International Journal of Frontiers in Sociology
ISSN 2706-6827 Vol. 3, Issue 1: 104-111, DOI: 10.25236/IJFS.2021.030113

Computer Network Security Maintenance and Management in the Era of Big Data

Liang Xing

Jilin Engineering Normal University, Changchun, China
448430060@qq.com

ABSTRACT. *With the development of information technology, the big data network has been initially formed. However, the network security problem is becoming more and more serious in this environment. China has put the network security in an important position of national security. This paper analyzes the text of China's network security governance policy from the perspective of big data, builds an analysis framework based on big data, analyzes the relevant provisions of China's network security governance policy, analyzes the existing problems and puts forward optimization suggestions, in order to provide reference for the formulation of China's network security governance policy and improve China's network security governance policy system. This paper collects the information of network security incidents and policies in 2020 from Google data analysis platform. After preliminary collection and sorting, 195 relevant policies on network security governance are obtained. In order to ensure the accuracy and pertinence of the materials, all policies are analyzed. The research results show that the application of some big data of network security governance is concentrated on the regulatory level, lacking specific implementation rules and methods. There are 183 policies involving regulatory control, accounting for 31.6%. Therefore, the national network information department should cooperate with the legislative department to formulate policies for the problems in the network ecosystem. Network is not only the extension of people's daily life, but also an important part of economic and social life.*

KEYWORDS: *Big Data Era, Computer Network Security, Maintenance and Management, Information Security*

1. Introduction

With the development and popularization of network technology and network equipment, the Internet is widely integrated into life, and the real society continues to expand into cyberspace. Network has gradually become a necessity of people's daily life. However, with the rapid development of network technology and network industry economy, the problem of network security has become increasingly prominent.

ISSN 2706-6827 Vol. 3, Issue 1: 104-111, DOI: 10.25236/IJFS.2021.030113

As the Internet has gradually entered a period of thick accumulation from a period of steady progress, the attention of all parties to "network governance" is increasing. In addition, with the continuous progress of China's governance capacity, the number of papers published on the theme of "network governance" is increasing year by year. From the existing research results, researchers are concerned about the following issues: Governance of network ecology in combination with regional characteristics, Including the localization of governance according to the uniqueness of China's border areas and the comparison of other countries and China's network security law [1]. Further research on network security from the perspective of national security, including summarizing the subject, object, mechanism and method of network governance by understanding the research progress at home and abroad [2]. The rumor about the bad influence of bondrum on national network security [3]. Sara Qamar's text analysis of policies and regulations of network governance includes the construction of a three-dimensional theoretical analysis framework of Internet policy tools, the analysis of the text content, the sorting out of Internet news policies in chronological order and the analysis of their characteristics [4]. Xu Shubin deepens the network structure of the original automatic encoder and generates the DAE network [5].

This paper analyzes the text of China's network security governance policy from the perspective of big data, builds an analysis framework based on big data, analyzes the relevant provisions of China's network security governance policy, analyzes the existing problems and puts forward optimization suggestions, in order to provide reference for the formulation of China's network security governance policy and improve China's network security governance policy system.

2. Computer Network Security Maintenance and Management Methods

2.1 Problems of Network Security in the Era of Big Data

(1) Big data operability needs to be strengthened

By studying the policy texts related to the network ecological governance and combining with the content of the policy text analysis unit, it is found that the network ecological governance mainly depends on the self-discipline of the network subject and the self-regulation of the network environment. For example, the policy stipulates that the online game industry association and other social organizations formulate the industry self-discipline norms in accordance with the laws, administrative regulations and articles of association [6]. At present, there are many network ecological governance policies, which have laid a good institutional environment for the development of related network industries, industries and enterprises from the macro level, and are conducive to the formation of a dynamic network ecosystem environment [7]. However, the policy text lacks specific implementation rules, such as governance procedures, governance channels, governance guarantee and other issues have not been clearly defined, and the

ISSN 2706-6827 Vol. 3, Issue 1: 104-111, DOI: 10.25236/IJFS.2021.030113

supporting implementation rules and implementation plans have not been issued, which leads to weak operability and reduces the operability of big data [8-9].

