

# Research on Operation Mechanism and Construction Path of Government Information Ecological Chain in Big Data Era

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**Abstract.** From "manual administration" to "information administration", the government constructs a new model of big data governance based on chain-dependent relations through the means of information technology and transmission and feedback of data information resources: Government Information Ecology Chain. It has the characteristics of information sharing, link diversity and information control, including the three components of node, chain and environment. Value-added mechanism, coordination and cooperation mechanism, dynamic balance mechanism is the operating mechanism of the government information ecological chain. The opening of government information, the self-organization ability of government information ecological chain and the ecological environment of government information affect the formation and development of the government information ecological chain. Therefore, it is necessary to build a government information ecological chain from fostering a scientific culture of government information ecological chain, enhancing the security of government information ecology chain, innovating the service mode of government information ecology chain, and building the platform of government information ecological chain.

**Keywords:** Big data; Government information ecological chain; Government information disclosure.

## 1. Introduction

"As time progresses, the world has evolved into a "new world" characterized by multi-center, multi-node, multi-department, multi-level, multi-actor, multi-logic, multi-multimedia and multi-practice[1]. With the continuous advancement of Internet information technology, this "new world" has entered an era of deep networking[2]. The public individual has gradually externalized into a digital self and engages in various digital activities in cyberspace. Utilizing big data technology, the government collects and processes data generated by digital individuals to realize the correct control of the logic of social development, and constantly innovates the government information service model. Through the construction of the government information ecological chain, it will help reshape the new information flow relationship between the government, society and the public, create a governance atmosphere with big data for effective management, scientific decision-making, and service innovation, and promote the formation of a co-construction, co-governance and sharing social pattern.

## 2. Government Big Data Governance: Connotation and Characteristics

### 2.1. Connotation of the information ecological chain

At present, information has become an indispensable part of the development of human society, and no one or organization can avoid dealing with information, and social subjects are constantly engaged in social activities related to information. In the social space formed by information, the organic whole formed by a series of activities carried out by people, human organizations and communities around information flow is the information ecosystem. In the information ecosystem, the information ecological chain is the key channel to realize the information flow and information sharing in the system. Different scholars have different views on the concept identification of information ecological chain. Some scholars believe that the information ecological chain is a subsystem of information ecology, which includes information, information person and information environment



as the constituent elements of information ecology. The main form is information sharing and transmission[3]. This definition gives a static description of the information ecological chain from the perspective of the information ecosystem, and summarizes the source, characteristics and components of the information ecological chain, but it does not point out the essential characteristics that are different from the general information system and the dynamic mechanism of information flow among various elements. Some scholars believe that the information ecological chain is the chain dependency of information flow between different types of information people in the information ecosystem. This relationship refers to the multiple complex relationship between different kinds of information people[4]. This definition captures the main body of the information ecological chain (information person) and its core function (information flow), describes the internal mechanism of information flow among information people in the information ecological chain, and deeply discusses its essence by grasping the main body composition and chain relationship of the information ecological chain. Among the above definitions, the latter is a relatively complete identification of the information ecological chain, which has been widely cited by researchers[5].

## **2.2. Connotation of government information ecological chain**

With the popularization of Internet technology, the working mode of "manual administration" of the government has gradually come to an end, and government organizations have increasingly begun to deal with daily affairs through the use of information technology and information tools. The working mode of "information administration" has come. As government departments, various enterprises, various social organizations, the public and other information people keep in close contact with each other, information transfer methods become more diversified, information transfer becomes more convenient and timely, and the interaction between information people and information ecological environment becomes more frequent. With the help of information technology, the government information ecological chain is the dependent chain formed by each subject in the government ecosystem around the transmission and feedback of information resources. The essence of the government information ecological chain is an extended information transmission chain. Nodes in the chain are arranged in a certain order and rule, and these nodes with different roles can exchange roles and adjust roles according to the actual operating environment, so as to optimize and adjust the government information ecological chain, thereby reducing the ecological environment's resistance to the overall operation of the government information ecological chain. At the same time, when the circulation channel is blocked or interrupted in the process of government information circulation, the information circulation network between nodes is used to extend the original link or expand the new link, so as to enrich the link diversity of the government information ecological chain and enhance the external adaptability of the government information ecological chain.

