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Research on the evaluation model and demonstration of patentee´s discourse power: A case study of cyber security

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ABSTRACT

With the deep meaning of discourse power in international relations, national discourse power has become an important manifestation of national soft power. This paper analyzes the main elements of the discourse power of patentee to speak, constructs the evaluation model, and selects the evaluation indexes related to the six characteristics according to the methods of patent measurement and social network analysis. In the empirical research stage, taking the field of network security as an example, the validity and reliability of the evaluation system are tested, and the accuracy of the evaluation results is tested by correlation. It is found that the evaluation system of discourse power of patentee to speak in the field of network security proposed in this paper is effective.

KEYWORDS

Discourse power of patentee; Evaluation of discourse power; Patent metrology; Analytic hierarchy process; Network security

1 Introduction

President Xi Jinping's addresses state the explicit demand for reinforcing the discourse system construction. China's discourse power is the solid foundation of economic, hi-tech, military, and cultural development in the world. To improve China's discourse power, it is essential to make better use of philosophy and social science to promote our discourse foundation. In the increasingly complicated international and domestic situation at present, how to construct the evaluation theory, methodology, and application system of China's discourse power has become an important and urgent project (Zhao, Wang, & Yu, 2019). With the improvement of China's comprehensive strength, we are beginning to participate in making various international standards and our international discourse power has been improved unprecedentedly (Xu, 2015). However, China's network technology started fairly late, the R & D technology of VPU and basic software such as CPU and operating system is still controlled by western countries. China's network security is insufficient in autonomous controllability. Therefore, the patentee's discourse power can be obviously improved via evaluating his discourse power to assist the national and corporate technical solution.

2 Correlational research

Derived from integration of various theories, discourse power was first proposed by western scholars (Wu, 2010). In the theory of cultural hegemony, Gramsci (2007) thinks that discourses can hardly make impartial and objective description for reality and the hegemonic ideas will infiltrate into discourses through selection and processing to influence the audience instead. In the theory of discourse democracy, Habermas (1992) believes discourses or discussions are a formal and ideal interaction and coordination of interpersonal interaction can achieve understanding and consensus through discourses. In the theory of micro power, Foucault views the discourse power as a network space and he holds that the discourse power, which is an "omnipresent" power and unable to be controlled and abandoned, is realized by asymmetric discourse flow (Musambira & Hastings, 2008). Researches on the discourse power at home and abroad include three parts:

(1) Research on the political discourse power. In studying international relations, western scholars assume that the international discourse power represents the national soft power. Some even think that the judicial system can be perfected through promoting the construction of public discourse power (Hua et al., 2005). Chinese scholars are more concerned about the research on ideology discourse power to maintain the ideological security in China. Hou (2014) believes that the discourse power is the implementation model of ideological leadership, and that not only the essential discourse of one topic, but also the discourse details should be noticed for taking the discourse power. Luo and Shi (2014) hold that the cultural discourse power, as the core of the ideological discourse power, also reflects the national soft power.

(2) Research on the discourse power from the perspective of network media communication. The internet entering every aspect of life, the network media have become a significant access to the ideological and cultural exchange in the society, and the media discourse power has played a key role in network opinion transmission. Some scholars are keeping an eye on this field. Internationally, Yakoba (2015) have introduced the cognitive mechanism of the media discourse power. Others have studied its application in group business operations. And even others assume that the capacity of managing and controlling the network opinion can demonstrate the government discourse power (Lei, 2017). In China, scholars mainly study how to improve people's cultural confidence through the internet, how to increase the international communication capacity through media publicity, and how to build a favorable world opinion atmosphere (Chen, 2014).

(3) Research on discourse system of the discourse power, which is focused on in China. A great number of research fruits have sprung (Shao & Tao, 2018), in response to the call upon constructing China's international discourse system. For instance, Xie (2019) has studied the core goal and main route of discourse system development of social sciences with Chinese features. Ruan (2003) suggests that self-expression through appropriate discourse modes is a crucial means to participate in constructing international order.

In general, researches on the discourse power in the world have made some progresses. Yet, the research in China started late, resulting in weak theoretical basis, few systematic fruits, and few researches aiming to the evaluation of the discourse power.

3 Evaluation framework of the patentee´s discourse power

Due to few researches on the patentee's discourse power, its fundamental connotation should be manifested at first; then, its meaning and elements should be analyzed with the patentee's characteristics, therefore, the evaluation index should be designed and selected with the elements and the relevant index system should be constructed. Finally, taking Cyber Security data as example as empirical research. The discourse evaluation framework of the patentee's discourse power in this paper includes two parts: the evaluation model construction and empirical research. In selecting and designing the evaluation index, the bottom index of the patentee's discourse power evaluation is designed in reference to patentometric methods and social network analysis and the index weight of each layer is determined by analytic hierarchy process, to obtain the evaluation system of the patentee's discourse power in the network security field with weight. At last, import Cyber security filed data as empirical research.

