Study on the knowledge dissemination efficiency and influence factors of electronic technology journals community based on the DEA-Tobit method

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Abstract: [Research objective] The construction of the journal community as the key content of the development of electronic technology, is of great practical significance to research knowledge production and dissemination efficiency of the journal community. [Research methods and data sources] This paper, by using DEA-Tobit model and in combination with the Chinese S&T Journal Citation Reports (Expanded Edition), focuses on the evaluation of the knowledge dissemination efficiency of electronic technology journal communities from the perspective of knowledge exchange, and demonstrates and studies the factors that affect the knowledge dissemination efficiency of journal communities.

[Conclusion](1) Generally speaking, there is still 31% optimization space for the knowledge dissemination performance of the electronic technology journal community, and the low scale efficiency value has a large impact on it. (2) Journals such as Electronic Products, Light & Lighting, Journal of University of Electronic Science and Technology of China, and Journal of Chinese Electron Microscopy Society have relatively high knowledge transmission efficiency, and the value of technical efficiency, pure technical efficiency, and scale efficiency of those journals are equal to 1. (3) The academic quality of journal papers is the key variable to influence the electronic technical journal community knowledge dissemination efficiency; the duration of the journal and the economic status of the journal location are also positive factors affecting the effectiveness of journal knowledge dissemination; factors such as the degree of journal cooperation, the internationalization level of journals, and the institutional distribution of journal articles have a limited impact on the effectiveness of knowledge dissemination in the journal community. In addition, in view of the lower time-sensitive of the electronic technology literature, the overall influence of the novelty of the literature used by authors, which is measured by “cited half-life”, on the performance of knowledge exchange is quite different from expectations.

1. Introduction

As a non-entity organization, "academic community" has the basic functions of scientific exchange, publication, cooperative competition, knowledge production and dissemination, reward and punishment, etc. It influences the cultivation of academic talents and the distribution of intellectual resources for scientific popularization of academic knowledge. It is an important aspect of national competitiveness. In terms of its level and the scope, the academic community can be big to all scholars engaged in the academic profession in the world, and can also be small to a group of scholars based on a particular issue, or a groups formed around several key figures (Zhang, 2012) [1]. These groups, in which the members follow a common pattern, accept the same standard of value, and have a regular
full professional ideas communication, are scientist groups who produce knowledge (Kuhn, Thomas S, 1962) [2]. The whole scientific system is a large knowledge flow system (Wang, Zhang, 2014) [3]. As an important part of the organizational structure of the "Academic Community", academic journals have gradually become a key platform for scholars to enter the academic community, participate in and establish a formal academic communication network. In turn, it will stimulate the members of the academic community to carry out academic knowledge innovation, knowledge management and academic evaluation, which is also the basis for the survival of academic journals. At present, the positive influence of journal community has attracted much attention. Zhu (2017) [4] believed that with the Shanghai academic circle as the axis, the modern Shanghai English journals have built an academic community connecting Chinese and western scholars and radiating to overseas countries. It has vigorously promoted the development and progress of Chinese and western cultural exchange. Other domestic scholars expressed similar views in the seminar on the construction of journal community in coastal provinces. They also believe that the construction of journal community can enhance the service function and evaluation function of journals and play a positive role in the construction of academic community (Deng, 2017) [5]. In addition, He (2004) [6] also stated that the journal of international relations participates in the “shaping” of the academic community of international relations. Its essential orientation is the “knowledge exchange platform” and the “window” of knowledge development. Some scholars focus on the research on the knowledge dissemination of academic journal community and analyze the status quo of knowledge dissemination. Yuan (2010) [7] found that the current Chinese journal recognition mechanism blindly advocates the core journal system based on “scientific metrology” transplanted from the West. This leads to the rupture between "journal recognition" and "community recognition", which has caused the failure of the dynamic mechanism of academic knowledge production in China. Tan (2014) [8] selected the papers and citation data which recorded in Journal of the China Society for Scientific and Technical Information from 1998 to 2012 to analyze the knowledge resources, core subjects, subject areas, and academic exchange of the informal academic community of information science. The results show that Journal of the China Society for Scientific and Technical Information has formed an informal academic community of information science research. Therefore, Hou (2016) [9] suggested that academic journals as the form of the scientific community, not only consider their object orientation as the carrier of knowledge dissemination, but also attach importance to their subject orientation as the promotion of knowledge growth. Zhu (2016) [10] mentioned that based on the development strategy of academic journals in universities, we should reform the journal management system, promote the professionalization, intensification, and digitalization of academic journals, strengthen systematic construction, and strive to build a new academic communication order in the Internet era. Moreover, in order to better play the role of the journals in knowledge innovation, new publishing model is worthy of attention. Wu (2017) [11] clearly affirmed the open access journal publishing model based on digital technology. He also stated that the open access movement of sci-tech periodicals should inherit the concept of publicity of scientific knowledge, maintain the peer review mechanism, and guarantee the quality control function of scientific journals on the production of scientific knowledge. As to the journal community evaluation functions and applications, Liu (2011) [12] stated that from the historical process, due to the development of the journal itself and the changing subject demand of the academic community, the evaluation of journals has gradually changed from paying attention to the physical attributes of journals to the perception and recognition of academic communities. Jin (2015) [13] also has similar views that "demand changes in the academic community is the fundamental driving force for the development of the science and technology journal". Moreover, Liu (2016) [14] stated that academic evaluation is an indispensable booster in the construction of academic journals and academic communities. However, authoritative, scientific, rigorous, and impartial academic evaluation can only come from the academic community, that is, peer review. Wang (2015) [15] conducted that the lack of academic community is an important reason for the alienation of academic evaluation function of academic journals. The original and fundamental academic communication function was neglected, and the academic evaluation function that evolved later became much
concerned. Academic journals and academic communities have multiple interactions in academic knowledge production, knowledge diffusion and knowledge evaluation. At present, research on the production, dissemination and innovation evaluation of journal community knowledge is slightly insufficient. Zhang (2017) [16] introduced h and g index evaluation factors to carry on the academic evaluation on tourism academic community based on 22619 tourism core academic papers from 2003 to 2016 as the whole sample. There is a small amount of quantitative research focusing on the "journal knowledge exchange efficiency" analysis. Among them, the research method based on non-parametric economic mathematical model is as follows, such as DEA-Tobit two-step method (Zhang, 2015) [17], stochastic frontier analysis (SFA) (Wan, 2017)[18], Super-SBM model (Wang, 2017;Wan, 2017) [19-20], and journal citation analysis (Chen, 2009; Liu, 2017; Li, 2016) [21-23]. In addition, social network analysis tools were also applied in a few cases (Zhang, 2012) [24]. Different from previous studies, by considering the differences between subject and combined with the periodical classification consistency and data consistency, 60 sample journals classified in the category of electronic technology (journal classification code for E19) are selected from Chinese S&T Journal Citation Reports (Expanded Edition) in this paper. And based on the perspective of knowledge exchange, this paper focuses on the quantitative analysis of the knowledge dissemination efficiency of electronic technology journals community. As is known to all, electronic information science and technology as a strategic emerging industry in China is an important part of the innovation-driven development strategy implementation in our country. It not only effectively supports the modernization of national defense, but also promotes the transformation and upgrading of traditional industries. The reality promotes and expands the research in the field of electronic technology. Compared with previous studies, which focused on the evolution of electronic science and technology basic principle and the application of technology from the dimension of natural science, this study focuses on exploring the production and dissemination of electronic technology-related academic knowledge. Clarifying the effectiveness and key influencing factors of the knowledge dissemination of electronic technology in domestic journals and publications will not only promote the formation of a new academic community, but also provide some guidance for the sustainable development of electronic technology. Therefore, it is realistic representative to make use of the cited data of the academic journal community in this hot field to carry out the study on the performance of knowledge transmission. We also expect to provide suggestions on the expansion and deepening of the theories related to electronic technology.

