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Research and Practice of a Demand and Decision-Driven Intelligent Book Acquisition System: A Case Study of Chongqing University Library (Postprint)

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Abstract

[目的/意义] Paper document acquisition remains one of the most fundamental tasks in contemporary libraries. Given the uncertainty of reader demands and the need for book value assessment, the priority of acquisition work is to improve acquisition efficiency while ensuring quality. The demand and decision-driven intelligent book acquisition system aims to integrate scientific resource acquisition mechanisms with an efficient and intelligent mindset, targeting improved acquisition efficiency and collection resource quality to achieve intelligentization in library acquisition work.

[方法/过程] Based on investigating the current state of intelligent acquisition research and practice, the system intelligently screens print materials by establishing business rules and decision weights across multiple dimensions, including university discipline construction needs, publisher models, reader behavior analysis, reader recommendations, and book prices. Taking the intelligent acquisition system of Chongqing University Library as an example, we analyze three built-in models: book evaluation, publisher and discipline quality, and author and discipline quality, to optimize acquisition business processes. Additionally, corresponding strategies are formulated for different business scenarios such as new book ordering, book supplementation, and reader recommendation purchases to optimize acquisition workflows.

[结果/结论] Driven by reader demands and key discipline construction decisions and supported by artificial intelligence technology, the intelligent book acquisition system can effectively enhance the efficiency and quality of print literature resource development work, representing the primary direction for current acquisition model transformation.

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Full Text

Research and Practice of a Demand- and Decision-Driven Intelligent Book Acquisition System: A Case Study of Chongqing University Library

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Abstract:
[**Purpose/Significance**] Paper literature acquisition remains one of the most fundamental tasks in modern libraries. Confronted with uncertain reader demands and the need to evaluate book value, the urgent priority for acquisition work is to improve efficiency while ensuring quality. The demand- and decision-driven intelligent book acquisition system aims to integrate scientific resource acquisition mechanisms with an efficient, intelligent mindset. With the goals of enhancing acquisition efficiency and collection quality, this system realizes the intelligentization of library acquisition work. [**Method/Process**] Based on an investigation of current research and practice in intelligent acquisition, the system establishes business rules and decision weights according to multiple dimensions including university discipline construction needs, publisher models, reader behavior analysis, reader recommendations, and book prices, enabling intelligent screening of paper documents. Using the intelligent acquisition system of Chongqing University Library as an example, this paper analyzes three built-in models—book evaluation, publisher-discipline quality relationships, and author-discipline quality relationships—to optimize acquisition workflows. The system implements tailored strategies for different business scenarios including new book subscription, collection supplementation, and reader recommendation acquisition. [**Result/Conclusion**] Driven by reader demand and key discipline construction decisions and supported by artificial intelligence technology, the intelligent book acquisition system can effectively improve the efficiency and quality of paper literature resource construction, representing the primary direction for current acquisition model transformation.

Keywords: smart library; paper literature acquisition; artificial intelligence; acquisition system
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Although digital literature resources have gradually become mainstream in library collections and services, some scholars and practitioners believe that paper literature resources are no longer important [**?**]. However, data from the Ministry of Education's University Library Fact Database shows that in 2018, the average paper literature procurement volume for "Double First-Class" university libraries was approximately 85,000 volumes [**?**], indicating that paper literature remains a crucial component of resource construction.

Book acquisition is a traditional yet fundamental library task, typically a

decision-making process based on uncertain demand forecasting. It involves acquisition librarians' understanding of reader needs and evaluation of book values [**?**], with results influenced by factors such as librarians' cognitive inertia, information asymmetry, and book procurement management mechanisms. Relying solely on subjective qualitative decisions based on librarian experience cannot handle large volumes of tasks and cumbersome acquisition work, leading to delays and limitations. Therefore, improving the efficiency and quality of book acquisition is the primary task for enhancing library literature resource construction under the background of smart library development. Technology promotes transformation, and the academic and professional communities have continuously explored using advanced technologies to revolutionize book acquisition work. Research and practice demonstrate that big data technology can conduct in-depth analysis of reader demand, bibliographic data, collection data, book value, and fund allocation [**?**], while artificial intelligence can effectively mine book information and comprehensively evaluate book quality.