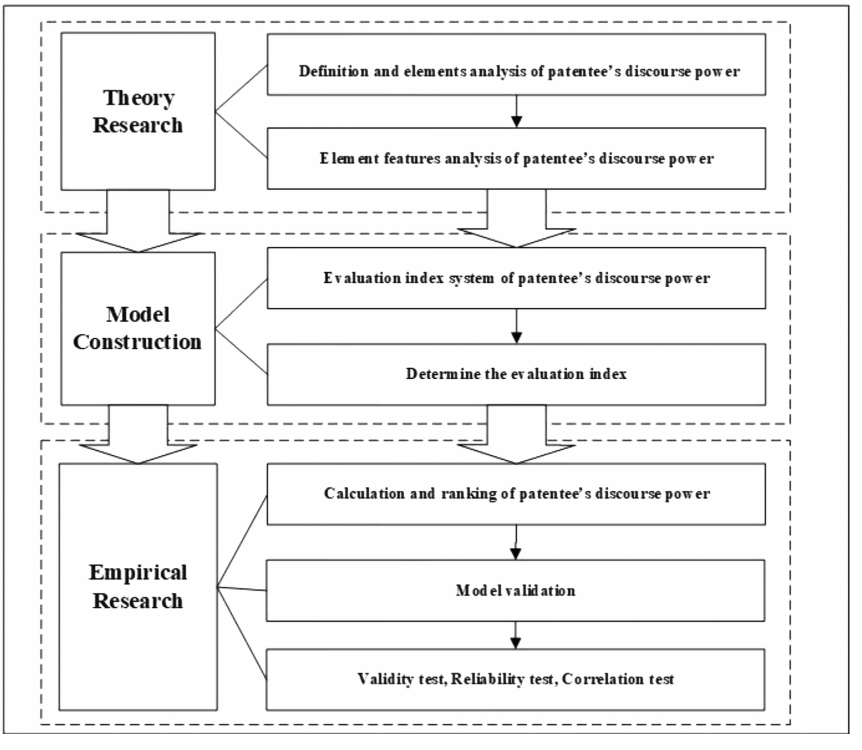

Figure 1 The Evaluation Framework of Patentee's Discourse Power

At the phase of empirical research, it is supposed to obtain patent literature about network security from Deventer database. Network security provides protection for the automated information system in order to realize the appropriate goal of integrity, usability, and confidentiality for protecting the information system resources (hardware, software, data and communication), including the measurements to prevent, precaution, detect, and correct the illegal behaviors about information transmission. By consulting Deventer manual sorting number meaning, this paper selects T01-N02B3 (Network security, Anti-Malware) and W05-D05B5E (Security based on preventing or detecting unauthorized network access) . This design retrieval formula is: MAN =(T01-N02B3 or W05-D05B5E). The retrieval time was Jan. 29, 2020, without time range. 4466 retrieval results have been obtained from Deventer patent database. In processing the patentees, 4177 patent data were left after deleting those whose patentees were individual patentee. Now that the large foreign companies have many subsidiary companies, this research adopts patentee code coreference for standard companies to avoid under-enumeration. In order to avoid non-standard code duplication, this research adopts patentee full-name coreference for non-standard companies. By manual cleaning through Baidu search, Google search, Deventer patentee consultation etc., this research obtains 1620 patentee in total.

4 Construction of the patentee´s discourse power evaluation model

The discourse power has a wide meaning. Due to the feature that discourses have context, the discourse power is of different types of political discourse power, ideological discourse power, news media discourse power, academic discourse power, financial discourse power, etc. according to the discourse power in different contexts (Zhang & Zhuang, 2017). The research subject in this paper is the patentee's discourse power, which needs to define the meaning of patentee's discourse power in the first place.

(1) the meaning of "patent" . "Patent" is derived from the Latin words “Litterae patentes” , referring to public literature. At present, the academic world defines patent as: patent is an invention and creation with patent right. The inventor or possessor applies to the national or local Patent Office for the patent. After being investigated by the patent examiner, the applicant is entitled to the patent for this invention within a certain period of time. Patent right includes exclusive right, permission right, and assignment right. Exclusive right means that only the patentee is entitled to the manufacturing, use, sale of the invented product. He has the exclusive right to this patent. Any other natural or legal persons or organizations cannot use, manufacture or sell the patent product without permission and payment. Permission right means that the patentee permits others to use the patent technique under certain conditions. For example, by signing a contract, the patentee permits others to use all or part of the invented technique with the patent right under certain conditions. Assignment right means that patent application right and patent right can be assigned to others. The qualified invention, or patent, is characterized by novelty, creativity, and practicability. Novelty is that the invention applying for patent has not yet been publicized before the application date; creativity is that the new invention has made obvious technological progresses, compared with the existing technology; practicability is that the invention can be used in manufacturing.

