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RESEARCH ARTICLE

Comparative study of the disciplinary status of Chinese and international information science from the perspective of disciplinary kinetic energy

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ABSTRACT

This study aims to identify other disciplines that are mainly influenced by Chinese and International Information Science, evaluate their status and influence in the academic system, and analyze the advantages and disadvantages of Chinese characteristic Information Science. It will be helpful to promote the integration of internationalization and localization of Information Science, and also help research enhancing the international discourse power of Information Science with Chinese characteristics. Based on the theory of disciplinary kinetic energy, we regard the interdisciplinary citation of Information Science papers as a driving force to promote the progress of other disciplines. So we constructed a disciplinary influence measurement model from topic output, citation rate and citation velocity, and measured the influence of Chinese and International Information Science on different disciplines from 2017 to 2021, respectively. The empirical research suggested that the disciplinary status of Chinese Information Science is slightly lower than that of International Information Science, which is mainly reflected in the lack of topic diversity, low citation rate, and low timeliness of citation. Chinese and International Information Science have cooperated closely with Management Science and Computer Science. Compared with International Information Science, Chinese Information Science has unique advantages in influencing Economics, Journalism & Communication. However, there is still room for improvement in cooperation with disciplines such as Environmental Science, Health Management, Electronic Information, *etc*.

KEYWORDS

Disciplinary kinetic energy; Information Science; Disciplinary influence; Comparison of Chinese and International Information Science; Disciplinary status

1 Introduction

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Sociology holds that social status refers to the honor or prestige a person receives due to their status or status in society. It can also be simply understood as a person's status within a certain group, that is, the level or position in social relationships. Referring to this definition, the meaning of discipline status can be extended to the recognition and prestige that a discipline gains in the national disciplinary system due to its influence (Liu & Zhang, 2014). The contribution of a discipline to society, academic innovation and practice, is an important factor affecting its academic status. The interdisciplinary citation of literature is one of the important forms of academic contribution of disciplines (Su, 2010). Therefore, using citation data to evaluate the impact of a discipline on other disciplines has become an important means of evaluating the status of a discipline.

Chinese information science has a unique historical background, development path, and historical mission. It originated from the technological information work that emerged in the 1950s, went through different stages of development from traditional information science to modern information science, and then to information age information science, and continuously expanded into the fields of competitive information, business information, and security information (Ma & Li, 2021). In the past decade, Chinese information science has not only strengthened academic norms and quality, and improved academic level, but also attached importance to international exchanges and strengthened the internationalization positioning of the discipline (Ke, 2020). Nowadays, a relatively mature disciplinary layout and knowledge system have been formed.

However, Chinese information science still faces a situation of low discipline status and competitiveness, particularly in terms of professional and academic competitiveness (Yan, 2019). With the development of big science, knowledge from various disciplines is cross-integrated. The boundaries between disciplines are gradually becoming blurred. Chinese information science needs to further clarify its disciplinary position, enhance its internal development space, and improve its discourse power in the scientific system. In addition, studies have shown that compared with developed countries such as the United States, the contribution of China to the development of information science is limited. There is still a need to enhance its international influence and discourse power (Zhao & Wang, 2018). In recent years, the discipline status and development prospects of Chinese information science have received widespread attention from scholars. The Chinese government is also attaching importance to policy guidance for the construction and academic research of social science disciplines, emphasizing the construction of a Chinese characteristic social science discipline system, academic system, and discourse system, and expanding international influence.

In this context, we evaluate the discipline status of Chinese information science and international information science in their respective academic systems, and analyze the advantages and disadvantages of Chinese characteristic information science. On the one hand, it helps to grasp the direction of improving the status of the Chinese information science discipline and promote its development. On the other hand, it helps to promote the organic integration of localization and internationalization of Chinses information science, deepen the path of building Chinese characteristic information science, and enhance international discourse power.

2 Literature review

International research on the disciplinary status and influence of Information Science from an interdisciplinary citation perspective started earlier. So (1988) found that about 8% of the papers in Library and Information Science (LIS) had been cited by other disciplines; Odell & Gabbard (2008) found that interdisciplinary citations accounted for 27% of the papers citing LIS; Cronin & Meho (2008) and Larivière et al. (2012) both found that Computer Science and Management were the disciplines most influenced by Information Science; Lund (2020) found that about one-tenth of the papers in LIS had been cited by other disciplines at least once. And there was a lot of academic exchange between Educational Technology and LIS.

