Experiences and Challenges of Science Press' s SciEngine Platform in Going Global (Postprint)

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Abstract

【Objective】To further improve the proprietary platform and enable Chinese scientific journals to "build their own ships to go overseas."【Methods】Taking SciEngine as a case study, this paper summarizes its development experience and analyzes the challenges it faces. 【Results】 SciEngine' s technical capabilities, content aggregation capacity, and market-oriented operation ability provide the necessary conditions to help Chinese scientific journals internationalize. However, it still faces considerable challenges in international competition. 【Conclusion】 The key for SciEngine to join the ranks of international publishing platforms lies in further resource integration, service innovation, enhancement of international brand recognition, and forecasting future technological developments.

Full Text

Preamble

ChinaXiv Partner Journal: The Experience and Challenges of Science Press' s SciEngine Platform in "Building Ships to Sail Overseas"

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Abstract

Purpose: To better improve the autonomous platform and further realize the "building ships to sail overseas" strategy for scientific journals. **Method**: Taking SciEngine as a case study, this paper summarizes the platform' s development experience and analyzes the challenges it faces. **Results**: SciEngine' s technical capabilities, content aggregation capacity, and market-oriented operational abilities provide the necessary conditions to help Chinese scientific journals go

global. However, it still faces considerable challenges in international competition. **Conclusion**: Further integrating resources, innovating services, enhancing international brand recognition, and making forward-looking judgments on future technological development are key for SciEngine to join the ranks of international publishing platforms.

Keywords: SciEngine; building ships to sail overseas; digital transformation; operational management; technological innovation

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The Chinese scientific journal research community has long called for the construction of an independent digital publishing platform. As China' s first self-developed scientific content service platform (commissioned by Science Press to its subsidiary, *Science China* Press), SciEngine is dedicated to helping Chinese journals go international and achieve the goal of "building ships to sail overseas." This paper summarizes SciEngine' s development experience and analyzes the challenges it faces in future development. The significance of this research lies, on one hand, in providing experience for publishing units with the capacity to develop their own platforms, and on the other hand, in offering suggestions for autonomous platforms to better compete internationally and achieve long-term profitability.

1.1 International-Standard Technology

Markup languages, particularly XML (Extensible Markup Language), form the technical foundation of digital publishing, with international STM publishers all applying XML-based workflows to generate and manage content. The self-developed SciEngine adopts XML as its technical foundation for information organization, fully drawing on the platform construction experience of foreign publishing giants and reaching international standards in basic technical conditions. For China' s scientific journal digital publishing, SciEngine serves as a demonstration model in both internal management technology and external service technology.

For internal editorial and management processes, the XML system is not merely an abstract technical language but also an easily operable template that can simplify operations and connect various workflow stages. For instance, during the typesetting process, the XML system can standardize or redraw images according to established publishing standards, ensuring uniform formatting and clear images. For issues such as italicization, superscripts/subscripts, and line

alignment in formulas, editors can make direct modifications through shortcut keys or source code command symbols without tedious manual adjustments. In traditional publishing workflows, editing and publication are relatively independent stages. However, in the XML system, these two stages can be seamlessly connected, greatly reducing the time required for handover and enabling publication upon article acceptance. On SciEngine' s pages, articles that have just been accepted (Just Accepted) are displayed, representing the seamless connection between these two stages. This not only helps authors publish their findings quickly but also enables the academic community to follow the latest research results.

In the publication stage, the XML system can easily achieve "create once, use multiple times, use permanently." For example, the HTML, PDF, and ePUB formats provided on SciEngine' s website can all be easily converted from XML files, and conversion to mobile phones or other reading devices requires no cumbersome operations. This is because the XML system separates data content from form (metadata schema), with the particularities of data formats realized within the universal framework of metadata.

XML technology also enables cross-database interfacing or integration with international databases to provide users with richer content services. For example, after integrating with the Web of Science (WoS) platform, SciEngine can display in real time the citation counts of articles on WoS and their social attention as presented by Altmetric. In summary, whether in editorial processes or user services, SciEngine' s technical conditions have reached international standards, equipping it with the technical capacity to help Chinese scientific journals go global.

1.2 Relying on Science Press to Aggregate Publishing Resources

Building an international digital publishing platform requires three indispensable elements: capital, technology, and content. Blindly pursuing advanced technology can easily lead to failure, as exemplified by Rice University Press —a typical failure case. At the end of the 20th century, Rice University Press launched a digital publishing experiment, publishing only about 20 digital books annually with an unclear profit model and no substantial external funding, making failure inevitable.

Science Press is one of the few domestic publishing institutions that possesses all three conditions. Ranked among the global top 50 publishers, Science Press has overseas branches and substantial strength. Since China' s reform and opening up, Science Press has actively participated in international cooperation and trade, importing and exporting a large number of book copyrights, thereby accumulating experience in cooperative publishing. Through the "borrowing ships to sail overseas" approach, leading Chinese journal brands such as *Science China* and *Science Bulletin* have gained international academic influence. As more

books and self-published journals go international, building an autonomous digital publishing platform has become a priority.

