Practical Exploration of Applying ERS to Evaluate Foreign E-book Performance: A Case Study of the University of Electronic Science and Technology of China (Postprint)

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Abstract

[Purpose/Significance] In the pan-knowledge environment, digital literature resources supporting university teaching and research are growing rapidly. To escape the dilemma of benefit evaluation brought by massive digital resources, the Electronic Resource Utilization Performance Analysis System (Electronical Resource System, ERS) for exploring dynamic management and evaluation of digital resources has emerged. [Method/Process] The library of University of Electronic Science and Technology of China introduced ERS, based on built-in data from local servers, configured collection resource data, procurement fund data, and COUNTER usage data, and by referencing the platform's computational concepts and methods, designed resource evaluation indicators from three dimensions: user demand, academic benefit, and cost benefit, to construct a performance evaluation model for foreign language e-books. [Results/Conclusion] The performance evaluation model based on ERS will provide practical guidance for the frontline of foreign language book resource acquisition, promoting tangible and grounded business operations, improving acquisition quality, enhancing fund utilization efficiency, optimizing procurement budgets and decision-making, and better realizing the support and promotion of literature resources for university teaching and research.

Full Text

Performance Evaluation of Foreign E-books Using ERS: A Case Study of UESTC Library

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Abstract: *[Purpose/Significance]* In the general knowledge environment, digital resources supporting university teaching and scientific research are growing rapidly. To address the evaluation dilemma posed by massive digital resources, the Electronic Resource System (ERS) has emerged to explore dynamic management and assessment of digital resources. *[Method/Process]* The UESTC Library introduced ERS, configuring collection resource data, procurement fund data, and COUNTER usage data based on built-in local server data. Referring to the platform's calculation ideas and methods, we designed resource evaluation indicators and constructed a performance evaluation model for foreign e-books from three dimensions: user demand, academic benefit, and cost-effectiveness. *[Result/Conclusion]* The performance evaluation model based on ERS will provide practical guidance for frontline foreign book acquisition work, improve acquisition quality, enhance fund utilization efficiency, optimize procurement budgets and decision-making, and better ensure and promote literature resources for university teaching and research.

Keywords: ERS; foreign e-books; performance evaluation
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Since 2015, when the State Council officially released the "Overall Plan for Coordinately Promoting the Construction of World-Class Universities and First-Class Disciplines," its basic principle of "adhering to a discipline-based approach" has pointed the direction for university literature resource construction. As a fundamental guarantee for disciplinary development, literature resources should be given high priority for precise construction. Academic monographs provide more systematic, reliable, and mature academic content, serving as both an important manifestation of academic researchers' achievements and a crucial carrier of research findings in various fields, making them indispensable academic resources for higher education and scientific research.

According to the university library fact database (2016-2018), seven benchmark institutions were selected: Tsinghua University, Huazhong University of Science and Technology, Shanghai Jiao Tong University (hereinafter "SJTU"), Southeast University, Xidian University, South China University of Technology, and Beijing University of Posts and Telecommunications. The data reveals that as industry and academia increasingly demand academic monographs, libraries have generally intensified foreign e-book construction, with three-year cumulative investments ranging from millions to over ten million RMB. However, foreign language collection development faces numerous constraints: high costs, long procurement cycles, diverse varieties, suboptimal usage, and challenges in balancing print and electronic formats. Moreover, while the industry is exploring performance evaluation for book resources, there remains a lack of universally recognized evaluation indicators and systems. Additionally, the visibility of research output improvement is insufficient. For example, SJTU's analysis of Scopus references over five years shows that while the world average citation rate for book resources is 15.7%, Chinese scholars' citation proportion is only

7.5%. This low visibility makes it difficult for libraries to make reasonable research funding and evaluation decisions regarding books. Consequently, unlike journals that maintain regular annual subscriptions, the annual funding ratio between foreign e-journals and e-books at benchmark institutions shows significant variation, indicating insufficient continuous investment and obvious fluctuations in procurement. Books are typically prioritized for expansion when funds are abundant and first to be canceled when budgets are tight. As the second-largest resource type after journals, balancing print and electronic collections, focusing on key resources, improving acquisition quality, enhancing fund utilization efficiency, optimizing procurement budgets and decision-making, and ensuring literature resources support research all present new challenges and considerations for research university libraries.