Chinese Information Science also pays attention to the research on disciplinary status from an interdisciplinary citation perspective. Zhao et al. (2012) used the citation network analysis method and found that Higher Education, Journalism and Media, Publishing Science, *etc*. were the social science disciplines with higher influence by LIS. Zhang & Wang (2013) found that the cumulative citation frequency of LIS in Computer Science, Higher Education, Publishing Science, *etc*. was higher. Using interdisciplinary citation index, Zhao & Liu (2014) obtained that the discipline radiation intensity of Chinese LIS was 24.53%. They also found that the main radiation disciplines were Computer Science, Journalism & Communication, *etc*. Wang & Zhao (2015) analyzed the knowledge outflow volume, flow intensity, flow speed at different periods, and found that Computer Software and Applications, Higher Education, Publishing Science, *etc*. were influenced by LIS at multiple periods. Xu (2016) used literature survey, quantitative analysis and other methods, and found that Computer Science cited the most papers in LIS in 2011-2015, accounting for 31.7%. Feng et al. (2018) used the citation diversity index and found that LIS mainly influenced Education, General Natural Sciences, Economics and Management, *etc*. Li (2019) analyzed the external influence of Chinese LIS since the reform and open-up and found that the high-frequency citing disciplines were mainly Management, Computer Science, Journalism & Communication, Education, *etc*.

The Chinese and International papers above mainly used indicators such as citation, citation rate, and citation diversity to identify the disciplines influenced by LIS. Few papers used indicators such as topic output and citation velocity to reflect the external influence of the discipline. In addition, there is a lack of comparative research on the status of Chinese and International Information Science in their respective academic systems with the same indicators and the same period. This makes it difficult to grasp the advantages and disadvantages of their respective disciplines, as well as the similarities and differences between Chinese and International Information Science in the direction of influence. Therefore, we constructed a disciplinary influence measurement model from the perspective of disciplinary kinetic energy to evaluate the influence of Chinese Information Science and International Information Science from 2017 to 2021 respectively. Additionally, we identified the disciplines that were greatly influenced by Chinese Information Science and International Information Science in their respective disciplinary systems. Finally, we evaluated the disciplinary status of both to further analyze the advantages and disadvantages of Information Science with Chinese characteristics and its potential development direction.

3 Methodology

3.1 Methods

The phenomenon of Information Science papers being cited interdisciplinarily and helping with the innovation of knowledge in other disciplines can be seen as the driving force of Information Science in other disciplines. Due to the irregular variation of the driving force over time, it is difficult to measure the magnitude of the force directly. So the kinetic energy formula in Physics is introduced to analyze the disciplinary kinetic energy generated by the driving force of Information Science in other disciplines.

3.1.1 Fundamentals of disciplinary kinetic energy

As shown in Figure 1, the disciplines affected by Information Science are regarded as objects in motion, and Information Science is the driving force for their progress.

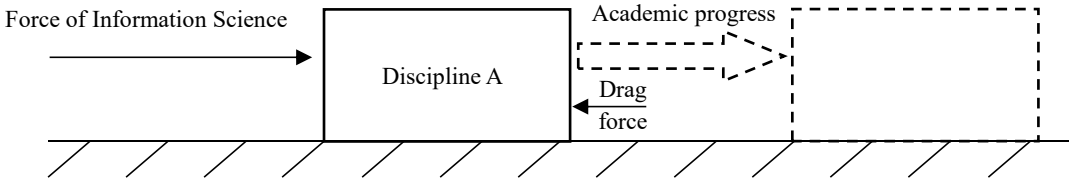

Figure 1 Schematic illustration of the driving force of Information Science in other disciplines

In Figure 1, the driving force of Information Science is generated by the citation of papers in Information Science by Discipline A. The force is in the same direction with the progress of Discipline A.

