

The Construction of Data Property Rights in the Age of Digital Economy

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Abstract: In the era of digital economy, data has become a very important resource and wealth. As the proportion of digital economy in the gross national product or national wealth continues to rise, how to better protect and utilize data has become a major issue of general concern to all countries. This paper analyzes the legitimacy and reasonableness of data empowerment from various perspectives, and finally concludes that the optimal path to protect the property rights and interests of various types of data lies in the construction of a new type of property rights, i.e., data property rights. Based on this, this article takes the formulation of general systems, the establishment of protective measures, and the clarification of exception restrictions as the basic framework, combined with the theoretical research status and practical production needs of data property rights, to conceive and explore the construction of data property rights system.

Keywords: Digital Economy; Data; Data Property; Data Property Rights; New Type of Right

1. Introduction

In the era of the digital economy, data has become an extremely valuable resource and wealth. As the share of the digital economy in a country's gross national product or national wealth continues to increase, how to better protect and utilize data is receiving more and more attention from countries. It has become a necessity to establish rights for data and regulate them. Among the various data rights and interests, data property rights are particularly important. At present, China has not yet formulated national laws and administrative regulations to clarify the specific definition of data property rights.²⁰²² The Opinions on Constructing a Data Base System to Better Utilize the Role of Data Elements (hereinafter referred to as the "Twenty Articles on Data")

published by China on December 2, 2022, exhaustively puts forward proposals for institutional frameworks in key areas, such as data property rights, data circulation and trading, data revenue distribution, and data governance, to enhance the protection and utilization of data. It is of great practical significance for strengthening the protection and utilization of data. In recent years, there have been many discussions on the issue of data property in civil law and intellectual property. Based on the results of the current discussions in the academic circles and the practice of data-related industries in China, this article provides suggestions for data property legislation in China.

2. Data Property Rights in the Digital Economy

2.1 The Importance of Data in the Digital Economy

2.1.1 Concepts and characteristics of data

"Data is not everything, but everything is becoming data." [1] Data has been recognized as a catalyst for economic growth, innovation and digitization across all industries. With the continuous advancement of digital technology, the digital economy has seen a rapid growth. Nowadays, the share of digital economy in the total economy of various countries continues to grow, and has become a core component of the world's economic development and a key area of competition, which means that the world has officially entered the era of digital economy. China attaches great importance to the development strategy of digital economy and has made a series of major decisions and deployments. Digital economy takes data as the core production resource, uses advanced information network as the operation platform, and relies on the efficient application of information technology to promote productivity enhancement and optimization of economic structure. It is not difficult to see that the key to promoting the development of digital economy

lies in data. On March 30, 2020, China has issued a guideline on building a more complete system and mechanism for market-based allocation of factors (hereinafter referred to as “Opinion”), which historically listed data as one of the five major factors of production on a par with land, labor, capital, and technology, revealing the important role of data in various fields of social production and life, and the importance of data is beyond doubt. The importance of data is unquestionable.

Since data is a key factor of production in the digital economy, clarifying its connotations is a necessity. Data in the legal sphere has its own specific connotation. China’s Data Security Law defines data as “any record of information by electronic or other means”.

Understanding data can begin with the relationship between data and information. Data and information are both interrelated and distinct from each other. On the one hand, data, as a record of information, is the carrier of information. On the other hand, information exists in data as the content of data. In other words, data and information are the relationship between recording and being recorded, form and content. Some scholars have pointed out that in the digital age, data mainly exists in the form of bit encoding in cyberspace, while information comes from people’s parsing of such data. The main difference between the two is whether or not they undergo a “reading” process. [2] From the perspective of semiotics, some scholars divide data into two aspects: one is “data file”, which has obvious objectivity and will not change due to differences in individual understanding; the other is “data information”, which covers the meaning behind the symbols and is subjective to a certain extent, reflecting the individual’s interpretation of the data. [3] Other scholars believe that information reflects the essential attributes and laws of things, which are analyzed by the cognitive subject and recorded as data in a specific form. The essence of information is objective and changing, while data is also objective, which reflects the cognitive subject’s understanding and cognition of the information at a specific point in time or a specific period of time, and this understanding and cognition may be direct or indirect. [4] The above viewpoints reveal the difference and connection between data and information from different perspectives, but they also point to an

original fact: regardless of the understanding, data carries information, and information is embedded in data.

As an emerging factor of production, data has distinctive characteristics, which are mainly reflected in the following features: first, non-exclusivity. In the era of digital economy, although the data subject can realize the holding of data through collection, collation, processing and other ways, but this does not restrict other data subjects to obtain the same or similar data in the same or different ways, and the holding of data by a certain data subject is not absolutely exclusive. Second, value. The valuable nature of data is presented in a more specific form. Specifically, the general non-specific nature of the single or small amount of data has a very limited economic value, almost negligible. Only the data will be organized and processed to data clusters expressed in the “big data”, the data contains a large number of economic value, including the value of use and exchange value. Third, disposability. The disposability of data means that in the process of its generation, circulation, trade and use, the relevant subject can actually manage it. The data subject realizes the goal of its utilization and circulation through a series of operations on the data. The above characteristics of data will also have an impact on the institutional construction of data property rights.