2. Selection of research methods and indicators

2.1 Research methods

Based on the cited report of Chinese electronic technology journals and combined with data envelopment analysis (DEA), the efficiency of knowledge dissemination of Chinese electronic technology journals community is evaluated in this paper. As an important carrier of knowledge exchange and learning innovation, journal citations and sources are difficult to reach the optimal scale in imperfect competitive market, government order and financial constraints. Therefore, in the field of non-parametric economic mathematical model construction, Afriat, Fare, Grosskopf, Logan, Banker, Charnes, Cooper and other scholars actively expanded the application of variable returns to scale (VRS) in DEA model. VRS cannot be affected by scale change to calculate the technical efficiency, and the estimated result is more consistent with the truth. Therefore, VRS model is used in this paper to evaluate the knowledge transmission efficiency of electronic technology journals community based on journal citation reports. In addition, in order to achieve a specific academic output, the academic input variable is more easily controlled when the knowledge dissemination efficiency of journal community is evaluated. Therefore, scholars prefer to use the input model, which was used in this paper.
In Equation (1), $k$ denotes the index of decision-making units (DMUs); $x_{n,k}$ is the quantity of input $n$ used by DMU $k$; $y_{m,k}$ is the quantity of input $m$ used by DMU $k$; $\lambda_k$ is the weighting coefficient of input $n$ and output $m$; $\theta^k$ is the relative efficiency value of the DMU $k$, which is located in the interval of $[0,1]$. The closer $\theta^k$ approaches 1, the higher the efficiency value.

In order to clarify the influence factors and degree of knowledge dissemination efficiency of the electronic technology journal community, dea-tobit two-step method was used in the study. Based on the above evaluation of knowledge dissemination efficiency of electronic technology journal community, this method further takes efficiency value as the dependent variable to make regression to various influencing factors. The coefficient and direction of the regression equation can be used to judge the degree and direction of performance impact. The standard form of the method is as follows.

\begin{align}
Y^*_i = \beta X_i + \varepsilon_i \\
Y_i = Y^*_i, \text{ if } Y^*_i > 0 \\
Y_i = 0, \text{ if } Y^*_i \leq 0
\end{align}

In Equation (2), $Y^*_i$ is the vector of dependent variable; $Y_i$ is the vector of efficiency value; $X_i$ is the vector of independent variable; $\beta$ is the vector of correlation coefficient, and is defined; $\varepsilon_i \sim N(0, \sigma^2)$ $y_i^* \sim N(0, \sigma^2)$.

