2 Heading	Level 3 Heading	Operational Definition
		2-8 = Analysts from Other Countries; 3-1 = Chinese Government; 3-2 = US Government; 3-3 = EU Government; 3-4 = Governments of Other Countries; 4-1 = International Organizations; 4-2 = Industry Associations; 5 = Users / Patients; 6 = Journalists; 7 = Others	
	Primary Sources Proportion of Corporate Sources	1=0%; 2=1-25%; 3=26-50%; 4=51-75%; 5=76-100%	
General Frame	Conflict Frame	0 = Not present; 1 = Secondary; 2 = Core	Emphasizes oppositional relationships, e.g., China-US competition, corporate-regulator confrontation, tech pros/cons debate.
	Human Interest Frame	0 = Not present; 1 = Secondary; 2 = Core	Presents through personal stories, user cases, or emotional narratives.
	Economic Consequences Frame	0 = Not present; 1 = Secondary; 2 = Core	Focuses on market value, business prospects, cost-benefit, or industry impact.
	Morality Frame	0 = Not present; 1 = Secondary; 2 = Core	Involves moral judgments regarding privacy invasion, fairness, social responsibility, etc.
	Responsibility Frame	0 = Not present; 1 = Secondary; 2 = Core	Identifies responsible parties or emphasizes responsibilities to be assumed.
	Health and Safety Frame	0 = Not present; 1 = Secondary; 2 = Core	Focuses on impacts on user health and safety, including medical accuracy, misdiagnosis risks, data breach hazards, etc.
	Inclusive Frame	0 = Not present; 1 = Secondary; 2 = Core	Emphasizes product accessibility, affordability, and role in narrowing health disparities.
Framing Devices	Core Metaphors	0 = No core metaphor; 1 = Friend/Partner; 2 = Doctor/Assistant; 3 = Tool/Weapon; 4 = Platform/Ecosystem; 5 = Threat/Risk; 6 = Other	
	Iconic Examples	0 = No exemplar; 1 = User Success Case; 2 = Tech Breakthrough Case; 3 = Negative Incident Case; 4 = Industry Comparison Case; 5 = Other	
	Core Descriptors	1 = Positive; 2 = Neutral; 3 = Negative *Record top 3 most frequent*	

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Level 1 Heading	Level 2 Heading	Level 3 Heading	Operational Definition
	Visual Imagery	0 = No visual imagery; 1 = Product Screenshot; 2 = Corporate Logo; 3 = User Photo; 4 = Executive Photo; 5 = Hospital/Medical Photo; 6 = AI/Technology Photo; 7 = Other	
Reasoning Devices	Problem Definition	0 = No clear problem; 1 = Data Privacy & Security; 2 = Medical Accuracy & Reliability; 3 = Algorithmic Bias & Health Inequity; 4 = Lack of Effective Regulation; 5 = National Tech Competition; 6 = Corporate Data Monopoly; 7 = Characteristics/Flaws of Healthcare Systems; 8 = High Costs; 9 = Other	
	Causal Attribution	Object: 1 = Corporation; 2 = Government/Regulator; 3 = Technology itself; 4 = User; 5 = Geopolitics; 6 = Social Needs; 7 = Current State of Healthcare; 8 = Other Direction: 1 = Positive; 2 = Neutral; 3 = Negative	
	Moral Evaluation	1 = Positive; 2 = Neutral; 3 = Negative	
	Treatment (Multi-select)	1 = Corporate Tech Upgrades & Self-regulation; 2 = Government Legislation/Policy; 3 = Industry Standards & Certification; 4 = User Self-protection; 5 = International Cooperation; 6 = Restriction/Ban of Technology; 7 = No Clear Solution	
Frame Interaction Measurement	Acceptance of the Company's Core Frame	1 = Full Adoption; 2 = Partial Adoption; 3 = No Adoption	
	Company's Frame Elements (Multi-select)	00 = No elements adopted; 1 = Metaphors; 2 = Data/Facts;	

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Level 1 Heading	Level 2 Heading	Level 3 Heading	Operational Definition
		3 = Problem Definition; 4 = Causal Attribution; 5 = Treatments	
	Types of Frame Interaction	1 = Frame Reinforcement; 2 = Frame Reconstruction; 3 = Frame Transformation	

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Conflicts of Interest

The authors declare no conflict of interest.

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Research on the Innovative Commercial Development Path of Public Opinion Analysis in Shandong Province

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Abstract

The public opinion analysis industry is undergoing a profound transformation from an information monitoring tool to a decision-making empowerment engine. However, its commercialization process faces multiple structural contradictions, including business model dilemmas, technological bottlenecks, disorderly market competition, stringent policy compliance, and misalignment with client needs. As a major province ranking among the top three in China's GDP with a population exceeding 100 million, Shandong Province exhibits a distinctive “dual nature” in its public opinion ecology, characterized by both proactive public oversight and regional stigmatization. This provides unique practical opportunities for the commercialization of public opinion analysis. Based on a systematic review of the commercialization challenges facing the public opinion analysis industry, this paper conducts an in-depth analysis of Shandong's public opinion characteristics and the existing foundation of its public opinion industry. It proposes four possible paths for the innovative commercialization of public opinion analysis in Shandong: technological breakthroughs; service upgrading; business model reconstruction; and ecological collaboration. The study concludes that Shandong, leveraging its unique public opinion governance practices and industrial foundation, has the potential to forge a differentiated development path distinct from traditional price-competition models, offering a “Shandong Model” for the commercial transformation of the national public opinion analysis industry.

Keywords

public opinion analysis, commercialization, Shandong province, regional characteristics, innovative development

1. Introduction

Over more than a decade of development, the public opinion analysis industry has evolved from a mere information monitoring tool into a critical infrastructure for government governance and corporate risk management. According to incomplete statistics, the global enterprise-level public opinion monitoring and services market exceeded RMB 10 billion in 2025, with a compound annual growth rate (CAGR) of over 8%. The domestic public opinion services market reached RMB 80 billion, showing rapid growth compared to a decade ago. However, this rapid market expansion has not been accompanied by a commensurate increase in industry profitability. With technological advancements, technical barriers have been lowered, basic monitoring functions have become increasingly homogeneous, price wars are rampant, and the industry's average gross profit margin has fallen by over 10 percentage points. The public opinion analysis industry is

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thus caught in a growth trap characterized by increasing volume but not profit. Concurrently, Shandong Province, as an economic powerhouse ranking among the top three nationally in GDP with a population exceeding 100 million, presents distinct regional characteristics in its public opinion ecology. On one hand, it has established a nationally rare proactive public oversight system through platforms like Wenzheng Shandong (Governance through Public Inquiry) [1]. On the other hand, it frequently faces regional stigmatization attacks such as labels like "the province obsessed with civil service exams," "drinking culture," and "feudal conservatism." This "dual nature" not only creates rich application scenarios for public opinion analysis services but also imposes higher demands on technical capabilities, service depth, and commercialization models within the industry. This paper aims to explore a core question: Against the backdrop of prevalent commercialization difficulties in the public opinion analysis industry, how can Shandong Province leverage its unique regional public opinion characteristics and industrial foundation to forge a differentiated and innovative development path?

2. Argumentation process

2.1 Commercialization Challenges in the Public Opinion Analysis Industry

2.1.1 Crisis in Business Model Sustainability

The public opinion monitoring industry suffers from a structural contradiction of "high investment, low return." Establishing a self-built monitoring system requires initial investments running into tens of millions of yuan, while basic annual subscription fees have dropped from the RMB 100,000 level to RMB 20,000-30,000. Furthermore, revenue growth from government clients is declining, SaaS (Software as a Service) transition is sluggish, and renewal rates continue to decrease. A deeper contradiction lies in the fact that clients require solutions integrated into their business contexts, yet standardized models struggle to fully meet the differentiated needs of various clients. Simultaneously, the rapid erosion of technological barriers exacerbates this dilemma. Basic public opinion monitoring technology is becoming increasingly pervasive, with numerous small and medium-sized vendors entering the market, leading to high functional homogeneity.

2.1.2 Technological Bottlenecks in Data Acquisition and Intelligent Analysis

Challenges in data acquisition are escalating. Major social media platforms are implementing stringent anti-crawling measures; high-frequency data collection from fixed IP addresses is easily blocked, leading to data gaps and sampling biases. Short-video monitoring presents higher barriers, requiring capabilities such as image recognition, speech-to-text transcription, and OCR (Optical Character Recognition) extraction. Moreover, unstructured data now accounts for over 60% of all data, rendering traditional keyword-based filtering nearly ineffective [2]. Simultaneously, the challenge of semantic understanding remains prominent. Complex linguistic phenomena prevalent in the Chinese language environment, such as sarcasm, internet slang, and puns, pose significant difficulties. Even advanced models struggle to achieve satisfactory sentiment analysis accuracy in complex contexts. Additionally, current Large Language Models (LLMs) have two major weaknesses – AI hallucinations and low accuracy on recent events – which hinder their ability to meet the real-time requirements of public opinion analysis.

2.1.3 Disorderly Market Competition and Escalated "Dark PR" Tactics

Basic functions have become commoditized, with user interfaces across different vendors looking similar. Some vendors over-promise customization to secure orders, leading to delivery difficulties later on. Price wars trigger a chain reaction of negative consequences. On the other hand, the boom in AI technology has enabled "Dark PR" (malicious public relations) and online troll armies to continuously evolve. In 2025, the total volume of public opinion in the automotive industry increased significantly compared to the past, with complaints related to "battery locking" incidents in the new energy vehicle sector surging by 273% year-on-year. Attack methods include coordinated sensationalism, identity impersonation, content reposting and rewriting, and AI-generated content produced in bulk. Some "Dark PR" operations have even industrialized their task allocation, distributing defamation tasks as systematically as assigning work orders.

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2.1.4 Rigid Constraints of Policies and Regulations

The Data Security Law of the People's Republic of China, the Personal Information Protection Law of the People's Republic of China, and the revised (2026) Cybersecurity Law of the People's Republic of China establish a stringent legal framework [3]. Vendors must continuously invest in security audits and system overhauls, while the legality of data acquisition is frequently questioned. Law enforcement challenges such as the admissibility of electronic evidence, data breach risks, and difficulties in cross-departmental evidence collection are real and persistent. Issues like algorithmic recommendation bias, information cocoons, and AI-generated content without proper source attribution also pose potential legal risks [3].

2.1.5 Structural Misalignment with Client Needs

Client needs have evolved from "knowing where public opinion is" to "early warning, analysis, and providing solutions for public opinion." However, most current analyses remain at the univariate level, easily misinterpreting correlations as causations. The depth of automated reports and the practicality of strategic recommendations are often insufficient. The majority of products merely serve as tools for a single department, lacking deep integration with client business processes.

2.2 Characteristics of Public Opinion in Shandong Province

2.2.1 Structural Features of the "Dual Nature" Public Opinion Ecology

Shandong's public opinion ecology presents a distinct "dual nature." On one hand, relying on platforms like Wenzheng Shandong [1], Shandong has built a nationally rare proactive public oversight system, forming a closed loop through on-site questioning of officials, immediate commitments to rectification, and follow-up visits. On the other hand, Shandong frequently suffers from regional stigmatization attacks, labeled as "the province obsessed with civil service exams," "drinking culture," or "feudal conservatism." This sense of dichotomy is intertwined with Shandong's unique "major province imprint"—social contradictions arising from its massive economic output versus industrial transition pains, and its traditional folk culture versus the pursuit of modern order.

2.2.2 Special Demands for Public Opinion Analysis Services

The characteristics of public opinion in Shandong impose four specific demands on analysis services: in-depth service needs for public oversight scenarios; precise identification needs for regional stigmatization; narrative construction needs for industrial transformation; and rapid response needs for online rumors.

In-depth service needs for public oversight scenarios: Platforms like Wenzheng Shandong require government agencies at all levels in Shandong to demand high timeliness, precision, and closed-loop management capabilities in public opinion monitoring. This necessitates comprehensive process assistance from public opinion service providers, spanning early warning to resolution.

Precise identification needs for regional stigmatization: Stigmatization labels like "the province obsessed with civil service exams" or "drinking culture" often originate from isolated extreme cases or jokes, which then spread via short videos and Weibo, forming stereotypes and storms of prejudice. This demands high multi-modal content recognition capabilities, deep semantic understanding, and refined sentiment analysis accuracy from service providers.

Narrative construction needs for industrial transformation: There is a structural disconnect in the information dissemination regarding Shandong's transition driven by new and old growth drivers. Traditional industries, though large in scale, lack compelling narratives, while emerging industries, despite having a tangible presence, lack effective branding and storytelling. Service providers need to shift from "passive monitoring" to "active narrative construction" to help Shandong build a new industrial image.

Rapid response needs for online rumors: Shandong is a hotbed for online rumors, where rumor-mongers often fabricate content linked to social pain points to generate clicks. The average response time for debunking rumors related to Shandong in 2025 has significantly decreased compared to before, placing extremely high demands on the real-time and accurate capabilities of public opinion monitoring.

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2.2.3 Existing Foundation for the Public Opinion Industry in Shandong

Shandong Province has accumulated a certain industrial foundation in the field of public opinion analysis. The Shandong Internet Media Group is one of the earliest news media organizations in China to engage in public opinion services. Its subsidiary, Dazhong Information Industry Co., Ltd., has been deeply involved in this sector for 15 years, developing full-chain service capabilities encompassing monitoring and early warning, analysis and assessment, response and guidance, and training and drills, serving nearly 500 institutions [4]. In 2025, it monitored and processed approximately 740 million pieces of data and produced over 23,000 public opinion analysis and think tank reports. Its annual revenue from public opinion data services exceeded RMB 60 million, ranking first in market share within the province and leading nationally.

In terms of technological innovation, the “Haidai Public Opinion LLM” passed the filing and review process with the Cyberspace Administration of China (CAC) in September 2025, becoming the first vertical industry-specific LLM for public opinion in Shandong Province. Concurrently, products like the “Haiyan Public Opinion Monitoring System” and the “Hailan Holistic Situational Awareness System” have undergone continuous iteration [2]. In 2025, the Shandong Internet Media Group completed the inclusion of “Shandong Internet and Related Services Internet Public Opinion Data” as a data asset on its balance sheet. The inclusion amount of over RMB 1.3 million accurately reflected the full lifecycle cost of the data, with the market value subsequently assessed at over RMB 20 million.

These practices demonstrate that Shandong possesses the industrial foundation and technological accumulation necessary for the innovative commercial development of public opinion analysis. The key lies in transforming regional characteristics into competitive advantages.

2.3 Paths for Innovative Commercial Development of Public Opinion Analysis in Shandong Province

Building upon the above analysis of common industry challenges and the specific characteristics of Shandong Province, this paper proposes four paths for the innovative commercial development of public opinion analysis in Shandong.

2.3.1 Technological Breakthroughs

Technological capability is the core competitiveness of the public opinion analysis industry and a key lever for escaping homogenized competition. Future breakthroughs for the industry lie in the systematic development of multi-modal content recognition capabilities, deep optimization of regional semantic understanding, and the prevention of AI hallucinations alongside enhanced real-time performance.

Systematic development of multi-modal content recognition capabilities: Faced with the reality that unstructured data from short-video platforms exceeds 60%, it is necessary to simultaneously possess capabilities such as image recognition, speech-to-text transcription, and OCR extraction [2]. Leveraging existing foundations like the “Haidai Public Opinion LLM,” Shandong can accelerate the R&D of multi-modal fusion analysis technologies to achieve comprehensive coverage of new information carriers like short videos and live streaming.

Deep optimization of regional semantic understanding: Shandong's public opinion landscape involves a significant amount of regional expressions, from internet slang to local dialects, and from sarcasm to puns, which generic models struggle to identify accurately. By constructing a regional linguistic corpus specific to Shandong based on existing LLMs and leveraging the research capabilities of prestigious local universities like Shandong University and Ocean University of China, it is possible to train sentiment analysis and opinion clustering models tailored to the Shandong context, thereby fostering better development in public opinion analysis.

Prevention of AI hallucinations and enhancement of real-time performance: LLMs face the dual weaknesses of AI hallucinations and real-time limitations in public opinion analysis. Exploring a hybrid “LLM + manual assessment” model can be effective, where the LLM handles data collection, preliminary classification, and trend prediction, while professional public opinion analysts are responsible for in-depth interpretation and strategy formulation. Going further, training AI models for decision-making analysis can leverage AI's efficiency advantages while mitigating its accuracy risks.

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2.3.2 Service Upgrading

Client needs have progressively shifted from "knowing where public opinion is" to "early warning, analysis, and providing solutions for public opinion." Public opinion service providers in Shandong must also closely follow this market shift, completing the transition from being a "monitoring tool" to a "governance partner."

Building a closed-loop service system integrating monitoring, early warning, assignment, handling, and feedback: Currently, most products serve only as tools for individual departments, lacking deep integration with client business processes. Leveraging its existing full-chain service capabilities, Shandong can further develop standardized response plan repositories and intelligent dispatch systems for different industries and scenarios, enabling automated closed-loop management of public opinion. Concurrently, introducing expert systems to assess customized business needs for different clients can enhance service quality. It is also crucial to expand from "post-event monitoring" to "pre-event early warning, in-event guidance, and post-event remediation." The proactive governance demonstrated by Shandong's Wenzheng Shandong platform highlights the effectiveness of active management. Service providers can learn from this experience by developing public opinion risk prediction models and positive topic-setting tools to help clients shift from passive reaction to active guidance. For instance, to counter recurring pessimistic narratives about Shandong's private economy, such as claims that the "business environment cannot retain talent," providers can offer services aimed at proactively constructing a positive image based on data.

Deep integration of think-tank-oriented services: Dazhong Information Industry Co., Ltd.'s internal reference biweekly, Dazhong Public Opinion Reference, has been continuously published for 460 issues. Building on this foundation, providers can further upgrade their offerings by integrating public opinion data analysis with public policy research and industrial strategic consulting, providing in-depth think-tank services that move from "what" and "why" to "how."

2.3.3 Business Model Reconstruction

To resolve the dilemma of increasing volume without profit growth, fundamental innovation in business models is required.

Promoting the asset-based operation of public opinion data: The Shandong Internet Media Group has already pioneered the inclusion of public opinion data as assets on the balance sheet, setting a benchmark for the industry. The next step involves exploring the compliant circulation and commercial application of data assets, transforming accumulated massive public opinion data into sustainable asset-based returns. Simultaneously, collaborating with universities and research institutions in Shandong to establish a Shandong Public Opinion Data Open Innovation Lab could facilitate data value realization while ensuring data security.

Deepening focus on vertical industries to build differentiated barriers: Generic public opinion monitoring has become a red ocean, but deep services for vertical industries still represent a blue ocean. As a major province in agriculture, manufacturing, and energy, Shandong holds unique advantages in vertical areas like agricultural public opinion, chemical safety public opinion, and new energy public opinion. Developing specialized models and industry-specific solutions for these sectors, and building competitive barriers through deep accumulation of industry knowledge, is a viable path. The Haidai Public Opinion LLM has already articulated its direction of gradually extending to multiple industries to create specialized small models or intelligent agents, a trajectory worth persistent pursuit.

Exploring a diversified revenue model integrating SaaS, consulting, and training: Given the persistent low retention rates of SaaS subscriptions, relying solely on subscription revenue cannot sustain continuous R&D investment. Drawing on hybrid models like "SaaS subscription + turnkey delivery," providers can offer differentiated services to various client segments: providing high-end integrated services (systems, manual analysis, think-tank reports) to government and large enterprises; offering standardized SaaS products to SMEs; while simultaneously expanding value-added services such as public opinion training, emergency drills, and security assessments to meet diverse client needs, enhance customer satisfaction, and increase the willingness for long-term cooperation.

2.3.4 Ecological Collaboration

The innovative development of the public opinion analysis industry cannot rely solely on individual companies; it requires building a collaborative and mutually beneficial industrial ecosystem.

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Strengthening government guidance and policy support: Shandong has already issued policies related to the deep integration and collaborative innovation of culture and technology. Building on this, the public opinion analysis industry could be designated as a key area for cultural-technology integration, with policy support in R&D investment, data compliance, and talent cultivation [3]. Furthermore, innovative mechanisms like the "direct liaison points for enterprise-related online complaint and rumor debunking" can be adopted to establish normalized collaboration platforms between the government and public opinion service providers.

Deepening industry-university-research collaborative innovation: Prestigious Shandong universities like Shandong University and Ocean University of China have existing research accumulations in areas such as influencing factors of public opinion dissemination, lifecycles of typical cases, and effectiveness evaluation of government new media responses. Establishing collaborative mechanisms connecting universities, enterprises, and the government can facilitate the translation of academic achievements into industrial capabilities.

Building regional industrial alliances and standards systems: Faced with the dual challenges of escalating "Dark PR" tactics and disorderly market competition, Shandong Province can take the lead in establishing regional industry standards and self-regulatory conventions for public opinion services, standardizing service processes, clarifying data compliance boundaries, and curbing vicious price competition. Simultaneously, platforms like the Shandong Provincial Online Public Opinion Management Forum can be utilized to promote industry exchange and collaborative governance.

3. Conclusion

The commercialization challenges faced by the public opinion analysis industry are essentially structural contradictions inevitably encountered during the transition from extensive expansion to high-quality development. Resolving these challenges requires not only continuous technological breakthroughs but also fundamental restructuring of business models and service philosophies. Shandong Province is already well-positioned in this transition and possesses unique advantageous conditions. Its "dual nature" public opinion ecology creates rich application scenarios and urgent upgrade demands for public opinion analysis services, while its existing industrial foundation provides a solid base for innovative development.

The four paths proposed in this paper—technological breakthroughs, service upgrading, business model reconstruction, and ecological collaboration—constitute a mutually reinforcing systemic framework. Technological breakthroughs address the question of "whether it can be done," service upgrading addresses "whether it can be done well," business model reconstruction addresses "whether it can be sustained," and ecological collaboration addresses "whether it can be scaled." The integration of these four elements is expected to help Shandong's public opinion analysis industry forge a differentiated development path distinct from traditional price-based competition models.

