

Research on Impact Enhancement Strategies for Sci-Tech Journals Based on Science of Science Theory

Authors: Yongxia Liang, Yang Zhongkai, Tian Hong, Liu Jingjing, Li Cuixia, Dong Wenjie, Yang Zhongkai

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Abstract

Purpose Based on a review of science of science theories related to scientific journals, this study constructs a “Five-Force Model” of scientific journal influence and proposes pathways and strategies for enhancing scientific journal influence. Methods Using literature review, in-depth interviews, concept analysis, and other methods, this study constructs the “Five-Force Model” of journal influence from the perspectives of scientific knowledge production, flow, and dissemination, and subsequently proposes countermeasures and recommendations. Results This study proposes that scientific journal influence comprises five dimensions: knowledge force, persuasion force, management force, expression force, and dissemination force, using these five dimensions to construct the “Five-Force Model” of scientific journal influence. Conclusion The formation and enhancement of scientific journal influence is a systematic endeavor; one can effectively utilize knowledge activity theory to enhance the knowledge force of scientific journals, gain a deeper understanding of paradigm theory to improve the persuasion force of scientific journals, recognize the Matthew effect in the scientific community to strengthen the management force of scientific journals, leverage structural hole advantages to showcase the expression force of scientific journals, and fully recognize the functions of scientific journals to strengthen their dissemination force.

Full Text

Research on Strategies for Enhancing the Influence of Scientific Journals Based on Science of Science Theories

LIANG Yongxia^{1,2}), YANG Zhongkai³)*, TIAN Hong¹), LIU Jingjing¹), LI Cuixia¹), DONG Wenjie¹)

¹⁾ National Science Library, Chinese Academy of Sciences, No. 33 Beisihuan Xilu, Haidian District, Beijing 100190, China

²⁾ Department of Library, Information and Archives Management, School of Economics and Management, University of Chinese Academy of Sciences, No. 33 Beisihuan Xilu, Haidian District, Beijing 100190, China

³⁾ School of Public Administration, Dalian University of Technology, No. 2 Linggong Road, Ganjingzi District, Dalian 116024, China

Abstract

[Purpose] This study constructs a five-force model of scientific journal influence based on science of science theories and proposes pathways and strategies for enhancing that influence. **[Methods]** Through literature review, in-depth interviews, and conceptual analysis, we developed a five-force model of journal influence from the perspectives of scientific knowledge production, flow, and dissemination, subsequently offering targeted recommendations. **[Findings]** We propose that scientific journal influence comprises five dimensions: knowledge power, persuasion power, management power, expression power, and dissemination power, which together form the five-force model. **[Conclusions]** The formation and enhancement of scientific journal influence constitutes a systematic project. Strategies include applying knowledge activity theory to enhance knowledge power, deepening understanding of paradigm theory to improve persuasion power, leveraging the Matthew effect in science to strengthen management power, exploiting structural hole advantages to demonstrate expression power, and fully recognizing journal functions to bolster dissemination power.

Keywords: Scientific Journals; Science of Science Theories; Five-Force Model of Influence; Enhancement Strategies

Introduction

In July 2019, four national departments jointly issued the *Opinions on Deepening Reform to Cultivate World-Class Scientific Journals* (hereinafter referred to as the *Opinions*) [?], which states that “scientific journals inherit human civilization, assemble scientific discoveries, and lead scientific development, directly reflecting national scientific competitiveness and cultural soft power.” Under the guiding ideology of “comprehensively grasping the laws of innovation development, scientific management, and talent growth,” the document calls for “effectively enhancing the international dissemination power and influence of China’s scientific journals.” This clarifies the important role of scientific journals while setting higher requirements. On September 11, 2020, General Secretary Xi Jinping emphasized in his *Speech at the Scientists’ Symposium* [?] the need to “respect the laws of talent growth and the inherent laws of scientific research activities.” Scientific research activities are closely related to the development

of scientific journals, requiring us to identify the fundamental laws of journal operation from the laws of scientific development, thereby further enhancing journal influence.

Current research on enhancing scientific journal influence has yielded fruitful results. Domestic scholars have proposed numerous effective pathways and strategies from perspectives including academic quality [?, ?, ?], academic activities [?], communication platforms [?], brand building [?, ?], editorial competence [?], and open science [?, ?]. Li et al. [?] suggested applying philosophical theories to improve journal academic quality and influence, while Zhao [?] argued for focusing not only on academic influence but also on enhancing academic discourse power. Although these practical measures have proven effective to varying degrees, they have not deeply explored the underlying mechanisms, necessitating further investigation and refinement from foundational research on journals.