2.1.2 Trends in the development of digital property and the propertyization of data

One of the distinctive features of the digital economy is the increasing number of digital properties and the gradual increase of their share in the total property of human society. The so-called digital property, also known as digital assets, refers to the types of property assets that exist in digital form. These assets include, but are not limited to, virtual currencies, smart contracts, payment tokens, digital copyrights, digital artworks, domain names, virtual lands, in-game items, digitized commodities, digital securities, and so on. Digital property is a high form product of data assets, which is mainly based on data assets as raw materials. The so-called data asset, i.e. data property, refers to the data resources controlled by the data subject and containing certain economic value. The process of transforming raw data into data property is called data property. The specific implementation path of data property is to explore, integrate and utilize the economic value

contained in the data through collection, collation, processing, etc., and finally transform the data into valuable property.

During the period of agricultural production, land and labor were the key production resources. And entering the industrial economy, capital gradually assumed an important position and gave rise to new factors of production such as technology. By the time of the digital economy, where the global technological and industrial revolutions are flourishing, data has become a key production factor. This is not only reflected in the continuous growth of digital property and the rapid trend of data property, but also manifested in the development of the digital economy era puts forward newer and higher requirements for data property, that is, how to more efficiently transform data into property, how to maximize the value of data property and so on. In the era of digital economy, the propertyization of data shows an increasingly common and important development trend, which puts forward requirements for the construction of a perfect data property right system.

2.2 Significance of Property Rights in Data in the Digital Economy

2.2.1 Justification of property rights in data

The digital economy, with its unprecedented speed of development, wide scope of radiation and deep influence, is becoming a key force in reorganizing global factor resources, reshaping the structure of the global economy and changing the pattern of global competition. In this context, it is undoubtedly natural and legitimate to construct a perfect data property rights system centered on empowering data processors and others to prevent others from infringing on their data rights and interests under specific conditions and within a specific scope. Specifically, there are three reasons why data property rights should be constructed.

First, constructing data property rights facilitates incentivizing data production. According to economics, incentive is a person's anticipation of punishment or reward and thus a corresponding response. The purpose of establishing data property rights is to create an incentive mechanism that encourages data innovation and promotes the in-depth development and efficient utilization of data, thereby giving full play to the role of data as an emerging factor of production. The key to

achieving this goal lies in respecting and safeguarding the labor paid in the data production process. In data development, processors put in a lot of resources, and the law should safeguard their legal rights and provide reasonable earnings expectations and returns, otherwise it will seriously dampen people's motivation to innovate. For this reason, the "Twenty Articles on Data" particularly emphasize the need to ensure that labor and other contributions are justly rewarded, and advocate the establishment of a property rights system that can both protect rights and interests and regulate the use of data. The core purpose of this is to build an incentive mechanism that encourages the active participation of all parties in the production and circulation of data, releasing the value of the data elements in a comprehensive manner, and tapping their potential to promote the digital economy. The core purpose is to build an incentive mechanism to encourage all participants to actively participate in the production and circulation of data, fully unleash the value of data elements, and tap their potential to promote the prosperity and development of the digital economy [5].

Second, the construction of data property rights is a response to the needs of national policy. Against the backdrop of the country's formulation of a development strategy for the digital economy, the construction of a sound data property rights system is a core element of the construction of a basic institutional system for the digital economy. At the national level, China has issued a series of normative documents to point out the basic direction for data property rights. At the local level, Guangdong, Hubei, Henan and other provinces have issued local normative documents dedicated to exploring the establishment of a data property rights system, advancing the relevant legislative process and formulating the corresponding rules for the determination of rights.

Thirdly, the construction of data property rights is conducive to providing better judicial protection for data property interests. At present, the Chinese judicial authorities have adopted a variety of ways to protect the property rights and interests of data subjects, including the use of copyright law, contract-related law and anti-unfair competition law. Although the courts have certain practical experience and preliminary judicial rules on data property

protection, due to the lack of laws and regulations specific to data property, the judgment standards for handling related disputes are not clear, resulting in uncertainty in the judgment results, which may lead to different judgments for the same case and difficulties in the connection of judicial work, and so on. Therefore, the construction of a perfect data property rights system can develop a more standardized and unified judicial practice system to provide better protection for the data subjects' data property interests.

