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Article

Soft law governance of enterprise data compliance in the context of environmental protection

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Abstract: Domestic and foreign countries have different views on soft law governance. In China, the understanding of "soft law" stays at a static level, which is considered to be a social norm in a pluralistic sense. Foreign countries understand "soft law" from a dynamic perspective, that is, they mainly tend to take it as a means of governance and a mechanism to solve disputes and contradictions. Combining the above two viewpoints, soft law governance can be understood as a governance concept or governance model, and it takes the needs of the governance object as the starting point. Moreover, it advocates bottom-up governance. This governance method reflects the value connotation of people-oriented, democratic, autonomous and inclusive, and actively practices "multi-subject participation". It can be seen that, rather than hard law, soft law is more suitable for the liquidity, development and change characteristics of enterprise data, especially in the context of environmental-related data, and is conducive to condensing the governance force of multiple subjects including the government. The effectiveness of enterprise data compliance governance is of great significance in the field of environmental protection. With the help of ecological environment data such as carbon emission data, environmental detection data and pollution control data, the efficiency and benefit of ecological environment governance can be improved, and the efficiency of ecological governance can be driven by data. But compared with the United States, the European Union and Singapore, the effect of enterprise data compliance soft law governance is not significant. Through literature research and comparative analysis, the factors affecting the effectiveness of Chinese soft law in enterprise data compliance governance are analyzed, and the solutions can be found from the comparative analysis.

Keywords: soft law; enterprise data; sustainable development; environmental data governance; environmental protection

1. Literature review and statement of problem

At present, artificial intelligence has shown a milestone development. Since the advent of ChatGPT, it has shown strong productivity of artificial intelligence technology, but behind this is a broader and larger data processing and utilization, and data risks have also emerged. In 2023, due to data security issues, Italian authorities issued a ban on ChatGPT, restricting its continued provision of related services in the country. However, from the perspective of the value release of data elements, data productivity benefits from data flows. As Victor Myerschelnberg says, if there is not enough data, the quality of artificial intelligence applications will be reduced, which in turn affects transaction efficiency and consumer welfare [1]. From the objective reality, under the joint promotion of e-commerce development and the Belt and Road policy, data flows frequently across borders. All of the above reflect the necessity and urgency of data governance. In the theoretical research and practice around data governance, "balancing development and security" has become a consensus at home

and abroad. The "Opinions on Building a Data-Based System to Better Play the Role of Data Elements" (referred to as "Data Twenty") divides data into three types: "enterprise data, personal data, and public data," and requires the improvement of the data compliance system. Among them, corporate data compliance governance is crucial for environmental protection, as enterprise-generated environmental data such as pollutant emissions data and resource consumption data need to be properly managed and compliant to ensure accurate environmental monitoring and effective environmental policies.

The International Energy Agency (IEA) released the 'Global Carbon Emissions Report 2023' in March 2024, which pointed out that in 2023, global energy-related carbon dioxide emissions continued the upward trend of last year, increasing by 410 million tons (coal-fired emissions accounted for 65%), an increase of 1.1% over 2022, reaching a record high of 37.4 billion tons [2]. In order to further promote the construction of a beautiful China, digital technology is gradually becoming an important engine of national green development, and carbon emission data, as the core resource of the green economy, has become an irreversible trend for cross-border flow. Carbon emission data covers production, energy consumption, supply chain and other aspects. It is an important indicator to measure the carbon emission of enterprises and even the country, and also an important reference to promote the realization of the "double carbon" goal. Some data also carry confidential information of enterprises such as commercial secrets and technical secrets. Once leaked, it will endanger the interests of enterprises and national security [3]. In addition to carbon emissions data, in the field of ecological environment, it also contains environmental testing data, environmental governance data and other types of environmental data. These data can provide new thinking, technology and methods for ecological environment governance, realize the timely feedback and dynamic digitization of environmental activities to the economy and society, and effectively improve the level of ecological environment governance and decision-making [4]. At present, the EU carbon border adjustment mechanism (CBAM) requires China's related product export enterprises to submit carbon emission data according to CBAM, which is easy to break through the data cross-border compliance boundary of "data cross-border security and free flow" [3]. In addition, environmental data such as environmental detection data and pollution control data are also tampered with and falsified, resulting in the distortion of environmental data itself, and its integrity and authenticity are questioned. Therefore, in the context of ecological environment protection, this paper discusses the issue of enterprise data compliance governance

It can be seen that the compliance of enterprise data restricts the security and development of the business environment in the era of artificial intelligence. Enterprise data compliance is to regulate the data behavior of market players, but in the process of enterprise data compliance governance, it is necessary not only to regulate the behavior, but also to deal with the uncertainty of technical algorithms behind data utilization and processing, opaque risks, national security and international digital economy competition. Under the new situation of the continuous development of artificial intelligence, GAI often needs to deal with open and changing data, so it is more inclined to adopt dynamically adjusted non-deterministic algorithms. Therefore, static governance is often difficult to work [5]. Therefore, some