In the long run, the ultimate value of the public opinion analysis industry depends on the real value it creates for its clients—whether it helps governments govern more effectively, whether it helps enterprises manage reputational risks more precisely, and whether it provides reliable decision-making bases in complex public opinion environments. If Shandong can persistently focus on this positioning, transforming public opinion pressures into innovative momentum, it will not only open up new space for its own industrial development but also provide a valuable "Shandong Model" for the commercial transformation of the national public opinion analysis industry.

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The Role and Challenges Faced by Social Work Stations in the Field of Social Assistance

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Abstract

With the continuous downward extension of social assistance to the grassroots level, township (street) social work stations have become an important platform for addressing the shortcomings of grassroots civil affairs and carrying out public services. This study reviews the development history of social work stations and their differentiated governance and service operation models in various regions, and explores their functions in the field of social assistance through practical cases. Studies have shown that social work stations can effectively address the shortcomings of grassroots civil affairs services and bridge the 'last mile' in serving the people by accurately identifying those in need of assistance, translating policies, integrating social resources, and empowering service recipients to integrate into society. Meanwhile, the development of social work stations still faces problems such as a shortage of professional personnel, frequent staff turnover, weak resource integration, and susceptibility to administrative constraints. This study clarifies the value and practical challenges of social work stations in the field of social assistance, and provides a reference for the standardized implementation of assistance services by grassroots social work stations.

Keywords

social work station, social work, social assistance, social worker

1. Introduction

Since the Sixth Plenary Session of the 16th CPC Central Committee, the country has gradually increased its attention to social services and put forward higher requirements for the quality and effectiveness of social services [1]. However, due to insufficient manpower, numerous tasks, and lack of professionalism in grassroots civil affairs services in townships, the traditional assistance methods that are 'extensive, incomplete, misguided, and only provide basic support without development' cannot meet the livelihood service needs of people in difficulty when providing social assistance services. With the gradual clarification and implementation of the guidelines for building social work stations, the state has further implemented its responsibility for providing basic livelihood services through social work stations. In particular, the 'Double Hundred Plan' in Guangdong Province and the 'He Plan' in Hunan Province were successfully implemented around 2017, which produced very good results in social assistance. This paper analyzes the development background and operation model of social work stations, combined with numerous case studies, to examine their role in social assistance and the challenges they face. It aims to provide reference and guidance for the further promotion of social work stations and the implementation and improvement of grassroots social work.

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2. Establish Background and Development of Township (Subdistrict) Social Work Stations

As the Party and the State have gradually increased their attention to people's livelihood security and basic social services, how to effectively carry out social work and provide social services has become the focus of more people's attention. At the same time, it is also an important issue that the Party and the State need to consider in order to realize developmental social assistance [2]. Many scholars believe that the decision to 'build a large social work talent team' proposed by the Sixth Plenary Session of the 16th CPC Central Committee in 2006 guided the introduction of a series of policies to promote the development of social work, and thus served as the policy starting point for building social work stations [3]. Some scholars believe that the social work station system was first practiced and then transformed into experience and policy. As early as 2000, Shanghai Pudong took the lead in establishing social work stations; later, Shenzhen Nanshan and Guangzhou-Shenzhen Social Work Service Centers accumulated early practical experience for the social work station system [4]. Social work stations are a product of the professional practice of social work in China. In 2017, Guangdong Province took the lead in implementing the 'Double Hundred Plan', and in 2018, Hunan Province launched the 'He Plan'. These two provinces began to build township (street) social work stations on a large scale in their respective provinces and formed their own models. The successful practice of these two plans not only provided confidence for the introduction of more policies, but also provided extensive practical experience for the subsequent construction and operation of social work stations across the country [5].

From 2020 to 2021, the state successively issued a number of policy documents to continuously promote the construction of social work stations. These policies included 'carrying out social assistance based on social work stations', 'improving the social work talent system', 'promoting full coverage of stations', and 'building a three-level social work service network', gradually forming a clear policy implementation roadmap. The call was responded to from all over the country, and the construction of social work stations was finally promoted across the country as a government action and a system design. It has become a professional comprehensive service platform born under China's unique national conditions and advanced system [6].

3. The Internal Governance Mechanism and External Operation Model of Social Work Stations

As a comprehensive platform positioned to effectively provide grassroots civil affairs services, social work stations bear the responsibility of connecting relevant government departments and social resources to address practical problems and improve the well-being of the public in a targeted manner. In order to maximize the function of social work stations, their governance mechanisms and operating models must be fully adapted to and suited to the specific circumstances of the area, street and community.

Based on the in-depth investigations and summaries of various scholars on social work stations in different regions, this study divides the governance mechanism of social work stations into three types: The first type is the direct hiring model represented by the 'Double Hundred Project' in Guangdong Province, in which townships (streets) directly hire social workers or draw them from certified social workers. The government sets up administrative and service positions in a coordinated manner, and the social work station operates independently under the hierarchical system and engages in professional affairs; The second type is the entrustment model represented by the 'He Plan' in Hunan Province, in which the street civil affairs department purchases project-based services from third-party social service agencies, and the social workers dispatched by the agencies provide social services and manage the social work station; The third type is the composite social work station, which is more widely used in Zhejiang Province. Its operation mode is mainly based on the direct dispatch of personnel by the government, supplemented by the professional services and supervision provided by social service agencies, with mutual cooperation and joint operation and maintenance [7].

If the governance mechanism can be seen as the internal management and coordination mechanism of a social work station, then the operational model of a social work station can be considered as the way it provides social services externally. China is vast and populous, with varying population distribution and economic development across different regions. Therefore, the model for social work stations to provide social services is always adapted to local conditions. Through comparison and summarization of service models in different regions and social work stations, it has been found that the way social work stations provide social services can be summarized into four steps: The first step is to investigate the specific living and economic conditions of every resident in the jurisdiction and establish information files; The second step is to identify and explain

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applicable policies to those in need; The third step is to develop specific service plans, link government departments, social organizations, volunteers, and other welfare service resources to solve the specific difficulties faced by service recipients; The fourth step is to help service recipients establish connections with society (through solving difficulties, adjusting mindset, building confidence, and developing skills).

4. The Role That Social Work Stations Can Play in Social Assistance

Existing research has elucidated the value of social work stations from multiple dimensions. This study focuses on the core mission of social work stations, emphasizing their role in the field of social assistance, and analyzing this role in conjunction with the four-step workflow summarized above. First, Comprehensive Investigation and Accurate Identification: The unique advantage of social work stations is that they can leverage the professional social workers' ability to ‘go door-to-door’, not only to fully understand the actual living conditions of every resident and promptly identify those facing difficulties and needing assistance, but also to deeply understand their predicaments and urgent needs. Furthermore, through numerous home visits and interviews, they can build ‘familiar relationships’ with local residents and gain their trust and support [8]. Through field research, Professor Zhang and Professor Liao found that the bankruptcy of a machinery factory in Guangdong Province led to the unemployment of a large number of people. However, the predicaments faced by the unemployed were not entirely the same. The local social work station, through in-depth visits and comprehensive investigations, categorized those in need of assistance into groups based on their needs, such as those applying for minimum living allowances, those applying for disability certificates, orphans, and single-parent families, and provided targeted assistance services [1]. After establishing trust with the local people through in-depth visits, the residents would proactively provide clues about other people in urgent need to the social workers, helping them to provide social assistance more quickly and accurately [2].

Second, Promote and Translate Policies: Compared to professional social workers, the general public has limited knowledge of policies and may not understand them accurately. At this time, frontline social workers, through their professional knowledge, can connect the needs of service recipients with applicable policies. Through ‘policy translation’, they can help the public understand policies, cite policies suitable for their own circumstances and able to meet their needs, and ensure that policies are effectively implemented [3]. A study shows that a community social work station compiled easily understandable booklets of policies that residents had high interest in and were highly applicable to, and carried out a series of promotional and explanation activities. Some residents with their own needs or who knew about the needs of their neighbors began to proactively report their difficulties to the social work station, including disability assessment and subsidy applications after stroke in the elderly, and low-income assistance applications for people with mental disabilities [2].

Third, Linking Social Resources to Achieve Social Assistance: The dispersion of community resources is a challenge faced by grassroots service providers. Social work stations can play the role of connectors, integrating and exploring existing resources and accurately delivering them to people in need. A study shows that a certain street has created a three-tiered resource network model: a basic resource layer integrating local resources such as community venues and volunteers, a professional resource layer linking public welfare foundations, medical institutions and enterprises, and a strategic resource layer connecting government departments and large enterprises. Within a year, the social work station linked resources worth more than 80,000 yuan, trained 54 volunteers, and achieved a service satisfaction rate of 98% [8]. Some social work stations also carry out special assistance projects for homeless people. The social work station is responsible for the overall planning and allocation of resources, providing homeless people with multi-level assistance from material support to accommodation and medical treatment, and then to returning home or finding relatives [9].

Fourth, Reduce Social Exclusion and Help Service Recipients Integrate Into Society: In the process of social assistance, social work stations not only help vulnerable groups solve practical problems, but also provide comprehensive and full-process assistance and support to service recipients from the perspectives of building self-confidence, social participation and self-development, so as to achieve the goal of reducing social exclusion, enabling service recipients to integrate into society, become self-reliant and achieve sustainable development [3]. A veteran in a certain county has been taking care of his paralyzed daughter for 23 years. Social workers not only contacted professional caregivers to guide him in taking care of his daughter, but also

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organized volunteers to help him take care of his daughter. They also encouraged him to participate in community publicity and speeches while the volunteers were taking care of his daughter, helping him to regain his sense of value and self-confidence [10]. A social work station in another location encountered a woman who had just lost her husband. She had been unemployed for years and was disconnected from society. The social workers began by comforting her grief, assisting and accompanying her in applying for minimum living allowance. During this process, they taught her how to use a mobile phone, expanding her access to information.

The social workers' companionship and guidance gradually fostered a sense of control and confidence in her life. Furthermore, the social workers helped her find a job as a cleaner and provided guidance on enrolling in pension insurance, life planning, and improving her financial management skills. This woman, who previously didn't have a cell phone and was afraid of others speaking loudly, now actively and confidently communicates with others after long-term companionship and assistance from social workers. The social workers also contacted volunteers to provide tutoring services for her son, resulting in improved grades and a better relationship between her and her mother-in-law [2]. A social work station in another region identified a child who had lost both parents. He became withdrawn and even dropped out of school due to injury. The social work station gradually built communication and trust with him by starting with his interests. They then provided him with social skills training, role-playing scenarios to simulate school social situations, gradually teaching him skills in speaking proactively, interacting with others, and handling conflicts. Moreover, the social work station organized family meetings to guide grandparents in cultivating communication skills between grandparents and grandchildren. Three months later, the child successfully returned to school, his math score improved by ten points, and he went from having zero social interaction to actively initiating one or two social interactions per week [8]. Numerous cases and studies have shown that individual predicaments do not exist independently, but are the result of imbalances in macro-micro interactions. The role of social work stations is to integrate the concept of empowerment into the process of providing social assistance, not only solving the current predicaments and problems of the recipients, but also focusing on cultivating their ability for long-term development and integration into society [8].

5. Challenges Faced by Social Work Stations in Carrying Out Social Assistance Work

The operation and development of social work stations also face some practical difficulties. First, both internal system governance and external service provision require the participation of professional personnel. In the process of implementing social assistance, the service quality of social work stations depends on the professional competence of social workers. However, most social work stations at present face the dilemma of insufficient professional personnel. One study showed that three social work stations in a certain area had a total of eleven social workers, of whom only one had an educational background related to social work, and only four had obtained social work qualification certificates, with a certificate holding rate of only 36.4%. The stability of employees at social work stations is also not guaranteed. Of the three social work stations in the area, only four have been employed for more than two years, while five have been employed for less than one year. Due to the nature of their services, social work stations need to maintain long-term communication and in-depth interaction with those they are helping. However, the high turnover rate of social workers leads to a break in the initial relationship established between the social work stations and those they are helping, as well as the social resources they have accumulated [11]. Some scholars have found that social work stations also face difficulties when connecting with social resources. This is because, in the process of connecting with external social resources, social work stations themselves lack core resources and value for exchange. This results in limited enthusiasm and investment from some partners, indirectly affecting the efficiency of resource integration and connection, and preventing the service quality and effectiveness from being maximized. Finally, whether it is a government-directly-hired, entrusted-operated, or comprehensive internal governance model, it is largely constrained by government management and support. In this situation, social workers will inevitably be constrained by the administratively-led assessment mechanism, and their work and thinking patterns will be constrained by the administrative performance requirements. This can easily lead to an imbalance in resource allocation and energy input between administrative affairs and professional services. If this is not adjusted in time, it will not only affect the professional development of social work stations, but also cause a mismatch between service supply and residents' actual needs [11].

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6. Summary and Recommendations

Social work stations, established under the Party and government leadership as grassroots comprehensive service platforms in townships, are designed to provide professional social services to disadvantaged groups and special-needs groups within their jurisdiction. They provide a safety net of basic living services through precise identification and refined assistance, bridging the ‘last mile’ of public service. Although social work stations face challenges such as a lack of professional talent, insufficient resources, and the influence of administrative control in providing assistance to those in need, their role and effectiveness in four aspects, comprehensive investigation, interpretation and linkage of policies, coordination of social resources, and empowerment of socialization, are significant. They deliver limited welfare service resources more accurately and effectively to people in need, greatly improving people's well-being and promoting social fairness and justice.

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Between Miracles and Observation: Jordanus's Mirabilia and the Reshaping of the Medieval Oriental Narrative

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Abstract

This paper examines Mirabilia Descripta (1329) by the Dominican missionary Jordanus Catalanus to explore how late medieval Europe reimagined the "East" at the intersection of religion and empirical observation. Focusing on the text's narrative strategies, knowledge classification, and intertextual networks, it traces the semantic shift of mirabilia from "miraculous wonders" to "empirical knowledge." The study argues that Mirabilia Descripta represents a crucial moment in medieval geographic writing, bridging theological discourse and experiential observation, while anticipating the emergence of modern empirical geography and ethnographic narration. This analysis clarifies the work's significance in the history of medieval geographic imagination and cross-cultural knowledge transmission.

Keywords

Jordanus Catalanus, mirabilia descripta, oriental narratives, mirabilia, empirical knowledge

1. Introduction

Since the thirteenth century, the rise of the Mongol Empire and the expansion of Eurasian communication networks brought about a profound transformation in Europe's understanding of the East. Missionaries, merchants, and envoys increasingly traveled eastward, promoting the accumulation and circulation of geographical knowledge while also giving rise to diverse forms of writing about the Orient. Within this broader shift in knowledge production, the Mirabilia Descripta, written around 1329 by the Dominican missionary Jordanus Catalani, emerged as a significant work that combined a religious perspective with an empirical mode of observation. Compared with the writings of Marco Polo and Odoric of Pordenone, Jordanus was not merely a traveler but also a systematic recorder. Although he used "marvels" as the organizing thread of his narrative, his ultimate concern was the production of knowledge. In doing so, he created a distinctive tension between accounts of miracles and empirical observation.

For a long time, however, scholarly interpretations of the Mirabilia Descripta have remained largely confined to the fields of missionary history and textual criticism. Its narrative strategies, mechanisms of knowledge classification, and position within the broader tradition of medieval geographical imagination have yet to receive systematic analysis. Through close reading and intertextual analysis, this study aims to demonstrate how the Mirabilia Descripta reshaped the meaning of the traditional category of mirabilia, thereby

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facilitating a cognitive shift from the witnessing of miracles to the construction of empirical knowledge. More specifically, this article addresses three central questions. How did Jordanus establish the authority of empirical observation through his distinction between "personal witness" and "hearsay"? How did he systematize knowledge through the tripartite structure of geography, material products, and religion? And how did the writing strategies of the Mirabilia Descripta both reflect and contribute to the transformation of late medieval European perceptions of the East?

This article argues that the Mirabilia Descripta not only inherited the rhetorical tradition of "marvel literature," but also promoted the emergence of a more empirical mode of geographical writing through its structural organization and linguistic strategies. The text functioned not only as a record of the Eastern world, but also as a reconstruction of ways of knowing. Within a framework shaped by faith, it introduced the seeds of rational inquiry, and through the experience of wonder, transformed marvels into knowledge. From this perspective, the present study seeks to reposition the Mirabilia Descripta within the intersecting histories of medieval knowledge production and cross-cultural transmission, while also clarifying its historical significance as a crucial cognitive nexus.

2. Mission and Writing: Jordanus's Eastern Experience and the Composition of the Mirabilia Descripta

Jordanus Catalani, also commonly known as Jordanus of Sévérac, was born approximately between 1275 and 1280 and occupied a central position in the history of Dominican missions to the East in the early fourteenth century. His significance lies not only in the vast geographical scope of his missionary journeys across Eurasia, but also in his role as a key intermediary linking the Latin Christian world with the civilizations of the Indian Ocean littoral.

He was born in Occitanie, in the town of Sévérac-le-Château. His surname "Catala," which in Occitan means "Catalan," suggests that his family may have had connections with Catalonia. According to local archival evidence, several individuals bearing the surname "Catala" lived in the Sévérac region during the thirteenth and fourteenth centuries [14]. One figure named Jordan Catala was active between 1286 and 1318 and may have belonged to the same family as the missionary Jordanus [5]. Although these traces are insufficient to establish his exact origins with certainty, they collectively reinforce the view that he emerged from an urban social background rather than from the feudal nobility.

During his youth, Jordanus received training within the Dominican Province of Toulouse and likely studied at the University of Toulouse, where he undertook systematic instruction in scholastic philosophy, theology, and classical rhetoric [6]. In the thirteenth century, the Dominican Order actively promoted missionary work in the East, particularly through its important base at Sultaniyya in Persia. During his education within the order, Jordanus may already have acquired knowledge of Persian and accepted the missionary vocation that prepared him culturally and linguistically for his later work in Persia and India [10].

Around the 1310s, he departed from the Mediterranean world and entered Persia through Armenia. He initially resided at the Dominican mission in Tabriz, which at the time served as both the political and commercial center of the Ilkhanateand an important site of interaction between Latin missionaries, Eastern Christians, and Muslims. Around 1320, he traveled southward along the Persian Gulf and embarked on his missionary journey to the Indian subcontinent [2]. In 1321, together with the friar Thomas of Tolentino and several companions, he sailed from Persia across the Arabian Sea and arrived at Thane on the western coast of India. Soon afterward, Thomas and his companions were executed by local authorities as a result of religious conflict, while Jordanus himself survived [11]. This event profoundly shaped his understanding of the risks of missionary work and the complexities of religious confrontation within non-Christian societies.

Afterward, he continued his activities across southern and western India, traveling through regions such as Gujarat and Surat. He maintained close contact with the Saint Thomas Christians and sent two Latin letters from India, dated October 12, 1321 and January 24, 1323 respectively, to his Dominican companions in Persia in order to report on missionary developments [7]. These letters constitute some of the earliest surviving European firsthand accounts of the society, religions, and natural environment of India's western coast, combining the functions of missionary reporting and empirical observation.

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Around 1324, Jordanus arrived at Kollam, also referred to in Latin sources as Columbum or Quilon, where he established a missionary center [11]. On April 8, 1330, Pope John XXII formally appointed him Bishop of Columbum through the papal bull Romanus Pontifex. His jurisdiction extended across India, Sri Lanka, Myanmar, and parts of Southeast Asia. This appointment not only established Jordanus as the first Latin bishop in India, but also signaled the formal incorporation of the Indian Ocean region into the universal pastoral and administrative framework of the Roman Church [11]. His responsibilities included coordinating relations between the Saint Thomas Christians of southern India and the papacy, while also assisting the diplomatic and ecclesiastical affairs of the archdiocese of Sultaniyya. In this sense, his role extended beyond that of a conventional missionary and positioned him as an active agent in the eastward expansion of ecclesiastical institutions.

Jordanus's prolonged residence in the East enabled him to develop a mode of writing centered on the processes of observation, recording, and interpretation. The Mirabilia Descripta was the culmination of this accumulated experience. The work provides detailed descriptions of India's natural environment, social customs, and religious practices and may be regarded as a representative example of medieval missionary geography. Scholars generally agree that the text was composed between 1329 and 1338, possibly during his second journey to the East or while returning to Europe. After this period, historical records no longer mention his activities, leading scholars to assume that he died either in India or during the return voyage [5].

The life and writings of Jordanus provide indispensable evidence for understanding religious and intellectual exchanges across Eurasia in the late Middle Ages. He lived at a historical moment shaped by the intersection of European geographical expansion, missionary ambition, and institutionalized systems of knowledge transmission. His travels across Persia, Armenia, and the Indian Ocean world exemplify the characteristic features of what may be termed "missionary geography." Unlike traditional pilgrimage narratives centered on Jerusalem, Jordanus expanded his perspective toward a much broader maritime world, transforming the East from the "periphery of the Holy Land" into a space integrated within the universal Church. As William H. McNeill and other scholars have suggested, Jordanus's writings reveal an early form of "universal ecclesiastical geography," a knowledge structure that connected the intelligibility of the world with the expansion of Christian evangelization [12]. Consequently, Jordanus represents not only a transition from pilgrimage to missionary enterprise, but also the emergence of a new epistemological model in which empirical observation and religious interpretation became closely intertwined. The study of Jordanus therefore contributes to the reconstruction of Dominican missionary practice and intellectual networks in the fourteenth century, while also offering an important case study for examining cross-cultural interaction between the medieval Christian world and Asian societies.

3. The Order of Marvels: Structure and Writing Strategies in the Mirabilia Descripta

As its title suggests, the Mirabilia Descripta belongs to the literary tradition of "collections of marvels" that extended from Greco-Roman antiquity into the medieval period. Unlike earlier mirabilia literature centered primarily on visions, monsters, and fantastical beings, however, the marvels described by Jordanus Catalani gradually move away from the realm of pure fantasy toward a mode of writing grounded in experience and observation. Although the text still mentions traditional motifs such as Amazons, cynocephali, griffins, and unicorns, Jordanus generally treats these accounts with caution and skepticism. He relegates such legendary beings to the distant margins of the "Third India" or the mysterious regions of Ethiopia, thereby signaling a deliberate distancing from the classical system of marvels. By contrast, he devotes considerable attention to firsthand descriptions of natural phenomena, animals, plants, and local customs. In Jordanus's view, the true marvel no longer resides in mythology, but in the visible realities of the world itself — a world that can be observed, recorded, and verified.