2. Domestic Research Status

The library community has continuously summarized practical experience and conducted theoretical explorations around foreign book resource collection development, covering government procurement processes, collection strategies in new technological environments, resource evaluation, and optimization of acquisitions. Resource evaluation has increasingly gained attention. While academic research on journal resource evaluation is relatively mature, book resource evaluation remains primarily qualitative, tending toward subjective review opinions with limited coverage and lacking unified evaluation standards. Cao Shangqing and Sun Dongying both employed the Analytic Hierarchy Process (AHP) to introduce structural evaluations of foreign language collections at South China University of Technology and Nanjing University of Aeronautics and Astronautics, respectively. Li Ruihua et al. combined the Delphi method with AHP to discuss the construction of a foreign book resource selection model. Kuang Denghui evaluated e-books across different disciplines using Altmetrics and citation evaluation. Additionally, Sun Yongzhong et al. constructed a fuzzy comprehensive evaluation system for foreign core academic books, Liu Li and Yuan Xilin developed a quality evaluation system for foreign academic books in mathematics, and Yang Yuli created an indicator system for single books in ESI computer science. Overall, these fine-grained evaluation models for foreign books from academic research perspectives have strong academic significance and reference value for guiding acquisition work, but they present difficulties in practice. Whether using Delphi or AHP, the evaluation process involves subjective scoring by acquisition librarians, making it difficult to ensure standardized and sustainable acquisition criteria. While Altmetrics-based platforms like Springer's Bookmetrix provide batch analysis, they lack universality for the vast number of publishers. Well-recognized third-party data such as SCI and ESI focus evaluation dimensions on authors, publishers, publications, and citations, emphasizing data mining and intelligence analysis that involves big data cleaning and structuring—tasks that are difficult for acquisition librarians to operationalize given their time constraints and business priorities.

Beyond academia, the industry has also explored practical solutions. For instance, Fudan University and the China Education and Publications Import & Export Corporation's Core Academic Resource (CAR) project identifies core collection levels based on shared holdings among world-class disciplinary institutions. Nanjing Insect Software Co., Ltd., relying on SJTU's research, provides multi-type digital resource evaluation analysis. Shanghai University of Medicine & Health Sciences, Shanghai University of Finance and Economics, and Nanjing University have shared experiences using ERS for foreign e-journal resource evaluation.

3. UESTC's Practice in Foreign E-book Evaluation Using ERS

3.1 Operation Mechanism

As a deep data mining platform, ERS collects standardized quantitative data such as resource lists, COUNTER reports, and citation statistics to organize electronic resource situations and conduct in-depth mining of resource utilization performance. Since its launch in 2015, ERS has now integrated data from over 100 universities, gaining recognition from numerous renowned domestic universities and professional library institutions. ERS incorporates built-in core evaluation standards for foreign books including Choice Outstanding Academic Titles, Clarivate's Book Citation Index (BKCI), Elsevier's Scopus index, and SJTU's Book Citation Report (BCR) as bibliometric standards, equipped with Ministry of Education discipline classification mapping bibliographies. By collecting and matching various corresponding data for foreign books, it presents analysis results from collection, discipline, and database perspectives, achieving integrated analysis of foreign e-book resources across different platforms, and providing appropriate evaluation scenarios and functional distributions for decision-makers, acquisition librarians, and subject librarians [Figure 1: see original paper].

3.2 Depicting the Collection Panorama

In recent years, first-class discipline construction has continuously enhanced the university's comprehensive strength, with further improvements in the benign interaction mechanism among discipline development, talent cultivation, faculty building, and scientific research. The library has also further consolidated the foundation of literature resource construction, with foreign e-book guarantee rates steadily increasing. Given the lag in resource publishing and usage stimulation, this study selected three years (2016-2018) of collection data configured in the system and horizontally compared sample universities' guarantees of similar resources to provide more objective references. Currently, the system includes average data from 17 "985" universities such as Tsinghua University, Huazhong University of Science and Technology, SJTU, and Southeast University. Over the three years, UESTC's various guarantee rates have steadily

increased, consistently exceeding the average level of "211" universities, and surpassing the "985" university average in 2018, indicating a relatively optimistic position among "985"/"211" institutions for similar resource guarantees [Figure 2: see original paper].