scholars have proposed that China needs an artificial intelligence law that can highly adapt to technological uncertainty, respond to local unique needs, and effectively respond to international competition [6]. Society is moving towards the era of artificial intelligence and big data, and social legislation must be in line with the environment of the times. In this regard, China has made a lot of legislation on data compliance governance, making the contemporary legal environment more perfect. At the same time, in order to further improve the data circulation environment, China has issued a top-level design document on data compliance governance to enhance the forward-looking and guiding force of China's policy environment. But overall, China's enterprise data compliance governance is dominated by hard law, but hard law is more conservative in value orientation [5]. This also leads to a deep tension between hard law and the development of artificial intelligence. Any effort to coordinate the two may weaken the obligation of data protection, interfere with the vested interests brought by artificial intelligence, or both [7]. At the same time, there are some difficulties in hard law governance, such as the "fragmentation" of legislation, the incompatibility of relevant legislation in different countries, the high cost of cross-border flow of enterprise data, and the lack of flexibility of hard law itself. On the concept of "soft law", 19th-century Austrian scholar Eugen Ehrlich, a representative of social law, first proposed the concept of "living law." He believes that the law arising from social life, including trading habits, is a "living law" [8]. Luo and other scholars believe that "soft law" refers to the legal norms that are not as complete as hard law in terms of legal structure, and do not need to rely on the state's compulsory guarantee but can produce social effectiveness [9]. This paper argues that hard law and soft law are different ways of the rule of law. The biggest difference between the two is the difference of "compliance" that is, although the latter can produce certain social effects, it lacks mandatory protection. However, it is normal for soft law to be embedded in the field of enterprise data compliance governance, such as digital financial governance [10], algorithmic governance [11], artificial intelligence service [12] and other fields closely related to enterprise data compliance. In addition, the negotiable and flexible adjustment mechanism of soft law can maximize the variability brought by technological iterative innovation, and can also promote the interest integration and cognitive convergence of multi-party regulatory entities on the basis of information sharing and consultation, thus bringing about the optimal allocation of transnational resources under the regulatory consensus [10].

Soft law not only shows considerable advantages in corporate data compliance governance, but also has application value in international environmental governance. For example, the EU makes full use of soft law governance in ecological governance. The EU's air quality standard directives issued from 1999 to 2008, based on the air pollution issues of common concern to EU countries, use an open coordination mechanism to formulate four pollutant emission standards that cause serious pollution to the atmosphere, and then require member states to formulate specific policies and implementation programs, which are supervised and implemented by member states [13]. The Paris Agreement is an international agreement that is legally binding on all parties to the United Nations Framework Convention on Climate Change under the negotiation mechanism. In international law, the Paris Agreement has the nature of "hard law." However, the "Paris Agreement" has created a new management model,

that is, the "soft law" model. Under the constraints of the "common area principle," it does not force developing countries to assume more responsibilities, but calls on them to decide on their own contributions, and stipulates the mechanism of "only advance and not retreat," encourages each country to continuously improve emission reduction targets and actions, and reduces the resistance to the implementation of the "Paris Agreement" to the greatest extent. On 12 December 2015, climate negotiators from 195 countries agreed to adopt the "Paris Agreement" in Paris, France [14]. Therefore, in the context of environmental protection, environmental-related enterprise data compliance governance can still be governed by soft law.

However, the soft law governance effect of enterprise data compliance is not significant. First, in the soft law generation process, the formulation subject has an absolute dominant position, such as the user agreement formulated by the network platform. Many network platforms have a "use as consent" clause, that is, users must agree in advance with the conditions proposed by the platform operator before using the services provided by the platform; otherwise, they can not use the corresponding platform services at all [15]. It can be further analyzed that due to the dominant position of soft law makers, soft law may have significant maker preferences. When enterprises collect, store, analyze and process ecological and environmental data such as environmental monitoring and pollution control, it is difficult to ensure the security, authenticity and integrity of the personal and national data involved. Secondly, there is a problem of insufficient compliance in the implementation mechanism of soft law, such as soft law norms such as guidelines and initiatives related to enterprise data compliance, which have specific standards and principles, but lack a rigid binding force. Even so, in extraterritorial governance, the practice and experience of soft law governance of enterprise data compliance are effective. Therefore, how to give full play to the effectiveness of soft law governance in China has become the focus of this paper.

2. Fundamental theory

Although the concept of "soft law" appears in the field of international law, it can be understood in different contexts of international law and domestic law. However, in the above dual context, soft law is considered to be non-enforceable clauses and norms. The difference is that in the context of international law, the understanding of soft law is more uniform. Soft law is considered to be non-enforceable clauses and agreements of non-treaty obligations, but in the context of domestic law, there are different understandings [16]. Luo and Song believe that soft law has connotation and extension. Soft law refers to those legal norms that do not rely on the state's coercive power to ensure implementation. Its external performance is part of the national law norms and all social law norms. The external performance can be further divided into three basic forms: flexible norms in national law, self-discipline norms created by political organizations, and autonomous norms created by social communities [17]. However, as far as the general understanding of "law" is concerned, law is a social norm that has enforcement power and is formulated or recognized by the state. However, from the perspective of the expansive understanding of law, "law" is a social norm in a pluralistic sense, not only referring to the law formulated by the state power

organs. Therefore, in the context of domestic law, there is a dispute between the illegality of soft law and the nature of soft law.

The debate on the nature of soft law focuses on the point of "whether it has validity". "Effectiveness" is often bound to "coercive force". However, effectiveness does not necessarily lead to effectiveness. Keynes believes that there is no correlation between efficiency and effectiveness. Effectiveness belongs to the category of ought to be, and efficiency belongs to the category of reality [18]. Therefore, actual coercive power does not necessarily bring about actual obedience, and the source or basis of effectiveness is also an open and unfinished issue. Therefore, it is not possible to affirm that soft law is not effective without coercive power [18]. In addition, the soft law itself is normative, and there is also the "effectiveness "of the ought-to-be category. Of course, this effectiveness often produces corresponding actual effects through "social identity", which has certain constraints. In this regard, soft law can still be equally effective without relying on external coercive power [18].

The adaptability of soft law governance and enterprise data compliance governance is reflected in the following aspects: first, the two are in line with each other in the governance concept; second, there are realistic and feasible foundations and examples, as described below.

