Exploring the Impact of New Media on Science Communication: Postprint

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Date: 2023-10-08T00:00:00+00:00

Abstract

With the advancement of new media technologies, digital communication technologies have been extensively applied, leading to transformative changes in the modalities of science and technology communication, which have gradually shifted from traditional media dissemination to network-based and digital dissemination. This transformation in communication paradigms inevitably catalyzes corresponding functional evolution. Through an examination of communication modalities in the new media era, it becomes evident that new media has exerted profound influence upon the three primary functions of science and technology communication, effectively fostering economic development in our nation and propelling innovative research in science and technology communication. This paper commences with an analysis of the developmental trajectory of science and technology communication under the new media context, identifies existing challenges within this evolutionary process, and subsequently proposes research-informed recommendations for future development.

Full Text

Preamble

Title: Research on the Impact of New Media on Science and Technology Communication

Abstract: With the development of new media technologies, digital communication technologies have been widely applied, fundamentally transforming the modalities of science communication from traditional media to network-based and digital platforms. This shift in communication methods inevitably promotes functional changes in communication itself. Through an investigation of communication modalities in the new media era, we can observe that new media has exerted tremendous influence on three mainstream functions of science communication, effectively promoting China' s economic development and advancing

innovative research in science communication. This paper begins by examining the development of science communication under new media, analyzes existing problems in its evolution, and proposes development recommendations with research significance.

Keywords: new media; science and technology communication; impact

CLC Number: G206
Document Code: A
Article ID: 1671-0134(2019)03-105-03
DOI: 10.19483/j.cnki.11-4653/n.2019.03.028

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Driven by the dual forces of digital technology and mobile communications development, science communication has entered a new media era, also known as the digital communication period. In explorations of the new media concept, most scholars consider new media as media forms supported by new technologies —such as digital television, electronic books, and digital films—that represent a higher-level communication medium compared to traditional media. Characterized by rapid dissemination speed, large audience reach, and high information volume, new media is becoming increasingly indispensable for science communication in the new era. Therefore, studying science communication in the new media context plays a vital role in improving communication efficiency and promoting the transformation of scientific and technological achievements.

1. New Media Platforms for Science Communication

1.1 Science Websites for Public Science Popularization

Websites serve as platforms that aggregate data and information, providing unified services to users through open information processing. Science websites established under the new media framework have become the main force for science information dissemination in the new era. Currently, numerous science websites are registered in China, primarily disseminating scientific knowledge and research achievements through online media while collecting diverse science information to provide quality services. Compared with traditional media, new media-based science communication offers advantages in speed, scale, audience reach, and storage capacity. The rise and application of popular science websites have enhanced the efficiency of disseminating scientific knowledge to the public, making it possible for citizens to understand and acquire scientific knowledge more rapidly [1].

1.2 Digital Television and Electronic Books

1.2.1 Development of Digital Television Digital television refers to the use of digital signals composed of binary digits (0s and 1s) throughout the entire process from studio production to transmission and reception. A crucial

development direction for digital television is its integration with internet media, freeing users from being tethered to their studies or laptops for sending emails, online gaming, or downloading and watching television content. This integration provides users with temporal and spatial freedom, enabling them to experience all PC functions anytime and anywhere using wireless mice or keyboards. The development of digital television represents an important hallmark of the new media era. As a widely accepted and utilized communication medium, digital television' s role in science communication is evident, significantly expanding the reach of science information.

1.2.2 Electronic Books Electronic books refer to the recording of textual, pictorial, video, and audio information using electricity, magnetism, or light as storage media, with information retrieval, copying, and transmission facilitated through other devices. Relying primarily on multimedia technology as their dissemination carrier, e-books influence the public not only visually but also aurally and tactilely. As a mass information carrier integrating learning, collection, retrieval, and preservation, e-books impact knowledge acquisition across various social sectors [2]. Serving as a primary vehicle for science information dissemination, reading e-books to transmit and acquire scientific information represents an important method in the new media era, substantially improving the efficiency of science knowledge propagation.

1.2.3 Application of Microblogging Microblogging platforms represent a major channel for new media information dissemination, achieving heights in science communication that traditional media could scarcely reach. The information propagation pattern of microblogging resembles nuclear fission, where a single influential repost can trigger viral dissemination across multiple channels simultaneously. Compared with blogs and forums, microblogging possesses greater influence and communicative power, with many information marketers leveraging it to increase readership and achieve the goal of disseminating scientific knowledge to the public. The application of microblogging constitutes a major innovative development in science communication models under new media environments, dramatically accelerating the speed of science information dissemination and expanding its audience reach.

1.2.4 Smartphones as the Fifth Major Communication Medium Smartphones represent a significant product of the new media era and a mainstream carrier for information dissemination. Their widespread adoption has substantially expanded the scope of information dissemination and audience reach, making them indispensable infrastructure for science popularization. Smartphones enable e-book reading—a function unavailable on conventional mobile phones. Building upon extensive smartphone usage, e-books can be transcoded into UMD or TXT formats for convenient reading. Generally, a 100,000-word book converted to UMD format occupies only about 100KB, significantly enhancing both the quantity and quality of reading compared to

traditional methods. As the fifth major communication medium, smartphones have naturally become a primary carrier for science communication [3].