In Physics, the kinetic energy theorem applies to both work done by a constant force and work done by a variable force. It can be used to calculate the kinetic energy produced by a force on an object and the change in kinetic energy. Based on the kinetic energy formula, researchers constructed the journal communication factor (JCF) to evaluate the communication level of journals, and found that it had a better evaluation function compared with the *h* index, impact factor and other indicators (Yu et al., 2021); Li et al. (2022) also proposed the disciplinary kinetic energy theory based on the kinetic energy theorem in Physics, explored its application in the evaluation of disciplinary influence, and found that this method is feasible and effective. Therefore, we use for reference the kinetic energy formula in the kinetic energy theorem to analyze the kinetic energy generated by the driving force of Information Science in Discipline A. The formula is as follows.

$$E_a = \frac{1}{2} m_a v_a^2 \qquad (1)$$

In Formula (1), E_a is the kinetic energy of Discipline A as a result of the force of Information Science; m_a is the quality of citations of Information Science by Discipline A; and v_a is the velocity at which Information Science is cited by Discipline A.

3.1.2 Citation quality

The model is constructed from the aspects of topic output and citation rate, and can evaluate the quality of citations of Chinese Information Science and International Information Science papers by other disciplines. The formula is as follows.

$$m_a = (T_q - T_a) \times \frac{C_a}{P_q} \qquad (2)$$

In Formula (2), T_q is the number of topics of Information Science papers; T_a is the number of same topics between Information Science papers and Discipline A papers citing Information

Science; C_a is the number of Information Science papers cited by Discipline A; P_q is the total number of Information Science papers. The details of the two indexes in m_a are shown in Table 1.

Table 1 Detailed information on topic output and citation rate in m_a

Indexes expression	Indexes name	Meaning
$T_q - T_a$	Topic output	The different values between T_q and T_a can represent the number of core topics that Information Science outputs to Discipline A through paper citations. It reflects the contribution of Information Science to the knowledge of Discipline A from the topic level.
$\frac{C_a}{P_q}$	Citation rate	The ratio of Information Science papers cited by Discipline A.

3.1.3 Citation velocity

We use the citation velocity model constructed in a previous study (Li et al., 2022), regarding the time axis as a frame of reference for the impact of Information Science on the progress of other disciplines. The principle is shown in Figure 2.

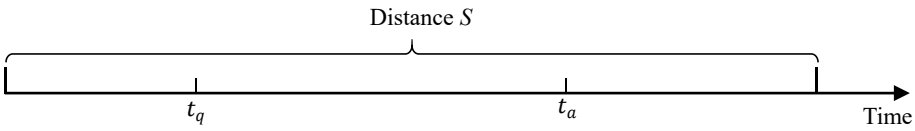

Figure 2 The principle of citation velocity

In Figure 2, the sample time range of Information Science is taken as distance *S*. This study selects Chinese and International Information Science papers from 2017 to 2021 as the sample, so the distance *S* is 5 years; t_a is the year of publication of cited paper in Information Science; t_q is the year of Discipline A paper citing Information Science paper.

So, the velocity formula is as follows.

$$v_a = \frac{S}{t_a - t_q + 1} \quad (3)$$

In Formula (3), citation velocity (v_a) is equal to time axis distance divided by reference interval time. The citation velocity can reflect the timeliness and novelty of interdisciplinary citations.

3.2 Data source and preprocessing

We evaluated the influence of Chinese Information Science and International Information Science on other disciplines from 2017 to 2021, using the influence measurement method constructed in this study. The Information Science journals indexed by CSSCI were used as the data source of Chinese Information Science. LIS journals with JCR partition in Q1 indexed by SSCI were used as the data source of International Information Science. Full details are given in Table 2.

Table 2 Source journals of Chinese and International Information Science samples

Disciplines	Sample source journals	Number of journals
Chinese Information Science	*Journal of the China Society for Scientific and Technical Information; Library and Information Service; Journal of Intelligence; Information and Documentation Services; Data Analysis and Knowledge Discovery; Library & Information; Journal of Modern Information; Journal of Information Resources Management; Information Studies: Theory & Application, Information Science; Documentation,Information & Knowledge*	11
International Information Science	*Journal of Informetrics; MIS Quarterly; Journal of the American Medical Informatics Association; International Journal of Information Management; Journal of Strategic Information Systems; Telematics and Informatics; Journal of Information Technology; Information Systems Journal; Government Information Quarterly; Journal of Computer-Mediated Communication; Information & Management; Information and Organization; Journal of Management Information Systems; Journal of Knowledge Management; Information Systems Research; Information Processing Management; Journal of Enterprise Information Management; Social Science Computer Review; Journal of the Association For Information Systems; Information Society; Journal of Computer Mediated Communication; International Journal of Computer Supported Collaborative Learning*	21

