

Game-Theoretic Approaches to Library-Database Vendor Negotiations: A Study Based on Analysis of Listed Companies' Annual Reports

Authors: Yang Hua, Li Lingli, Mo Xiaoxia, Xin Lei, Niu Yue, Mo Xiaoxia

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Abstract

Purpose/Significance To address industry challenges such as unreasonable contracts, high product pricing, and steep price increases faced by libraries in digital resource procurement negotiations, this study introduces listed company annual report analysis as a method to seek new game-theoretic approaches. **Method/Process** This research constructs an analytical framework encompassing industrial chain analysis, revenue-profit indicators, and competitiveness factors, using Elsevier, CNKI, and Clarivate as case studies. The analysis reveals that competitiveness, profit, and renewal rate are the three primary concerns of database vendors. It is argued that libraries exhibit both active and passive dimensions in their negotiations with vendors, and that past negotiation perspectives have demonstrated certain biases in understanding operating costs versus price increase margins, profit margins and reference benchmarks, as well as open access versus social responsibility. **Results/Conclusion** In the open information ecosystem, libraries will face a new round of funding pressures and business restructuring. They should adopt competitive strategies exploring zero-sum and repeated games, moderately shift funds toward domestic academic publishers, seek media attention and legal support, and deepen research on digital publishing product pricing to address emerging challenges. **Limitations** Due to limitations in annual report data, subsequent research must expand supplementary materials with relevant research reports.

Full Text

Research on Game-Theoretic Strategies Between Libraries and Database Providers Based on Analysis of Listed Companies' Annual Reports

Yang Hua¹, Li Lingli², Mo Xiaoxia^{3*}, Xin Lei⁴, Niu Yue^{1}

¹Northwestern Polytechnical University Library, Xi' an 710072

²Hangzhou Library, Hangzhou 310007

³National Science Library, Chinese Academy of Sciences, Beijing 100190

⁴Xi' an Gaoxin Financial Data Management Co., Ltd., Xi' an 710114

Abstract:

[Purpose/Significance] In response to persistent challenges in digital resource procurement negotiations—including unreasonable contracts, high pricing, and steep annual increases—this study introduces annual report analysis of listed companies as a novel approach to inform game-theoretic strategies for libraries. [Method/Process] We construct an analytical framework encompassing industry chain analysis, revenue-profit indicators, and competitiveness factors, examining three major database providers (Elsevier, CNKI, and Clarivate) as case studies. Our analysis reveals that competitiveness, profitability, and renewal rates constitute the three primary concerns of database providers. We argue that libraries simultaneously occupy both active and passive positions in negotiations with database providers, and that previous negotiation frameworks exhibited misconceptions regarding operating costs and price increases, profit margins and benchmarks, and the relationship between open access and social responsibility. [Result/Conclusion] Libraries will face renewed funding pressures and business restructuring in the open information ecosystem. To address these emerging challenges, libraries should explore competitive strategies based on zero-sum and repeated game frameworks, strategically reallocate funds toward domestic academic publishers, seek media attention and legal support, and deepen research on digital publishing pricing mechanisms. [Limitation] Due to inherent limitations in annual report data, future research should incorporate additional industry reports and professional investment analyses to supplement these findings.

Keywords: Digital resource procurement; Annual reports of listed companies; Database providers; Open Access; Game theory

Classification Number: G250.7

As specialized institutions for knowledge resource selection and services, libraries maintain ongoing partnerships with various data service providers, employing proactive strategies such as consortium purchasing and promoting open access to maximize users' rights to knowledge and information [1]. However, they simultaneously face challenges from upstream vendors, including disguised price increases, bundled sales, and double-charging practices. Enhancing bargaining power in negotiations with commercial database providers (hereinafter referred to as “database providers”) has consistently represented a critical measure for scholars and practitioners to improve cost efficiency in both research and procurement practice.

Current scholarship primarily analyzes database providers and their products from two perspectives: the industry-strategy level and the resource-tactics level.

