Research and Development of Performance Evaluation for Technology Support in Electronic Resources Acquisition by Research Institutions: A Case Study of the Chinese Academy of Sciences Consortium's Procurement of Foreign Electronic Journals (Postprint)

Authors: Zhu Xuejun, Luo Qishan, Zhao Yan

Date: 2023-04-01T16:16:05+00:00

Abstract

[Purpose/Significance] This paper introduces the work conducted and preliminary achievements obtained by the National Science Library, Chinese Academy of Sciences in the field of electronic resources science and technology support performance evaluation, providing a useful reference for research institutions undertaking similar evaluation efforts.

[Method/Process] By integrating theories and practices of electronic resources effectiveness evaluation from both domestic and international sources, we construct an indicator system for electronic resources science and technology support performance evaluation using foreign-language e-journals as a case study, and conduct empirical evaluation; simultaneously, according to the science and technology support performance evaluation needs of research institutes, we supplement and improve the indicator system oriented toward institute-level evaluation purposes.

[Results/Conclusion] Through empirical evaluation, the constructed foreign-language e-journals science and technology support performance indicator system demonstrates operability; simultaneously, by integrating the evaluation needs of research institutes, we have reformed and constructed a foreign-language e-journals science and technology support evaluation indicator system that meets the evaluation requirements of both the consortium-leading unit and individual research institutes, specifically comprising 4 evaluation dimensions and 16 evaluation indicators.

Full Text

Preamble

Research and Development on Scientific Support Performance Evaluation of Electronic Resources in Research Institutions—A Case Study of Foreign E-Journals Subscribed by the Chinese Academy of Sciences Consortium

Zhu Xuejun[1], Luo Qishan[1,2], Zhao Yan[1,2]
[1] National Science Library, Chinese Academy of Sciences, Beijing 100190
[2] Department of Library, Information and Archives Management, School of Economics and Management, University of Chinese Academy of Sciences, Beijing 100190

Abstract: [Purpose/Significance] This paper introduces the work undertaken and preliminary achievements made by the National Science Library, Chinese Academy of Sciences (CAS) in the field of scientific support performance evaluation of electronic resources, providing a useful reference for research institutions conducting similar evaluations. [Method/Process] Drawing on domestic and international theories and practices of outcome assessment, we constructed an evaluation index system for scientific support performance of electronic resources, using foreign e-journals as a case study, and conducted empirical evaluations. Additionally, based on institutes' evaluation needs, we supplemented and improved the index system to better serve institutional assessment purposes. [Result/Conclusion] The empirical evaluation demonstrates that the constructed index system for foreign e-journals is operable. By integrating institutes' evaluation requirements, we developed an improved evaluation system containing 4 assessment dimensions and 16 indicators to meet the needs of both the consortium coordinating body and individual institutes.

Keywords: Foreign E-Journals; Consortium Purchasing; Scientific Support Performance; Evaluation Index System
Classification Number: G250
DOI: 10.13266/j.issn.0252-3116.2020.24.007

With the rapid development of computer networking, electronic resources have become the primary information source for researchers. As resource content continues to expand and diversify, the costs of subscribing to scientific electronic resources have risen sharply, prompting subscribers to increasingly focus on evaluating how effectively these resources support scientific innovation. Such evaluations help determine whether investments are justified, whether resource structures align with disciplinary needs, and whether content meets research demands. The *Guidelines for Digital Library Resource Management* recently issued by the National Digital Library Construction and Service Joint Conference explicitly identifies "establishing and improving resource support effectiveness evaluation systems and conducting regular or annual assessments" as a core task in digital library resource management [1]. This reflects a consensus among dig-

ital library resource developers on the need to evaluate the support effectiveness of subscribed electronic resources.

Since 2002, the National Science Library, Chinese Academy of Sciences (hereinafter "the Library") has coordinated consortium purchasing of scientific electronic resources for CAS. Faced with escalating resource volumes and subscription costs, the Library began exploring methods to evaluate the support effects of consortium resources on users' scientific innovation activities in 2011. Drawing on existing research findings in relevant evaluation fields and practical work requirements, the Library established an evaluation index system for scientific support performance of electronic resources, using foreign e-journals as a case study. Furthermore, in response to institutes' needs for evaluating subscribed scientific electronic resources, the system was supplemented and improved. This paper introduces the exploratory work and preliminary achievements in this domain to provide a reference for advancing scientific, effective, and operable evaluation practices.