Science of science, also known as “the science of sciences,” is a discipline that takes modern science and technology as its research object to reveal and understand their essential characteristics and development laws [?], possessing rich connotations and extensions. Knowledge of science of science can help journal editors deeply understand the social and cultural functions of journals, clarify editorial philosophies, improve review efficiency, and expand research horizons—making it a fundamental principle and skill that scientific journal editors should understand and master. Building on previous research [?], this paper distills a five-force model of scientific journal influence based on science of science theories and proposes pathways and strategies for enhancement, aiming to provide references for promoting the high-quality development and world-class journal construction of China’ s scientific journals.

1. Funding and Author Information

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Authors: LIANG Yongxia (ORCID: 0000-0003-2676-4722), Ph.D., Associate Research Librarian, Editor-in-Chief, E-mail: liangyx@mail.las.ac.cn; TIAN Hong, Research Librarian; LIU Jingjing, Ph.D. Candidate, Editor; LI Cuixia, M.S., Editor; DONG Wenjie, Ph.D., Associate Research Librarian.

Corresponding Author: YANG Zhongkai (ORCID: 0000-0003-3444-3822), Ph.D., Professor, Doctoral Supervisor, E-mail: email@dlut.edu.cn.

2. Theoretical Framework

2.1 Science of Science Theories Related to Scientific Journals Science of science possesses rich connotations and extensions. As an interdisciplinary field, it exists and develops in various disciplinary forms [?], with its research objects extending to all scientific and technological knowledge and related carriers (people, objects, organizations, etc.). Scientific journals serve as carriers of scientific and technological knowledge, making them important research objects and topics in science of science.

The emergence, development, and evaluation of scientific journals have accompanied the evolution of science of science theories and methods. Relevant theories include: scientific knowledge activity theory (encompassing scientific knowledge accumulation theory, scientific frontier theory [?], knowledge unit drift and recombination theory, social construction theory of scientific facts [?], current mining discipline theory [?, ?], scientific cooperation theory, etc.), paradigm theory [?], social network analysis and structural holes theory [?], the Matthew effect in science, scientific knowledge growth laws (optimal age law for scientific creation, exponential law of scientific knowledge growth, three major laws of bibliometrics, etc.), priority confirmation and scientific reward systems [?, ?], and the social functions of scientific journals.

2.2 Connotation and Extension of Scientific Journal Influence Influence is the ability to change others' thoughts and actions in a manner they are willing to accept, encompassing strategic influence, impression management, performance ability, persuasive power, and collaboration-induced influence [?]. Scientific journal influence generally refers to the capacity of a journal' s published academic research outcomes to promote relevant academic research and application development within a certain period. This ability fundamentally stems from the research and application value of academic literature but is also constrained by societal recognition and cognitive levels, content diversity, and the journal' s dissemination capabilities during that period, making objective and accurate qualitative analysis and evaluation extremely complex and difficult. Various journal evaluation systems have introduced diverse influence indicators, such as citation metrics, reprint metrics, and distribution metrics. The *AMI Comprehensive Evaluation Report for Chinese Humanities and Social Sciences Journals (2018)* [?] proposed the AMI evaluation model, which assesses not only the influence of academic journals themselves but also their external development environment, award status, and institutional norms.

Through reviewing foundational science of science theories, expert interviews, and conceptual analysis, this study posits that the formation of scientific journal influence is a systematic project accompanying the entire journal workflow, which cannot be fully reflected by single or composite indicators alone but requires a systematic perspective. In this study, journal influence refers to the ability of journal elements to change or influence the thoughts, perspectives, and actions of the academic community and society in a manner that stakeholders

are willing to accept. It can also be interpreted as strategic influence, impression management, performance ability, persuasive power, and collaboration-induced influence.

2.3 Construction of the Five-Force Model of Scientific Journal Influence

Based on literature review and incorporating evaluation indicators from the AMI model relevant to this study’s theme, we have consolidated the influence evaluation indicators into five primary dimensions—knowledge power, persuasion power, management power, expression power, and dissemination power—along with eleven secondary indicators, as shown in [Figure 1: see original paper] and .