3.1 The Structure and Rhythm of Geographical Narrative

Although relatively brief in length, the Mirabilia Descripta is highly structured and densely informative. The work consists of sixteen chapters covering a wide range of subjects, including natural geography, flora and fauna, religious customs, social organization, and political institutions. Its geographical narrative follows a spatial pattern that moves outward from the familiar toward the distant and then gradually returns. The opening section (chapters 1–3) focuses on the Mediterranean, Armenia, and Persia, thereby establishing the

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narrative within the boundaries of a relatively familiar world. The central section (chapters 4–6) concentrates on "Lesser India," "Greater India," and the "Third India," which together form the core landscape of Eastern marvels. The later chapters (7–14) shift toward regions such as "Greater Arabia," "Great Tartary," and Georgia, presenting a more complex image of foreign civilizations. Finally, the concluding chapters (15–16) return once again to matters associated with the Mediterranean frontier, thereby completing the narrative cycle.

This "radiating and returning" structure is not merely a geographical arrangement but also a form of theological ordering. The narrative begins from the known Christian world, passes through lands associated with non-Christians, and ultimately returns symbolically to the center of faith. The movement from center to periphery and back again creates a metaphorical path of redemption, transforming geographical space into a hierarchical spiritual landscape.

Within the narrative itself, Jordanus frequently employs the Latin expressions vidi ("I have seen") and dicitur ("it is said") in order to distinguish between firsthand experience and hearsay [11]. This distinction reveals a conscious awareness of empirical writing practices. Although Jordanus was not an empiricist in the modern sense, such differentiation nevertheless marks a significant transition from narratives of miracle toward narratives of observation. This tendency is particularly evident in Chapter Eight, "Concerning the Great Tartar," where he describes the ruler of Great Tartary in strikingly positive terms, portraying him as wealthy, just, diligent, courteous, and magnificently dressed [11]. He also provides detailed accounts of paper currency, porcelain production, and funeral customs. The balanced and relatively neutral tone of these descriptions recalls the writings of Marco Polo and Odoric of Pordenone. More importantly, it demonstrates that the "East" in Jordanus's writing is not represented solely as a realm of strangeness and terror, but rather as a civilization possessing order, rationality, and human dignity.

3.2 From Geographical Description to a Missionary Vision

The organization of the text also reveals a clear missionary-geographical purpose. In chapters four through six, Jordanus's discussion of the "Three Indias" repeatedly emphasizes the survival and renewal of Christianity within non-Christian lands. For example, he provides detailed descriptions of the Saint Thomas Christians, praises the relative tolerance of local non-Christian communities, and expresses optimism regarding the future possibility of large-scale conversion. These passages are closely connected with the missionary strategies of the papacy, as reflected in the letters of Pope John XXIIand the overseas activities of the Franciscan and Dominican orders. Jordanus's objective was therefore not simply descriptive. Rather, he sought to establish a geographical foundation for a universal missionary vision of the Church. As Robert Silverberg has argued, the Mirabilia Descripta may be understood as "the textual component of a Franciscan world atlas," in which geographical writing and religious expansion are fundamentally intertwined [18].

It is also significant that Jordanus organizes his chapters not according to physical distance alone, but according to degrees of spiritual proximity and concentrations of marvels. The most distant Eastern regions, especially Greater India and Great Tartary, contain the greatest density of miraculous and extraordinary descriptions. This reflects the enduring medieval tradition of mirabilia literature, in which distant lands were imagined as privileged spaces of divine manifestation. Such territories functioned simultaneously as objects of curiosity and as arenas for spiritual testing. Henry Yule once suggested that the structure of the Mirabilia Descripta may imply a "pilgrimage-like path of reading," beginning in the Christian world, passing through foreign marvels, and ultimately returning to the center of faith [11].

From the perspective of textual intention, the arrangement of the Mirabilia Descripta reveals a geographical imagination centered on the accessibility of salvation. The narrative begins in the familiar regions of the Mediterranean and the Middle East, moves through Armenia and Persia as ancient borderlands of Christianity, advances into India and Tartary as domains of non-Christian peoples, and finally returns toward regions such as Georgia and Asia Minor that once again approach the spiritual center of Christendom. This cyclical movement corresponds closely to the symbolic model of medieval "universal ecclesiastical geography," in which descriptions of geographical expansion simultaneously demonstrated the potential universality of Christian salvation [7]. In this sense, the Mirabilia Descripta is not merely a geographical treatise but also a theological narrative. It transforms the writing of marvels into a strategy for legitimizing faith, thereby incorporating the "strangeness" of foreign lands into the rational order of universal Christianity.

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3.3 The Circulation of the Text and Its Modern Rediscovery

The textual history and scholarly transmission of the Mirabilia Descripta reflect the characteristic trajectory of many medieval works from private manuscript circulation within religious orders to modern rediscovery within the contexts of geography and Oriental studies, and finally to contemporary reinterpretation through interdisciplinary scholarship. The transmission history of the text itself may therefore be understood as a six-century-long "journey of knowledge."

The earliest surviving Latin manuscript was probably copied between the late fourteenth and early fifteenth centuries. Its style of writing suggests origins within the manuscript traditions of religious houses in northern Italy. The text was first published in 1839 by the French scholar Coquebert-Montbret in the Recueil de Voyages et de Mémoires. The edition was based on a fourteenth-century parchment manuscript from the collection of Baron Walckenaer [11]. Later, the French sinologist Henri Cordier noted in Les Voyages de Jordanus that the manuscript originally circulated within Franciscan and Dominican missionary networks and that certain sections had at times been mistakenly attributed to Odoric or other missionaries. Marginal annotations and geographical corrections contained within the manuscript further reveal continuous revision and supplementation by later readers and copyists [2].

The modern scholarly revival of the Mirabilia Descripta began with the publication of Henry Yule's English translation in 1863. Through careful textual comparison and geographical identification, Yule established the author's identity as Jordanus of Sévérac and corrected the earlier misconception that he was "Jordanus the Catalan." Yule argued that although the work did not provide major geographical discoveries, it represented one of the earliest examples of "religious geography" in Europe and revealed the institutional presence of the Latin Church in India during the early fourteenth century [11]. According to Yule, Jordanus was "not a scientist," yet he possessed an "organ of wonder," an ability to observe situated between faith and experience that granted his writing a distinctive epistemological significance.

At the same time, Yule's interpretation also reflected the colonial intellectual climate of the nineteenth century. In the conclusion of his preface, he asserted that "unless India becomes the land of Christ, there is no hope of resurrection." This statement reveals the dual identity of Yule as both missionary-minded scholar and Orientalist. While he admired medieval marvel writing, he also used it to reaffirm the religious assumptions of the imperial age. Consequently, Yule's translation functioned not only as a textual recovery, but also as an ideological reconstruction that granted the Mirabilia Descripta renewed scholarly legitimacy within modern Orientalist discourse.

During the twentieth century, Henri Cordier further consolidated the text's importance in the study of medieval geography and missionary history through works such as Bibliotheca Sinica and Les Voyages de Jordanus. Cordier argued that the text's composition was closely linked to the papal missionary programs of the thirteenth century and represented a transition from miracle narrative toward geographical observation. Although rooted in religious belief, the work increasingly relied upon methods of observation, comparison, and inductive reasoning in its representation of foreign spaces. Meanwhile, the British historian Peter Jackson reinterpreted Jordanus within the broader history of Eurasian exchange in The Mongols and the West, 1221–1410. He identified the Mirabilia Descripta as a crucial source for understanding information networks and ecclesiastical communication systems during the era of the Mongol Empire [10].

By the late twentieth and early twenty-first centuries, the Mirabilia Descripta had also become integrated into the fields of travel narrative studies and postcolonial scholarship. Robert Silverberg associated the text with legends of Eastern Christian kingdoms in The Realm of Prester John, arguing that it continued the tradition of "biblical geography" through which unknown lands were symbolically incorporated into the universal framework of salvation history [18]. Similarly, scholars such as Suzanne Conklin Akbari and Felipe Fernández-Armesto have emphasized that the Mirabilia Descripta represents a transitional form between marvel writing and empirical geography. Although constrained by rhetorical and theological conventions, the text nevertheless reveals early tendencies toward empirical observation.

Since the beginning of the twenty-first century, scholarship on the Mirabilia Descripta has continued to expand through new translations and critical editions. The Catalan edition translated and edited by Jordi Joan Baños has provided an important foundation for research within Iberian academic contexts. At the same time, the study Une image de l'Orient au XIVe siècle: les Mirabilia descripta de Jordan Catala de Sévérac [5],

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completed in 2005 at the École des chartes by Christine Gadrat, has been praised by Thomas Tanase as "destined to become the authoritative edition" [19]. Gadrat not only conducted a meticulous textual analysis but also explored, from the perspectives of iconography and cultural history, the ways in which Jordanus constructed his image of the East. Her work further strengthened the importance of the Mirabilia Descripta within the fields of medieval travel literature and cross-cultural studies. Together, these recent scholarly contributions have deepened and broadened the interpretation of this remarkable medieval text.

In sum, the Mirabilia Descripta is not merely a medieval collection of marvels, but also a crucial node in the production and circulation of knowledge. Its textual history mirrors the transformation of medieval learning into modern scholarship. From monastic manuscripts to Orientalist translations, and from religious testimony to cultural analysis, the writings of Jordanus have continued to be rediscovered and reinterpreted across changing intellectual contexts.

4. From "Miracle" to "Knowledge": The Semantic Transformation of Mirabilia and the Emergence of Empirical Writing

4.1 The Semantics and Cognitive Function of "Marvels"

The term mirabilia derives from the Latin verb mirari, meaning "to wonder" or "to marvel," and fundamentally refers to things that inspire astonishment or admiration. In both classical and medieval contexts, mirabilia occupied an ambiguous space between miracle and natural wonder. It could refer simultaneously to manifestations of divine power and to unfamiliar phenomena found in nature or in distant lands. In the Latin translation of the Bible, the phrase mirabilia Deispecifically denoted the "wonders of God," carrying a strong theological significance as a linguistic expression of the relationship between faith and miracle. By the medieval period, however, especially within the tradition of mirabilia mundi literature, the semantic range of mirabilia gradually expanded to include geographical wonders, natural anomalies, and legendary accounts. It became an important discursive framework through which the unknown world could be interpreted and organized. In other words, mirabilia was not merely a religious category, but a composite concept situated at the intersection of theology, natural philosophy, and narrative rhetoric. Its ambiguity and flexibility enabled it to function as a bridge between religious cognition and empirical observation.

On the one hand, the concept preserved the tradition of miracle narratives by allowing travelers and writers to affirm divine authority and the order of creation through the language of marvels. On the other hand, it also provided a legitimate mode of expression for empirical observation, enabling foreign lands to be represented as knowable and describable realities. As Mary B. Campbell has argued, medieval travel narratives may be understood as a form of "theological empiricism," in which the traveler's witness functioned simultaneously as religious testimony and empirical report. Within this discursive structure, marvels became a rhetorical instrument that legitimized experiential statements. Through the narration of wonder, authors were able both to interpret the world theologically and to record it empirically [1].

From the perspective of cognition, marvels gradually evolved into an important engine of knowledge production. Lorraine Daston and Katharine Park have demonstrated that from the twelfth century onward, wonder increasingly became institutionalized as a mode of understanding the world. The recording and classification of marvels no longer functioned merely as supplements to faith, but emerged as essential methods for comprehending the order of nature [3]. Similarly, Anthony Grafton has emphasized that medieval practices of collecting extraordinary stories and ancient texts laid important cultural and methodological foundations for early modern scholarship [8]. By the late Middle Ages, therefore, mirabilia had ceased to function solely as evidence of divine miracles and instead became a cognitive mechanism that stimulated observation, documentation, and classification. This gradual semantic and methodological shift from marvels to scientia marked a profound transformation within the medieval system of knowledge itself.

The Mirabilia Descripta stands as a representative text of this epistemological transition. As a Dominican missionary, Jordanus Catalani initially approached the East from the perspective of religious evangelization. Yet during his travels, he increasingly adopted strategies grounded in empirical observation. He frequently employed expressions such as ut vidi("as I have seen") and ut audivi a fide dignis ("as I heard from trustworthy persons") in order to distinguish firsthand experience from reported information. Through this distinction, he established a form of epistemic authority rooted in perception and experience (auctoritas per experientiam).

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Unlike the scholastic tradition, which relied primarily upon textual authority and patristic sources (auctoritas per textum), Jordanus strengthened the credibility of his narrative through the perspective of the eyewitness. By continually invoking the reader's sense of wonder, he transformed marvels into both a rhetorical strategy for the spread of faith and a medium for the production of geographical and ethnographic knowledge.

4.2 Jordanus's Empirical Strategies

As a missionary, Jordanus demonstrated remarkable attentiveness to the religions, customs, and natural resources of the peoples he encountered in the East. His interests, however, were highly selective. Although contact with Eastern Christian communities must have been important to his work, he devoted relatively little attention to them. Instead, he adopted a posture of detached yet careful observation, offering vivid descriptions of Hindu and Parsi rituals. Significantly, he rarely judged these religious practices directly. His concern lay less with the truth or falsity of doctrine than with ritual practice itself and with the people who performed it. As a result, the reader senses that the true focus of his narrative is humanity rather than dogma.

A similar precision and sense of wonder characterize his descriptions of local customs, food, domesticated animals, and plant life. Jordanus recorded a wide variety of Indian flora and fauna, and his detailed discussions of elephants in particular reveal a deep curiosity about the natural world of the East.

Jordanus's originality becomes especially clear in the way he negotiated the tension between inherited literary traditions and personal experience. He openly declared that his work aimed to describe unusual things. Yet whenever such marvels threatened to exceed the boundaries of plausibility, his tone became restrained and cautious. In Greece, for example, he found little worth recording, whereas his descriptions became increasingly detailed as he traveled farther east. Even so, his narrative remained anchored within the realm of experiential credibility. Although he rarely cited the Bible or ecclesiastical authorities directly, he nevertheless sought to preserve many legendary motifs traditionally associated with the East. His solution was to assign these myths to clearly demarcated geographical zones, particularly the so-called "Third India," while explicitly stating that he had never personally visited these regions and knew of them only through reliable testimony. Through this strategy, he successfully distinguished between observed reality and inherited legend, satisfying his readers' expectations of marvels while preserving the credibility of his experiential narrative.

This balance is particularly evident in his discussion of the unicorn. In describing "Lesser India," Jordanus refers to an animal called the Rhinoceros, which resembled a horse and possessed a curved horn on its forehead. Yet he carefully emphasizes that this creature was "not the unicorn" [11]. The "true unicorn," by contrast, is relocated to the distant "Third India," alongside dragons and the giant bird known as the rukh. There, he writes, "in this land of India are found the true unicorns, shaped like large horses, with a single horn upon the forehead, short, thick, sharp, and solid." This narrative strategy reflects a subtle compromise. Jordanus remained faithful to his own observations by distinguishing the rhinoceros from the mythical unicorn, yet he also preserved the imaginative power of traditional legend by situating the unicorn within a remote and inaccessible realm. In doing so, he created an intermediate space between empirical reality and inherited fantasy.

This approach contrasts sharply with the stronger realism of Marco Polo. In his travel account, Marco Polo describes the "unicorns" of Sumatra as ugly creatures with the skin of buffaloes, legs like elephants, and black horns, which delighted in wallowing in mud and resembled wild boars [13], in other words, rhinoceroses stripped entirely of mythical grandeur. Jordanus, by contrast, chose a strategy of coexistence rather than demystification. His narrative expanded geographical knowledge while still preserving the poetic and symbolic dimension of marvel literature.

Jordanus employed a similar distinction between experience and legend in his discussion of the Earthly Paradise. He explicitly located Paradise between the "Third India" and Ethiopia, in a region he himself had never visited. He described four rivers flowing from Paradise, carrying gold and precious stones, while dragons dwelling near one of these rivers supposedly left behind bones and jewels that eventually came into the possession of the Ethiopian ruler known as Prester John. These descriptions demonstrate that Jordanus did not simply repeat traditional legends uncritically. Rather, he organized them within a carefully defined framework that clearly separated empirical observation from unverifiable myth. In this way, he maintained a crucial equilibrium between wonder and credibility.

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The broader logic underlying Jordanus's narrative strategy may be understood through the interconnected principles of testimony, measurement, and difference.

First, at the level of testimony (testimonium), Jordanus consistently emphasized his own firsthand experience and the reliability of his sources. Expressions such as "I saw with my own eyes" or "I learned from trustworthy persons" establish a foundation of narrative authenticity. This rhetoric of witnessing continued the devotional logic of medieval pilgrimage narratives, in which testimony reinforced faith, while simultaneously laying the groundwork for a new form of empirical authority. As Valerie I. J. Flint has argued, medieval marvel narratives traditionally relied upon chains of authority in order to validate their truthfulness [4]. Jordanus, however, internalized authority within the experience of the individual observer. He reorganized the visible world of the East through the eyes of the traveler rather than through the doctrinal framework of the missionary. This experiential witnessing not only gave the text a stronger sense of reality, but also enabled the transformation of marvels into objects of knowledge.

Second, at the level of measurement (mensuratio), Jordanus introduced quantitative language in order to define and compare spaces, resources, and customs. He frequently employed expressions such as "a certain number of days' journey," "richer in gold than the kingdoms of Europe," or "twice the height of ordinary men." Through such comparisons, marvelous phenomena were incorporated into a measurable cognitive system. As Mary B. Campbell has observed, measurement in medieval geographical writing was itself a form of intellectual power. By introducing numbers, proportions, and spatial calculations, marvels were repositioned within a rational order. Jordanus's narrative technique therefore marked a further secularization of the semantic meaning of mirabilia. The marvelous no longer referred solely to divine miracles, but increasingly to observable and measurable forms of difference.

Finally, at the level of difference (differentia), Jordanus organized Eastern products, customs, and religions through strategies of comparison that situated them at the boundaries of European knowledge systems. Statements such as "their faith is contrary to ours," "stones grow within their waters," or "their trees bear silver" preserved the exotic appeal of marvel narratives while simultaneously reinforcing a Western-centered perspective of knowledge through contrast and differentiation. Yet this construction of difference was not entirely exclusionary. Rather, it constituted a fundamental principle of medieval empirical classification. As Anthony Pagden has argued, the discourse of difference in European travel writing functioned as a mechanism of knowledge production through which the world could be reorganized into a comprehensible whole [1]. In this sense, Jordanus's text represents an intermediate stage in the transformation of marvels into empirical geographical knowledge.

Taken together, the Mirabilia Descripta is far more than a simple collection of curiosities. It is a representative text that reflects the transformation of European knowledge paradigms during the fourteenth century. Although still clothed in the language of marvels, the work quietly advanced a new mode of cognition through the self-validation of testimony, the rational framing of measurement, and the epistemological organization of difference [8]. In this process, Jordanus not only recorded a richly varied Eastern world, but also demonstrated, through his cautious and innovative prose, how late medieval Europeans gradually attempted to measure with the tools of experience a distant world that had long been defined by myth and miracle.

5. Intertextuality and Inheritance: The Position of the Mirabilia Descripta within the Genealogy of Medieval Geographical Imagination

Within the medieval literary tradition of mirabilia, the Mirabilia Descripta of Jordanus Catalani did not emerge in isolation. Rather, it formed part of a broader intertextual network that connected it with both earlier and contemporary writings. This intertextuality is especially visible in descriptions of certain exotic peoples, such as the Cynocephali and the Pygmies, both of which functioned as recurring cross-cultural motifs within medieval geographical imagination.

As early as the travel account of Odoric of Pordenone, the inhabitants of the Nicobar Islands were described as people with human faces and canine features who worshipped oxen, displayed courage, and practiced cannibalism [15]. Odoric nevertheless noted that their ruler governed justly and allowed foreign travelers to move safely through the region. Similarly, Marco Polo located the Cynocephali in the Andaman Islands,

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describing the women as beautiful while portraying the men as dog-headed cannibals [13]. Comparable accounts also appeared in the writings of Ibn Battuta [9]. Jordanus inherited this traditional motif, yet he relocated it to the "Third India" and attempted to integrate it into a more systematic geographical framework.

A similar intertextual relationship may be observed in the descriptions of the Pygmies. Odoric wrote that although these people were physically small, they nevertheless possessed rational souls [20]. Jordanus likewise described a group living on Java who were no taller than children of three or four years of age, covered in hair, and dwelling in forests and mountains [11]. Yet neither writer treated these peoples simply as monstrous non-human beings. Instead, both attempted to redefine them through categories of rationality and embodied experience. This shift reflects a broader cognitive transition within medieval marvel literature, moving gradually toward empiricism and away from pure mythological representation.

Such transformation becomes even more apparent in the overall structure of the Mirabilia Descripta. Unlike the narrative method of Marco Polo, whose account follows the linear logic of travel and relies upon the authority of personal visitation "I was there", Jordanus abandoned the framework of sequential journeying and reorganized his material into a tripartite structure of geography, material products, and religion. This arrangement creates a layered progression from material realities to systems of belief. For example, in his discussion of India, he first describes products such as pearls, diamonds, and frankincense, then turns to local customs and notions of chastity, and finally addresses religious practices. Through this structure, marvels cease to depend solely upon personal anecdote and instead become integrated into a more systematic framework of knowledge. As Mary B. Campbell has observed, Jordanus "begins with wonder but ends with classification" [1]. This act of classification was not merely a method of organizing information, but also a rhetorical strategy for legitimizing knowledge itself. Through rationally ordered narrative structures, marvels were transformed into comprehensible and transmissible forms of world knowledge.