Industry-strategy research examines database types, business models, and industry competition from international and sectoral development perspectives, including classifications of database provider types [2], analyses of operational models, resource volume and quality, and platform service competitiveness of major providers [3-4]. These studies have preliminarily concluded that certain database providers possess market monopoly status, which serves as the source of their unreasonable pricing and aggressive increases [5-6]. Resource-tactics research addresses practical issues in digital resource procurement, such as domestic and international library consortium development [7-8], licensing agreement and procurement contract rationality [9-11], digital resource utilization tools and evaluation methods [12-13], and negotiation and game-theoretic strategies [14-15].

While these studies have yielded theoretical insights and implementable recommendations from economic, legal, and library science perspectives, their impact on improving libraries' passive positions in contract pricing and rights allocation remains uncertain [16]. Negotiation outcomes typically depend not on libraries' specific claims but on whether database providers make concessions. This paper approaches the problem from the database providers' perspective, using annual reports of listed companies as supporting evidence to design an annual report analysis method oriented toward library digital resource procurement negotiations. Through case studies of Elsevier, CNKI, and Clarivate, combined with literature review, we examine the coexisting passive and active characteristics in past library-database provider negotiations, identify current controversies in negotiation practice, analyze challenges libraries will face in digital resource development under open access trends, and propose new game-theoretic strategies for negotiation reference. This annual report analysis method also provides a novel theoretical research perspective for digital resource development practice.

Methodology for Analyzing Listed Companies' Annual Reports

Annual reports of listed companies comprehensively reflect their financial status and operating results over the past year [17]. As publicly available documents, they are widely used in securities, investment, and accounting fields to analyze corporate operations and have been adopted in information science research on competitive intelligence methods, demonstrating their value for industry intelligence studies [18] and as tools for identifying corporate cooperation and competitive relationships [19]. In library digital resource procurement research, annual report indicators have frequently been cited as evidence for analyzing database provider behavior. This study selects annual report information from authoritative sources including CNInfo [20], RELX Group's official website [21], and the U.S. Securities and Exchange Commission (SEC) website [22]. The analysis proceeds through four stages: first, mapping the industry chain to clarify the division of labor and roles of different database providers; second, examining disclosed financial and operating data to assess actual market scale and

profit/loss; third, analyzing competitive niches and development strategies to identify sources of market position and development trends; and finally, synthesizing comparative annual report information to derive insights for improving library negotiation strategies.

Industry Chain Analysis

In multi-case comparative studies using corporate annual reports, the singular nature of individual company data presents a limitation. Therefore, we first map the digital publishing industry chain to clarify the division of labor and roles of different database providers from an industry perspective, enabling comprehensive comparison using data from the entire industry chain. The digital publishing industry integrates various commercial entities including publishers, technology developers, platform operators, and terminal device manufacturers, forming a complex competitive-cooperative ecosystem [23]. Following the sequence of production, provision, and acquisition of products, the chain can be divided into upstream (content providers), midstream (content integrators and developers), and downstream (content users) [24] (see [Figure 1: see original paper]).

The essence of the industry chain lies in vertical division of labor. While upstream, midstream, and downstream roles appear clearly defined, some enterprises have expanded to build longer industry chains or dominate market share through scale advantages, thereby enhancing their industry status. For example, Elsevier has integrated content, platforms, and knowledge services to establish a comprehensive upstream-midstream industry chain with minimal constraints from other enterprises. CNKI, as an integrator, has built dominant discourse power over upstream and downstream players through scaled operations integrating Chinese academic journals and “exclusive authorization” of core resources.

Financial and Operating Performance

Annual financial status represents crucial information in corporate reports. Regarding the persistent price increase issue in library digital resource procurement, the mainstream view attributes this to database providers extracting excessive profits [25]; however, what constitutes “excessive profits” lacks clear standards. Annual reports disclose annual profit data, enabling more precise tracking. Under accounting standards, profits are reflected through two operating indicators (operating revenue and net profit), while profitability is measured through gross margin and net margin. These form a revenue-profit indicator system for examining database provider profitability [17], with formulas shown in .

Although financial indicators have clear calculation methods, profits can be inflated or concealed through altered accounting methods, necessitating complementary information for comprehensive profit assessment.