1. Research and Practice Progress in Outcome Assessment

International library service quality evaluation systems primarily comprise two frameworks: performance assessment and outcome assessment [2]. The scientific support performance evaluation research conducted in this study aligns more closely with the theoretical concept of outcome assessment. Therefore, we focus on research achievements and practical progress in the outcome assessment field.

1.1 Theoretical Research Achievements in Outcome Assessment

Outcome assessment originated in European and American libraries, with the 1998 white paper *Academic Library Outcome Assessment Report* published by ACRL (Association of College and Research Libraries) serving as a milestone. This document systematically elaborated on the concepts and principles of outcome assessment and demonstrated implementation through case studies [3]. Subsequent research and practice by academic libraries at home and abroad have continuously refined outcome assessment theories.

After years of research by major foreign institutions including ACRL, IMLS (Institute of Museum and Library Services), and ISO (International Organization for Standardization), two perspectives on outcome assessment have emerged. One view assesses changes or successes experienced by individual library users after utilizing library resources, services, and activities, including improvements in skills, knowledge, capabilities, and behaviors [4]. The other perspective evaluates the value generated by library programs and services based on changes observed in library users [5].

Outcome assessment focuses on evaluating and planning around changes in library users. Consequently, different libraries as assessment subjects design different outcome assessment indicators according to their own characteristics and specific missions. Despite variations in specific indicators, the main assessment

content remains consistent [3]: (1) Evaluation of changes in academic performance; (2) Evaluation of changes in career prospects; (3) Evaluation of changes in academic development; (4) Evaluation of changes in students' information literacy; (5) Evaluation of changes in faculty teaching; and (6) Evaluation of changes in students' future successful lives.

1.2 International Practice Progress in Outcome Assessment

The impact assessment initiative jointly implemented by SCONUL (Society of College, National and University Libraries) and LIRG (Library and Information Research Group) began in 2003 [6], with 22 university libraries participating. The project assessed how specific services or innovative activities affected learning, teaching, and research at each institution. Using action research methodology [7], the project involved: participating libraries selecting evaluation content, establishing specific assessment topics, designing "success criteria" benchmarks, developing evaluation methods, identifying evidence to be collected, and employing appropriate means to gather such evidence. This approach enabled each library to design personalized evaluation content, topics, and methods, thereby exploring and establishing impact assessment systems and methodologies through the 22 case libraries. This initiative provided a theoretical foundation for SCONUL's subsequent Value and Impact Programme (VAMP).

ACRL's Assessment in Action (AiA) project launched in 2013, with over 200 higher education institutions participating in the following three years [8]. Each institution formed an assessment team that designed evaluation content, indicators, and methods based on their specific requirements and ACRL's established principles and standards. The three-year project fully assessed and demonstrated the positive impact of academic libraries on student success, helping institutions recognize libraries' role in research teams and their capacity to guide outcome assessment initiatives.

1.3 Domestic Practice Progress in Outcome Assessment

Similar to international practice, outcome assessment in China has primarily been conducted by academic libraries. Drawing on the *Evaluation Indicators and Methods for Academic Libraries (2010 Revised Draft)* issued by the Ministry of Education [9], evaluations cover nearly 60 indicators across five dimensions: operational conditions, collection development, automation/networking/digitalization, user services, and scientific management. These indicators focus on assessing library work quality, differing significantly from outcome assessment practices abroad. Systematic evaluation of how electronic resources impact users' scientific research activities has yet to be found in China.

2. Framework for the "Scientific Support Performance Evaluation" System

2.1 Connotation and Evaluation Approach of "Scientific Support Performance Evaluation"

Drawing on domestic and international theoretical research and practical experience in outcome assessment, particularly in higher education institutions, we define "scientific support performance evaluation" as assessing the support effectiveness of consortium-subscribed electronic resources on researchers' scientific innovation activities, particularly their impact on literature usage behavior, demand satisfaction, and research output. This differs from current evaluations that focus solely on student impact.