We collected 13,016 bibliographic information of Chinese Information Science papers indexed by journals from 2017 to 2021 in Table 2. Correspondingly, we collected 60,716 bibliographic information of the papers citing Chinese Information Science papers. The data above was collected from the VIP journal database on March 8th, 2022. Then we collected 8,552 bibliographic information of International Information Science papers from 2017 to 2021. At the same time, we collected 73,506 corresponding bibliographic information citing International Information Science papers. The data was collected from the Web of Science database on May 30th, 2022. Finally, after removing the non-research papers such as editorial department announcements, we obtained 11,763 bibliographic information of Chinese Information Science papers and 7,556 bibliographic information of International Information Science papers.

The data preprocessing steps are as follows.

1) We divided the papers citing Chinese and International Information Science papers by the disciplines respectively and counted the number of papers in each discipline. The discipline classification of Chinese journals was based on the *Chinese S&T Journal Citation Reports (Extended Edition)* compiled by the Institute of Scientific and Technical Information of China. The report divided more than 2,400 kinds of core journals into 152 disciplines. The discipline classification of international journals was based on journal discipline attribution of the Web of Science database. Using the VLOOKUP function in EXCEL software, we compared journal titles in the bibliographic information of papers to identify the discipline attribution of the journals whose papers cited

Information Science papers. Then we counted the value of C_a in each discipline respectively.

2) Firstly, we used Bibexcel to extract keywords from Chinese and International Information Science papers and their citing papers respectively to count the value of T_q. Secondly, we used the VLOOKUP function to identify the same topics between Information Science papers and Discipline A papers citing Information Science to count the value of T_a.

3) We counted the publication year t_q of the cited papers of Information Science and the publication year t_a of Discipline A papers citing Information Science papers.

4 Principal disciplines influenced by Chinese and International Information Science

We substituted the results of data preprocessing into the disciplinary influence measurement method constructed from the perspective of kinetic energy to identify the principal disciplines influenced by Chinese and International Information Science and to evaluate the disciplinary status of both.

(1)Citation quality

We respectively substituted the number $P(China)_q$=13,016 and $P(International)_q$ =7,556 for Information Science papers, the number $T(China)_q$=16,319 and $T(International)_q$=20,778 for topics of Information Science into formula 2. The citation quality m_a of the Chinese and International intelligence disciplines was calculated, and the results are shown in Tables 3 and 4, respectively.

(2) Citation velocity

We substituted the publication year t_a of the interdisciplinary cited papers in Information Science and the publication year t_a of the Discipline A papers citing Information Science into formula 3. The citation velocity v_a of Chinese and International intelligence disciplines was calculated, and the results are shown in Tables 3 and 4, respectively.

(3) Disciplinary kinetic energy

We substituted the induced citation quality m_a and velocity v_a into formula 1 to measure the disciplinary kinetic energy generated by its driving force. The results are shown in Table 3 and Table 4, respectively.

Table 3 The top 15 principal disciplines influenced by Chinese Information Science

Ranking	Discipline	T_a	C_a	m_a	v_a	E_a
1	Management	2,461	2,818	3,000.30	1.89	5,367.11
2	Economics Synthesis	3,471	2,618	2,584.21	2.02	5,250.29
3	Journalism & Communication	1,886	1,974	2,188.90	2.04	4,538.95
4	Computer Science & Technology	2,398	2,461	2,632.11	1.84	4,460.25
5	Natural Science Synthesis	2,238	1,828	1,977.57	1.99	3,920.57
6	Business Economics	781	824	983.66	2.21	2,399.33
7	Archives, Museum Studies	1,022	1,163	1,366.81	1.79	2,188.05
8	Social Science Synthesis	779	791	944.39	2.08	2,052.21
9	Information & Systems Science Related Engineering & Technology	963	960	1,132.59	1.86	1,958.72
10	Electronic Technology	743	853	1,020.77	1.77	1,593.80
11	National Economics, Managerial Economics,	425	467	570.26	2.09	1,250.86

