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The Legal Dilemma and Solution Path of Defining Data Ownership in the Digital Economy Era

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Abstract: *In the era of digital economy, data is a key production factor, and its ownership definition is the core prerequisite for market-oriented allocation of data factors, personal privacy protection, and maintenance of market competition order. This article takes the legal issue of defining data ownership as the research object, clarifies the concept, intangibility, replicability, and other characteristics of data from a multidisciplinary perspective, and explains the connotations and limitations of related theories such as the "three element rights structure", property rights theory, and intellectual property theory; Furthermore, analyze the legal difficulties faced by the current definition of data ownership, including incomplete legal systems, disputes over ownership subject identification, imbalanced distribution of rights and interests, technological challenges, and legal lag. In response to the above difficulties, this article proposes a solution path: improving the legal system of data ownership and formulating a unified data property law; Clarify the rights and responsibilities of the subject, strengthen the control of personal data, and define the boundary of data rights between enterprises and governments; Establish a contribution based equity distribution mechanism; Promote the integration of blockchain and other technologies with laws to achieve property rights confirmation and regulation. The research provides theoretical support and practical guidance for defining data ownership, which is of great significance for promoting the healthy development of the digital economy.*

Keywords: *Digital Economy, Data Ownership, Triple Rights Structure, Data Property Law, Equity Distribution Mechanism*

1. Introduction

With the rapid development of information technology, the digital economy has become the core engine driving global economic growth. The importance of data as a new production factor in the digital economy era is increasingly prominent. In 2019, the country for the first time listed data as an important factor of production alongside land, labor, capital, and technology, fully affirming the crucial role of data in economic development. Data is widely used in risk assessment in the financial sector, precision marketing on e-commerce platforms, and disease prediction in the medical industry, providing strong impetus for innovative development in various industries. For example, e-commerce platforms can accurately push products and improve user purchase conversion rates by analyzing user browsing, purchasing, and other data, thereby enhancing the economic benefits of enterprises.

However, the current unclear definition of data ownership has caused a series of problems, seriously hindering the healthy development of the digital economy. At the level of economic development, unclear ownership of data leads to a lack of standardization in the data trading market, high transaction costs, and hinders the free flow and maximization of value of data. According to relevant research, due to disputes over data ownership, the negotiation cycle of some data trading projects has been extended by 30% -50%, and transaction costs have increased by 20% -40%. This has prevented many potential data transactions from being reached, restricting the development vitality of the digital economy. In terms of protecting rights and interests, personal data privacy is frequently violated, and users' personal information is illegally collected, used, and traded, causing great inconvenience and losses to users. For example, some apps excessively collect users' personal information without their knowledge and sell it to third parties, resulting in frequent harassing phone calls and spam messages to users. At the same time, the data assets of enterprises also face the risk of infringement, which affects their innovation enthusiasm and market competitiveness. Therefore, clarifying the definition of data ownership is of great practical significance for promoting the development of the digital economy and protecting the rights and interests of all parties.

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2. Theoretical basis for defining data ownership in the digital economy era

2.1 Concept and characteristics of data

In the era of digital economy, data, as a core production factor, needs to be defined from a multidisciplinary perspective: from the perspective of computer science, data is a set of symbols that can be input into a computer and processed by a program, covering forms such as numbers, text, images, etc., existing in the system as binary units 0 and 1; From the perspective of informatics, data is unprocessed raw material that can be transformed into meaningful information through processing and analysis[1].

Data has four unique characteristics, one of which is intangibility, existing in electronic form without physical entities, making it difficult to physically perceive and control. For example, user purchase records on e-commerce platforms are stored only in digital codes on servers; The second is replicability, which allows for low-cost unlimited copying without sacrificing content and value. For example, digital music can be downloaded and copied by multiple users with no difference in quality; The third is non exclusivity, where the same data can be used by multiple parties simultaneously without interfering with each other. For example, experimental data shared by research institutions can be synchronized by multiple teams for research; The fourth is value derivation. The value increases dynamically with the use scenarios and processing methods. For example, Internet enterprises realize the improvement of business value by mining user browsing and searching data to accurately push advertisements.