On the one hand, the governance concept of enterprise data compliance should be co-governance and win-win. This can be learned from the policy and legal environment of enterprise data compliance. Policy documents such as "Guiding Opinions on Promoting and Regulating the Application and Development of Healthcare Big Data", "Opinions on Promoting the Coordinated Development of E-commerce and Express Logistics", "Guiding Opinions on Strengthening Data Asset Management" and other basic laws such as "Data Security Law", "Network Security Law", "E-commerce Law", "Personal Information Protection Law" all have relevant expressions of "multi-party co-construction, participation" and "coordinated promotion," and include industry self-discipline and market dominance into data compliance governance measures.

From the perspective of the expanding scale of the digital economy, the in-depth application of enterprise data not only brings competitive advantages to enterprises, but also creates benefits for society. However, this is based on data circulation. However, the speed and scale of data circulation are affected by the credible and safe circulation environment. The purpose of enterprise data compliance governance is to create a credible and safe circulation environment. In addition, enterprise data not only comes from the authorization of personal information, but also from the opening of public data. The compliance governance of enterprise data is not only related to individuals and society, but also the concern of national governments. Therefore, the interests of individuals, enterprises, public collectives, and national governments are superimposed on corporate data compliance governance.

In the context of environmental protection, this win-win concept is also crucial. For example, accurate enterprise environmental data compliance can help environmental protection organizations monitor environmental changes more accurately, and at the same time, enterprises can improve their environmental performance and reduce potential environmental risks through compliance, which is beneficial to both the environment and the long-term development of enterprises. Soft

law governance can play an important role in promoting this win-win situation. Soft law norms can encourage enterprises to actively disclose environmental data, strengthen industry self-discipline in environmental data management, and promote cooperation between enterprises and environmental protection stakeholders.

On the whole, corporate data compliance governance should not only be a unilateral responsibility of the state and the government, but also a multi-agent co-governance including the government and industry organizations, which is in line with the soft law governance model. Soft law governance is a new type of rule governance. The process and effect of governance are generally guaranteed and realized through internal or external forces. Internal or external binding forces mainly refer to self-obedience, market pressure or public opinion, rather than state coercion. Moreover, soft law governance is democratic and open, which means that it can provide space for dialogue and cooperation among different subjects. Therefore, soft law governance can create more collaborative rather than antagonistic relationships [16]. In theory, multi-agents can achieve a win-win situation from the effectiveness of enterprise data compliance governance, but the real realization of this win-win situation is to meet the interests of multiple parties and promote the common realization of the interests of all parties through the formation of rules. The soft law starts with the actual effect and pays more attention to the compliance of all parties based on their respective wills [19]. Its own formation is based on the participation and consensus of multiple subjects. Therefore, the soft law governance of enterprise data compliance can bring a win-win situation to relevant stakeholders.

On the other hand, enterprise data compliance is no longer a matter of one country, and many countries are conducting enterprise data compliance governance to varying degrees. From the current situation of governance at home and abroad, the soft law governance of enterprise data compliance has a realistic and feasible basis and example. The universality, technicality, complexity and timeliness of data governance determine that standard guidelines with a soft law nature will play a huge role [20]. The EU GDPR realizes the incentive for enterprise data compliance through two ways: code of conduct and certification. Among them, the code of conduct refers to the detailed rules and standards specified by industry associations and market players to promote the reasonable application of GDPR according to different industry characteristics and different enterprise scales. In addition, from the requirements of the compliance management system and the guidelines for the use of the "Compliance Management Measures for Central Enterprises" issued by China, the normative sources of compliance all contain standards with the nature of soft law, including industry standards, good governance standards, generally accepted best practices, ethics and community expectations.

The Data Governance Institute (DGI), established in 2003, proposed the DGI Data Governance Framework in 2004 and has been applied by hundreds of organizations around the world. Microsoft's "Privacy, Confidentiality and Compliance Data Governance Guidelines" are highly recommended as a resource on the International Privacy Experts Association's website [21].

3. Demonstration research and design

3.1. Research methods and routes

This paper attempts to analyze and demonstrate from both theoretical and practical perspectives. The methods used include literature research and comparative research. The literature mainly comes from the journal articles, legal and policy documents and research reports of CNKI and other databases, official websites and research institutes (centers). The object of comparative analysis is the soft law governance practice of enterprise data compliance in major countries or regions. From this, measures to improve the effectiveness of China's soft law governance in enterprise data compliance are extracted.

3.2. Sample selection

The sample is the research object, including the soft law governance practice of enterprise data compliance in China, the European Union, the United States and Singapore. Internationally, China, the United States and Europe are the three poles of the development of the world's digital economy, and the foothold and starting point of this paper is the soft law governance of enterprise data compliance in China. Therefore, it is necessary to sort out and analyze the practice of soft law governance in China. In addition, the EU's strict regulatory model, the US's soft law governance model, and Singapore's multi-collaborative model are extraterritorial representatives of the corporate data compliance governance model [5]. Therefore, in general, the specific practices of China, the European Union, the United States and Singapore are taken as the research objects.

3.3. Sample description

Compared with the hard law, the soft law is mainly characterized by "flexible inclusion" and "pluralistic autonomy". The flexibility and inclusiveness of soft law is manifested in the lack of clear requirements in legislative procedures, revision methods, and publishing subjects. The generation process of soft law is completely based on social and market needs, and can be continuously updated and iterated with changes in the market and technology to maintain its vitality and viability [22]. In terms of enterprise data compliance governance, technology is accompanied by the whole life cycle of enterprise data and becomes one of the influencing factors of enterprise data compliance governance. The pluralistic autonomy of soft law is manifested in the participation of multiple subjects, and the interests of different subjects are taken as the guidance to promote the compliance of soft law. At the same time, in the research data on "soft law", "data governance", and "artificial intelligence", measures such as "both soft and hard law and interaction" are reflected. Therefore, in the description of the research object, it is mainly from the perspective of subject participation, technology application, and interaction between hard and soft law.