(2) the meaning of “patentee” . Patentee, the possessor of the patent, is entitled to the main part of patent right and to the exclusive enforcement right of the certain patent given by the inventor with the patent, his company or organization, or the patent assignee within a certain period of time. Patentee can be a natural person, or a non-natural person such as organization or company. Patentee also includes the original subject who originally acquires the patent right and the inheriting subject who inherits the patent right. The two types are not differentiated in this paper. Patentee is entitled to the rights endowed by law, and meanwhile undertakes the obligations stipulated by law, namely, the patent right.

(3) the meaning of “patentee's discourse power” . According to the analysis about the meaning of patentee, it is easy to find that the patent held by the patentee can represent the patentee's control over technology. If patent is viewed as “discourse” , then the patentee's discourse power is the discourse power of the patent technology. With the previous research

on "discourse power" and the specific context of the patentee and patent technology, this paper defines "the patentee's discourse power" that after applying for patent and being licensed, the patentee spreads his technological fruits and influences other patentees' research to form a technical barrier, and even defines the purpose of business rules to help the patentee occupy the market and seek economic returns.

4.1 Evaluation index system

Based on the fundamental concept of patentee, this paper designs a three-graded index for the evaluation system of the patentee's discourse power. The first-grade index includes 3 elements of the patentee's discourse power: transmissibility, influence, and coercive force; the second-grade index includes 6 traits of the patentee's discourse power in the network security field: technological competitiveness, technical cooperation, technological innovation, influence in the industry, influence out of the industry, and industry standard setting capacity; the third-grade index includes 21 relevant indexes.

But according to the basic principle of data availability about the evaluation model design, the law status field of patent has not been retained in the Deventer database selected in the empirical research of this paper. Therefore, the patent lifetime cannot be obtained, that is, the patentees' average lifetime in the third-grade index cannot be calculated. As a result, a substitute index should be selected into the evaluation system. It is found by consulting literature that Li and Zhao (2017) have proved that a positive correlation appears between the patent lifetime and its examining time. The longer its examining time is, the higher expectation the patent examiner has for retrieval capability and resources. The more discussion rounds with the patentee about its technical nature in examining the patent, the better technicality and novelty of the patent, and the less likely the patent is to be examined as invalid in the future. Thus, the original index is modified to be the patentees' average examining time. The modified patentee evaluation system is shown in Table 1. The symbols before each index have two meanings: letters represent the grade of the index; and numbers the sequence order. For instance, B1 represents the first first-grade index.

Table 1 evaluation system of the patentee's discourse power

The first–grade index	The second–grade index	The third–grade index
B1 transmissibility	C1 technological competitiveness	D1 the total number of the patentees´ authorized patents
		D2 the number of the patentees´ authorized patents in USA
		D3 the number of the patentees´ authorized PCT patents
		D4 the number of the patentees´ authorized triad patents
		D5 the patentees´ technology strength
		D6 the average terms number of patent for each patentee
		D7 the patentees´ average technology scope
	C2 technological innovation,	D8 the patentees´ self–citation rate
		D9 the patentees´ science relevancy
		D10 the patentees´ technology life cycle
	C3 technical cooperation	D11 the degree number centrality of patentees cooperation network
		D12 the middle centrality of patentees cooperation network
		D13 the closeness centrality of patentees cooperation network

The first–grade index	The second–grade index	The third–grade index
B2 influence	C4 influence in the industry	D14 the out–degree centrality of patentees citation network
		D15 the closeness centrality of patentees citation network
		D16 the eigenvector centrality of patentees citation network
		D17 the middle centrality of patentees citation network
	C5 influence out of the industry	D18 patentees´ average citation frequency out of the industry
B3 coercive force	C6 industry standard setting capacity	D19 patentees´ average number of patent families
		D20 patentees´ average examining time
		D21 the necessary patent number for patentee standard

(1) relevant index of transmissibility

Transmissibility elements can be divided into three traits: technological competitiveness, technological innovation, and technological cooperation. According to social network analysis and patentometrics, the evaluation indexes are selected related to those three traits.

In terms of technological competitiveness, although the total number of patentees' authorized patents can represent patentees' technological competitiveness, the patents applied to different Patent Offices should be given different weighting coefficients due to different technical contents (Wen, 2014). CHI Research proposes using technology strength to measure the patentee's overall technological level, which plays a crucial role in patent lawsuits. In some scholars' research, the demanding number of terms of patent right influences a company's technological capacity (Tong & Frame, 1994; Saiki et al., 2006). Lerner (1994) suggest that the international patent classification number should be used to represent the technological scope of a certain patent, which helps to find the positive correlation between the technological scope and the market value of a public company. To sum up, there are 7 evaluation indexes related to technological competitiveness: the total number of the patentees' authorized patents; the number of the patentees' authorized patents in USA; the number of the patentees' authorized PCT patents; the number of the patentees' authorized triad patents; the patentees' technology strength; the average terms number of patent for each patentee; the patentees' average technology scope, which all have a positive correlation to technological competitiveness in numerical value.