2.2 Relevant theories of data ownership

In the theoretical spectrum of defining data ownership, the "triple rights structure" theory holds an important position, and its core lies in deconstructing data rights into a three-dimensional category of data producer rights, data processor rights, and data user rights [2]. As the original generation subject of data, data producers enjoy initial control rights, including the ability to choose data usage methods, define scope, etc., such as individual users' dominant control over the data when posting original content on social media platforms; Data processors need to be authorized by producers to carry out data collection, storage, analysis, and other processing activities, and enjoy corresponding processing rights and profit rights. Typically, big data analysis enterprises are authorized to form service plans through data mining and obtain economic returns; Data users are required to exercise their usage rights for specific purposes within a legal framework. However, this theory has limitations in practice, as the ambiguity of rights allocation ratios and exercise boundaries can easily lead to conflicts between subjects. In addition, property rights theory and intellectual property theory also provide ideas for defining data ownership: from the perspective of property rights theory, some scholars advocate endowing data with property rights attributes to clarify ownership, but the intangibility and replicability of data make it difficult for traditional property rights rules to adapt; In the dimension of intellectual property theory, academia tends to provide intellectual property protection for data sets or products with originality, but their strict originality requirements and time limits make it difficult to cover a large amount of raw and non-original data. Although the above theories have their own strengths and weaknesses, they collectively provide diverse perspectives and research foundations for improving the data ownership definition system.

2.3 Importance of defining data ownership

The definition of data ownership plays a core supporting role in the development of the digital economy, the protection of personal privacy, and the maintenance of market competition order [3]. In the dimension of digital economy development, clear data ownership is the prerequisite for market-oriented allocation of data elements. Only by clearly defining data ownership and usage rights can we break down barriers to data circulation, improve data utilization efficiency, and stimulate innovation vitality in the digital economy. For example, in the data trading market, clear ownership delineation can reduce the degree of information asymmetry between trading parties, avoid transaction risks, compress transaction costs, provide guarantees for the standardized development of data transactions, and inject sustained momentum into the development of the digital economy. From the perspective of personal privacy protection, precise definition of data ownership is a key means of safeguarding personal data control rights. Personal data contains sensitive privacy information such as health and finance, and clarifying individuals' rights to their data can effectively curb illegal data collection, abuse, and leakage, and safeguard personal legitimate rights and privacy security. Typical examples include clarifying individuals' ownership and control over medical data through legal regulations, requiring medical institutions to obtain clear authorization when using patient medical data, and thus building institutional

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barriers for personal privacy protection. At the level of maintaining market competition order, clear definition of data ownership is an important lever to prevent data monopoly and unfair competition. In the digital economy era, data has become a core competitive resource for enterprises. If the ownership definition is vague, it is easy for enterprises to seize other people's data through unfair means, which undermines the fair competition ecology of the market; Clear ownership rules can regulate the acquisition and use of enterprise data. For example, in the e-commerce field, by defining the ownership of user data and transaction data, it can prevent competitors from maliciously grabbing and abusing enterprise data, safeguard the legitimate rights and interests of enterprises, and ensure a fair market competition environment.

3. Legal dilemma in defining data ownership in the digital economy era

3.1 Imperfect legal system

In the current booming digital economy, data has become a key factor of production. However, there are still many imperfections in China's legal system regarding data property rights. From a legislative perspective, there is currently no unified data property law in China, and the legal definition of data property rights is relatively vague. Although laws and regulations such as the Civil Code, Data Security Law, and Personal Information Protection Law involve data rights and interests, the provisions are relatively scattered and lack systematicity and clarity. The Civil Code only provides principled provisions on data rights in the General Provisions, without clearly defining the specific content and boundaries of data rights; The Data Security Law focuses on data security management, but the definition of data property rights is not deep enough; The Personal Information Protection Law mainly focuses on the protection of personal information, and there are deficiencies in the property rights provisions for other types of data such as enterprise data and public data. This leads to a lack of clear legal basis for the ownership, use, and exercise of data rights in practical applications, which can easily lead to legal disputes.

In addition, there are conflicts between different laws and regulations regarding data ownership regulations. For example, in terms of personal data, the Personal Information Protection Law emphasizes the right of individuals to control their personal information, while the Cybersecurity Law focuses more on the security protection obligations of network operators for data. There are certain differences in the provisions of the two laws on the use and management of personal data, which makes it difficult for enterprises and individuals to determine specific rights and obligations when processing personal data, increasing the difficulty of legal application. In the field of data trading, due to the lack of unified data trading rules and standards, data trading platforms in different regions and industries have differences in data ownership recognition, trading processes, and trading supervision, which makes it difficult to guarantee the legality and standardization of data trading and restricts the healthy development of the data element market.