It can be said that the essential function of the government information ecological chain is to realize the flow of information inside and outside the government, and to transfer and share information among all nodes of the government information ecological chain, so as to achieve the goal of realizing the optimal value of information. In the government information ecological chain, the difference of information potential energy is caused by the different conditions and abilities of each node, and government information resources tend to flow from nodes with higher information potential energy to nodes with lower information potential energy, thus forming a push for the flow of government information to the public. At the same time, in the government information ecological chain, nodes with lower potential energy will actively obtain information from nodes with higher potential energy, thus forming a pulling force for the flow of public information to the government. Realizing the bidirectional flow of information in the government information ecological chain[6]. In addition, there are multiple compound relations in the ecological chain of government information. The government information ecological chain is composed of different types of information people such as government, enterprises, social organizations and individuals. Among these "multi-information people", a multi-compound relationship is formed, such as equal cooperation, mutual benefit and so on. In addition, the information people existing in the government information ecological chain, whether they are civil servants inside the government, non-government personnel outside the

government, social organization personnel, or individual social individuals, are of great significance to the stability and existence of the government information ecological chain. They participate in the whole process of information flow equally. On the basis of mutual benefit, we will achieve win-win cooperation through risk sharing and fruits sharing.

### **2.3. Characteristics of government information ecological chain**

The rise of big data, "Internet +" and other information waves has made the generation and acquisition of data increasingly popular, and the flow of information led by the government and participated by the whole people has begun to develop in the direction of ubiquity, diversification and wisdom. The government information ecological chain shows the following characteristics in the operation process. One is information sharing. The popularization of Internet technology has provided interactive platforms and technical support for information exchange and sharing among government agencies of different departments, regions and levels. Government departments have realized information sharing across vertical and horizontal departmental boundaries, breaking the difficulties of cross-departmental information sharing and the dilemma of information island caused by the division of government departments in the past. At the same time, enterprises, social organizations, individuals and other information subjects have formed a close information interaction with the government with the help of digital networks, supplementing the "chain break" dilemma caused by the inequality of space, time, function and resource in the information ecological chain, and promoting the good operation of the government information ecological chain[7]. Second, link diversity. In the government information ecological chain, government power resources are concentrated in specific departments, which affects the flow and feedback of information, and information flow is mostly carried out in a top-down vertical way, such as the direct delivery of policy documents. However, there is a certain lag and obstruction in bottom-up information feedback, which makes the production and transmission of government information contradictory with the demand matching of social information subjects. The single form of links hinders the efficiency of information circulation and the accurate matching of information supply and demand to a certain extent. With the advent of the Internet era, information subjects in the government information ecological chain are increasingly relying on digital networks to establish contact with the government, and government power is gradually shifting to the network, showing digitalization, and information communication forms such as micro-blog interaction and e-government are increasing. The government can have a more comprehensive and scientific understanding of a wider range of information through various channels, and transmit the required information to the public after processing, and the public can also feedback their suggestions in a timely manner, so as to achieve information sharing. Third, information management and control. The management goal of the government information ecological chain is to realize information sharing and maximize information benefits. The key of management is to manage, regulate and control the information, information resources, information systems and information structures in the government information ecological chain. Specifically, in the era of big data, information resources are characterized by various types, large quantities and uneven quality, and there is a contradiction between disorderly expansion and orderly utilization of information data[8]. It is necessary to start from the collection, processing and organization of information sources, to orderly reveal, organize, standardize and control information to form information products with practical value and promote the realization of information value[9]. Through the effective management of government information ecological chain, the influence of external bad information factors on information transmission can be reduced, and the balanced development of government information ecological chain can be realized.

### **3. Operation Mechanism of Government Big Data Governance**

At present, the single closed government information flow can no longer meet the public's demand for diversified information, forcing the government to further open information data and seek a wider range of social subjects to jointly complete the production, acquisition, organization and transmission

of information. Therefore, the government information ecological chain needs to rely on the value-added mechanism, coordination and cooperation mechanism, dynamic balance mechanism, to achieve the continuous transmission of information and the development of the chain.