For most libraries, the purpose of book acquisition work is to meet reader needs and select literature resources with high scientific, academic, and artistic value [**?**]. Especially under the "Double First-Class" construction background, universities have proposed "Double First-Class" construction goals and key discipline development priorities, inevitably causing libraries to tilt resource procurement toward key disciplines. Building on these two new technologies, this study proposes a reader demand-driven and key discipline construction decision-driven approach to develop and practice an intelligent book acquisition system. This system improves acquisition efficiency and collection quality to a certain extent, providing important references for scientific decision-making through reasonable resource allocation schemes, and promotes transformation in acquisition thinking, concepts, and even workflows with an efficient and intelligent mindset.

2. Research and Practice Status of Intelligent Acquisition Systems

2.1 Research Status of Intelligent Acquisition Systems

Many scholars have explored the application of big data and artificial intelligence in book acquisition work to drive model innovation. R. H. Wang, Y. Tang, and G. Q. Liu proposed a book procurement method based on genetic neural networks, where the model adjusts thresholds according to different weights to predict whether to purchase a book. Simulation experiments demonstrated that the acquisition model has good predictive and generalization capabilities [**?**]. K. Ma studied a library procurement process based on Enterprise Resource Planning (ERP), introducing ERP-based library procurement processes and researching ERP systems for book procurement that can achieve functions such as procurement planning, supplier cooperation, order management, order tracking, expediting, and book check-in [**?**]. Jing Yuan and Chen Ya argued that through reader procurement mechanisms and library alliance systems, libraries

could develop cloud-based book acquisition systems to pre-collect collections based on reader needs and build core collections using scientometric methods, thereby improving acquisition efficiency [?]. Bai Guangsi proposed constructing an intelligent resource procurement system based on in-library data, where data processing completes the compilation of proposed purchase lists, ensuring efficiency and quality in new book procurement [?]. Zhu Huashun argued that using digital information technology and text mining algorithms to construct a user-based book acquisition system could achieve functions such as book resource provision, collection, analysis, and interactive processing [?]. Wang Xiaocui integrated a supply chain capability evaluation mechanism for booksellers into the book acquisition system to understand and evaluate bookseller supply capabilities and levels [?]. Wang Hong and Lei Juxia believed that artificial intelligence technology can accurately predict reader needs and evaluate book quality, enabling scientific decision-making to achieve optimal book acquisition effects, and proposed an AI book acquisition model design and process operation [?]. Pan Mingqian and Zhang Jianguo studied how AI technology and intelligent computer decision-making methods for information collection and analysis, evaluation model establishment, and feedback-based intelligent decision-making can enable more readers to participate in acquisition decisions [?]. Wang Hong, Yuan Xiaoshu, and Lei Juxia argued that analyzing library big data for machine learning applications can provide more scientific decisions for book acquisition [?].

These studies theoretically validate that big data and AI technologies, and the resulting intelligent acquisition systems, can deeply analyze reader needs, infer book quality, and effectively optimize resource allocation. However, most research remains at the theoretical or design stage without practical application.

2.2 Practice Status of Intelligent Book Acquisition Systems

The library community has always emphasized management automation and unmanned management [?]. Faced with repetitive and cumbersome acquisition processes daily, some libraries have implemented selection assistance systems [?]. However, these auxiliary systems only meet procedural needs for literature procurement but lack information needed for scientific decision-making, unable to provide decision support. Procurement lists are still determined by acquisition librarians based on experience, remaining highly subjective. For example, Fudan University Library developed a book acquisition auxiliary decision support system that built a data warehouse dimension model for book circulation and clickstream data based on existing library data, enabling multidimensional statistical analysis of collection data, circulation data, OPAC search logs, e-book usage, and comparisons between Chinese and English print and electronic books [?]. Wuhan University and Xiamen University libraries jointly developed a Chinese book acquisition platform integrating functions such as book evaluation, order generation, business communication, duplicate checking, and collection supplementation [?]. Nanchang University Library added

