



# Research on the Data Right Confirmation Mechanism from the Perspective of the Value Chain

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**Abstract.** In the era of big data, data rights confirmation has become an important strength to promote data circulation and market development, ensure data revenue, and achieve data security. Based on the previous research results of value chain and data value chain, this study constructs a value chain model involving the development of the whole life cycle of data, such as data acquisition, data processing, data analysis, and data application. Then, with reference to the "Effect-Mechanism-Analyzing-Mechanism" (EMAM) management research methodology, the data right confirmation mechanism was constructed, and a variety of subjects, objects and rights bundles involved in data right confirmation were sorted out, so as to provide a reference for the establishment of the basic system of data rights confirmation. Finally, it is suggested that (1) establish a classification and grading standard system to ensure the security of data rights confirmation transactions, (2) improve the data rights confirmation system and optimize the market ecology of data elements, and (3) innovate data rights confirmation management tools and deepen the application of blockchain and other technologies.

**Keywords:** Data Rights, Data Elements, Data Value Chain, Data Lifecycle, Data Rights Mechanism.

## 1 Introduction

Data has already become a valuable resource driving economic development, social governance, and technological innovation. The "Decision on Several Major Issues for Adhering to and Perfecting the Socialist System with Chinese Characteristics and Promoting the Modernization of China's System and Capacity for Governance" passed by the Fourth Plenary Session of the 19th Central Committee of the Communist Party of China regards data as a national fundamental strategic resource. This marks the first mention in official documents of data value distribution, i.e., distribution based on contribution. The "Central Committee of the Communist Party of China's Recommendations for Formulating the Fourteenth Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through 2035" points out that to promote the development and utilization of data resources, standards and fundamental systems

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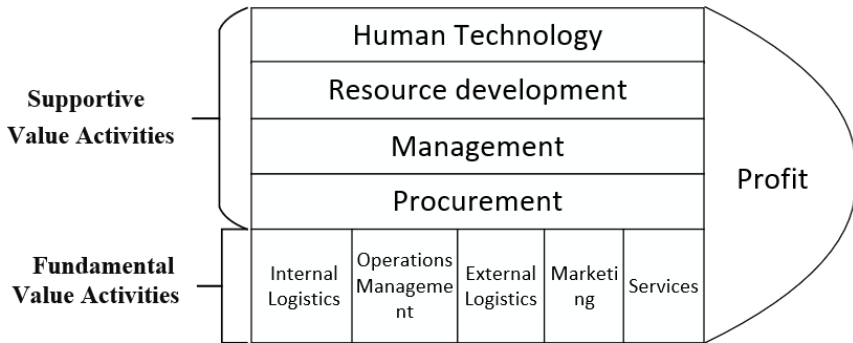
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for data transaction circulation, data property rights, and data security protection should be established. The "Opinions on Building a Data Basic System to Better Play the Role of Data Elements," reviewed and approved by the 26th meeting of the Central Commission for Deepening Overall Reform, proposed a data rights mechanism that separates the rights of data possession, data processing use, and data product operation, recognizing and protecting the legitimate rights and interests of all participants in data. Data elements have unique property attributes, and there is still controversy over the division of different property rights. Firstly, the stakeholders involved in the management and construction of data resources are diverse, generally completed by multiple participants, with data widely present in platforms, systems, and networks under the control of multiple stakeholders. Secondly, data property rights can be shared, transferred, and exchanged among multiple entities, having a divisible attribute. Lastly, data property rights are highly dependent on technology. Current intellectual property protection can protect creative data collections, data models, and data products, but the objective records of original data, which hold significant value in the digital economy, cannot be protected by existing intellectual property laws. Therefore, the mechanism for confirming data rights urgently needs to be explored and established. This study, based on the complex information environment, explores the mechanism for confirming data rights from the perspective of the data value chain.

## **2 Literature Review**

### **2.1 Current State of Domestic and International Research on the Data Value Chain**

The value chain concept was introduced by Michael Porter in his 1985 book "Competitive Advantage" where he posited that the value chains of a company and its upstream and downstream businesses are interconnected. Originally, the value chain was used as an analytical tool to assess a company's competitive advantage. Subsequently, based on the principles of the value chain, emphasis was placed on activities related to value creation, value addition, and value distribution, from product production and processing to sales. Scholars both domestically and internationally have extensively researched and applied the value chain model, not only in the construction and analysis of tangible asset value chain models but also, with the advent of the knowledge economy and the information revolution, in the gradual formation of intangible asset value chain analysis models. These include the knowledge value chain model, the information value chain model, and the data value chain model in the field of data assets.