### **3.1. Value-added mechanism**

The value increment mechanism is the driving force mechanism to satisfy the common pursuit of all nodes in the government information ecological chain. In the era of big data, data has become a unique way to change the relationship between the government and the public. The mining of its value can not only improve the government's information public service ability, but also stimulate the enthusiasm of the public to create value by using data. This also requires government departments to open government data to a greater extent, open and integrate government data resources, and seek to maximize the value of data. Open government data itself does not directly generate value, but can only be used and developed to create real value. After the opening of government data, in addition to the information prohibited by relevant information laws and regulations, social organizations and enterprises can use open government data to develop and deeply utilize information products, create products and services that better meet the needs of the public, and reduce the pressure on government departments to use data to provide public goods and services. The public can use the acquisition of data to process it into their own internal knowledge, and enjoy the products and services brought by the government, social organizations and enterprises while improving their own production and living standards. It is worth noting that each subject of the government information ecological chain is affected by its own and external environment in the process of pursuing and realizing information value increment. In the process of government data opening to the outside world, the Internet tools used, the internal organization management and data quality management of the government all affect the level and effectiveness of data opening. The way and ability of data users also have a direct impact on the data utilization effect. The higher the degree of data openness, the better the quality of data, the stronger the ability of data users, the better the utilization effect of government open data, the higher the public value created, which can also encourage and promote the government to open more valuable data, so as to form a virtuous cycle of data utilization[10]. In addition, external social, political, economic, cultural and technological factors also have an important impact on the openness and value creation of government data. For example, through the formulation of relevant information laws and regulations, while encouraging social organizations, enterprises and the public to collect, process, sell and other value-added utilization activities of information open to the government, social subjects are prohibited to monopolize the access to government information data through illegal means, so as to promote the healthy operation of the government information ecological chain. Around the production, processing, organization and transmission of information, all subjects in the government information ecological chain seek new points of value appreciation on the basis of increasing the quality and quantity of the original value. The government also promotes the pursuit of public value appreciation of all subjects by means of resource accumulation, capacity improvement, technological update and management improvement, making the government information ecological chain continue to move forward.

### **3.2. Collaborative cooperation mechanism**

The collaborative cooperation mechanism is a structure or function automatically formed by all nodes in the government information ecological chain in accordance with the information flow rules, and forms an information flow force under the guidance of the government information environment to realize information sharing among nodes, promote the internal and external nodes of the information ecological chain to produce collaborative cooperation, and thus drive the scientific development of the government information ecological chain. The cooperative mechanism in the government information ecological chain has its own structural characteristics, which are mainly manifested in two aspects: First, the same node produces cooperative relations with different nodes in different dimensions around information flow. On the one hand, government information is the whole integration of data collected or collected by different functional departments or management fields of

the government and different levels of government and its departments. The amount of information is huge and covers a wide range of fields. To fully manage and utilize these data, government departments need to realize cooperation within the government system and promote the operation of government information flow. On the other hand, with the continuous embedding of information technology in the government governance system, it stimulates the public's desire to acquire and use government information, and reconstructs the circulation relationship between the state and the public. Closed information cooperation within the government system can no longer meet the public's needs for rapid information acquisition, comprehensive understanding and exchange of needed information in the information age. The internal and external information coordination and cooperation of the government has become an important driving mechanism to promote the continuous development of the government information ecological chain in the era of big data. The government can generate collaborative flow of information with various government departments and their related personnel to jointly explore the information value among various departments. It can also choose to exchange information with information subjects such as social organizations, individuals and network platforms outside the government system, so as to obtain information data in multiple dimensions and promote more scientific and reasonable decision-making. Second, the nodes in the government information ecological chain have different types of cooperation in different periods. Governments often share information and cooperate with other social subjects according to different administrative purposes and means, thus deriving different information ecological chains and creating new public values on this basis

### **3.3. Dynamic balance mechanism**

In the chain dependency relationship generated by the flow of information between different information people, dynamic balance is the key factor to ensure the sustainable balance and stable operation of the government information ecological chain. In the government information ecological chain, the supply and demand balance of upstream and downstream nodes, the mutual adaptation of information levels and the symbiotic and mutually beneficial relationship promote the smooth operation of the government information ecological chain. Ensure that all nodes in the chain are closely connected, thus promoting the stable development of the chain. After mining and analyzing massive data, the government can better understand public demand, behavior and attitude, promote its own information policy and service provision, and ensure the balanced development of supply and demand information between upstream and downstream nodes in the process of information transmission. With the help of big data technology, the government can collect the most real behavioral information of the public from social media, real-time transactions, comment hotspots and other behaviors used by the public, and through analyzing and mining these unstructured information data, provide the public with information services and products that better meet their needs and development level. This reconstructs the information transmission relationship among the government, society and the public. However, the dynamic balance of information flow often fluctuates or breaks under the influence of human or environmental factors, which requires the government to enhance the anti-interference ability of the government information ecological chain with the help of internal and external forces to maintain the steady development of the government information ecological chain. Unlike the enterprise information chain, which relies on economic interests to maintain the stability of the chain, the nodes of the government information ecological chain do not have a close mechanism of symbiosis of economic interests. In the process of government information transmission, when some information people pass on false news for personal gain or monopolize information transmission through illegal means, the government information ecological chain cannot be effectively adjusted through the market mechanism. The ecological chain of government information is broken or fluctuated. However, the government can rely on its management power to take compulsory measures to supervise or punish information people, so as to realize the stability of the government information ecological chain. In addition, it is not enough to maintain the sustainable and stable development of the information ecological chain only by relying on its own internal forces, and it is also necessary to strengthen the sense of responsibility of the

government "information people" by virtue of external factors such as moral constraint and cultural identity in the society, so as to ensure the effective operation of the government information ecological chain