In terms of technological innovation, the influence of a paper is calculated after removing self-citation in citation analysis of academic research to ensure the scientificity of the result. But in consideration of the different citation purposes of patent literature and academic literature, and the more general self-citation in patents (Wen, 2018), some scholars have researched the self-citation phenomenon in patents, finding that the patentees' self-citation can represent the core technology inside the company, which means the company is good at innovation (Kang & Su, 2009). In the "patent scoreboard", CHI Research proposes that the technological life cycle can detect the interval of updating the technology to the next generation, indicating the speed of technological innovation. If a company's technological innovation speed is remarkably higher than the average level in the industry, it enjoys better competitive advantage. It also suggests that patentee's science relevancy should be used to measure correlation degree between the company's research and development direction and the frontier research in the academic world. The higher the correlation degree, the better technological innovation it has. Therefore, as is shown in Table 1, there are 3 the evaluation indexes related to technological innovation: the patentees' self-citation rate; patentees' science relevancy; patentees' technological life cycle; which all have a positive correlation with technological innovation in numerical value.

In terms of technological cooperation, patentees' cooperation network should be built. If two patentees co-own one patent, they are considered to be of partnership, which finally will form a undirected network planning. With social network analysis theory, adopting the degree number centrality to measure the "star" patentee in the patent cooperation network represents the patentee's technological transmissibility to other patentees; using the middle centrality to measure the "intermediary" patentee in the patent cooperation network represents the patentee's control capacity over technological flow in the cooperation network; using the closeness centrality to measure the patentee's potential cooperation capacity represents his technological transfer ability with other patentees. Thus, as is shown in Table 1, there are 3 indexes regarding technological cooperation: the degree number centrality of the patentees cooperation network; the middle centrality of the patentees cooperation network; the closeness centrality of the patentees cooperation network, which all have a positive correlation with technological cooperation in numerical value.

(2) the relevant index of influence

Based on the industrial characteristics of network security, the influence element is divided into two traits: the influence within the industry and the influence out of the industry. According to social network analysis and patentometrics, the evaluation indexes are selected related to the traits.

The influence within the industry is reflected by patentees' patent citation network. In this network, nodes represent patentees, the direction of the sides of directed network the citation relations among patentees, and the weight of the sides the citation number. According to social network analysis, the degree number centrality is used to calculate the direct technological influence of the patentees' technology; the closeness centrality to calculation the patentees' potential technological influence; the network eigenvector centrality to calculate the patentees' absolute influence; the "intermediary agent" in patent technological influence is recognized by the middle centrality; thus, as is shown in Table 1, there are 4 indexes related to the influence within the industry: the out-degree centrality of patentees'citation network; the closeness centrality of patentees' citation network; the eigenvector centrality of patentees' citation network; the middle centrality of patentees' citation network.

The influence out of the industry can reflect the patentee's technological influence on other industries through the patentee's average citation frequency cited by other industries, which represents the patentee's technological scope, as is shown in Table 1.

(3) the relevant index of coercive force

According to the industrial characteristics of network security, the coercive force element is the standard setting capacity of an industry. Through patentometrics, the relevant indexes are chosen related to the traits.

Some scholars have found that a company's patent families can demonstrate its international market competitiveness. The more patent families (Harhoff et al., 2003), the stronger international market competitiveness, and the better capacity of setting the industrial international standards. The patent law stipulates that the patentee must pay a sum of annual patent fee to obtain the patent right, or he is considered to abandon it. The patent lifetime is a "fixed number of years of contract extension" for a patentee. Only if the patent brings more profit for the company than the cost to maintain it will the patent renewal fee be paid. Consequently, with regards to the patent influencing the industrial standards, its lifetime is remarkably longer than general patents. Standard essential patents refer to those which are included in the industrial standards and cannot be ignored in implementation. Calculating the patentee's number of standard essential patents can directly evaluate his coercive influence capacity in setting standards. There are 3 indexes related to the standard setting ability: the number of patentee's patent families; the average lifetime of patentees; the number of patentee's standard essential patents, which all have a positive correlation with industrial standard setting ability in numerical value.

4.2 Determination of index weight

This paper adopts analytic hierarchy process to determine the weight of research objects, which is shown as follows.

(1) designing the hierarchical model of the structure

The hierarchical model of the structure is designed according to the evaluation system in Table 1, as is shown in Figure 2. The target layer is the patentee's discourse power evaluation in the network security field; the criterion layer is divided into two layers: the first-grade index and the second-grade index; the project layer, only one layer, has 21 third-grade indexes in total, which are simplified into relevant indexes in the figure.