3.2 Difficulties in determining ownership subject

The identification of data ownership subjects in the digital economy era faces significant complexity, and there are disputes and challenges among individuals, enterprises, and governments in the process of defining and exercising data rights. As the original producer of data, individuals should have basic rights to their personal data, but in practice, because of the data collection mode under the Internet technology, individuals are often in a weak position, and it is difficult to effectively control their own data rights: many APPs acquire a large amount of personal data and use it for commercial purposes without the user's knowledge or full understanding through lengthy and obscure privacy policy clauses, resulting in the lack of the right of individuals to know and control the way and direction of data use. At the same time, the boundary between personal data rights and enterprise data rights is blurred. Especially when enterprises process personal data, the dispute between the two on the distribution of data rights is more prominent. As the core subject of data collection, processing, and use, enterprises also face complexity in determining their data rights. The data accumulated by enterprises through legal means constitutes important assets, but their rights are not absolute. It is necessary to balance personal data rights and public interests. In practice, some enterprises excessively collect and use personal data in pursuit of commercial interests, which violates personal privacy and data rights. Moreover, conflicts of data rights between different enterprises occur frequently. For example, in data competition cases, the legality of enterprises' acquisition and use of others' data lacks clear legal standards and judgment basis. As the manager and owner of public data, the government also faces challenges in ownership recognition: public data has

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public attributes, and ownership should belong to the state or all citizens. However, in actual management and use, the government needs to clarify its own rights and obligations, as well as citizens' rights to know, participate, and benefit from public data. Although China has made progress in the open use of public data, there are still legal gaps and institutional deficiencies in the definition of public data ownership, security protection, and profit distribution, which urgently need to be improved through legislation and institutional construction.

3.3 Imbalance in equity distribution

There is a significant imbalance in the distribution of rights and interests among various entities throughout the entire process of data production, collection, and use. In the production process, as the original producer of data, individuals often find it difficult to share the value-added benefits of data, such as the life and opinion data shared by social media users, which are used by platforms for advertising and precision marketing to achieve commercial value, but users rarely receive corresponding returns; In the collection process, enterprises rely on technology and resource advantages to collect a large number of personal and public data, but they have not fully compensated the data providers. Some Internet enterprises use free services to induce users to authorize data collection, and obtain huge commercial benefits themselves, while the providers are in a passive position; In the process of use, data users often pursue maximizing their own interests and neglect the protection of owner's rights. For example, in big data analysis and artificial intelligence applications, users may infringe on owner's privacy and data rights when obtaining competitive advantages through data mining. Moreover, the data trading market lacks reasonable pricing mechanisms and distribution rules, and transaction prices are controlled by a few data monopoly enterprises, making it difficult for owners to obtain fair returns. The causes of such imbalance mainly include three aspects: firstly, the imperfect data property rights system, which leads to a lack of clear legal basis for the distribution of rights and interests; Second, the data market has a significant monopoly. A few large Internet enterprises control the whole process by virtue of their data and technological advantages, squeezing the rights and interests of other subjects; The third challenge is the difficulty in evaluating the value of data, which is influenced by multiple factors such as quality, timeliness, and application scenarios, making it difficult to accurately measure and resulting in a lack of scientific basis for equity allocation.

3.4 Technological challenges and lagging legal responses

The iterative development of technologies such as data encryption and blockchain not only brings new challenges to the definition of data ownership, but also highlights the lag in legal response. Although data encryption technology improves the security of data transmission and storage, the unidentifiable nature and access restrictions of encrypted data increase the difficulty of defining ownership. For example, in encrypted digital currency cases, the encryption characteristics of transaction records make it difficult to confirm the identity of the actual owner and transaction subject of the digital currency, which poses obstacles to ownership recognition and dispute resolution. Blockchain technology, with its decentralized, tamper proof, and traceable characteristics, provides a new path for defining data ownership. Its distributed storage and full process recording functions can ensure the authenticity and integrity of data, providing evidence support for ownership determination. However, the application of this technology also faces legal gaps, such as the scope of legal protection for on chain data, the legal effectiveness of smart contracts, and data supervision rules, which are not yet clear. Relevant legislation in China is currently unable to adapt to the needs of technological development. There are three main reasons for the lag in legal response to technological challenges: firstly, the formulation and revision of laws require strict procedures and long cycles, making it difficult to synchronize the speed of technological updates; Secondly, rapid technological iteration makes it difficult for legislators to fully grasp the characteristics and application scenarios of new technologies, resulting in insufficient targeted regulations; Thirdly, there are differences in technological development levels and legal systems among different countries and regions, making it difficult to establish unified rules for defining data ownership at the international level, further exacerbating the complexity of legal responses.