#### **4. Influencing Factors and Paths of Government Big Data Governance**

Government information ecological chain is a complex social system, its formation is affected by many factors and its construction is also complicated. Its construction is helpful for the government to observe and analyze the information flow behavior inside and outside the organization, which can better enable the government information to realize efficient flow and value increase.

##### **4.1. Influencing factors of government information ecological chain**

In the era of big data, the connection between the government information ecological chain and the external environment is getting closer and closer. Identifying, analyzing, mining and screening the information value contained in big data has become the main goal of the government information ecological chain, which determines the innovation and development of the government information ecological chain. Expanding the openness of government information, enhancing the self-organizing ability of the government information ecological chain and improving the adaptability of the government information ecological chain to the external environment play a key role in deeply mining the value of big data and stabilizing the continuous operation of the government information ecological chain.

##### **4.1.1. Openness of government information**

The scope, content and depth of all kinds of data information collected, processed and collated by the government in the process of exercising its functions affect the development of the government information ecological chain. The openness of the government information ecological chain continues to improve, showing the new characteristics of the information transmission range between nodes is gradually extensive, the data sharing content is increasingly diversified, and the data utilization and mining degree is gradually deepened. The information flow mode also breaks the traditional one-way information transmission of "publish-receive", and replaces it with the sharing information mode of "publish-feedback-perfect". This means that the higher the degree of information openness, the greater the chance of realizing the value of open information as an effective government-public communication mechanism and tool. However, when information is shared between nodes, it is also easy to have nonlinear features of competition. On the one hand, in the government information ecological chain, there are gaps in the ability, way and content of information subjects to obtain information. Due to different data content modules between different government departments, different authority of data acquisition between upper and lower departments, different channels and methods of data acquisition between the government and enterprises, the data information obtained by different nodes is different. However, information subjects all want to obtain first-hand resources, information and service objects in big data as much as possible, resulting in a certain degree of information monopoly or self-protection measures. On the other hand, the characteristics of data information determine that each node in the government information chain does not have enough ability to monopolize big data, and it is necessary to open data and realize data sharing. To some extent, the contradiction between information openness and monopoly affects the efficient operation of the government information ecological chain. For example, in the process of obtaining information in the past, the government, due to its particularity, has obvious advantages in obtaining information and often becomes the biggest monopolist of information, while the public, due to its weakness in obtaining information, can only extract as much useful value as possible from the limited data released by the government. It also reduces the public's incentive to use government data. This requires the government itself to improve the ability and degree of openness of data, and promote the efficient flow of information in the government information ecological chain.

#### **4.1.2. Self-organizing ability of government information ecological chain**

The self-organizing ability of the government information ecological chain can also be called the guarantee mechanism of the government information ecological chain, which refers to the ability of the government information ecological chain to restore and maintain a relatively stable state through self-regulation when the information flow process fluctuates due to internal and external interference. The self-organizing ability of the government information ecological chain is a strong guarantee for the stable operation of the information ecological chain, which mainly consists of the ability of organization and coordination and the ability of information management and control. The ability of organization and coordination means that the government can organize and coordinate all nodes in the government information ecological chain by means of structural adjustment, deepening function and improving system, so as to realize the mutually beneficial sharing and reasonable flow of information among various subjects in the government information ecological chain. The ability of information management and control refers to the ability of the government to improve the effective operation of the information ecological chain through its management ability of the information ecological chain. In the government information ecological chain, there are often problems such as information monopoly, information garbage or information security, which cause certain interference or destruction to the normal operation of the government information ecological chain. If the government has a strong self-organization ability, it can expand the length and width of the chain by means of organization allocation, system optimization and function deepening. The contradiction of poor information flow between nodes caused by certain factors is diluted, and the government information release is coordinated with the information needs of the public. On the contrary, if the government's self-organization ability is weak, when the chain is broken or unbalanced, the government cannot adjust the internal structure of the information ecological chain and control the abnormal behaviors of each node, which seriously affects the normal transmission and effective use of information.