3.3.1. Governance practice in China

In recent years, China has created a number of soft law norms on data compliance, which involve multiple levels and subjects (see **Tables 1** and **2**).

Table 1. lists the central-level and local-level soft law norms.

Central-level guidelines.	The 14th Five-Year Plan and the Three-Year Action Plan for Data Elements X (2024–2026). Promoting the development of a big data action plan; 'Overall scheme of ecological environment big data construction'.	It emphasizes promoting data compliance circulation, giving full play to the multiplier effect of data elements, stimulating the potential of data elements, and enabling economic and social development. Promote the unity of development and standardized management, and build a digital ecology of safe and credible circulation.
Local-level development planning	The overall plan for the development of the digital economy was formulated by various regions and "Based on the new track of the digital economy, the action plan for promoting the innovation and development of the data element industry (2023–2025)" and so on.	The development of the digital economy, multi-subject cooperation, international communication and so on have become the key words of enterprise data compliance governance.

Table 2. Lists the different subject-levels soft law norms.

National-level policy documents, norms, industry standards and technical standards, governance principles	The State Council issued the "Outline for Action to Promote the Development of Big Data"; "Guidance on promoting and standardizing the application and development of big data in health care" issued by the General Office of the State Council; the National Development and Reform Commission and other departments issued the "Guidelines for the Construction of National Data Standard System"; two editions of 'artificial intelligence standardization white paper' compiled by China Institute of Electronic Technology Standardization; the Central Network Information Office issued the "Global Artificial Intelligence Governance Initiative"; the State Administration of Market Supervision and Administration of the People's Republic of China and the National Standardization Management Committee issued the "Information Security Technology Machine Learning Algorithm Security Assessment Specification" "Artificial Intelligence Data Labeling Procedure for Machine Learning". The National New Generation of Artificial Intelligence Governance Professional Committee issued the "New Generation of Artificial Intelligence Governance Principles-Developing Responsible Artificial Intelligence". The Ministry of Ecology and Environment issued the 'Compilation Specification for Basic Data Sets of Ecological Environment Information'.	It reflects the characteristics of standardization, unification and normalization in the governance of enterprise data compliance in China, and establishes the principles of harmony and friendship, fairness and justice, inclusive sharing, respect for privacy, shared responsibility, safety and controllability, open cooperation and agile governance.
Industry-level self-regulation convention	The China Artificial Intelligence Industry Development Alliance organized relevant experts to study and draft the "Artificial Intelligence Industry Self-discipline Convention (Draft for Comments)". The Shenzhen Artificial Intelligence Industry Association and dozens of companies such as Obi-Zhongguang jointly issued the "New Generation of Artificial Intelligence Industry Self-discipline Convention".	Focus on people-oriented, justice and fairness, security and controllability, privacy protection, inclusive sharing, clear rights and responsibilities, collaboration, industry standards and other aspects.
Consensus, ethical reports, declarations issued by scientific research institutions and enterprises.	Beijing Zhiyuan Artificial Intelligence Research Institute jointly issued the "Artificial Intelligence Beijing Consensus" with universities, scientific research institutes and industrial alliances. Beijing Zhiyuan Artificial Intelligence Research Institute and Ruilai Wisdom jointly launched the "Artificial Intelligence Industry Responsibility Declaration" with the participation of Baidu, Cambrian and other enterprises and research institutions. Tencent Research Institute and Tencent AI Lab jointly formed the "Technical Ethics in the Intelligent Era-Reshaping the Trust in the Digital Society".	It takes people-oriented, safe and controllable, technological trust, open sharing and responsibility as the principles of governance.

Soft law norms include both national soft law and folk soft law. There are norms with macro-guiding significance and micro-operability in national soft law, but most of the folk soft law are framework rules formulated in accordance with the guidelines and hard law norms at the central and national levels. The industry self-regulatory organization has become the executor of national soft law or even hard law rather than the explorer of corporate data compliance governance rules. The soft law formulated by it is a reaffirmation of the above-mentioned normative essentials, and it is difficult to play the role of innovating rules and cooperating with hard law [23].

The main body of soft law includes the state, industry, enterprises and other multiple subjects, but there is a conflict of interest between them objectively, which will hinder the formation of private-private cooperation and public-private cooperation. The field of artificial intelligence has shown an "oligopoly" situation. Taking the field of generative artificial intelligence as an example, at present, there are no legal barriers in this field, but in fact, few enterprises can enter this high-yield field. One of the reasons is that most enterprises can not afford the high cost of training models and technology. In addition to the high cost, the level of technology will also lead to the oligarchy in the field of artificial intelligence. This is because the research and development of artificial intelligence requires a very high level of technology, and in the 1985 "White Paper on the Establishment of the Internal Market", the European Commission proposed to eliminate technical barriers, which also reflects the objective reality that technical barriers will seriously hinder market competition [24]. Another reason is that limited subjects often hold the vast majority of data resources, so the industry discourse power is also controlled by a small number of subjects. This will lead to the inability to form the largest consensus in the true sense between the main bodies of the intelligent industry, and it will be more difficult to cooperate effectively on the basis of consensus. In addition, technical barriers and transparency barriers naturally exist between smart industry subjects and other social subjects, which will lead to the lack of a trust basis for achieving governance synergy [5].

In the literature involving enterprise data compliance and data governance, technical support is one of the important measures for enterprise data compliance and governance. Because the Internet of Things, artificial intelligence, blockchain, cloud computing and machine learning technologies have the highest frequency of occurrence, the above five types of technologies constitute the most representative and widely used technology set [25]. However, there are ethical risks in technology application, and technical logic is not naturally integrated with social logic and policy logic. In addition, auxiliary tools such as technology platforms lack standardized construction, and there are still development bottlenecks in systematic development.