The period 2016-2018 was a peak for UESTC's foreign e-book acquisition, with the collection base expanding rapidly, annual usage increasing year by year, relatively stable annual usage growth rates, but declining utilization rates—a trend warranting continued attention in future years (Table 1). Over 17,000 book titles generated usage, with Springer overwhelmingly dominating high-usage sources, accounting for 96.80% of titles with >100 chapter downloads and 97.14% of titles with >1,000 chapter downloads. This stems partly from its large resource base and partly from database usage and measurement methods, where default chapter downloads may inflate usage figures, while simultaneously revealing disciplinary concentration and indicating disciplinary development directions. Books with >5,000 downloads concentrated in medical informatics fields, such as Medical Image Computing and Computer-Assisted Intervention, Neural Information Processing, and communications antenna directions like Wireless Algorithms, Systems, and Applications, and the Handbook of Antenna Technologies. This not only demonstrates UESTC's mainstream advantages in information and communication but also reveals the development direction and potential of information medicine—an interdisciplinary field built upon traditional electronic information disciplines—providing a basis for focusing on key disciplinary guarantees and construction.

3.3 Focusing on Core Disciplinary Resources

UESTC is a typical industry-characteristic university, serving as the source of high and new technology in China's electronic information field, with highly concentrated disciplines. Using an all-discipline guarantee rate cannot scientifically reflect the actual guarantee of foreign book resources for teaching and research, necessitating further analysis focusing on mainstream key disciplines. ERS implements Ministry of Education discipline classification for foreign books, refined to second-level disciplines, providing a fast track for focusing disciplinary collection resources and service construction. This classification extracts Library of Congress subject headings, classification numbers, Dewey classification numbers, and other information from MARC records, maps them to Chinese Library Classification numbers, then achieves mapping with Ministry of Education disciplines, supplemented by manual identification and data cleaning. This facilitates rapid mastery of disciplinary publishing markets and assists in disciplinary evaluation. First-level discipline evaluation, led by the Ministry of Education's Degree and Graduate Education Development Center, is a top priority in university teaching work. As basic 办学条件, literature resource construction plays a foundational role in disciplinary evaluation. The university attaches great importance to discipline construction, emphasizing both benign interaction among discipline development, talent cultivation, faculty building,

and scientific research, and demanding more stable and continuous strengthening of literature resources. In the fourth round of disciplinary evaluation, UESTC's number of A+ disciplines ranked first among western universities, tied with Xi'an Jiaotong University. ERS reveals that under the "Engineering" discipline category, the collection guarantees 64,000 titles with a 20.76% guarantee rate and 1.08 million annual downloads—far exceeding other discipline categories. Under "Engineering," 39 first-level disciplines are included, with about half having guarantee rates higher than the discipline category average, and usage highly concentrated in mainstream disciplines [Figure 3: see original paper].

Although not an evaluation standard itself, applying this classification better aligns with domestic discipline construction, enabling rapid extraction of disciplinary collection data for discipline evaluation, discipline point demonstration, and professional application, providing effective references for "Double First-Class" construction.

On the Ministry of Education discipline foundation, further analysis can be conducted using BCR. Compiled based on citation statistics of books indexed in Scopus, BCR is China's first foreign academic book citation report developed using bibliometrics, showcasing nearly 1,000 highly cited foreign academic books from 2016-2018, providing the latest international professional research progress to guide more precise introduction of first-class academic works. UESTC's BCR collection includes 29,000 titles with a 24.03% guarantee rate and 80,000 chapter downloads in 2018, with the "Engineering" category alone guaranteeing 12,000 titles (41.84%) and 63,000 downloads (79.53%). Among these, three first-level disciplines—"Control Science and Engineering," "Electronic Science and Technology," and "Information and Communication Engineering"—are far ahead.