#### **4.1.3. Government information ecological chain environment**

Policies and regulations, information technology, network culture and other factors constitute the external environment of information circulation in the government information ecological chain. Whether the government can quickly adapt to the changes brought by the external environment to the information ecological chain has become an important factor affecting the government information ecological chain circulation. Specifically, in order to ensure the process of social informatization, the government has continuously introduced policies and regulations to encourage and promote the networking degree of government government activities and economic activities, and carried out information production, information acquisition and information dissemination in the government information ecological chain to promote the transformation of the government information ecological chain from chain to network. The government can also use laws and regulations to regulate information behavior in the process of information flow and optimize the development environment of the government information ecological chain. At the same time, in real life, people are already filled with massive information and data, but in the absence of effective technology, these ubiquitous information and data will not produce much value to the government. With the continuous development of Internet technology, the centralized processing of massive data from the society becomes possible. The government begins to pay attention to mining the value contained in those data that are traditionally considered to be of no value through information system integration technology, information filtering technology, data encryption technology, etc. At the same time, it also promotes the innovation of government services and expands and extends the original government information ecological chain. The government information ecological chain presents the information ecological layout from point - line - network. In addition, network culture also plays a great role in promoting the government information ecological chain to avoid information risks and reduce information pollution. The network cultural environment of the government information ecological chain includes the government, enterprises, social organizations, the public and other information subjects, and the activities formed by information collection, information processing and

information dissemination in the big data environment, as well as the values and social mentality reflected by them. In the open and free network cultural environment, information subjects can more or less reflect the real society and information needs through information behaviors such as government information browsing, opinion expression and network buzzwords, which will have a certain impact on the state and characteristics of the government information ecological chain.

## **4.2. Path selection of government big data governance**

### **4.2.1. Cultivate government information ecological chain culture**

Cultivating the government information ecological culture with "big data" as the core is an important factor for the efficient operation of the government information ecological chain, which affects the overall development direction of the ecological chain. Under the background of large amount of information, wide variety, low value density and fast data processing speed, the government must build an information ecological culture with big data as the value orientation and establish data processing mechanisms and data ecological culture including data collection, big data storage and data sharing systems in order to realize rapid and effective information flow. Cultivate an atmosphere of information knowledge innovation based on the application of big data, and improve the efficiency of government information flow and information processing.

### **4.2.2. Strengthen the security guarantee of the government information ecological chain**

Perfect information security guarantee system is the key guarantee to clarify the rights and responsibilities of information subjects and ensure the safe and effective circulation of government information ecological chain. This is not only about national security but also about the protection of personal privacy, so the government must establish a data security system. First of all, it is necessary to improve the relevant laws and regulations on the disclosure and use of government information related to big data, make clear provisions on information problems that may occur in the process of information transfer, regulate the rights and obligations of information subjects, and create a good environment for information use. Secondly, the government is required to strengthen the construction of the standard system and evaluation system for the safe use of data, and standardize the security assessment of data flow while strengthening the safe use of data.

### **4.2.3. Innovate the service model of government information ecological chain**

The continuous development of information technologies such as the Internet of Things, cloud computing and artificial intelligence has provided the possibility for the government to dig deep into big data and improve the intelligence, digitalization and networking of administrative activities and service supply. In this context, the government should replace traditional information service activities with "big data" as a new business and process, so as to deepen data mining, data storage and data reuse, constantly improve the standardization and ordering of data and information use process, and share data with more departments, enterprises and individuals to achieve the optimal value creation of data. At the same time, the government should make the training and learning of Internet skills and concepts sustainable, and improve the training and introduction of big data talents in government agencies.

### **4.2.4. Build the government information ecological chain platform**

The construction of government information ecological chain platform refers to the construction of government administration platform under the background of big data. At present, the rapid development of the Internet information industry provides technical support for the construction of the platform, and the good development of e-government provides confidence and experience for the construction of the platform. The construction of the government information ecological chain platform will contribute to the transformation of government functions and the innovation of government governance. The construction of the platform first needs to establish the thinking concept of the scientific utilization of big data, and formulate relevant development plans and routes from the strategic level. Secondly, encourage the development of high-end information industry, provide

technical support for the construction of government information ecological chain platform, and build a government information governance platform with Chinese characteristics. Finally, open the connection between the government and the outside, realize the sharing and integration of resources, and provide guarantee for the acquisition of information on the platform.

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