	Quantitative Economics					
12	Higher Education	465	471	573.70	1.88	1,015.16
13	Basic Engineering & Technological Sciences	520	527	639.68	1.77	1,000.67
14	Administration	133	292	363.12	2.29	949.11
15	Agricultural Synthesis	341	327	401.41	2.16	939.46

Table 4 The top 15 principal disciplines influenced by International Information Science

Ranking	Discipline	T_a	C_a	m_a	v_a	E_a
1	Computer Science, Theory & Methods	3,166	4,447	10,365.35	7.86	319,870.41
2	Computer Science Information Systems	4,773	8,246	17,466.55	5.53	267,033.72
3	Management	4,182	7,337	16,114.99	4.51	163,919.16
4	Business*	4,534	8,145	17,510.24	4.30	162,155.33
5	Medical Informatics	3,101	3,067	7,175.14	6.06	131,744.05
6	Environmental Science	2,228	4,035	9,905.94	4.98	122,787.14
7	Health Care Sciences & Services	2,151	2,911	7,176.18	5.71	116,918.74
8	Computer Science, Artificial Intelligence	2,676	4,025	9,642.74	4.85	113,610.75
9	Telecommunications	1,953	2,838	7,070.59	5.35	101,292.34
10	Green & Sustainable Science & Technology	1,813	3,108	7,800.85	4.53	80,113.90
11	Communication	2,406	2,464	5,991.08	5.16	79,864.40
12	Economics	1,767	1,820	4,579.15	5.82	77,526.04
13	Environmental Studies	1,111	2,949	7,675.75	4.47	76,546.27
14	Engineering, Electrical & Electronic	3,097	3,738	8,746.90	4.08	72,844.14
15	Computer Science, Interdisciplinary Applications	2,890	3,687	8,728.57	3.91	66,886.98

*Includes Finance, Accounting, Marketing, E-commerce and other professional directions.

In Table 3, Chinese Information Science mainly affected Management, Economics Synthesis, Journalism & Communication, Computer Science & Technology, *etc*. Its influence was mainly focused on social science and relatively weak in natural science. Among them, the quality of citation of Chinese Information Science cited by Management was the highest, indicating that these two disciplines had long-term close cooperation in research methods and theoretical viewpoints. This is determined by the disciplinary attributes and historical development path of Chinese Information Science; the Administration cited Information Science at the fastest velocity, which indicated that the academic achievements of Information Science had strong timeliness in the application of this discipline. To a certain extent, it also indicated that Chinese government data-related research had achieved initial results, but there is still much room for improvement in the amount of knowledge outputs and paper citations of the discipline.

From Table 4, we can conclude that International Information Science mainly affects Computer Science, Theory & Methods, Computer Science Information Systems, Management, Business, Medical Informatics, and Environmental Science. Computer Science Information Systems had the highest citation quality of citing International Information Science. International Information Science was cited by Computer Science, Theory & Methods with the highest timeliness, indicating that the international computer field paid much attention to Information Science.

5 Comparison in the disciplinary status of Chinese and International

Information Science

5.1 Comparison in disciplinary influence intensity

According to Tables 3 and 4, International Information Science was generally higher than Chinese Information Science in all indexes during the same period. This reflected the relatively insufficient influence of Chinese Information Science. After comparing the gap between Chinese Information Science and International Information Science in various indexes, we analyze the causes of this phenomenon and provide advice for Chinese Information Science to enhance its influence.

1) There is a gap in the diversity of the core research topics between Chinese Information Science and International Information Science.

We compared the total number of papers and the number of topics in Chinese Information Science and International Information Science, and found that Chinese Information Science published more than 11,000 papers containing more than 16,000 topics from 2017 to 2021, while International Information Science published more than 7,000 papers containing more than 20,000 topics.

In Table 3, the number of cross topics between Chinese Information Science and Natural Science Synthesis is 2,238. This number approximates the number of cross topics between International Information Science and Environmental Science in Table 4. However, due to the lower total number of topics of Chinese Information Science, its number of topics outputting to Natural Science Synthesis is much lower than that of topics of International Information Science outputting to Environmental Science.

