Reflections on Evaluating Electronic Resource Subscription Decisions: A Case Study of the Chinese Academy of Sciences Consortial Procurement (Postprint)

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Abstract

[Purpose/Significance] Establish an evaluation indicator system framework for electronic resource subscription decisions that aligns with practical work characteristics, design scientifically rational principles and application models for utilizing evaluation results, and provide support for formulating scientifically sound electronic resource subscription decisions. [Method/Process] By integrating domestic and international theories and practices of electronic resource subscription decision evaluation, and taking the Chinese Academy of Sciences' consortium electronic resource subscription as a case study, analyze and design the evaluation principles, evaluation content, and evaluation indicators for the electronic resource subscription decision evaluation indicator system. [Results/Conclusion] Construct a decision evaluation indicator system framework comprising 5 evaluation dimensions and 18 evaluation indicators, and propose the evaluation result application principles of "demand priority, quality assurance, cost optimization, and comprehensive consideration," as well as application models of vertical comparison, horizontal comparison, and categorical comparison for evaluation results.

Full Text

Considerations on Electronic Resource Acquisition Decision Evaluation: A Case Study of Group Purchasing at the Chinese Academy of Sciences

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Abstract

[**Purpose/Significance**] Taking into account the characteristics of electronic resources acquisition work, this paper establishes a framework for an acquisition decision evaluation indicator system and builds application guidelines for its use in order to support scientific and reasonable acquisition decision-making. [**Method/Process**] Based on the theory and practice of electronic resource acquisition decision evaluation from major domestic and international information institutions, and taking the Chinese Academy of Sciences (CAS) Consortium's electronic resources acquisition as an example, this paper analyzes and designs the evaluation principles, evaluation content, and evaluation indicators for the electronic resource acquisition decision evaluation indicator system. [**Result/Conclusion**] The paper constructs a decision evaluation indicator system framework containing five evaluation dimensions and eighteen indicators, proposes the application principle of "demand first, quality guarantee, cost optimization, and comprehensive consideration," and presents three application models: vertical comparison, horizontal comparison, and categorical comparison.

Keywords: electronic resources; group purchasing; acquisition decision evaluation; indicator system
Classification Number: G250

Introduction

With the rapid development of computer networking, electronic resources have become the focus of collection development for literature service institutions and research organizations both domestically and internationally. According to statistics released by the National Science Library of Chinese Academy of Sciences in April 2017 [1], the CAS Consortium purchased over 170 databases in the previous year, including nearly 17,000 foreign electronic journals, over 110,000 foreign electronic books, and more than 600,000 foreign dissertations; as well as 17,000 Chinese electronic journals, over 380,000 Chinese books, and more than 3.11 million Chinese dissertations. The volume of electronic resources has achieved rapid growth.

As the content of subscribed electronic resources continues to expand and diversify, acquisition costs have risen year by year. Subscribing institutions are increasingly concerned about whether their financial investment in electronic resources is reasonable, whether the resource structure meets disciplinary requirements, and whether the content satisfies research needs. Some libraries indirectly evaluate the service effectiveness of subscribed electronic resources by assessing library service quality, while others directly evaluate usage effectiveness through quantitative indicators such as user statistics. However, these evaluation methods focus on assessing the service effectiveness of subscribed resources for users, and their results rarely provide decisive support for pre-

acquisition decision-making. Yet scientific and reasonable acquisition decisions directly determine the quality of electronic resource subscriptions.

This paper combines domestic and international research and practice in electronic resource acquisition decision evaluation with the actual characteristics of CAS Consortium's electronic resources acquisition work to discuss the evaluation principles, content, and result application principles that should be considered in electronic resource acquisition decision evaluation, providing references for conducting such evaluations.

