

Prioritization Method for Journal Resources in University Disciplines and Empirical Analysis: Postprint

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Abstract

[Purpose/Significance] To construct a unified quantitative method for prioritizing subject journal resource guarantees in universities, thereby enabling refined evaluation of subject journal resource guarantee status in university libraries, providing an important basis for their optimization and improvement, and thus facilitating the construction and development of various disciplines within the institution. [Method/Process] First, starting from users' resource utilization behaviors and needs within the academic research process, comprehensively and systematically identify the construction target set of university subject journals; then quantitatively describe the demand relevance and importance of journals within the target set, propose a priority method and measurement model for university subject journal resource guarantees, and apply it to an empirical analysis of journal resource evaluation for the ESI Biology & Biochemistry discipline at the University of Electronic Science and Technology of China. [Results/Conclusion] This method not only enables quantitative ranking of the guarantee priority of each journal demanded by a university discipline within the library's collection, but also further quantifies the guarantee support level of various full-text databases for that discipline's journals, providing new insights for the evaluation of subject journal resources in university libraries.

Full Text

Preamble

Title: A Method and Empirical Analysis for Prioritizing Subject Journal Resource Guarantee in Universities

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Abstract:

[Objective/Significance] This study develops a unified quantitative method for determining the priority order of subject journal resource guarantee in university libraries, enabling refined evaluation of collection development status and providing an important basis for optimization. This approach aims to support the construction and development of university disciplines. [Method/Process] Beginning with user resource utilization behaviors and needs throughout the academic research process, the study systematically identifies the target set for subject journal construction. It then quantitatively describes the demand relevance and importance of journals within this target set, proposing a priority method and measurement model for subject journal resource guarantee. The model is applied to an empirical analysis of journal resource evaluation for ESI Biology & Biochemistry at the University of Electronic Science and Technology of China. [Result/Conclusion] This method not only enables quantitative ranking of guarantee priority for each journal demanded by a subject, but also quantifies the support degree of full-text databases for that subject's journals, offering new insights for subject journal resource evaluation in university libraries.

Keywords: university library; user needs; subject journal collection; guarantee priority; collection evaluation

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With the proposal and advancement of the “Double First-Class” construction initiative in recent years, the principle of “adhering to a discipline-based approach” has become a crucial guiding ideology for resource development in university libraries. First-class discipline construction forms the foundation of first-class university development, and high-quality discipline literature resources appropriate to the development stage are essential conditions and important support. While discipline literature resources include books, journals, conference papers, dissertations, and other types, journal resources are the preferred and primary resource type in academic research references. Coupled with rising subscription costs, journal resource development and evaluation have attracted significant attention. Meanwhile, as “user-centered” collection development concepts have gained traction, the degree to which user resource needs are satisfied has become an important standard for collection evaluation. A key question facing university libraries is how to determine whether their discipline journal resource allocation optimally meets the research needs of faculty and students and effectively supports discipline construction.

2 Related Research Progress

Discipline attributes constitute a crucial content characteristic of university collections, making discipline literature guarantee analysis a key dimension in collection evaluation both domestically and internationally, with particular emphasis on subject journal resources. Consistent with the two analytical perspectives in collection evaluation, subject journal resource guarantee analysis also follows

two main approaches:

- (1) **Collection-centered perspective.** This approach evaluates the quantity and quality of subject journals in the collection, primarily using list-checking methods to match subject journals against core index directories such as JCR, SCI, SCOPUS, Ulrich's Core, and CSSCI source journals. Studies by Wan Zhaodong et al., Liu Pengnian et al., and Liu Liangbi exemplify this approach. However, these directories represent global or regional disciplinary landscapes and cannot reflect the specific journal demand characteristics of an institution's discipline development stage and research direction.
- (2) **User-centered perspective.** This approach evaluates how well the collection meets subject user needs. Since cited literature in academic papers provides good representation of users' information resource needs, many studies employ citation analysis to compare user citation journals with collection journals, often using core index inclusion or citation frequency as decision-making criteria. A few studies further analyze the journals where papers are published. However, research by D. Rossmann reveals significant gaps between citation analysis results and users' perceived resource satisfaction, indicating that citation analysis alone is insufficient to fully uncover faculty and student resource needs.

