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Research on the Path of Digital Intelligence Technology to Empower Public Collaborative Governance of Environmental Protection: A Text-based Empirical Analysis

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Abstract: Based on the perspective of digital intelligence governance, this study uses social media comments as the database, uses text mining, sentiment analysis and grounded theory to identify the key factors affecting environmental collaborative governance, and constructs a public collaborative governance model based on activity theory. The results show that public emotional tendencies and governance issues can jointly affect the improvement of environmental governance efficiency through the interaction between the six elements of subject, object, tool, rule, community and division of labor in the activity theory model. The research results provide theoretical support and practical reference for enhancing the effectiveness of public participation in environmental governance.

Keywords: Digital Intelligence Technology; Environmental Protection; Public Collaborative Governance; Text Mining and Sentiment Analysis; Activity Theory.

1. Introduction

With the advent of the digital age, the field of environmental protection is undergoing profound transformation. The public's willingness to participate in environmental governance has been increasing, and gathering public forces to improve the efficiency of collaborative governance has become a key issue. As an innovative force integrating artificial intelligence and big data, digital intelligence technology is becoming a core element in promoting collaborative environmental governance, and is also strategically supported by national policies such as the "Regulations on the Work of Ecological and Environmental Protection Supervision". In this context, it is of great practical significance to explore how the public can participate in environmental collaborative governance under the influence of digital intelligence technology.

Public collaborative governance of environmental protection based on digital intelligence technology refers to the use of text mining, sentiment analysis and other technologies to mine public opinions to identify key elements and gain insight into public demands, so as to build a scientific governance path. Foreign studies have been extensive, such as Hsu A et al. (2023), which reveals the potential of big data in environmental governance[1]. Kruk SRL et al. (2021) summarized the model of governance shaped by digital intelligence technology[2]. Kloppenburg et al. (2022) distinguished three forms of digital and intelligent environmental governance[3]. Bakker K et al. (2018) proposed five elements of digital intelligence related to environmental governance[4]. Domestic research mostly focuses on governance model innovation and empirical evidence, such as Zhang Jie and Liu Yaqi (2024) verifying the positive impact of digital intelligence integration[5]. Peng Zhongyao (2023) found that digital intelligence technology can promote the systematization and precision of environmental governance efficiency[6]. Liu Yiwen and Chen Xijun (2023) empirically analyzed the positive effect of the digital-intelligence integration development index on pollution reduction and carbon reduction[7]. At the same time, some scholars have pointed out the potential risks in the digitalization process, such as Peng Xiaoxia (2024), who pointed out the multiple risks faced by the digitalization of environmental governance at both the technical and legal levels[8]. Chen Jian (2023) analyzed the practical obstacles to the modernization of environmental governance enabled by digital technology[9].

Existing studies are still insufficient in theoretical interpretation and method integration. To this end, this paper focuses on the collaborative governance of the public on environmental protection, uses text mining and sentiment analysis methods to analyze public attitudes and demands, and constructs a collaborative governance path model empowered by digital intelligence to improve the matching degree between policy and public participation, and provide a reference for environmental governance practice.

2. Model Basis and Performance Evaluation Indicators

2.1. Model Basics

In order to systematically identify the key elements affecting public collaborative governance under digital intelligence technology and construct a theoretical model, this study comprehensively applies the following four core methods:

2.1.1. Sentiment Classification Model

SnowNLP sentiment analysis algorithm is used to judge the sentiment tendency of comment text. Based on the naïve Bayesian classifier and sentiment dictionary, the algorithm determines the sentiment polarity by calculating the weighted scores of the sentiment words in the text. The formula for calculating the sentiment score is:

$$\text{SentimentScore} = \sum\left(\text{SentimentValue}(w_i) \times \text{TermFrequency}(w_i)\right) (1)$$

2.1.2. LDA Theme Model

The hidden Dirichlet allocation model is used to extract the potential thematic structure from the text. The model assumes that each document is a mixture of multiple topics and is generated by the document-topic distribution θ_d and the topic-word distribution ϕ_z. The joint distribution of its document generation process is:

$$P(\theta, z, w \mid \alpha, \beta) = P(\theta \mid \alpha) \prod_{z=1}^{N} P(z_z \mid \theta) P(w_z \mid z_z, \beta) \quad (2)$$

2.1.3. Grounded Theoretical Analysis Methods

The qualitative research method of using programmatic three-level coding to conduct qualitative analysis of text data, and to summarize and construct theories through systematic analysis of original data, follows the systematic three-level coding process, including open coding (extracting the initial concepts and categories from the original data), spinning coding (discovering and establishing logical relationships between categories to form the main category) and selective coding (integrating core categories and constructing the final theoretical model) [10].