Competitive Niche and Development Strategy Analysis

Annual report sections on market position, competition and risk, and strategic planning primarily introduce corporate regulations and internal information. Comparative analysis of these sections can position database providers within their competitive niches and extract three core elements: market share, core competitiveness, and corporate strategic planning (see) to enhance the specificity of library negotiation strategies. Market share, hampered by ambiguous statistical 口径 and difficult market research, is generally disclosed only by ultra-large enterprises and serves as preliminary reference. Core competitiveness, as the source of corporate status and upstream-downstream discourse power, serves as the primary reference. Strategic planning, representing next-step strategies for maintaining core competitiveness and determining whether such competitiveness can be sustained, serves as a supplementary reference.

Case Study: Annual Report Analysis of Three Database Providers

Following comprehensive mapping of the digital publishing industry chain and financial and competitiveness factors, this study selects three high-priced database providers from procurement practice—Elsevier, CNKI, and Web of Science’ s parent companies RELX, Tongfang Co., and Clarivate—as case studies. Based on their different listing dates and development stages, we tracked and analyzed 5-15 years of annual report data, with summarized information presented in .

Industry Chain Roles and Strategic Positioning Currently, only Elsevier possesses a mature upstream-midstream industry chain, holding 18% of the global academic publishing market with approximately 7% annual growth in publishing volume, maintaining a stable industry position. Clarivate, through continuous mergers and acquisitions post-listing, is expanding from midstream to upstream, representing a rapid development phase. CNKI employs a horizontal integration expansion strategy focused on the domestic market without vertical upstream-downstream layout.

Revenue-Profit Indicators Converting different currencies to RMB using standard international exchange rates (see), Elsevier’ s 2021 operating revenue was 18.6 times that of CNKI and 3.7 times that of Web of Science. Elsevier’ s net margin was also the highest among the three at 36.98%, far exceeding CNKI’ s 14.96%, while Clarivate incurred losses due to high operating costs from continuous mergers and acquisitions. Elsevier’ s 2021 profit reached RMB 7.594 billion, nearly 40 times that of CNKI, demonstrating dominant scale and profitability.

Competitiveness Factors **Competitive Niche:** Elsevier published 215 of 216 Nobel Prize-winning papers since 2000, achieving a 99% share. CNKI’ s exclusive authorization rate for Chinese core journals exceeds 90%. Both

database providers monopolize high-quality academic resources. **Core Competitiveness Sources:** Elsevier owns high-level academic journals such as *Cell* and *Lancet*, while CNKI integrates over 90% of Chinese core journals through “exclusive authorization agreements” with publishers. **Competitors:** Elsevier identifies Springer Nature as its primary competitor; Clarivate positions Elsevier’s Scopus and SciVal products as its competitors; CNKI does not identify any competitors.

Analysis of these competitiveness factors, combined with the three companies’ annual report discussions on core competitiveness, reveals that high-level academic achievements, competitors, and renewal rates constitute the three primary concerns. All emphasize that possessing high-level academic achievements (including high-quality journals, papers, and scientific evaluation indicators) forms the core of competitiveness. Elsevier focuses on stable profit growth and competitive advantages, explicitly stating in annual reports that pricing is based on “customers’ maximum affordability” and detailing annual increases in paper volume, citation rates, and market feedback on new product lines to demonstrate consolidated market position. Clarivate shows sensitivity to renewal rates, noting plans to cover losses through price increases while expressing concerns about potential renewal rate declines, and has developed AI tools to maintain balance between price increases and renewals. CNKI, due to significant divergence from its parent company’s main business, shows no systematic competitive strategy deployment, though its “exclusive authorization” and first-mover advantages maintain stable dominance in Chinese academic resources.

