

Intelligence Analysis Services Supporting the “Double First-Class” Construction in Higher Education Institutions: Practice and Reflection (Postprint)

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Abstract

[Purpose/Significance] This study explores how university libraries can, within the context of “Double First-Class” construction, keep pace with the tasks of “Double First-Class” development, leverage the advantages of information analysis services, and support the “Double First-Class” construction of universities. [Method/Process] Based on the practice of information analysis services at Tsinghua University Library, this paper clarifies the advantages of library information analysis services, analyzes the service targets, service content, and work models of information analysis services, and provides inspiration for libraries to develop ideas for conducting information analysis services. [Results/Conclusion] The practice of information analysis services at Tsinghua University Library demonstrates that there exists substantial demand for library information analysis services in the “Double First-Class” construction of universities. Libraries need to broaden their thinking, liberate their minds, innovate in form, discover their own irreplaceable advantages, and approach library undertakings with a developmental perspective and a management philosophy in order to effectively play a supporting role in “Double First-Class” construction.

Full Text

Preamble

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Practice and Reflection on Information Analysis Services Supporting the Construction of “Double First-Class” Universities

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Abstract

[Purpose/Significance] This paper explores how university libraries can align with the “Double First-Class” construction initiative, leverage their strengths in information analysis services, and support university development under this strategic framework.

[Method/Process] Based on the practice of information analysis services at Tsinghua University Library, this study clarifies the advantages of library-based information analysis, analyzes the service objects, content, and work models, and provides insights for developing such services in academic libraries.

[Result/Conclusion] The practice at Tsinghua University Library demonstrates significant demand for library information analysis services in supporting “Double First-Class” construction. Libraries must broaden their perspectives, embrace innovative approaches, identify their unique and irreplaceable advantages, and adopt a developmental and managerial mindset toward their operations to effectively fulfill their supporting role.

Keywords: subject service; information analysis service; “Double First-Class” construction; Tsinghua University; library

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1. Introduction

In October 2015, the State Council issued the “Overall Plan for Coordinating the Construction of World-Class Universities and First-Class Disciplines,” which explicitly outlined the tasks for the “Double First-Class” initiative: building world-class faculty, cultivating top-notch innovative talents, enhancing scientific research levels, inheriting and innovating excellent culture, and promoting technology transfer. This new national education strategy, following the earlier “211” and “985” programs, aims to strengthen China’s higher education competitiveness and international influence.

As a supporting unit for teaching and research, university libraries must innovate their services and enhance their capabilities to meet the new requirements of the “Double First-Class” era. Since the new century, user information-seeking behaviors and library usage patterns have continuously evolved, compelling libraries to adjust their services and models. Confronted with the “Double First-Class” context, librarians have recognized the need to redefine library services. Researchers have called for “service innovation,” while others have examined subject services, research services, knowledge services, and patent information services. Among these, subject services have received the most extensive attention, covering institutional competitiveness evaluation, disciplinary competitiveness analysis, and embedded knowledge services by subject librarians. Patent

information services have also emerged as a new service area for libraries.

Literature review reveals that “library intelligence services” have attracted attention since the 1970s-80s, with continuous research since then. Initially, these services focused on collecting and organizing intelligence materials, compiling bibliographies, providing regular indexes, offering search tools and spaces, delivering retrieval guidance, and conducting novelty searches. In recent years, “information analysis services” have evolved to include more sophisticated offerings such as bibliometrics and patent analysis, becoming a value-added information service and a new growth point for libraries. Zhang Xin et al. constructed a service system for library information analysis services based on user categories (decision-makers, managers, and researchers).

Existing research tends to emphasize theoretical analysis over practical exposition. However, integrating theory with practice better promotes the development of information analysis services in real-world contexts. Therefore, this paper uses case studies from Tsinghua University Library to analyze the advantages of library-based information analysis services, explore their models from a broad perspective, and discuss how academic libraries can play a supporting role in “Double First-Class” construction.