### 2.2 Selection of data and indicators

#### 2.2.1 Select input and output variables

In order to meet the application conditions of DEA method as far as possible and based on the scientific requirements of indicator design, the research indicators are mainly selected from the 2017 edition of Chinese S&T Journal Citation Reports (Expanded Edition). The report can be used for quantitative analysis and scientific evaluation of journals of academic characteristics and subject status. It can objectively reflect the journal community development trend and regularity of knowledge dissemination. The following processing is handled when selecting the evaluated journals of knowledge dissemination efficiency: through analyzed and sorting journals in the 2017 edition of Chinese S&T Journal Citation Reports (Expanded Edition), there are 62 journals in the category of electronic technology (journal classification code for E19). In view of the default of "extended impact factor" and other key indicators in electronic journal (English) and photon sensor (English), 60 journals were finally selected in consideration of the consistency of journal statistical classification, data coherence and availability of research data. Journal selection situation is shown in Table 7.

Based on the analysis assumed that all rated journals faced the same luck in their operations, the academic input-output index for the evaluation of knowledge dissemination efficiency of community journals of electronic technology should be highly correlated and meet the following requirements: (a) the input-output factors are the same and both are positive; (b) the index reflects the main process of knowledge dissemination of journal community; (c) different academic input and output indicators
Table 1. Academic "input" and "output" indexes of knowledge dissemination performance of electronic journals community.

| Index | Academic input index | Academic output index |
|-------|----------------------|-----------------------|
|       | Source literature quantity | Average citation | Paper's average cited frequency | Extended influence factor | Extended H index | Diffusion factor | Extended discipline impact indicators | Extended the number of references |
| Min   | 40 | 0.19 | 0.49 | 0.16 | 2 | 11.43 | 0.03 | 45 |
| Max   | 2920 | 51.05 | 13.96 | 3.25 | 16 | 82.35 | 0.68 | 1068 |
| Mean  | 348 | 11.455 | 4.363 | 0.628 | 5.917 | 39.951 | 0.337 | 363 |
| Std.  | 514.683 | 7.663 | 2.606 | 0.552 | 2.942 | 17.609 | 0.179 | 255.302 |

Note: All values are rounded off to three decimal places as far as possible, except for Table 8.

The electronic technology academic journal community input index includes source literature quantity (piece) and the average citations (piece). These two variables reflect the unity of absolute quantity and relative quantity. Source literature quantity can be interpreted as the total number of papers published by the evaluated journals in the statistical year. It is the source of citation data of the statistical journals and it reflects the breadth of academic investment in the evaluated journal. As to the average number of citations, which refers to the average number of references cited by each paper, it can reflect the depth of academic investment in evaluating journals to some extent.

Output index covers paper's average cited frequency (time/piece), extended influence factor, extended H index, diffusion factor, extended subject impact indicators and extended the number of references. The paper's average cited frequency is the ratio of the extended total cited frequency to the source literature quantity, which indicates the degree of the evaluation journals being used and valued. The extended influence factor and the extended H index are the fair index to evaluate the academic output level and influence of journals in current. Both of these indicators can reflect the depth of academic output of knowledge dissemination in the community of electronic technology journals. The specific significace of the diffusion factor index is the number of journals involved in each cited 100 times in the current year, indicating the diffusion range of the total cited frequency. The index of extended discipline influence refers to the proportion of the number of journals that are quoted by the discipline to the total number of journals. The extended number of cited journals refers to the number of cited evaluated journals, reflecting the usage range of evaluated journals. These three indexes all reflect the breadth of academic output of knowledge dissemination in sci-tech journals.

2.2.2 Action mechanism and factor setting. Generally speaking, the selection of factors that affect the efficiency of knowledge communication in journal community needs to consider the internal and external factors of knowledge communication in journal community. The internal factors include the academic quality of the journal itself, the novelty of the journal literature, the degree of cooperation of the journal, the level of internationalization of the journal, the distribution of the journal paper institutions and regions, the time of publication, etc. External factors should consider the economic situation of the region where the journal is located. The following variables were selected after comprehensive consideration of the requirements of the index design and composition characteristics, the rationality of the index and the accessibility of the data. (1) Academic quality of journals. As the main carrier of knowledge transmission, academic quality of journal papers determines the efficiency of knowledge transmission. Fund paper ratio, that is the proportion of papers supported by various funds in all papers, is chosen in this paper to represent academic quality of journals. (2) Novelty of the literature used by authors. At present, knowledge exchange changes with each passing day, and many journal papers are driven by the pursuit of academic frontier innovation. Emphasis on the novelty of the paper, which is also an important aspect of the quality of the journal. Citation half-life is used to
indicate the novelty of the literature. (3) Degree of cooperation of journals. As an important means for academic community to spread academic consensus, paper cooperation is of great significance in the discovery of new technology, new knowledge and subsequent knowledge dissemination. The average number of authors of journal papers is chosen to represent this variable. (4) Internationalization level of journals. The internationalization of knowledge dissemination has become an important trend in the current development of journals. It is an important aspect to measure the influence of journals. This paper chooses “overseas paper ratio” to represent this variable. (5) Institutional distribution of journal papers. This index can measure the coverage and dissemination influence of knowledge of journal papers, as well as the internal quality of journal papers. Institutional distribution number is used to represent it. (6) Running time. The running time of academic journals bears the change of times and the innovation of running journals and is also the accumulation of journal quality. The running time in this paper is represented by the time from the founding time of the journal to 2016. (7) Economic status of the region where the journal is located. In general, the knowledge exchange and dissemination level of the journal community, as the embodiment of the regional cultural soft power, is positively correlated with the regional economic situation. Annual economic situation (GDP) of the region where the journal is located is chosen to represent this variable. Table 2 shows the statistic value of seven explanatory variables and their predicted direction.