This case demonstrates that, while other disciplines have a certain level of attention to Information Science, the ability to output knowledge depends on the diversity of core research topics within the discipline itself. The issues reflected in this case are reflected in all disciplines influenced by Chinese Information Science, indicating that compared with International Information Science, the proportion of professional core methods and theories outputted by Chinese Information Science is relatively low. Therefore, improving the diversity of the core research topics of Chinese Information Science is one of the most important means to enhance the output of the topics and thus the influence of Information Science.

2) The low interdisciplinary citation rate of Information Science in China is the result of multiple factors such as focusing on the integration of disciplines, the educational background of faculty, and the interdisciplinarity of journals.

Comparing column 4 in Tables 3 and 4, we found that the interdisciplinary citations of International Information Science are significantly higher than Chinese Information Science. However, the number of papers published in International Information Science is more than 4,000 fewer than in Chinese Information Science during the same period. We can conclude that there is a large gap between the interdisciplinary citation rate between Chinese Information Science and International Information Science.

Journal of Information Management is not only indexed by zone 1 of SCI in LIS, but also indexed by six kinds of disciplines including Marketing, Management Information Systems, Computer Networks and Communications, Artificial Intelligence, and so on. The above phenomenon often appears in International Information Science. This study argues that the interdisciplinarity and inclusiveness of journals are also important factors for knowledge exchange and interdisciplinary

citation.

3) The citation rate of Chinese journals generally falls behind that of international journals.

The faster a paper is cited, the greater its influence is exerted, reflecting the greater value of the paper and the greater influence of the author (Qi, 2017). Comparing Table 3 with Table 4, we found that the rate of interdisciplinary citations in Chinese Information Science was generally lower than that of international journals. This indicates that the diffusion and dissemination of Information Science research achievements in international journals are faster. The phenomenon is related not only to the educational background of the interdisciplinary nature of journals as mentioned above, but also to the publication cycle of journals. Journals with publication cycles of bimonthly and quarterly can no longer meet the demands for the timely dissemination of ever-changing scientific and technological achievements. These journals should comply with the requirements of scientific and technological development and shorten the publication cycle of journals (Cui, 2020). Reasonably increase the publication volume while ensuring the quality of the paper. In addition, organizing or participating in interdisciplinary academic conferences and enhancing academic exchanges with other disciplines are important means to enhance the external attention of Chinese Information Science as well as the citation rate of the discipline.

5.2 Comparison in disciplinary influence directions

To compare the differences between Chinese Information Science and International Information Science on the disciplinary influence directions and focus on the relative relationship between the disciplines, we normalized the results of kinetic energy E_a calculations in Tables 3 and 4 respectively. We used the maximum-minimum normalized normalization formula for linear transformation.

$$E_a' = \frac{E_a - E_a(min)}{E_a(max) - E_a(min)} \qquad (4)$$

After normalizing, we got the principal disciplines influenced by Chinese Information Science and International Information Science (Table 5).

Table 5 The top 15 principal disciplines influenced by Chinese and International Information Science (normalized)

Ranking	Chinese Information Science		International Information Science	
	Discipline	E_a'	Discipline	E_a'
1	Management	1.00	Computer Science, Theory & Methods	1.00
2	Economics Synthesis	0.98	Computer Science Information Systems	0.82
3	Journalism & Communication	0.84	Management	0.47
4	Computer Science & Technology	0.82	Business	0.47
5	Natural Science Synthesis	0.72	Medical Informatics	0.36
6	Business Economics	0.43	Environmental Sciences	0.33
7	Archives, Museum Studies	0.38	Health Care Sciences & Services	0.31
8	Social Science Synthesis	0.36	Computer Science, Artificial Intelligence	0.30

9	Information & Systems Science Related Engineering & Technology	0.34	Telecommunications	0.26
10	Electronic Technology	0.27	Green & Sustainable Science & Technology	0.19
11	National Economics, Managerial Economics, Quantitative Economics	0.20	Communication	0.19
12	Higher Education	0.16	Economics	0.18
13	Basic Engineering & Technological Sciences	0.15	Environmental Studies	0.18
14	Administration	0.14	Engineering, Electrical & Electronic	0.16
15	Agricultural Synthesis	0.14	Computer Science, Interdisciplinary Applications	0.14

1) Both Chinese and International Information Science have a high influence on Management and Computer Science and are highly focused on topics such as artificial intelligence, machine learning, social media, *etc.*