(2) Big data structure imbalance

There is imbalance in the big data structure of network ecological governance, which is mainly reflected in the overall imbalance and internal imbalance. First of all, the imbalance of the overall structure of big data is mainly reflected in the overflow of environmental big data [10]. Environmental big data plays a leading role in the overall policy. The main reason is that the established policy objectives are not achieved in the early implementation process. Therefore, in the later stage of Policy Governance, it is necessary to constantly formulate policies to emphasize, which leads to the phenomenon of policy overflow. In big data, the use of regulation, administrative penalty and security management is more prominent. The advantage of these tools is that they can avoid or control various uncertainties in the process of network ecological governance according to policy objectives [11]. However, in the actual process of network ecological governance, the diversification of the main body and the variability of the environment make it difficult for the governance policy to determine the accurate governance objectives, and it is difficult for the government departments to build a smooth policy operation mechanism. Therefore, if a large number of mandatory measures such as regulation and punishment are used, it is easy to cause confusion of policy implementation agencies and target objects, and even lead to policy failure.

2.2 Network Security Management and Maintenance Model

After receiving the input data, the model first conducts feature learning through the DAE network and records the learning results. According to the learning results and DNN classifier, the input data is classified, and then the classification results are applied to the subsequent quantitative assessment process of network security situation. Dae-dnn model can be used not only for binary classification, but also for multi classification

$$d_{jh} = \int_0^{\infty} dF_j(y) \int_0^{y} (y - x) dF_h(x) \tag{1}$$

The closer the value is to 1, the easier it is to be judged as abnormal flow. The calculation formula of sigmoid function (fsgm) is as follows:

$$f(x) = \frac{1}{Nh} \sum_{i=1}^{N} k(\frac{X_i - x}{h}) \tag{2}$$

The sum of the output values of each category is equal to 1. The model selects the category with the largest output value as the predicted category. The calculation formula of softmax function (fsfm) is as follows:

$$h_t = \tanh(w_c x_t + u_c(r_t \Theta h_{t-1}) + b_c) \tag{3}$$

In the daednn model, the DAE model is used for feature learning. In order to make the DNN classifier fully learn the feature extraction results of the DAE,

ISSN 2706-6827 Vol. 3, Issue 1: 104-111, DOI: 10.25236/IJFS.2021.030113

improve the performance of the model and reduce the risk of over fitting, the daednn model is trained by stages. The training data are input into the DAE. After the model training, the DAE model and DNN model are combined to train the two networks. In order to obtain the training results of the DAE model, the weight value of the DAE network in the daednn model is set to the reserved weight value, and the parameters of the DAE layer are set to untrainable, which is trained together with the DNN network

$$\sigma t = \frac{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(FI_{it} - FI_{it})^2}}{FI_{it}} \tag{4}$$

$$x_{\mathrm{H}} = \frac{p_2 - p_1 + 1}{2} \tag{5}$$

After processing the three classification features, the data set changes from 41 feature dimensions to 116 feature dimensions. There are significant differences between the minimum and maximum values of some features. In order to reduce the negative effects of different numerical levels on the model, the logarithmic scaling method is used to scale the eigenvalues and normalize them to the same interval.

3. Experimental Design

3.1 Contents of Network Security Management and Maintenance

This paper collects the information of network security incidents and policies in 2020 from Google data analysis platform. After preliminary collection and sorting, 195 relevant policies on network security governance are obtained. In order to ensure the accuracy and pertinence of the materials, all policies are analyzed.