Table 2. Description of variables, statistics and predicted direction.

| Explanatory variables                      | Assignment instructions                                      | Min  | Max   | Mean  | Std.  | Pre_D |
|--------------------------------------------|-------------------------------------------------------------|------|-------|-------|-------|-------|
| Academic quality of journals               | "Fund paper ratio", the proportion of papers supported by various funds in all papers | 0    | 0.990 | 0.491 | 0.311 | +     |
| Novelty of the literature used by authors  | Citation half-life                                           | 3.990| 27.500| 6.785 | 3.052 | -     |
| Degree of cooperation of journals          | "Average number of authors” of journal articles               | 1.45 | 5.630 | 3.050 | 0.913 | +     |
| Internationalization level of journals     | "Overseas paper ratio"                                        | 0    | 0.550 | 0.050 | 0.130 | +     |
| Institutional distribution of journal articles | "Institutional distribution number" (units: pieces)        | 16   | 1738  | 204.950| 303.008| +     |
| Running time                                | Duration of the journal (unit: year)                         | 3    | 62    | 34.533| 13.101| +     |
| Economic status of the region where the journal is located | Annual economic situation (GDP) of the region where the journal is run (unit: 100 million yuan) | 1385.82 | 27466.150 | 16495 | 8941.40 | +     |

Note: the statistics value in Table 2 are listed with the cited report of 2017 edition of sci-tech journal as an example. Among them, fund papers ratio, citation half-life, average number of authors, overseas paper ration, and institutional distribution are all from journal citation report; duration of the journal is from China National Knowledge Infrastructure (CNKI); the economic status of the journals comes from “2016 statistical bulletin on national economic and social development” of different region.

From Table 1 and Table 2, we can see that during the knowledge dissemination of the journal community, the fluctuations of academic inputs and academic outputs are relatively obvious. It is influenced by the academic ecology of knowledge dissemination in journal community, journal management mode and random interference factors. Among the factors that affect the efficiency of knowledge dissemination in the journal community, the statistical results show that: (a) The locations
of journals are relatively concentrated and mainly distributed in Beijing, Xi’an, Shanghai, Chengdu, Nanjing, and Chongqing. For example, 23 journals come from Beijing, such as Journal of Electronic Measurement and Instrumentation, Journal of Electronics & Information Technology, Foreign Electronic Measurement Technology, Acta Electronica Sinica, Electronic Measurement Technology, China Illuminating Engineering Journal. 8 journals come from Xi’an, such as Insulators and Surge Arresters, Power Capacitor & Reactive Power Compensation, Journal of Xidian University (Natural Science), Electronic Design Engineering. There are 4 journals located in Shanghai including Lamps & Lighting, Nano-Micro Letters, and Journal of Shanghai Dianji University. There are three electronic technology journals in Chengdu, Nanjing, and Chongqing respectively. (2) In general, the area where the journal is located is the provincial capital (including the capital and municipality directly under the central government) or the key city of the province. The economic foundation of the place where the publication is run is relatively good, but at the same time the difference of economic aggregate between regions is great. For example, Shanghai, the city where Electronic Technology is located, had the best economic situation which reaching 2,766,615 billion yuan in 2016. However, Bengbu, the city where Journal of Anhui Vocational College of Electronics & Information Technology is located, was the lowest with 138.582 billion yuan. (c) The institutional sources of journal articles are widely distributed, with an average value of 204.95. Among them, the number of institutional sources that published their papers in Electronics World located in Beijing is as high as 1738; and the number of institutional sources that published their papers in Journal of Guilin University of Electronic Technology is at least 16. (d) Electronic technology journals have a relatively long running cycle, with an average running time of 34.533 years. Journal of Xidian University (Natural Science) and Insulators and Surge Arresters were founded in 1955 and 1958 respectively. Vacuum Electronics and Journal of University Electronic Science and Technology of China were founded in 1959. The latest is Electronic Science & Technology, which was launched in Beijing in 2014. (e) At present, Chinese is the main publication language of electronic technology journals in China, and there are also a few pure English journals such as Journal of Semiconductor, Nano-Micro Letters, Chinese Journal of Electronics and Photonic Sensors. In addition, the trend of cooperation of journal papers is also accelerating, with 3.05 authors per paper. But at the same time, the internationalization of electronic technology scientific journals is relatively lagging. The average overseas paper ratio of all journals is only 5%.

3. Empirical analysis of knowledge dissemination performance measurement in electronic technology journals community

3.1 Performance measurement of knowledge dissemination in journal community

DEAP2.1 software is used in this paper to measure the knowledge dissemination of electronic technology journals community. The measure results are shown in Tables 3-7. Table 3 gives the mean of technical efficiency of knowledge dissemination in electronic technology journals community; interval distribution of technical efficiency, pure technical efficiency, and scale efficiency of knowledge dissemination in electronic technology journals community are shown in Tables 4-6; the detailed information about the technical efficiency of knowledge dissemination in electronic journals community can be found in Table 7.