Based on this connotation and the evaluation approaches used in outcome assessment, our evaluation approach is: during a specific period, assess changes in CAS researchers' literature usage behavior, literature demands, and research output resulting from the consortium's electronic resources. Through evaluation, we analyze the impact/contribution of subscribed resources on CAS users' research activities and output, as well as existing deficiencies, thereby providing references for improving resource development.

2.2 Design of the Scientific Support Performance Evaluation Index System

According to the connotation and evaluation approach, we transformed "scientific support performance evaluation" into assessments of user utilization, demand satisfaction, and research output. The resulting index system contains three evaluation dimensions and eight indicators, as shown in .

The basic data required for calculating these indicators include: consortium foreign e-journal download statistics, foreign e-journal subscription lists, participating institute lists, SCI/JCR/Ei journal lists, CAS publication journal lists, SCI citation journal lists, DII patent lists, and DII patent citation lists.

3. Case Evaluation of Foreign E-Journals' Scientific Support Performance

CAS consortium resource subscription began in 2002. After nearly five years of rapid development, a stable scientific electronic resource guarantee system was basically formed by 2007, with foreign e-journals' impact on users' research activities becoming evident. Therefore, we selected 2007-2010 as the typical period for case evaluation.

3.1 Calculation Results of Case Evaluation Indicators

The calculated values for each indicator from 2007-2010 are shown in .

The results reveal the following trends: (1) In "user utilization": "average downloads per journal" declined slightly in 2008 but then increased steadily. (2) In "demand satisfaction": "average accessible journals per institute" grew steadily in 2007-2008 but decreased slightly in 2009-2010; "accessible resource quality" and "demand satisfaction rate" remained stable, with the former at approximately 72% and the latter at approximately 80%. (3) In "user research output": "number of published articles" increased steadily; "journal coverage for publications" remained stable at around 82%; "number of patent applications" increased rapidly; and "journal coverage in patent citations" remained stable at approximately 33%.

3.2 Analysis of Case Evaluation Results

Analysis of the 2007-2010 evaluation results indicates that CAS consortium foreign e-journals produced positive scientific support effects on users' research innovation activities, manifested in three aspects:

First, the resources guided researchers toward "instant access" literature usage behavior, as evidenced by the steady growth in "average downloads per journal." Second, they effectively satisfied researchers' demand for high-quality scientific literature. The stable growth in "accessible resource quality" and "demand satisfaction rate" demonstrates that: the consortium increased subscribed foreign e-journals from 4,385 titles in 2007 to 6,411 in 2010 (a 46.2% increase), while maintaining "accessible resource quality" at 72%, strongly supporting demand for high-quality literature; and the stable "demand satisfaction rate" alongside growing downloads indicates that subscribed journals received high user attention and usage. Approximately 80% of foreign journals cited by users came from consortium subscriptions, demonstrating robust support for CAS researchers' literature needs.

Third, the resources promoted high-quality research output. This is evident from: "journal coverage for publications" remaining stable at around 83% despite rapid growth in CAS publications (the number of journal titles used for publications increased from 1,722 in 2007 to 1,978 in 2010); and "journal coverage in patent citations" remaining stable at around 33% despite surging patent applications (cited journal titles increased from 313 in 2007 to 819 in 2010).

4. Development of Scientific Support Performance Evaluation Under Consortium Resource Growth

From 2002 to 2020, the volume of accessible scientific electronic resources and financial investment through consortium purchasing reached substantial scale, intensifying institutes' demand for scientific support performance evaluation. Although the case evaluation demonstrated operability of the foreign e-journal evaluation index system, gaps remained relative to institutes' own evaluation purposes, hindering their assessment efforts. Through multiple analyses and

incorporating institutes' evaluation needs, the following improvements were proposed:

(1) Given substantial institutional investment in electronic resources, cost evaluation should be added as a primary purpose, including: resource procurement cost, cost reduction through consortium participation, price increase rate, and cost per download.

(2) In "user utilization," add "title usage rate" and "download ranking" indicators. "Title usage rate" evaluates the efficiency of whole-database subscription models, while "download ranking" helps assess resource guarantee effectiveness from a usage distribution perspective.