Christine Gadrat has further argued that although Jordanus physically traveled in the East, his writing remained deeply rooted within the intertextual tradition of marvel literature. On the one hand, he presented himself as an eyewitness narrator. On the other hand, he consciously adopted narrative models familiar to his audience, thereby creating a productive tension between personal experience and inherited literary conventions. His linguistic style also reveals important cross-cultural dimensions. His concise Latin prose occasionally incorporated Romance and Eastern linguistic elements. The early use of the term porcellana for porcelain, for instance, reflects the close relationship between geographical knowledge and linguistic transmission [6]. This linguistic hybridity was not merely a stylistic feature but also reveals the social pathways through which knowledge circulated. Through monastic copying, oral retelling, and translation, the Mirabilia Descripta became a shared "text of Eastern knowledge" among religious communities and contributed to the formation of a broader late medieval "community of Oriental narratives."

The intertextual relationship between Jordanus and Odoric of Pordenone is especially revealing of Jordanus's rhetorical position. Odoric's Itinerarium largely centered upon miracles and sacred marvels, whereas Jordanus introduced a more empirical mode of narration into similar subject matter. In discussing the legendary mountain of Sri Lanka associated with Adam's fall from Paradise, Jordanus wrote that local people claimed Adam had descended there, "yet the mark upon the rock is not as deep as the story declares." The small conjunction "yet" transforms the account from a purely transcendent miracle into a phenomenon open to verification and observation. This "skepticism within faith" became an important innovation in fourteenth-century religious writing. Without dismantling the framework of belief, Jordanus introduced the logic of empirical verification, thereby allowing "the testimony of the missionary" and "the observation of the traveler" to coexist within the same narrative structure.

As Joan-Pau Rubiés has argued, the Mirabilia Descripta established "a new logic of coexistence between religious testimony and empirical description, making marvels part of geographical knowledge" [17]. This logic would later be inherited by Portuguese missionaries of the fifteenth and sixteenth centuries, who likewise began with wonder yet increasingly concluded with measurement, classification, and observation.

At the level of textual transmission and literary genealogy, Jordanus also formed important connections with later travelers such as John of Marignolli. In his own Eastern travel account, Marignolli continued the tripartite classificatory structure found in the Mirabilia Descripta and incorporated several of its empirical details. As Christine Gadrat has demonstrated, Jordanus's letters concerning the martyrdom at Thane were repeatedly copied, revised, and expanded within monastic networks, eventually generating multiple manuscript

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traditions [19]. This process reveals the fluidity and reproducibility of the Mirabilia Descripta as a "knowledge text." It was not a static individual work, but rather a body of knowledge capable of being cited, expanded, and rewritten. Through this dynamic intertextual process, the Mirabilia Descripta secured its central place within the tradition of late medieval geographical writing.

6. Conclusion

The textual history of Mirabilia Descripta reflects a remarkable "intellectual journey" traversing its origins as a private monastic codex to its status as an object of modern scholarly inquiry and, ultimately, a subject of contemporary interdisciplinary interpretation. Through an analysis of its structure, narrative, and intertextual relations, this paper has elucidated the pivotal position of this work within the evolution of the medieval geographical imagination.

The writing of Jordanus Catalanus signifies a profound internal transformation within the tradition of "wonder" literature. While he did not entirely discard the religious undertones of mirabilia, he utilized the empirical strategies of "witnessing, measurement, and difference" to reshape wonder into a cognitive tool and an engine for knowledge production. In Mirabilia Descripta, the East is no longer a mere repository of myths and grotesqueries, instead, it emerges as an empirical object that can be observed, categorized, and understood. This semantic shift from "miracle" to "knowledge"—reflects not only the loosening of the late medieval cognitive system but also foreshadows the dawn of modern geographical and ethnographic methodologies.

In terms of narrative structure, Jordanus broke away from the traditional linear itinerary, replacing it with a tripartite classification system of "geography, commodities, and religion." This structure serves as more than just a method of information organization, it represents a hierarchical construction of cognition ascending from the material world to the spiritual order and demonstrates the infiltration of rational thought into the theological framework. Within his specific accounts, the rigorous distinction between vidi ("I saw") and dicitur ("it is said") established the authority of individual experience in the constitution of knowledge, allowing the "missionary's witness" and the "traveler's observation" to coexist and mutually reinforce one another.

Within the broader context of intellectual history, Mirabilia Descripta participated in and facilitated the transformation of the "Oriental" image. Since the era of the Alexander Romance, the East had long been imagined as a stage for miracles and monstrosities. Under Jordanus's pen, however, the East began to emerge as a world possessed of internal logic and accessible through rational inquiry. This shift concerns not only the expansion of geographical knowledge but also the ethical dimension of perceiving the "Other", the Easterner is no longer a monster or a mere symbol, but a subject endowed with a rational soul and practical experience.

Consequently, Mirabilia Descripta serves as both a summation of the medieval mirabilia tradition and a harbinger of modern empirical knowledge. Beginning with wonder, employing systematic observation as its method, and culminating in the reconstruction of knowledge, the work builds an invisible bridge between mirabilia and scientia. This bridge connects faith with reason and miracles with experience, it also links an ending era of old cognition to a burgeoning epoch of new knowledge. The true value of Mirabilia Descripta lies in the subtlety of this historical pivot, it is an incomplete revolution, yet an undeniable enlightenment.

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Traditional Chinese Music Goes Global: Encoding and Digital Audience Reception in Black Myth: Wukong

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Abstract

Video games can circulate culturally specific music widely, but positive audience response does not by itself show how that music is interpreted. This study examines the encoding and English-language online reception of traditional Chinese musical material in Black Myth: Wukong. The encoding analysis draws on identifiable official soundtrack and production sources. The reception analysis uses 225 source-traceable analytic records purposively retained from 42 public Reddit and Steam discussion threads dated between 18 August 2024 and 19 August 2025. To reduce searchability and avoid retaining user identities, the dataset stores anonymized paraphrases rather than verbatim comments; each record is linked to its public thread URL and source metadata. One decoding-position code and eight non-exclusive thematic codes were applied. Dominant readings accounted for 151 records (67.1%), negotiated readings for 60 (26.7%), and oppositional readings for 14 (6.2%). Track identification was the most frequent theme (n = 110), followed by emotional appreciation (n = 56), access and distribution (n = 44), and historical contextualization (n = 37). Cultural-learning discourse appeared in 17 records, while no record met the conservative criterion for exoticizing language. The results show that online reception frequently involved naming, locating, and contextualizing musical material rather than affective evaluation alone. Because the corpus is purposive, Reddit-heavy, and coded by one researcher, the findings describe the selected discourse and do not estimate platform populations or causal effects.

Keywords

video game music, encoding-decoding, online reception, traditional Chinese music, cultural communication

1. Introduction

Cultural products travel across linguistic and historical boundaries more easily than the interpretive conventions that originally made them meaningful. Hall's [1] encoding-decoding model treats communication as a contingent relation between production and reception rather than as the automatic transfer of a stable message. Reception aesthetics similarly emphasizes that audiences interpret unfamiliar works through prior horizons of expectation [2]. For cultural products designed for transnational circulation, the central question is therefore not only whether audiences approve of a work, but what forms of interpretation accompany that approval.

Video games intensify this problem because music, image, narrative, and player action are encountered together over extended periods. Game music does not merely decorate play. It can organize emotion, mark spaces and characters, connect a new production to earlier media memories, and make culturally specific

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material legible within familiar genre structures [3,4]. Chinese games have increasingly been discussed as vehicles for cultural identity and international communication [5], yet research often concentrates on narrative adaptation, visual symbolism, or aggregate audience sentiment rather than on the interpretive work directed at music [6-9].

Black Myth: Wukong provides a useful case because its soundtrack combines newly composed material with traditional instruments, chant-based adaptation, and reworked music associated with the 1986 television adaptation of Journey to the West. The official soundtrack selection contains 67 downloadable tracks, while several high-profile pieces remain accessible in the in-game music library because of copyright restrictions [10]. Production materials further document the use of suona, sanxian, adapted Buddhist chant, orchestral recording, and the reimagining of established television themes [11,12]. These materials make it possible to connect documented production choices with the kinds of questions and evaluations that appear in public English-language discussion.

Previous reception research on the game demonstrates the availability of large online corpora and the usefulness of sentiment and network analysis [13]. However, volume and polarity do not remove the need for source-level verification or for distinctions among forms of response. A positive post may express emotional pleasure, identify a historical reference, ask for the name of an instrument, or complain that a soundtrack cannot be downloaded. These are analytically different acts even when their overall evaluation is favorable. Musical exoticism also warns that appreciative language can simplify cultural difference into a generalized aesthetic category [14-16], but such a claim must be based on observable discourse rather than inferred from unfamiliarity alone.

The present study addresses two linked questions. First, which traditional or historically recognizable musical resources are documented in the soundtrack's production materials? Second, how do traceable English-language public discussion entries position and interpret that music? Rather than estimating the attitudes of a player population, the study describes a small, purposively selected discourse corpus. Its contribution is substantive and methodological: it identifies recurring reception practices around appreciation, contextualization, track identification, learning, and access, while making every reception-side observation auditable through a source URL and analytic identifier.

2. Method

2.1 Research Design

The study used a qualitative-dominant, two-sided case design. The encoding side examined documented soundtrack-production materials. The reception side used qualitative content analysis [17] with descriptive counts to classify interpretive positions and thematic practices in public online discussion. The two components were connected by focusing on the same object: traditional and historically recognizable musical material in Black Myth: Wukong. No inferential tests were used because the reception corpus was purposive rather than probability-based.

2.2 Case and Scope

Black Myth: Wukong was selected because it achieved substantial international circulation and because its soundtrack visibly incorporates traditional instruments, chant-based material, and reworked music associated with Journey to the West. The analysis is restricted to music and soundtrack access. Visual design, gameplay difficulty, and narrative interpretation were excluded unless an entry explicitly connected them to music.

2.3 Encoding-side Materials

Encoding evidence was restricted to identifiable public sources: the official Steam soundtrack page published by Game Science; production footage and a documentary released by 8082Audio, the studio credited with major parts of the game's audio production; and published China Daily reports and interviews. The sources were accessed on 31 July 2026. Claims were retained only when a source directly documented the musical element, recording process, adaptation, or production strategy. The study did not infer the cultural meaning of every track from instrumentation alone.

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2.4 Reception Corpus Construction

A source-level corpus was assembled manually from publicly accessible Reddit and Steam discussion pages. Searches combined the game title with the terms "soundtrack," "OST," "music," "song," "chant," "instrument," "Celestial Symphony," "Rebirth Mantra," and named chapter or trailer cues. The search and screening log is supplied in Supplementary Table S4. Relevant English-language opening posts and replies were purposively retained when they directly addressed soundtrack evaluation, track identification, cultural or historical context, traditional instruments or chant, or access to the music. Duplicate records, entries shorter than five words, non-English material, and technical sound-bug discussions unrelated to the music itself were excluded.

The final corpus contains 225 analytic records from 42 unique public threads: 201 records from 34 Reddit threads and 24 records from eight Steam threads. The source dates range from 18 August 2024 to 19 August 2025. YouTube was excluded to keep the corpus within threaded discussion forums that share a consistent opening-post-and-reply structure, and because YouTube comment reception of the game had already been examined in prior work [13]. To reduce the possibility of reverse-identifying individual users through search engines, usernames were not retained and the supplementary dataset stores short anonymized paraphrases rather than verbatim quotations. Each record nevertheless includes an analytic ID, platform, thread ID, thread date, thread title, thread-level URL, retrieval date, and coding results. Direct comment permalinks were not retained; the supplement should therefore be understood as a source-traceable analytic record rather than a verbatim archive.

2.5 Coding Procedure

The unit of analysis was one relevant discussion contribution, either an opening post or a reply. Each record received one decoding-position code. A dominant reading accepted, recognized, or endorsed the music or its cultural-musical framing without a substantive reservation. A negotiated reading combined acceptance with information seeking, access criticism, qualification, or reinterpretation. An oppositional reading explicitly rejected the value, effectiveness, or relevance of the soundtrack. Questions about a track name, genre, history, availability, or delivery were coded as negotiated when the request or reservation changed the interpretive position rather than merely supplying factual context.

Eight thematic codes were applied on a non-exclusive basis, drawing on thematic analysis [18]: emotional appreciation, historical contextualization, track identification, comparative evaluation, access and distribution, cultural learning, identity and memory, and exoticizing language. Supplementary Table S1 provides operational definitions and decision rules. The first author conducted a rule-assisted first pass to flag potentially relevant words and phrases, followed by a complete manual review of all 225 records and a second whole-corpus consistency check. Because the corpus was coded by one researcher, no intercoder-reliability coefficient is reported. The audit trail permits readers to inspect every retained paraphrase, source thread, and code assignment.

2.6 Analysis

Frequencies were calculated for the three decoding positions and eight thematic codes. Theme co-occurrence counts were calculated at the record level. Counts are descriptive summaries of this purposively selected discourse corpus and are not estimates of Reddit, Steam, or player populations. Automated sentiment analysis and inferential platform tests were not used because the research question concerns interpretive practices and because the platform distribution is strongly imbalanced.

3. Results

3.1 Corpus Composition and Auditability

The reception corpus comprised 225 source-traceable analytic records from 42 unique public discussion threads. Reddit contributed 201 records from 34 threads, and Steam contributed 24 records from eight threads. Each record has a thread-level URL and source metadata in Supplementary Table S2. The dataset also marks every excerpt as an anonymized paraphrase rather than a verbatim quotation. The corpus is purposive and

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Reddit-heavy. The platform totals are therefore reported as corpus composition rather than as evidence of platform effects.

Table 1: Composition of the traceable reception corpus.

Platform	Records	Source-date range	Sampling unit
Reddit	201	2024-08-19 to 2025-08-19	Relevant opening posts and replies from 34 threads
Steam	24	2024-08-18 to 2025-06-24	Relevant opening posts and replies from 8 threads
Total	225	2024-08-18 to 2025-08-19	225 analytic records from 42 source threads

3.2 Documented Encoding Strategies

The source review identified five defensible encoding strategies. The official soundtrack page establishes the scale and current distribution format of the soundtrack. Production sources document specific recording and adaptation practices rather than requiring the analysis to infer them from listening alone.

Table 2: Encoding claims and their documentary evidence.

Documented strategy	Realization in the soundtrack	Analytic relevance
Large-scale original soundtrack	Official selection of 67 downloadable tracks; several licensed pieces remain in the in-game library	Establishes the soundtrack as an extensive designed object and links distribution constraints to reception.
Reimagining established Journey to the West themes	"Celestial Symphony" and "Where Lies the Path Ahead?" were reworked for the game	Connects the new game to television memory and recognizable musical heritage.
Adaptation of Buddhist chant	Production footage identifies "I Also Want to Be a Destined One" as an adaptation of the Rebirth Mantra	Creates a point at which players can recognize, question, or seek the source of chant-based material.
Recording of traditional instruments	Dedicated production footage documents suona recording; the producer also described the use of sanxian	Shows that traditional timbres were recorded as production components rather than described only as audience impressions.
Blending traditional and contemporary techniques	The studio describes combining traditional musical resources with modern composition, orchestration, and production technology	Provides a documented basis for analyzing comments about continuity, remake, modernization, and cultural recognition.

3.3 Decoding Positions

Dominant readings were the most frequent position, accounting for 151 of 225 records (67.1%). Negotiated readings accounted for 60 records (26.7%), and oppositional readings for 14 (6.2%). Dominant records included strong praise, repeated listening, recognition of named tracks, and direct contextual explanations that accepted the music's cultural framing without reservation. Negotiated records frequently combined appreciation with a request for a track name, genre, cultural background, downloadable file, or streaming release. Oppositional records were comparatively uncommon and most often rejected the value of a soundtrack edition or criticized the inability to access the music outside the game rather than rejecting traditional Chinese musical material itself.

These distributions describe the selected records only. The Reddit and Steam samples differ greatly in size and were obtained purposively from music-related threads, so no inferential platform comparison was conducted. Figure 1 presents the overall decoding-position counts and percentages.

3.4 Thematic Structure

Track identification was the most frequent theme, occurring in 110 records (48.9%). Emotional appreciation appeared in 56 records (24.9%), access and distribution in 44 (19.6%), and historical contextualization in 37 (16.4%). Comparative evaluation occurred in 22 records (9.8%), cultural learning in 17 (7.6%), and identity and memory in 10 (4.4%). No record met the conservative operational criterion for exoticizing language. Because thematic codes were non-exclusive, the frequencies sum to more than the corpus size.

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Figure 1: Decoding positions in the 225-record discussion corpus.

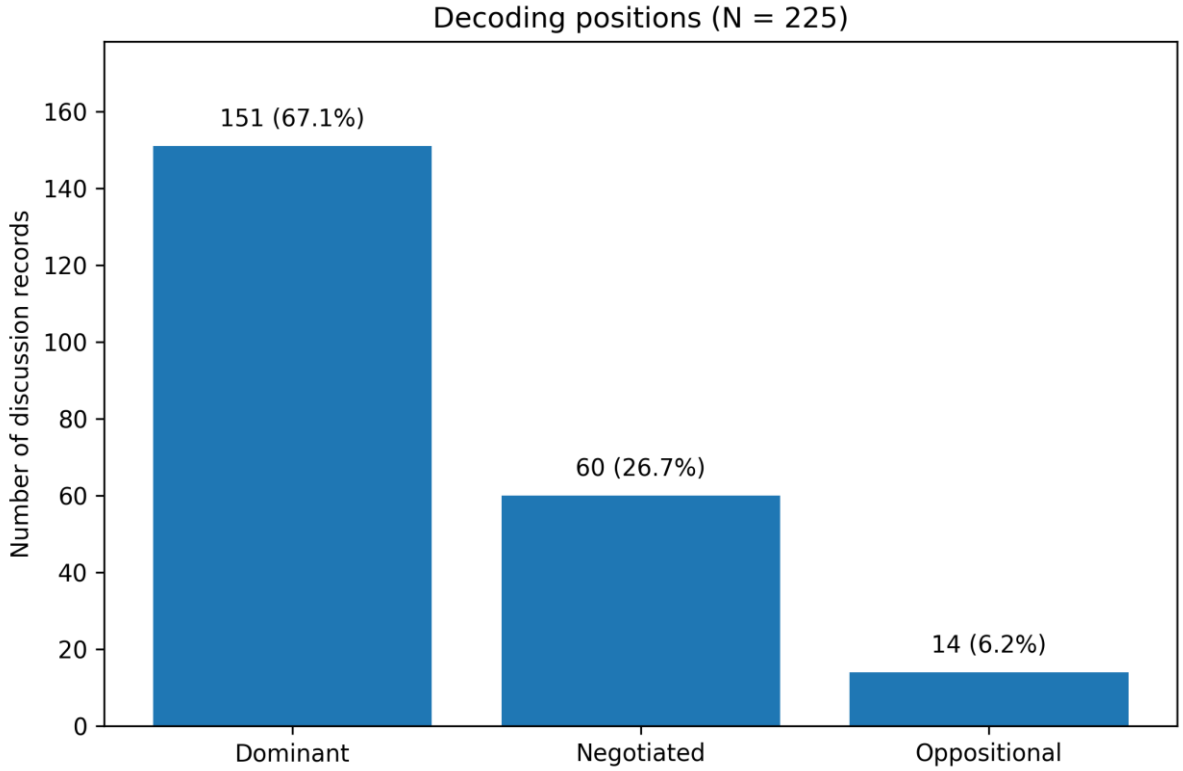
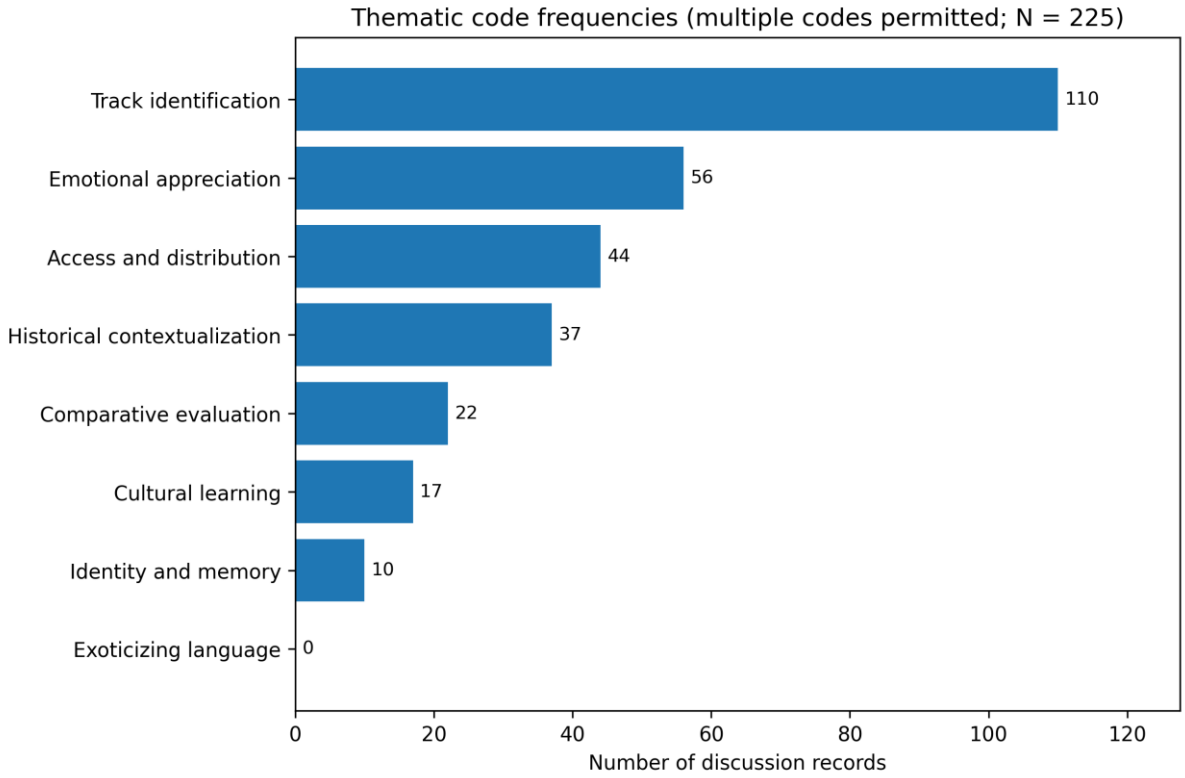


Figure 2: Frequency of thematic codes in the 225-record corpus; multiple codes were permitted.