2.1.4. Construction of Activity Theory Model

The theoretical model of activities is adopted, which emphasizes the bridging role of activities in the process of internalizing knowledge and skills. Based on the results of grounded analysis, a systematic collaborative governance path model including six elements: subject, object, tool, rule, community and division of labor is constructed.

2.2. Performance Evaluation Indicators

In text mining and model evaluation, model performance usually needs to be comprehensively measured through multi-dimensional indicators. In this study, the effect of the sentiment analysis model is mainly evaluated based on the accuracy, recall rate and F1 score of the classification task, and the quality of topic mining is optimized and evaluated with the help of the confusion index of the topic model.

3. Research Implementation and Result Analysis

3.1. Data Collection and Processing

Based on keywords such as "digital intelligence governance", "digital intelligence technology", "environmental protection", "environmental governance", and "public participation", this study collected relevant user comment texts from Douyin and Weibo platforms from May 2025 to January 2026, and obtained a total of 118,212 pieces of data, which were used for subsequent positive, neutral and negative sentiment analysis, LDA theme model mining and grounded theoretical coding comparison, so as to provide data support for the research on matching public sentiment and policy themes, as shown in Table 1.

Table 1. Data presentation table

Page URL	Account number	Title	Commentator	Comment content	Likes	Key words	platform
www.douyin.com/video/7325740377661607218	sheila	Beautiful China	Thanks**	Ecology	1	Environmental protection	TikTok
https://m.weibo.cn/detail/5083567467790370	Golden chrysanthemum 201212	Environmental protection	GEA**	Great, you are a...	6	Environmental protection	Weibo

Firstly, the data is cleaned, and the vacant values, duplicates and invalid content in the original comments are processed sequentially, and the methods of markup supplementation one by one, deduplication of the drop_duplicates() function, manual screening and elimination of invalid comments, and induction of duplicate sentiment words are used, and finally about 75,222 comment texts can be obtained for analysis.

3.2. Data Exploratory and LDA Analysis

3.2.1. The Distribution Characteristics of Public Comment Emotions

In this study, the SnowNLP model was used to classify emotions. The initial model accuracy was 0.701, the recall rate was 0.643, and the F1 score was 0.641. After parameter and dictionary optimization, the model performance was significantly improved: the accuracy rate reached 0.804 (an increase of 14.7%), the recall rate reached 0.803 (an increase of 24.9%), and the F1 score reached 0.791 (an increase of 23.4%). Finally, the optimization model was used for analysis, and the results showed that the distribution of public sentiment was as follows: neutral sentiment accounted for 65.30%, negative emotion accounted for 23.62%, and positive sentiment accounted for 11.08%. As shown in Figure 1.

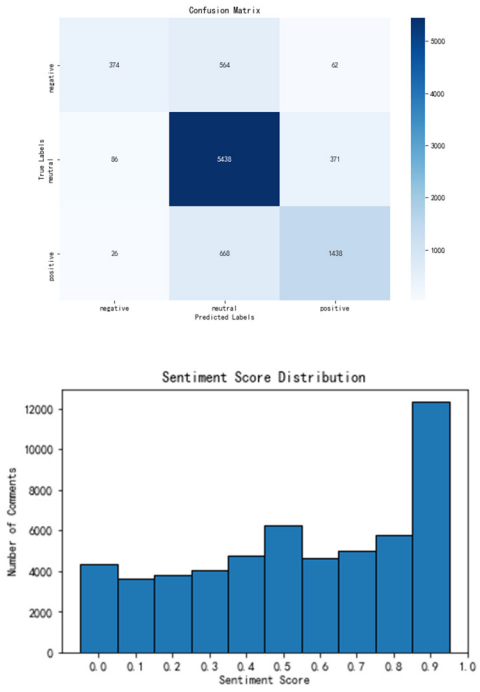

Fig 1. Optimized confusion matrix and classification results

3.2.2. Thematic Structure of the LDA Model

In order to further reveal the focus of the issue under

different emotions, the LDA model will be used to extract the theme of three types of emotional texts. Based on the principle of minimizing confusion, the optimal number of positive emotions is determined to be 8, neutral emotions are 7, and negative emotions are 4. The results are shown in Figure 2.