In general, China's corporate data compliance governance reflects the trend of hard law-based and soft law-assisted governance, but there are still obstacles in how to coordinate the two to maximize their effectiveness. Although the main and auxiliary status of the two has been clarified, the roles and responsibilities of the two in enterprise data compliance are still not clear, and the "discourse power "of soft law is easily weakened in governance practice. In addition, China's existing soft law regulation is not only rigid and fragmented, but also not deep enough. Soft law cannot form a constructive support for the blind spots that hard law is difficult to involve, which is also an important reason for the difficulty of collaborative governance. This

situation also exists in enterprise environmental data compliance governance. For example, when dealing with emerging environmental data-related issues such as the use of AI in environmental monitoring, soft law fails to provide sufficient and flexible guidance, and the coordination between hard and soft laws is also inadequate.

3.3.2. EU governance practices

In the process of EU data governance, the characteristics of "strong regulation" are very prominent. "Strong regulation" refers to unified data legislation, and government departments intervene more in the digital market and regulate the behavior of the data factor market. At the same time, in 2015, the European Commission issued the "European Digital Single Market Strategy" and in 2020, it issued the "European Data Strategy". These digital strategies all hope to create an international and open data market by creating the EU as a "world model" for data-driven, corporate and public sectors to make better decisions. From strong regulation to promoting data flow, the EU's data governance model has changed, from data-protected individual governance to empowering enterprise data. In terms of the main body of EU data governance, it also shows the characteristics of diversity. The main body of governance is composed of the European Commission, member states, industry sectors and enterprises. The European Commission not only protects data but also provides experience in data governance, openness, and requirements, as well as advice on strategies for cross-sectoral standardization. The government is responsible for formulating policies, laws and standards with the goal of standardizing and legally operating the data factor market. Industry self-regulatory organizations and enterprises belong to the category of non-governmental organizations. They are responsible for supervision and corporate compliance, and are also important suppliers of the EU's "soft law" of data governance [26]. In the environmental data governance aspect, the EU's strong regulation also ensures that enterprises' environmental data is properly managed. For example, the EU's regulations on data protection and circulation also apply to environmental data, and industry-specific soft law measures further promote the standardization of enterprise environmental data management.

3.3.3. U.S. governance practices

In the context of global governance of artificial intelligence, the US government has adopted a series of important measures and policies to strengthen artificial intelligence and data governance in the face of the security risks brought about by the development of artificial intelligence.

On the one hand, pay attention to the formulation of artificial intelligence security application specifications. In January 2023, the United States released the "Artificial Intelligence Risk Management Framework", which focuses on the effectiveness, reliability, security and flexibility, transparency, interpretability, privacy protection, fairness and other dimensions of artificial intelligence systems, and guides organizations to develop artificial intelligence systems in a safe and credible direction.

On the other hand, "soft law" is integrated into governance practice. First, at the conceptual level, the concept of collaborative governance is integrated into the design, development, use and decision-making of artificial intelligence systems to promote the consistency of artificial intelligence systems from design to application with value ethics and expected goals. The US government has signed a voluntary commitment

agreement with artificial intelligence companies to allow them to make commitments to build an automated system with security as the top priority. Second, to promote industry self-discipline, major technology companies are required not only to support the formulation and promulgation of artificial intelligence regulations, but also to formulate corresponding autonomous norms. It is also necessary to promote industry organizations to make suggestions for artificial intelligence governance [27]. In the field of enterprise environmental data, the US also uses soft law to promote governance. For example, through industry-led initiatives, enterprises are encouraged to adopt best practices in environmental data management, and the concept of collaborative governance is applied to coordinate the actions of different stakeholders in environmental data-related activities.

3.3.4. Singapore's governance practices

The Singapore government has formulated soft laws such as "Governance Framework (II)" and "Generative Artificial Intelligence Model Governance Framework" (hereinafter referred to as "GAI Governance Framework"). These soft laws play an important complementary role where hard laws are difficult or inconvenient to touch. At the same time, in order to improve the certainty of governance norms, the Singapore government has also developed a number of auxiliary data governance tools, among which AI Verify has the highest promotion.

In the "operation management" section of the "governance framework (2)", the relevant content of data governance is stipulated. Its core content includes two aspects, one is to construct the "data accountability" system within the enterprise, and the other is that the data governance scope covers the whole process of the data life cycle. Specifically, the corresponding rule system is constructed from the aspects of data source, quality, deviation, training, review and update. In terms of data sources, the data are classified according to the different traceability directions of the data, and the backtracking methods of the data also show different characteristics; in terms of data quality, the three factors of accuracy, integrity and authenticity are used as the criteria for data quality, and enterprises are encouraged to conduct self-examination and rectification of data quality. In terms of data deviation, it guides enterprises to eliminate the inherent deviation of data itself by ensuring data integrity and using heterogeneous data sets; in the aspect of data training, the possible risk problems are listed, and it is suggested to use the test data set to test the model. In terms of data review and update, it is recommended that enterprises regularly clean and review data to prevent repeated use of data to form data bias in intelligent models. In addition, "governance framework (2)" guides governance activities by enumerating practical examples [5].

The whole content of the "GAI governance framework" involves nine parts, such as accountability, data, trusted development and deployment. In addition to the special chapter, the content of data governance is also covered in eight other aspects. In general, the "GAI governance framework" has the following characteristics: First, accountability is placed at the top of the "GAI governance framework". The core of this part is to guide the distribution of responsibilities of relevant social subjects. Second, the "GAI governance framework" attaches importance to the protection of personal data, infringement in the use of copyright data and the management of data

quality. In terms of protecting personal data and ensuring the credible use of personal data, it is suggested that legislators and regulatory bodies should combine personal data protection laws with GAI data governance, and clarify the application path of laws, such as stipulating the applicable standards and exceptions of informed consent rules. The risk of copyright infringement faced in the use of copyright data advocates a multi-party dialogue approach to jointly seek solutions; in terms of managing data quality, it is recommended that governments and social groups jointly build a representative and international training database to ensure the cultural representation of GAI. Third, we have established a number of initiatives to enhance data security, such as disclosing data sources and improving model transparency [5]. Singapore's soft law and governance tools can be well applied to enterprise environmental data compliance. For example, the data accountability system can be used to ensure that enterprises are responsible for the accuracy and security of their environmental data, and the data governance tools can help monitor and manage environmental data more effectively.