**Fig. 1.** Value Chain Model

Rayport and Sviokla[1]believe that there is a virtual value chain within information systems, thereby introducing the concept of the value chain into it to establish an information system value chain model. This model aids in understanding the processes of value extraction and value transmission through data technology. With the development of the value chain model, Latif A and Saeed, among others[2],proposed the concept of a linked data value chain, which assists data analysts in identifying and analyzing potential risks.Kasim H and Hung T[3]consider the data value chain to encompass the entire data value-adding process from data collection to decision-making, including data collection, data transmission, data analysis, data simulation, data management, and data visualization. Within the data value chain, raw data continuously appreciates in value along with the flow of information, ultimately producing tools of greater value. Kriksciuniene D, among others[4] divides the data value chain into several stages: data generation and acquisition, data analysis and processing, data storage and management, and data visualization leading to data services for business use. Curry E views the data value chain as an information system composed of a series of advanced data activities, mainly including data acquisition, data analysis, data management, data storage, and data use, emphasizing the importance of resolving the issue of interest distribution among many participants. Ren Fubing and Sun Meiling, based on the value-added process of government open data, divide the data value chain into four basic stages: "data collection, data processing, data opening, and data utilization," along with auxiliary activities such as policy support, financial support, technical assurance, and human resource assurance. Ge Jian and others construct an industrial Internet system architecture based on the data value chain from two data logic routes: the "data-information-knowledge-wisdom" model and the "data-model-service-value" model.

From the corporate value chain to the knowledge value chain, to the information value chain, and then to the data value chain, different research fields are constructed based on Porter's basic value chain model. The data value chain posits that the release and creation of data value require both basic and auxiliary activities to be completed together. The basic activities of data value involve the entire lifecycle management process of data, from collection and processing to development and application, supported

by technology empowerment, security regulation, ownership determination, and value enhancement.

## 2.2 Current State of Domestic and International Research on the Data Value Chain

The concept of data right confirmation was first proposed by Western countries, with its early theoretical origins in privacy protection issues. American scholars Brandeis and Warren published "The Right to Privacy" in the Harvard Law Review in 1890, introducing the concept of privacy rights. Since then, privacy rights as a crucial aspect of citizens' personality rights have gradually been recognized at the legal level. With the development of the information age, the scope of privacy rights has expanded from the privacy of residence to personal privacy and then to data privacy. Professor Alan Westin of Columbia University defined privacy in the information society as "the right of individuals to control, edit, manage, and delete information about themselves and to decide when, how, and to what extent this information is communicated to others." In 1974, the United States passed the Privacy Act, which focused on preventing the government from misusing the citizen information and data records it holds. With the launch of the U.S. government's open data movement, the UK also gradually began to explore the path to data openness. In May 2010, UK Prime Minister David Cameron first proposed the concept of "Right to Data," stating it as a fundamental right of every citizen in the information age and promising to promote the "Right to Data" throughout society[5]. As the era of big data develops, research on data rights has gradually extended, involving privacy rights, data property rights, data sovereignty, and other aspects[6].

Domestically, the meaning of "data right confirmation" has different interpretations in the industry and legal fields. For example, when the Beijing Big Data Trading Service Platform was launched, the Beijing Software and Information Service Exchange proposed the concept of data right confirmation as: the process of clarifying the responsibilities and rights of both parties in a data transaction to protect their respective legitimate rights and interests, providing guidance on the determination of rights in aspects such as the rights holder, the nature of rights, methods of data transaction, data sources, data formats, data volumes, and granularity, to guide related parties to safely, uniformly, and scientifically complete data transactions[7]. Domestic and international research on data right confirmation has three mainstream directions: analysis of data right confirmation in business scenarios, analysis of data right confirmation legislation based on relevant stakeholders, and research on technical methods of data right confirmation.

**Table 1.** Main Research Directions in Data Right Confirmation

Research Direction	Representative Authors	Main Content
Analysis of data right confirmation in business scenarios	Li Zheng et al.[8], Tang Qiaoying et al.[ 9],Fan Wei[10], Zhang Peng et al.[11]	Focusing on different data scenarios such as public data, government open data, internet platform data, corporate data, etc., analyzing the main problems of data right confirmation and the paths to achieve it.