Although user-centered subject journal guarantee analysis is more popular among scholars and relatively more abundant, single-perspective analyses have limitations and provide simplistic decision-making bases. Recent research has begun exploring comprehensive approaches, such as studies by Li Hui and Liu Shiyong and Sui Guiling et al., which incorporate journal usage rates and H-index metrics to quantitatively describe both demand degree and academic value. Hua Fang et al. argue that the key to evaluating subject journals lies in defining a target collection for comparison, which determines analysis objectivity. Their study constructs a target collection from both institution-specific and globally highly-cited journals for mechanics at Tsinghua University.

Overall, current research on subject journal guarantee evaluation in university libraries, while covering both collection and user perspectives, remains coarse in scoping journal construction targets, typically relying on simple sets from directories or citation trails without comprehensive, in-depth mining of discipline user needs. Moreover, few studies explore the guarantee priority order for each journal, mostly making direct decisions based on citation frequency or quality indicators, with limited unified quantitative evaluation of both resource demand and quality.

3 Research Design

This study first systematically identifies the scope of journal demands for a university discipline based on users' journal utilization behaviors. It then quantitatively describes various attribute characteristics of journals in the target set

to construct a measurement model for subject journal resource guarantee priority, enabling unified quantification of priority order for each journal. Finally, the model is applied to systematic evaluation of subject journal resource guarantee status.

3.1 Target Set Analysis for Subject Journal Construction

The ultimate purpose of collection development is to meet user information needs, and information behavior represents the externalization and extension of these needs. Systematic in-depth study of information behavior helps directly capture explicit user needs and indirectly infer implicit needs. Therefore, to establish a more complete subject journal resource guarantee system, this study analyzes subject users' journal resource needs from the perspective of resource utilization behaviors throughout the academic research process.

[Figure 1: see original paper] illustrates user resource utilization behaviors in a typical complete academic research process. As shown, users' academic resource utilization runs through the entire research process, 主要包括 three categories: (1) literature investigation (including identifying research gaps and tracking relevant studies); (2) journal selection for submission; and (3) tracking research related to one's own 成果. From the perspective of demand urgency and relevance, resources involved in literature investigation and journal selection constitute direct current needs, while tracking related research represents potential indirect needs. The journal demands involved in these three utilization behaviors constitute the resources needed for discipline development—the target set for subject journal construction.

Based on user resource utilization behavior characteristics, this target set can be constructed as the union of four demand journal subsets, as shown in Table 1 :

- (1) **Subset One:** Citation journals from a university's subject publications—the journals cited in users' literature investigation, directly related to research with high relevance.
- (2) **Subset Two:** Publication journals of a university's subject papers—the journals containing the institution's research outputs, representing direct demand with the highest relevance.
- (3) **Subset Three:** All journals in an authoritative or standard subject directory—the basic range for journal selection, representing potential demand for future discipline expansion despite some direction mismatches.
- (4) **Subset Four:** Citing literature journals that cite the university's subject papers—journals involved in tracking research related to institutional outputs, representing potential demand for future development.

3.2 Construction of Subject Journal Guarantee Priority Measurement Model

In subject journal resource systems, tiered guarantee ensures optimal fund allocation while providing high-quality, urgently needed resources. Demand relevance and resource importance serve as primary bases for priority classification.

3.2.1 Demand Relevance The four demand journal subsets can be divided into “direct demand” and “potential demand” layers. Subsets One and Two are directly utilized by current researchers with high relevance and urgency, warranting higher priority. Subsets Three and Four represent potential needs for future development, with lower priority. Journals overlapping both categories receive the highest priority.