4. The path to resolving the legal dilemma of defining data ownership in the digital economy era

4.1 Improve the legal system of data ownership

Developing a unified data property law is a key measure to address the issue of incomplete legal

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systems for data ownership. The law should clarify the basic elements of data property rights, such as the definition of rights holders, rights content, and rights limitations. In terms of definition, clearly defining data property rights is the right to possess, use, benefit from, and dispose of data, and clarifying its unique attributes that distinguish it from traditional property rights and intellectual property rights. For rights holders, it covers the status and scope of rights of different entities such as individuals, enterprises, and governments in data property rights. For example, it is clear that individuals have the right to control their personal data, and companies have the right to operate legally collected and processed data. In terms of the content of rights, the specific connotations and exercise methods of data ownership, usage rights, profit rights, and disposal rights shall be specified in detail. At the same time, we clarify the restrictions on data property rights, such as reasonable limitations on data property rights based on public interest, national security, and other reasons.

It is also necessary to revise relevant laws and regulations to eliminate conflicts in data ownership provisions between different laws. When revising the Civil Code, further refine the relevant provisions on data rights, clarify the status and protection rules of data as a new type of civil right object, and align it with the Data Property Law. In the Personal Information Protection Law, the ownership definition of personal information data and the rights and obligations between individuals and enterprises in the processing of personal information data are more clearly defined to avoid conflicts with other laws. In the revision of the Cybersecurity Law, the obligation of network operators to protect data security is strengthened, while clarifying their rights boundaries in the legitimate use of data, ensuring consistency with laws such as the Data Property Law and the Personal Information Protection Law. By revising these laws and regulations, a coordinated and unified legal system for data ownership will be formed, providing solid legal protection for the definition of data ownership.

4.2 Clarify the data ownership subject and rights allocation

In the definition of data ownership rights, it is necessary to clarify the content and exercise boundaries of rights for individuals, enterprises, and governments respectively. In terms of personal data rights, individuals should enjoy complete control over their personal data and have the right to decide on matters such as data collection, use, storage, and sharing. When companies collect and use personal data, they must obtain explicit consent from individuals and inform them of the purpose, scope, and method of use in a clear and understandable manner. For example, when an app collects user information, it must display a privacy policy in a prominent form such as a pop-up window, and can only be collected with the user's consent; At the same time, individuals should have the right to access, correct, delete, and carry data, be able to understand the storage and use of data at any time, request correction of erroneous data, deletion of data that does not require use or withdrawal of consent, and be able to carry data to other platforms for free circulation. At the level of enterprise data rights, enterprises have the right to operate and profit from legally collected and processed data. They can analyze and mine the legitimate data generated by users' use of products and services to optimize products and services, enhance competitiveness, and the data operation income belongs to the enterprise. However, enterprise rights are limited by personal data rights and public interests, and must comply with laws and regulations to protect privacy and security. When using user data for precision marketing, excessive infringement or illegal purposes is not allowed. In terms of government public data rights, as the manager and owner of public data, the government has the right to collect, organize, store and manage public data to serve public affairs and social governance, such as using traffic flow and demographic data for urban planning and traffic management; At the same time, it is necessary to assume the obligation to ensure data security and privacy, prevent leakage and abuse, and promote the open sharing of public data, clarify the conditions for open use, and balance the protection of personal privacy and corporate trade secrets.

4.3 Establishing a reasonable data rights distribution mechanism

The allocation of equity based on factors such as data contribution and cost input is an important principle for building a reasonable data equity allocation mechanism. In the process of data production, individuals, as the original producers of data, should receive corresponding benefits based on their data contributions. For example, in some crowdsourcing data collection projects, individuals should receive certain economic or other forms of return by providing high-quality data. Enterprises have invested a significant amount of manpower, material resources, and financial resources in the process of data collection, processing, and analysis, and should enjoy corresponding data revenue rights based on their cost inputs and data value-added contributions. For example, big data analysis companies provide valuable market insights and decision-making recommendations to enterprises through in-depth analysis

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of massive data, thereby obtaining corresponding economic benefits.