Although there are many differences between Chinese and International Information Science in terms of historical mission, development history, educational background and journal attributes, there are still commonalities in interdisciplinary cooperation with Management and Computer Science. It is determined by the content and research methodology of the discipline. First of all, there are a large number of cross-research contents between Management and Computer Science, such as research management, knowledge management, competitive information, information security management and other research directions. In the statistics of cross topics T_a in this paper, the cross topics between Chinese Information Science and Management are mainly focused on the topics like big data, think tanks, artificial intelligence, knowledge mapping, rooted theory, *etc*. While the cross topics between International Information Science and Management are mainly focused on topics like social media, COVID-19, knowledge management, artificial intelligence, *etc*. It can be concluded that the influence of Chinese Information Science on Management is mainly about theoretical research and data analysis methods, while International Information Science is more inclined to network media data and cooperation on fact hotspots. Both of them are more focused on interdisciplinary exchanges in artificial intelligence. Secondly, the influence of Chinese and International Information Science on Computer Science both focuses on natural language processing methods. The high-frequency cross topics between Chinese Information Science and Computer Science are big data, network public opinion, government data, data mining, deep learning, and so on. The cross topics between International Information Science and Computer Theory and Methods are mainly machine learning, blockchain, deep learning, social media, natural language processing, *etc*. We could conclude that there is a certain commonality in the direction of cooperation with Computer Science between Chinese Information Science and International Information Science, both of which are interdisciplinary in text analysis methods or data mining methods.

2) Chinese Information Science has a more balanced influence on other disciplines, and its

discipline status is relatively stable.

After analyzing Table 5 we found that the disciplines influenced by International Information Science have significant concentration and dispersion phenomena. Its disciplinary status in the disciplinary system mainly relies on two computer disciplines (Computer Science, Theory & Methods and Computer Science Information Systems). However, the influence of other disciplines influenced by International Information Science is less than half of these two disciplines. This indicates that International Information Science is extremely focused on cooperation with Computer Science, which receives unbalanced attention in the disciplinary system. Although it is easier to carry out interdisciplinary cooperation more deeply in this discipline, with the continuous centralization of research resources, the breadth of radiation of disciplinary influence will decline, and the scenarios of disciplinary application and diversity of research will be limited. It is a double-edged sword for the development of the discipline. On the contrary, the influence of Chinese Information Science on Management, Economics, Computer Science, Journalism & Communication and other disciplines is relatively balanced, which is beneficial to the diversity of the development of disciplines. Moreover, its disciplinary status in the academic system does not rely solely on one type of discipline, making the status of Chinese Information Science relatively stable.

3) The influence of Chinese Information Science on Economics and Journalism & Communication has unique advantages.

In Table 5, compared with International Information Science, Chinese Information Science focuses more on the knowledge output of Economics Synthesis, Journalism & Communication. In detail, the influence of Chinese Information Science on Economics is mainly focused on reading promotion, user profiling, social media and other cross topics. The research achievements of Information Science can be further extended and applied in Economics. The influence of International Information Science on Economics is mainly about blockchain, bitcoin, artificial intelligence, digital economy and others. These topics have weak relevance to the core research content of Information Science. There is a significant theoretical and methodological overlap between the research of Journalism & Communication, like journal evaluation, academic influence, peer review, and the research of Information Science, like bibliometrics. Therefore, the cooperation between the two is relatively close.

4) There is still significant room for improvement in the cooperation between Chinese Information Science and other disciplines, such as Environmental Science, Health Management and Electronic Information.

After comparing Table 5 and analyzing the cross topics T_a of this paper's statistics, we found that the influence of International Information Science on Environmental Science ranks sixth. The influence on topics such as sustainable development, COVID-19, social media, digital transformation is relatively high. While the number of papers in Information Science cited by Chinese Environmental Science is relatively small. Internationally, in addition to cooperating with Information Science on hot topics such as COVID-19 and public health emergencies, Health Management also jointly studies research topics such as electronic health records, natural language processing, and digital health. The collaboration mostly focuses on the application of text analysis methods in medical data. Moreover, International Information Science also cooperates with Electronic Information in the fields of blockchain, machine learning, internet of things, feature extraction and cloud computing.