4. Analysis and comparison

Through the comparison and analysis of the practice of soft law governance of enterprise data compliance in China, the European Union, the United States and Singapore, China and the European Union have chosen the path of hard law as the main and soft law as the supplement, while the United States and Singapore are quite the opposite. This is based on their respective actual situation, such as industrial development, regulatory systems, and regional advantages, so they have adopted different practical paths. However, there is a great consistency in the core content of the new soft law governance between China, the United States and Europe, which is to take into account the development of the digital economy and data security. From the analysis of the specific practice of the above-mentioned soft law governance, there are four main factors that restrict the soft law governance of enterprise data compliance in China, as follows.

4.1. Environmental factors of data security circulation

The EU has introduced a number of bills and data strategies to promote data circulation and strengthen data protection and platform governance. Data circulation is the key to stimulating the value of data elements and breaking data barriers. Data security and credibility are the key to efficient data circulation. As mentioned above, the reason why it is difficult to form effective synergy among multiple subjects in the practice of soft law governance of enterprise data compliance in China lies in the differentiation of competitive interests. Data resources are an "oligopoly". Due to the mutual feedback between technological progress and data resources, the cost of technology and resource acquisition is greatly reduced, resulting in market barriers. Therefore, data circulation is conducive to breaking data monopoly. At the same time, the security and credibility of data circulation will affect the enthusiasm of collaborative governance. When the data security problem is high, the subject will lose the enthusiasm for collaborative governance data and produce negative burnout collaborative behavior. In addition, the more efficient the circulation of data is, the

wider the scope of the main body of radiation will be, which will help to penetrate into the multi-directional relationship [28]. In the context of environmental data, these factors are also significant. For example, if enterprise environmental data cannot circulate securely and efficiently, it will be difficult to conduct comprehensive environmental monitoring and assessment, and the cooperation between different environmental stakeholders will also be hindered. These factors are also significant in the context of environmental data. For example, if corporate environmental data cannot be circulated safely and efficiently, it will be difficult to conduct comprehensive environmental monitoring and assessment, and cooperation between different environmental stakeholders will be hindered. Due to the impact of carbon reduction targets and the carbon border adjustment mechanism (CBAM), the cross-border flow of environmental data, such as carbon emissions has become an objective situation. The cross-border flow of ecological environment data involves not only carbon accounting rules between different countries but also data security. In order to strengthen the security of data flow at home and abroad, Singapore has established a digital partnership with the EU, and issued the landmark results of digital trade principles, putting forward the key proposition of "free flow of credible data" [29].

4.2. Identification factor of collaborative governance concept

The development of collaborative behavior requires the relevant subjects to agree with the concept of collaborative governance. This internal implicit cognition directly affects the external collaborative behavior. In addition, the concept of collaborative governance should include scientific principles, professional judgment of technical rules, economic interests, political influence, administrative efficiency, social equity and other considerations. In the soft law governance of enterprise data compliance, data technology still plays an important supporting role, but the ethical risks of technology always exist. This is because the technical logic is not naturally integrated with social logic and policy logic. Therefore, it is necessary to strengthen the interaction between technological logic and social logic and policy logic, that is, the ethical constraints of technological innovation and application. The US government integrates "soft law" into governance practice. First of all, at the conceptual level, it integrates the concept of collaborative governance into the design, development, use and decision-making of artificial intelligence systems, and promotes the consistency of artificial intelligence systems from design to application with value ethics and expected goals. Singapore's "Governance Framework (II)" and "GAI Governance Framework" aim to build an internal 'data accountability' system that aligns with ethical values. In enterprise environmental data compliance, promoting a shared understanding of collaborative governance concepts is crucial. For example, when enterprises, environmental protection organizations, and the government have different understandings of how to manage environmental data, it will be difficult to achieve effective cooperation in environmental governance. Microsoft has put forward six principles of AI, including fairness, reliability and security, privacy and security, inclusiveness, transparency and responsibility [30]. It means that the data collection, storage, application, processing and analysis of ecological environment data are also guided by the above principles. It is precisely because of the recognition of the ethical

concept of artificial intelligence that Microsoft, IBN and other technology giants signed the "Rome Declaration on Artificial Intelligence Ethics" with the relevant parties of the European Union [31].

4.3. Technical tool factor

In the era of digital intelligence, digital technology tools help to realize the multi-agent collaborative governance model in the soft law governance of enterprise data compliance, and break the barriers and isolated islands in the governance of enterprise data compliance. In other words, the higher the level of technical tools, the higher the effectiveness of corporate data compliance soft law governance [28]. In Singapore's governance practice, the Singapore government has developed many tools to assist data governance, such as privacy-enhancing technology sandboxes, which have improved the certainty of governance norms. At the same time, a unified and standardized data platform is established to achieve more efficient data integration management and data sharing in the process of supporting the business of various institutions and their interaction with the public and enterprises. In addition, the corresponding database and platform are built for specific needs. For example, the MyInfo platform, which is dedicated to sharing authentication data between governments and businesses. These data management auxiliary platforms can not only promote enterprise data compliance governance, but also promote interconnection and help all parties improve their data capabilities. Due to the inconsistent data capabilities of different stakeholders and the lack of internal motivation for trust and collaborative governance, it is difficult to form an integrated governance ecology. In this regard, Singapore has launched an auxiliary platform, such as a certification platform for data protection trust marks, to show the public that the protection of personal data by enterprises conforms to the corresponding standards and the best practices of enterprise data compliance. All of the above provide space for multiple subjects to achieve self-governance and participate in governance, and also increase the transparency of corporate data compliance governance [32]. For enterprise environmental data, advanced technical tools can improve the efficiency of data collection, analysis, and sharing. For example, using blockchain technology to ensure the immutability and traceability of environmental data, and data platforms to integrate environmental data from different sources for better governance.