(3) In "demand satisfaction," adjust "average accessible journals per institute" to "average accessible journals per capita" to eliminate personnel change effects, and add "resource coverage time span" to reflect temporal content expansion.

(4) In "user research output," add "average publications per capita in SCIE/JCR/Ei-indexed journals" to eliminate personnel change effects.

The resulting foreign e-journal scientific support evaluation index system, applicable to both consortium coordinating bodies and individual institutes, is shown in .

The improved system contains 4 evaluation dimensions and 16 indicators. Calculating these indicators requires diverse data including institute FTE (full-time employee) counts, publication lists, citation lists, usage statistics, resource subscription lists, and financial data. To ensure calculation accuracy and enable real-time query of results, and to meet CAS's requirements for platform-based, standardized management of consortium resources, this index system is being developed into a platform—the Institute-Consortium Collaborative Electronic Resources Procurement Performance Evaluation and Optimization Analysis Service Platform. All CAS institutes will access their scientific support performance evaluation results through this platform to support data-driven improvement of resource guarantee effectiveness.

References

[1] *Guidelines for Digital Library Resource Management* Released [EB/OL]. [2020-11-06]. http://www.lsc.org.cn/contents/1186/14755/.

[2] Zhang Hongxia. International Library Service Quality Evaluation: Formation and Development of Performance Assessment and Outcome Assessment Systems [J]. Journal of Library Science in China, 2009, 35(1): 78-85.

[3] American Library Association. Task Force on Academic Library Outcomes Assessment Report [EB/OL]. [2020-11-17]. http://www.ala.org/acrl/publications/whitepapers/taskforceacader

[4] Institute of Museum and Library Services. Outcome-based Evaluation

Basics [EB/OL]. [2020-11-19]. https://www.imls.gov/grants/outcome-based-evaluation/basics.

[5] American Library Association. Standards for Libraries in Higher Education [EB/OL]. [2020-11-19]. http://www.ala.org/acrl/standards/standardslibraries.

[6] Blagden P. The LIRG/SCONUL Measuring Impact Initiative Overview of Phase 1 Impact Projects [J/OL]. [2020-11-19]. https://www.lirgjournal.org.uk/index.php/lir/article/view/184.

[7] Payne P, Conyers A. Measuring the Impact of Higher Education Libraries: The LIRG/SCONUL Impact Implementation Initiative [J/OL]. [2020-11-19]. https://www.lirgjournal.org.uk/index.php/lir/article/view/180.

[8] Association of College and Research Libraries. Academic Library Impact on Student Learning and Success: Findings from Assessment in Action Team Projects [R]. Chicago: ACRL, 2017.

[9] Steering Committee for Academic Libraries, Ministry of Education. *Evaluation Indicators and Methods for Academic Libraries (2010 Revised Draft)* [EB/OL]. [2020-11-06]. http://www.scal.edu.cn/tjpg/202006030136.

Author Contributions

Zhu Xuejun: Framework design and paper revision;
Luo Qishan: Research design, data collection, and paper writing;
Zhao Yan: Paper revision.

Study on Scientific Outcome Assessment of E-resources Subscribed by Research Institutions—A Case Study of CAS Consortium's Foreign E-journals

Zhu Xuejun[1], Luo Qishan[1],[2], Zhao Yan[1],[2]
[1] National Science Library of Chinese Academy of Sciences, Beijing 100190
[2] Department of Library, Information and Archives Management, School of Economics and Management, University of Chinese Academy of Sciences, Beijing 100190

Abstract: [Purpose/significance] This paper mainly introduced the e-resources scientific outcome assessment index system and relevant practice carried by National Science Library, CAS, in order to provide useful suggestion for scientific outcome assessment. [Method/process] Based on the theory and experience of outcome assessment carried by the main libraries at home and abroad, the e-resources scientific outcome assessment index system is established and applied to assess foreign e-journals scientific outcome, and is improved combined with the assessment needs of National Science Library, CAS and CAS's institutions. [Result/conclusion] The e-resources scientific outcome assessment index system is operable, and is improved, containing 4 assessment aspects and 16 indicators, to meet the assessment needs of National Science Library, CAS and CAS's institutions.

Keywords: foreign e-journals; consortium purchasing; scientific outcome assessment; evaluation index system

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