Post-print: Innovative Practices in New Technology Application, Digital Transformation, New Media Communication, and Operations of Scientific Journals in the Context of Media Convergence

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Abstract

[Objective] To explore how scientific journals can leverage new technologies to conduct business, achieve digital transformation, and utilize new media for efficient dissemination and operation within the context of media convergence.

[Methods] This study examines the application of virtual reality, artificial intelligence, mobile, and multimedia technologies in scientific journals, analyzes the current status and challenges of digital transformation and new media dissemination and operation, and proposes solutions.

[Results] Driven by new technologies, scientific journals have enhanced editorial efficiency, improved article readability, and elevated their core competitiveness.

[Conclusion] Scientific journals hold considerable promise in new technology application, digital transformation, and new media dissemination and operation; thus, actively promoting the transformation and development of scientific journals is imperative.

Full Text

Preamble

ChinaXiv Partner Journal: Innovative Practices in New Technology Application, Digital Transformation, and New Media Communication and Operation for Scientific Journals in the Context of Media Convergence

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Abstract

[**Objective**] This study explores how scientific journals can leverage new technologies to conduct business, achieve digital transformation, and utilize new media for efficient communication and operation in the context of media convergence. [**Method**] We examine the application of virtual reality technology, artificial intelligence technology, mobile technology, and multimedia technology in scientific journals, analyze the current status and dilemmas of digital transformation and new media communication and operation, and identify solutions. [**Results**] Driven by new technologies, scientific journals have improved editorial efficiency, enhanced article readability, and strengthened their core competitiveness. [**Conclusion**] Scientific journals have tremendous potential in new technology application, digital transformation, new media communication, and operation, and should actively promote their transformation and development.

Keywords: media convergence; scientific journals; new technology; digital transformation; new media communication
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Introduction

With the popularization of the Internet and the development of digital technology, traditional media are gradually transitioning toward new media and digitalization, making media convergence an inevitable trend in media development —scientific journals are no exception. The *13th Five-Year Development Plan for Press, Publication, Radio, Film, and Television* emphasizes "researching and applying artificial intelligence technologies, including machine writing, machine translation, intelligent topic selection planning, and intelligent content distribution based on deep learning and brain-like intelligence," "promoting the printing industry toward green, digital, intelligent, and integrated development," and "enhancing the informatization, intelligence, standardization, and intensification of distribution and circulation"[1], focusing on the comprehensive promotion of digital transformation and the overall industrial layout of the publishing industry. In December 2021, the National Press and Publication Administration officially issued the *14th Five-Year Period Development Plan for the Publishing Industry*

(hereinafter referred to as the *Plan*). The *Plan* explicitly proposes implementing a digitalization strategy and points out the need to "strengthen the digital publishing industry," "vigorously enhance intelligence levels," and "elevate industrial digitalization to a new level" [2]. These two five-year plans demonstrate a progressive development in guiding and planning the digital transformation, integrated development, and deep integration of the publishing industry. Against this backdrop, scientific journals must continuously explore innovative practices in new technology application, digital transformation, and new media communication and operation to cope with increasingly fierce competition and enhance their core competitiveness.

1. New Technology Applications

Driven by new technologies, editors of scientific journals can conduct more efficient work. For instance, they can use big data technology to conduct in-depth analysis of research fields to more accurately identify, evaluate, and edit articles; employ artificial intelligence in research and publishing; and utilize blockchain technology to protect article copyrights, optimize publishing processes, reasonably control academic misconduct, and achieve rapid and intelligent manuscript acceptance [3-6]. These new technologies can help scientific journal editors improve work efficiency and reduce costs in the digital environment while providing the latest technical support for the digital transformation of scientific journals.

1.1 Application of Virtual Reality Technology in Scientific Journals

Virtual Reality (VR) technology is a digital technology that simulates real physical mechanisms and scenarios. Traditional scientific journals predominantly present articles in text and image formats. VR technology can present scientific research findings to readers in the form of three-dimensional images, enabling real-time interaction and experience in a virtual world and further deepening understanding and cognition of scientific achievements. For example, the scientific journal *Pocket Research* utilizes VR technology to present a large number of research findings through 3D interaction, significantly improving article readability and comprehensibility. Another example is the *PaiPaiDong* software, the first software to integrate traditional media with VR technology. Based on a VR technology-enabled three-dimensional paper media business platform, it brings static graphics to life in three-dimensional space. News events can dynamically display the entire process, and in some cases, portrait avatars can even engage in dialogue, creating an entirely new and different experience for users [4].