3.2.2 Resource Importance To support discipline development, guaranteed journals should be both relevant and important. Importance manifests in journal quality and local utilization, as detailed in Table 2. Current journal quality evaluation systems are mature, with impact factors and journal partitions widely applied. This study adopts the Chinese Academy of Sciences JCR 分区 as one quality criterion and further employs “ESI highly-cited paper concentration ratio” (the proportion of a journal’s ESI highly-cited papers to the discipline’s total) to assess quality through distribution patterns.

Local utilization is measured through three aspects: citation frequency, publication frequency, and citing frequency of the institution’s disciplinary outputs—represented by local citation volume, publication volume, and citing literature volume in each journal.

3.2.3 Priority Model Comprehensively considering demand relevance and importance, this study constructs the following measurement model for journal m ’s guarantee priority in a single discipline:

$$P_m = I_m \times r$$

Where P_m represents journal m ’s priority value in a subject’s demand set (higher values indicate higher priority). According to literature distribution concentration principles, most disciplinary literature is concentrated in few journals. This study applies the Pareto Principle (80/20 rule) to identify the top 20% priority journals as key resources requiring focused guarantee.

The variable r represents journal m ’s demand relevance coefficient (journals in both direct and potential demand > direct demand only > potential demand only). I_m represents journal m ’s importance, comprising quality level and local utilization:

$$I_m = \sum()_i \times w_q + \sum()_j \times w_u$$

Quality level consists of Chinese Academy of Sciences JCR 分区 (Q_1) and ESI highly-cited paper concentration (Q_2), with weights a_1 and a_2 . Local utilization comprises citation frequency (U_1), publication frequency (U_2), and citing frequency (U_3), with weights b_1 , b_2 , and b_3 . The weights w_q and w_u represent quality and utilization weight coefficients respectively.

To avoid dimensional and scale differences, all indicator data are normalized before calculation. Weight coefficients a_i and b_j are determined using the CRITIC objective weighting method, while r , w_q , and w_u use subjective expert scoring, allowing flexible assignment based on institutional and disciplinary contexts.

Given current journal subscription models relying on full-text databases, journal priority values are aggregated by database to calculate each database's priority value for the discipline, serving as an evaluation metric for database support.

3.3 Evaluation Indicators for Subject Journal Guarantee Status

Resource guarantee, demand satisfaction, and resource utilization are interdependent. Guarantee rate represents the library's provision capacity for a discipline's total journal resources, reflecting collection completeness:

$$\text{Guarantee Rate} = \frac{\text{Library's provided subject journals}}{\text{Total subject journals}} \times 100\%$$

Satisfaction rate reflects how well provided journals match user demand:

$$\text{Satisfaction Rate} = \frac{\text{Library's provided direct-demand journals}}{\text{Total direct-demand journals}} \times 100\%$$

Utilization rate reflects the efficiency of invested resources:

$$\text{Utilization Rate} = \frac{\text{Library's provided direct-demand journals}}{\text{Library's provided subject journals}} \times 100\%$$

These three indicators reveal different collection development states. Under adequate funding, libraries should aim for high guarantee, satisfaction, and utilization rates. Under budget constraints, they should prioritize high satisfaction and utilization rates even with lower guarantee rates, ensuring maximum resource efficiency.

4 Empirical Analysis

4.1 Data Sample

Given that the University of Electronic Science and Technology of China (UESTC) has long focused collection development on mainstream key disciplines, and based on the library's 2015 "Academic Resource Guarantee and

Satisfaction Assessment Report” showing strong support for these disciplines, this study selected Biology & Biochemistry—once a potential ESI discipline (July 2017) that entered the top 1% in May 2018—to evaluate its journal resource guarantee status.