4.4. Organizational guarantee factor

Organizations can effectively strengthen the interconnection and interaction of subject coordination, and realize the stability, efficiency and scientificity of soft law governance.

The main body of EU data governance is composed of the European Commission, member states, industry sectors and enterprises. The UK has set up a policy laboratory, which is composed of government officials, experts from all sectors of society and enterprises. In order to promote stakeholders to form an integrated governance ecology, the U.S. government has signed a voluntary commitment agreement with many top artificial intelligence companies including Open AI, Google, and Microsoft, requiring them to make a commitment to build an automated system with security as

the first priority. In addition, the Agile Government Center was established in the United States, which plays a similar role as the UK's policy laboratory. These practices virtually provide a platform and space for all parties to discuss, understand policies, and participate in governance, promote cross-sectoral and cross-industry communication, interaction, and cooperation, encourage professionals from different backgrounds to share knowledge, and promote all parties to emerging technologies. A comprehensive understanding of the opportunities and challenges brought about, so as to achieve the goal of multi-governance [33]. In the field of enterprise environmental data compliance, such organizational forms can also play a positive role. For example, establishing an environmental data governance alliance that includes government environmental protection departments, enterprises, research institutions, and environmental non-profit organizations can promote information sharing and cooperation. This alliance can jointly formulate industry standards for environmental data management, and promote the coordinated governance of enterprise environmental data through regular communication and cooperation mechanisms.

5. Reference and enlightenment

5.1. Factor analysis

The main negative problems in the environmental factors of data circulation are reflected in the privacy leakage and data black production in the process of data circulation. Therefore, it is necessary to take into account circulation and security and build a trusted circulation environment. In this regard, the application of hard methods and technical tools can be used as the main implementation path, especially the application of blockchain technology and AI Verify. At present, due to the conflict and imbalance of interests, it is difficult for multiple subjects to form a consensus on the concept of collaborative governance. The differentiation of interests lies in the existence of data barriers. Therefore, breaking data barriers by data circulation is an important way to promote consensus among different subjects. There are technical ethical risks in the use of technical tools. Therefore, it is necessary to strengthen the coupling between technical logic and social interests and policies. The ultimate realization still lies in people, which requires joint communication among multiple subjects and strengthening the understanding of policies. In terms of organizational guarantee, there are problems such as unclear role positioning between multiple subjects and lack of effective cooperative organizations. It is necessary to clarify their respective responsibilities and establish cooperative organizations through the interaction and coordination of soft and hard laws (see **Table 3**).

From the analysis table, we can see the basic relationship and final direction between the realization paths of the above four influencing factors: concept → circulation → technology → organization → soft law and hard law coordination, expanding the soft participation path of multiple subjects.

Table 3. Factor analysis table.

Influencing factor	Embodiment	Solutions	Realization path
Environmental factor	Privacy leakage, data black production, etc.	Trustworthy circulation environment	Hard law regulation and technical tools
Conceptual factor	Conflict of interest	Break the data barriers	Data circulation
Technical factor	Ethical risk	The integration of technical logic with public interests and policies.	Communicate with multiple subjects, discuss and understand policies together.
Organizational factor	The role positioning between the subjects is not clear, and there is a lack of effective multi-subject cooperation organizations.	Clarify and implement their respective rights, obligations and responsibilities, and establish cooperative organizations.	The coordination of soft law and hard law expands the participation path of multiple subjects.

5.2. Synergy of soft and hard law

Both soft law and hard law are the subordinate concepts of the rule of law. They belong to the proper meaning of the rule of law environment and are also important indicators to test whether the rule of law environment is perfect or not. The two have different roles in the governance of enterprise data compliance. Therefore, it is necessary to coordinate the two. The coordination and interaction between soft law and hard law need to integrate and transform the advantages and functions of soft law and hard law to a certain extent. Enterprise data compliance governance ultimately still takes the normative model as the foothold. Therefore, although it is soft law governance, it still needs to have the legitimacy foundation of constitutional and legal supremacy. In addition, soft law and hard law play different roles in the governance of enterprise data compliance. Hard law norms set a discretionary boundary for its governance, and soft law norms can provide governance standards and space for public participation in the case of administrative dominance.

On the one hand, from the perspective of the characteristics of the digital economy, the attributes of artificial intelligence and data determine that the positioning of traditional hard law strong supervision and hard regulation should be gradually adjusted, and “inclusion”, “prudence”, “agility” and “promotion” have become legislative high-frequency words. The implementation outline of the construction of the rule of law government (2021–2025) clearly requires “promoting the better combination of effective market and promising government” and “improving the inclusive and prudential supervision mode adapted to innovation and creation”. Invisibly, the regulatory status and role of multiple entities such as market entities and industry organizations have been adjusted, but their autonomy has been emphasized more, and their subjective status in enterprise data compliance has been highlighted accordingly.