2.2.2 Justification of property rights in data

With the growing practical demand for data property protection, the theoretical research on data property protection in the legal profession has continued to deepen. At present, scholars have widely recognized the necessity of data property protection. However, on how to protect data property, there is still controversy in the academic community, there are two main views: right and non-right. Scholars who advocate non-rights are generally of the view that the current legal framework can already effectively protect data-related rights and interests, and the need to establish a separate data property rights system is not significant. Some individual scholars are also concerned that data rights may restrict other subjects' access to and utilization of data, which in turn may have a certain impact on the fair utilization of data. However, scholars who advocate for non-rights-based protection also hold different views on what kind of system should be used for protection.

Some scholars have put forward the theory of limited control of data, arguing that the promotion of data sharing and flow should be taken as the base point of the legal system of data protection, [6] and that the anti-unfair competition law should be used as the main means of protection of data property. However, the problem of utilizing the anti-unfair competition law to protect data property is that the legislative purpose of the anti-unfair competition law is to maintain the competitive order rather than to determine civil rights and interests. The protection of data property through the anti-unfair competition law can only be utilized in the form of reverse protection, and it is not possible to make provisions on the content of data rights and the restriction of data rights from the front. In addition, the determination of whether unfair competition is constituted is still based on whether the

infringed rights and interests are rights and interests protected by law. For example, some scholars have pointed out that the anti-unfair competition law should take property rights or contractual rights as the basic reference [7]. The lack of property rights in data will make it difficult to define various unfair competition behaviors involving data rights and interests. Moreover, the anti-unfair competition law can only resolve disputes between civil subjects with competitive relationships, and it is difficult to regulate the legal relationship related to data rights and interests between civil subjects without competitive relationships. Therefore, the anti-unfair competition law is not sufficient to provide all-round protection for data property.

Some scholars, on the other hand, have argued that, given that data, as an objectively existing immaterial form, can be protected in absolute right by utilizing existing property rights regulations and referring to the protection model of intangible assets such as electric energy and radio spectrum resources [8]. However, the sharing and mutual benefit qualities of data are clearly not compatible with the concept of absolute exclusive control in traditional property rights law. Traditional property rights are based on the principle of exclusive use by the right holder, with the reasonable use by others as an exception. The opposite is true for data property. Since in general, the reading, identification and use of data by others will not restrict the exercise of the data subject's rights and interests in his or her relevant data, only improper means such as large-scale crawling of data may damage the data subject's rights and interests in his or her relevant data. In other words, for data property, it is the principle of reasonable use by others and the exception of exclusive use by the right holder. Therefore, the protection of data property is not suitable for the traditional property ownership system.

Some data may be protected by intellectual property rules when certain conditions are met [9]. When data are manifested as data products with originality, such as databases as compiled works, they should be protected by copyright law. However, mere collection and organization of data is usually difficult to satisfy the strict requirements of originality in intellectual property rights, and the value of data is mainly reflected in its role as a basic means of production rather than in its innovativeness. As a result, most data is difficult to obtain protection

under intellectual property rules [4]. It is clearly inappropriate to use the intellectual property system to regulate data property when the intellectual property system cannot be applied in most cases of data property and only in a few cases.

To summarize, the existing legal systems such as anti-unfair competition law, property law and intellectual property law cannot protect data property well. The optimal path to protect the rights and interests of various types of data property is to explore a new way of protection and build a new type of data property right based on the property right and intellectual property right, combining with the theoretical research status of China's data property and the actual needs of production.

3. General Institutionalization of Property Rights in Data

3.1 Legal Attributes of Property Rights in Data

3.1.1 Concept and nature of property rights in data

In this paper, data property right refers to the right of civil subjects to control, use, gain and dispose of specific data, which is a new type of property right alongside property right and intellectual property right. Any organization or individual has the obligation not to act on it, and shall not restrict, interfere with or infringe upon others' data property rights without legal permission.

3.1.2 Subjects and objects of the right to data property rights

The subject of the right to property rights in data refers to the data processor who independently decides on the purpose and manner of processing in the data processing activities, mainly various legal persons and unincorporated organizations, mainly enterprises. On whether natural persons can become the subject of data property rights. Some scholars believe that the principle of "separation of human and property" should be adhered to, and all data property rights should be allocated to the data processor, i.e., the natural person as the source of data does not enjoy the data property rights, but the natural person as the data processor can enjoy the data property rights [10]. Some scholars believe that the data source of personal data should also be recognized as the subject of the right to data property rights, even if the value of the data may

seem insignificant, should not be deprived of the natural person's property rights and interests in their personal data, and let these rights and interests fully vested in the enterprise [11]. This paper supports the idea of "separation of person and property", but argues that natural persons cannot be qualified data processors, and can only process data as a member of various legal and unincorporated organizations. Therefore, the subject of data property rights in this paper is a legal person or an unincorporated organization that independently decides on the purpose and manner of data processing activities (including collection, processing, utilization, etc.).