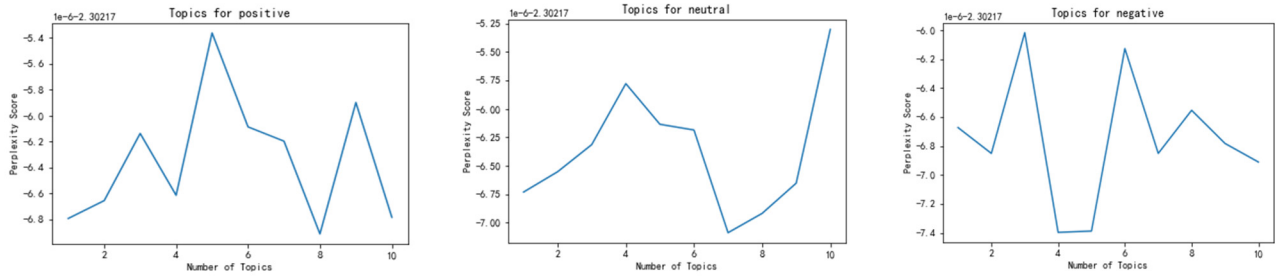

Fig 2. Confusion curve of three types of emotion LDA theme models

The results show that there are obvious differences in public concerns under different emotional tendencies. Positive sentiment comments focus on environmental protection, green development and other topics, and the content distribution is relatively concentrated. Neutral sentiment comments cover green energy, ecological protection and other aspects, and the theme distribution is relatively scattered but systematic. negative emotional comments are highly focused on specific practical issues such as environmental protection, energy conservation, and emission control. This difference reflects the public's differentiated topic concern logic in different emotional states, as shown in Table 2.

Table 2. Extraction results of three types of emotional LDA themes

Emotional type	Theme summary	TOP5 core keywords
Positive emotions	Environmental protection	Environmental protection, environmental conservation, rectification, law enforcement, and inspection
	Green living	Green, no side effects, life, low carbon, and saving electricity
	Low carbon emissions	Low carbon, pollution, emissions, global, hope
	Pollution control	Pollution, rectification, environmental protection, inspection, law enforcement, discharge
	Public participation	The public, good people, publicity, starting with me, the whole family
	Public welfare action	Public welfare, volunteers, contributions, publicity, global
	Energy conservation and emission reduction	Saving electricity, green, emission, rectification, and low carbon
	Global advocacy	Global, propaganda, Xi Jinping, green waters and green mountains, hope
Neutral sentiment	Green energy	Photovoltaics, batteries, methanol, electricity bills, and questions
	Ecological protection	Environmental protection, protection, hope, air, water conservation
	Resource classification	Global, garbage, carbon neutrality, photovoltaic, rural
	Global environmental protection	Protecting the environment, everyone is responsible, support, electricity, garbage
	Guarantee energy and reduce emissions	Carbon, power generation, environmental protection, solar energy, expensive
	Ecological balance	Green, cost, straw, recovery, death
	Low-carbon living	Technology, destruction, clothing, hydrogen, energy saving
Negative emotions	Environmental protection and energy saving	Environmental protection, electricity, volunteers, energy, new energy
	Resource saving	Save water, electricity, life, activities, plugs
	Emission control	Garbage, pollution, classification, discharge, recycling
	Rural governance	Rural areas, publicity, electricity bills, a copy, number

3.3. Grounded Theoretical Model based on LDA Feature Words

The LDA model reveals the "topic spectrum" of public discussion. In order to deeply explore the stable cognitive and behavioral logic under these superficial topics, and systematically explain the differentiated participation patterns corresponding to different emotional tendencies (such as

positive, neutral, and negative), the thematic feature words extracted by LDA will be used as the qualitative analysis corpus, and the procedural three-level coding steps of the grounded theory will be strictly followed for systematic interpretation and theoretical construction.