3.2 Steps of Network Security Management and Maintenance

This paper analyzes the text of China's network security governance policy from the perspective of big data, builds an analysis framework based on big data, analyzes the relevant provisions of China's network security governance policy, analyzes the existing problems and puts forward optimization suggestions, in order to provide reference for the formulation of China's network security governance policy and improve China's network security governance policy system. Big data is an important means and strategy for the government to conduct vertical management and supervise the horizontal coordination of various departments, which affects the implementation effect of policies and regulations. Quantitative analysis of policy texts using big data is the mainstream policy analysis method, which has been widely used in multi-disciplinary fields. Network security governance is different from the mandatory network regulation governance. It is based on the rule of law and according to the law of network communication to regulate and improve

ISSN 2706-6827 Vol. 3, Issue 1: 104-111, DOI: 10.25236/IJFS.2021.030113

network security, so as to stimulate the internal self-purification ability of the network and self-governance between the network and the participants.

4. Network Security Management and Maintenance Analysis

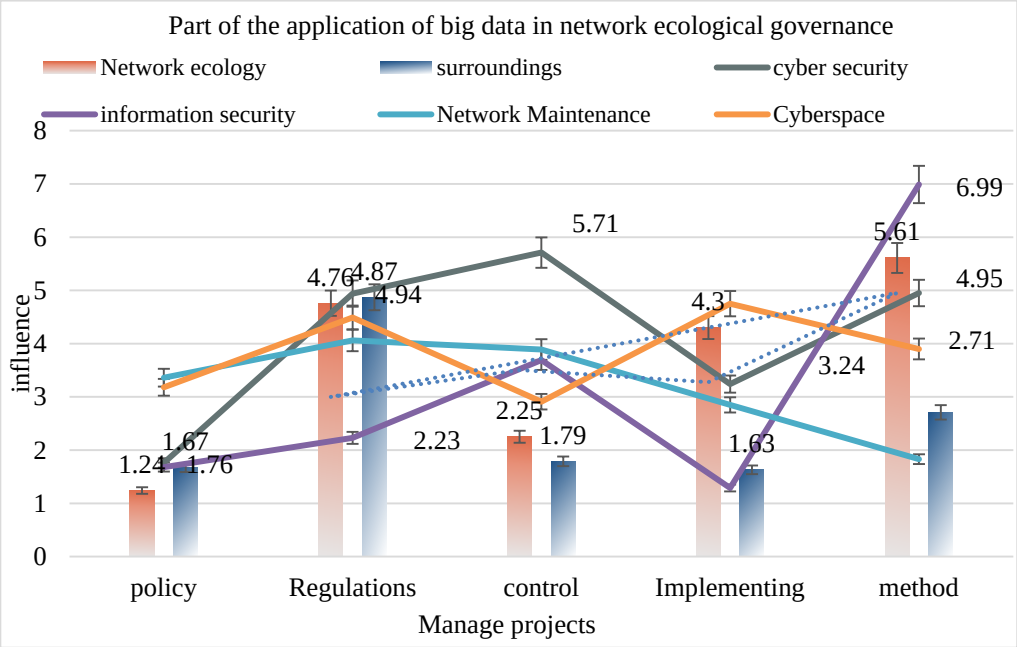

Figure 1.*Part of the application of big data in network ecological governance*

As shown in Figure 1, the application of some big data of network ecological governance is concentrated on the regulatory level, lacking specific implementation rules and methods. There are 183 policies involving regulatory control, accounting for 31.6%. Therefore, the national network information department should cooperate with the legislative department to formulate policies for the problems in the network ecosystem. Network is not only the extension of people's daily life, but also an important part of economic and social life. Therefore, we should improve the policies and regulations related to network ecological governance, enhance its operability, so as to form a more humanized and standardized network ecological environment.