According to article 34 of the Personal Information Protection Law and article 38 of the Data Security Law, State organs process data in order to carry out their statutory duties, not in pursuit of economic gain. Article 42 of the Data Security Law further emphasizes that State organs shall not use data-processing activities for economic gain, but shall promote the open use of public data. Therefore, the subject of the property right to data does not include State organs.

The object of the data property right is all available data, with enterprise data being the main focus.

3.1.3 Characterization of property rights in data

After clarifying the concept, nature, subject and object of data property rights, the characteristics of data property rights can be summarized. Generally speaking, data property rights have the following basic characteristics:

Firstly, the property right to data has the same essential characteristics as property rights in general. Like property rights and intellectual property rights, it is a generally applicable property right that focuses on the protection of property interests rather than personality interests. All data property interests, whether direct or indirect, can be converted into substantial economic value through market transactions. This is similar to traditional property rights in that the property interest represented by a data property right can be realized through the direct sale or licensing of data or through the trading of data-related services and products. This feature provides incentives for participants in the data ecosystem to engage more effectively in the process of data production and utilization, thereby promoting the healthy development of the digital economy. Second, the right to data property is of an erga

omnes nature, i.e. any civil subject other than the subject of the right to data property is subject to an obligation not to act. The effect of the right to data property rights is effective for an unspecified majority of people, and it has general and extensive legal binding force. At the same time, the data property right of the world manifests itself in the same way as the right of property, intellectual property rights, has the attribute of publicity and public trust. The mode of publicity of property right is the delivery of movable property and registration of real property, while the publicity and trust attribute of intellectual property right is manifested in registration and protection measures taken by itself, which is diversified. The publicity of data property rights will also have diversity, and at present, registration, delivery and transfer of possession, sampling access verification can be used. With the advancement of science and technology, such as the evolution of network information technology, big data, artificial intelligence and blockchain, the ways of publicizing data property rights will continue to expand.

Third, the right to data property has a certain degree of disposability. The so-called disposability of the right to data property means that the subject of the right to data property enjoys the right to control the object of the right. In the data ecosystem, the establishment of data property rights gives the right subject the right to decide and manage its data resources. The subject of rights can independently decide on the use, sharing, transfer and other behaviors of the data according to his own needs and wishes, so as to realize the effective use and management of the data. It should be noted that this disposability is weaker than traditional property rights and intellectual property rights, as it is limited to a certain extent by the protection of personal information and the protection of national interests and public interests.

The right to data property is relatively exclusive. The exclusivity feature of the right to data property is distinctive in that it prevents any unwarranted infringement, such as unlawful acquisition, theft or destruction of data. Unauthorized large-scale data crawling is considered illegal, while illegal downloading, copying or accessing of another person's data is likewise strictly prohibited by law. In addition, precautionary technical measures put in place by rights holders are also supported by the law. It

should be noted that the exclusivity of data property rights, like disposability, is weaker than traditional property rights, and is not the absolute exclusivity that traditional property rights have. The data subject cannot restrict others from downloading, copying or accessing the data held by him/her in a reasonable and compliant manner, nor can he/she prevent others from obtaining the same or similar data in a lawful manner.

3.2 Empowerment of Decentralization of Data Property Rights

3.2.1 Types of property rights in data

As mentioned above, data property rights refer to the rights of civil subjects to control, use, gain and dispose of specific data. According to these four powers, the right to data property can be subdivided into four specific rights: the right to hold data resources, the right to use data processing, the right to income from data property, and the right to dispose of data property. Among them, the right to hold data resources corresponds to the right to control, the right to use data processing corresponds to the right to use, the right to income from data property corresponds to the right to income, and the right to dispose of data property corresponds to the right to dispose. These four rights are discussed in detail in the following article.

3.2.2 Content of property rights in data

First, the right to hold data resources. The right to hold data resources is the right to control the data object held by the subject of the right to data property rights, specifically, the subject of the right to data property rights can store and dispose of the data and relatively exclude others from interfering with it. The right subject's right to control the data it holds is a prerequisite for it to exercise its complete data property right. Only when control of the data is achieved can the subject of the right to data property rights proceed to exercise other powers on that basis. The right to hold data resources can be either a positive act of control, such as the holder of the data resources can protect some important data through encryption technology; it can also be a kind of mimetic act of control, such as the platform will release the data it holds to the public, and allow others to browse and obtain the data, but these data are still under the control of the platform in practice.

It should be made clear that the right to hold data resources is a concept introduced in Article

20 of the Data Act. The reason why Article 20 uses the expression “right to hold” rather than “right to own” is that the control of the right to hold data resources is not equivalent to the traditional property right of “possession”. The reason for this is that control of the right to hold data resources is not equivalent to “possession” of traditional property rights. In property law, “possession” refers to the actual control and management of property by the right holder [12], which is manifested in the domination of the object and the prevention of others from interfering with it [13]. In contrast, the control of data by the data right holder shows a relatively weak exclusivity, which is different from the concept of “possession” in traditional property rights. In other words, the right to hold data resources can only be expressed as a relative control over the data, rather than the absolute dominion and control of a right in rem.