5.3 Suggestions on enhancing the disciplinary status of Information Science

The discussion of enhancing the disciplinary status of Chinese Information Science is often based on the perspective of historical evolution, institutional cooperation, or disciplinary field cooperation, but lacks consideration in comparison with International Information Science. Therefore, based on the comparative analysis of citation data between Chinese Information Science and International Information Science, this study explores measures to enhance the disciplinary status of Chinese Information Science.

1) Encouraging diversified research directions and expanding the scope of the external influence of Information Science. Comparing Chinese Information Science with International Information Science, this study found that the most fundamental difference between them is the direction of integrating disciplines. International Information Science attaches great importance to the integration of computer technology and information technology. Although it has overall elevated its disciplinary status, there has also been an excessive reliance on Computer Science. Therefore, China should not only refer to the direction of technological integration in International Information Science, but also grasp the dominant role in disciplinary integration. On the basis of adhering to the core theories and methods of Information Science, we encourage the development of diverse research directions.

2) Analyze the applicability of international development paths in China and conduct relevant research rationally. Some development directions of International Information Science, such as the application of information management in the digital transformation of environmental science, combining text analysis methods with digital health, and Information Science ideas in the internet of things have not yet received widespread attention in China. Further exploration is needed to determine whether these international interdisciplinary cooperations are in line with China's national conditions and have practical application value. Conducting relevant research after rational analysis of applicability can promote the further expansion of influence direction of Chinese Information Science.

3) Strengthen cooperation and exchange between interdisciplinary institutions and scholars and raise the profile of the discipline. The proportion of teachers with interdisciplinary educational backgrounds in International Information Science is relatively large, and the interdisciplinary of journals is also stronger, resulting in a high interdisciplinary citation rate and disciplinary attention. However, blindly following the international faculty structure or changing the professional direction of journals will not only cause Chinese Information Science to lose its core competitiveness, but also hinder the improvement of its disciplinary status. Therefore, it is necessary to rationally view the differences in the disciplinary structure between International Information Science and Chinese Information Science, and use other means to enhance the attention of the discipline. For example, we can conduct interdisciplinary academic seminars and strengthen communication between interdisciplinary institutions and scholars. While expanding the research achievements of Information Science to other disciplines, we also need to understand the requirements of other disciplines for Information Science, to carry out targeted interdisciplinary cooperation.

6 Conclusion

This study constructed a disciplinary influence measurement model from the perspective of disciplinary kinetic energy, evaluated the disciplinary status of Chinese Information Science and International Information Science from 2017 to 2021, and compared the commonalities, strengths and weaknesses of the two from the perspectives of influence intensity and direction. Through analysis, it was found that the commonality between International Information Science and Chinese Information Science is the close cooperation with Management and Computer Science. Chinese Information Science has two advantages and two disadvantages. One of the advantages is that the impact on other disciplines is more balanced, resulting in a more stable disciplinary status. Another advantage is that Chinese Information Science tends to integrate with Humanities and Social Sciences such as Economic user profiling and Journalistic Communication journal evaluation. One of the disadvantages is that Chinese Information Science lags behind International Information Science in all three indexes of its disciplinary status. This is related to factors such as diversity of core themes, integration of disciplinary directions, background of teacher education, interdisciplinary nature of journals, and publication cycle of journals. Another disadvantage is that International Information Science tends to integrate with computer technology such as integrating digital transformation in Environmental Science, digital health in Health Management, the internet of things in Electronic Information, cloud computing. In contrast, the research of Chinese Information Science is insufficient in these aspects.

To enhance the disciplinary status of Chinese Information Science steadily and evenly, we should face the gap in the strength of influence between Chinese Information Science and International Information Science. We should start from the causes of the problem and gradually enhance the hard power of the discipline. We can not blindly follow the development path of International Information Science and abandon the advantages and unique disciplinary system of Chinese Information Science. At the same time, we can not ignore the potential development paths provided by other countries.

To promote the integrated development of internationalization and localization of Information Science, future research will focus on the following two aspects. Firstly, we should focus on the weaknesses of Chinese Information Science, explore whether the direction of integration of disciplines in other countries is in line with China's national conditions, and analyze their potential cooperation plans. Secondly, we should identify the technical methods that have been applied in International Information Science but have not yet been applied in Chinese Information Science and analyze their feasibility. At the same time, we will further improve the research method of this study, enhance the universality of the model and the generalizability of the research results.

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