2. Main Functions of Science Communication in the New Media Era

2.1 Knowledge Transmission and Diffusion

Knowledge can only be directly applied to cultural and economic activities when it is accepted and mastered by people. The scope of knowledge mastered by individuals determines the potential directions for its application. A mainstream function of new media-based science communication involves the dissemination and diffusion of scientific knowledge, which forms the foundation for improving public scientific literacy. Science communication can disseminate fundamental scientific knowledge to the public, demystifying science and continuously delivering basic scientific knowledge through new media technologies while enhancing public understanding. Transmitting and diffusing scientific knowledge equips the public with foundational capabilities to grasp scientific concepts and improves the professionalism and rationality of scientific, cultural, and economic activities.

2.2 Supporting National Strategic Innovation Systems

National strategic innovation systems encompass both technological and institutional innovation, including initiatives such as building smart cities and digital societies, developing new technologies to guide industrial reform, and continuously generating new industries and employment opportunities. Science communication responds to national development calls by cultivating public scientific literacy through knowledge dissemination, cultural atmosphere building, and guided learning from the perspective of technological innovation [4]. Furthermore, national strategic innovation systems insist on synchronized development of technological and economic reforms, strengthening the connection between science and economy while following the laws of technological innovation and socio-economic development to construct a social environment conducive to innovation-driven development. The primary purpose of science communication is to align with socio-economic development directions, starting from the laws of technological development and actively integrating with social media economic trends to promote innovative development of China' s economic system.

2.3 Enhancing National Economic Strength

Science and technology constitute primary productive forces, and their development serves as the decisive factor driving economic growth and the core force for enhancing national economic strength. From the perspective of technological conditions for economic development, the power of technological innovation primarily stems from scientific research and knowledge innovation, as well as broad participation from experts and the general public. Technological innovation

evolves through collaborative development among knowledge innovation, technological innovation, and management innovation [5]. Therefore, technological innovation requires science communication to disseminate scientific knowledge to the public and increase public participation in innovation, thereby enhancing national economic strength through technological development. Science and technology remain core conditions for promoting social progress and economic development, simultaneously improving national scientific literacy and fostering economic growth and social advancement during the popularization of scientific knowledge.

3. Obstacles Constraining Science Communication Functions in the New Media Era

While the new media era offers positive factors that effectively promote science communication under specific media environments, it also presents negative hindering factors that impede the development of science communication functions. The main constraining factors are as follows:

3.1 Singularity of Communication Models and Content

Science constitutes a crucial factor shaping our lifestyle and future development. As a primary driver of knowledge popularization, sharing, and application, science communication not only promotes the development of science itself but also advances society. However, under the influence of new media technology development, both the models and content of science communication have become relatively monotonous. Current theoretical models of science communication remain dominated by Lasswell' s model, Shannon-Weaver model, Maletzke' s model, and Mikhailov' s model [6]. Lasswell' s model represents the most primitive communication definition, focusing only on one-way transmission during science information dissemination. Although it considers audience reactions, it provides no channels for feedback, making two-way interactive communication impossible and yielding limited communication effects. The Shannon-Weaver model proposed a mathematical model for information transmission and introduced the concept of "noise,"but it remains a one-way, linear transmission model. Maletzke' s model presents a systematic model of the information transmission process, placing information within a social environment under the combined influence of various forces and factors, forming a system between sender and receiver that enables a two-way interactive communication system. Mikhailov decomposed the transmission relationship between science information senders and receivers into informal and formal transmission modes. He considered transmission through scientific literature as formal transmission, while personal transmission constituted informal transmission. This model only provides a rough description of science knowledge transmission messages, fails to truly reflect transmitted information, and cannot adequately consider environmental impacts on the transmission process. Evidently, science communication models suffer from problems such as one-way transmission and environmental factor neglect, with

relatively singular models that struggle to achieve current two-way interactive communication.

Regarding content, science communication currently focuses primarily on engineering and technical information, including communications, mining, military affairs, medicine, and agriculture, supplemented by basic scientific knowledge such as geography, astronomy, chemistry, and biology [7]. Since science communication targets the entire public, transmitted information must be 通俗化 (popularized), understandable, and concise. Engineering and technical information accounts for up to 43% of content, demonstrating the singularity characteristic of current science communication content. In terms of engineering content, communications, medicine, and agriculture are closely related to people' s daily lives and meet public cultural knowledge demands. Consequently, scientific knowledge gradually forms a system and develops into a lifestyle-oriented science knowledge transmission model, which directly leads to the neglect of other content areas such as astronomy, mathematics, and chemistry. This content singularity gradually solidifies public understanding of scientific knowledge, resulting in a widespread lack of basic scientific literacy.