2. Advantages and Approaches for University Libraries in Supporting “Double First-Class” Construction Through Information Analysis Services

Information analysis is a process of information processing that extracts value from raw data. The foundation of information analysis is intelligence resources. Library information analysis services utilize publicly available materials such as books, journals, patents, conference proceedings, technical reports, standards, and dissertations, employing bibliometric and statistical methods to mine information value for users.

2.1 Advantages of Library Information Analysis Services

According to the overall goals of “Double First-Class” construction, universities must achieve breakthroughs in high-quality faculty development, high-level talent cultivation systems, and scientific research with technology transfer. This requires innovative thinking and methods at all levels—decision-making, management, and research. Such innovation drives demand for in-depth information analysis. However, due to limited manpower or analytical skills, these needs often go unmet by university administration or research units. Libraries, with their extensive resources and staff expertise in literature retrieval, bibliometrics, and information analysis, can provide objective factual basis and data support. As an independent third party relative to university decision-makers, managers, and researchers, libraries can offer objective, impartial, and unique analytical perspectives, becoming an important component in supporting “Double First-

Class” construction and contributing to more scientific research evaluation systems.

2.2 Approaches to Library Information Analysis Services

Libraries must clearly define their service objects, content, and work models to align with “Double First-Class” tasks and create distinctive service systems. Service design should position libraries as vital components of university construction, considering issues from the institutional perspective and leveraging resource and personnel advantages. Through continuous interaction with users, libraries can deepen their understanding of user needs and enhance their service capabilities.

2.2.1 Service Objects Information analysis services are highly targeted, with different users having vastly different needs. For instance, faculty focus on paper details and research frontiers, while administrative departments prioritize macro-level statistics. Therefore, clarifying service objects and understanding their characteristics facilitates personalized and in-depth service delivery. Primary service objects include researchers, managers, and decision-makers. Researchers focus on specific domains such as disciplinary frontiers, methodologies, and latest achievements; managers concentrate on institutional development, planning, and peer comparisons; and decision-makers emphasize global trends and strategic positioning. Although service objects can be categorized, their needs follow no fixed pattern and require case-by-case analysis.

2.2.2 Service Content Service content must be fundamentally user-driven while incorporating accessible library resources. Libraries should clearly position themselves in supporting “Double First-Class” construction, leverage their unique advantages, and design services aligned with institutional development needs. Detailed service content lists should be developed from perspectives such as disciplinary construction, talent development, and research output promotion, with timely adjustments as “Double First-Class” work progresses. Information sources include all publicly accessible resources: books, journals, conferences, technical reports, patents, and standards. Service types include factual data, data analysis, research reports, and database construction.

2.2.3 Work Models Information analysis service models can be divided into “internal work models” and “external service models.”

(1) Internal Work Models: These include personnel organization and implementation patterns. Organizationally, staff can be full-time or part-time, comprising information analysts and subject librarians. Implementation follows project management principles, organizing teams based on project content and adopting individual or collaborative approaches depending on complexity.

(2) External Service Models: These encompass user response mechanisms, quality control systems, and service marketing strategies. The user response

mechanism requires in-depth discussions between responsible parties from both library and client before project initiation to assess feasibility, timeline, and staffing. Quality control involves both parties: libraries must ensure methodological rigor, data reliability, and report standardization, while users must guarantee complete project briefs and adequate cooperation. Service marketing requires brand awareness—establishing, promoting, and maintaining a brand reputation. Service development typically follows a cyclical process of proactive promotion, user engagement, and deepening cooperation. Each completed commission represents a marketing opportunity. Libraries must demonstrate their irreplaceable value beyond simple data harvesting or database reliance, building strong partnerships to attract more users and enhance deep-level service capabilities.

3. Practice of Tsinghua University Library in Supporting “Double First-Class” Construction Through Information Analysis Services

Tsinghua University Library’s information analysis services originated from the SCI Consultation Center’s paper statistics work. On June 25, 1998, the Tsinghua University Council approved the “Ten Opinions on Improving the Quantity and Quality of SCI-Indexed Papers at Tsinghua University,” launching the “Thousand Papers Project” and establishing the SCI Consultation Center at the library. Since then, the library has conducted multi-level, multi-angle information analysis services in paper statistics, disciplinary evaluation, and talent assessment.