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1. Domestic and International Research on Electronic Resource Acquisition Decision Evaluation

A systematic review and analysis of research findings and practical experiences in electronic resource acquisition decision evaluation reveals that, based on the classification of evaluation dimensions and content, the electronic resource acquisition decision evaluation indicator systems designed and implemented by domestic and international institutions mainly fall into two types: "demand-driven, budget-guaranteed" and "resource quality-focused."

1.1 "Demand-Driven, Budget-Guaranteed" Type This type of evaluation system prioritizes user demand while considering the resource purchaser's budget and financial capacity. Its main characteristics are that the alignment between electronic resource content and user needs, the degree of demand satisfaction, and acquisition price constitute the primary evaluation dimensions. Specific indicators include "subject/content," "target user group/scope," "usage statistics," "demand level," "cost," "price comparison with similar products," "price comparison across different formats," and "annual price increase limits." It also includes indicators for vendor capability, technical support, and platform functionality, such as "publisher support," "technical support services," "hardware/software availability," "usage models," and "system functionality and reliability."

Major institutions employing this type include the Taiwan Academic Electronic Information Resources Sharing Consortium (CONCERT) [2], Hong Kong University Library [3], The Center of Research Libraries (CRL) [4], Canadian Research Knowledge Network (CRKN) [5], University of Maryland Libraries [6], and Florida Atlantic University Libraries [7].

1.2 "Resource Quality-Focused" Type This evaluation system considers resource quality/content as the primary factor for acquisition decisions. Its main characteristic is that resource quality forms the core evaluation dimension, with specific indicators such as "database content and quality," "sustainability of digital literature," and "quality of digitization and information systems." It also includes indicators for database retrieval systems and local system compatibility,

such as "system performance," "platform stability," and "compatibility with local library systems."

The Digital Resource Acquisition Alliance (DRAA) of Chinese university libraries [8] and the German Research Foundation (DFG) [9] employ this type of system.

Analysis of these different types of evaluation systems reveals that they reflect institutional characteristics—that is, the specific features and tasks of an institution's electronic resources acquisition work are embodied in the concrete evaluation content and indicators, ensuring the evaluation system serves actual acquisition work. For example, DRAA's mission is to "unite and cooperate in digital resource acquisition, standardize group purchasing behavior, and secure optimal prices and best services for member libraries." Therefore, the alliance examines whether electronic resource quality meets the requirements of "digital academic resources" and achieves "optimal prices and best services" by standardizing vendor service behavior and effectiveness. For CONCERT, its purpose is to introduce electronic resources at the most favorable prices to save procurement funds and manpower, which determines that its evaluation focuses on user demand satisfaction and cost efficiency control.

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2. Analysis and Design of the CAS Consortium Electronic Resource Acquisition Decision Evaluation Indicator System Framework

An institution's acquisition work characteristics determine its evaluation indicator system. Therefore, before discussing the CAS Consortium framework, we first analyze the features of its electronic resources acquisition work, then design the evaluation principles, content, and quantitative methods. For convenience, we refer to the "CAS Consortium Electronic Resource Acquisition Decision Evaluation Indicator System" as the "decision evaluation indicator system."

2.1 Characteristics of CAS Consortium Electronic Resources Acquisition Work Currently, CAS Consortium's electronic resources acquisition has three main characteristics:

(1) **Content focuses primarily on natural sciences.** This is determined by the research directions and fields of CAS institutes. CAS research concentrates mainly on natural sciences, with limited involvement in social sciences or interdisciplinary fields (e.g., Institutes of Science and Technology Consulting, History of Natural Sciences, and Psychology). This determines that CAS Consortium's electronic resources are predominantly natural science resources, supplemented by a small amount of social science resources.

(2) **Full-text journal databases as the core, supplemented by abstract and tool databases.** CAS Consortium primarily subscribes to

full-text journal databases, supplemented by abstract and tool databases such as Clarivate's Web of Science (WOS) and Thomson Data Analyzer (TDA), and the American Chemical Society's SciFinder. This relates to researchers' methods of accessing and utilizing research information and their reading habits.