3.3.1. Open Coding

In this study, the LDA theme characteristic words under three types of emotions are interpreted, labeled and conceptualized sentence by sentence. Through continuous comparison and semantic merging, the initial concepts with similar semantics are summarized into higher abstraction categories. Taking positive emotion as an example, a total of 8 initial concepts (b1-b8) were extracted in this process, which were further summarized into 5 core categories (B1-B5). Characteristic words such as "environmental protection, rectification, and law enforcement" are conceptualized as "environmental protection", and are summarized as "B1 environmental protection" together with concepts such as "pollution control". "Green life, low carbon emissions" is classified as "B2 sustainable living". The overview of the openness coding results of the three types of emotions is shown in Table 3.

Table 3. Open coding results of three types of emotional classifications

Emotional type	Category (B)	Initial Concept (b)	TOP5 core keywords of LDA
Positive emotions	B1 Environmental protection	b1 Environmental protection	Environmental protection, environmental conservation, rectification, law enforcement, and inspection
		b4 Pollution control	Pollution, rectification, environmental protection, inspection, law enforcement, discharge
	B2 Sustainable living	b2 Green living	Green, no side effects, life, low carbon, and saving electricity
		b3 Low carbon emissions	Low carbon, pollution, emissions, global, hope
		B7 Energy conservation and emission reduction	Saving electricity, green, emission, rectification, and low carbon
	B3 Public participation	b5 Public participation	The public, good people, publicity, starting with me, the whole family
	B4 Action & advocacy	b6 Public welfare action	Public welfare, volunteers, contributions, publicity, global
	B5 Advocacy and education	b8 Global advocacy	Global, propaganda, Xi Jinping, green waters and green mountains, hope
Neutral sentiment	B1 Energy & technology	b1 Green energy	Photovoltaics, batteries, methanol, electricity bills, and questions
		b5 Energy conservation and emission reduction	Carbon, power generation, environmental protection, solar energy, expensive
	B2 Lifestyle	b2 Ecological protection	Environmental protection, protection, hope, air, water conservation
		b4 Global environmental protection	Protecting the environment, everyone is responsible, support, electricity, garbage
	B3 Environmental governance	b3 Resource classification	Global, garbage, carbon neutrality, photovoltaic, rural
	B4 Ecological protection	b6 Ecological balance	Green, cost, straw, recovery, death
		b7 Low carbon living	Technology, destruction, clothing, hydrogen, energy saving
Negative emotions	B1 Low-carbon transition	b1 Environmental protection and energy saving	Environmental protection, electricity, volunteers, energy, new energy
	B2 Pollution control	B2 Emission governance	Garbage, pollution, classification, discharge, recycling
		b3 Rural governance	Rural areas, publicity, electricity bills, a copy, number
	B3 Resource conservation	b4 Resource saving	Save water, electricity, life, activities, plugs

3.3.2. Spindle Coding

Table 4. Spindle coding results of the three types of emotional classifications

Emotional type	category	Main category	Sub-category	Category connotation
Positive emotions	Object	C1 Environmental management	B1 Environmental protection	A general term for the actions taken by citizens to protect the living environment and ensure development.
		C2 Daily actions	B2 Sustainable living	in maintaining economic, social, and environmentally healthy lifestyles.
	Subject	C3 Object of conduct	B3 Public participation	Citizens take the main participation to promote social decision-making and the implementation of activities.
			B4 Action & advocacy	An important means for citizens to promote social progress and development.
	Tools	C4 Awareness boost	B5 Advocacy and education	Interpenetration jointly promotes social progress and individual development.
Neutral sentiment	Community	C1 Environmental co-governance	B1 Energy & technology	Specializing in innovation and production and the critical role of these technologies in the energy transition.
			B2 Lifestyle	With "environmental protection" and "water conservation" as the core, it shows the community's promotion of green lifestyle and daily environmental protection, reflecting the pursuit of a sustainable lifestyle
	Rules	C2 Environmental order	B3 Environmental governance	With "protecting the environment" as the core, it emphasizes the position of "electricity" as a key resource in environmental policy, highlighting the importance of rules in guiding and regulating environmental governance activities.
	Division of labor	C3 Ecological collaboration	B4 Ecological protection	Focus on the keywords "ecology" and "protection", highlight the division of labor and cooperation between various entities in maintaining ecological balance and promoting sustainable development, so as to achieve long-term stability and health of the ecosystem.
Negative emotions	Community	C1 Energy transformation	B1 Low-carbon transition	Promote the transformation of the energy structure and form a new energy + environmental protection community.
	Division of labor	C2 Environmental governance	B2 Pollution control	Clarify the division of responsibilities and form an environmental governance system with the participation of multiple parties such as emissions, governance, and publicity.
	Tools	C3 Energy conservation and consumption reduction	B3 Resource conservation	Through technological innovation and preferential energy policies, the masses will be improved to save water and electricity.