Under the “Double First-Class” context, Tsinghua University Library has continuously innovated service forms and deepened content, making information analysis services a new growth point. To ensure smooth service delivery, the library allocated sufficient resources and full-time staff, establishing an Information Analysis Group in 2016. Work approaches combine individual and team collaboration based on workload and complexity, with teams extending beyond the Information Analysis Group to include subject librarians based on disciplinary backgrounds.

3.1 Making Bibliometrics Effective for “Double First-Class” Tasks

Bibliometrics examines literature systems and characteristics using mathematical and statistical methods to study distribution structures, quantitative relationships, and patterns, thereby revealing structures and trends in science and technology. Accurate and comprehensive literature retrieval is fundamental to bibliometrics. Librarians’ extensive experience in literature retrieval, novelty searches, and database management gives them distinctive advantages in comprehensiveness and accuracy. During “Double First-Class” construction, Tsinghua University librarians have developed user needs and demonstrated the power of bibliometrics, conducting extensive services.

3.1.1 Bibliometrics Supporting Disciplinary Construction First-class disciplinary construction is the foundation of “Double First-Class” initiatives. Defining and quantifying disciplinary construction indicators is an ongoing exploration. Alongside disciplinary evaluations and personnel system reforms, Tsinghua has completed numerous disciplinary construction tasks, with the library contributing significantly through bibliometrics. Services have been provided for the Mathematics Department, School of Aerospace Engineering, School of Law, School of Social Sciences, School of Medicine, School of Information Science and Technology, and School of Economics and Management. Disciplinary analyses typically involve domestic and international benchmarking, research performance assessment, and global impact analysis—providing factual basis for disciplinary planning at both school and university levels. Benchmarking institutions are usually provided by clients, while indicators are offered by the library for user selection. Analyses incorporate institutional, disciplinary, and scholar perspectives, covering metrics such as publication statistics (papers, patents), citation impact, disciplinary influence, international impact, and departmental contributions.

In 2016, to support the School of Information Science and Technology’s 13th Five-Year Plan, the library conducted a bibliometric comparison of five first-level disciplines against eight international universities, analyzing the school’s contribution to Tsinghua’s research output and research directions of seven subordinate institutions [Figure 1: see original paper]. Key parameters included annual publication trends, percentile distributions, journal impact factor distributions, departmental contributions, and the school’s contribution to Tsinghua’s top 1% highly cited papers. Results showed clear growth in SCI papers across the school’s disciplines, outpacing benchmark institutions, though average impact remained lower but with a narrowing gap—providing clear guidance for disciplinary development.

3.1.2 Bibliometrics Assisting Talent Assessment The primary task of “Double First-Class” construction is “building a world-class faculty.” President Xi Jinping emphasized in May 2018 that “the key to talent cultivation lies in teachers” and that “faculty quality directly determines a university’s capacity and level.” This underscores the critical importance of faculty development.

During Tsinghua’s centennial anniversary in 2011, the university launched personnel system reforms, now completed across 38 departments. The library has contributed to this talent system through several initiatives. One example involves post-hire evaluation of recruited talent commissioned by the Human Resources Department, assessing all research outputs of scholars hired in the past decade both before and after joining Tsinghua. Metrics include publication trends, author affiliation analysis, first-author and corresponding-author affiliation analysis, citation counts, and journal impact factors—used alongside other indicators to evaluate research performance. Another example is a talent assessment report for the Earth System Science Department [Figure 2: see orig-

inal paper], examining research output from both departmental and individual perspectives, including ESI disciplinary analysis, highly cited papers, and hot papers. This report serves as a reference document for departmental personnel reforms.