The Library-Database Provider Game

Passive Position in Negotiations

Annual report analysis reveals that major database providers possess clear understanding of their scale, academic resource positioning, competitors, and pricing power. However, a disconnect exists between libraries’ planned economic model and database providers’ market-oriented operations, resulting in limited autonomy in transaction conditions (with users as the “third party” and universities as the “fourth party” funding providers) and transaction models (characterized by low substitutability of heterogeneous products, package-based subscriptions, and print-electronic bundling) [26]. This places libraries in a passive position, forced to accept high pricing, continuous increases, and unreasonable contract terms [25]. Regarding libraries’ demands for price reductions or smaller increases that directly impact database provider profits, providers may offer modest concessions during initial product introduction phases when their position is not yet consolidated. Subsequently, negotiation space for pricing diminishes, with most libraries having to adapt to the annual increase business model, transforming demands for price reductions into requests for smaller increases.

Active Position in Negotiations

Although database providers offer limited pricing concessions, their emphasis on stable renewal rates from long-term cooperative relationships enables them to accommodate certain library demands, including consortium negotiations, service quality improvements, and open access promotion. As shown in , despite Elsevier' s path dependence on subscription models, its 2012 annual report already proposed an open access strategic transformation, adding over 100 gold OA journals annually after 2019 as transitional attempts. Additionally, libraries demonstrate agency through national licensing agreements [27], internet anti-monopoly actions [28], and applied game-theoretic research in negotiations [14], which respectively contribute to foundational resource security, anti-monopoly research, and negotiation strategy formulation.

Points of Contention

In implementing library-database provider negotiations, libraries have attempted to identify common interests through market-oriented thinking, strengthening research on database provider product structures and profit models [26] and engaging economics experts in negotiations [29]. However, annual report analysis reveals certain discrepancies between library perceptions and actual conditions.

Operating Cost Stability and Price Increase Justification Library Perspective: When a database adds over 100 new journals within a certain period, libraries conclude that the provider' s costs remain stable while price increases significantly exceed cost growth [29].

Annual Report Evidence: The digital publishing and services industry belongs to the high-tech services sector, characterized by relatively stable operating costs post-construction but increasing three-expense outlays (sales, management including R&D, and financial expenses) with inflation and corporate expansion, which substantially impact operations. Analysis of CNKI' s annual reports reveals that between 2018-2020, profits decreased from RMB 197 million to RMB 192 million, with net margins dropping from 19.77% to 16.45%, indicating that increased profits from price hikes could not cover rising expenses. Future negotiations should emphasize prices exceeding libraries' maximum affordability and advocate for providers to control three-expense outlays and expand user bases rather than relying on price increases for profit growth.

Profit Margins and Benchmarking Library Perspective: CNKI' s profit margin exceeds Elsevier' s.

Annual Report Evidence: Profit margin generally refers to net margin. In 2020, based on RELX and Tongfang Co. annual reports and calculations using formulas in , CNKI' s actual net margin was 16.45% while Elsevier' s reached 36.98%. Comprehensive assessment of corporate scale, profit, and product line

layout demonstrates Elsevier's far superior profitability. Moreover, the two companies occupy different industry chain roles—one being a Chinese academic data platform and the other an international STM (Science, Technology, Medicine) publisher and integrated data platform/knowledge service provider—making direct horizontal comparison inappropriate. Regarding CNKI's high pricing, analysis should examine the underlying mechanism of excessive resource monopoly caused by domestic data platforms' "exclusive authorization agreements," while encouraging users to adopt preprints and open access resources to reduce over-dependence on midstream platforms.

Open Access and Social Responsibility Library Perspective: Publishers privatize scientific papers and sell them at high prices, violating scientific principles; therefore, academic journals should fulfill social responsibility through open access.

Annual Report Evidence: From a corporate perspective, survival and competitive advantage consolidation take precedence, with social responsibility representing a moral requirement offering limited concession space. Recent open access progress stems from the cOAlition S initiative (Plan S), which since 2018 has required scientific articles funded by national, regional, and international research councils to be published in open access journals or platforms [30]. This movement created demand among European scholars to publish in open access journals, driving strategic transformation toward open access publishing among major providers like Elsevier and Wiley—a market behavior driven by supply-demand relationships rather than solely by social responsibility.

These analyses demonstrate that annual report data can bridge information gaps in libraries' understanding of market dynamics, reducing evidentiary errors and misguided negotiation directions in past price negotiations. However, developing effective game-theoretic strategies aligned with economic principles and commercial competition rules requires continuous tracking of database providers' strategic movements and corresponding organizational and business adjustments.