Analysis of data right confirmation legislation based on related stakeholders

Wen Yuheng[12], Li Liangwei[13], De Hert et al.[14]

From the perspectives of data rights, data entitlements to data property rights, analyzing the paradigm shift in data right confirmation, concept selection, and the subject of attribution, presenting various viewpoints such as "data platform ownership", "data individual ownership", "data shared by individual and platform". Legislative directions include "new personality rights", "trade secrets", "intellectual property rights", etc. Data right confirmation technologies include data citation analysis technology, data provenance technology, electronic forensics technology, blockchain technology, reversible information hiding technology, timestamps, digital fingerprints, etc.

Research on technical methods of data right confirmation

Zhao Haijun[15], Bao Xiaoli[16], Wang Hailong et al.[17]

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Through the academic history combing and research trend analysis of related studies at home and abroad, it has been found that research on the data value chain lacks in-depth analysis of practical experience. As for research on data right confirmation, most studies are currently in the stage of conceptual and connotation analysis of data right confirmation and the jurisprudential verification research phase, without forming a specific right confirmation mechanism. In recent years, research on data elements, data governance, and data right confirmation themes has gradually increased, mostly focusing on the exploration of right confirmation paths for government data, open data, etc., without a comparatively clear data right confirmation mechanism. Therefore, this study, based on the value chain perspective and analyzing from the data lifecycle dimension, holds significant research value in exploring the data right confirmation mechanism.

### 2.3 Legal Practices of Data Right Confirmation Domestically and Internationally

Data right confirmation, as a relatively new legal concept, is experiencing rapid development and transformation globally. In recent years, both domestically and internationally, a wealth of experience and cases have been accumulated in the legal practice of data right confirmation. Domestically, from the national to the local level, a series of laws and regulations have been issued in succession, attempting to provide a clear and comprehensive legal framework for data right confirmation. Meanwhile, internationally, especially in the European Union and the United States, in-depth explorations and practices in data right confirmation have been conducted, whose regulations and practices offer beneficial references for our country.

**International Legal Practices in Data Right Confirmation.** Since the enactment of the Freedom of Information Act by the United States Congress in 1966, after decades of development, the U.S. federal government has formed a relatively mature framework

and system for data collection, publication, use, and management. The United Kingdom has also been active in promoting the openness of government data. The Freedom of Information Act came into full effect in the UK in January 2005.

Globally, the legal practice of data right confirmation is increasingly attracting widespread attention to address the growing demands for digital data and privacy protection. The international community has adopted various measures to ensure the lawful use of data and the protection of personal data rights. For instance, the European Union's General Data Protection Regulation (GDPR), referred to as "the strictest data law in history," demonstrates the global nature of data rights issues. Practices in data right confirmation internationally indicate that data rights are a global issue, with countries and regions striving to ensure lawful data use and protection through regulations and policies. While there are some differences in regulations among countries, they all aim to balance the circulation of data elements and the protection of data rights.

**Table 2.** International Legal Practices in Data Right Confirmation

Organi-za-tion/Co-untry	Relevant Policies and Regulations	Main Content	Limitations
EU	Data Protection Directive; General Data Protection Regulation (GDPR); e-Privacy Regulation	The confirmation of personal data rights spans the entire lifecycle of data generation, collection, processing, and transaction, including the rights of data subjects to be informed, to be forgotten, deletion, objection, rectification, and update, etc.	Mainly stipulates personal data rights, but the definition of non-personal data rights is not clear.
USA	California Privacy Rights Act (CPRA); Consumer Data Protection Act (CDPA)	Emphasizes national data security, protecting the rights of consumers in various states to exercise control over their personal information. Focuses more on the commercial use of data.	Utilizes traditional competition laws and industry self-regulation, regulated by weaker property rights.
CHINA	Personal Information Protection Law; Data Security Law; Civil Code Of the People's Republic of China;"Data Twenty Articles"	Emphasizes the protection of important and core data, encourages the lawful, reasonable, and effective utilization of data, ensures the lawful and orderly free flow of data, with a focus on compliance and security.	Clarifies the legal status of data rights but does not confirm the connotation and protection rules of data rights.