3.1.3 Bibliometrics Aiding Scientific Research Universities, research institutes, and enterprises constitute China's three major innovation forces. Scientific research is a crucial university mission bearing national innovation responsibilities. While faculty are primary research agents, their methodologies and tools have evolved dramatically in the information age. Information analysis methods and tools can provide alternative research perspectives that prove genuinely effective. Tsinghua University Library participated in a Chinese Higher Education Research Association project led by the Institute of Education—"Research on Standards and Evaluation Systems for Characteristic First-Class Universities and Disciplines"—responsible for developing the "academic output evaluation indicator system" within a multi-dimensional university evaluation framework [Figure 3: see original paper]. The library also contributed to "Tsinghua University's Global Strategy Research," benchmarking 12 universities on high-level journal publications, international co-authorship, and interdisciplinary indicators. In these projects, the library participated as a researcher, offering novel metrological perspectives and methods that demonstrated the broader application potential of library information analysis services.

3.1.4 Bibliometrics Examining Global Strategy Global strategy is a key measure for Tsinghua's world-class university construction. In March 2016, Tsinghua announced the establishment of the Asian Universities Alliance at the Boao Forum to promote comprehensive cooperation and deep exchange among Asian universities and enhance their role in addressing regional and global challenges. To support alliance preparations, Tsinghua's Office of International Cooperation and Exchange commissioned the library to retrieve and analyze research outputs of 15 member institutions, focusing on co-authorship patterns [Figure 4: see original paper], identifying each institution's strengths and collaborative disciplines to discover common interests and future cooperation opportunities. This work involved repeated communication with users on research design, methodology, and result presentation, fully leveraging the library's bibliometric strengths and demonstrating capabilities previously unknown to administrative departments. Deputy Director Zhong Zhou noted: "Previously, our understanding of international cooperation remained at the level of mutual visits and student numbers. Academic collaboration is equally important, but we had never conducted such analysis..." This commission opened a new perspective for understanding international cooperation.

3.1.5 Deep Mining of ESI Information for Enhanced Disciplinary and Talent Assessment ESI (Essential Science Indicators), developed by the Institute for Scientific Information, is a widely used tool for measuring research

performance and tracking scientific trends. In China, it is used in major talent programs such as the National Science Fund for Distinguished Young Scholars, National Science Fund for Excellent Young Scholars, and the Young Thousand Talents Program.

Since March 2017, the library team has regularly collected, organized, and analyzed Tsinghua's ESI highly cited papers, accurately identifying them at the departmental level and compiling the "Tsinghua University Departments ESI High-Level Papers Newsletter" [Figure 5: see original paper], distributed regularly to faculty and research administrators through subject librarians. The team also provides literature retrieval certificates upon request and systematically analyzes the distribution of high-level papers across departments, personnel, and disciplines.

While ESI is commonly used for disciplinary assessment through metrics like number of listed disciplines, rankings, and institutional counts, the team has gone beyond conventional indicators. They produced the "ESI-Based Disciplinary Analysis of Tsinghua University" series [Figure 5: see original paper], predicting when non-listed disciplines will enter ESI rankings, conducting in-depth analyses of newly listed disciplines (e.g., "Analysis of Tsinghua University's Immunology Papers in the Past Decade," "Analysis of Tsinghua University's Neuroscience & Behavior Papers in the Past Decade"), and analyzing departmental contributions to ESI-listed disciplines. As Tsinghua's disciplinary level improves, the analysis has incorporated top 0.1% and 0.01% indicators, enabling more granular disciplinary analysis and providing clearer insights for institutional decision-making.

3.2 Libraries Contributing to Intellectual Property Protection in "Double First-Class" Construction

The 19th Party Congress report emphasized the strategic importance of intellectual property protection. As major patent producers, universities' patent protection work is significant. Currently, university administrative departments focus more on post-output patent management, protection, and transfer, but libraries can contribute to the entire patent protection chain through intellectual property information services.

Tsinghua University Library began cultivating expertise and acquiring resources in the patent domain in 2012, launched a "Patent Information Service" column on its website in 2014, and established the "Tsinghua University Intellectual Property Information Service Center" in 2018, providing patent application pre-researches, competitiveness analysis, patent early-warning analysis, and intellectual property literacy education to faculty, departments, functional units, and external users.