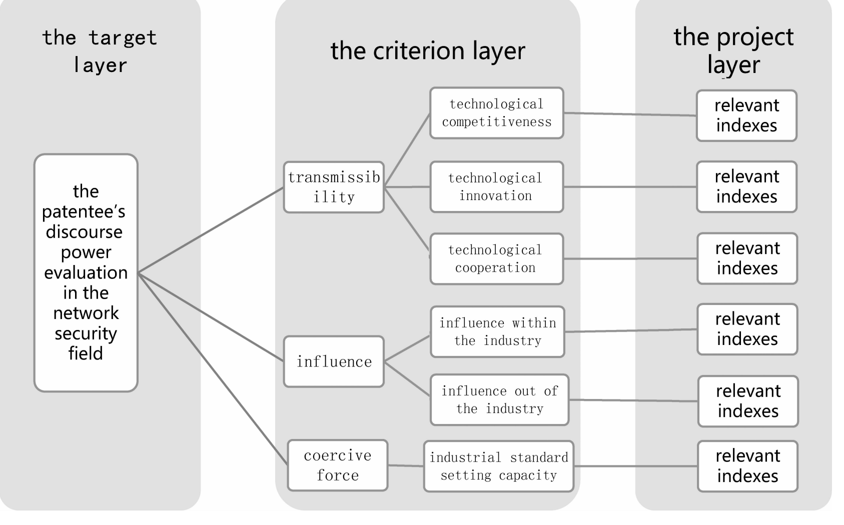

Figure 2 the hierarchical model of the structure

(2) build the judgment matrix layer-by-layer and calculate weight vector

In analytical hierarchy process, the method of expert assessment is usually adopted to compare pairs of elements belonging to the same supernatant on the same layer. This paper sends questionnaire to 3 experts in the library and information field and the network security field to collect the scale value of judgment matrix. The method of arithmetic mean is adopted as the final value of the matrix.

The weight of the layers' overall ranking is obtained according to the weight calculation of the obtained indexes of each layer, as is shown in Table 2. The weight of an index of each grade over the senior index is notated in the brackets after the index name. In order to see the contribution of each index to the patentee's discourse power evaluation clearly, the index proportion of each grade is visualized, shown in Fig. 4-2. Among the first-grade indexes, B1 transmissibility includes the most third-grade indexes, making up the highest proportion, 0.5190. Among the second-grade index, C4 influence within the industry accounts for the highest proportion, 0.2529. Among the third-grade indexes, D11 the patentee's self-citation rate and D16 the eigenvector centrality of the patentees' citation network represent the highest proportion, which are the core dimensions for the patentee's discourse power evaluation.

Table 2 the final weight of indexes

The first–grade indexes (weight over the general goal)	The second–grade indexes (weight over the first–grade indexes)	The third–grade indexes (weight over the second–grade indexes)	The final weight of the third–grade indexes
B1 transmissibility (0.5190)	C1 technological competitive-ness (0.4957)	D1 the total number of patentee´s authorized patents (0.0633)	0.0163
		D2 the number of patentee´s authorized patents in USA (0.1506)	0.0387
		D3 the number of patentee´s PCT authorized patents (0.0997)	0.0256
		D4 the number of patentee´s authorized triad patents (0.2276)	0.0586
		D5 the patentee´s technological strength (0.3434)	0.0883
		D6 the average term number of patentee´s power demand (0.0482)	0.0124
		D7 patentee´s average technological scope (0.0671)	0.0173
	C2 technological cooperation (0.0916)	D8 the degree number centrality of patentees´ cooperation network (0.1636)	0.0078
		D9 the middle centrality of patentees´ cooperation network (0.4079)	0.0194
		D10 the closeness centrality of patentees´ cooperation network (0.4284)	0.0204
	C3 technological innovation (0.4127)	D11 patentee´s self–citation rate (0.6866)	0.1471
		D12 patentee´s average science relevancy (0.1922)	0.0412
		D13 patentee´s technological life cycle (0.1211)	0.0259
B2 influence (0.3035)	C4 influence within the industry (0.83333)	D14 the out–degree centrality of the patentees´ citation network (0.1587)	0.0401
		D15 the closeness centrality of patentees´ citation network (0.0717)	0.0181
		D16 the eigenvector centrality of patentees´ citation network (0.5758)	0.1456
		D17 the middle centrality of patentees´ citation network (0.1938)	0.0490
	C5 influence out of the industry (0.1667)	D18 patentee´s average citation frequency out of the industry (1)	0.0509
B3 coercive force (0.1775)	C6 industrial standard setting capacity (1)	D19 the average number of patentee´s patent families (0.5756)	0.1022
		D20 patentee´s average patent–examining time (0.2968)	0.0527
		D21 the number of standard essential patents (0.1276)	0.0226

5 Comprehensive evaluation of the patentee´s discourse power

5.1 Evaluation model test

(1) reliability test of evaluation indexes

This paper adopts a usual method, Cronbach reliability coefficient, for index reliability test (Zhou, 2013). If the reliability coefficient ≥ 0.9, the index reliability is excellent; if 0.9 > the reliability coefficient ≥ 0.8, the index reliability is good; if 0.8 > the reliability coefficient ≥ 0.7, the index reliability is acceptable; if 0.7 > the reliability coefficient, the index reliability is poor and needs modifying. With SPSS software, this paper performs validity test on the evaluation results of 1620 patentees' cases based on 21 indexes. As is shown in Table 3 and Table4., the reliability coefficient is calculated to be 0.813, which means the reliability of the index system is fairly good and does not need modification.

