

Deep Integration of Technology and Content: Real-World Basis, Key Challenges, and Imple- mentation Pathways (Postprint)

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Abstract

The deep integration of technology and content represents a vital component of comprehensive media convergence. Under the “dual-wheel drive” paradigm of technology and content, traditional mainstream media are innovating modes of content expression and expanding the scope for future media development. Nevertheless, this deep integration also confronts significant challenges, including delayed conceptual renewal and misalignment between content and technology. These issues require thorough analysis, alongside the formulation of solutions and practical pathways for deep integration concerning future orientation, mechanism reform, and ecosystem construction.

Full Text

Preamble

The Realistic Foundation, Challenges, and Practical Pathways for the Deep Integration of Technology and Content

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Abstract: The deep integration of technology and content constitutes a vital component of comprehensive media convergence. Under the “dual-wheel drive” of technology and content, traditional mainstream media have innovated content expression methods and expanded their developmental horizons. However, this deep integration also faces prominent challenges such as lagging conceptual updates and mismatches between technology and content. This paper systematically examines these issues and proposes solutions and practical pathways for deep integration from the perspectives of future orientation, institutional innovation, and ecosystem construction.

Keywords: technology and content; media convergence; media ecology; media and technology; institutional innovation

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Media convergence is a systematic project involving top-level design, institutional mechanisms, cutting-edge technologies, and industrial structures, with technological elements serving as the intrinsic driving force for its sustained development. During the rapid evolution of internet technologies and the continuous emergence of frontier technologies such as 5G and artificial intelligence, the trend toward in-depth media convergence has become increasingly prominent. On September 26, 2020, the General Office of the CPC Central Committee and the State Council issued the *Guidelines on Accelerating the In-Depth Development of Media Convergence* (hereinafter referred to as the *Guidelines*), which explicitly states: “We must use advanced technologies to lead and drive integrated development, leverage the achievements of the information technology revolution including 5G, big data, cloud computing, the Internet of Things, blockchain, and artificial intelligence, and strengthen forward-looking research and application of new technologies in the field of news communication.” In this top-level design for deep media convergence, the role of technological elements has been elevated to a new historical height, making the deep integration of technology and content a crucial subject and practical direction for the future development of the media industry.

Technology and content do not exist in a simple binary parallel relationship but rather in a state of deep intermingling and mutual influence. Technological development has spawned innovative content presentation formats, production models, and dissemination mechanisms, while content evolution has simultaneously activated new applications of technology in practical, effective, and beneficial ways. Consequently, the deep integration of technology and content represents an important manifestation and forward direction of media convergence. Research on this integration must be organized around three dimensions: realistic foundation, challenges, and practical pathways, thereby providing theoretical synthesis and empirical reference for the sustainable development of China’s media sector.

1.1 Top-Level Design Guidance: Blueprint for Deep Integration

The deep integration of technology and content ultimately remains a crucial component of comprehensive media convergence, requiring holistic, systematic, and intelligent development under top-level design guidance. Examining the operational logic of deep technology-content development, technology introduces a value system and practical pathway adapted for future development, while traditional content continuously absorbs technological achievements to reconstruct its forms and production models. Since the 2014 meeting of the Central Leading Group for Comprehensively Deepening Reform approved the *Guidelines on Promoting the Integrated Development of Traditional and Emerging Media*, elevating media convergence to a national strategy, through to the 2020 *Guidelines* explicitly calling for advancing in-depth media convergence, the top-level design has continuously adapted to new circumstances, gradually delineating a convergence blueprint for China's future media development.

Top-level design guidance is also a process from quantitative accumulation to qualitative transformation. Deep integration of technology and content does not emerge spontaneously but gradually develops the necessary conditions through prior technological accumulation and high-quality content creation. For instance, when China first emphasized the importance and urgency of media convergence from a national strategic height in 2014, media organizations at all levels subsequently embarked on transformation journeys. However, due to the lack of practical experience and guidance, technology-content integration often remained superficial, failing to permeate the entire content production process. After several years of development and accumulation by 2020, numerous exemplary cases of integrated development had emerged nationwide, establishing a realistic foundation for deep integration. The promulgation of the *Guidelines* represents an explicit response to this evolving trend. Analyzing this top-level design reveals a clear blueprint oriented toward advanced technology-driven development, rational resource allocation, and self-sustaining mechanisms. Technological development serves as an internal driver ensuring continuous content innovation, which in turn enhances market competitiveness and feeds back into further technological advancement, creating a forward-looking and virtuous cycle of deep integration.