Developing an autonomous publishing platform is not merely an aspiration for independence but also a general trend in the international publishing industry. In the digital age, publishing products are not just individual books or journals but data streams in an ocean of data. Aggregating these dispersed data streams into an XML-based digital publishing platform may require significant initial investment and internal management adjustments, but in the long run, it reduces marginal costs and creates aggregation effects.

Beyond existing resources, scientific publishing companies also expand their content resources through cooperation and mergers with other publishing units. China's numerous and dispersed publishing units can use the SciEngine platform for international operations as a method to promote the overall development of the journal industry under the existing publishing landscape. For example, *Acta Biochimica et Biophysica Sinica*, selected for the "Excellence Action Plan for Chinese Scientific and Technological Journals" in 2019, adopted open access publishing through the SciEngine platform in 2022, representing both the realization of the Excellence Action Plan' s "building ships to sail overseas" strategy and an independent exploration of open access publishing.

In terms of mergers and acquisitions, in 2019, "Science Press completed the acquisition of 100% equity of French EDP Sciences, marking the first time a Chinese scientific publishing institution has truly completed the acquisition of a Western publishing organization."Mergers and acquisitions are important means for large publishing enterprises to achieve self-renewal and transformation. John Wiley has continuously created profit points for itself through mergers at different historical stages; during the critical stage of digital transformation, Wiley' s acquisition of Blackwell Publishing led to the integration of Wiley Interscience and Blackwell Synergy into the online platform that eventually became Wiley Online Library.

The acquisition of EDP Sciences was also a strategic action taken by Science Press at a critical stage of digital publishing transformation, adding 75 internationally-oriented journals to SciEngine. Purposefully seeking strategic mergers can rapidly increase content resources while bringing international reputation and enhancing competitiveness to the platform.

Promoting journal internationalization does not require blindly building autonomous platforms; instead, appropriate approaches should be chosen based on thorough assessment of capital, technology, and content prerequisites. The construction of SciEngine became possible precisely because these three conditions were met, enabling further resource aggregation and growth.

1.3 Market-oriented Products and Services

SciEngine' s software development employs open bidding to suppliers, ensuring that the developed products are market-oriented from the outset and provide high-quality products and services to users.

SciEngine offers free-to-browse journals, allowing users to experience the platform' s presentation methods and functions. Some journals provide QR codes for easy user follow-up.

The search bar on SciEngine adopts the internationally common model of keywords, authors, and titles, facilitating use by global users. The platform integrates book and journal resources, enabling the search engine to match not only journal article titles precisely but also book chapter titles.

For submission, users can directly access the journal' s submission website through submission links. Some journals allow real-time receipt of manuscript status information and message reminders by following the SciCloud WeChat official account, facilitating manuscript checking, payment, and other operations, and achieving interaction between social media and the platform.

Although SciEngine, launched in 2016, missed the two waves of autonomous platform construction, it still has the capacity to enter the international market with its relatively rich content resources. At least in terms of current content volume, while there remains a considerable gap with the thousands of journals held by publishing giants, it is not inferior to second-tier publishers. In 2021, SciEngine hosted 275 scientific and technological journals, while World Scientific had only about 140.

In summary, SciEngine possesses product awareness and service consciousness, and has initially developed the ability to monetize its resources.

2. SciEngine' s Challenges

2.1 Brand Integration Needs Improvement

Although SciEngine has aggregated considerable resources and enables one-stop searching, its own content brand has not been fully integrated with the content brands acquired through cooperation or mergers—for example, there is still no unified submission system. This hinders the formation of brand recognition for SciEngine. China' s specialized journals, unlike those abroad that are concentrated in certain enterprises, often find it difficult to pool resources and support each other. If this situation continues in digital publishing platforms, it will greatly reduce the overall efficiency of manuscript processing. In the digital publishing era, article content is not merely an asset held by a particular institution but rather value-added data streams that flow freely across different carriers. To achieve "sailing overseas," it is necessary to break down the barriers and interest distribution mechanisms between journal publishing institutions.

Digital publishing platforms cannot be satisfied with merely promoting existing excellent scientific journals; they must also cultivate new brands based on the platform. In this process, while national financial and policy support is important, the platform' s own marketing is also crucial. From the formulation of business strategies and promotion of journal clusters to copywriting and official account editing, specialized teams should be responsible for implementation. Mature digital publishing platforms have their own interface and color styles, which are repeatedly presented during external promotion to strengthen brand recognition. Common examples include corporate "theme colors" and "theme patterns," which, like a national flag' s colors and patterns, carry rich meaning. For instance, Sage Publishing' s theme color is blue, and its WeChat official account also uses blue as its theme color. This not only creates formal harmony across various posts but also carries brand culture. Additionally, platforms can experiment with open access and utilize funding and technology from venture capital and multinational corporations to cultivate new brands.

In summary, during the integration of aggregated resources, attention must be paid not only to data integration but also to brand element integration.

2.2 Social Media Promotion Needs Improvement

Social media has become an important channel for publishers to promote their products. Although SciEngine is still in its initial construction stage with much work remaining, this cannot justify neglecting the preheating and dissemination functions of social media.