a data management system to its existing Huiwen system, correlating author achievements and popularity data to assist Chinese book acquisition decisions, achieving a 30% reduction in zero-borrowing-rate books through the auxiliary decision system [**?**]. Shanghai Jiao Tong University Library designed a book recommendation platform enabling effective participation from readers and subject librarians, realizing reader demand-driven recommendations, resource classification through subject navigation, and automatic and efficient information feedback [**?**]. Renmin University of China Library led multiple institutions in developing an intelligent system covering the book acquisition workflow, achieving statistical analysis, bibliographic integration, and bibliographic push functions, converting cumbersome manual services into system processing and realizing comprehensive automation of acquisition workflows [**?**].

Based on research of these systems, the author found that auxiliary acquisition systems can help acquisition librarians understand collection construction and utilization, comprehensively analyzing data on reader demand, library status, and book information. Some systems consider author factors, improving book borrowing rates to some extent, while others include reader recommendation functions to meet reader participation needs. However, most systems only fulfill partial functions in book acquisition, using either reader demand or book quality as a single decision basis rather than comprehensively considering factors such as readers, book quality, and libraries' literature support role in key discipline construction.

Chongqing University Library addresses these problems by proposing a demand- and decision-driven intelligent acquisition system architecture that uses decision-making to drive acquisition. The system comprehensively considers reader demand and key discipline construction, analyzes and models existing collection and reader behavior data, applies data models and intelligent algorithms to automatically screen books that meet reader needs or have high value, and provides scientific decision-making basis for acquisition librarians to complete book acquisition work scientifically, quickly, and efficiently. This paper discusses this practice as an example to provide reference for intelligent acquisition exploration.

3. Reader Demand-Driven Acquisition Decisions

In the intelligent book acquisition system, reader demand-driven acquisition work is divided into two modes: one considers reader needs in acquisition work, namely the reader recommendation mode; the other allows readers to directly make acquisition decisions, namely the Patron-Driven Acquisition (PDA) mode.

3.1 Reader Recommendation

The intelligent acquisition system uses big data to analyze reader behavior, explore factors influencing reader demand, and directly connect with reader terminals. Readers recommend books for library procurement through electronic

orders or forms, and acquisition librarians can view and process reader recommendations in real-time within the system, eliminating cumbersome repetitive processes such as data export/import and manual duplicate checking, reducing librarian burden and improving reader enthusiasm.

3.2 Patron-Driven Acquisition

Patron-Driven Acquisition is an integrated decision-making procurement management model where readers purchase books for free and the library pays. This model has seen some application in public libraries but has not received due attention in university libraries due to management systems and the homogeneous nature of reader groups. Chongqing University Library cooperated with JD Books to establish the first online book procurement platform for university readers in China, with the goal of full-process informatization. Through this platform, readers can online select books they need that meet collection requirements, with logistics directly delivering to their homes. After reading, books are returned to the library. Readers can obtain needed books immediately, greatly shortening the waiting time under traditional procurement models. The PDA mode workflow is shown in Figure 1 [Figure 1: see original paper] and Figure 2 [Figure 2: see original paper]. PDA transfers partial book procurement authority to readers, truly enabling reader participation in acquisition decisions. This not only simplifies acquisition processes, guides effective reader participation, improves literature resource borrowing rates, but also further broadens collection scope to better serve university teaching and research.

Reader demand-driven acquisition decisions can deeply understand reader needs. The combination of reader recommendation and patron-driven acquisition modes truly realizes user-centered personalized services, improving resource utilization rates and enriching collection resource structures while reducing librarian burden to a certain extent.