Second, the right to use data for processing. The right to use data for processing is also proposed in the “Twenty Data Articles”. As its name suggests, the right to use data for processing refers to the right to process and use data. It covers both the process of transforming information into data and the processing of existing data. However, given the nature of the flow of data and the objectives for which the property rights rules were established, data processing is only one stage in the data flow, and its main purpose is for subsequent use. The focus of the right to use data processing is on the word “use”. The exercise of the right to use data processing has a variety of ways, the subject of the right to data property rights can explore and utilize the value of the data from a variety of dimensions, for example, in the decision-making process of the enterprise, through the analysis of specific data, the decision-making process can be changed from relying on the management’s subjective judgment to the analysis of objective data. For example, the rights subject can use data to realize the digital transformation of enterprise management and operation through big data, artificial intelligence, computer science and technology. In addition, the subject of the right can also use the data to grasp the user’s preferences and habits, so as to accurately provide the services that the user may need. In conclusion, the right to use data processing is the most important right in the right to data property, and it is one of the key rights of the subject of the right to data property to realize economic

benefits by using the data object.

Third, the right to income from data property. The right to income from data property refers to the right of the subject of data property to obtain certain economic returns through data transactions and services. The right to use data processing emphasizes the use value of data, while the right to income from data property focuses on the exchange value of data. A common model of the right to income from data property is the transaction of data, and the transaction of data is usually divided into two ways. The first way is that the subject of the data property right directly transfers the right to hold data resources to others and requires the other party to pay the corresponding consideration, and the big data trading centers in many Chinese cities are operated in this way. The second way is that the subject of the data property right still holds his own data, but allows others to copy the data he holds, thus generating a copy of the data, and the copier enjoys the data property right to the copy of the data. Again, the copyist is required to pay a certain amount of money to the subject of the original data. Another common model of the right to income from data property is the service provision of data, for example, the subject of the right to data property rights allows others to access and use the data held by him, and accordingly receives a certain amount of service fees. The well-known enterprise search is adopting this model. With the continuous progress of information technology, the realization of the right to income from data property will become more diversified, and the right to income from data property is another key right of the subject of the right to data property to realize economic benefits by using the data object.

Fourth, the right to dispose of data property. The right to dispose of data property refers to the authority of the subject of the right to data property to make the final disposition of the data object. On the basis of complying with the law, ensuring no infringement of the rights and interests of the relevant personal information, and safeguarding the interests of the State and the public interest, the subject of the right has the right to exercise the final decision-making power over the data held by the subject of the right. In fact, the data transaction mentioned above is also a manifestation of the right to dispose of data property. The subject of the right to data property rights exercises the right to

dispose of data property while exercising the right to income from data property. In addition, the exercise of the right to dispose of data property also includes the destruction of data.

4. Setting up Measures for the Protection of Data Property Rights

The protection of rights is an important factor that cannot be ignored in the process of building a data property rights system. This paper argues that, regarding the protection of data property rights, it is necessary to establish a protection system with perfect content, reasonable framework and easy to implement in practice. Specifically, it is necessary to combine the actual needs of data protection in China on the basis of the two perspectives of self-protection and other relief to be considered. At the same time, it is also necessary to learn from the legislative and practical experience of different countries or regions in the protection of data property rights.

4.1 Self-protection of the Property Right to Data

Self-protection of data property rights refers to the act of the subject of data property rights to protect his or her own data property rights through various means within the scope permitted by law, which is a defensive act to prevent others from infringing on his or her own data property rights, and therefore belongs to the prior protection rather than the subsequent relief. The so-called various means and methods include, but are not limited to: technical measures, such as setting passwords for accessing databases, using secure encryption to store data, and performing data integrity checks; physical devices, such as encrypted storage devices designed to protect data from theft; and hardware tools, which assist the software in preventing unauthorized copying of data. Private protection of the subject of the right to data property rights is the most common and dominant form of protection of data property rights.

4.2 Alternative Remedies to the Property Right in Data

When data rights are infringed, legal remedies become crucial for restoring effectiveness and repairing damages. The realization of the interests of data property right holders depends on the effective protection of their rights by law.

In addition to setting up self-protection measures by granting a certain amount of free space to data property right holders, the law should also clarify the legal liability for infringement of data property rights. Such legal liability can be expressed as civil tort liability in civil law, as well as administrative and criminal liability in public law. The former can be regarded as private law remedies, while the latter is considered to be public law safeguards.