Table 3. The average efficiency of knowledge dissemination in electronic journals community.

| Overall efficiency | Technical efficiency | Pure technical efficiency | Scale efficiency |
|--------------------|----------------------|--------------------------|------------------|
| Mean               | 0.69                 | 0.893                    | 0.775            |

The results listed in Table 3 show that the average technical efficiency of 60 sample journals is 0.69, the average pure technical efficiency is 0.893, and the average scale efficiency is 0.775 when the
factors such as management inefficiency, environment and random interference are taken into consideration comprehensively. Therefore, if the current level of academic input remains unchanged, there is still 31% room for optimization of knowledge dissemination performance of electronic technology journals community.

The results shown in Tables 4-7 reveal that:

1. Technical efficiency. Among the 60 evaluated sample journals, the overall performance level

| Table 4. Interval distribution of technical efficiency of knowledge dissemination. |
|----------------------------------|-------|-------|-------|-------|-------|-------|
| Technical efficiency            | < 0.4 | 0.4-0.5 | 0.5-0.6 | 0.6-0.7 | 0.7-0.8 | 0.8-0.9 | 0.9-1 |
| Number of journals              | 2     | 7      | 14     | 11     | 7      | 9      | 10   |
| Percentage (%)                  | 3.333 | 11.667 | 23.333 | 18.333 | 11.667 | 15     | 16.667 |

| Table 5. Interval distribution of pure technical efficiency of knowledge dissemination. |
|------------------------------------------|-------|-------|-------|-------|-------|
| Pure technical efficiency                | < 0.6 | 0.6-0.7 | 0.7-0.8 | 0.8-0.9 | 0.9-1 |
| Number of journals                       | 3     | 5      | 7      | 7      | 38    |
| Percentage (%)                           | 5     | 8.333  | 11.667 | 11.667 | 63.333 |

| Table 6. Interval distribution of scale efficiency of knowledge dissemination. |
|-----------------------------------------|-------|-------|-------|-------|-------|
| Scale efficiency                        | < 0.4 | 0.4-0.5 | 0.5-0.6 | 0.6-0.7 | 0.7-0.8 | 0.8-0.9 | 0.9-1 |
| Number of journals                      | 2     | 3      | 5      | 7      | 12     | 16     | 15   |
| Percentage (%)                          | 3.333 | 5      | 8.333  | 11.667 | 20     | 26.667 | 25   |

| Table 7a. Details of the technical efficiency of knowledge dissemination in the community of electronic technology journals. |
| No. | Journal title                                      | Technical efficiency | Pure technical efficiency | Scale efficiency |
|-----|---------------------------------------------------|----------------------|--------------------------|------------------|
| 1   | Journal of Anhui Vocational College of Electronics & Information Technology | 0.69                 | 0.794                    | 0.868            |
| 2   | Semiconductor Optoelectronics                     | 0.591                | 0.752                    | 0.787            |
| 3   | Semiconductor Technology                          | 0.803                | 1                        | 0.803            |
| 4   | Journal of Semiconductors                          | 0.475                | 0.594                    | 0.8              |
| 5   | Journal of Changzhou College of Information Technology | 0.779               | 0.96                     | 0.811            |
| 6   | Chinese Journal of Sensors and Actuators           | 0.754                | 0.977                    | 0.772            |
| 7   | Transducer and Microsystem Technologies            | 0.694                | 0.967                    | 0.717            |
| 8   | Light & Lighting                                  | 1                    | 1                        | 1                |
| 9   | Insulators and Surge Arresters                     | 0.567                | 0.658                    | 0.862            |
| 10  | Power Capacitor & Reactive Power                   | 0.556                | 0.668                    | 0.832            |
| 11  | Compensation                                      |                      |                          |                  |
| 12  | Audio Engineering                                 | 0.455                | 0.588                    | 0.775            |
| 13  | Video Engineering                                 | 0.571                | 0.799                    | 0.715            |
| 14  | Electronic Measurement Technology                  | 0.545                | 0.787                    | 0.692            |
| 15  | Journal of Electronic Measurement and Instrument   | 0.904                | 1                        | 0.904            |
| 16  | Electronic Test                                   | 0.57                 | 1                        | 0.57             |
| 17  | Electronic Product Reliability and                 | 1                    | 1                        |                  |
| No. | Journal title                                      | Technical efficiency | Pure technical efficiency | Scale efficiency |
|-----|--------------------------------------------------|----------------------|--------------------------|------------------|
| 29  | Electronic Information Warfare Technology         | 0.887                | 0.948                    | 0.935            |
| 30  | Acta Electronica Sinica                           | 0.876                | 1                        | 0.876            |
| 31  | Electronics and Packaging                         | 0.842                | 1                        | 0.842            |
| 32  | Journal of Electronics and Information Technology | 0.603                | 0.919                    | 0.657            |
| 33  | Electronic Components & Materials                 | 0.537                | 0.667                    | 0.805            |
| 34  | Practical Electronics                             | 0.564                | 1                        | 0.564            |
| 35  | Electronics Quality                               | 0.556                | 1                        | 0.556            |
| 36  | Research & Progress of SSE Solid State Electronics| 0.894                | 0.966                    | 0.926            |
| 37  | Lamps & Lighting                                  | 0.813                | 0.963                    | 0.844            |
| 38  | Journal of Guilin University of Electronic Technology | 0.751               | 1                        | 0.751            |
| 39  | Foreign Electronic Measurement Technology          | 0.72                 | 0.911                    | 0.791            |
| 40  | Journal of Hangzhou Dianzi University              | 1                    | 1                        | 1                |
| 41  | Huadian Technology                                | 0.647                | 0.873                    | 0.741            |
| 42  | Journal of Jilin University (Information Science Edition) | 0.855               | 0.918                    | 0.932            |
| 43  | Electronic Products                               | 1                    | 1                        | 1                |
| 44  | Journal of Cryptologic Research                   | 0.946                | 0.998                    | 0.948            |
| 45  | Nano-Micro Letters                                | 0.82                 | 1                        | 0.82             |
| 46  | Journal of Shanghai Dianji University              | 0.903                | 1                        | 0.903            |
| 47  | Journal of Shenzhen Institute of Information Technology | 0.845              | 1                        | 0.845            |
| 48  | Information and Electronic Engineering            | 0.486                | 0.543                    | 0.895            |
| 49  | Microelectronics                                  | 0.659                | 1                        | 0.659            |
| 50  | Microelectronics & Computer                       | 0.611                | 1                        | 0.611            |
| 51  | Micronanoelectronic Technology                    | 0.691                | 0.828                    | 0.835            |
| 52  | Journal of Wuhan University of Technology         | 1                    | 1                        | 1                |