4. Key Discipline Construction-Driven Acquisition Decisions

The *Regulations for University Libraries* stipulates that university libraries should "build a university-wide literature information resource system to provide literature information support for teaching, research, and discipline construction" [**?**]. High-quality literature information resources are important supports for university discipline construction, and library acquisition work should maximize the discovery of high-quality paper literature resources to promote discipline development. The system uses intelligent algorithms to evaluate book quality while incorporating built-in book evaluation models, publisher-discipline quality relationship models, and author-discipline quality relationship models. These establish correlations between book quality, authors, publishers, and corresponding discipline quality to accurately identify core publishers and quality authors for specific disciplines, ensuring intelligent screening of books highly

relevant to and of high quality for discipline construction.

4.1 Book Evaluation Model

Quality books are important literature guarantees for core collection construction and key university discipline development, making careful selection essential in acquisition work. Book evaluation methods include book reviews, library-based book evaluation, book citations, Altmetrics-based book evaluation, and comprehensive evaluation [**?**]. Different reader levels have different evaluations of factors affecting book value, making evaluation models most objective. The intelligent book acquisition system builds a book evaluation model based on internet and library data, using a star rating system and Bayesian average algorithm to calculate book scores on the internet (WR1), within the library (WR2), and borrowing situations in the library (WR3). The final book score S is calculated as:

$S = WR1 \times$weight coefficient $1 + WR2 \times$weight coefficient $2 + WR3 \times$weight coefficient 3

where the three weight coefficients can be set according to procurement reality.

The algorithm expressions for WR1 and WR2 are:

$$WR_{1,2} = \frac{v}{v+m} \times R + \frac{m}{v+m} \times C$$

where $WR_{1,2}$ represents the weighted rating, R represents the average score from user voting for the book, v represents the number of votes for the book, m represents the average number of votes for all books, and C represents the average score for all books.

The algorithm expression for WR_3 is:

$$WR_3 = \frac{n}{n+b} \times \frac{1}{P} + \frac{b}{n+b} \times \frac{1}{T}$$

where WR_3 represents borrowing situation, P represents the average borrowing period for the book in the library, n represents the number of borrowers for the book, b represents the average number of borrowers for all books, and T represents the average borrowing period for all books in the library.

Book scores may vary significantly across different disciplines. Therefore, the model incorporates the *Chinese Library Classification* (CLC) to add correspondence between CLC and disciplines, enabling librarians to scientifically select and procure quality books in specific fields based on book levels and domains. Future considerations include incorporating book type as an influencing factor into the model to provide more accurate and quality evaluations for different book types.

4.2 Publisher-Discipline Quality Relationship Model

Currently, numerous publishers exist with varying quality levels, each focusing on different discipline areas. To better support key discipline construction and libraries' literature support functions, the intelligent acquisition system associates CLC classifications with Ministry of Education discipline classifications to build a publisher-discipline quality relationship model. Based on the book evaluation model, this model calculates the average score of all books published by a specific publisher in a particular discipline within the book evaluation model. Higher scores indicate higher quality of books published by the publisher in that discipline, enabling the identification of quality publishers for specific disciplines and rational allocation of budget resources to guarantee key discipline construction.

The publisher-discipline quality relationship model uses a star rating system, where higher scores correspond to more stars. The star rating situation for publishers in specific discipline areas is shown in Figure 3 [Figure 3: see original paper].

4.3 Author-Discipline Quality Relationship Model

Similar to the publisher-discipline quality relationship model, the system associates CLC-classified books with Ministry of Education discipline classifications to build an author-discipline quality relationship model. Based on the book evaluation model, this model calculates the quality of all books published by a scholar in a specific discipline, thereby identifying high-quality authors for scientific decision-making in book acquisition and supporting university "Double First-Class" and key discipline construction.

With built-in book evaluation, publisher-discipline quality, and author-discipline quality models, librarians can conveniently and intelligently screen books that better meet university "Double First-Class" construction needs during acquisition, providing important reference basis for acquisition decisions and literature support for key discipline construction.