The four demand journal subsets for UESTC’s ESI Biology & Biochemistry are shown in Table 3 :

- **Subset One:** Citation journals from UESTC’s ESI Biology & Biochemistry publications (2007-2017) from Web of Science, totaling 1,515 journals (215 in the discipline, 1,142 in other ESI disciplines, 158 non-ESI).
- **Subset Two:** Publication journals of UESTC’s papers (2007-2017) from InCites, totaling 76 journals (73 in the discipline, 3 multidisciplinary).
- **Subset Three:** All 419 journals in the ESI Biology & Biochemistry category (October 2017 ESI master journal list), including the 73 discipline journals from Subset Two.
- **Subset Four:** Journals citing UESTC’s discipline papers (2007-2017) from Web of Science, totaling 956 journals (174 in the discipline, 721 in other ESI disciplines, 61 non-ESI).

The union of these subsets yields 2,146 journals as the target collection.

4.2 Journal Analysis

Comparing these 2,146 journals (1,527 direct-demand journals) with library holdings yields the results in Table 4 . The overall guarantee rate is 72.69%, indicating relatively complete collection development. The satisfaction rate is 71.97%, showing high alignment with user demand. The utilization rate is 70.45%, demonstrating good resource efficiency.

Applying the priority model to all 2,146 journals and identifying the top 20% (429 journals) as high-priority resources reveals a guarantee rate of 68.76% for these high-priority journals—lower than the overall rate. Since all 429 are direct-demand journals, satisfaction rate equals guarantee rate at 68.76%, also below overall levels, while utilization reaches 100%. This indicates that UESTC needs to improve guarantee of high-priority journals for Biology & Biochemistry.

4.3 Database Analysis

Locating the 2,146 journals across full-text databases identified 283 databases. Summing journal priority values by database yields database priority values, with the top 10 shown in Figure 2 [Figure 2: see original paper]. Databases A (84.18), B (38.52), and C (31.59) rank highest, indicating they are crucial support databases.

Table 5 details the top 10 databases. Among important databases, those with lower guarantee rates include D (41.82%), F (52.87%), and B (61.47%). Lower satisfaction rates similarly affect D (40.91%), F (56.52%), and B (57.95%). Lower utilization occurs in I (50.72%), H (54.93%), and F (56.52%).

Figure 3 [Figure 3: see original paper] shows the top 10 databases for unguaranteed journals (586 total), while Figure 4 [Figure 4: see original paper] shows databases for unguaranteed high-priority journals (134 journals). Eight databases (B, A, D, K, F, L, N, and E) appear in both rankings, indicating they prominently cover unguaranteed journals overall and at high priority. These merit particular consideration, especially the top three: B, A, and D.

In summary, for Biology & Biochemistry journal resource development, UESTC should consider expanding journals in existing databases B, A, D, F, and E, and potentially acquiring resources from currently unsubscribed databases K, L, and N.

5 Research Summary

As a vital dimension of collection evaluation, subject resources are increasingly important in the “Double First-Class” construction context. This study systematically identifies a subject’s journal construction target set from users’ resource utilization behaviors in the academic research process. Through innovative comprehensive analysis of demand journals, it proposes a quantitative method for subject journal resource guarantee priority and demonstrates its application in evaluating UESTC’s ESI Biology & Biochemistry journal resources.

Empirical results reveal the discipline’s collection status from two dimensions (journals and databases) across three aspects (guarantee rate, satisfaction rate, and utilization rate), providing optimization pathways. The study highlights the need for robust resource information infrastructure to support accurate, comprehensive evaluation aligned with institutional resource systems.

The priority method enables quantitative ranking of guarantee priority for each subject journal and quantifies database support degrees, offering new approaches for subject journal evaluation. Currently limited to single-discipline models, future work should explore multi-discipline priority models to enhance overall collection decision support. Additionally, incorporating journal subscription costs represents a necessary next step for improvement.

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Zhang Yu'e: Responsible for research framework design, guidance, and paper revision.

Ke Jiaxiu: Responsible for data collection/analysis and paper writing/revision.

Du Li: Responsible for research topic selection and paper revision.

Note: Figure translations are in progress. See original paper for figures.

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