Comprehensive comparison reveals significant differences among standards' coverage. For instance, Choice's top three are Oxford, MIT, and Cambridge; BCR's top three are Wiley, Cambridge, and IEEE/IET Electronic Library (IEL); while index coverage (BKCI, Scopus) for academic societies varies dramatically: Institution of Engineering and Technology (IET) (0%, 30.43%), International Society for Optical Engineering (SPIE) (0%, 22.97%), Institute of Physics (IOP) (0%, 24.13%), Morgan & Claypool (0%, 0.11%), Royal Society of Chemistry (RSC) (0%, 25.65%), and Society for Industrial and Applied Mathematics (SIAM) (0%, 21.06%). Therefore, book evaluation should not adopt a single standard; multiple standards can more scientifically identify key disciplinary publishers.

3.4 Indicator Design and Model Construction

The ideal situation for e-books is permanent collection with low cost and high usage, necessitating consideration of weight relationships among "price-usage-collection." The scoring design emphasizes the university's characteristics. UESTC is an industry-characteristic university with electronic information science and technology at its core, covering the entire electronic information

discipline category, featuring high concentration and rapid iteration—placing high demands on literature resources' timeliness and practicality. First, regarding timeliness, book resources are far less current than journals due to their publication and circulation cycles, and third-party academic evaluations based on inclusion or citation are typically lagging. Second, from the user demand perspective, not only do domestic and international discipline classifications differ, but even domestic institutions have different research directions under the same broad discipline. Academic evaluation can provide relatively objective and professional third-party references but may not meet personalized needs for institutional discipline development. Therefore, in evaluation, we prioritize resource practicality—direct cost-effectiveness—combined with user demand research and potential benefits, supplemented by academic evaluation evidence, striving to minimize inevitable biases through multi-dimensional indicators.

The current system's built-in foreign e-book calculation model and weights are: Total Score = Full Download Cost (0.3) + Chapter Download Cost (0.3) + Unique Title Ratio (0.2) + Permanent Access Archive (0.2). The design approach scores individual items by ranking, then applies weights, with a default total of 100 points to avoid excessive data gaps caused by database size.

Referring to this model's calculation ideas and methods, and combining the university's own needs, we explored constructing a foreign e-book evaluation framework from three dimensions:

(1) **Dimension One: User Demand Evaluation.** Different weight scores should be assigned to various user types including academic leaders/discipline experts, professors, associate professors, lecturers, doctoral students, master's students, undergraduates, and others.

(2) **Dimension Two: Academic Benefit Evaluation.** Due to the university's high discipline concentration and expensive foreign original book procurement costs, the collection principle has always prioritized academic books. Evaluation indicators apply ERS system built-in standards.

(3) **Dimension Three: Cost-Effectiveness Evaluation.** The cost dimension comprehensively considers three variables: usage, funds, and resource volume, setting three evaluation indicators: Annual usage, reflecting resource timeliness and popularity; Cumulative single-use cost. Since books are one-time purchases, annual procurement funds don't correspond one-to-one with annual usage, making simple annual fund/annual usage calculations unscientific. We attempt to measure cumulative single-use cost based on cumulative funds and annual usage; Usage factor. As different publishers have varying pricing strategies, simply comparing single-use costs horizontally is unfair. Through normalization of usage and resource volume, we examine their proportional relationship to measure relative resource use benefits. Usage Factor = (Proportion of a resource's book downloads in total foreign book downloads) / (Proportion of a resource's book volume in total foreign book volume). When the usage factor exceeds

1, the e-book resource utilization is good; otherwise, it's unsatisfactory.

These three dimensions and indicators have some overlap. For instance, BCR reveals panoramic book citation data from a third-party evaluation perspective. If matched to the university's user citation data, it could reflect both user research needs and usage, essentially providing more precise cost-effectiveness evaluation.

Integrating the aforementioned dimensions and indicators, the model is constructed as follows: Total Score = User Demand Evaluation (0.3) + Academic Benefit Evaluation (0.3) + Cost-Effectiveness Evaluation (0.4), with a default total of 100 points. Within dimensions, user demand and academic benefit indicators use equal weighting. For cost-effectiveness, considering the university's science and engineering characteristics and rapid discipline iteration, annual usage carries 0.4 weight, while the other two indicators each have 0.3.