The five-force model is constructed around the process of knowledge production and dissemination. Knowledge power is proposed based on knowledge activity theory (encompassing knowledge acquisition, accumulation, creation, symbiosis, and flow), persuasion power on scientific paradigm theory, expression power on structural holes theory, management power on the Matthew effect and optimal age for scientific creation theory, and dissemination power on the social functions of scientific journals. These five forces possess distinct attributes yet are interrelated and mutually reinforcing rather than completely separable.

**** Three-level indicators for the science of science-based scientific journal influence model

| Secondary Indicator | Tertiary Indicator |
|-------------------------|---|
| Knowledge Power | Knowledge Acquisition Power: Highly-cited papers count Knowledge Accumulation Power: Journal article volume, reference volume Knowledge Flow Power: Citation count, current-year impact factor, impact factor, five-year impact factor, international citations Knowledge Creation Power: Number of special columns and issues Knowledge Symbiosis Power: Journal-discipline relationship metrics |
| Persuasion Power | Discourse Power: Research paradigms, new concepts, cultural leadership Service Power: Discipline construction, knowledge services |

| Secondary Indicator | Tertiary Indicator |
|----------------------------|--|
| Management Power | Driving Force: Open publishing construction, integrated publishing construction, publishing service construction Academic Integrity: Editorial team, talent pool, institutional development |
| Expression Power | Reputation: Peer review participation numbers and scope, journal and editorial staff awards, paper awards, average attendance at academic conferences, circulation volume, copyright revenue |
| Dissemination Power | Distribution: Paper reprint volume, number of online platforms, overseas distribution, online visibility |

Knowledge power emphasizes factors requiring attention during the knowledge production phase, focusing on examining content quality through capabilities in knowledge acquisition, accumulation, flow, creation, and symbiosis. Management power stresses the journal manager's ability to coordinate human, financial, and material resources. Dissemination power represents a comprehensive assessment of the journal's final product dissemination capabilities, directly reflecting the level and effectiveness of knowledge and management power. Persuasion power concerns stakeholders' recognition of the journal's operational effectiveness and economic benefits, while expression power relates to the journal's visibility.

3. Enhancement Strategies

3.1 Leveraging Knowledge Activity Theory to Enhance Knowledge Power (1) Focus on Citation Quantity and Quality to Strengthen Knowledge Accumulation Power

Scientific papers should "stand on the shoulders of giants" by emphasizing knowledge accumulation and thoroughly reviewing predecessors' achievements to identify their own innovations. In routine manuscript processing and revision, we have observed that many authors (most being journal editors) do not adequately review prior work, raising questions about whether they emphasize citations in their own editorial work or remind authors to engage with previous research. By proactively helping authors analyze knowledge accumulation, understand paper

and citation structures in their disciplines, and summarize citation characteristics of high-impact journals in their fields, editors can achieve multiplier effects in future publication work.

(2) Extensively Utilize Scientific Intelligence Tools to Enhance Knowledge Acquisition Power

Scientific knowledge development follows certain patterns, including “current mining disciplines,” “re-mining disciplines,” and leading disciplines, all requiring editors with profound disciplinary knowledge to possess keen discovery and acquisition capabilities. With the development of science of science, intelligence experts can predict scientific development trends and hotspots. For instance, Zhao Hongzhou predicted that quark physics was an “exploratory mining discipline,” nuclear physics with undiscovered energy conversion effects was a “current mining discipline” deserving attention, and condensed matter physics would become a popular “re-mining discipline.” In today’s big data era, scientometric experts have developed numerous tools and software to help researchers explore hotspots and mine information. Journal editors can leverage these tools to enhance knowledge acquisition, identify research hotspots, conduct rich mining, locate current mining disciplines, and thereby organize manuscript planning that provides guidance to authors, ultimately helping their papers become high-quality, highly-cited works.

(3) Organize Thematic Issues Proactively to Foster Knowledge Creation Power

In *Laboratory Life*, Latour uses vivid examples to reveal that scientific facts are not representations of the natural world but products of laboratory construction resulting from collective argumentation, negotiation, and compromise among scientists—meaning scientific frontiers are created. Price argued that scientific frontiers consist of approximately thirty to forty papers discussing a particular topic concentrated in a specific period, forming both the frontier of that era and the knowledge foundation for the next. In our research, we consulted the editorial director of an environmental journal organizing a 30th-anniversary special issue (following 10th and 20th-anniversary issues) in a domestically continuous field. When the special issue was organized, the research direction had not yet formed; after its publication, research in this area gradually increased or even exploded, demonstrating that special issues can create frontiers while laying foundations for future ones.