**Domestic Legal Practices in Data Right Confirmation.** With the vigorous development of China's digital economy, the issue of data right confirmation has gradually emerged, attracting wide attention from legislators and all sectors of society. At the

national level, China's Personal Information Protection Law provides a basic legal framework for data right confirmation. This law establishes the rights of data subjects and clarifies the obligations of data processors, setting preliminary norms for data right confirmation. Moreover, the Data Security Law further ensures data security, preventing data from being illegally obtained and used, thereby maintaining the integrity of data right confirmation from another perspective.

At the local level, various regions have issued big data-related regulations, exploring data right confirmation in more detail. For example, the Guiyang Big Data Exchange Guanshan Lake Convention was the first to describe data right confirmation, clarifying data rights in big data transactions. Tianjin, Shenzhen, Shanghai, and other places have also introduced corresponding regulations, recognizing the data rights of data suppliers and explicitly defining the data personality rights of personal data, providing a richer legal practice for data right confirmation.

**Table 3.** Domestic Legal Practices in Data Right Confirmation

Name	Publication Date	Relevant Content on Data Rights	Legislative Features
Guiyang Big Data Exchange Guanshan Lake Convention	June 2016	Data rights in big data transactions include data ownership, possession, usage rights, and the right to benefits.	First to describe data right confirmation
Tianjin Municipal Data Transaction Management Interim Measures	January 2022	Data suppliers have complete data rights.	Confirms the subject of data rights in big data transactions
Shenzhen Special Economic Zone Data Regulations	July 2021	Natural persons have rights to personal data including the right to delete, access, copy, withdraw consent, etc.; data processing entities have rights to data products and services including usage rights, profit rights, and disposition rights.	First to clarify personal data's data personality rights in big data transactions, specifying the data property rights of derived data subjects
Shanghai Municipal Data Regulations	November 2021	Natural persons have data personality rights, including the right to refuse, correct, supplement requests, deletion requests, etc.; data collecting entities may process and use data, recognizing the data property rights of original data.	Confirms the data personality in big data transactions

### 3 Construction of a Data Value Chain Model Based on the Data Lifecycle

#### 3.1 Data Lifecycle

The concept of the lifecycle first appeared in the field of biological research and gradually evolved into other areas. Researchers domestically and internationally have explored the connotation of the data lifecycle through data studies, proposing numerous data lifecycle models. For example, the DataONE model divides the data lifecycle into collection, description, discovery, preservation, analysis, integration, etc.; the DDI model defines the data lifecycle as conceptual design, data collection, data processing, data distribution, data storage, data analysis, data discovery, repurposing; and the geo-spatial model includes definition, assessment/inventory, acquisition, access, maintenance, use, archiving, etc., in its data lifecycle model. The data lifecycle can display the entire process from data generation to destruction. Based on the data value-added process, this study divides the data lifecycle into a series of processes such as data acquisition, data processing, data analysis, and data application.

#### 3.2 Construction of the Data Value Chain Model

Through grounded theory and desk research, based on the theory of data lifecycle management, this study organizes the changes in data elements' forms and values during the data value-added process to construct a data value chain model. The basic links of data value enhancement include data acquisition, data processing, data analysis, and data application. As the data processing flow progresses, different forms of data emerge, involving changing stakeholders.