Using Springer e-books as a representative example for scoring: As the earliest foreign e-book resource introduced to the university (2006), with copyright years traceable to 2005, comprehensive discipline coverage, and accounting for 24% of total collection funds and 28% of total resources, with the highest borrowing rate of approximately 25% and average borrowing rate of about 17%, it is highly representative. **User Demand Dimension:** The library conducted two-phase user research. The first phase was a "UESTC Digital Literature Demand Survey" for all faculty and students, collecting nearly 400 valid questionnaires from 20 departments involving professors, associate professors, lecturers, doctoral students, master's students, undergraduates, and staff. The second phase was a "UESTC Digital Resource Demand Demonstration Meeting" with expert representatives from over 20 departments evaluating digital resources by category. Springer e-books ranked first in both phases. **Academic Benefit Dimension:** BKCI guarantee rate was 18% (ranking 4th), Scopus guarantee rate 21% (9th), BCR guarantee 17% (8th), and Choice guarantee rate less than 1% (10th), giving Springer a comprehensive ranking of 4th. **Cost-Effectiveness Dimension:** Annual usage accounted for 88% of total collection (ranking 1st), cumulative annual single-use cost was 1 RMB (1st), and usage factor was 3.31 (1st). Springer's final score was 95.5 points, ranking first among foreign e-book collections. Calculated scores and rankings for each database apply to optimizing resource construction. For instance, when funds are tight, Springer can serve as the guaranteed baseline resource for foreign e-books.

Two additional points merit attention: First, **permanent usage rights.** All foreign e-books introduced by UESTC have permanent usage rights, which can be divided into unconditional and conditional types. The most common condition requires maintaining other resource subscriptions on the same publisher/platform. For example, Springer stipulates: "If you are an existing Springer Link subscriber (including any Springer Link product, regardless of quantity or purchase method), no platform fee is charged; otherwise, users must submit annual maintenance fees for the Springer Link electronic publications

platform, which during the 2019-2021 group purchase period is 600 euros per year." Similar provisions exist for Cambridge, SIAM, and SPIE. Considering the university's disciplines and database usage, no cancellations or secondary payments have occurred, so this dimension is not yet included in scoring. In practice, although publishers have relevant regulations for permanent usage rights, issues like insufficient transparency in long-term preservation (especially involving foreign third-party preservation entities) or unclear emergency access activation conditions require case-by-case review of individual databases to ensure permanent usage rights.

Second, **unique titles.** The collection's net title rate is 85.62%. Duplicate titles mainly originate from three sources: Foreign e-book resources have large historical accumulations, lacking necessary attention and effective technical support for duplicate checking; In earlier years, domestic university libraries mostly introduced foreign e-book resources through aggregators in bulk, and as international publishers successively expanded into the Chinese market, especially through package purchase models, inevitable duplication between old and new collections occurred; Cooperative publishing between Wiley and IEEE-Wiley. Subsequent collection construction will fully utilize ERS for duplicate checking to actively guide avoidance of redundant resource development. Given that historical duplication persists, this factor is not included in scoring but will function during new resource evaluation.

4. Conclusion and Discussion

First-class academic resource guarantee is the cornerstone for advancing the university's Double First-Class construction goals. Performance evaluation can more precisely promote collection resource construction to better guarantee disciplinary construction. Collection performance evaluation requires both scientific evaluation indicators and practical acknowledgment of acquisition work challenges—ensuring resource quality while bearing unavoidable burdens of huge acquisition funds, time-sensitive procurement, strict standardized processes, and fund execution progress assessments. Therefore, practical operability should be a basic condition for resource evaluation and represents an innovation of this study.