Researchers often follow social media accounts that provide new information about the scientific community, participate in discussions in online forums, and share their research findings in online academic communities. These venues should also become focal points in SciEngine' s brand building process. Research has found that Chinese scientific journals' latest research results receive relatively few mentions on social media, and international promotion efforts are insufficient, due to a lack of mature social media operation strategies.

To better promote SciEngine' s content resources and release findings in a timely manner, it is best to form localized science communication teams for different language and cultural circles, specifically responsible for operating social media. In recent years, international publishers such as Elsevier have made full use of domestic social media like WeChat and Weibo for localized communication, promoting new journals and advertising new technical services while compiling and disseminating outstanding research results.

The comprehensive level of scientific journals includes not only academic quality and editorial standards but also science communication capacity. Science communication on social media is not simply copying journal articles directly to the internet but rather content processing based on the original papers. Particularly, popular science articles that appeal to both experts and laypeople often attract more attention. Getting more local users to see and follow content on

SciEngine is a prerequisite for establishing its international brand image.

A study of the "Nature Research" WeChat official account found that its pushed content is basically original, often containing Chinese elements. To stimulate readers' interest immediately, article titles employ suspense-creating and emotionally expressive wording. Although this may seem at odds with scientific rigor, it does contribute to higher readership in actual communication effects. Of course, as a channel for disseminating scientific knowledge, news and popular science articles cannot have the slightest deviation when expressing scientific content, otherwise the brand image will be damaged.

In summary, SciEngine is almost a blank slate in terms of building localized communication platforms and needs to learn from the mature mobile and social media communication strategies of other publishers to move from obscurity to recognition.

2.3 Service Innovation Based on Segmented Users Needs Development

Globally, the digital publishing industry has transformed from the relatively simple "technology + content" model to an increasingly complex "technology + content + service concept" model. Previously, STM publishing giants could rely on advanced technology and accumulated massive content to attract large numbers of users with rigid demands. However, today, with XML-based digital publishing technology relatively mature and print content largely digitized, relying solely on technology and content to navigate the complex market environment has become quite difficult. Under such circumstances, only by allowing digital publishing enterprises to fully compete with domestic and foreign companies can the government foster service concepts that meet the needs of vast numbers of researchers and transform content tools into knowledge service providers.

As a digital product, digital publishing platforms primarily face two types of users: individual subscribers and institutional users such as schools, research institutions, and enterprises. Although SciEngine has the capacity to generate revenue from both types of users, it still needs to develop distinctive services to ensure diversified profit-making methods. International STM publishers are not only leaders in publishing technology innovation but also often leaders in service innovation. Only by continuously following up on new technologies and services and creating their own characteristics can they better participate in international competition.

Several trends in STM publishing in recent years deserve attention. First, research increasingly relies on social media for information acquisition and group communication, and international STM publishers are placing greater emphasis on building online research communication communities. This not only enhances user stickiness but also provides a basis for further service optimization based on user behavior. Under the advocacy of international publishers such as Macmillan, journal evaluation metrics that emphasize social media commu-

nication power (such as Altmetric) are gaining influence. Whether new metrics attempting to challenge the impact factor can form a new order in the journal evaluation system remains to be seen, but the correlation between social media communication power and journal influence cannot be ignored.

Second, specialized databases for particular professional fields are receiving increasing attention. Due to the different characteristics of each discipline, users may not be able to precisely retrieve information in general databases, such as chemical structural formulas or physics equations. In specialized databases, special settings can meet professional editing and retrieval needs. The digital publishing platforms of the American Chemical Society and the British Physical Society have designed discipline-specific data structures according to their own disciplinary logic. With the rapid growth of academic literature and increasing pressure on researchers to read papers, specialized databases may become the preferred choice for future researchers.

Third, new technologies remain key to driving digital publishing development. Although XML technology laid the technical foundation for digital publishing more than 20 years ago, digital publishing technology has not stood still, especially in knowledge service software development, where international publishers often lead. Currently, the standardization of audio-visual content and even virtual reality content is an area being explored by the publishing community. Existing forms such as video abstracts and video papers are by no means the end point of new publishing formats; reproducing research processes in the metaverse may be the future of scientific publishing.

Conclusion

SciEngine' s operation has ended the awkward situation of China, as a major producer of scientific papers, lacking an autonomous content service platform. Its hardware conditions, content aggregation capabilities, and market-oriented operational methods provide a solid foundation for realizing the "building ships to sail overseas" strategy. However, SciEngine still faces considerable challenges in international competition. Further integrating resources, innovating services, enhancing international brand recognition, and making forward-looking judgments on future technological development are key for SciEngine to join the ranks of international publishing platforms.

Given SciEngine' s continuous development, research on autonomous platforms should shift from the conceptual level to the practical level, converting good ideas into actual construction plans. The publishing industry is evolving rapidly, and this paper only provides some incomplete perspectives. Future researchers can conduct more in-depth analyses from institutional mechanisms, technology-driven mechanisms, talent mechanisms, capital operation mechanisms, and business model innovation mechanisms. Specific issues such as technology selection, institutional setup, talent recruitment, and team building still need to be explored in practice.

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