1.2 Application of Artificial Intelligence Technology in Scientific Journals

The development of Artificial Intelligence (AI) technology has also found application in scientific journals. With advances in natural language processing and

other technologies, AI can automatically process and analyze large amounts of data in scientific journals, improving article quality and readability. Intelligent automatic typesetting not only enhances publishing efficiency but also ensures the timeliness of papers [7-8]. Additionally, AI technology can recommend articles relevant to readers' research interests through recommendation algorithms, reducing the difficulty of finding articles and improving the reading experience.

1.3 Application of Mobile Technology in Scientific Journals

Mobile technology has become an indispensable part of daily life. For scientific journal publishers, launching mobile applications is a crucial means of maintaining industry competitiveness. Through mobile applications, scientific journals can provide readers with the latest and highest-quality scientific research findings anytime and anywhere, freeing scientific communication from temporal and spatial constraints. Mobile technology applications in scientific journals mainly manifest in several aspects: (1) **Mobile Reading**: Mobile technology can provide a superior reading experience for scientific journals through apps and WeChat subscription accounts that regularly push journal updates and support online reading. Mobile reading is convenient and allows users to access paper information anytime and anywhere, significantly improving paper citation rates and journal dissemination effectiveness. (2) **Mobile Submission**: Mobile technology enables researchers to submit papers anytime and anywhere via smartphones or tablets, providing more convenient and efficient services for contributors through mobile upload, editing, and submission operations. (3) **Data Analysis**: Mobile technology provides more convenient and real-time data analysis tools for scientific journals, using big data mining and analysis to more accurately grasp reader group needs and understand behavioral characteristics and trends in journal usage. (4) **Communication and Interaction**: Mobile technology offers a convenient and efficient platform for communication and interaction between readers and authors, facilitating academic discussions and sharing through social exchanges, thereby enhancing journal update frequency and visibility. (5) **Scientific and Technological Innovation Applications**: The rapid development and application of mobile technology have brought cloud technology and artificial intelligence applications into the journal field, promoting innovation in digital publishing and digital editing and providing comprehensive, real-time academic achievements and information for a broader audience of readers and researchers.

1.4 Application of Multimedia Technology in Scientific Journals

In the era of media convergence, multimedia technology has also become an important component of scientific journals. Multimedia technology can organically combine various forms of information such as text, images, audio, and video to enrich article expression. Applications of multimedia technology in scientific journals mainly include: (1) **Diverse Formats**: Multimedia technology enables scientific journals to move beyond traditional print formats and present

information in multiple forms such as images, videos, audio, and animations, making research findings more vivid and intuitive. (2) **Video Recording**: Some scientific journals have gradually introduced video recording technology, allowing authors to demonstrate experimental operations and present research findings through recorded videos, making them easier for readers to understand. (3) **Data Visualization**: Multimedia technology can also be applied to data visualization, providing readers with more intuitive and comprehensible data presentation methods such as maps and scatter plots, making information display more dynamic. (4) **Interactive Evaluation**: Multimedia technology can also be used for interactive communication in journal evaluation schemes, making evaluation more intuitive and clear during the process of assessing journal quality or paper review, thereby improving the quality management level of scientific journals.

In summary, as the era of media convergence deepens, scientific journals must continuously embrace new technologies, explore new publishing formats, improve the efficiency and effectiveness of scientific communication, and meet readers' diverse information needs. The application of new technologies such as virtual reality, artificial intelligence, mobile, and multimedia will become an important development direction for scientific journals.

2. Digital Transformation

Digital transformation is an irreversible trend for scientific journals. As traditional media, digital transformation means keeping pace with the times. Digital transformation can help scientific journals achieve better communication and operational efficiency and make them more competitive.

2.1 Current Status of Digital Transformation

The implementation of digital transformation has gradually become an inevitable aspect of competition among scientific journals. An increasing number of scientific journals have begun digital transformation, including converting from print to digital versions, online publishing, electronic journal archives, and using digital technologies such as social media to interact with readers. For example, *Science China* has achieved digital transformation, with its electronic version indexed in multiple major database platforms worldwide. Simultaneously, the journal uses social media to interact with readers, opening WeChat public accounts, Sina Weibo, and other social platforms to achieve seamless online and offline integration.