This paper discusses the application and promotion of foreign e-book performance evaluation in acquisition practice. Using the ERS system, UESTC quickly grasped its foreign e-book collection overview, showing relatively optimistic guarantees among "985" universities, with high concentration in mainstream key disciplines and usage. The focus lies in computer science, engineering, mathematics, physics, and other mainstream key disciplines, especially artificial intelligence, electronic and electrical engineering, and automation control systems. On this foundation, relying on the ERS system and integrating academic market position from a publishing perspective, academic recognition from an awards perspective, user recognition from a collection perspective, and research value from a citation perspective, we designed resource evaluation indi-

cators from three dimensions—user demand, third-party academic evaluation, and cost-effectiveness—and constructed a foreign e-book performance evaluation model. This provides practical references for focusing on key resources, improving acquisition quality, enhancing fund utilization efficiency, and optimizing procurement budgets and decisions, thereby improving literature resources' guarantee for university teaching and research.

Existing Problems and Future Research Directions:

ERS Platform: Basic data updates and calibration, such as timely updates of built-in core standards and measurement standards, and proper matching of resource volumes and usage generated by OA books, versioned books, and books with free access during irregular activities. Platform functional extensibility, such as personalized settings for users regarding built-in calculation models and indicators.

Disciplinary Balance. Through the Serri system, 抽查 Choice disciplines revealed that print collection guarantee rates increased from 50% to 66.67% for "Computer Science" and from 45.61% to 50.88% for "Engineering." Print resource allocation not only depicts the collection panorama and effectively improves core collection rates but also provides references for optimizing print-to-electronic ratios. Given the scattered publication status of missing titles, print supplementation is more operationally practical. Notably, due to the university's disciplinary characteristics, humanities and social science collections are mostly below average guarantee levels. How industry-characteristic science and engineering universities like UESTC can effectively conduct and utilize resource performance evaluation to focus on advantageous resources, optimize key discipline construction while simultaneously supporting quality education and vigorously safeguarding ecological diversity in humanities and social sciences, represents a positive response to the national advocacy for general education and cultivation of composite talents. Furthermore, evaluation aims to optimize the collection system and improve cost-effectiveness, requiring systematic key reading promotion for evaluation focal points, such as high-quality but underutilized Choice titles.

Storage Rights Guarantee. Collection construction inevitably operates within the government market procurement environment, facing dilemmas from both aggregators and publishers. On one hand, resources introduced through aggregators in earlier years have successively expired, presenting unclear copyright status, and aggregator-harvested foreign resources integrated into application systems circumvent foreign resource ideological review during government procurement, becoming potential instability factors. On the other hand, as the journal market stabilizes, publishers have expanded into e-books, mostly providing permanent usage rights through remote access, which is difficult to constrain with "force majeure." Global trade faces major fluctuations, and the U.S.-China high-tech economic and trade tug-of-war has triggered restricted access to research resources for entities on the U.S. entity list, sounding an alarm for the industry. How to guarantee users' legal permanent usage rights is a critical issue on the industry agenda. Domestic one-stop platforms for digital

resource selection and access such as CNPereading and Iresearch have launched successively, providing new choices and guarantees for collection construction through standardized, legal domestic mirror archiving. We should investigate and implement backup archiving permissions for publisher resources in China and emergency access plans, implementing graded assessments.

Evaluation Expansion. Journal resource evaluation is relatively mature, with standards and indicators like JCR/ESI/SNIP/SJR widely used and highly recognized in university research. In contrast, evaluation discussions focusing on book resources, especially foreign academic e-books, lag behind. Even with index standards like BKCI and Scopus, their universality is far inferior to journals, and libraries without formal index database subscriptions cannot collect and match publication and citation data through ERS, making cost-effectiveness evaluation from a citation perspective less cost-effective than journals. As acquisition librarians' capabilities generally improve, or through library business reorganization and integration, the strong combination of disciplinary evaluation and acquisition may provide more precise academic benefit evaluation focal points, continuously improving the acquisition work system to better guarantee and support discipline construction.

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Author Contributions:
Zhang Yunyue: Foreign book acquisition, ERS data configuration, and paper writing;
Qin Hong: Topic direction, evaluation dimensions, and indicator guidance;
Du Li: Practical framework planning for user evaluation dimension and data weight guidance.

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Keywords: ERS; foreign e-book; performance evaluation

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