Table 1. *Data privatization mechanism, cyberspace security*

Item	Network Ecology	Surroundings	Cyber Security	Information Security	Network Maintenance	Cyberspace

ISSN 2706-6827 Vol. 3, Issue 1: 104-111, DOI: 10.25236/IJFS.2021.030113

policy	1.24	1.67	1.76	1.68	3.36	3.18
Regulations	4.76	4.87	4.94	2.23	4.06	4.49
control	2.25	1.79	5.71	3.69	3.89	2.91
Implementing	4.3	1.63	3.24	1.29	2.85	4.75
method	5.61	2.71	4.95	6.99	1.83	3.9

As shown in Table 1, the Cyberspace Security of data privatization mechanism is omni-directional, and full range perception of cyberspace security situation is one of the important tasks of intelligence departments. However, the developed information technology in the expansion of the network frontier at the same time, did not bring a high degree of integration of cyberspace. On the contrary, while cyberspace is being integrated on the macro level, it is being split on the micro level. The divided cyberspace is not suitable for the full range diffusion of network security threats. Based on the deficiencies of big data in 58 network ecological governance policies, this paper puts forward the following policy suggestions combined with the current situation of policies, in order to provide some paths for the development of national network ecological governance system.

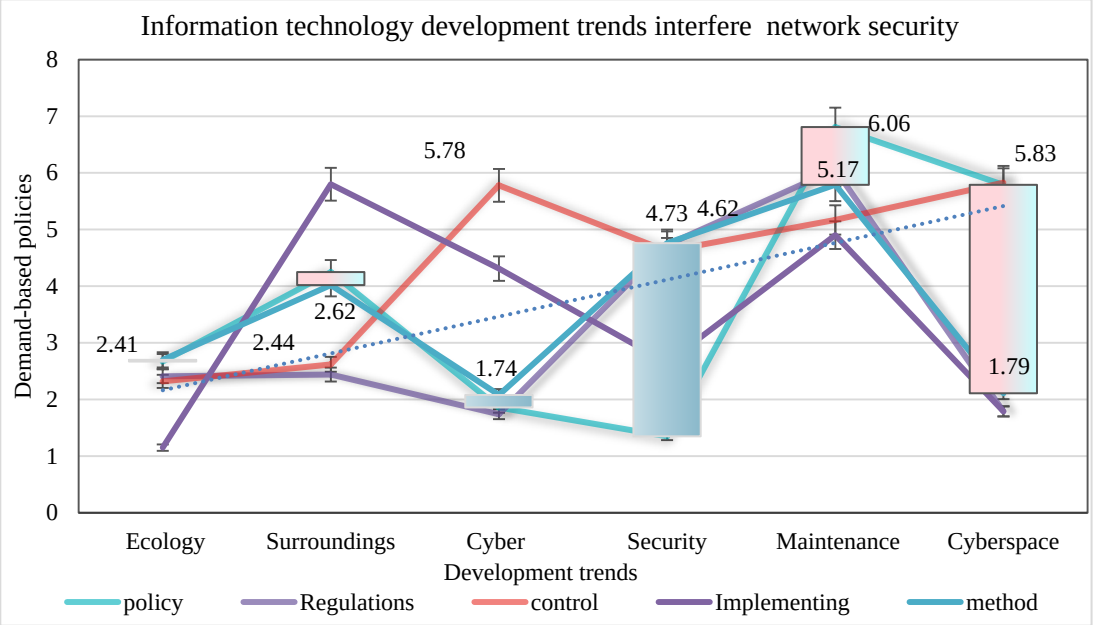

Figure 2. *Information technology development trends interfere network security*

As shown in Figure 2, the development of information technology will interfere with network security to a certain extent. Artificial intelligence has been in the data

ISSN 2706-6827 Vol. 3, Issue 1: 104-111, DOI: 10.25236/IJFS.2021.030113

acquisition, analysis, formation of judgment, and combat planning and other aspects of human brain can not match the advantages. The United States and other network developed countries have formulated and issued artificial intelligence strategies, and take artificial intelligence as an important means to maintain national security.