Continued Table 7b.
has a large room for improvement. There are 9 journals with the technical efficiency value below 0.5, accounting for 15% of the total number of sample journals. The number of sample journals with the technical efficiency between 0.5 and 0.8 is large, accounting for 53.333%. The journals with technical efficiency value higher than 0.8 are 19, which accounts for 31.667%. Combined with the detailed information in Table 7, the knowledge dissemination of 7 journals (Light & Lighting, Electronic Product Reliability and Environmental Testing, Journal of University Electronic Science and Technology of China, Journal of Chinese Electron Microscopy Society, etc.) is technically effective.

(2) Pure technical efficiency. The interval distribution of pure technical efficiency in Table 5 shows that the proportion of the interval 0.9-1 is large, with 63.333%. The journals with pure technical efficiency below 0.7 are 8, which is accounting for 13.333% of the total evaluated journals. Combined with the detailed information in Table 7, the pure technical efficiency of journal knowledge dissemination generally performs well. Pure technology has appeared 24 times effectively, including some important electronic technology journals such as Journal of Electronic Measurement and Instrumentation, Journal of Electronics & Information Technology, Acta Electronica Sinica, and Electronic Measurement Technology.

(3) Scale efficiency. The 16.667% ratio falls in the <0.6 range, and the 0.6-0.7 and 0.7-0.8 intervals each accounted for 11.667% and 20%, respectively. The scale efficiency of the knowledge dissemination of the five journals, which are Electronic Science & Technology, China Digital Cable TV, China Radio, Electronic Science and Technology, and Electronic Design Engineering, are all below 0.5. At the same time, the five journals, Electronic Test, Electronic Engineering & Product World for Engineering Managers & Designers, Electronics World, Practical Electronics, and Electronics Quality, also have a low scale efficiency of the knowledge dissemination. The knowledge dissemination of 7 journals, such as Light and Lighting, Electronic Products, Journal of Wuhan University of Technology (Information & Management Engineering), and so on, is effective in scale technology.

(4) In general, the statistical results show that the knowledge dissemination technology efficiency, pure technical efficiency and scale efficiency of the electronic technology journal community have 31%, 10.7% and 22.5% optimization space respectively. The performance of journal community knowledge dissemination is more affected by the inefficiency of scale. Of course, the improvement of pure technical efficiency is also an important way to enhance the efficiency of journal community knowledge dissemination.

### 3.2 Tobit regression results

In order to further clarify the factors affecting the performance of knowledge dissemination in the electronic technical journal community, the EVIEWS 9.0 software package is used for regression analysis. The dependent variable is the efficiency value measured by DEA. Take seven variables listed in Table 2 as independent variables. The results of the regression analysis are shown in Table 8.
Table 8. Tobit regression results.

| Influence factors                          | Model 1 (technical efficiency as the dependent variable) | Model 2 (pure technical efficiency as the dependent variable) | Model 3 (scale efficiency as the dependent variable) |
|-------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------|
| C                                         | 0.2650                                                   | 0.9203 ***                                                  | 0.2402                                              |
|                                           | (1.081)                                                  | (4.1699)                                                   | (1.1836)                                            |
| Academic quality of journals              | 0.2481 *                                                 | 0.2779 *                                                    | 0.0043                                              |
|                                           | (1.7103)                                                 | (2.1281)                                                   | (0.0365)                                            |
| Novelty of the literature used by authors | 0.0252 *                                                 | 0.0024                                                     | 0.0314 ***                                          |
|                                           | (1.7408)                                                 | (0.1882)                                                   | (2.6287)                                            |
| Degree of cooperation of journals         | 0.0002                                                   | 0.0873                                                     | 0.0936 *                                            |
|                                           | (0.0032)                                                 | (1.5391)                                                   | (1.7950)                                            |
| Internationalization level of journals    | 0.1007                                                   | 0.5218                                                     | 0.6670 *                                            |
|                                           | (0.2068)                                                 | (1.1905)                                                   | (1.6550)                                            |
| Institutional distribution of journal     | 1.73 e-05                                                | 0.0001                                                     | 9.93 e-05                                           |
| articles                                  | (0.1998)                                                 | (1.5370)                                                   | (1.3828)                                            |
| Running time                              | 0.0009                                                   | 0.0019                                                     | 0.0008                                              |
|                                           | (0.3029)                                                 | (0.6831)                                                   | (0.3313)                                            |
| Economic status of the region where the   | 3.67 e-06                                                | 1.50 e-06                                                  | 5.49 e-06 *                                         |
| journal is located                        | (1.0782)                                                 | (0.4877)                                                   | (1.9445)                                            |
| Likelihood value                          | 17.2307                                                  | 20.3809                                                    | 22.8960                                             |

Note: All values are rounded off to four decimal places or are expressed in scientific notation; Z statistic are given in parentheses, and the significant levels corresponding to *, **, and *** are 1%, 5%, and 10%, respectively. The intercept terms are all positive values.