The co-occurrence pattern shows how different forms of reception were combined. Emotional appreciation co-occurred with track identification in 31 records and with comparative evaluation in 18. Historical contextualization co-occurred with track identification in 18 records and with cultural learning in 12. Track identification co-occurred with access and distribution in 14 records, indicating that the desire to name a

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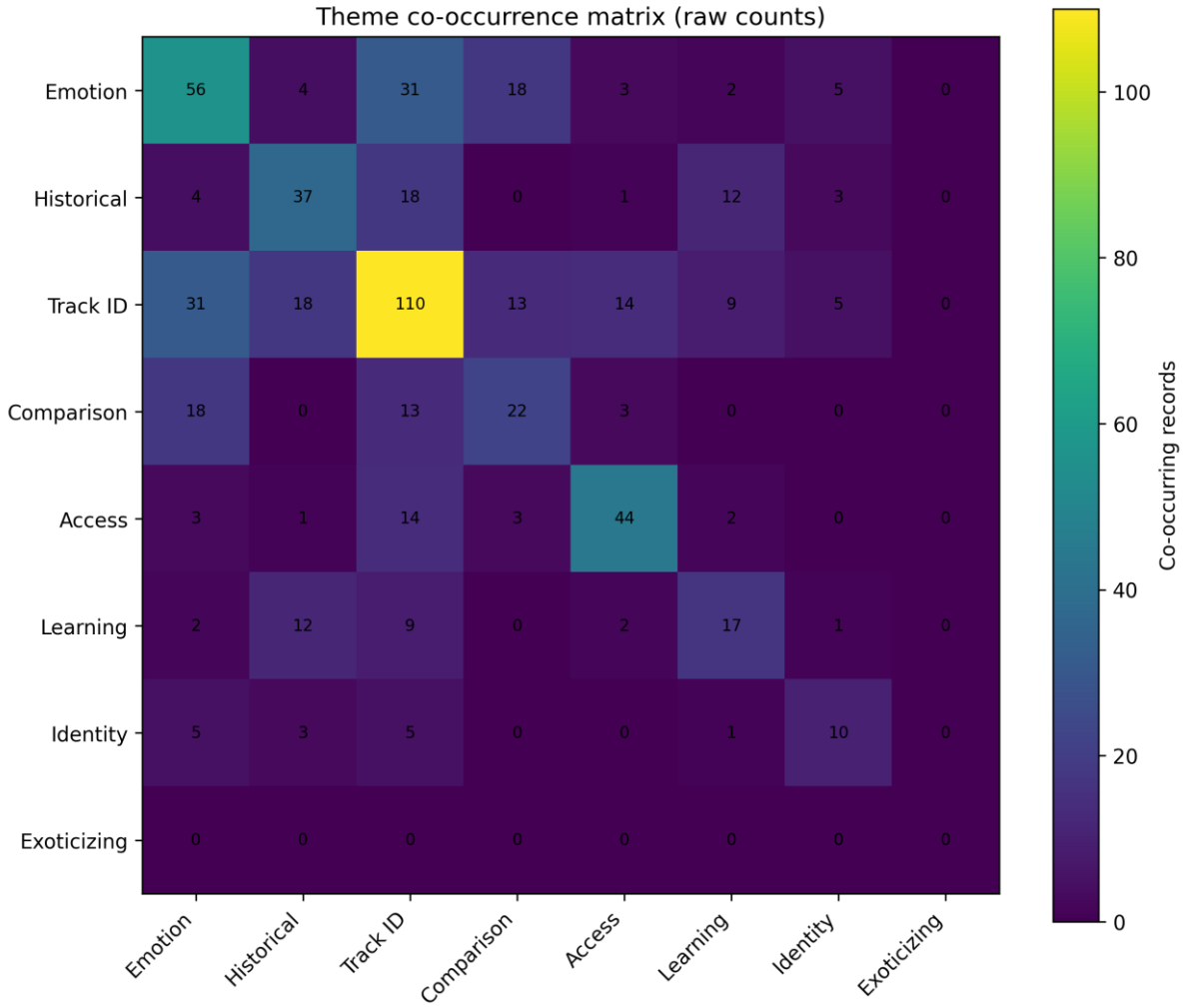
musical passage was often connected to the ability to find, stream, or download it. These raw counts are displayed in Figure 3 and are not significance tests.

3.5 Boundaries of Interpretation

No retained record met the conservative exoticizing-language criterion. This absence cannot establish that exoticizing discourse is absent from the wider audience; it may reflect the search terms, source selection, paraphrasing procedure, or strict decision rule. More directly observable evidence of cultural engagement appeared in 17 cultural-learning records, including requests for information about chant, instruments, genre, historical sources, or the 1986 Journey to the West television adaptation. The analysis therefore focuses on observable information seeking rather than inferring an unobserved psychological barrier to learning.

Figure 3: Theme co-occurrence matrix using raw record counts.



4. Discussion

4.1 Reception as Negotiated Interpretive Work

Dominant readings formed the largest category in the corpus, but dominance should not be equated with deep cultural understanding. Some records expressed sustained emotional approval, whereas others accepted or supplied a track identification or contextual explanation without further reflection. Negotiated readings were also substantial and commonly joined appreciation with requests for names, histories, genres, or access. Hall's [1] framework remains useful because it distinguishes acceptance, qualification, and rejection without reducing reception to a positive-negative continuum.

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This result qualifies approaches that equate positive polarity with successful cultural transmission. Sentiment can describe evaluative tone, but it does not distinguish enjoyment from track recognition, historical contextualization, or cultural learning. The present study therefore does not claim that positive reception is unrelated to understanding. It shows that more specific indicators—such as identifying a chant, naming an instrument, connecting a cue to an earlier adaptation, or seeking further information—are needed before claims about interpretive engagement can be made.

4.2 Historical Recognition and Information Seeking

Historical contextualization appeared in 37 records, emotional appreciation in 56, and explicit cultural-learning discourse in 17. Some users connected the soundtrack to the 1986 Journey to the West television adaptation, asked about Buddhist chant or traditional instruments, or sought music in related regional styles. Others expressed nostalgia or linked the game to established Wukong memories. These patterns show that affective appreciation, historical recognition, and information seeking can overlap, although the corpus cannot determine whether online questions led to sustained learning outside the thread.

The encoding-side sources help explain why such responses were possible. The production did not rely solely on undifferentiated “Chinese-style” atmosphere. It reworked recognizable television themes, adapted chant material, recorded traditional instruments, and combined these resources with contemporary production. Such choices create multiple entry points: memory for audiences who know earlier adaptations, timbral novelty for unfamiliar listeners, and searchable identifiers for users who seek more information.

4.3 Access and Distribution as Part of Reception

Access and distribution appeared in 44 records. Users asked where to find particular tracks, whether the soundtrack was available on Spotify or as downloadable files, why a deluxe edition required the game to remain open, and whether copyright restrictions explained missing pieces. These posts are part of reception because they document what audiences can do after hearing the music: identify it, replay it, compare versions, or seek related material.

For cultural communication, access conditions can affect what audiences are able to do after an initial encounter. Searchable track titles, translated liner notes, credits, instrument names, and clear file access can convert momentary appreciation into opportunities for further inquiry. This is a practical design implication rather than evidence that access automatically produces cultural learning.

4.4 Methodological Implications

Source-level documentation demonstrates both its value and its limits. The 225-record audit trail ties every analytic record to a public thread, source date, retrieval date, and code assignment. At the same time, the use of anonymized paraphrases and thread-level rather than comment-level permalinks means that the supplement is not a verbatim archive. Larger studies should preserve institutionally approved raw records and stable comment identifiers at the time of collection, while respecting platform terms and the searchability risks of public quotations. Platform should not be inferred from these data. Reddit supplied 201 records and Steam 24, and the threads were selected because they contained music-related discourse. Any difference between the two platforms would therefore be confounded with sampling volume, thread topic, visibility, and retrieval conditions. Platform counts are retained only to describe the corpus.

4.5 Limitations

The reception corpus is purposive, English-language, and strongly weighted toward Reddit. Although 225 records provide substantial thematic coverage, they do not constitute a random or representative sample and cannot estimate the prevalence of interpretations among players or non-posting audiences.

The unit of analysis includes both opening posts and selected replies from 42 public threads. The supplementary text is paraphrased to reduce searchability, and direct comment permalinks, usernames, voting behavior, deleted material, private groups, and user histories were not retained. Thread-level URLs improve source traceability but do not provide the same auditability as an archived verbatim corpus with stable comment identifiers.

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The analysis was conducted by one coder using a rule-assisted first pass followed by two manual reviews. The detailed codebook and full audit trail improve transparency, but they do not substitute for independent coding. Future work should use multiple trained coders and report agreement on a clearly defined sample.

Source pages may change or disappear. URLs and retrieval dates are supplied, but long-term preservation would require an institutionally approved archive consistent with platform terms and research ethics. The platform imbalance also prevents valid platform comparison.

The encoding analysis relies on production documentation and does not include acoustic feature analysis. It identifies documented instruments, adaptations, and production choices rather than measuring musical structure directly.

5. Conclusion

This study examined documented soundtrack design and 225 source-traceable analytic records of English-language public discussion about traditional Chinese music in Black Myth: Wukong. Production materials document the reworking of Journey to the West themes, chant adaptation, traditional instruments, and contemporary scoring practices. In the reception corpus, dominant readings were most frequent, but the most common thematic activity was track identification. Emotional appreciation, soundtrack access, historical contextualization, and explicit cultural-learning questions also appeared.

The evidence supports a cautious conclusion. Positive response alone is not a sufficient measure of cultural understanding, but online reception can contain observable forms of engagement beyond approval, including naming tracks, identifying instruments or chants, connecting music to earlier media, and seeking cultural context. The corpus does not support claims about population prevalence, platform effects, or the causal consequences of exoticizing discourse. Future research should combine larger prospectively archived corpora, stable comment identifiers, multiple coders, multilingual sampling, and direct measures of learning.

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Cross-Border Ageing from Hong Kong to Guangdong: Mobility, Welfare and Social Integration in the Greater Bay Area

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Abstract

Hong Kong is aging rapidly, while the local residential care capacity remains constrained. More and more elderly people are now spending part or all of their later years in Guangdong. This article explores how the institutional division under “one country, two systems” affects cross-border aging in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA), and whether the expansion of cross-border care services will lead to more equitable aging. This study integrates transnational aging, Bourdieu's capital theory, place attachment and social embeddedness. Moreover, this study draws on policy documents, official statistical data and six original semi-structured interviews with Hong Kong elderly people living in Shenzhen, Zhongshan and Guangzhou. This article holds that cross-border aging is a socially stratified mobility process. Unequal capital determines who can move, and fragmented welfare portability determines which rights can move with them. And place attachment and embeddedness determine whether the move results in a sustainable home. Interviews show that even where the schemes exist, healthcare discontinuity, eligibility uncertainty, and digital barriers persist. Therefore, merely expanding care service capacity for care may reproduce inequality in later life rather than alleviate it.

Keywords

cross-border ageing, Greater Bay Area, welfare portability, Bourdieu’s capital theory, place attachment, social embeddedness

1. Introduction

Hong Kong’s population is ageing at an alarming rate, making long-term care a significant social issue. In 2023, the population aged 65 and above would projected to reach about 1.76 million, or 23.3% of the population, a share expected to reach 36% by 2046 [1]. The same projections point to shrinking family size, weakening family care capacity, poverty among older people and long waits for subsidised residential care. Such pressures have led the government to encourage elderly care and residential services in Guangdong, in particular the Guangdong–Hong Kong–Macao Greater Bay Area (GBA). In a survey of 1,761 Hong Kong residents, more than 80% would consider retirement in a mainland GBA city, acceptance peaked at 63% among those aged 61 to 75, and 96% supported expanding the Guangdong scheme [2].

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However, cross-border elderly care should not be regarded simply as moving the elderly from an expensive city to one with cheaper land and services. It is a sociological process involving mobility, social class, local attachment and cultural adaptation. This paper therefore asks: under "one country, two systems", how does institutional division between Hong Kong and Guangdong shape who is able to move, which rights move with them, and whether relocation produces a sustainable home? Using transnational ageing, Bourdieu's capital theory, place attachment and social embeddedness, it argues that cross-border ageing is essentially a socially stratified process of mobility: unequal capital determines who can move, fragmented welfare portability determines which entitlements travel, and attachment and embeddedness determine whether a move succeeds. Simply increasing the number of care beds, therefore, may perpetuate rather than mitigate later-life inequalities.

This paper develops a multi-level analytical framework that connects mobility capacity, institutional welfare portability and place-based sense of belonging. This framework helps assess whether expanding cross-border care delivers more equitable ageing outcomes or merely shifts related welfare costs.

2. Theoretical Framework

The paper integrates four perspectives, each explaining a different layer of the same process. Transnational ageing treats later life as organized beyond a single nation-state [3], and a retirement-mobilities approach extends this to the movement of pensions, care, information and family support rather than of people alone [4]. Together they describe the structural condition of GBA cross-border ageing: older people must connect to two systems inside one sovereign state. Bourdieu's theory of economic, social and cultural capital [5] then explains the unequal ability to use those channels, and therefore who becomes mobile. Place attachment [6] explains why resources alone cannot guarantee a meaningful home, since familiarity, identity and participation are built over time. Social embeddedness [7] explains why care decisions are taken within family and community networks rather than by isolated individuals. The four perspectives thus move from structure to capacity to belonging: expanding care options may reproduce inequality unless welfare, healthcare and social relations can also cross institutional boundaries.

3. Data and Method

This analysis utilized three sources. Official statistics and policy papers provide the institutional context. The 2023 HKFTU survey showed the willingness to age across the boundary [2]. The main qualitative data come from six original semi-structured interviews with Hong Kong seniors aged between 61 and 75 living in Shenzhen, Zhongshan or Guangzhou. Participants were purposively recruited through Hong Kong resident networks (Table 1).[1] A shared interview guide explored motivations for relocation, healthcare access, welfare portability, digital barriers, community integration and policy-related priorities. The transcripts were coded thematically into eight recurring themes. These themes formed the basis for the analysis presented below. Participants were anonymously reported as P1 to P6.

Table 1: Profile of interview participants

ID	Age / gender	Former occupation	Guangdong base	Time in Guangdong	Mobility pattern
P1	67 / Male	Civil servant	Shenzhen	3 years	Mostly Guangdong; monthly return to Hong Kong
P2	72 / Female	Retail worker	Zhongshan	4 years	With spouse; Hong Kong every 1–2 months
P3	64 / Female	Accountant	Guangzhou	2 years	Near daughter; frequent Hong Kong visits
P4	75 / Male	Technician	Shenzhen	5 years	Long-term; Hong Kong for some medical care
P5	69 / Female	Teacher	Zhongshan	2.5 years	Mostly Guangdong; active locally
P6	61 / Male	Business owner	Guangzhou	1.5 years	Two-city lifestyle

Note: Participants were recruited via purposive sampling. Interview transcripts are original empirical data generated for this research.

[1]These semi-structured interviews and participant profiles shown in Table 1 constitute original qualitative data collected by the authors for this study.

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4. Analysing Cross-border Ageing in the Greater Bay Area

4.1 Cross-border Mobility and Policy Context

The traditional elderly care policy adheres to the principle of "aging in place". It is assumed that staying in a familiar family and community is the ideal outcome. In the Greater Bay Area, this line is blurred. For many Hong Kong people, Guangdong is the place of their ancestral home, property, work or relatives. Official population statistics show that as of mid-2024, approximately 99,600 Hong Kong residents aged 65 or above normally reside in Guangdong in Guangdong [8]. Many people travel permanently or intermittently between Hong Kong and cities on the Chinese mainland in their later years. P1 described his Shenzhen flat not as leaving Hong Kong but as having another base, while P6 said high-speed rail makes a two-city lifestyle workable.

Government policy has opened some of these channels. The Residential Care Services Scheme in Guangdong was launched as a pilot in June 2014, regularised in January 2020 and extended from July 2023 to older persons waitlisted for subsidised nursing-home places as well as care-and-attention places [9]. By the end of February 2026, 26 homes in Guangdong had joined the scheme, providing subsidised services to 1,048 Hong Kong older persons [10]. Participation remains extremely low relative to Hong Kong's older population: the availability of a policy does not by itself produce social acceptance or actual mobility.

4.2 Selective Mobility and Capital Inequality

Cross-border ageing is characterized as a path of selective mobility: those who move tend to be relatively independent, able to travel and able to compare housing, medical and care options, and many own private property, have adult children living apart from them, and hold educational qualifications or white-collar work experience. Bourdieu's theory of economic, social and cultural capital [5] explains this pattern.

Economic capital — savings, pensions, property and the capacity to absorb extra costs — determines affordability. Retired technician P4 said he could live more comfortably in Shenzhen on the same retirement income, while P1 and P2 both emphasized larger space and lower daily costs. Social capital – family, friends and community ties – reduces uncertainty. P5 only moved to Zhongshan after her friends had settled down. She stated that this reduced her fear of moving. Cultural capital—education, digital abilities, and mainland system knowledge—determines contract comprehension, mobile payments, and service evaluation.

Cross-border care may deepen inequality in later life. Shenzhen, Guangzhou, and Zhongshan are options for the elderly with greater economic capital, but low income, bad health, and limited digital access raise the threshold. Most prospective migrants are middle-class, thus they are price- and quality-sensitive. Lower mainland prices can't fix the affordability problem alone.

Mobile payment, telemedicine and electronic health records can reduce this fragmentation through digital technology. On one hand, it has been noted that older Hong Kong migrants living in Shenzhen make use of mobile payment and other instrumental apps. On the other hand, the frequency with which they utilize information and communication applications is significantly lower. This same divide emerged in our interview data. P3 worked as an accountant and had a high level of self-assurance regarding the applications. She did, however, acknowledge the possibility that those who are older, who live alone, or who have a lower level of digital skills could be excluded from services that are technically available. However, P2 said that the biggest problems she had were identity verification and hospital appointments. In Bourdieu's terms, this is about the unequal distribution of cultural capital, not of devices. Literacy, confidence and language support are needed for effective use.

4.3 Welfare Portability and Fragmented Social Citizenship

Cross-border aging also highlighted the regional character of welfare. Welfare is meant for the inhabitants of an administrative system. Therefore, the elderly do not change their formal citizenship when they move, but their access to public housing, subsidized medical care, residential care and emergency support becomes uncertain. The main challenges are the absence of portability of welfare and weak institutional connections [12]. Unless public benefits are transferable, private capital must fill the vacuum.

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There are benefits that can be transferred. Portable cash-based benefits are available under the Guangdong Scheme and the Portable Comprehensive Social Security Assistance (PCSSA) Scheme. In order to maintain their positions on the Hong Kong Central Waiting List, participants are permitted to try designated Guangdong facilities for a period of six months. On the other hand, partial portability has resulted in a "deservingness gap." Due to the fact that access is restricted by assessment status and residency documentation, independent movers are afforded a lower level of protection than scheme members.

The most obvious example is medical continuity. Currently, Elderly Health Care Vouchers are accepted at 21 service points in nine cities in the mainland GBA. By the end of May 2026, more than 40,600 eligible elderly had used the expanded scheme [13]. Continuity is still disrupted by differences in drug catalogs, clinical standards and insurance payments. Eligibility uncertainty was each person's biggest issue, rather than income. According to P5, each programme has its own set of conditions, and P4 stated that it is unreasonable to expect older people to become policy experts in order to be aware of the numerous forms of assistance that are available. Regulation, finance, liability, and data governance remain distinct under *one country, two systems*. Therefore, integration requires legal coordination, not more points of service [12].

Cross-border flows are also susceptible to external shocks. During the pandemic restrictions, the movement of the elderly between Shenzhen and Hong Kong dropped dramatically according to mobile phone data [14]. And so a care model that requires frequent transit will need contingency plans for medication, remote consultations and emergency transport.

4.4 Place Attachment, Trust and Family Care

Capital explains who can move, but place attachment explains whether moving allows for making a meaningful home. Capital finances relocation and shapes adaptation, but it cannot substitute familiar routines and social relations [5, 6]. The elderly make place through meaningful activities, daily routines and relationships. A move to Guangdong could mean a bigger place to live. But this can undermine community ties, trustworthy healthcare, and a sense of control. P1 felt comfortable in Shenzhen but still considered Hong Kong his home. P4 often breakfasts with Hong Kong men. He may feel lonely without them. P5, having the highest local integration, emphasized that integration required deliberate effort.

A recent study supports this interpretation: Older mainland immigrants living in public housing in Hong Kong are often reluctant to return. Secure housing, reliable healthcare and non-transferable social connections keep them in a specific community [15].

Family relationships are rebuilt rather than simply strengthened or weakened. Care decisions are embedded in family and community networks rather than being made by isolated individuals [7].Some daily care work has been transferred from relatives to paid workers and institutions, reducing the burden on caregivers while generating a sense of guilt and uncertainty about responsibility. The uncertainty is concentrated in the transition from independence to dependence. P2 chose Zhongshan for independent retirement, not for elderly care services. P4 believes that living independently is one thing and being disabled is another. Cross-border care can only be sustainable when institutional and home care reinforce each other.

5. Policy Implications

The following are three priorities. Firstly, welfare integration should give priority to continuity. Independent immigrants who are not protected by the scheme need information and minimum guarantees [11, 16]. Establishing Cantonese-language service hubs in major Guangdong cities to disseminate information on healthcare, welfare provisions, residential care and emergency contacts was the most frequently suggested reform among interview participants. This is the change most frequently proposed by the participants. Second, medical portability should shift from increasing service points to connecting systems. It was determined by the participants that the mutual recognition of medical records, prescriptions, and test results would be the most beneficial reform. It is necessary to coordinate the regulation and clearly allocate liability in order to accomplish this.