(4) Promote Scientific Collaboration to Enhance Knowledge Symbiosis Power

Novel ideas and information emerge from weak ties with individuals in different groups, and individuals in structural holes gain competitive advantages and innovation capabilities through information filtering. This illustrates that those positioned in structural holes or at interdisciplinary boundaries are more likely to produce innovative results. In 2020, the National Natural Science Foundation of China established the Department of Interdisciplinary Sciences to encour-

age interdisciplinary research and promote knowledge symbiosis. Collaboration among scholars from different disciplinary backgrounds appears more likely to yield innovative outcomes. Comprehensive reviews' authority, domain specificity, and practicality give them strong appeal, high intelligence value, and even a role in leading disciplinary development, making them more likely to generate high impact [?] and providing guidance for students, researchers, and industry with strong practical utility.

(5) Accelerate Publication Speed to Strengthen Knowledge Flow Power

Claims to scientific discovery priority emphasize timeliness—they must be published first, before other researchers discover or announce the same findings, to establish originality and gain recognition from the scientific community and corresponding rewards. The scientific reward that scientists value most is rapid publication after peer recognition. Understanding the true meaning of priority confirmation requires accelerating manuscript processing and improving review efficiency. Experts note that Chinese scientists submit to international journals primarily because of their speed. Once published, papers gain recognition from the scientific community and enter the academic exchange system to be seen and cited by other researchers—a virtuous cycle. Internationally influential journals are generally monthly, semimonthly, or even weekly publications. Accelerating publication speed not only facilitates knowledge flow but also rewards scientists.

3.2 Deepening Understanding of Scientific Paradigm Theory to Enhance Persuasion Power (1) Organize Academic Activities to Build Academic Exchange Platforms

Kuhn [?] proposed that only when scientists enter normal science can they effectively engage in scientific communication. Research demonstrates that among various scientific communication methods, journals remain the most effective. Scientific journals can organize diverse academic activities to provide scientists with venues for publishing innovative ideas, thereby promoting open scientific exchange and knowledge dissemination. Journals should strive to create opportunities and establish open exchange platforms to publicize researchers' achievements, making scientists truly regard the journal as their backing and achieving win-win outcomes.

(2) Enhance Peer Review Quality to Maintain Scientific Norms

A crucial process for academic journals is peer review before publication, which serves as recognition of the paper and quality control. Peer review is also an academic exchange process where reviewers provide comments for authors' revision, and authors respond and defend their work, improving paper quality through mutual understanding and consensus-building. A highly responsible and professional reviewer team provides a solid foundation for ensuring peer review quality. Journals should focus on improving peer review quality, providing quality services to reviewers, communicating editorial philosophies, and

maintaining good interactions with experts.

(3) Establish Various Awards to Enhance Journal Attractiveness

Scientific journals should grant prestige and recognition to completed work within the scientific community. Establishing various awards can stimulate the vitality of authors, reviewers, editorial board members, editors, and other stakeholders, thereby enhancing journal visibility, reputation, and attractiveness.

3.3 Emphasizing Talent Team Building to Enhance Management Power (1) Leverage the Matthew Effect to Identify Potential Talent for Journals

The Matthew effect in the scientific community arises from intense competition, scarce research resources, and objective differences in scientists' research capabilities. To achieve its goal of expanding human knowledge, the scientific community must prioritize efficiency—maximizing knowledge growth with minimal input. From an equity perspective, it should provide equal opportunities for all to contribute, but limited resources make this impossible, creating a dilemma: restricting the Matthew effect reduces efficiency, while unrestricted application intensifies internal contradictions and may bury unknown talents, causing inequality. Therefore, the Matthew effect must be appropriately constrained. Applied to journals, the effect means authors with more publications find it easier to publish again, while those with few or no publications face barriers due to institutional reputation, funding, academic rank, etc. Journals should avoid this phenomenon by focusing on paper value and discovering potential talent.

(2) Understand and Apply the Optimal Age Law for Scientific Creation to Identify Outstanding Scientists and Research Teams

To reach world-class levels in scientific frontiers, a country must cultivate outstanding scientists. General Secretary Xi Jinping's *Speech at the Scientists' Symposium* proposed “respecting the laws of talent growth and scientific research activities to cultivate strategic scientific and technological talents, leading talents, and innovative teams with international standards.” Journal editors can apply the optimal age law for scientific creation to identify and predict authors' peak creative ages in their disciplines, scanning and analyzing experts based on age thresholds to provide necessary support for cultivating outstanding scientists, such as offering communication opportunities, awards, green channels for publication, and vigorous promotion of their achievements.