According to the empirical results of Tobit regression model 1, model 2, and model 3, we can conclude that: (1) In general, the higher the academic quality of journals, the higher the performance of journal community knowledge dissemination. In other words, the higher the "fund paper ratio" will be beneficial to knowledge production, communication and diffusion. In addition, technical efficiency and pure technical efficiency are significant at the statistical levels of 10% and 5%, respectively. At the same time, however, it should be noted that it has an insignificant negative impact on the scale efficiency of knowledge dissemination. This suggests that simply improving the "fund paper ratio" may be saturated in terms of academic influence on electronic technology journals. Accelerating the connotation construction of journals is more critical than the format of running journals. (2) As an important trend of current knowledge exchange, the cooperation and internationalization of journals are increasing. However, the results in Table 8 show that the cooperation and internationalization of journals has a negative impact on the pure technical efficiency of journal knowledge exchange. It indicates that the overall performance of knowledge exchange in China's electronic technology journals has not been improved accompanying with the enhancement of the cooperation and internationalization of journals. This may be affected by the incomplete implementation of the "going out" strategy in the journal publication and management process. The current reality is that the collaborative papers of electronic technology journals are still dominated by domestic authors, and the internationalization of journals is also lagging behind. This is evident from the average 5% of overseas papers in sample journals. (3) Judging from the universality of institutional distribution of journal articles, this situation has not brought about an increase in the efficiency of journal knowledge exchange, which is quite different from the expected research direction. The possible reason is that the coverage and the academic influence of the current electronic technical journal articles are still insufficient. The journal brand needs to be improved, and the audience of the corresponding journal papers needs to be further increased. (4) The duration of journals and the economic status of the region...
in which the journal is located generally have a positive impact on the efficiency of journal knowledge exchange, which is roughly the same as expected. In general, the location of electronic technology journals is mostly provincial capital cities (including Beijing) or the city with strong economic in various provinces, but it should also be seen that the content and form of publications reflect obvious regional and professional nature. Statistical analysis found that the location of electronic technology journals is mainly dominated by key academic centers and electronic technology industry cluster district. For example, there are 31 journals from Beijing and Xi’an, accounting for more than half of the total number of journals. (5) The novelty of the literature used by authors, which is measured by “cited half-life”, has a negative impact on the performance of knowledge exchange. This result is opposite to the expected direction and passed the significance test. The possible reason is that the basic principles related to electronic technology are knowledge with lower time-sensitive, and their value can be maintained for a long time. Therefore, their influence on knowledge dissemination performance has certain deviations from expectations.

4. Conclusions and recommendations
Using Chinese S&T Journal Citation Reports over the years, this paper focuses on the evaluation of the knowledge dissemination effectiveness of the electronic technology journal community, and demonstrates the factors affecting the knowledge dissemination efficiency of the journal community. The conclusions are as follows: (1) Generally, there is still 31% optimization space for the knowledge dissemination performance of the electronic technology journal community, and the low scale efficiency value has a large impact on it. (2) Journals such as Electronic Products, Light & Lighting, Journal of University Electronic Science and Technology of China, and Journal of Chinese Electron Microscopy Society have relatively higher knowledge dissemination efficiency, and technical efficiency, pure technical efficiency, and scale efficiency are all 1. (3) The academic quality of journal papers is an important factor influencing the efficiency of knowledge dissemination in journal community. The duration of journals and the economic situation of the journal location are also positive factors influencing the effectiveness of knowledge dissemination in electronic technology journals. Independent variables such as degree of journal cooperation, Internationalization level of journals, Institutional distribution of journal articles have limited impact on the effectiveness of journal community knowledge dissemination. In addition, in view of the lower time-sensitive of the electronic technology literature, the influence of the novelty of the literature used by authors, which is measured by “cited half-life”, on the performance of knowledge exchange has a certain deviation from expectations. The conclusions mentioned above give the following enlightenments: First, we should strengthen the construction of the journal community, improve its intrinsic behavioral pattern and value system, and play its important role in the creation of academic environment and knowledge innovation in electronic technology science. Second, it is necessary to strengthen the internal management of the academic journal community of the electronic technology, keep pace with the times, and establish a quality-oriented concept. Third, the transformation of communication mode of the journal community should be accelerated by introducing modern information technology actively and attaching importance to the combination of digitalization and communication channels. Fourth, with the aim of advocating academics, we should strengthen research cooperation and internationalization, and rely on a common platform to use domestic and foreign academic resources.