2.2 Dilemmas of Digital Transformation

Despite the clear advantages of digital transformation, its problems cannot be ignored. Digital transformation of scientific journals requires high costs, advanced technical capabilities, and sufficient technical talent. It also means journals must face a harsher competitive environment and need to enhance their

brand influence and service quality. Specific problems facing digital transformation of scientific journals include: (1) **Insufficient Resources and Technology**: Digital transformation requires substantial resources and funding, as well as professional talent for technical development and operation. Some scientific journals cannot undertake digital transformation due to limited internal technology and funding. (2) **Difficulty Changing Traditional Mindsets**: Editors of some established scientific journals, due to long-standing traditional concepts and work methods, tend to be conservative and have difficulty accepting digital transformation, limiting the progress of digital transformation. (3) **Increasingly Intense Competition**: With the arrival of the digital era, competition in the scientific journal field is intensifying, with more and more competitors. If scientific journals cannot seize opportunities in digital transformation, they may face elimination and market share decline. (4) **Changing User Demands**: As user demands change and more scientific journals enter the digital field, users have higher requirements for the quality, reliability, and timeliness of online information. Scientific journals must adapt to these changes and continuously optimize digital transformation to better meet user needs. (5) **Data Security and Maintenance Difficulties**: In the digital era, data security and maintenance for scientific journals are challenging, requiring a series of measures to ensure data security and integrity and prevent hacking and other abnormal operations. It is necessary to understand and fully assess these dilemmas to address the challenges of digital transformation. In promoting digital transformation, more flexible and diversified marketing methods and management models must be explored to continuously expand the depth and breadth of digital transformation and development, driving scientific journals forward.

2.3 Countermeasures for Digital Transformation

In the context of media convergence, digital transformation of scientific journals is no longer an optional issue but an essential strategic transformation. Although the difficulties faced by digital transformation are unavoidable, scientific journals can better address these challenges and achieve digital transformation by strengthening financial capabilities, enhancing technical capabilities, and improving brand influence to better serve the development of science and technology.

2.4 Content of Digital Transformation

Digital transformation includes multiple aspects such as digital distribution, digital publishing, and digital editing. Digital distribution refers to using Internet technology for digital dissemination, including digital magazines and digital books. Digital publishing can not only attract more readers but also accelerate the publishing cycle and shorten the time-to-market. Digital editing refers to using digital technology to fine-tune and process article content and structure to improve language quality, word accuracy, and artistic appeal, thereby enhancing article readability.

2.5 Aspects to Consider in Digital Transformation

(1) **Digital Publishing Platform**: Establish a digital publishing platform to lay the foundation for journal dissemination. The platform can be built independently or through third-party platforms, with appropriate technologies selected to ensure the security and reliability of journal content. (2) **Journal Searchability**: Improve journal ranking in search engines through SEO (Search Engine Optimization) and metadata methods, increase exposure in relevant fields, and strengthen connections and interactions with reader groups. (3) **Reference Management**: An important part of digital transformation is establishing reference management systems that improve reference quality and standardize reference formats in core journals through preprocessing and automation, bringing great convenience to reference management. (4) **Data Management**: Digital journals also require urgent data management solutions. Professional data management platforms can be built using big data technologies such as data statistics and data prediction to fully mine and manage journal data, providing important data support for journal development. (5) **Mobile Applications**: Combined with mobile technology, mobile applications should be launched to allow readers to access journal content anytime and anywhere, facilitating convenient and quick reading, downloading, and learning of papers, and improving the visibility and digital dissemination effectiveness of scientific journals. In summary, digital transformation of scientific journals is a systematic project that requires customized design plans based on individual circumstances, comprehensive consideration of multiple factors including platforms, technology, data, and talent, and the use of digital thinking, advanced technology, and high-quality user experience to drive the digital transformation and development of scientific journals.