Third, services should be differentiated by level of capital and by care need. Those with limited economic capital require transport and cost support, while those with limited cultural capital need a human support channel alongside digital services, since digitalisation can conceal exclusion rather than remove it. Provision

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should extend beyond residential institutions to community and home-based care, dementia care and rehabilitation, because most participants preferred to age in place near family rather than enter an institution. Integration should also be measured rather than assumed, through Cantonese-language services, peer groups and community activities. Responsibility is shared across national policy coordination, provincial community services and Hong Kong-side expansion of recognised homes; the long-term objective identified by participants is portability itself, so that older people do not lose security by ageing in another GBA city.

6. Conclusion

Cross-border ageing in the Greater Bay Area is better understood as a stratified mobility process than as a transfer of care capacity. Integrating the four perspectives yields an insight none provides alone: transnational ageing identifies the institutional channels, capital theory explains unequal access to them, and place attachment and embeddedness explain why access does not amount to settlement. The result is a fragmented social citizenship in which people cross the boundary far more easily than rights, trust and belonging do, and it extends transnational ageing theory, developed for movement between sovereign states, to two institutional systems within one country.

The study has clear limitations. The qualitative material rests on six purposively selected participants in Shenzhen, Zhongshan and Guangzhou, all relatively independent and of middle income, so frail, low-income and institutionalised older people are not represented and other parts of Guangdong are not covered. The gender differences in care were noted, but not systematically analyzed, and the cross-sectional design captures experiences at one point in time rather than changes over time.

Future research should longitudinally track cross-border mobility, particularly as older adults transition into states of care dependency. It should also compare scheme-supported participants with self-initiated migrants and investigate gendered patterns in care experiences. In terms of policy, sustainable cross-border aging requires institutional and health care coordination, redistribution support and culturally embedded services. This thereby protects the dignity, safety and sense of belonging of elderly people with unequal resources.

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Research on the Challenges and Countermeasures for Ideological and Political Education of College Students in Sino-Foreign Cooperative Education Models

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Abstract

This research analyzes strategies for ideological and political education of college students within the framework of Sino-foreign cooperative education. The paper first analyzes the unique characteristics and challenges of such education in this context, then proposes specific strategies and recommendations across five areas: precise targeting and personalized customization; diverse integration and innovative development; institutional guidance and the establishment of a support system; the cultivation of distinctive features and the construction of a new curriculum-based ideological and political education system; and resource sharing and in-depth integration. By targeting student requirements, innovating educational approaches and methods, improving institutional frameworks, developing a distinctive curriculum-based ideological and political education system, and promoting the mutual exchange and integration of Chinese and foreign educational philosophies and resources, this paper strives to provide a comprehensive and systematic solution for ideological and political education of college students in Sino-foreign cooperative education programs. This research seeks to boost the relevance and effectiveness of education and cultivate high-caliber talent with an international perspective and cross-cultural communication skills.

Keywords

Sino-foreign cooperative education, ideological and political education for college students, challenges, countermeasures

1. Introduction

The Sino-foreign cooperative education model was developed as an answer to the issue of globalization, which is to be able to train high-caliber individuals who have an international outlook and a sense of intercultural communication through domestic and foreign educational resources [1]. Nevertheless, this model not only offers plenty of learning opportunities and a wide international viewpoint to college students but also confronts them with a new challenge to their ideological and political education. General Secretary Xi Jinping has pointed out that the question of what kind of people should be raised, how they should be brought up, and who they should be raised to serves as the underlying question of education and the central question of building an educationally powerful country [2]. The same statement can be applied to both the ideological and political education of the Sino-foreign cooperative education model.

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The ideological and political education under the Sino-foreign cooperative education model has a complex range of challenges. On one hand, the concepts and pedagogical principles of foreign teachers can affect the minds of students in a deep way and confuse them with the values and beliefs, as they are exposed to the influences of different cultures [3, 4]. On the other hand, the material and approach of some foreign instructors may not meet the demands of domestic ideological and political education, which in some ways destroys the coherence and efficacy of such training [5]. In this situation of challenges, it is necessary to come up with effective strategies that will help in reinforcing the ideological and political education among college students in Sino-foreign cooperative education models.

2. Analysis of the Unique Characteristics of Ideological and Political Education for College Students in Sino-Foreign Cooperative Education Models

2.1 Diversity of the Student Body

The student population in Sino-foreign joint education programs shows unprecedented diversity [3, 6]. Not only do students come from various regions, cultures, and families, they also have substantial distinctions in their academic abilities, interests, values, and thinking patterns. Such variety requires greater efforts in the field of ideological and political education.

Firstly, faculty should have the ability to communicate across cultures, so as to develop an improved understanding and appreciation of the differences that exist between students, which can lead to the creation of more individualized teaching approaches. Secondly, due to the variety of students, the substance and the techniques of ideological and political education need to be more versatile and responsive to the requirements of diverse students. As an illustration, for those students with a high degree of international orientation, more international cases and global problems can be added to help increase their sense of international responsibility and global awareness. In addition, as students in Sino-foreign cooperative education programs tend to have good foreign language skills and are exposed to cross-cultural communication, they are likely to put more focus on expanding the boundaries of their international outlooks and developing cross-cultural skills during the process of receiving ideological and political education. It will require teachers to constantly come up with new ways of presenting the teaching topic and new methods that will suit the needs of the students.

2.2 Expandability of Teaching Spaces

This is because the teaching space in the Sino-foreign cooperative education model has a high level of extensibility. It is mainly manifested by the variety of teaching formats and the abundance of teaching resources.

Regarding the format, the majority of Sino-foreign cooperative education programs make use of a hybrid learning model which incorporates both online and face-to-face teaching methods as well as overcoming time and space limitations of the conventional classroom [7, 8]. This versatile teaching method will give more opportunities in ideological and political education. As an illustration, teachers have the opportunity to use the online platform to share their teaching materials and conduct discussions and interactions, and students are able to learn and communicate any time and at any location. In addition to improving the efficiency of learning, this strategy also increases the level of interest and involvement of students.

Concerning the resources, in the Sino-foreign cooperative education model, there is a wider and more varied range of teaching resources available [1, 9]. Some of them are high-level domestic and foreign textbooks, online classes, and international academic conferences. Such resources offer ideological and political education a wider learning perspective and greater learning opportunities. Teachers may use these resources to enhance the content of teaching and develop new ways of teaching, which makes the ideological and political education more relevant and effective.

2.3 The Complexity of Educational Guidance

The educational guidance under the Sino-foreign cooperative education model is extremely complicated. Such complexity can be mostly observed in the variety of students ideologies and the confrontation between Chinese cultural values and Western cultural values.

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On the one hand, students can be affected by various cultural traditions and values, which would create a variety of ideological views [3, 4]. The diversity has more difficulties in the sphere of ideological and political education in leading students to the right values and high ideals. Teachers should be more responsive to the ideological shifts of their students and offer prompt and relevant counseling and assistance. Conversely, this clash between Chinese and Western values can contribute to student confusion and disorientation about some issues. As an illustration, there might be significant disparities between Chinese and Western societies in the areas of values like individualism and collectivism and values of freedom and responsibility [4]. Such disparities may confuse and conflict students during the experience of real-life problem-solving. Hence, teachers must have the ability to communicate cross-culturally to have a better understanding of and direct the students towards having good values and ethics.

2.4 Differences in Educational Philosophies

Talent development goals, pedagogic approach, and assessment criteria are the main areas where the educational philosophies of the Sino-foreign cooperative education model will be different.

Concerning the objectives of talent development, the educational cooperation between China and foreign countries tends to give more importance to developing the innovative spirit and practical skills of the students as well as highlighting the role of the students in the process of learning [1, 6]. It is quite opposite to the conventional educational systems, which aim at transferring information and test preparation. Subsequently, teachers should pay more attention to creating an atmosphere of critical thinking and independent reasoning in ideological and political education so as to ensure that students are more capable of adapting to the needs of the future society.

Sino-foreign cooperative education focuses more on heuristic teaching and inquiry-based learning when it comes to teaching methods [10, 7]. These strategies promote active student involvement in the discussion and practical exercises of the classroom, which helps develop their innovativeness and problem-solving abilities. Teachers can apply these strategies in ideological and political education by helping students to participate in various activities like case studies and group discussions in order to increase their interest in learning and their level of engagement.

Concerning the assessment criteria, Sino-foreign cooperative education programs are usually based on various evaluation approaches such as classroom performance, assignment completion, and project-based practice. This method is less biased and gives a better reflection of the overall achievement of students and their competency levels. Teachers in ideological and political education may apply this strategy by employing a variety of evaluation tools to evaluate the learning outcomes of students and their ideologies and political attributes in an all-round way and in an objective manner.

3. Challenges in Ideological and Political Education for College Students in Sino-Foreign Cooperative Education Models

3.1 3.1 Lack of Practical Relevance in Educational Approaches and Methods

The challenge of ideological and political education in the context of Sino-foreign cooperative education programs begins with the issue of educational approaches and methods that do not have practical relevance. First, this challenge can be seen as the incongruence between the educational content and the student population. Considering the great variety and international nature of the students who attend Sino-foreign cooperative education programs, their cultural backgrounds, modes of thought, value systems, and educational requirements are very diverse. Nevertheless, the existing ideological and political education material tends to be rather homogeneous and standardized, so that there is no possibility to consider such diversity, and it leads to the gap between the content of education and the real needs of students [11, 3].

In particular, the mismatch has a number of manifestations. On the one hand, there is excessive focus on the transfer of theoretical knowledge in the educational process and a lack of attention to the development of practical skills. Students in Sino-foreign cooperative education programs often prioritize practice and innovation more so that they can access more knowledge and competencies that are applicable to real-life scenarios and social life. Nevertheless, the existing ideological and political education has been concentrated

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on the presentation and explanation of theoretical concepts, which do not have any practical elements closely related to reality, and therefore, cannot satisfy this requirement of the students. On the other hand, teaching strategies are highly conventional and tedious, devoid of novelty and variety [10, 8]. In Sino-foreign cooperative education programs, students are usually used to more open and varied forms of education, including group discussion, case studies, and role-playing. But the present ideological and political education generally uses conventional lecturing, which does not provide the chances to interact with students and communicate with them, so that their involvement and interest remain low.

Moreover, the educational aims are not practical. In the Sino-foreign cooperative education model, students usually have more definite and precise career plans and development goals. But the existing ideology and politics education tends to overemphasize developing the political literacy and morality of students at the expense of education and counseling on career development, which makes students feel lost and bewildered in the face of their future career decisions.

3.2 Lack of Coordination in Leveraging the Internet for Educational Work

The introduction and growth of the Internet bring the challenge of how to use the Internet to conduct their activities in ideological and political education in the context of Sino-foreign cooperative education programs. Nevertheless, because of the complexity and instability of the virtual world, coupled with the absence of cooperation and strategy among universities in their application of the Internet in their practice, this issue is especially acute.

Firstly, the overwhelming amount of online information and its fragmented form represent a major challenge to ideological and political education [8]. The sources of information on the internet are numerous and varied, but their quality can differ greatly. The students who do not have enough discernment are easy to mislead and manipulate by dangerous material. Simultaneously, because information is so fragmented, students frequently find it difficult to obtain well-rounded and organized educational materials, which leads to poor learning results. The second difficulty of ideological and political education is the variety and complexity of the internet platforms. There are various types of educational platforms and applications available on the internet, each with its own features and functionalities. Nonetheless, because there is no coordination and planning among the universities in using these platforms, students tend to experience confusion and get lost in choosing and using them. Moreover, the lack of information exchange and sharing among different platforms makes the integration and use of educational resources ineffective. Also, the management and guidance of online public opinion represent a serious challenge. The internet is very free with regard to speech and extremely fast when it comes to the speed at which information spreads, but there are problems like cyberbullying and spreading rumors. It is an urgent problem that higher education institutions need to solve to effectively steer and regulate online public opinion to create a sound and peaceful educational environment.

3.3 Lack of Institutional Guarantees and Support for Implementation

The ideological and political education under the Sino-foreign cooperative education model is also threatened by a lack of institutional guarantees and assistance with the implementation. The problem is mainly expressed in organizational structure, financial support, staffing, and evaluation systems.

An efficient and organized organizational framework is also required in the Sino-foreign cooperative education programs that engage cooperation and interaction of various countries and regions to provide a smooth execution of all the processes [5]. Nevertheless, the organizational frameworks of ideological and political education at other universities are not yet developed, which results in poor development rates and inefficiency [5, 11]. Moreover, due to the variety of inputs and expenditures of these programs, the financial support should be adequate so that all activities can be carried out smoothly. Nonetheless, the budget allocated to ideological and political education at some universities is still not enough to implement all the important educational activities and projects effectively. Moreover, because of the inter- and multidisciplinary nature of this type of programs, a highly competent and professional faculty is required to perform both teaching and research duties. But the current staffing solutions of ideological and political education at several universities are not optimal, which leads to low quality of teaching and research work. Finally, since this sphere comprises assessment and evaluation of various aspects, a scientific and rational assessment system is needed to guarantee the effectiveness and quality of all activities. But there are some universities that either do not have or have

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incomplete evaluation systems regarding ideological and political education, which prevents them from assessing the real effectiveness of educational activities and identifying their problems [11].

4. Countermeasures for Ideological and Political Education of College Students in Sino-Foreign Cooperative Education Models

4.1 Enhancing the Targeted Approach and Timeliness of Ideological and Political Education for College Students

The implementation of a deepened ideological and political education of college students in the special educational environment of Sino-foreign cooperative education should start with a targeted and individualized approach. First, educators must get a comprehensive picture of the cultural background of students, their thinking patterns, their needs to learn, and their ideological tendencies through the use of regular academic status surveys, questionnaires, and personal interviews. Extending upon this basis, educational programs should be tailored to specific purposes and put into practice. As an illustration, to overcome possible cultural adaptation problems of international students, there are possibilities of workshops on developing cross-cultural communication skills; to overcome the possible absence of international perspective among the local students, lectures discussing contemporary issues in the world could be conducted. Simultaneously, it is important to pay attention to the timeliness of educational activities. Through the close monitoring of domestic and international news events, the most recent policies and social trends must be immediately introduced to the ideological and political education classes, allowing the students to enhance their knowledge and devotion to the ideological and political theories along with participation in the discussion of societal issues.

Moreover, personalization is the most important aspect of improving the level of ideological and political education. With the creation of individual student growth profiles that record the academic results, interests, preferences, and psychological well-being of a student, customized educational services are offered to every student. For instance, classes on international cultural adaptation and career planning can be offered to students who would like to study abroad, and thematic seminars or field trips can be arranged for students who are interested in certain social problems. Ideological and political education can be made more relevant and effective by being precisely targeted and personalized to meet the real requirements of students.

4.2 Exploring Innovative Pathways for Ideological and Political Education Among College Students

Facing globalization, the strategies of ideological and political education of college students should be more diversified and liberalized. On the one hand, it is supposed to actively apply the best educational ideas and practices of foreign countries - including critical thinking training, project-based learning, and the flipped classroom - into the curriculum of ideological and political education to encourage the initiative and creativity of students [10, 7]. With the creation of difficult learning tasks, students gain a greater insight into and practice in applying the ideology and politics theories in the course of problem solving. Conversely, it is supposed to consider interdisciplinary teaching designs, like combining the expertise of economic, socio-cultural, and historical fields into thematic workshops that touch on topics like Economic Ethics under the influence of Globalization and Social Transformation viewed through Cross-Cultural Lens respectively, which will expand the minds of students and enrich their multidimensional perception of ideological and political theories [7, 12].

At the same time, it is necessary to focus on the innovation and creation of new educational formats. Using the latest technology solutions like virtual reality and artificial intelligence, it is supposed to provide an immersive educational experience, enabling the students to see the beauty of ideology and politics education in the virtual environment. In addition, events like international academic conferences and cultural salons could be arranged where famous scholars and business experts would be invited from both local and foreign countries to take part in scholarly exchange and intellectual discussion, thus offering the students greater learning opportunities and areas. With varied integration and creative development, ideological and political education can be brought to life and become more interesting, exciting, and encouraging to students to participate and learn.

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4.3 Establishing an Institutional Support System for Ideological and Political Education of College Students

Development of institutions is essential to provide sustainable and healthy development of ideological and political education of college students. Initially, the educational management system must be enhanced so as to define the role and distribution of labor between educational departments across all levels, hence creating a cooperative environment that combines top-down and inter-departmental coordination [5]. In parallel, it is necessary to create a solid mechanism of educational funding security in order to have enough investments in educational resources and their rational utilization. Introduction of ideological and political education programs and the recognition of the best results should be encouraged by means of the creation of special funds and scholarships.

Additionally, it is necessary to develop a scientific and rational assessment system and incentives [11, 5]. The ideological and political performance of the students ought to be included in the overall quality assessment, and the quality of education should be enhanced by frequent evaluations, feedback, and improvements. Simultaneously, it is important that those teachers and students who are performing exceptionally well are celebrated and honored to encourage interest and innovation in teaching practice. Moreover, it is suggested to enhance institutional innovation and implementation. Such measures may include the setting up of self-governing organizations like student ideological and political clubs and volunteer service teams to promote the ability of students to educate themselves and manage themselves. By giving them guidance and support systems, the final resource will have strong institutional protection and resources support on ideological and political education.

4.4 Development of an Ideological and Political Education System That Has a Curriculum-based Approach and is Characterized by the Unique Features of Sino-Foreign Cooperative Education

Within the framework of the Sino-foreign cooperative education model, it becomes especially important to form the unique characteristics of the curriculum-based ideological and political education system. On the other hand, the plan is to study the ideological and political aspects of Sino-foreign cooperative education, including the international viewpoint and cross-cultural communication, in great detail, then apply them to specific courses, and thus turn them into real-life carriers of ideology and political education [12, 11]. To illustrate this point, economics classes may include topics of economic ethics in the context of globalization; management classes can focus on the importance of cross-cultural management; and literature classes can examine comparative literature through the lens of cross-culturalism. The comprehensive implementation of ideological and political education in the curriculum helps students develop a better understanding of and loyalty to ideological and political theories and learn specialized information.

However, innovative methods of teaching and new ways of ideology and political education within the curriculum ought to be embraced. Interactive teaching strategies that include case studies, scenario simulation, and role-play must be used to assist students in gaining more insight and use of ideological and political theories by way of real-life experiences [11, 7]. Meanwhile, there is a need to ensure that ideological and political education is integrated with campus culture and social practice. With the help of the organization of such events as international cultural festivals and volunteer service months, students will have the opportunity to feel the beauty and importance of ideological and political education by actively participating in it. Furthermore, it is supposed to consider the creation of a transnational online education site where internationally recognized scholars are invited to teach remotely or engage in online seminars, thus creating greater learning environments and options for the students. Through developing unique characteristics and developing a new system of ideological and political education integration into the curriculum, it is planned to add some highlights in this sphere in the context of Sino-foreign cooperative education.

4.5 Promoting Mutual Learning and Integration of Educational Philosophies and Resources Between China and Foreign Countries

Mutual learning and integration of educational philosophies and resources are important ways of improving the quality of ideological and political education in Sino-foreign cooperative education. On the one hand, it is necessary to enhance cooperation and exchange with foreign universities to share quality educational resources

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[9, 1]. The process of mutual learning and integration of educational philosophies, teaching methodology, and curriculum design can be promoted by faculty exchange visits and student exchange programs. Simultaneously, the use of cooperative mechanisms, including transnational online education platforms or joint research centers, should be investigated to offer a wider range of learning and research options to faculty and students. On the other hand, focus should be put on developing an international-minded faculty with cross-cultural communication competencies [9, 6]. Faculty members can increase their professionalism and international competitiveness through overseas training programs and international conferences. Meanwhile, faculty members are also encouraged to engage in international exchange and cooperation projects to acquire cross-border educational experience and thus offer more abundant and varied teaching resources and case materials in the field of ideological and political education. High-quality development of ideological and political education of college students under the Sino-foreign cooperative education system may be facilitated by resource sharing and deep integration.

5. Conclusion

With an ever-growing tendency towards globalization in the modern era, Sino-foreign cooperative education has emerged as an important trend in higher education [1]. With this trend in mind, ideological and political education of the college students needs to be constantly innovative and evolving to satisfy the needs of the society. The solutions and suggestions presented in this paper are intended to offer new perspectives and guidelines in the area of ideological and political education based on the Sino-foreign cooperative education paradigm. Nevertheless, education is a continuous development process that implies constant exploration and practice. In the future, it is suggested to develop stronger cooperation and interaction between international universities, exchange high-quality educational materials, and facilitate the further integration of Chinese and foreign education concepts and resources. Simultaneously, it is supposed to pay attention to the development of students international viewpoint and cross-cultural communication competencies so that they can become the high-level professionals with competitive skills in the international market. It should be confident that with all combined work, ideological and political education of college students within the framework of Sino-foreign cooperative education will produce even greater outcomes and will help in promoting the internationalization of higher education.

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Research on the Path of Social Work Participation in Juvenile Procuratorial Work

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Abstract

The revised two major laws have introduced social work into juvenile judicial protection and crime prevention, which can play a positive role in alleviating the pressure on juvenile prosecution departments and improving service effectiveness. This paper analyzes the collaborative practice between social work agencies and procuratorial departments in City Z. It finds that social work possesses unique strengths and can exert remarkable effects in juvenile prosecution work, which are reflected in four dimensions: protecting and assisting juvenile victims, educating-rehabilitating juvenile offenders, preventing juvenile delinquency, and safeguarding the legitimate rights and interests of minors. Meanwhile, this study identifies prominent challenges for social work engagement in juvenile prosecution, including imperfect institutional mechanisms, unstable participation opportunities and inadequate social support systems. Accordingly, policy suggestions are put forward to optimize top-level design and construct a sound social support system.