Challenges for Libraries in the Open Access Transition

As open access transformation agreements responding to Plan S become reality in multiple countries [31], major database providers have initiated strategic layouts for open access transformation, actively disclosing relevant market dynamics in annual reports to demonstrate stable market positions to shareholders. This information holds significant value for libraries. For example, Elsevier's 2020 annual report disclosed that after substantially expanding open access journals, open journal revenue growth already exceeded traditional subscription journals, indicating that open journal profitability is no longer a corporate concern and has been embraced and advanced by major publishing groups. The 2021 report highlighted Shanghai Jiao Tong University's use of 11 Elsevier products (ScienceDirect, eBooks, Scopus, ClinicalKey, ClinicalKey Student, SciVal,

Knovel, Engineering Village, Reaxys, Embase, Amirsys) while achieving “Double First-Class” construction effectiveness, with ScienceDirect usage reaching 1% of global total usage. This demonstrates that knowledge service products developed by database providers to adapt to the new information order have been systematically introduced to domestic libraries, consolidating original product advantages. This information signals that libraries will face new challenges in supporting publishing, funding preparation, and service types as upstream business models and product structures evolve.

Complexity of Library Publishing Support

Library support for publishing involves transitioning subscription fees to funding support through “offset,” “read and publish,” and “publish and read” models during the open access transition. This creates numerous uncertainties regarding whether deduction bases can be publicized, allocation ratios between subscription fees and OA publishing charges, article pricing rationality, and how libraries determine publishing support standards amid surging article volumes [32].

Re-examination of the digital publishing industry chain reveals that under open access transformation agreements, libraries are shifting from downstream institutional content consumers to midstream roles combining subscription and publishing support, with more pronounced intermediary attributes. Increased upstream open publishing volume and associated uncertainties raise the complexity and processing difficulty of library operations (see [Figure 2: see original paper]).

Funding Pressures on Libraries

From a management accounting perspective, corporate profit increases primarily occur through higher product pricing, reduced cost expenditures, or expanded market scale. Since open access business models rely primarily on APC processing fees to maintain costs and profits, some high-quality journals may increase publication volume and accept lower-quality articles to boost profits, thereby ceasing to provide quality filtering services for readers [33]. As the open access transition has only recently begun, publishers currently charge both authors’ APCs and libraries’ subscription fees, creating a double-charging phenomenon [32]. As libraries advance open publishing support, surging publication volumes will intensify funding pressures. Additionally, the open science order will trigger discussions on new standards for research output evaluation, requiring libraries to purchase professional knowledge analysis tools to support assessment. Funding for open publishing, database subscriptions, and knowledge analysis tools will collectively strain library budgets.

Library Service Transformation

Although open publishing models remain uncertain for researchers, different countries, the publishing industry, and library functional transformation during the transition period [31], the breakdown of “paywalls” will confront libraries with surging unstructured data. Major publishers like Elsevier and Clarivate have seized the initiative, developing new product series to gain first-mover advantages, such as Elsevier’s SciVal and ClinicalKey and Clarivate’s Darts-ip and DTA. Domestic universities’ “Double First-Class” construction pursuit of high-level academic achievements, combined with China’s strategic direction toward high-quality economic development, drives libraries to transform into knowledge innovation service institutions and expand knowledge analysis and service businesses. This requires professional knowledge analysis tools to select high-quality information in the open access environment, deconstruct and reorganize fine-grained knowledge units, and provide customized problem-solving solutions for users. Elsevier’s annual report noted that among Shanghai Jiao Tong University’s 180+ library staff, 60% already use its products for data analysis and information science work, demonstrating that these new products will catalyze library service transformation from information supply and technical support perspectives.

New Game-Theoretic Strategies Based on Annual Report Analysis

Facing multiple challenges of purchasing diverse product types, 叠加 supporting open publishing, and service transformation within limited budgets, while database providers simultaneously confront triple pressures from competitors vying for profits, renewal rate maintenance, and attracting high-level academic achievements, libraries can analyze major database providers’ core demands and strategic deployments through the annual report analysis framework from industry chain, financial, and competitive perspectives. This enables libraries to adapt organizational development to environmental trends and user needs, and explore new negotiation strategies from their own role positioning.