3. New Media Communication and Operation

In addition to digital transformation and new technology applications, new media communication and operation are also important trends for scientific journals in the context of media convergence. Scientific journals should actively seize the development opportunities of new media, conduct extensive dissemination through various channels such as social media, WeChat public accounts, Weibo, and video accounts, strengthen interaction with readers, and promote their attention to and identification with scientific journals. Simultaneously, efforts should be made to expand the reader base, carry out brand promotion activities, and improve the visibility and reputation of scientific journals. In terms of operation, scientific journals need to further improve their management and services, strengthen post-maintenance and management, and enhance journal content and quality. Additionally, scientific journals should strengthen integration with existing media and improve content innovation capabilities and media influence through cooperation and resource sharing.

3.1 Current Status of New Media Communication for Scientific Journals

With the rise of emerging media such as online media and mobile Internet, the communication methods and channels of scientific journals have undergone tremendous changes. Scientific journals have opened new media channels such as WeChat public accounts, Weibo, post bars, and apps, and launched various forms of digital publications and online services using mobile Internet and other technological means. The emergence of these new media platforms has broken the geographical and temporal limitations of traditional media, enabling faster, more intuitive, and interactive information dissemination for scientific journals. However, new media communication for scientific journals also faces many difficulties and challenges. First, there are numerous and diverse new media communication platforms, making it difficult to select appropriate communication channels and forms to fully leverage the characteristics and advantages of new media. Second, competition in the new media communication field is fierce, making it another challenge to capture audience attention and interest and improve interactivity and user stickiness. Furthermore, new media communication places higher demands on scientific journals, requiring them not only to provide high-quality content and services but also to maintain interaction and communication with readers and respond promptly to their needs and feedback.

3.2 Current Status of New Media Operation for Scientific Journals

New media operation for scientific journals refers to the management of journal brands, content, services, readers, and other resources using new media channels [9-10]. The goal of new media operation is to improve the digital level and brand influence of scientific journals and achieve digital transformation and brand building. Specifically, new media operation for scientific journals should include the following aspects: First, **brand building**: creating a scientific journal brand image through new media channels to enhance reader recognition and trust in the journal brand. Second, **content production**: deeply exploring content resources centered on scientific journals, producing high-quality digital content to meet reader needs and interests, and enhancing journal value and influence. Third, **user experience**: providing better experiences and services for readers through the interactivity and functionality of new media to establish good reader relationships. Fourth, **data analysis**: studying reader needs and interests through data analysis, accurately targeting readers, optimizing channels and content, and improving communication effectiveness and user satisfaction. However, new media operation for scientific journals also faces multiple challenges. First, it requires full utilization of information technology, network technology, and data technology, demanding high technical capabilities and high-quality talent resources. Second, new media operation differs significantly from traditional journal operation, requiring a thorough understanding of new media characteristics and patterns and a spirit of innovation and change. Finally, new media operation must attach great importance to reader feedback

and needs, continuously adjusting and improving strategies and plans to maintain continuous innovation and core competitiveness.

3.3 Future Development of New Media Communication and Operation for Scientific Journals

In the context of media convergence, new media communication and operation for scientific journals will face more opportunities and challenges. Future development should focus on the following aspects: First, **forming a new media ecosystem**: scientific journals should comprehensively utilize new media channels and traditional media to form a diversified and three-dimensional communication system, creating a scientific journal new media ecosystem. Second, **improving digitalization levels**: scientific journals should seize the opportunities of digital transformation, strengthen digital construction and services, and enhance digital capabilities and levels. Third, **mining reader value**: through new media interaction and data analysis, scientific journals should explore reader needs and value, accurately target readers, and improve reader loyalty and satisfaction. Fourth, **strengthening cooperation and interconnection**: scientific journals should enhance cooperation and exchanges with other science and technology media, research institutions, and technology enterprises to form cross-boundary cooperative and mutually beneficial partnerships, jointly promoting new media communication and operation. New media communication and operation for scientific journals represent a new trend and model for the development and dissemination of scientific journals in the context of media convergence, bringing more opportunities and challenges that require scientific journals to actively adapt to changes, strengthen innovation and practice, and actively promote digital transformation and brand building [11-12].

In conclusion, in the context of media convergence, scientific journals need to actively explore the application of new technologies, digital transformation, and new media communication and operation to provide more support for their digital transformation. Only through continuous exploration and practice in these areas can scientific journals enhance their competitiveness in the digital era and provide strong momentum for their long-term development.

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