Table 3 abstract of individual cases treatment

abstract of individual cases treatment			
		number	%
Individual cases	valid	1620	100.0
	Elimination[a]	0	.0
	total	1620	100.0
a. line deletion of all variables based on the process			

Table 4 reliability statistics

Cronbach Alpha	Cronbach Alpha based on standardized items	Number of items
0.813	0.843	21

(2) validity test on the evaluation index

Validity is the index on the basis of index reliability, meaning whether the index can or cannot measure the contents of the object precisely. The better the index scores coincide with the contents of the examined object, the higher validity the index has. The measurement of index validity includes content validity and construct validity.

Content validity is also known as logical validity, referring to the appropriateness for setting the indexes of the object to be measured. The evaluation indexes in this paper are derived from literature research. A set of index system is obtained through conceptual analysis and then verified by experts through analytical hierarchy process. Therefore, this paper has fairly high content validity.

Construct validity is whether the structural design of the evaluation system is reasonable. This paper adopts factor analysis to verify the structural validity of the evaluation system.

Table 5 shows that KMO is set to be 0.821>0.8, and the null hypothesis is rejected in Bartlett sphericity test. It assumes that the correlation coefficient matrix is not unit matrix, meaning this group of data is suitable for factor analysis.

Table 5 examination table of KMO and Bartlett

KMO and Bartlett examination		
Applicability measurement of KMO sampling		0.821
Bartlett sphericity degree examination	Approximate Chi–square	5906.738
	Degree of freedom	210
	conspicuousness	0.000

In the scree plot in Figure 3, it is better to choose the number of common factors at the "inflection point" . When the number of common factors is within the range of [4 , 5 , 6], the model works effectively. With the total variance explained in Table 6, after the number of principal component >6, the eigenvalue <1 , so 6 is selected as the common factor. In the meantime, the cumulative variance contribution rate of the common factor is 67.012% and the cumulative variance contribution rate >60%, so the evaluation system has a fairly high acceptable validity.

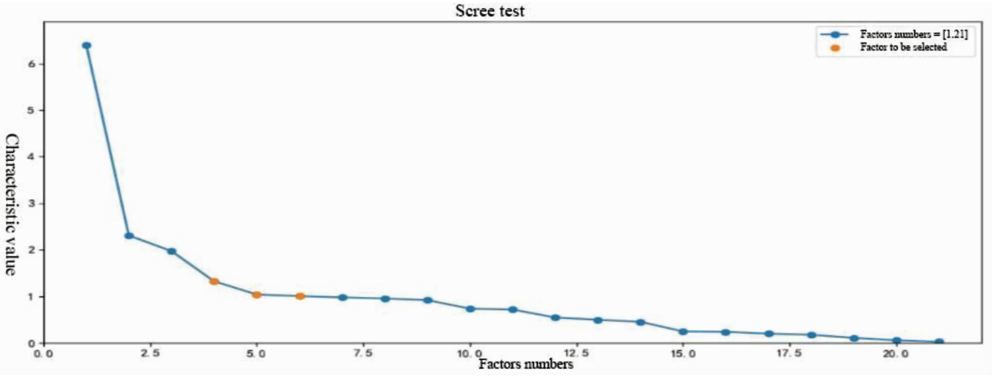

Figure 3 the scree plot

Table 6 total variance explained

components	Initial eigenvalues			Quadratic sum of extracted loads		
	total	Variance percent	accumu-lation %	total	Variance percent	accumu-lation %
The total number of patentees´ authorized patents	6.403	30.490	30.490	6.403	30.490	30.490
The number of patentees´ authorized patents in USA	2.311	11.003	41.493	2.311	11.003	41.493
The number of patentees´ authorized PCT patents	1.976	9.409	50.902	1.976	9.409	50.902
The number of patentees´ authorized triad patents	1.328	6.323	57.225	1.328	6.323	57.225
Patentees´ technological strength	1.044	4.971	62.196	1.044	4.971	62.196
The term number of patentees´ average power demand	1.011	4.816	67.012	1.011	4.816	67.012
Patentees´ average technological scope	0.982	4.679	71.690			
The degree number centrality of patentees´ cooperation network	0.959	4.567	76.257			

components	Initial eigenvalues			Quadratic sum of extracted loads		
	total	Variance percent	accumu-lation %	total	Variance percent	accumu-lation %
The middle centrality of patentees´ cooperation network	0.925	4.404	80.660			
The closeness centrality of patentees´ cooperation network	0.741	3.530	84.191			
Patentees´ self–citation rate	0.722	3.436	87.626			
Patentees´ average science relevancy	0.551	2.623	90.249			
Patentees´ average technological life cycle	0.503	2.397	92.646			
The out–degree centrality of patentees´ citation network	0.459	2.185	94.830			
The closeness centrality of patentees´ citation network	0.253	1.205	96.036			
The eigenvector centrality of patentees´ citation network	0.244	1.161	97.196			
The middle centrality of patentees´ citation network	0.204	0.972	98.168			
Patentees´ average citation frequency out of the industry	0.181	0.862	99.030			
The average number of patentees´ patent families	0.113	0.537	99.568			
The average examining time of patentees´ patents	0.061	0.290	99.857			
The number of standard essential patents	0.030	0.143	100.000			
Extraction method: PCA (principal component analysis)						