Keywords

social work, minors, juvenile prosecution work, social support

1. Introduction

Since the 19th National Congress of the Communist Party of China, all sectors of society have paid increasing attention to the protection of minors, and relevant legal systems for the protection of minors have been continuously improved, providing continuous safeguards for the healthy growth of minors. In 2018, the Supreme People's Procuratorate and the Central Committee of the Communist Youth League jointly issued the “Cooperation Framework Agreement on Constructing a Social Support System for Juvenile Procuratorial Work”, which recommended that Communist Youth League organizations at all levels vigorously support juvenile judicial social work service agencies, build specialized social work assistance teams, and assist in completing assistance and education, social investigation, and appropriate adult presence [1]. The revised “Law of the People's Republic of China on the Protection of Minors” and “Law of the People's Republic of China on the Prevention of Juvenile Delinquency” (hereinafter referred to as the “Two Laws”) in 2021 further drew on practical experience in juvenile judicial work in recent years, explicitly proposing to leverage professional social forces to help guardians of minors involved in cases improve their guardianship capabilities and establish mechanisms for the protection of minors [2]. Procuratorial departments across the country have actively responded to policy calls by introducing social forces to participate in juvenile procuratorial work. An

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increasing number of social workers have engaged in the protection of minors, and the role of social work participation in juvenile procuratorial work has become increasingly prominent. This also represents an innovation and reform in the working mechanisms and methods of juvenile procuratorial departments, contributing to the establishment of a new pattern for the protection of minors.

This study takes the juvenile judicial social work practice in City Z as its research object, systematically exploring the feasibility, practical effects, current dilemmas, and optimization paths of social work participation in juvenile procuratorial work. The research hypothesis posits that social work, by virtue of its professional values and unique advantages, can play an irreplaceable role in juvenile procuratorial work, effectively alleviating the case-handling pressure of procuratorial organs and improving the service effectiveness of judicial protection for minors. However, due to limitations in participation mechanisms, funding guarantees, social support, and talent teams, social work participation in juvenile procuratorial work has not yet formed a mature and stable working model, and its professional advantages are difficult to fully unleash, urgently requiring institutional improvement and path optimization to address these issues. This study holds significant theoretical and practical value for promoting the socialization and professional development of juvenile procuratorial work and constructing a new pattern for the protection of minors.

2. Feasibility of Social Work Participation in Juvenile Procuratorial Work

Procuratorial organs are one of the most important institutions in China's legal system for judicial protection of minors, and juvenile procuratorial work represents the “specialized business” of procuratorial organs. In juvenile procuratorial operations, social work demonstrates considerable feasibility and advantages in promoting the transformation and growth of juvenile offenders, achieving the goals of preventing recidivism and facilitating social reintegration, while also playing a positive role in alleviating the pressure on juvenile procuratorial departments and improving service effectiveness [3].

2.1 Policy Basis for Social Work Participation in Juvenile Procuratorial Work

The revised Two Laws both emphasize the involvement of social forces and focus on multi-party collaborative protection of minors. Relevant documents from the Central Committee of the Communist Youth League regarding the construction of social work talent teams for youth affairs also explicitly state that social work should play an important role in youth affairs to achieve the goals of preventing juvenile delinquency and post-crime rehabilitation. Furthermore, at the national judicial policy level, increasing emphasis is placed on the protection and rehabilitation of minors rather than deterring minors involved in cases through severe punishment, which provides certain policy space for the involvement of social work.

2.2 High Alignment Between Professional Values and Juvenile Protection Philosophy

Minors possess high malleability during their growth process, and with proper guidance and assistance, they can be encouraged to reform themselves. Social work adheres to a series of value orientations including “belief in human potential,” “strengths perspective,” and “de-labeling,” which align closely with the philosophy of “educating, reforming, and rehabilitating juvenile offenders” in juvenile procuratorial work. This alignment helps remove the label of “problem youth” and discover their potential, guiding them to build self-confidence and facilitating their return to normal life.

2.3 Complementary Roles Between Judicial Work and Social Work

From the perspective of professional collaboration, the participation of social work can alleviate the work pressure of juvenile procuratorial departments and improve service effectiveness. Juvenile procuratorial work encompasses both judicial work involving minors and social work such as legal education and judicial assistance undertaken in an administrative capacity. Excessive administrative work leads to inefficiency and formalization in juvenile procuratorial work, yet social investigation and follow-up assistance require meticulous participation from professionals. Juvenile procuratorial departments often face heavy caseloads and dispersed attention, while social workers with backgrounds in psychology and sociology can effectively compensate for the insufficient energy of procuratorial departments in assisting and educating juvenile offenders. This also makes the involvement of social work in professional services such as individual case

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assistance and education for minors feasible, achieving complementary roles and dual protection between procuratorial organs and social forces for minors involved in cases [4].

2.4 Unique Advantages of Social Work Participation in Juvenile Procuratorial Work

Judicial work emphasizes procedures, laws, and regulations, tending toward rationality, while social workers are trained to uphold professional values such as equality, respect, and acceptance, emphasizing affinity and trust-building. In participating in social investigations and assistance for minors, social work possesses unique advantages. For juvenile offenders, both supervision and service are important, yet these two roles entail certain conflicts. Supervision requires emphasis on authority, principles, and rationality, while service requires affinity, empathy, and care. In the eyes of juvenile offenders, the identity of prosecutors is more akin to supervisors, while the "professional service provider" role training received by social workers enables them to more easily establish equal cooperative relationships with minors. Consequently, social workers can more smoothly gain the trust of juvenile offenders, thereby providing higher-quality professional services in care, education, and counseling. Additionally, social workers have received training in psychological counseling, communication skills, and family education, theoretically making it easier for minors to open up and establish trust with staff.

3. Current Status of Social Work Participation in Juvenile Procuratorial Work

The Supreme People's Procuratorate proposed in the "2018-2022 Procuratorial Reform Work Plan" to explore the establishment of crime prevention, parental education, graded intervention, and protection systems. Subsequently, the Supreme People's Procuratorate and the Central Committee of the Communist Youth League established pilot programs for constructing juvenile procuratorial social support systems in more than 40 municipalities, actively exploring graded intervention work for minors involved in cases [5]. At the policy level, the status and role of social work in juvenile procuratorial work have been established.

Through reviewing literature and news materials, it can be found that the main forms of cooperation between current procuratorial departments and social work service providers in China are position-based procurement and project-based procurement. Position-based procurement refers to a model in which judicial social workers after completing training at social work agencies, are dispatched to procuratorial departments to assist with juvenile procuratorial work, receiving dual management and guidance from both procuratorial departments and social work service agencies. Project-based procurement involves professional service agencies providing services such as appropriate adult presence, social investigation reports, and assistance and education during agreed work periods according to the needs of procuratorial departments [6]. The content of social work participation in juvenile procuratorial work varies across different regions, but in terms of service recipients, it can be divided into intervention services for juvenile offenders, juvenile victims, and ordinary minors. Regarding juvenile offenders, the Shenzhen Futian District Qihang Public Welfare Service Center conducts comprehensive, whole-process, and full-chain intervention in juvenile criminal cases at the investigation stage, continuously aligning social work professional methods and philosophies with case handling procedures, and carrying out correction and assistance in areas such as individual deviant cognition, behavior, negative emotions, negative peer relationships, parent-child relationships, and social relationships of juvenile offenders. The Shanghai Procuratorate's juvenile procuratorial department introduces social work agencies to conduct social investigations, appropriate adult presence, conditional non-prosecution assistance and education, and establishes social observation systems for juvenile offenders through social work organizations, demonstrating effects of judicial connection and social linkage [7]. The Beijing Haidian District People's Procuratorate strengthens collaboration with social work in areas such as social investigation, appropriate adult presence, and follow-up assistance and education through government procurement of social services. The Shenzhen Municipal People's Procuratorate's proposed "precise assistance and education" has formed an "assistance and education circle" involving procuratorial officers in supervision and dynamic review of assistance effectiveness, social workers implementing precise assistance, and experts providing guidance and evaluation of service effectiveness. For juvenile victims, the Shenzhen Futian District Procuratorate and social work agencies have worked together to use "one-stop evidence collection and protection" as a key entry point, intervening promptly after receiving police reports and seizing the "golden 48 hours" for optimal counseling. Additionally, for ordinary minors, most social workers link volunteer resources, Communist Youth

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League committees, and women's federations to carry out legal education activities or conduct targeted preventive legal education in schools and communities with high numbers of minors involved in cases.

In some Western countries, the breadth and depth of social work participation in juvenile procuratorial work are even greater. Examples include victim-offender mediation, juvenile crime treatment, family services for drug users and juvenile offenders, victim and witness support services, and domestic violence shelter services. In the United States, non-governmental organizations employ a large number of social workers to implement federal, state, and local legal aid and crime prevention programs, or use social work methods to provide flexible and targeted service plans for minors or adults in need [8]. In common law countries, judicial social workers can also serve as expert witnesses in court or provide expert testimony in a neutral capacity as appointed by the court, with their professional opinions influencing judicial decisions [3].

4. Practice and Effectiveness of Social Work Participation in Juvenile Procuratorial Work

With the revision and implementation of the Two Laws, the attention given to juvenile judicial protection and juvenile procuratorial work has reached unprecedented heights, and the responsibility of procuratorial organs for juvenile judicial protection has become increasingly arduous. Against this background, the procuratorial department in City Z, based on actual work needs, selected social work service agencies with good professional qualifications and industry reputation through field visits and observations, and entrusted juvenile offender observation and assistance, social investigation, victim assistance, and juvenile crime prevention work to qualified social service agencies through direct commissioning, negotiation, and bidding. By establishing budgets and purchasing social work services, professional judicial social work services are provided for minors.

4.1 Practice Process of Social Work Participation in Juvenile Procuratorial Work

In the cooperative practice between the juvenile procuratorial department in City Z and social work agencies, the participation of social workers covers most of the five major work tasks of juvenile procuratorial work, including protecting and assisting juvenile victims, educating and rehabilitating juvenile offenders, preventing juvenile delinquency, and safeguarding the legitimate rights and interests of minors.

4.1.1 Protecting and Assisting Juvenile Victims to Avoid Secondary Harm

Social work service teams adopt case-based methods, comprehensively understanding the social environment and needs of juvenile victims to develop targeted service plans for their assistance, preventing secondary harm. Social workers possess disciplinary literacy in psychology and sociology, and in addition to providing case follow-up and linking required resources, they can also observe service recipients during the service process. When detecting tendencies toward depression or other conditions, they use relevant scales for assessment. If serious physical and mental health issues are identified, they refer service recipients to psychological counseling experts for guidance, promptly feedback to the procuratorate and guardians, and finally adjust service plans to help service recipients better return to normal life. Compared to psychological counselors, social workers place greater emphasis on the “social nature” of victims. Beyond providing direct counseling, they also conduct counseling and training for guardians or other significant others, guiding family members to understand the psychological and behavioral norms of victims, improving companionship and discipline techniques, and creating a favorable healing atmosphere for the recovery of service recipients.

4.1.2 Educating and Rehabilitating Juvenile Offenders to Promote Positive Change

After accepting the procuratorial department's commission, social workers adhere to the policy of education, reform, and rehabilitation, as well as professional service philosophies, participating in the assistance and education of juvenile offenders through case work or group work methods. Under the guidance of the procuratorial department, social workers sign four-party assistance agreements, service referral agreements, and other documents with service recipients and guardians, and establish standardized service files. During the “early observation and assistance” stage of bail, seamless connection can be achieved, clarifying work objectives with service recipients and families, focusing on guiding them to analyze their actual situations, actively seeking compensation and forgiveness, and fully investigating and objectively assessing individual psychological states and supervision conditions to provide a basis for subsequent prosecutorial decisions regarding prosecution. During the observation and assistance stage following conditional non-prosecution

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decisions by the procuratorial department, social workers, within a 6-12 month work cycle, provide services such as psychological counseling, emotional support, career planning, and personality development for service recipients and their families based on actual needs and risk points, through individual meetings, family meetings, volunteer services, parent classes, and workshops. They construct or repair social support systems, correct personal cognition and behavior patterns, adjust family and individual social functions, enhance social participation and social responsibility, ultimately achieving positive individual and family transformation and reducing recidivism rates.

4.1.3 Conducting Legal Education to Prevent Juvenile Delinquency

In terms of preventing juvenile delinquency, a procuratorial department in City Z fully absorbed and drew upon advanced experience from developed regions, establishing a cross-professional team for juvenile crime prevention projects consisting of prosecutors, university experts, professional social workers, and middle school leaders and teachers. Based on literature review and previous case data, combined with the personality characteristics of minors, they developed the highly professional “Protecting Youth, Procuratorial Love Guiding the Way” juvenile crime prevention project. This project relies on primary and secondary schools, communities, and other places where minors gather, conducting diverse and rich in content legal education activities. In terms of service content, activities cover the Civil Code, Criminal Law, prevention of school bullying, prevention of sexual assault, anti-domestic violence, drug prohibition, sex education, interpersonal relationships, family conflicts, parent-child relationships, and emotional management. In terms of project formats, activities are diverse. For general minor populations, activities such as educational theater, legal classrooms, legal break-time meals, legal scenario drama competitions, and mock courts are conducted to strengthen juvenile crime prevention, legal education, and safety education, aiming to enhance legal awareness and safety consciousness. For potentially high-risk groups, such as students who have received disciplinary records or exhibit deviant behavior, social workers conduct youth groups on themes such as emotional management and safe interpersonal relationships, as well as interactive legal scenario dramas and interactive crime prevention theater, aiming to enhance behavioral and emotional control capabilities, establish safe friendship perspectives, strengthen legal awareness, and ultimately achieve the goal of reducing crime risks.

4.1.4 Safeguarding the Legitimate Rights and Interests of Minors and Demonstrating Judicial Warmth

When safeguarding the legitimate rights and interests of minors, social work mainly participates by accepting and conducting social investigations commissioned by procuratorial organs and serving as appropriate adults. For minors on bail or under conditional non-prosecution, social workers conduct thorough investigations and assessments of service recipients' personality characteristics, growth experiences, family supervision conditions, and social environments from professional and objective standpoints, exploring the motivations for juvenile delinquency, protective factors, and risk factors to form assessments of supervision conditions and submit written reports to juvenile procuratorial departments for decision-making reference. If a minor is being interrogated and guardians cannot be present, social workers serve as independent third parties as appropriate adults to ensure the legality and fairness of the interrogation.

4.2 Effectiveness of Social Work Participation in Juvenile Procuratorial Work

The procuratorial organs in City Z have actively introduced social work into juvenile procuratorial work. Based on recommendations from experts and partners, they have continuously standardized service procedures, improved service quality, and guided social work service agencies to provide diversified and effective professional services, achieving certain results.

4.2.1 Needs-based Approach with Pioneering Service Standardization

Before the Supreme People's Procuratorate issued the “Specifications for Juvenile Justice Social Work Services” (draft for comments), the procuratorial organs in City Z had already established a judicial service system based on experience, widely consulting university social work teachers, legal experts, and social workers. Meanwhile, social work service agencies have also developed service guidelines for juvenile judicial social work, clarifying the standards for documents such as case intervention plans, case closure material lists, cross-regional examination agreements, social investigation reports, mid-term evaluations, and case closure reports, forming a relatively comprehensive juvenile judicial social work service system.

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4.2.2 Comprehensive Assistance with Remarkable Education and Rehabilitation Effectiveness

During the assistance and education process, social workers leverage their professional advantages by thoroughly investigating the social nature of parties and providing relevant materials as references for procuratorial decision-making, making the handling of juvenile cases more meticulous and in-depth. During the assistance and education period, social workers adhere to professionalization and personalization as working principles, aiming to assist service recipients in restoring and improving social functions, and employing flexible and diverse methods for comprehensive assistance, including psychological counseling, legal awareness enhancement, family relationship improvement, proper friendship, and social participation. Over the past three years, City Z has referred nearly 200 minors involved in cases to social work service agencies, with social workers providing more than 1,500 instances of assistance and education, completing 300 social investigations, and serving as appropriate adults more than 100 times. Juvenile offenders who received professional social work services have generally shown improved legal awareness, significantly improved family supervision conditions, significantly enhanced social participation through volunteer services and other forms, and reduced recidivism risk rate to below 10%.

4.2.3 Procuratorial-school-community Cooperation with Effective Crime Prevention

Procuratorial organs actively cooperate with social workers and universities to conduct legal education, establishing juvenile judicial social work practice bases with local universities. Social workers and university interns actively participate in legal education work, conducting diverse and rich in content activities. In terms of service formats, there are legal classrooms, legal break-time meals, legal scenario drama competitions, and mock courts conducted in cooperation with prosecutors, as well as institution-original educational theater, interactive legal scenario dramas, and interactive crime prevention theater attracting university student participation. In terms of service content, activities cover the Civil Code, Criminal Law, prevention of school bullying, prevention of sexual assault, anti-domestic violence, drug prohibition, sex education, interpersonal relationships, family conflicts, parent-child relationships, proper friendship, and emotional management, aiming to enhance service recipients' legal awareness and friendship capabilities, safeguard the legitimate rights and interests of minors, and provide emotional support and career planning services for service recipients and their families. In City Z's M District alone, procuratorial organs, with the help of social workers, universities, and other social forces, have completed more than 100 legal education activities, covering over 80,000 minors, significantly improving local minors' legal awareness. The “Protecting Youth, Procuratorial Love Guiding the Way—Juvenile Crime Prevention Project” conducted by the M District juvenile procuratorial department won the Excellence Award in the 2021 Guangdong Province “Youth Social Organizations Participating in Social Governance” thematic case competition and the First Prize in the 2022 City Z Excellent Social Work Project competition.

5. Limitations and Path Improvement of Social Work Participation in Juvenile Procuratorial Work

In the practice of the juvenile procuratorial department in City Z purchasing social work services, the professional advantages of social work have been evident in areas such as juvenile rights protection, crime prevention, and observation assistance. However, as an emerging social force, social work also faces certain limitations in its participation in juvenile procuratorial work, affecting the improvement of service effectiveness.

5.1 Limitations of Social Work Participation in Juvenile Procuratorial Work

5.1.1 Imperfect Participation Mechanisms for Social Work

Judicial social work in juvenile procuratorial work has not yet formed effective connection mechanisms, and one-stop judicial social work service systems are imperfect. Particularly in cross-professional, cross-departmental, and cross-domain contexts, judicial social work lacks clear cooperation methods and pathways in juvenile procuratorial work. For example, parental education for minors involved in cases lacks mandatory legal foundations, making it impossible for procuratorial organs to compel guardians to accept parental education. Additionally, the legal status of social work participation in juvenile procuratorial work in China

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remains unclear, lacking independent provisions for social work intervention in juvenile procuratorial work, and relevant departments do not recognize the legitimacy of such participation, creating certain obstacles to the implementation of specific systems such as assistance examination and social investigation [9].

5.1.2 Unstable Participation Opportunities for Social Work

Limited by local economic development and social needs, opportunities for social work participation in juvenile procuratorial work are scarce and unstable. Taking City Z as an example, funding for social work participation in juvenile procuratorial work currently lacks unified fiscal support, with each county and district paying for social work service fees from case-handling funds based on their own needs, but overall service procurement efforts are limited and standards are low. Furthermore, variations in fiscal levels, work philosophies, and personnel changes among responsible persons in different regional procuratorial organs result in narrow and unstable participation channels for social workers or social work service agencies, affecting service continuity. Some judicial social workers have had to transfer to other service fields due to insufficient caseload.

5.1.3 Imperfect Social Support Systems

A comprehensive social support system is crucial for the transformation and growth of juvenile offenders. However, in practice, social support from families, communities, and social organizations is insufficient. First, some guardians, due to working outside their hometowns, feudal thinking, or rigid mindsets, show low enthusiasm for parental education. Second, juvenile offenders are “labeled” due to their cases, making it difficult for them to be accepted by peer groups and affecting their integration into their original social lives. Furthermore, in economically underdeveloped areas, the awareness of active social participation is low, and formal support received by service recipients is insufficient. The existence of these issues constitutes obstacles to more effective social work participation in juvenile procuratorial work.

5.1.4 Weak Talent Teams in Judicial Social Work

Limited by regional economic conditions and industry scale, the number of professionals specializing in juvenile judicial social work is insufficient, and professional competence needs improvement. The nature of juvenile procuratorial work requires participating social workers to have backgrounds in social work, psychology, law, and other disciplines, yet in reality, judicial social workers are often familiar with social work and psychology but have weak understanding and mastery of laws and regulations. Additionally, juvenile judicial social work in underdeveloped areas is still in its initial stages, and social workers also face issues of insufficient professional competence and lack of experience, affecting the full realization of social work advantages in juvenile procuratorial work.

5.2 Path Improvement for Social Work Participation in Juvenile Procuratorial Work

5.2.1 Improving Top-level Institutional Design

The revised Two Laws cover multiple aspects of judicial social work, providing both macro-level guiding principles and micro-level specific measures, offering beneficial references for the involvement and participation of judicial social work. However, it is still necessary to clarify the legal status and rights-responsibility subjects of social work participation in juvenile procuratorial work, combine practical pilot experience, promote resource sharing, construct effective connection mechanisms between judicial social work and juvenile procuratorial work, and guarantee the effectiveness of juvenile procuratorial work. Furthermore, the participation of social organizations is multi-level and multi-faceted, and only through sound institutions can the role of social forces be fully realized. Taking mandatory parental education as an example, only when institutional provisions mandate that guardians accept parental education through compulsory means can social work better assist guardians in fulfilling their supervision and education obligations. Therefore, judicial units should serve as the main body, coordinating family, school, government, and social resources, ensuring government financial investment, and constructing a complete one-stop service system.

5.2.2 Issuing Local Supporting Policies for Judicial Social Work

Currently, procuratorial organs' purchase of social work services is conducted according to normative documents issued by the Ministry of Public Security, the Supreme People's Procuratorate, and other

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departments. While these documents have certain reference value, they suffer from insufficient specificity and limited effectiveness. Regarding which parts of juvenile procuratorial work social work services can participate in, and how the procedures and standards for purchasing services should be determined, facing such uncertainty, local governments can, within the scope permitted by law, formulate and improve local judicial social work regulations adapted to local economic development based on local livelihood conditions. Local regulations can effectively compensate for the shortcomings of top-level design, possess higher implementability and specificity, and can flexibly formulate response measures according to local juvenile judicial service needs, promptly address issues encountered in the local development of judicial social work, and promote the long-term and stable development of judicial social work.