(3) **Increasing diversification of resource types.** With the enrichment of online resources, traditional literature resource types have expanded significantly, including practical software resources, data resources, experimental reagent data, and image data. The proportion of such new literature resources in CAS Consortium's subscriptions is gradually increasing, such as EndNote software for editing and managing references, the China InfoBank database providing economic and social statistics from various countries, and the InCites database helping research managers understand field trends. Simultaneously, the proportion of open-access electronic resources accessible to the CAS Consortium is gradually increasing, including: (i) open-access educational courseware (e.g., Open Education Consortium, MIT OpenCourseWare, Open University's Course, Chinese Guokr MOOC Academy); (ii) open-access scientific data (e.g., Global Biodiversity Information Facility, China Virtual Observatory for Astronomy, DataCloud of China); and (iii) open-access journals (e.g., journals from HighWire Press, PubMed Central).

2.2 Design of Evaluation Principles Drawing on evaluation principles from major domestic and international information institutions [10-12] and considering CAS Consortium's acquisition characteristics, the evaluation principles should include:

(1) **Quantitative evaluation as primary, qualitative as supplementary.** Evaluation indicators should be primarily quantitative to provide decision-makers with intuitive, objective data for acquisition decisions.

(2) **Systematic principle.** The number of indicators should be appropriate—sufficient to reflect acquisition work characteristics, demand patterns, and resource features without being overly complex or redundant. Indicators should have primary and secondary importance levels. Based on practical experience and requirements, the importance of each indicator can be predetermined, assigning attributes like "core indicator" or "extended indicator" to emphasize key metrics and de-emphasize auxiliary ones. This ensures the system comprehensively reflects electronic resource acquisition while maintaining clear priorities and structure, facilitating result acquisition and application.

(3) **Feasibility principle.** Data required for indicators and data processing methods must be accurate and reliable to ensure evaluation results can inform acquisition decisions. Additionally, the time-benefit trade-off of data collection and processing must be considered.

2.3 Design of Evaluation Content CAS resource development requirements align with the "demand-driven, budget-guaranteed" evaluation system, focusing on user demand satisfaction and cost efficiency while ensuring authoritative, high-quality content. Therefore, the evaluation content includes:

(1) **User Demand.** Evaluates user demand for subscribed electronic resources. Given CAS Consortium's characteristics—natural science resources as the main body with limited social sciences, and diversified resource types—evaluation indicators should measure demand intensity and breadth. Specific indicators include: (i) applicable user scope/ratio; (ii) usage proportion/ranking among similar resources or within the same discipline; and for full-text resources, (iii) the scope/ratio of subscribed resources with actual usage.

(2) **Resource Quality and Content.** Evaluates the quality and content of subscribed resources. Considering CAS Consortium's focus on full-text journals supplemented by abstract and tool databases, indicators include: (i) resource coverage period; (ii) content overlap with existing subscriptions; (iii) resource update cycle/frequency; and (iv) publisher reputation in the field.

(3) **Usage Effectiveness.** Evaluates resource utilization, including usage volume during specific periods, trial usage, and denial-of-access incidents.

(4) **Acquisition Cost.** Evaluates procurement costs and changes, including price increases, resource acquisition costs, and cost variations.

(5) **Personalized Services.** Given the trend toward diversified resource types, the evaluation system must consider whether subscribed resources offer personalized services, including: specialized retrieval technology, specialized indexing technology, specialized resource organization technology, and user access restrictions.

Based on this analysis, the main framework of the decision evaluation indicator system—including evaluation content, indicators, and their meanings—is presented in Table 1 .

2.4 Design of Quantitative Evaluation Methods With the framework established, a quantitative evaluation method using weighted calculations transforms indicator values into quantitative results for decision reference. Key aspects include:

(1) **Indicator Value Assignment.** Indicators fall into three types: numerical, quantitative, and scoring. Numerical indicators (e.g., "applicable user scope/ratio") are calculated directly. Quantitative indicators are binary (yes/no), such as "specialized retrieval technology." Scoring indicators assign values within a scoring range, such as "resource content update frequency." Values should be assigned based on actual acquisition conditions.