(3) correlation test of evaluation results

At present, there is very rare literature about the quantitative research on discourse power, which is hard to verify the evaluation results in this paper through other discourse power evaluation methods. But in the element analysis about the discourse power in this paper, it is believed that the patentee's influence is one of the important component elements of patentee's discourse power. Feng (2009) assumes that h index can well demonstrate the patentee's influence. Consequently, this paper will prove the scientificity of the results through testing the correlation between the discourse power evaluation results and the h index of the patentee.

Fig. 4 draws the scatter diagram of the discourse power evaluation results and the h index and labels the names of patentees' with higher discourse power and h index, who are pioneers of the network security business. In Table 7, the correlation between discourse power and the h index is examined from the angle of statistics principle. It turns out to be a remarkably positive correlation, indicating that this research is scientific. But the correlation test result shows the correlation coefficient is 0.527, belonging to moderate correlation, because the patentee's discourse power in the network security field not merely includes the patentee's influence, but the patentee's technological competitiveness, the patentee's cooperation capacity, the patentee's innovation capacity, and the patentee's capacity to set the industrial standards.

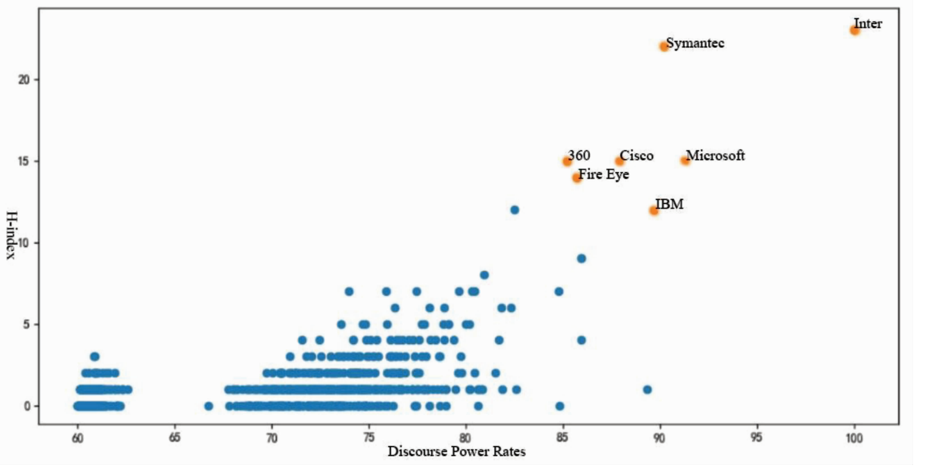

Figure 4 the scatter diagram of discourse power evaluation and the h index

Table 7 correlation test results

		The discourse power scores	The h index scores
The discourse power scores	Pearson correlation	1	0.527**
	Sig. (two–tailed)		0.000
	Number of individual cases	1620	1620
The h index scores	Pearson correlation	0.527**	1
	Sig. (two–tailed)	0.000	
	Number of individual cases	1620	1620
**. At the level of 0.01 (two–tailed) , correlation is remarkable.			

5.2 Evaluation result analysis

In the aspect of patentee type, only Netherlands Institute of Applied Science, Electronic and Communication Research Institute, and Columbia University (NY) are scientific research institutions, and the other 47 patentees are companies and manufacturers. 59% of companies and manufacturers patentees specialize in network security products, and the rest ones's businesses are all related to IT products, such as Intel, Software, etc.. 76% of them are public companies, which means patentees with greater discourse power work better in their internal financial condition.

Globally, Fig. 5 is a three-dimensional scatter plot about the first-grade index scores of 1620 patentees. The patentees close to the origin point are distributed densely, who have lower discourse power. The patentees distant from the origin point are distributed sparsely, who have higher discourse power. The Top 5 patentees, Intel, Symantec, FireEye, Software, and CrowdStrike, all have absolute discourse power in the world's network security development because of their better first-grade index scores. To show the more explicit developing status of those network security patentees from different countries, this research selects the Top 100 patentees and draws the nation distribution diagram of patentees with high discourse power. As is shown in Fig. 6, the blank countries have 0 patentees with high discourse power, and other countries are divided into 3 levels: the number of patentees with high discourse power ≥ 10 (USA); 10> the number of patentees with high discourse power ＞1(China, Japan, Canada, Russia, etc.); the number of patentees with high discourse power =1(Australia, Spain, etc.). At each level, the darker, the more the number of patentees with high discourse power in this country. USA has 64, accounting for a proportion larger than the total number in all other countries. China, Japan, and South Korea have 8, 7, and 6 respectively.