Exploring Competitive Strategies Through Zero-Sum and Repeated Games

Database providers do face competition: Elsevier identifies Springer Nature as its competitor, while Clarivate views Elsevier’s Scopus product as its rival. However, in actual procurement, Elsevier, Springer, and Clarivate are each exclusively represented as single-source purchases due to their independent intellectual property rights and uniqueness, lacking competitive constraints and creating divergent perceptions of market competition from those of database providers. Numerous studies demonstrate that database products can be partially substituted by other databases [34] or OA resources [35], warranting further investigation into whether procurement models can shift to competitive

negotiations.

Under budget constraints with diminishing increases, database providers enter zero-sum competition for the existing market, where weaker players risk losing market share or exiting. To cover more resources for users, libraries have abandoned “big deal” subscription models in favor of precisely matched, reasonably priced solutions. For instance, facing a 20% budget reduction in 2017, the University of Missouri Library reduced big deal subscriptions to Wiley, Springer, and Elsevier by 15% and completely eliminated Sage big deal purchases, instead acquiring specific subject collections and individual titles while maintaining coverage of institutional needs [15]. Libraries can leverage this zero-sum game situation to guide providers toward reasonable procurement proposals and eliminate big deal models.

Digital resource subscriptions represent annual repeated transactions where, under normal repeated game competition, providers would struggle to dominate pricing. However, libraries commonly sign three-year contracts with major database providers due to high resource dependency, with providers exchanging high increases for long-term contracts to maintain renewal rates, marketed as “preferential” or “discounted” pricing. Long-term contracts enable providers to “import-use-depend” their products with customers, subsequently extracting higher prices through exclusive competition strategies while linking products to title evaluation, academic impact, and discipline assessment functions, transforming libraries into passive clients. Therefore, the impact of long-term versus short-term subscription strategies on upstream competitive patterns requires attention, particularly during open access transformation when providers facing intense competition will inevitably introduce long-contract incentives and low-price trial products to exclude competitors, necessitating vigilance against such practices.

Strategically Reallocating Funds to Domestic Academic Publishers to Enhance China’ s Voice in Digital Publishing

Although libraries possess some room for strategic adjustment, the long-standing issues of forced acceptance of unreasonable contracts, high pricing, and continuous increases in foreign digital resource procurement fundamentally stem from insufficient international competitiveness and lack of pricing power in China’ s digital publishing industry [37]. Currently, only Science Press (China Science Publishing & Media Ltd.) among domestic publishers competes in the same ecological niche as the five major international academic publishers (Elsevier, Wiley, Springer Nature, Taylor & Francis, SAGE). However, its main business remains book sales, with journals accounting for only 14% of total operations [38], though it has published quality journals like *National Science Review* and *Science World* and is strategically adjusting toward journal business and open access transformation. As partners, libraries should recognize their role in building China into an academic publishing powerhouse by strategically guiding funds and high-level academic achievements toward domestic publish-

ers in subscription procurement, open access publishing support, and research output evaluation, helping Chinese digital publishing enterprises accumulate capital and enhance international competitiveness.

Seeking Media Attention and Legal Support

Affected by pandemic and economic conditions, funding reductions combined with database provider price increases have compelled procurement entities to seek solutions through various channels. Regarding CNKI' s pricing and copyright issues, widespread attention has been generated through trending topics on social media, with multiple political advisors such as Ni Minjing advocating for solutions to protect public knowledge access rights [39].