The main axis code aims to identify and establish the internal connection between categories, and summarize them into main categories that can summarize the essence of phenomena. Through continuous comparison and logical correlation analysis of the categories in Table 3, this study identifies a total of 10 core main categories of three types of emotions, and their connotations and relationships are summarized in Table 4.

3.3.3. Selective Coding

On the basis of spindle coding, selective coding further extracts "public collaborative governance of environmental protection" as the core category, systematically integrates the logical relationship between the main categories, and constructs a collaborative governance path model based on activity theory. The model covers six elements: subject, object, tool, rule, community and division of labor, which provides a theoretical basis for subsequent policy suggestions and governance paths.

Table 5. Selective coding results of three types of emotional classifications

Emotional type	Typical relationship	Relationship structure	Relationship type	Relationship structure connotation
Positive emotions	Object → Core categories	(C1 Environmental management, C2 Daily actions) → Collaborative governance of the public for environmental protection	Causality	Factors of environmental protection and sustainable development can adjust the impact of public collaborative governance of environmental protection.
	Subject → Core categories	(C3 Object of conduct) → Collaborative governance of the public for environmental protection	Causality	Public participation actions can be used as the main body to influence environmental protection and public collaborative governance.
	Tools → Core categories	(C4 Awareness boost) → Collaborative governance of the public for environmental protection	Causality	Publicity and education as tools affect environmental protection and public collaborative governance
Neutral sentiment	Community → Core categories	(C1 Environmental co-governance) → Collaborative governance of the public for environmental protection	Causality	As the goal of the community, green transformation can regulate the effect of collaborative governance of environmental protection and public governance.
	Rules → Core Categories	(C2 Environmental Order) → Collaborative governance of the public for environmental protection	Causality	As a rule, resource circulation affects environmental protection, public collaborative governance, and directly affects implementation and effectiveness.
	Division of labor → Core categories	(C3 Ecological collaboration) → Collaborative governance of the public for environmental protection	Causality	As a division of labor, ecological maintenance directly affects the effectiveness of public collaborative governance of environmental protection.
Negative emotions	Community → Core categories	(C1 Energy transformation) → Collaborative governance of the public for environmental protection	Causality	Promote the adjustment and optimization of energy structure, and promote environmental awareness and public participation.
	Division of labor → Core categories	(C2 Environmental governance) → Collaborative governance of the public for environmental protection	Causality	The two complement each other in environmental governance, but the limitations of environmental governance prompt people to pay more attention to the importance of public collaborative governance.
	Tools → Core Categories	(C3 Energy conservation and consumption reduction) → Collaborative governance of the public for environmental protection	Causality	Through public collaborative governance, we will jointly promote the realization of environmental protection goals and form a virtuous circle of mutual benefit and win-win results.