On the other hand, it is not only necessary to clarify the role positioning and task division of multiple subjects in soft law, but also to strengthen the binding force of soft law. Soft law often makes the normative objects comply with the rules through flexible ways such as calls and suggestions. This flexible implementation method leads to a great reduction in the effectiveness of soft law governance of enterprise data compliance. In this regard, we can learn from the “compliance or interpretation” mechanism developed in the field of corporate governance, which specifically refers to the combination of mandatory disclosure obligations on the basis of arbitrary norms,

that is, when non-compliance with arbitrary norms, reasonable explanatory statements must be made, so as to maintain the flexibility and autonomy of arbitrary norms while making them binding [11]. You can also learn from Singapore's clear setting of corresponding principles, requirements, and corresponding settings or associated adverse consequences in soft law norms such as the AI Verify test framework. At the same time, the mature enterprise data soft law will be upgraded to hard law in time, and the binding force of enterprise data soft law norms in data compliance governance will be ensured through the national coercive force of hard law. In the context of enterprise environmental data compliance, the synergy of soft and hard laws is equally important. Hard laws can set basic requirements and boundaries for enterprise environmental data management, such as stipulating legal responsibilities for data leakage. Soft laws can then provide more flexible and detailed guidance, like industry-specific best practices for environmental data collection and use. By coordinating the two, we can achieve more comprehensive and effective governance.

5.3. Expand the participation path of multiple subjects

China can learn from the practices of the United States and the European Union, form self-discipline supervision in a self-committed way, and allow more subjects to participate in the soft law governance process of enterprise data compliance. On 25 September 2024, local time, the European Commission announced the "Artificial Intelligence Convention", which aims to encourage companies to issue voluntary commitments on how to handle and deploy artificial intelligence. This is an important step in promoting innovation and compliance in the AI field. On 12 September 2023, local time, the U.S. government again received a second round of voluntary commitments from eight companies. These flexible measures are designed to allow market players to give priority to social responsibility in the process of future technological innovation and data application, and are also the requirements of internal governance. They can not only ensure the cooperative attitude of enterprises and promote technological innovation, but also take into account the protection of regulatory policies and technological development. When the relevant stakeholders violate the commitment, they should be regulated by the ethical review of science and technology or the 'social responsibility system' in the field of corporate governance, such as ethical review and 'social responsibility'.

In our country, there are many soft law documents such as policy regulations, guidelines and information technology standards formulated by the state and the government to guide enterprise data compliance. In this regard, it is necessary for the government to return the soft law formulation dominance of enterprise data compliance governance to market subjects and social middle-level subjects, and play the role of participants themselves. This can not only prevent the neglect of markets and differences, but also avoid the infinite breakthrough of soft law and the phenomenon of power vacuum. At the same time, the government, the market and the middle layer of society jointly participate in the formulation of soft law on enterprise data compliance, which is the expression and coordination of the interests and will of the three, so as to take into account the accuracy, appropriateness, advancement and

locality, and contribute to the coordination of individual benefits and overall interests [34].

First, research institutes, information technology enterprises, industry organizations, universities and other governance bodies should enhance their enthusiasm and initiative to formulate soft law norms according to national policies and regulations. Social organizations such as enterprises, scientific research institutes and universities should strengthen cooperation with each other, and condense the soft law rules and standards in the construction of algorithm models, the use of training data, and the interaction security of data information in various industry-university-research cooperation projects. In particular, institutions such as universities and scientific research institutes have authoritative, professional and non-profit characteristics in the public's perception. Therefore, the soft law norms formulated by them can be more widely supported in society. Secondly, the government needs to use its own influence in social governance to build a communication platform such as the UK's policy laboratory, so that various stakeholders related to corporate data compliance governance can conduct extensive and in-depth exchanges around this issue, fully reflecting their respective interests. On this communication platform, we should pay special attention to the participation degree and relevant opinions of social people such as network users. At the same time, give the public a certain degree of supervision and establish a normalized feedback channel [35].

The soft law governance subject of enterprise data compliance should not be limited to different domestic subjects, but should focus on the international level and carry out international cooperation. In the context of frequent cross-border and cross-regional flow of data, we should not only look at and promote the effectiveness of soft law governance of enterprise data compliance governance from a domestic perspective, but also take into account the international perspective and consider the international rules and standards of data flow. With the help of the Belt and Road mechanism and platforms, such as giving full play to the role of China's local governments and extraterritorial cooperation mechanisms, such as the Shanghai-Singapore Comprehensive Cooperation Council. In order to further standardize the data market and promote the efficient and convenient circulation of data transactions and compliance security, China has set up global data exchanges (centers) in many places to supervise the whole process of data transaction circulation. Therefore, in the soft law governance of enterprise data compliance, we should also give full play to the subjective role of this institution, strengthen the global promotion of data exchanges (centers) in various places, and actively participate in the development of domestic and international rules and standards such as data flow, data security, certification evaluation and so on. In the area of enterprise environmental data compliance, expanding the participation of multiple subjects can bring more diverse perspectives and resources. For example, inviting international environmental organizations to participate in the formulation of soft law norms can introduce advanced international experience. Strengthening international cooperation in environmental data governance can also help China better integrate into the global environmental protection network and promote the international flow of environmental data in a compliant manner.

6. Conclusion

Soft law governance has great potential in enterprise data compliance, especially in the context of environmental-related data. Through the comparative analysis of practices in China, the EU, the US, and Singapore, this paper has identified the influencing factors of soft law governance effectiveness and proposed corresponding improvement measures. China should learn from international experience, address existing problems in data security circulation, collaborative governance concepts, technical tools, and organizational guarantees. By coordinating the relationship between soft and hard laws and expanding the participation of multiple subjects, China can enhance the effectiveness of soft law governance in enterprise environmental data compliance. This is not only conducive to promoting the healthy development of enterprises in the digital age but also plays a positive role in global environmental protection. Future research can further explore the specific implementation mechanisms of soft law in different industries and regions to optimize the soft law governance system for enterprise environmental data compliance.

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