5.2.3 Strengthening the Construction of Social Support Systems

First, encourage public welfare institutions and social enterprises to participate in juvenile procuratorial work through the introduction of preferential policies. Second, procuratorial organs need to properly seal juvenile criminal records, and based on local actual conditions, learn from and draw upon advanced practices from other regions, actively report to Party committees and People's Congresses, and strive for national fiscal support with supporting measures for social work organization services. Third, through policy advocacy, increase social tolerance for juvenile offenders, guide juvenile offenders to participate in society, and eliminate public misunderstandings about juvenile offenders. Through these measures, create a favorable atmosphere for the growth of minors, and actively promote the formation of juvenile judicial communities and minor protection communities [5].

5.2.4 Establishing Diversified Talent Cultivation Mechanisms for Juvenile Judicial Social Workers

First, provincial procuratorial departments can cooperate with schools to form talent cultivation mechanisms, strengthening the professional competence of judicial social workers through courses with higher relevance. Second, local procuratorial or other judicial organs can also establish collaborative mechanisms with universities, providing both student practice bases and promoting the development of judicial social work and talent cultivation through projects or research. Finally, social work service agencies should strengthen training in social workers' professional competence and communication skills, improving the efficiency and effectiveness of judicial social workers in serving minors.

6. Conclusion

This study takes the practice of social work participation in juvenile procuratorial work in City Z as its entry point, systematically exploring the feasibility, practical effectiveness, and practical dilemmas of social work intervention in juvenile judicial protection, and has formed certain contributions at both theoretical and practical levels.

In terms of theoretical value, this study enriches research content in the intersection of juvenile judicial protection and social work, verifies the applicability of social support theory and strengths perspective theory in juvenile procuratorial work, provides theoretical support for social work intervention in the judicial field, and further expands the research boundaries of judicial social work. In terms of practical value, this study summarizes the practical experience of procuratorial organs in City Z in introducing social forces, forming standardized service processes covering social investigation, observation and assistance, victim assistance, and crime prevention, providing a replicable and promotable reference model for procuratorial organs in underdeveloped regions to purchase social work services. According to statistics, over the past three years, City Z has referred nearly 200 minors involved in cases to social work service agencies, with more than 1,500 instances of assistance and education provided, and recidivism risk rate reduced to below 10%, achieving significant social effects.

Compared with existing research findings, previous literature has mostly focused on advanced experiences in developed regions such as Beijing, Shanghai, and Shenzhen, or emphasized the introduction of foreign judicial social work systems, while this study takes City Z as a sample, filling the empirical research gap regarding social work participation in juvenile procuratorial work in underdeveloped regions. Furthermore, previous studies have mostly explored social investigation or conditional non-prosecution assistance from a single dimension, while this study systematically covers four domains: protecting and assisting juvenile

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victims, educating and rehabilitating juvenile offenders, preventing juvenile delinquency, and safeguarding the legitimate rights and interests of minors, offering a more comprehensive research perspective. In terms of research methods, this study combines practical data and case analysis, pioneering the establishment of relatively comprehensive juvenile judicial social work service guidelines and documentation standards, innovating the “procuratorial-school-community” cooperative legal education model and interactive crime prevention forms such as “educational theater,” and promoting the development of social work participation in juvenile procuratorial work from experiential exploration toward standardization and professionalization.

However, this study still has certain limitations and unresolved issues. First, the legal status of social work participation in juvenile procuratorial work remains unclear, lacking independent intervention basis, which affects the rigid implementation of systems such as social investigation and assistance examination. Second, funding sources are unstable, and local fiscal support is limited, resulting in significant fluctuations in social work participation opportunities and service quality. Third, social support systems remain imperfect, with the “labeling” of juvenile offenders being prominent, and insufficient collaboration among multiple subjects including families, communities, and social organizations. Finally, judicial social work talent teams are weak, with a shortage of professionals possessing composite backgrounds in social work, psychology, and law, constraining the further improvement of service effectiveness.

Based on the above issues, future research can further focus on the following aspects: first, strengthening legislative research on social work participation in juvenile procuratorial work to clarify the legal status and rights-responsibility boundaries of social work; second, exploring the establishment of stable government procurement service fiscal guarantee mechanisms to promote the normalization and institutionalization of social work participation in juvenile procuratorial work; third, deepening research on multi-party collaborative mechanisms involving “family-school-community-judiciary” to construct systematic social support networks; and fourth, strengthening research on professional talent cultivation and vocational competency certification for judicial social work to improve team professionalization levels. It is hoped that through the joint efforts of theoretical and practical circles, a sound institutional system for social work participation in juvenile procuratorial work can be established, a more comprehensive social support system for minors can be built, the healthy growth of minors can be effectively safeguarded, and the high-quality development of juvenile procuratorial work in the new era can be promoted.

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Legal Pathways for Digital Empowerment of Rural Revitalization in Old Revolutionary Base Areas

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Abstract

Digital empowerment can provide important governance and legal support for rural revitalization in old revolutionary base areas. Yet wider network coverage or the launch of a digital platform should not, by itself, be treated as evidence that rule-of-law governance has been achieved. Many old revolutionary base areas are located in remote mountainous regions, where digital legal governance has developed slowly, infrastructure is not always fully used, and platforms can easily become little more than visible traces of administrative assessment. Whether digital empowerment is effective should instead be judged by more concrete questions: whether legal services respond to villagers' needs, whether different groups can participate meaningfully, and whether disadvantaged residents have access to remedies. Three problems are especially prominent at present. The ownership and sharing of agricultural data remain unsettled; digital capacity in grassroots law enforcement and justice is still limited; and some groups, particularly older residents, do not receive sufficient information or protection of their data-related rights. This article therefore argues that technology should be placed within a legal framework rather than allowed to determine governance on its own. Data sharing should follow the Regulations on Government Data Sharing, information collection should comply with the Personal Information Protection Law, coordination and online case handling at the grassroots level should be improved, and participation and remedies for vulnerable groups should be made genuinely accessible. The Ma Xiwu judicial tradition may also be carried forward through forms such as online courts, but its continuation must be supported by institutions and procedures rather than by the mere existence of a platform.

Keywords

digital empowerment, old revolutionary base areas, rural revitalization, legal pathways

1. Introduction

The 20th National Congress of the Communist Party of China called for advancing rural revitalization across the board and for building a modern socialist country under the rule of law. The Comprehensive Rural Revitalization Plan (2024–2027) further sets out arrangements for digitally enabled rural governance, including the integration and sharing of agriculture-related data and the practical use of digital platforms [1]. The State Council's Opinions on Supporting the Revitalization and Development of Old Revolutionary Base Areas in the New Era also identifies these areas as priority regions in the broader rural revitalization agenda [2].

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Most old revolutionary base areas lie in mountainous regions near provincial borders and remain distant from major urban economic centers. Their economic foundations are often comparatively weak, development has tended to be slower, and grassroots governance is still largely administration-led, leaving limited room for social actors to participate in public affairs [3]. As digital reform moves further into local communities, the central question is no longer whether digital technology should be introduced. What matters is how law can regulate key processes such as data sharing, online enforcement, and rights-based remedies, so that digital platforms do not become empty formalities and statutory rights do not exist only on paper. Given the particular development conditions of these regions, using legal institutions to discipline digital empowerment and strengthen public legal services at the grassroots level is therefore an important part of high-quality rural revitalization.

Digital governance in rural areas has consequently attracted sustained attention from both scholars and practitioners. One line of research focuses on the basic conditions of digitally enabled rural governance, especially the contribution of infrastructure and digital platforms to governance efficiency. Using dynamic QCA, Kong Li and colleagues argue that digital-village development can compensate for weaknesses in traditional factors and generate a green-development path in which older and newer drivers operate together [4]. Guan Yongbin and colleagues likewise find that the digital economy can improve the efficiency of public-service provision, with particularly strong effects in counties located in old revolutionary base areas [5]. Such work is valuable, but it often treats infrastructure as if it were sufficient to produce better governance. That assumption deserves caution. Technical coverage does not automatically produce rule-of-law outcomes, and a gap can remain between universal access to hardware and universal access to institutions.

A second body of research starts from the institutional requirements of rule-of-law development in rural areas. Xie Pengcheng and Yang Yonghai introduce three kinds of empowerment—psychological, resource and structural—which can improve the establishment of rule-of-law villages [6]. From the perspective of village self-government, Liu Chang mentions that the online discussion groups can enhance the transparency and democratic supervision, but may also meet with conflicts between the platform functions and the local needs, as well as the variations in the computer skills of the participants [7]. Li Xia sets up a coordination mechanism between law and digital intelligence, offering an alternative way to understand the legal support for government management in the information age [8]. This debate is sometimes considered as a comparison between stricter regulation and greater technological freedom. These opinions do not necessarily contradict each other. Law can serve as the connecting element, keeping the necessary restrictions while permitting local discretion and technological flexibility.

A third set of studies focuses on old revolutionary base areas. Liu Zhengquan investigates Sichuan and analyzes the use of compulsory legal regulations to enhance the legal aspect of electronic local government management [3]. Li Yixu and Zhao Gengke reveal the institutional limitations on the development of digital villages in these areas, such as poor infrastructure, lack of digital talents and inadequate data exchange [9]. Feng Zijia, emphasizing the red cultural resources, states that these resources can offer political support and promote governance, thus becoming an important driving force for the regional rejuvenation [10].

Taking into consideration the current research, it mainly discusses the digital governance of rural China in whole or focuses on the infrastructure and red cultural resources in the old revolutionary base areas. There are few papers which integrate digital empowerment, red cultural resources and legal ways into a comprehensive analytical framework. This paper bases on the fact that the governance in these regions is still largely carried out by administration and the chances for public participation are restricted. It suggests a legal system which is suitable to the local conditions, able to adapt to the evolving practices, promote the involvement of various parties and safeguard the less privileged people in the digital environment.

2. Practical Developments in Digitally Empowered Rural Revitalization in Old Revolutionary Base Areas

2.1 Gradual Improvement in Digital Infrastructure

As digital technology becomes more deeply embedded in everyday life, the state has continued to expand rural digital infrastructure, and network access and information services in old revolutionary base areas have improved considerably. By the end of 2025, gigabit broadband had reached every county, 5G every township,

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and broadband every village nationwide. More than 99.4% of townships were connected to the government extranet, and over 880,000 rural collective economic organizations had been brought onto the national platform for online supervision of collective assets, resources, and funds. During the same period, internet penetration in rural China reached 69.5% [11]. This remained below the national penetration rate of 80.1% [12], but the relatively low dispersion of digital-infrastructure indicators suggests that the initial goal of physical digital coverage has largely been achieved.

Infrastructure, however, is only a factual precondition for digital governance. It should not be equated with universal access to public legal services. Statutory public-service obligations under the Rural Revitalization Promotion Law address whether networks and platforms exist; whether villagers can actually obtain legal consultation, dispute mediation, or other services depends on how procedures are connected. Digital records, for example, can serve as evidence that village affairs were disclosed, but online disclosure alone may still fail to produce the supervisory effect required by the Organic Law of Villagers' Committees if it is not linked to the procedures of village supervision committees and township governments. Digital governance therefore still requires better coordination between online and offline processes, clearer allocation of rights and responsibilities, and institutional rules that prevent technology projects from becoming formalistic exercises.

2.2 Emerging Results from Digital-Governance Applications

The continuing spread of rural digital systems has gradually integrated digital tools into a range of grassroots governance settings in old revolutionary base areas. Applications now include the interconnection and circulation of administrative data, remote dispute resolution, online democratic deliberation, and the provision of public services. The Regulations on Government Data Sharing, coming into force in 2025, brought about a change in the way data is shared by incorporating it into a formal legal framework. It regards the legal exchange of data as the basic principle, bases the transmission of information on the fulfillment of statutory responsibilities, and sets up a standardized process for both requests and responses, along with a series of hierarchical dispute-settlement procedures. These arrangements offer an institutional support for the cooperation between local governments and the regular flow of governmental data [13].

Digital-governance platforms are also widely applied in village matters. For instance, a village-level digital consultation platform in Xiangshan, Zhejiang, involved over 20,000 villagers and solved about 60,000 daily problems, indicating the effect of digital means on increasing local involvement [5]. Such platforms can widen channels for involvement and improve governance efficiency, but they must remain anchored in existing law. Online deliberation and voting still need to satisfy the procedural requirements of the Organic Law of Villagers' Committees. A digital process cannot simply replace a legally required villagers' meeting; otherwise, a decision may lack legal effect because the required procedure was never completed.

2.3 Initial Digitalization of Revolutionary Legal Resources

Old revolutionary base areas are also important sources of China's revolutionary legal traditions. The judicial approach associated with Ma Xiwu emphasized proximity to ordinary people, circuit hearings, mediation as a priority, and the resolution of disputes in local settings. Some of these ideas have acquired new forms in the digital era through online platforms and remote services [14]. Parties can now participate in mediation or hearings through tools such as WeChat mini-programs, extending public-service obligations into online spaces and making dispute resolution more accessible [3]. In Shaxi Town, Tongjiang County, Sichuan, a so-called 'red court' has used information technology to continue the principle of remaining close to the people and has established online services that increase public participation in dispute resolution [14]. Feng Zijia similarly treats red cultural resources as an important resource for improving rural governance and stresses that their contribution depends on institutionalized channels [10].

These practices offer useful experience, but the richer institutional meaning of the Ma Xiwu tradition—especially public trust, local accessibility, and mediation-centered dispute resolution—has not yet been fully integrated into the logic of digital services. If the cultural advantages of old revolutionary base areas are to be translated into contemporary governance capacity, institutional support is needed for matters such as the selection of mediators, coordination with the judicial system, data confidentiality, and records management.

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3. Legal Difficulties in Digitally Empowered Rural Revitalization

3.1 Insufficient Legal Rules for Digital Empowerment

Rural development has long depended on support from the legal system, but the existing institutional framework does not yet respond smoothly to the pace of technological change. Several problems have become particularly visible.

First, the ownership and use of agricultural data remain insufficiently regulated. There is still no unified legal framework governing the collection and use of agriculture-related data, and local data resources are consequently dispersed and fragmented. Farmers are the principal sources of much of this information, yet they often lack effective rights to manage the data or share in the benefits created from it. The source text states that this places farmers in a 'dominant position' in the distribution of data value, although the surrounding discussion points to weak protection of their interests. Long-term residents in rural areas usually have weaker ability to protect their rights. The Personal Information Protection Law has improved the formal regulations regarding personal information; however, the actual implementation at the local level is still inconsistent.

In addition, the mechanisms for exchanging government data in the old revolutionary base areas are still imperfect. The legal basis for government data sharing is hard to put into effect in some local conditions, and it is unclear what kind of information can be shared and what should be kept confidential, which helps to maintain the existing information barriers [10]. Moreover, confidential documents may involve personal information. If the data are distributed without adequate processing or anonymization, it may lead to the infringement of the legal rights and interests of the citizens.

Moreover, the local digital administration may become formalistic. Some systems are established mainly based on the administrative evaluation criteria rather than taking into account the actual requirements of the people, and the stress on the attainable efficiency may limit the kinds of services offered by the platforms [3]. A common and universal method of digitization may restrict the residents and be against the aim of overall and conveniently available rural governance.

3.2 Limited Digital Capacity in Grassroots Law Enforcement and Justice

Digital technology can enhance the efficiency of local administration, however it demands higher abilities from the staff in the police and judicial departments. In some backward regions which have progressed relatively slowly and are now undergoing a digital transformation, the ability of the institutions cannot always follow the rapid development of technology. The grassroots administrative personnel may be elderly and might not receive enough digital training. According to the reference, 36% of the rural workers are over 55 years old and have received only junior-secondary education or less [6]. The front-line control officers still mainly depend on the traditional working methods and have limited practical experience in activities such as data collection, the transmission of electronic evidence and the management of online business. Such restrictions affect the operation of the intelligent control systems.

Moreover, digital tools cannot alone overcome the lack of manpower and resources. A too great dependence on algorithms may produce a 'technological Leviathan' as well. The automated systems are efficient, but they might reduce the flexibility for the enforcement officers, and the embedded algorithmic bias may cause unfair treatment. The digital divide creates another procedural risk: some residents may not be able to access online judicial services or submit applications in the required manner [3]. If an online platform provides no meaningful channel for parties to explain their position, or if poor network conditions in mountainous areas prevent documents from being filed on time, procedural gaps can arise and undermine the principle of lawful procedure.

3.3 Inadequate Protection for Digitally Disadvantaged Groups

Digital governance improves efficiency but can also generate new forms of inequality. In rural areas, these burdens tend to fall most heavily on people who already have fewer resources for participation.

Older residents face the most obvious digital divide. As urbanization draws younger adults toward cities for work, older people, women, and children are often left in rural communities. Many members of these

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groups have limited experience with smart devices, low awareness of online risks, and difficulty adapting to modern administrative systems.

Transparency in local data collection is another concern. When village-level platforms collect personal information, notification procedures are often simplified to the point that residents cannot easily understand complex data-processing rules. Genuine informed consent is therefore difficult to secure. Older people may find it especially hard to distinguish among different forms of data use, including the storage of facial-recognition data or health information, while risks of leakage and misuse remain present [15].

At the same time, the reduced participation of younger adults, combined with the limited capacities of many remaining residents, leaves rural digital governance facing a dual problem: too few active participants and insufficient governance capacity [6].

4. Legal Pathways for Improving Digitally Empowered Rural Revitalization

4.1 Improving the Legal Framework for Digital Empowerment

A more integrated legal framework is needed if digital empowerment is to support rural development in old revolutionary base areas. Current problems include uncertainty over rights in agricultural data, incomplete rules for data sharing, and poorly formalized evaluation mechanisms for digital platforms. Regulation should therefore cover the full data cycle, from the identification of rights and interests to circulation, use, and governance.

To begin with, rules governing agricultural-data interests and use should be clarified. Some scholars propose a farmer-centered protection framework that connects data circulation with rights protection, coordinates individual and collective interests, and places technological applications within legal constraints. Clearer rules would help define entitlements, improve benefit distribution, and strengthen risk prevention [16].

Government data sharing also requires a more concrete and uniform list for old revolutionary base areas. Such a list should distinguish confidential information from data that may be made available, require security and confidentiality review before sharing, and remove unnecessary barriers to cross-departmental circulation. Done properly, this could reduce the persistent problem of local data silos [17].

Finally, the strategy used to build and assess digital platforms should change. Evaluation should not depend solely on indicators imposed by higher-level authorities. Residents' actual needs, satisfaction, and observable governance outcomes should also be included. Platforms are more likely to support rural development when they are judged by whether they solve problems rather than by whether a technical system has merely been installed.

4.2 Strengthening Coordinated Grassroots Law Enforcement and Judicial Mechanisms

Digitalization at the grassroots level can distance formal power from local needs if institutions lack the ability to use new tools effectively. Local enforcement bodies and other legally authorized institutions therefore need stronger digital legal capacity. This requires a governance model that combines online and offline channels and allows several actors to participate, together with sustained digital training for local legal personnel. Rural public legal-service systems should cultivate local cadres who understand both law and digital technology and should build governance teams suited to digital-village development, linking administrative, social, and judicial forms of governance.

Traditional judicial experience should also be connected more carefully with contemporary digital technology. The Ma Xiwu approach emphasized accessibility and convenience for ordinary people. In a digital setting, those principles could inform a collaborative model in which judges, online mediation mechanisms, local residents, and public supervisory bodies each retain clearly defined roles. Online courts may support a more complete digital process—online filing, technology-assisted adjudication, remote mediation, and judicial confirmation—but digitalization should preserve rather than erase the strengths of local judicial practice. Regular digital-skills training is equally important, both for enforcement personnel and for villagers, because narrowing the digital divide requires capacity on both sides of the governance relationship.

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4.3 Protecting the Lawful Rights and Interests of Digitally Disadvantaged Groups

Digital-village development should not be pursued at the expense of residents who are less able to use technology. In accordance with the Personal Information Protection Law, protection should extend across the entire process of information collection, use, and remedy [15].

First, online and offline services should operate in parallel. Rural digitalization should not eliminate traditional service channels or impose a single technological standard on every locality. Standards need to be adjusted to local conditions so that efficiency gains do not come at the cost of accessibility for vulnerable groups [18].

Second, grassroots data collection must be more strictly regulated. Village platforms collecting residents' information should provide clear notice, and sensitive information such as facial-recognition or health data should be processed only with the separate authorization required by law. Older residents' rights to know and to make autonomous choices deserve particular attention, and hidden or secondary uses of personal information should be prevented.

Third, digital training should be differentiated. Village cadres and younger residents may need training in digital governance and platform use, whereas older people and other vulnerable groups may need basic operational support. Village-level assistance and proxy-service arrangements should be maintained, with appropriate confidentiality safeguards, so that every resident retains a practical opportunity to participate in digital governance.

5. Conclusion

The deeper integration of digital technology and rule-of-law governance has become an important route for rural development in old revolutionary base areas. Digital infrastructure in these regions has generally improved, and online governance platforms are gradually becoming part of local administration. Yet technical diffusion does not automatically produce effective governance. Delayed institutional development remains a major obstacle.

The problems examined in this article include shortages in public legal services, insufficient digital capacity in grassroots law enforcement and justice, and weak protection for disadvantaged groups. The corresponding responses are institutional rather than purely technical: a clearer legal framework for data and platform governance, stronger coordination among enforcement and judicial bodies, and more concrete safeguards for groups that face digital barriers. These measures can improve both the quality and accessibility of local digital governance.

There is also a longer-term tension between rapid technological change and the slower pace of institutional adjustment. The proposals made here therefore need to be adapted to local conditions rather than applied mechanically. In rural digital governance, the purpose of legal protection is not to place technology under ever tighter control for its own sake. It is to draw fair boundaries for digital governance, keep participation genuinely open, and preserve basic commitments to justice and equality. As the legal framework for agriculture-related data develops and digital-village programs continue to advance, old revolutionary base areas may be able to connect digital governance more closely with rule-of-law institutions and convert their revolutionary legal traditions into practical resources for contemporary rural revitalization.

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Conflicts of Interest

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