4. Construction and Interpretation of Activity Theory Model

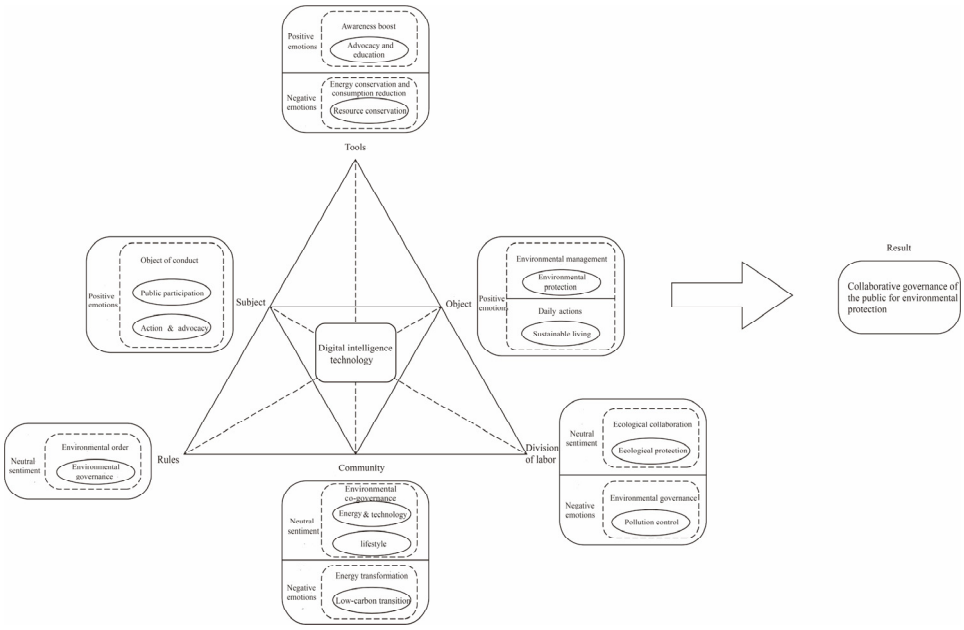

Fig 3. Theoretical model of public collaborative governance activities for environmental protection based on digital intelligence technology

Through grounded analysis, this study finds that public collaborative governance is mainly affected by ten main categories. Based on the activity theory model, these factors can be integrated into six elements: Object of Conduct as the subject, environmental management and daily actions as the object, environmental co-governance and green development as the community, environmental order as rules, awareness improvement and energy conservation and consumption reduction as tools, and ecological cooperation and environmental governance correspond to the division of labor. Together, these elements constitute the key system affecting the collaborative governance of environmental protection public, and the theoretical model is shown in Fig.3.

4.1. Subject

In the collaborative governance of environmental protection public, the subject is defined as the "object of conduct" driven by positive emotions and empowered by technology in the digital intelligence governance environment, that is, individuals or organized groups that actively participate in and promote environmental protection actions. They are the core force that attracts social attention, participates in policy discussions, practices green life, and continues to promote the governance process through online and offline interaction between words and deeds.

The role of the subject is mainly realized through two paths with the support of digital intelligence technology. First, the public participation enhanced by digital intelligence, with the help of social media analysis, emotional computing and other technologies, so that individual expressions such as "the public" and "start with me" converge into quantifiable and responsive governance signals. The second is data-driven Action & Advocacy, which transforms collective actions such as "public welfare" and "volunteers" into organizational and traceable governance practices through collaborative platforms and algorithm recommendations. The digital intelligence environment not only improves the breadth and efficiency of public participation, but also promotes the transformation of the main role from traditional participants to data contributors and collaborative governance nodes.

4.2. Object

In the collaborative governance of environmental protection public, the object refers to the specific goals and problems targeted by the governance activities, and under the framework of digital intelligence governance, this study summarizes it into two aspects: "environmental management" and "daily actions". Environmental management emphasizes the systematic regulation of environmental impact by relying on technical means such as intelligent monitoring, big data simulation and policy simulation. Daily actions refer to personal environmental protection behaviors recorded, quantified and motivated through digital platforms, which together constitute the role object and content carrier of digital intelligence collaborative governance.

Driven by positive emotions, the public's attention to environmental governance is presented in two dimensions: "environmental protection" and "sustainable living", and the focus and behavior transformation are realized through digital intelligence technology: the former strengthens the response ability to structural issues through technical tools such as pollution traceability analysis and intelligent early warning of law enforcement; the latter promotes the sustainability of individual behavior with the help of carbon footprint calculation and green consumption algorithm recommendations. Digital intelligence technology not only improves the accuracy of public cognition of environmental issues, but also promotes the transformation of environmental goals from public issues to monitorable and evaluable common actions through the dual drive mechanism of emotion and data.

4.3. Community

In the collaborative governance of the public on environmental protection, the community refers to the dynamic group collection that relies on the connection of digital intelligence platforms to share ideas and methods to achieve governance goals, which is embodied in this study as "environmental co-governance" under neutral emotions and "energy transformation" under negative emotions. Environmental co-governance promotes the integration of new energy technologies such as photovoltaics and batteries into public life through energy Internet of Things and technology sharing databases. Energy transformation relies on industrial ecological big data and resource metabolism simulation to coordinate environmental sustainability in economic growth, which together constitute the structural foundation for public collaborative participation in the digital intelligence era.