Establishing a mechanism for redistributing data benefits is also key to balancing the interests of all parties involved. We can consider establishing a data revenue adjustment fund to extract a certain proportion of funds from data trading profits to support the development of the data industry, data security protection, and compensation for personal data rights. For example, allocating some funds to research and development of data security technologies to enhance data security protection capabilities; Compensate users whose personal data rights have been infringed upon and safeguard their legitimate rights and interests. At the same time, we will strengthen the supervision of data revenue distribution, prevent data monopoly and unfair competition, and ensure the fairness and rationality of data revenue distribution. For example, we are regulating monopolistic enterprises in the data market, restricting their unreasonable data pricing and profit distribution behavior, and maintaining market competition order.

4.4 Strengthen the integration of technology and law

The use of blockchain technology to achieve data ownership verification is an innovative measure to solve the problem of defining data ownership. Blockchain has the characteristics of decentralization, immutability, and traceability, which can provide reliable technical support for data authentication. Through blockchain technology, the entire process of data generation, storage, use, and circulation is recorded on the blockchain, forming an immutable timestamp and data chain, thereby clarifying the ownership relationship of data. For example, in the process of data transactions, using blockchain smart contracts to automatically execute the rules and conditions of data transactions, ensuring the legality and security of data transactions, while clarifying the transfer of ownership of data.

Establishing data security technology standards and cooperating with legal supervision can effectively address data security challenges. We require enterprises and institutions to strictly comply with technical standards such as data encryption, access control, and data backup during data processing to improve data security. For example, it is stipulated that enterprises must use high-strength encryption algorithms when storing user personal data to prevent data leakage. At the same time, the law should clearly punish behaviors that violate data security technology standards and strengthen the deterrent power of the law. For example, enterprises that fail to process data in accordance with data security technology standards, resulting in data leakage, will be held legally responsible in accordance with the law, including fines, suspension of business for rectification, etc. Through the organic integration of technology and law, a comprehensive data ownership protection system is formed to promote the healthy development of the digital economy.

5. Conclusion

This study takes the core issue of defining data ownership in the digital economy era as the research object, systematically exploring its legal dilemma and solutions. In terms of theoretical dimension, the study first clarifies the conceptual category and essential characteristics of data, deeply explains the core essence of data ownership related theories such as the "three element rights structure", and demonstrates the fundamental value of defining data ownership from three levels: digital economy development, personal privacy protection, and market competition order maintenance.

In terms of examining the current situation of the rule of law, on the one hand, the research will sort out the relevant legislative system of data ownership in China, covering national level legislation such as the Data Security Law and the Personal Information Protection Law, as well as local supporting regulations; On the other hand, benchmarking international legislative practices, drawing on foreign experiences such as the EU's General Data Protection Regulation (GDPR) and the US's California Consumer Privacy Act (CCPA), and combining with guiding cases issued by the Supreme People's Court, we extract the rules and standards for determining data ownership in judicial practice.

Through research, it has been found that the current definition of data ownership faces multiple legal challenges. Firstly, the legal system is incomplete, lacking unified legislation on data property rights, and there are conflicts of rules between existing laws and regulations; Secondly, there is controversy over the identification of ownership subjects, and the boundaries of rights and responsibilities between individuals, enterprises, and governments in defining and exercising data rights are blurred; Thirdly, there is an imbalance in the distribution of data rights and interests, with a lack of fairness in the distribution of benefits among all parties involved in the entire process of data production, collection, and use; Fourthly, there is a disconnect between technological development and legal response, with new technologies such

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as data encryption and blockchain leading to new issues in defining ownership, while legal regulation lags behind significantly.

In response to the above difficulties, targeted solutions have been proposed: firstly, to improve the legal system of data ownership, promote the legislative process of unified data property rights law, revise existing laws and regulations to eliminate rule conflicts; Secondly, clarify the rights and responsibilities of data ownership subjects, strengthen individuals' control over their data, and define the boundaries and obligations between enterprise data management rights and government public data management rights; The third is to establish a fair data rights distribution mechanism, determine the distribution ratio based on data contribution and cost input, and establish a data revenue redistribution system; The fourth is to promote the deep integration of technology and law, use blockchain technology to achieve data ownership and circulation traceability, and synchronously establish data security technology standards to cooperate with legal supervision. This study provides theoretical support and practical guidance for solving the problem of defining data ownership in the digital economy era, and has important practical significance for ensuring the healthy and orderly development of the digital economy.

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