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References
[1] Zhang, B. (2012) The Current Situation, Problem and Transforming Paths of the Academic Community in China. China Higher Education Research, (11):9-12+98. (in Chinese)
[2] Kuhn, T.S. (1962) The structure of scientific revolutions. Chicago and London.
[3] Wang, L., Zhang, Q.P. (2014) Research on Mechanism of Knowledge Flow Based on Citation Network. Journal of Harbin Institute of Technology (Social Sciences Edition.),16(01):110-116. (in Chinese)
[4] Zhu, Y.G. (2017) English journals in modern Shanghai, construction of academic communities and sino-western cultural exchanges. Journal of Shanghai Normal University (Philosophy & Social Sciences Edition), 46(04):86-93. (in Chinese)
[5] Deng, Y.Y., Wu, Q. H. (2017) Discussion on the role of academic guidance of journals in strengthening the development and cooperation of journals in coastal provinces and regions -- summary of the conference on "construction of journal community". The Journal of South China Sea Studies, 3(03):115-118. (in Chinese)
[6] He, Z.Y. (2004) The Development of the Study of IR Theory in China from an Analysis of the IR Journals: An Investigation Based on the Journal World Economics and Politics. World Economics and Politics, (11):66-74+7. (in Chinese)
[7] Yuan, T.C. (2010) “Community Recognition” Versus “Journals Recognition”: The Paradox of Dynamics of Chinese Academic Knowledge Production. Tsinghua Journal of Education, 31(01):26-31. (in Chinese)
[8] Tan, C.H., Ma, X.J. (2014) The Formation of Informal Academic Community in Library Science Field: A Metric Analysis Based on Journal of Library Science in China from 1998 to 2012. Journal of Intelligence, 33(03):64-71. (in Chinese)
[9] Hou, D.M. (2016) From knowledge dissemination to knowledge growth: the orientation of academic journals as a scientific community. Theoretical Investigation, (03):174-176. (in Chinese)
[10] Zhu, J. (2016) Constructing of the New Order of Academic Communication in the Internet Age – Taking the Development Strategy of University Academic Journals as the Center. Wuhan University Journal (Humanity Sciences), 69(02):66-80. (in Chinese)
[11] Wu, S.M., Li, Z.F. (2017) Influences of Open Access to Scientific Journals on Science Organizational System. Chinese Journal of Scientific and Technical Periodicals, 28(11):979-985. (in Chinese)
[12] Liu, Y., Ye, J.Y., Yuan, X.L. (2011) Road to Freedom: Analyzing Journal Assessment and Its Value Orientation. Journal of Nanjing University (Philosophy, Humanities and Social Sciences), 48(03):147-154+160. (in Chinese)
[13] Jin, H.P. (2015) The Motive Force of the Development of Scientific Journals and Their Future Prospect. Chinese Journal of Scientific and Technical Periodicals, 26(07):699-704. (in Chinese)
[14] Liu, W.S. (2016) Academic journals, academic communities and academic evaluation. Lingnan Journal, (02):5-8. (in Chinese)
[15] Wang, H.B. (2015) The Internal Logic between Academic Communities, Academic Journals and Academic Evaluation. China Social Science Review, (03):69-81+126-127. (in Chinese)
[16] Zhang, L.G., Wang, C.J., Zhang, D., et al. (2017) Evaluating the Research Performances of Tourism Academic Communities of China from 2003 to 2016. Tourism Tribune, 32(12):117-127(in Chinese).
[17] Zhang, L. (2015) Study on Knowledge Exchange Efficiencies and Influencing Factors for Academic Journal Based on the DEA-Tobit Two-step Method. Studies in Science of Science, 33(04):516-521+615. (in Chinese)
[18] Wan, L. (2017) Evaluation of Knowledge Exchange Efficiency and Influence Factors of Academic Journals. Chinese Journal of Scientific and Technical Periodicals, 28(12):1160-1165. (in Chinese)
[19] Wang, H., Wang, S.Q. (2017) Research on Evaluation and Influencing Factors for Knowledge Exchange Efficiency of Library and Intelligence Science Journals [J]. Evaluation, 35(03):134-138+156. (in Chinese)
[20] Wan, L., Cheng, H.P. (2017) Empirical Study on Knowledge Exchange Efficiency Evaluation of Important Journals of Department of Management Sciences—Based on the Super-SBM and SFA Methods [J]. Journal of Modern Information, 37(11):69-73. (in Chinese)

[21] Chen, Y.J., Zhao, X. (2009) Study on Knowledge Exchange of International Information & Library Science Based on the Perspective of Journal Citation Networks. XianDaiTuShuQingBaoJiShu, (06):55-60. (in Chinese)

[22] Liu, C., Li, X.X., Shao, Z.Y. (2017) Analysis on the Influence Degree and the Interdisciplinary Degree Between ‘Library and Information Science’ and ‘Journalism and Communication’ in China -- Based on the Analysis of Journal Citation. Journal of Intelligence, 36(07):111-115+95. (in Chinese)

[23] Li, T.T., Li, X.X. (2016) Informatics Periodical Cross – Citiation Analysis Base on the Citation Content [J]. Journal of Intelligence, 35(02):110-115. (in Chinese)

[24] Zhang, Z.L., Jiang, M.H., Li, X.Y. (2012) Heterogeneous Knowledge Exchange of Important Management Periodicals Selected by Department of Management Sciences of National Science Foundation of China. Chinese Journal of Management, 9(06):792-799. (in Chinese)