4.2.1 Private law remedies for data property rights

With the development of the digital economy, there have been many cases of judicial practice on data infringement in China, including the famous cases of Weibo v. Pulse, Taobao v. Meijing, and Volkswagen Dianping v. Baidu. "There have been many cases of judicial practice. However, because China does not yet have a clear data property rights regime, the final decisions in these cases all rested on the courts finding that the defendants had violated the Anti-Unfair Competition Law. The case of Taobao v. Meijing is worth mentioning. In 2017, Taobao filed a lawsuit with the Hangzhou Railway Transportation Court on the grounds that Anhui Meijing had illegally obtained and profited from the data of its "Business Counsel" product, thereby interfering with the sales of the product, harming its economic interests and destroying the fair competition in the market. Hangzhou Railway Transportation Court. This case, as the first data product case heard by an Internet court, not only continued the traditional judicial strategy of applying the Anti-Unfair Competition Law, but also demonstrated new progress in the legal protection of data products. First, the case tended to recognize for the first time that data products have independent property value, defining them as a property interest with market competitiveness. Second, in addressing the grounds for protection, the court, in addition to the conventional anti-unfair competition arguments, specifically emphasized that the plaintiff's substantial investment in the data product and the defendant's gratuitous exploitation amounted to stealing the fruits of others' labor. Failure to set limits on such behavior would undermine the incentive of big data developers to innovate, which would in turn constrain the innovation and development of the industry as a whole. In addition, the calculation of compensation in this case took the form of the defendant's infringement profits.

The significance of this case is undoubtedly significant, not only in the emergence of a tendency to recognize and protect data property rights, but also, more importantly, in providing a reference for the calculation of compensation for the liability for data property rights infringement. This article believes that the calculation of damages for data property right infringement liability can refer to the practice of Article 17(3) and (4) of the Anti-Unfair Competition Law, i.e., the amount of compensation for the damaged data subject shall be based on the actual loss, and if the actual loss can't be measured accurately, it shall be determined with reference to the benefits obtained by the infringer due to the infringement. If it is difficult to quantify the specific loss suffered by the right holder or the infringer's unlawful gain, the court will award a certain amount of compensation to the right holder at its discretion based on the specific circumstances of the infringement. The value of data products (e.g., "Business Counsel" products) can be determined through relevant market pricing, while the value of data resources that are not data products can be identified and priced by professional centers, such as big data trading centers. Meanwhile, taking the calculation of damages as an entry point, this paper attempts to reflect on the relevant norms of data infringement.

Data infringement refers to acts of unauthorized access to or improper use of legally protected data without the explicit authorization of the right holder and without a legally justifiable basis. Such acts shall be held liable for civil infringement in accordance with the law. Data infringement is regarded as an unlawful *de facto* behavior at the legal level. Whether the perpetrator is liable and for what kind of liability depends on the specific provisions of the law. And the consequences brought about by the infringement behavior, its legal character should be clearly reflected in the normative model of the data property rights protection system. This normative model includes the composition, types, and corresponding legal responsibility of data infringement, which will be elaborated in detail below.

On the question of the constituent elements of infringement. The analysis of the constitutive conditions of data infringement from a legal point of view should proceed in the order from objective to subjective conditions. Objective elements are mainly concerned with the

illegality of the act and the infringement of the object of the right, while subjective elements relate to the attributability of the perpetrator. Among the objective elements, the primary aim is to identify the legitimate object of the right. The object of a data infringement must be a valid data property right protected by law. This means that only those data that are recognized and protected within the legal framework can be the object of a data infringement. Those data whose right holders have waived their relevant rights or whose protection period has exceeded the time limit should not be regarded as the object of data infringement.

Secondly, aggravating behavior is also an important part of the objective elements. Aggravated conduct for the purposes of data infringement liability is primarily conduct that violates the property rights and interests of others in data. This may manifest itself in acts such as unauthorized access to or misuse of data, but need not be necessitated by actual material damage. This is because the infringement of data property rights often manifests itself as a breach of the right of prohibition, i.e., the perpetrator violates the duty of "omission".

The subjective element, on the other hand, as an important concept in legal evaluation, emphasizes the impact of the perpetrator's inherent mental state on legal liability. Considering the limited exclusivity of the property right to data, Chinese legislation may stipulate that "without the permission of the right holder, no organization or individual may acquire or utilize the data for business purposes", thus setting the boundary of the effectiveness of the right holder's right of inhibition. The "purpose of production and business" demonstrates the perpetrator's awareness of the wrongful act and the pursuit of the purpose caused by the wrongful act, which are two elements of subjective fault, and can be used as a yardstick for the law to measure the subjective fault of the perpetrator. Only when the above elements are met at the same time will the perpetrator be judged to have committed a tortious act.