(2) **Standardization.** All three indicator types require standardization to enable weighted calculation. Numerical and scoring indicators use classic min-max normalization, while quantitative indicators use normalization methods. This scales all indicators to the [0,1] interval, enabling comparison and weighting.

(3) **Weight Determination.** Weights are determined through three steps: priority ranking, initial weight calculation, and weight adjustment. Priority ranking orders indicators by importance in actual acquisition decisions. Initial weight calculation assigns values to these priorities and normalizes them to sum to 1. Weight adjustment fine-tunes these values based on practical experience to ensure alignment with actual work.

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3. Application Principles and Models for Evaluation Results

The quantitative evaluation results provide objective measurements that must offer systematic, hierarchical evaluation data to decision-makers. Application should follow the principle of "demand first, quality guarantee, cost optimization, and comprehensive consideration":

(1) **Demand-centric.** Resources should meet the needs of CAS's frontline research and teaching with clear demand sources and sufficient scale.

(2) **Quality guarantee.** Based on user needs, prioritize high-quality resources and personalized functions to support research and teaching quality improvement.

(3) **Cost optimization.** While meeting user demand and quality requirements, continuously optimize cost-effectiveness and adjust resource allocation structures within budget constraints.

(4) **Comprehensive consideration.** Pay special attention to prominent weak indicators in the evaluation system during acquisition decisions.

Evaluation results can be applied through three models:

(1) **Model I: Vertical Comparison of Individual Resources.** For individual resources, construct longitudinal evaluation data across acquisition cycles to analyze: (i) changes and trends in user demand, content quality, usage effectiveness, and acquisition costs; (ii) overall evaluation result changes and trends to inform acquisition decisions; and (iii) relationships between dimension-specific trends and overall trends to identify key influencing factors.

In vertical comparison, individual resources may exhibit sporadic or universal demand patterns, or transition between them. When applying this framework, if data is available, consider adding quantitative indicators like "document delivery

cost" and "third-party resource sharing cost," and qualitative indicators like "core user evaluation" to supplement decision-making information.

(2) **Model II: Horizontal Comparison Among Multiple Resources.** For multiple similar resources, analyze: (i) differences in specific evaluation dimensions and indicators to identify relative strengths and weaknesses; (ii) differences in overall evaluation results to rank acquisition priorities; and (iii) provide priority rankings at both overall and specific indicator levels to inform decisions.

(3) **Model III: Comparison Across Different Resource Types.** Classify resources by language (Chinese/foreign), discipline (e.g., chemistry/biology), or literature type (e.g., abstract/full-text), then evaluate categories to analyze: (i) relative strengths and weaknesses in overall demand, usage effectiveness, acquisition costs, and personalized services for each category; and (ii) comparative advantages and disadvantages across different resource types to help decision-makers assess overall user demand satisfaction and identify strengths and gaps in the resource provision system.

Implementation Requirements

While this paper discusses the principles, content, and indicators for building an electronic resource acquisition decision evaluation indicator system using the CAS Consortium as an example, practical implementation requires:

(1) **Refining indicators.** Adjust and optimize specific indicators, determine value assignment methods and weights, and conduct sample experiments and system adjustments.

(2) **Conducting actual evaluations.** Based on evaluation objectives, collect and organize relevant data, perform calculations, comparisons, analysis, and evaluation to obtain final results.

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Author Contributions

Zhai Shuang: Collected and organized domestic and international research on electronic resource acquisition decision evaluation.
Luo Qishan: Analyzed CAS electronic resources acquisition characteristics; analyzed and designed evaluation principles, content, and indicators; constructed the evaluation indicator system framework.
Zhang Jing: Designed application principles and models for the acquisition decision evaluation indicator system framework.

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