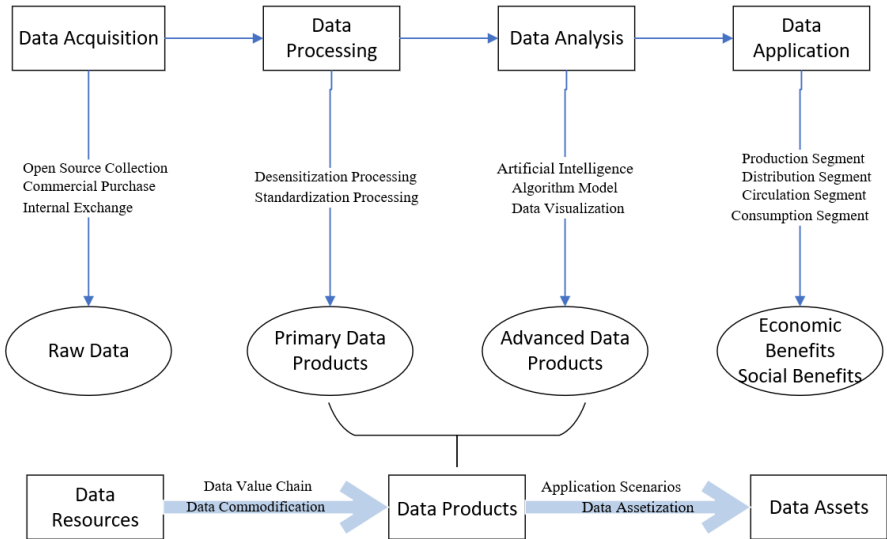


Fig. 2. Data Value Chain Model



**Data Acquisition Stage.**Data acquisition is the first stage of the data value chain model. The goal of this stage is to collect and organize data from various sources, including open-source collection, commercial purchase, and internal exchange. Data directly derived from the acquisition and preliminary processing by the data acquisition entity is called raw data, which is the most basic data resource, and the data acquisition entity possesses the most original data ownership.

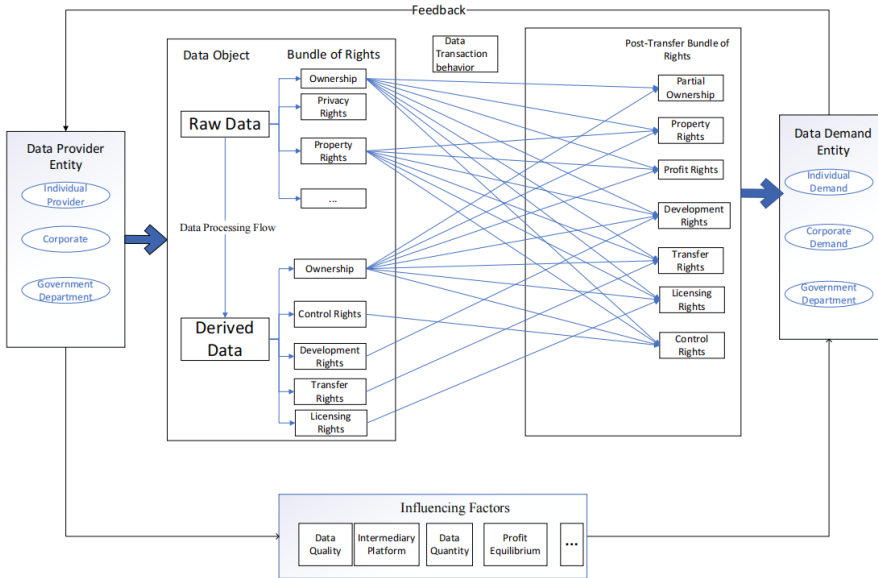
**Data Processing Stage.**Data processing involves operations such as data cleaning, deduplication, and format conversion, aimed at improving data quality and usability. After data is desensitized and standardized, primary data products are formed. At this point, data resources gradually evolve into data products, realizing value upgrade, generating a large amount of derived data, involving more data rights subjects, and changing data rights.

**Data Analysis Stage.**Data analysis is the core link in the data value-added process, where valuable information and knowledge are extracted through in-depth mining and analysis of data. The main tasks of this stage include data visualization, statistical analysis algorithm models, artificial intelligence technologies, etc., i.e., training data through algorithms to obtain predictive knowledge, forming advanced data products. At this time, the data value is upgraded, producing a large amount of derived data, making data types and data rights subjects more complex, involving issues related to intellectual property.

**Data Application Stage.**Data application involves applying the extracted data value to actual business processes. This stage encompasses production, distribution, circulation, consumption, and other business processes. Data products undergo value upgrading through application scenarios, gradually transforming into enterprise data assets, generating a large amount of derived data. The data value is applied to actual business, involving issues related to commercial interests.