Driven by different emotions, digital intelligence technology helps the community to present two aspects and promote its integration: under neutral emotions, the public rationally examines energy costs and technical benefits through open data platforms. Negative emotions are often identified as transition anxiety through public opinion monitoring and affective computing, and are also transformed into change drivers through online collaboration tools. Although the emotional orientation is different, relying on digital communities and collaborative algorithms, the two can form a closed loop of consensus on lifestyle and energy issues, so as to accurately channel multiple emotions into a collaborative governance force of continuous participation, interaction and innovation.

4.4. Rules

In the collaborative governance of environmental protection and public protection, rules are the governance order framework empowered by digital intelligence, and the boundaries of the rights and responsibilities of each subject are clarified through data protocols and algorithm logic. The core of this study is to build dynamically regulated and traceable behavioral norms and resource allocation mechanisms based on smart contracts, data standards and collaborative algorithms, so as to systematically ensure environmental sustainability and social well-being.

Driven by neutral emotions, the public's compliance with the rules of "environmental governance" is more rational and efficient due to the empowerment of technology. "resource classification" relies on image recognition, Internet of Things and incentive points system to enable personal waste classification behavior to be recorded and feedback. "Global environmental protection" promotes carbon neutrality and renewable energy cooperation through cross-border data sharing platforms and blockchain certification. Digital intelligence technology not only deepens the public's understanding and recognition of rules, but also transforms

rules from static text to dynamic links throughout the governance process through data supervision and collaborative implementation, laying the foundation for an accurate and iterable collaborative governance system.

4.5. Tools

In the collaborative governance of environmental protection and public protection, tools refer to the key technologies and methods used by subjects to achieve governance goals in the digital intelligence environment, and this study defines "awareness boost" driven by positive emotions and "energy conservation and consumption reduction" accompanied by negative emotions as the core tools. The former relies on intelligent recommendation algorithms, emotional content generation and precision education platforms to systematically enhance public awareness and attention to environmental protection; the latter uses Internet of Things (IoT) monitoring, household energy consumption data feedback and behavior prompting technology to promote the public to carry out specific and quantifiable participation actions such as water conservation and electricity consumption.

The two tools form a differentiated synergy path under the governance framework empowered by digital intelligence: awareness enhancement with "advocacy and education" as the core, and the construction of emotion-cognitive dual-driven consensus through data narrative, virtual experience and personalized push; while energy conservation and consumption reduction expressed by "resource conservation" is based on real-time data perception and intelligent feedback mechanism, transforming problem awareness into continuous behavior change. Despite the different emotional bases, the two jointly form a closed loop of "perception-analysis-guidance-feedback" in the digital intelligence platform, becoming a key technical intermediary to transform public will into evaluable and optimized governance actions.

4.6. Division of Labor

In the collaborative governance of environmental protection, the division of labor refers to the intelligent responsibility allocation of each subject in the governance chain based on dynamic roles and data expertise under the support of the digital intelligence platform. This study concretizes them into "ecological collaboration" and "environmental governance". The former relies on ecological data models and collaborative algorithms to drive multi-agents to carry out preventive protection and systematic restoration under neutral emotions; the latter uses pollution traceability maps and intelligent task dispatch mechanisms to promote cross-domain response and accurate implementation of specific environmental problems under negative emotions.

The division of labor under different emotional orientation forms a differentiated collaborative model in the empowerment of digital intelligence. The division of labor under neutral emotion strengthens the systematic and predictive closed loop of ecological maintenance through the "ecological protection" simulation and technology matching platform; The division of labor driven by negative emotions is based on real-time problem sensing and algorithm optimization paths to improve the efficiency of reactive and targeted "pollution control" execution. Digital intelligence technology not only clarifies the responsibility interface but also promotes the transformation of public participation into traceable, evaluable, and adaptive optimization collaborative governance practices through the coupling of data flow and workflow, and systematically supports the refined implementation of environmental governance goals.

5. Summary

Based on the public comment data in social media, this study comprehensively uses sentiment analysis, LDA theme model and grounded theory to construct a theoretical model of public participation in environmental collaborative governance empowered by digital intelligence. The model reveals the interaction path between the six core elements of subject, object, tool, rule, community and division of labor, and clarifies how the public with different emotional tendencies can collaboratively participate in environmental governance under the influence of digital intelligence technology. This study not only expands the application scenarios of activity theory in the field of environmental governance, but also provides an empirical basis for building an emotion-perceived and data-driven collaborative governance model for environmental protection, which is helpful to improve the accuracy of public participation and the response efficiency of environmental governance.

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