With regard to the types of data infringement, a limited enumeration of the types of infringement is appropriate for the consideration of limited exclusive protection of the property right to data. Generally speaking, improper use of data, improper access to data, access to and use of data beyond the scope of access rights, and other

improper access to and use of data should be recognized as data infringement. Improper access refers to those acts of improperly accessing data under the control of the right holder in violation of laws and regulations, integrity norms and business ethics. Improper use, on the other hand, refers to those activities that jeopardize the interests of data right holders and disrupt the legitimate trading order of the data market. Acquiring and using data beyond the scope of access right refers to accessing data beyond the scope of legal or contractual agreement and acquiring and using data on this improper basis. Other acts of improper access to and use of data belong to the “underpinning provisions”, which are left to the judge’s judgment in the light of the specific circumstances of the case, giving the judge a certain degree of discretion.

The question of liability for data infringement. In the face of an infringed data property right, the right holder may request the infringer to assume the tort liability of stopping the infringement and compensating for damages, thus realizing civil remedies. The cessation of infringement of data property rights is similar to the exclusion of obstruction in the traditional protection of property rights, but the difference is that the right holder can not only request the cessation of the current infringement, but also has the right to request the elimination of potential risks of infringement that may arise. It is worth stating that due to the immaterial nature of data, the data property right holder cannot invoke civil remedies such as requesting restitution or return of the original object. Once infringed upon, data cannot be restored to its original state or control through “repair” or “restitution” as in the case of material property. The mechanism for compensating damages for data property rights has commonality with traditional ownership damages in terms of mechanism and principle, and its core is to fill in the damages. However, it is also important to note that in the data property rights system, the way of compensation for damages is limited to monetary payment, and there is no case of filling the damages through the acquisition of the same product, which is also determined by the immateriality of data. In addition, on the basis of its limited property rights and limited protection, it is not appropriate to apply a “punitive damages” system to damages for infringement of the property right to data, which should be

limited to a certain reasonable range.

4.2.2 Public law guarantees of property rights in data

The public law safeguard of data property rights refers to the fact that when the behavior of the wrongdoer infringing on data property rights is too serious, in addition to civil liability, he or she should also bear certain administrative or criminal liability. Specific measures for the formulation of relevant legal norms to specify what kind and degree of behavior need to bear administrative or criminal liability. The relevant rules for administrative and criminal liability can be determined by the data property rights system in conjunction with the administrative and criminal penalty system. For example, according to Article 49 of the Public Security Administration Punishment Law, any act involving “theft, fraud, forcible acquisition, plunder, extortion, or intentional damage to public or private property” will be subject to legal liability, while Articles 264 and 275 of the Criminal Law provide for the crimes of theft and intentional destruction of property respectively. At that time, the separate law on the data property right system can be stipulated as follows: “The act of improperly obtaining data without the permission of the data right holder is regarded as theft; the act of intentionally destroying data without the permission of the data right holder is regarded as the intentional destruction of property. Both of the above behaviors, depending on the severity of the circumstances, shall be held liable with reference to the relevant provisions of the Public Security Administration Punishment Law and the Criminal Law.” This can be realized by making corresponding amendments to the Public Security Administration Punishment Law and the Criminal Law when formulating the system of data property rights, and introducing relevant judicial interpretations. As for the implementation of the above protection measures, it depends on the coordination of public security organs, pro-curatorial organs and judicial organs.

4.3 Extraterritorial Experience with the Protection of Property Rights in Data

The reach of the digital economy era is global, and every country has been swept up in the wave of big data. In the face of this wave, different countries have adopted different approaches. The EU has gone through two practices of data

property rights, and the final answer given by the EU is to fully de-proprietize the data and instead set up a data access right that focuses more on data sharing. Therefore, the EU cannot provide a paradigm on the protection of data property rights, but of course the lessons learned by the EU in such a long attempt are worth learning.

The focus of this paper is on the data property protection model in the United States. Data property protection in the U.S. is mainly achieved through the Computer Fraud and Abuse Act (CFAA), which establishes rules against computer trespassing, and explicitly states that one should not intentionally violate another person's computer system without authorization or in excess of authorization in order to obtain protected information. The term "exceeding authorization" in this context can provide a reference to the Chinese term "exceeding the scope of the right of access to obtain or use data" in the context of data property rights infringement, which is defined by the CFAA as "exceeding the scope of authorization". The CFAA defines "exceeding authorization" as "unauthorized access to a computer system and unauthorized alteration of data to which access should not have been permitted," while in practice it can be categorized into four types: 1. Contractual paradigm. The contractual paradigm emphasizes a clear agreement between the computer owner and the user. If the user exceeds the scope of the agreement to obtain or use the relevant information, then this behavior constitutes "beyond the authorization". 2. Agency paradigm. The agency paradigm applies when there is an employment relationship between the computer owner and the visitor. In such a relationship, an employee is considered to have "exceeded authorization" if he or she accesses the computer against the employer's interest or for a purpose other than that for which he or she was authorized to do so. 3. The Access Regulation Paradigm. This paradigm focuses on routine computer system access and the intended use of information. Any access that deviates from the norm may be defined as "beyond authorization". 4. Policy Paradigm. The policy paradigm relates to the computer owner's publicly available user access policies. If others violate these policies to access the computer system, their actions are considered "beyond authorization" [14]. China's data property rights

regime can translate the useful and reasonable parts of the above U.S. law when determining "acts of obtaining or using data beyond the scope of access rights." For example, in determining whether access rights have been exceeded, the various contracts signed between the plaintiff and the defendant, as well as the access policy published by the plaintiff on its website, or the industry practice of the Internet industry regarding data access, will be taken as important references.