## 4 Construction and Analysis of Data Right Confirmation Mechanism

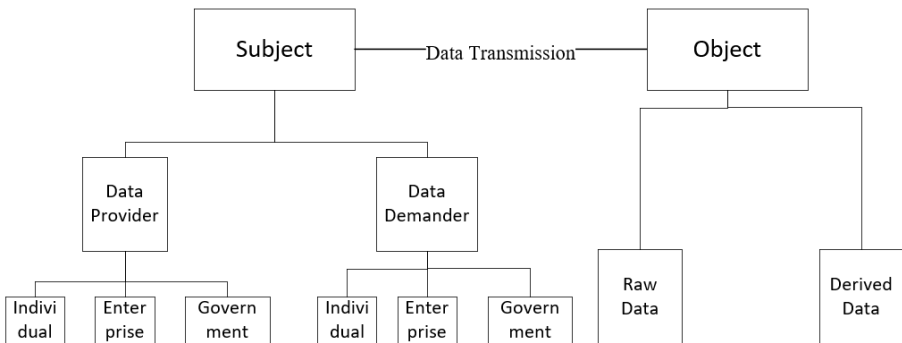
This study refers to the "Effect-Mechanism-Integration-Mechanism" (EMAM) research methodology proposed by Professor Chen An from the Institutes of Science and Development, Chinese Academy of Sciences, exploring the mechanism behind data right confirmation through the subjects and objects involved in data right confirmation and their relationships. Based on the data value chain model, data is divided into raw data and derived data, constructing a data right confirmation mechanism, including the subjects of data right confirmation, the objects of data right confirmation, the bundle of data rights, and their interrelationships.



**Fig. 3.** Data Right Confirmation Mechanism

**4.1 Subjects of Data Right Confirmation**

Depending on the scenario of data generation and application, the subjects of data right confirmation are divided into data providers and data demanders. Both data providers and demanders include individual entities, corporate entities, and government entities, with different entities involving different data elements.



**Fig. 4.** Subjects and Objects of Data Right Confirmation

**Individual Entities.** The raw data of personal data originates from users' internet access activities. When we use electronic devices, such as mobile phones, computers, tablets, etc., to access the internet, our actions leave traces in the online world, generating raw data. Specifically, these raw data include but are not limited to personal travel trajectories and internet usage records. Travel trajectories map our physical locations in the online world, recording places we have visited and the duration of stays. Internet usage

records are more comprehensive, covering various activities we conduct online, including visited websites, used applications, searches conducted, purchases made, etc. Based on raw data, further processing through technical means like data mining, machine learning, etc., can generate personal derived data. Derived data are results of processing, analyzing, and handling raw data, providing deeper, more detailed personal information. For instance, by analyzing personal travel trajectories and internet usage records, one can infer interests, consumption habits, lifestyle patterns, etc. These data are of high value to businesses.

**Corporate Entities.** Corporate raw data usually includes the behavioral data of the institution itself and its owned data. These data reflect the basic activities, operational status, business performance, etc., of the enterprise, constituting the foundation of corporate data. Raw data typically comes from internal systems, business databases, sensors, etc. Derived data includes data obtained by enterprises through collection, processing, labeling, etc., operations, like data cleaning, data transformation, data aggregation, data classification, etc., aiming to transform raw data into forms easier for analysis and use. Derived data also includes data acquired from external sources, such as market surveys, user feedback, industry reports, etc.

**Government Entities.** Raw data with government departments as the main body refers to data generated by government departments in the process of performing their duties. This data includes operational data of government departments, such as the daily operations of government agencies, the provision of public services, the distribution of social welfare, etc.; it may also include some specialized data, like meteorological information, geographical information, and other public data. Government derived data refers to data generated by government departments in the process of collecting, processing, and handling data. These data are usually produced in the use of raw data, for instance, when conducting research to provide better public services, government departments need to collect and process a large amount of data. This data may include demographic data, economic data, environmental data, etc. After processing and analysis, these data can provide important references for policymakers.

## 4.2 Objects of Data Right Confirmation

The objects of data right confirmation are data elements, which have distinct characteristics compared to traditional elements. The ownership of data is not as clear and explicit as traditional production factors, and there is greater complexity and ambiguity from the production of data to the realization of its value.

From the perspective of data generation and ownership, data has characteristics of infinite supply (non-exhaustiveness), non-consumption, replicability, non-scarcity (or partial scarcity), uncontrollability (randomness), multi-sourcing, derivativeness, ambiguous ownership (multi-party co-creation), (privacy) high sensitivity, and exponential growth. This means data can continuously be acquired, used, and replicated without being exhausted or restricted; the generation of data often involves contributions from multiple parties, leading to disputes over ownership; some data may be highly sensitive, involving national security, trade secrets, or personal privacy, thus requiring special attention to privacy protection during use; due to the diversity of data sources, including humans, machines, nature, etc., data has multi-sourcing, etc.