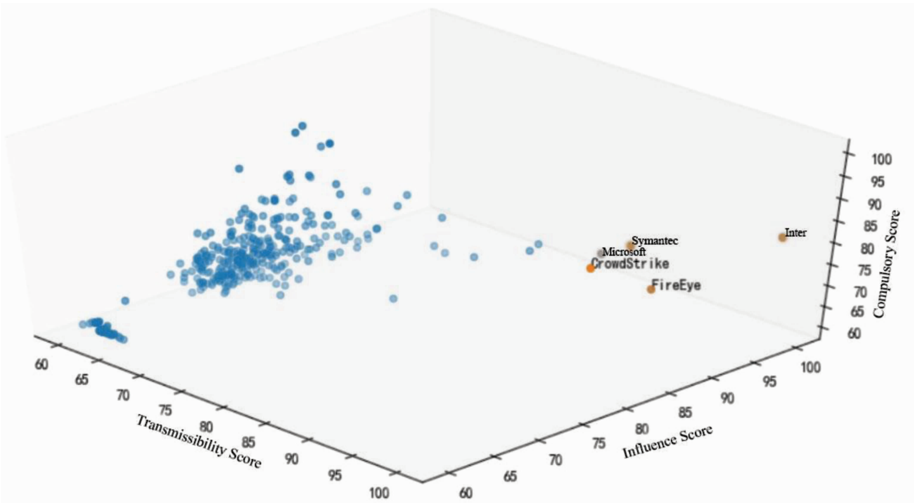

Figure 5 the scatter diagram of patentees' first-grade indexes

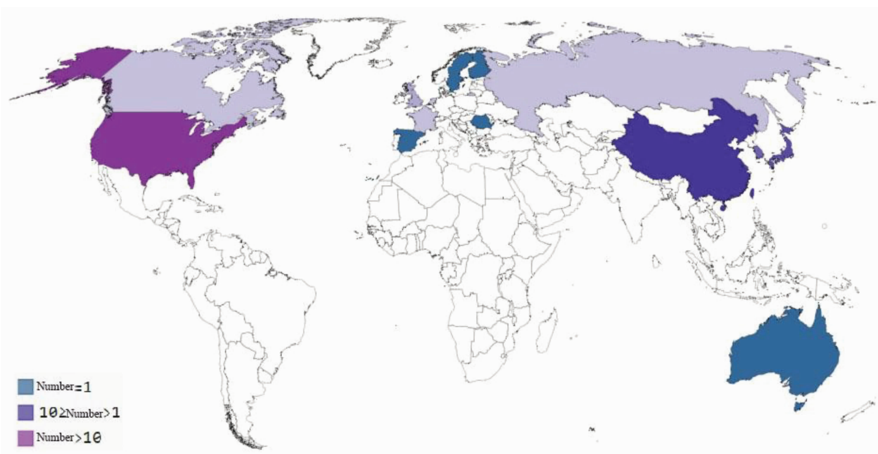

Figure 6 distribution of the Top 100 patentees' nations

6 Conclusion

This paper elaborates the concept of discourse power through literature research, and analyzes the patentee's discourse power into three principal elements-transmissibility, influence, and coercive force-by defining the concept of patentee's discourse power with the meaning of patentee. Then, based on the traits of the network security field, it analyzes the features of the element. There are 6 features in the three elements: technological competitiveness, technological cooperation, technological innovation, influence within the industry, influence out of the industry, and the capacity to set industrial standards. After that, it selects the relevant indexes of patentee's discourse power evaluation in the network security field with patentometrics and social network analysis. According to the design principle of evaluation system, treating elements as the first-grade indexes, features the second-grade, and relevant indexes the third-grade, this paper designs the evaluation system of patentee's discourse power and determines the weight of indexes with analytic hierarchy process. Finally, it tests the evaluation model at the empirical stage.

This paper proposes an effective evaluation system of the patentee's discourse power in the network security field. Cronbach reliability coefficient is used to examine the reliability of evaluation indexes, factor analysis to test the validity of evaluation indexes, and the relevant analysis to verify the accuracy of the evaluation results. The evaluation system proposed by this paper passes all three tests. Hence, it is considered effective.

US has much higher discourse power than other countries in the network security field. As a result, we should consult the US cases and study the US technology in promoting network security. In the first place, we should open the doors for the development of those network security manufacturers in China, make favorable policies for those entrepreneurial companies, and award the companies who apply for international network security patents. In the second place, we are supposed to encourage companies and universities to bring in senior network security engineers and attract outstanding network security companies from abroad, promoting the technological development of China's network security companies through technical talent flow and market competition. Finally, we should lay emphasis on network security talent cultivation, encourage academic exchange between domestic and international elite universities, urge the network security majors to participate in innovation contests, and attempt to organize outstanding students to study in the network security companies during summer and winter vocations.

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