5. Special Exceptions to the Limitation of the Property Right in Data

The limitation of rights is also an important factor in the process of constructing a data property rights regime. Limitations on the right to data property are mainly aimed at setting appropriate boundaries of competence, i.e., based on the principle of balancing interests in the law, and appropriately dealing with the relationship between individual interests and public interests, and between fundamental rights and the rights of third parties. These restrictions include provisions on the geographic scope of application, the time period of validity, and the functional limitations of the right [15]. This article focuses on the limitations on the boundaries of competence and the field of effectiveness of the right to data property.

5.1 Priority Protection of Prior Rights

The so-called prior rights mainly refer to the personality rights in the personal information rights and interests. Personal information rights and interests not only have the personality value of personal dignity, but also have the property value of economic level. The personality value in the personal information rights and interests is enjoyed by the individual, while the property value in the personal information rights and interests is enjoyed by the right holder of the data property right after the right holder obtains the authorization of the individual and collects, processes and handles the personal data. The interest in personal information as a personality right has a legal value that has priority over the right to data property, and when the two are in conflict, priority should be given to the protection of the more prioritized interest. If the right holder of the property right in data anonymizes the personal data held by the right holder so that the personal data no longer contains personal information and cannot be

directed to a specific individual, then the right holder's right to enjoy the property right in the personal data can be unrestricted. If the right holder of the data property right has not erased the personal information on the personal data held by the right holder, the exercise of the data property right of the right holder must be subject to certain restrictions in accordance with the principle of priority protection of prior rights. This limitation is specifically manifested in the fact that the source of the personal data enjoys the right to know and decide on the personal data collected by others, as well as the right to carry out acts such as accessing, copying, amending, supplementing, deleting, transferring, and so on. These rights ipso facto affect the exercise of the property right to data.

In addition, prior rights include intellectual property rights. The exercise of data formed on the basis of information that is the object of intellectual property rights should be subject to reasonable restrictions, given that data property rights may directly or indirectly bind intellectual property rights. When intellectual property rights return to the public domain, the relevant data property rights are expanded accordingly, but for those rights that are closely linked to personal identity, such as the right of authorship of a work, the data property rights are still subject to certain limitations.

5.2 Giving Way to the Needs of the National Interest and the Public Interest

In today's booming digital economy, data security has become a core component of national sovereign security, which is directly related to a sovereign country's control over its own data, and thus determines the country's data-related discourse in the international arena. Frequent interference and improper intervention in data by other countries may even pose a serious threat to the safe operation of national sovereignty. Therefore, when exercising the corresponding rights, the right holders of data property rights must give way to the defense of national interests when necessary, such as prohibiting the cross-border flow of certain data, prohibiting the trading of certain data, and so on. The same applies to the public interest. When the exercise of the corresponding right of the right holder of the data property right may cause damage to the public interest, the relevant authorities are authorized to impose necessary restrictions on part of their data property rights.

Of course, such restrictions must be in accordance with the principles of proportionality and necessity, i.e., they must be related to the national interest and the public interest, and they must be reduced to the smallest extent that can be controlled.

6. Conclusion

The booming development of digital economy has provided fertile ground for data as a production factor to release economic vitality and boost high-quality development. This paper expresses the significance of constructing a perfect data property right system through multiple analyses, such as explaining the important status of data in the era of digital economy, describing the development trend of digital property and data property, and explaining that the current existing legal system in China is unable to provide better protection for data property. After that, this paper discusses the general system construction of data property rights from the perspectives of legal attributes of data property rights and empowerment division. On this basis, the paper discusses in detail how to protect the data property right from the two aspects of self-protection and other remedies, as well as how to protect the data property right while restricting it, so as to make it give way to the priority of the right, the national interest and the protection of public interests, and to ensure the balance of various rights and interests. In the end, a more perfect and reasonable data property rights system model is constructed.

This paper argues that China should, under the overall arrangement of the national development strategy of digital economy, take the policy documents such as "Twenty Articles on Data" as the guidance, take the actual needs of the data market as the starting point, and take various theoretical researches of the academic circles as the important reference basis, and formulate the national data property rights related separate laws as soon as possible, so as to provide solid legal protection for all kinds of data property and promote the vigorous development of China's digital economy. The law will provide solid legal protection for all kinds of data property and promote the prosperous development of China's digital economy.

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