From the perspective of competitiveness and exclusivity, data has non-competitiveness and non-exclusivity (or partial exclusivity). This means multiple users can use the same data simultaneously without interfering with or affecting each other. However, for non-public proprietary data, there may be exclusivity, meaning only specific users can access and use these data.

**Table 4.** Characteristics of Data Elements.

Analysis Perspective	Characteristics of Data Elements	Explanation
	Infinite Supply (Non-exhaustiveness)	The supply of data is infinite, inexhaustible
	Non-consumption	Using data does not deplete the data itself
	Replicability	Data can be replicated without limitation
	Non-scarcity (or Partial Scarcity)	Data is not scarce (some special data is scarce)
	Uncontrollability (Randomness)	The generation of data is random and uncontrollable
Generation and Ownership	Multi-sourcing	The sources of data are diverse, including humans, machines, nature, etc.
	Derivativeness (Non-direct Product Nature)	Data often derives from other production processes or activities
	Ambiguous Ownership (Multi-party Co-creation)	The generation of data often involves contributions from multiple parties, with disputes over ownership
	(Privacy) High Sensitivity	Data often involves national security, trade secrets, or personal privacy, its use is sensitive
	Exponential Growth	The growth of data volume follows an exponential trend
Competitiveness and Exclusivity	Non-competitiveness	Consumption of data by users does not reduce the supply of data to other users
	Non-exclusivity (or Partial Exclusivity)	Public data is non-exclusive, non-public proprietary data is exclusive

### 4.3 Bundle of Data Rights

The State Council issued the "Opinions on Building a Data Basic System to Better Play the Role of Data Elements," proposing to explore a structural separation system for data property rights, establishing a data property rights system framework of "three rights

separation" for data resource ownership, data processing and use rights, and data product operation rights. Based on policy content and domestic scholars' research results, this study analyzes and summarizes, dividing the bundle of data rights into data ownership, data privacy rights, data property rights, and data usufruct rights, where data usufruct rights include data control rights, data licensing rights, data development rights, and data transfer rights.

**Table 5.** Bundle of Data Rights.

Data Rights	Relevant Data Types	Explanation
Data Ownership	Raw Data, Derived Data	Belongs to the originator of the data, that is, the creator who enables the production of data. Examples include individual behavior records, a nation's natural resources, etc.
Privacy Rights	Raw Data	Mainly concerns the privacy rights of personal data, which refers to data that can identify specific information about an individual, aimed at protecting personal privacy and freedom.
Property Rights	Raw Data, Derived Data	Established as a type of property right alongside virtual property in Article 127 of the "Civil Code." The entity that legally collects raw data can obtain data property rights.
Data Control Rights	Derived Data	Refers to the right to autonomously control and manage data that has been legally obtained.
Data Licensing Rights	Derived Data	Licensing methods include exclusive licensing, sole licensing, non-exclusive licensing, etc., typically shared within the internet ecosystem, primarily in the form of API interface calls.
Data Usufruct Rights		Refers to the right to process data through technology and methods to enhance data benefits, potentially resulting in specialized data products such as system software, research reports, visualization maps, etc.
Data Development Rights	Derived Data	
Data Transfer Rights	Derived Data	Data, as a property, can be transferred or mortgaged through agreed methods to enhance solvency and protect data security.

#### 4.4 Analysis of the Transfer of Data Rights

Different subjects of data right confirmation have different scopes of rights over their raw data and derived data. Through collection, contract, sharing, and other transaction behaviors, data rights are transferred from data providers to data demanders.

**Data Collection Behavior.**Data collection behavior refers to the process of collecting and acquiring data from various sources (e.g., humans, machines, nature, etc.). This process may involve different technologies and methods, including web crawlers, API interfaces, etc. For data not involving privacy, ownership, property rights, and other rights are transferred. For data involving privacy, capable of identifying specific individuals, ownership is not transferred. During the data collection process, particular attention should be paid to collection compliance and personal data privacy protection.

**Data Contract Transaction Behavior.**Data contract transaction behavior refers to the act of data trading parties clearly defining the data content, price, quantity, time, etc., of the transaction through a contract, and exchanging data and payments according to the agreed method of the contract. This trading method usually involves data as the object of the transaction and contracts as the constraining means to ensure smooth transactions. Through signing contracts, data rights ownership is usually clarified in contract terms, generally involving the transfer of property rights, while data ownership and usufruct rights need to be further clarified through contract terms.