Media oversight and legal sanctions may become third-party mechanisms to curb monopolies. From listed database providers' annual reports, the academic database market currently exhibits high and persistent copyright concentration barriers lacking dynamic trends for long-term effective competition [40], with major providers establishing dominant market positions. Media attention can convene policymakers, industry experts, and the public to analyze monopoly phenomena and seek solutions, creating opportunities for competing databases or helping identify alternative public academic resources. These profitable database providers have developed rapidly under legal frameworks protecting copyright and supporting innovation—for instance, CNKI continues to enjoy a preferential 15% corporate income tax rate for national high-tech enterprises (versus the standard 25% rate). However, abuse of copyright and market position to undermine fair competition rules will trigger anti-monopoly regulation. According to the State Administration for Market Regulation' s *China Anti-Monopoly Law Enforcement Annual Report (2021)*, 175 monopoly agreement cases, abuse of market dominance cases, and abuse of administrative power cases were investigated in 2021, representing a 61.5% year-on-year increase, effectively maintaining market order and preventing disorderly capital expansion [28]. Regarding domestic database providers' "choose one of two" authorization practices, the publishing community has vigorously debated their illegality [41], and regulators have grown vigilant toward monopolistic trends dominated by single database providers, suggesting that combined public attention and enforcement progress may resolve domestic monopoly practices.

Deepening Research on Digital Publishing Pricing

Comparative annual report analysis reveals that database providers typically concentrate high-quality resources in specific disciplinary areas through differentiated, 错位 layouts to avoid homogeneous competition and consolidate advantages. For example, Elsevier, as the world' s largest academic publishing group, has numerous product lines in science, technology, and medicine, including the high-level medical journal *Lancet* and the clinical medicine reference platform ClinicalKey, while Clarivate has entered humanities through ProQuest and acquired Darts-ip, a global legal data and intellectual property case provider.

The pharmaceutical industry exemplifies pricing issues arising from intellectual property barriers and 错位 competition: patent protection enables patent drugs and exclusive medicines to monopolize specific markets, creating high prices. In response, WHO issued *WHO Guidelines on Country Pharmaceutical Pricing Policies* to guide governments in assessing drug value and regulating prices through multiple approaches: (1) publishing and evaluating price recommendations covering cost-effectiveness, R&D costs, and special processes; (2) employing pharmacoeconomic methods to assess drug value; (3) advocating government oversight to promote price transparency; and (4) advocating government-organized bidding, negotiation, and tax reduction [42]. These initiatives have achieved positive results in various countries and offer problem-solving approaches for other industries facing monopolies due to intellectual property protection.

Digital publishing possesses distinct characteristics from pharmaceuticals, with stronger resource heterogeneity that, combined with digitalization and platform development, easily creates scaled monopolies. South Korea, Denmark, and Ireland have gradually introduced third-party evaluation agencies to provide trial platform consultation and procurement assessment solutions in national procurement processes [8][12], aiming to better evaluate digital resource pricing and usage effectiveness. The International Coalition of Library Consortia (ICOLC), established for worldwide library digital information resource procurement and vendor pricing practices, holds biannual conferences to announce latest database pricing practices to over 200 member consortia [43]. However, compared to the pharmaceutical industry, theoretical research and institutional development in R&D cost assessment, economic theory application, policy regulation, and procurement standardization require further maturation. Libraries will confront monopoly and pricing issues long-term and must invest greater effort in studying objective laws to develop scientific approaches balancing intellectual property protection with public information access rights.

In the era of digital resources dominating library collections, libraries partner with numerous database providers, though only a few are listed on domestic and international securities markets. These few large corporations dominate market pricing, order, and development direction. Long-term tracking and analysis of their annual reports can broaden libraries' information horizons in negotiations, rationally examine digital resource price fluctuations from market economy perspectives, and deeply consider underlying mechanisms, thereby enabling libraries to develop medium- and long-term game-theoretic cooperation strategies from high-dimensional strategic perspectives encompassing legal environments, international competition, and industry development trends. While annual reports serve as auxiliary information, the methodology has limitations: disclosed information is reserved to protect commercial secrets, financial data may be subjective to incentivize shareholders, and major providers like Springer Nature lack publicly available data due to private financing. These deficiencies can be supplemented with professional investment institution research reports to improve information reserves for commercial cooperation and procurement

operations.

Author Contributions:

Yang Hua: Annual report research, manuscript writing
Li Lingli: Research framework design, manuscript revision
Mo Xiaoxia: Literature research, manuscript revision
Xin Lei: Financial data calculation, revision, and review
Niu Yue: Manuscript revision

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

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