3.2 Media Usage Imbalance

Traditional media still dominates science information dissemination, while new online media development for science communication remains slow. In the new media environment, traditional media maintains a broad communication market. Affected by new technology development and talent shortages, relevant organizations and institutions are not particularly proficient in applying new online media technologies, leading people to prefer traditional media instead. Research indicates that traditional media' s proportion in science information dissemination far exceeds that of new online media. Traditional media offers usage advantages over new media networks—once personnel become proficient with certain communication software, they are reluctant to adopt new alternatives, and traditional media imposes lower professional literacy requirements on users, facilitating broader adoption. Additionally, the slow development of new online media for science communication represents a key factor constraining science knowledge dissemination. While new online media demonstrates vigorous growth momentum, its practical applications reveal contrary development patterns. New online media demands higher professional literacy from both senders and receivers of science information, requiring substantial knowledge and competencies to achieve proficiency. Consequently, the development process of new online media for science communication remains extremely slow, and China must persist in cultivating relevant specialized talent.

4. New Approaches to Enhance Science Communication Functions in the New Media Environment

Enhancing science communication functions in the new media environment is crucial for improving national scientific literacy and promoting scientific, economic, and cultural development. Primary approaches include:

4.1 Establishing a Favorable Science Communication Environment

Establishing a favorable environment constitutes a fundamental approach to improving science communication functions. This requires first creating a positive social environment—the primary setting for science information dissemination. The concept that "science and technology are primary productive forces" must be popularized among the entire public, encouraging everyone to become both transmitters and receivers of scientific knowledge while fostering an atmosphere where science drives social progress and development. Second, the state and government must increase financial investment in science communication, providing funding guarantees for enterprises or companies researching and developing new communication media. The government should commend enterprises or individuals actively using new online media, increase funding for new media technology research and development, enhance R&D enthusiasm, and leverage state and government endorsement to increase credibility of new online media technologies. Finally, a cultural atmosphere conducive to new media-based science communication must be created. Cultural influence is the most deeply rooted factor, and for any new phenomenon to gain public recognition and acceptance, relevant cultural contexts must be established. Regarding the cultural environment for science communication under new media, we must construct a cognitive environment for basic scientific knowledge such as astronomy, biology, chemistry, and physics among the public, increase scientific awareness, eliminate outdated traditional culture, and actively foster an environment for disseminating scientific culture. Establishing a favorable science communication environment represents the first step toward functional improvement, requiring active research and efforts across social, economic, and cultural dimensions to create an environment where the entire population possesses scientific thinking.

4.2 Integrating Communication Models and Innovating Content

Integrating communication models and innovating content represents crucial content for improving communication functions, requiring the breaking of singular transmission methods and content. First, we must establish a new situation where multiple communication methods coexist, theoretically breaking the one-way transmission limitations of Lasswell' s and Shannon-Weaver' s models by increasing exchanges between senders and receivers of science information. We must also establish a social communication environment that considers various forces and factors, abandoning one-way and linear transmission to a certain extent. Second, we need a content control system for new media. In the new media

environment, information content is complex and includes substantial false information. Such false scientific information can easily lead to erroneous public perceptions, inducing dangerous attempts and causing frequent accidents. Therefore, science information dissemination must be controlled. Content control can be implemented through: establishing strict information detection systems for information screening; implementing rigorous management systems with clear responsibility allocation; and enforcing punitive measures against information publishers whose reposts or readership reach certain thresholds, with penalties ranging from fines to detention depending on severity. Only by identifying problems at the source can we promote widespread information dissemination, achieve the goal of transmitting science information, improve national scientific literacy, and promote socio-scientific and economic development.

4.3 Creating Multimedia-Based Science Communication Systems

Creating multimedia-based science communication systems represents an important pathway for improving new science communication functions. Influenced by the new media environment, we must actively research and develop multimedia communication systems. First, we should create integrated systems combining traditional and new media. Since current information dissemination still relies primarily on traditional media, we must accelerate the integration of new media with traditional media, actively leveraging new media' s communication advantages to improve science information transmission efficiency. Additionally, schools and relevant institutions should accelerate the cultivation of new media technology talent to provide human resource guarantees and talent advantages for new media technology applications. Second, we must accelerate the innovation process of science communication media. Under the influence of new online media technology, traditional media are gradually becoming obsolete, necessitating accelerated innovation in communication media and active research on new media technology applications to improve science information transmission efficiency. This process requires continuous increases in talent and capital investment, as well as active cooperation from national and enterprise entities, with increased funding for innovation and cultivation of innovative new media technology professionals.

The new media era represents an inevitable social development trend, and science communication should actively embrace this trend by leveraging new media technology to accelerate its own development. Science communication must accelerate research on reforming traditional transmission technologies, apply new media' s digital network management technologies, integrate communication models, innovate communication content, and provide high-quality science communication information to the public. Simultaneously, innovative science communication technologies can expand information audiences, effectively promote China' s economic development, and improve national quality.

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