**Data Sharing Transaction Behavior.**Data sharing transaction behavior refers to the act of different organizations or individuals sharing and exchanging data among two or more parties for a certain purpose. Data sharing and exchange can occur at different levels, such as data exchange within a company, between companies, and between the government and external entities. The sources of data for this type of sharing and exchange can vary, including both owned raw data and processed derived data. For these data, the sharing and exchanging parties need to have clear authority and permission based on the data's source and nature to proceed with data sharing and exchange. Data sharing methods involve the transfer of data ownership, usage rights, and usufruct rights, generally not involving the transfer of privacy rights. The specific rights involved need to be negotiated and determined by the data sharing provider and demander.

## 5 Research Conclusions

This study, based on the data value chain model and the division of the data lifecycle, refers to the "Effect-Mechanism-Integration-Mechanism" (EMAM) research methodology, analyzes and organizes the various subjects, objects, and rights bundles involved in data right confirmation, and analyzes different data rights transfer methods such as data collection, data contract transactions, and data sharing transactions. It constructs a data right confirmation mechanism, providing a reference for the establishment of a basic system for data right confirmation in China. To establish a data right confirmation system, the following suggestions are made:

### **5.1 Establish a Categorized and Graded Standard System to Ensure the Safety of Data Right Confirmation Transactions**

In a complex information environment, establishing a categorized and graded standard system is crucial for ensuring the safety of data right confirmation transactions. Through the analysis of this study, involving various data forms and processing stages and processes in the data value enhancement process, it is necessary to classify and grade various types of data during the process of data right confirmation transactions. It is recommended to establish a "top-down" data classification and grading system, according to the "Information Security Technology Important Data Identification Rules (Draft for Comment)" and "Cybersecurity Standards Practice Guide Data Classification and Grading Guide (Draft for Comment)" issued and promulgated at the central level. Subordinate institutions should refine the data classification and grading standards for their industry and department, establishing a comprehensive data classification and grading system. Establishing a categorized and graded standard system will help improve the transparency and controllability of data right confirmation transactions, reduce data risks, and enhance data security and credibility. This will have a positive impact on the healthy development of the data market and the protection of data owners' rights.

### **5.2 Improve the Data Right Confirmation System, Optimize the Data Element Market Ecology**

To achieve effective management of data right confirmation and promote the development of the data market, it is suggested to improve the data right confirmation system. This system should include laws, regulations, policies, and standards to ensure the lawful use of data and the protection of data rights. As can be seen from the data right confirmation mechanism of this study, the content of data rights bundles is complex, and data transaction methods are diverse. Currently, China does not have a clear legal system for data right confirmation. Therefore, it is necessary to gradually perfect the data right confirmation system through a pilot-first approach. Following a market-oriented, scenario-first approach, further optimize the development ecology of the data element market. Support regions with a certain basis for data element market development to pilot data property registration, data property evaluation and supervision, data property circulation, data property transactions, etc. Encourage enterprises, research institutions, etc., to provide professional data operation services based on their own technological advantages, achieve the implementation of data property rights systems in fields such as finance, energy, and gradually summarize effective experiences of the data property rights system in practice, forming replicable and promotable successful models.

### **5.3 Innovate Data Right Confirmation Management Tools, Deepen the Application of Technologies Such as Blockchain**

In today's rapidly developing big data and artificial intelligence technologies, the establishment of a data right confirmation system can reference various tools to accelerate the data right confirmation process. For example, conducting blockchain-based data

property registration pilots, fully utilizing blockchain's decentralized, immutable characteristics to achieve the unique confirmation of data assets and information traceability, providing technical support for advancing data security, management and operations, and property protection. Blockchain, with its immutability and traceability, has applications in the field of data asset transactions, can build an index for data asset transactions, helping data source tracing and right confirmation. Meanwhile, based on blockchain smart contract technology to standardize data management interfaces, it can solve problems caused by the absence of detailed rules for data property laws, such as inconsistent data property standards across platforms, difficulties in data sharing integration, providing a powerful technical tool for standardizing data property ownership, transfer, and distribution. In summary, by innovating data right confirmation management tools, it can better meet the needs of data right confirmation, improve the efficiency and security of data management, promote the development of the data market, and protect data rights. This will help drive the research and development of data right confirmation mechanisms in a complex information environment.

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