3.2.1 Industry Analysis from a Patent Perspective Patents, with their exclusivity and exclusionary nature, reveal industry technology landscapes.

Since large enterprises often have comprehensive patent portfolios, patent landscapes can be viewed as microcosms of industry structures. In 2017, commissioned by Tsinghua's Global Industry 4.5 Research Institute, the library conducted patent analysis on emerging industries to reveal industry status from a patent perspective. The analysis included patent holder analysis, country/region analysis, technology classification, and technology layout. Combining legal information and patent mapping, the team produced layout maps for ten industries, publishing the "China Innovation and Entrepreneurship Development Report" and its sub-reports [Figure 6: see original paper]. Subsequently, they integrated patent perspectives into industry analysis in the "Intelligent Connected Vehicles" domain. Defining industry scope from a literature retrieval perspective was a key challenge, addressed through repeated communication with researchers to subdivide industries into technical fields and define scope through technical search strategies. Integrating patents into industry analysis opened new avenues for both industry research and library information analysis services.

3.2.2 Institutional Assessment Using Patent Indicators Patents are an important component of university research output and a key indicator for evaluating research strength. While universities maintain patent statistics, research management departments lack time and resources for in-depth analysis. Leveraging their literature analysis advantages and rich resources, libraries have made beneficial attempts in this area.

The library completed patent analyses of Tsinghua University [Figure 7: see original paper], including overall statistics (application numbers, grants, transfers), cooperating institutions, inventors, and research fields, with particular attention to "legal status"—analyzing maintenance duration of valid patents and reasons for patent invalidation, providing new perspectives for university-wide patent statistics.

The library also completed departmental patent analyses [Figure 7: see original paper]. Since Chinese patent law stipulates that employers own patents for employee inventions, making universities the patent holders, direct departmental assessment is challenging. Using the "Department of Automotive Engineering" as a case study, the team developed assessment methods by combining inventor, classification, and patent holder information to identify departmental patents, analyzing output trends, legal status, cooperation patterns, and high-value patents. This analysis reveals departmental technology landscapes from multiple perspectives (cooperation, relevant patent holders, citation patterns), providing references for technology transfer.

4. Challenges in Developing Library Information Analysis Services

As a new growth point for library services, information analysis will play a greater role in supporting “Double First-Class” construction. However, fulfilling this mission requires significant efforts in both internal capacity and external operations.

(1) Deepening Service Content. Library information analysis service content is open-ended, with new demand points emerging as institutions develop. Libraries must maintain innovative awareness, align with institutional development from a strategic perspective, and enrich service content. In practice, libraries often position themselves too low to integrate into institutional construction from a big-picture perspective, which inevitably affects service design. Library leaders and information analysts must adapt to their new role in “Double First-Class” construction and engage in institutional development as stakeholders.

(2) Enhancing Internal Capacity. In recent years, libraries have made continuous efforts to “enhance capacity and demonstrate value,” driving their development. Through collaboration with functional departments, schools, and faculty, libraries have built strong campus relationships and gained recognition. However, capacity remains insufficient to meet evolving user demands and improve service quality. A major reason is the inadequate talent development system—libraries struggle to attract top talent, and continuing education for librarians lacks systematic and standardized approaches, leaving staff skills far behind industry levels. Without excellent talent, service improvement is impossible.

(3) Adopting a Business Mindset. Treating library services as a business requires university libraries to base themselves on their institutions while facing the industry, formulate medium- and long-term development plans, courageously accept practical testing, and continuously enrich and revise their approaches to demonstrate value in institutional development. With a business mindset, libraries should clarify their mission and core competitiveness, adopt a developmental perspective on services, and adapt to institutional development and “Double First-Class” progress. As the saying goes, “Running water never stagnates; a door hinge never gets worm-eaten.” Libraries will undoubtedly make greater contributions to supporting “Double First-Class” construction and future development, ensuring a thriving library enterprise.

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Author Contributions

Li Jin: Conceptualized the research framework, wrote, revised, and finalized the manuscript.

Zhao Chenggang: Revised the manuscript.

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