5. Business Rules and Workflow of the Intelligent Book Acquisition System

5.1 System Architecture

The intelligent book acquisition system is a book acquisition business management system based on data and intelligent algorithms. By analyzing and modeling existing library collection data, reader behavior data, and internet book review data, and according to different procurement needs and business rules, the system automatically screens books requiring procurement for librarians, improving acquisition efficiency and quality. The system architecture is shown in Figure 4 [Figure 4: see original paper].

The system can configure multiple screening rules according to acquisition scenarios, with detailed rule items allowing weight settings. Rules are applied to comprehensively score and intelligently screen books for procurement. The system generates statistical reports for intelligent screening results, enables manual intervention in screening results, approves orders for high-priced books and books with high copy numbers, processes book check-in, and statistics arrival rates.

5.2 Business Rules

Generally, acquisition librarians select books based on factors such as library nature and mission, collection status, budget, reader demand, service capacity, and management systems [**?**]. The system divides book screening standards into five dimensions: library nature and service objects, book quality, reader behavior, reader recommendations, and price, as shown in Figure 5 [Figure 5: see original paper].

The system further divides screening dimensions into simple rules and weighted rules. Simple rules include standard copy numbers, price, and duplicate checking. Weighted rules measure the importance of specific book attributes or characteristics, including key disciplines, publishers, and authors, which can be divided into three levels: general, important, and very important. Specific business rules and descriptions are shown in Table 1 . Acquisition librarians can preset business rules to achieve intelligent screening in different procurement scenarios.

5.3 Workflow

The system subdivides acquisition work into scenarios such as supplier procurement (new book subscription), collection supplementation, collection replenishment, reader recommendations, and patron-driven acquisition according to different procurement channels and stages. The "supplier procurement" scenario is the most common situation in book acquisition, where librarians only need to preset business rules and import bibliographic data provided by suppliers. The system then completes new book subscription with one click according to built-in model algorithms. Figure 6 [Figure 6: see original paper] and Figure 7 [Figure 7: see original paper] show the intelligent screening results and workflow for "supplier procurement." In the intelligent book acquisition system, librarians no longer need to perform manual, duplicate-checking, screening, filtering, and price-inquiry work, making procurement more convenient, faster, and more objective and scientific.

The intelligent acquisition system simplifies book acquisition processes and improves librarian work efficiency. Librarians only need to preset business rules conforming to collection construction principles and then complete book acquisition with one click according to different acquisition scenarios, effectively improving acquisition efficiency while ensuring quality.

The intelligent book acquisition system is based on reader demand and key discipline construction. Addressing large amounts of uncertain reader demand in book acquisition, the system analyzes historical data to explore literature acquisition decision patterns, studies user demand influencing factors, and proactively collects resources meeting user needs. The combination of reader recommendation and patron-driven acquisition modes effectively realizes reader demand-driven acquisition decisions. Simultaneously, to meet the requirements of university "Double First-Class" and key discipline construction, the system uses big data and artificial intelligence technologies to collect and organize book information. Through book evaluation models and publisher- and author-discipline quality models, the system scientifically evaluates literature quality in specific disciplines, transforming acquisition work from a passive state dominated by librarian experience to providing high-quality literature resource support for discipline construction. Additionally, by subdividing various influencing factors in acquisition work into specific business rules that librarians preset, the system enables one-click acquisition for different procurement scenarios, greatly simplifying acquisition workflows, improving efficiency, and ensuring timely resource ordering to a certain extent.

Research and application practice demonstrate that the demand- and decision-driven intelligent book acquisition system, with its efficient and intelligent mindset and scientific resource procurement schemes, provides important references for scientific book acquisition decisions. The system not only improves acquisition work efficiency but also effectively enriches collections, optimizes structure, and enhances resource quality. The intelligent book acquisition system, driven by reader demand and key discipline construction, implements scientific book acquisition work, establishes an acquisition model better adapted to intelligent environments, accurately grasps new directions in literature resource development under discipline construction contexts, and effectively promotes library literature acquisition transformation work, representing a transformation in acquisition models to a certain extent.

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