Table 2. *The data model on which artificial intelligence relies is stable*

Item	policy	Regulations	control	Implementing	method
Network Ecology	2.67	2.41	2.32	1.15	2.7
Surroundings	4.25	2.44	2.62	5.8	4.02
Cyber Security	1.86	1.74	5.78	4.31	2.08
Information Security	1.35	4.73	4.62	2.65	4.76
Network Maintenance	6.81	6.06	5.17	4.9	5.79
Cyberspace	5.79	1.79	5.83	1.79	2.11

As shown in Table 2, the data model, information technology means and data resources on which artificial intelligence relies have certain stability, and it is difficult to realize forward-looking and systematic decision-making with current technology. Huge data, complex data structure and dynamic data types make it necessary for relevant departments to carry out network security intelligence support with the help of artificial intelligence. Therefore, processing data in a stylized and closed way will undoubtedly interfere with human brain's ability to judge the current environment and obtain important information.

5. Conclusions

The overflow of environmental big data in the big data of China's network ecological governance indicates that the current network ecological governance belongs to the big data under the administrative paradigm, lacks certain rationality and practicability, and is unable to solve the network security problems with uncertainty, which is not suitable for today's era environment of rapid development and change of network. Therefore, we should strengthen the use of supply-oriented big data and demand-oriented big data, optimize the structure of big data, and build a balanced network ecological governance big data system. Supply oriented big data mainly plays its role through technical support, information support, infrastructure, human resources and other means. We should make reasonable policy planning according to the actual situation of network ecological governance, so as to ensure the efficiency of policies and avoid the duplication of policies. Strengthening the use of demand-oriented big data can increase the stability of the network industry, and give better play to the governance role of big data under the macro guidance of the government, so as to establish a sound governance mechanism and improve the government's comprehensive allocation ability of network market resources. Increase the combination of big data in the network ecosystem elements. The network ecosystem is complex and diverse, and each problem involves multiple

ISSN 2706-6827 Vol. 3, Issue 1: 104-111, DOI: 10.25236/IJFS.2021.030113

elements. A single big data cannot solve the problem effectively for a long time. Therefore, we should increase the combined use of big data in the network ecosystem elements, and give play to the comprehensive governance function of big data.

References

[1] Bala R. A Review On Kdd Cup99 And Nsl-Kdd Dataset [J]. International Journal of Advanced Research in Computer Science. 2019, 10(2): 64-66.
[2] Chawla N V, Bowyer K W, Hall L O, Et Al. Smote: Synthetic Minority Over-sampling Technique [J]. Journal of Artificial Intelligence Research, 2020, 16(1): 321-357.
[3] Randy Borum, John Felker,Sean Kern. Strategic cyber intelli gence[J]. Information and Computer Security, 2019, 23(3):31-332.
[4] Sara Qamar,Zahid Anwar. Data-driven analytics for cyber-threat intelligence and informantion sharing[J]. Computers & Security, 2017, 6(7):35-58.
[5] Xu Shubin, Gan Zhiwang. Research status and development trend of 5G security technology [J]. Radio Communication Technology, 2020, 46(2): 133-138.
[6] Xu Xiaolin, Liu Shuai, Mao Zijun. Research on network security issues and governance in China's border areas [J]. Electronic Government Affairs, 2020, 6(2): 46-54.
[7] Wang Daozheng, Hu Ju. Vietnam's characteristic cyber security governance practices-Observation of Vietnam's "Cyber Security Law"[J]. Intelligence Magazine, 2019, 38(2): 105-109.
[8] Zhou Yi. Network information content governance from the perspective of overall national security: progress, connotation and research logic [J]. Intelligence Theory and Practice, 2020, 43(8): 44-50.
[9] Li Haoqing. Research on the ecological governance of network rumors facing political security[J]. Modern Information, 2018, 38(10): 43-50.
[10] Huang Lina, Huang Lu. Policy Tools for Internet Governance in China: Formation, Selection and Optimization——Based on the Content Analysis of Internet Policy Texts from 1994 to 2017 [J]. Intelligence Magazine, 2020, 39(4): 90-97.
[11] Wu Zhiyong, Zhao Beihong. Changes in China Internet News Policy and Policies in the Past Twenty Years [J]. Modern Communication, 2016, 38(2): 134-139.