(3) Focus on the Development of Talent at All Levels and Provide Career Planning

Scientific journals must attend to talent team building, including reviewer teams, editorial boards, editorial staff, and publishing/distribution teams, each with distinct responsibilities and career objectives. These groups require differentiated management and career planning to enable them to contribute effectively

in their respective positions, fostering better development of the entire team and academic community.

3.4 Exploiting Structural Hole Advantages to Demonstrate Expression Power Burt proposed the “structural holes” theory in *Structural Holes: The Social Structure of Competition* [?], examining interpersonal network structures to analyze which network configurations can bring greater benefits or returns to actors. Structural holes refer to gaps in social networks where certain individuals have direct connections with some but not others, creating discontinuities that appear as cavities in the overall network structure. Scientific journals should identify structural holes within stakeholder networks and leverage these advantages to demonstrate journal expression power by selecting appropriate online platforms and finding suitable disseminators.

3.5 Fully Recognizing Journal Functions to Strengthen Dissemination Power The functions of scientific journals refer to their actual and potential roles. As is well known, the core functions of scientific journals are knowledge certification, refinement, dissemination, and preservation. The ultimate purpose of publication is dissemination, yet currently, Chinese journals’ dissemination power remains insufficient and requires strengthening.

(1) Leverage Academic and Ideological-Cultural Leadership

The *Opinions* state that scientific journals inherit human civilization, assemble scientific discoveries, and lead scientific development, directly reflecting national scientific competitiveness and cultural soft power. Under new circumstances, the rapid development of open science, data science, and new technologies presents new challenges, and paradigm shifts enrich the connotations and extensions of scientific journals. Facing these challenges, how can journals remain true to their original mission and better embody national scientific competitiveness and soft power? Only by recognizing their positioning, telling China’ s stories well, and disseminating China’ s voice can journals fulfill their academic and ideological-cultural leadership roles.

(2) Serve Discipline Construction and Expand Publicity Channels

Scientific journals should serve scientific development, particularly discipline construction. For journals affiliated with research institutes and universities, this means aligning with key disciplines and local characteristics by analyzing institutional advantages in geography, talent, literature resources, and research capabilities to understand the latest disciplinary developments and future trends, thereby proposing reasonable topic selection and manuscript planning strategies.

Journal publicity requires diverse perspectives and spaces, relying on diversified manuscript solicitation models and presentation forms. Topic selection can leverage expert solicitation, disciplinary calls for papers, seminars, symposiums, and academic forums to engage frontline researchers and academic groups, continu-

ously exploring tactical, strategic, comprehensive, and interdisciplinary topics to expand channels for publicizing disciplinary achievements.

(3) Improve Open and Integrated Publishing Levels

We should vigorously promote comprehensive open publishing, advancing the five domains of open science (open access, open data, open practices, open collaboration, open recognition and rewards) to provide optimal experiences for publishing research results and data. We must build powerful and influential academic journal publishing platforms and construct integrated all-media publishing matrices. By actively exploring richer and more convenient information dissemination channels through WeChat public platforms, we can meet diverse user needs and leverage the platform's social stickiness to build academic functional communities. Drawing on domestic and international experiences, we should innovate value-added services for integrated publishing.

Conclusion

This paper has conducted conceptual analysis of scientific journal influence based on science of science theories, constructed a five-force model, and proposed enhancement strategies accordingly. It should be noted that this study represents only preliminary insights into applying science of science knowledge to journal research, with limitations including the need for more empirical validation of the five-force model and further refinement of various influence dimensions. Future plans include continuing to excavate science of science theories and laws related to scientific journals and conducting larger-sample empirical studies to contribute to improving China's scientific journals. Enhancing journal influence is a systematic project requiring joint efforts from all stakeholders in the scientific community, not just journal editors. We hope more colleagues will join this research to contribute to China's scientific and journal development.

Author Contributions

LIANG Yongxia: Designed the paper framework, organized materials, wrote the initial draft, and revised the final manuscript.

YANG Zhongkai: Provided design concepts and revised the final manuscript.

TIAN Hong: Guided paper design and provided revision suggestions.

LIU Jingjing, LI Cuixia, DONG Wenjie: Collected materials and data, and provided revision suggestions.

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