1.2 Content Technology Empowerment: Guarantee for Deep Integration

Understanding the crucial role of content technology requires first recognizing that the principal agents of deep media convergence are China's traditional mainstream media. Confronted with the impact of new technologies and applications, the rational utilization of frontier technologies for content innovation has become an inevitable development trend. In reality, content technology itself represents a developmental approach specifically proposed for media transformation, profoundly grasping the overarching trend of vertical development and dual-wheel driving of "technology + content." Technology alone cannot effectively activate

media industry transformation, just as content alone cannot adequately adapt to future media development directions and possibilities. Content technology empowerment involves starting from the concept itself, deeply comprehending its logical foundation, and understanding how new technological applications spawn new content forms to seize future development opportunities.

Building upon this understanding, we can reconceptualize deep technology-content integration through three main architectures: the mainstream media “central kitchen” framework, intelligent content production architecture, and precision content distribution architecture. In the process of deep integration, the “central kitchen” plays an indispensable role. Previous research has identified various problems in its practical application, yet these issues do not stem from irreparable flaws in the “central kitchen” concept itself but rather from the lack of corresponding institutional adjustments needed to fully leverage its capacity for media content integration built upon frontier technologies. Content production intelligence and distribution precision represent deeper integration at the content level. The “central kitchen” comprehensively integrates media technologies and consolidates the necessary technological foundation for content development, upon which intelligent and precision-oriented patterns of content production and distribution are formed. This constitutes the practical manifestation of content technology empowerment. For example, *People’s Daily’s* “central kitchen” construction has been deeply adapted to its own developmental status, achieving deep integration goals through dynamic development and incremental innovation.

1.3 Industry Structure Shaping: Drivers of Deep Integration

Technological development has profoundly transformed the direction of the media industry. As the all-media communication system continues to be constructed and improved, the media industry is gradually revealing a new landscape. Deep integration of technology and content is driven not merely by top-level design or spontaneous media initiatives but by inherent evolutionary drivers—namely, the logic of technological development superseding traditional content logic. Under profound technological drivers, the media industry increasingly exhibits cross-platform, cross-industry, and cross-sector characteristics, with the “carriage” of the digital industry blurring boundaries between media and other sectors, forcing traditional mainstream media to confront the practical imperative of technology-content integration.

Two major drivers shape this integration at the level of industrial structure transformation. First, in an era where everything is media and everything is interconnected, information communication has become more profound and essential, with previous technological limitations gradually being erased. Communication models, channels, and transmission efficiency are undergoing tremendous transformation. Applied to the media industry, different media organizations can flexibly and diversely engage in cross-boundary integration with internet enterprises and technology companies. The intermediary and information transmis-

sion attributes of media are positioned centrally, 打通社会生产的各个环节, 实现“信息基础设施”意义上的技术与内容深度融合。

Second, content ultimately serves users themselves, and the practical implementation of deep integration hinges on how to better align with actual user needs. The industry structure dominated by mobile internet requires media to emphasize more precise and vertical content output, deeply integrating technological development advantages with content production and distribution strengths to adapt to the current industrial landscape.

2.1 Lagging Conceptual Updates: Unresolved Superficial Integration and Content Homogenization

The key to deep technology-content integration lies in the renewal and reshaping of development concepts. Development concepts represent media builders' forward-looking grasp of technological development, content forms, communication models, and industrial structures in the media sector—an issue requiring close attention throughout the deep convergence process. However, lagging conceptual updates have consistently plagued media convergence development because such concepts are not static or localized but dynamic and holistic. Establishing development concepts adapted to media organizations' distinctive characteristics remains a practical concern for major media outlets and research institutions.

Outdated development concepts not only cause difficulties and inefficiencies in integrating existing resources but also lead to superficial and formalistic technology development, undermining the sustained healthy growth of the media industry. The consequences of lagging conceptual updates are superficial integration and content homogenization. Superficial integration primarily stems from a lack of long-term vision and strategic resolve during transformation, where substantial investments in technology platforms result only in simple additive combinations with traditional content, failing to achieve secondary production processes integrating technology and content. This can be summarized as the prominent problem of “one-time collection, one-time production, multi-platform distribution” —a severe challenge currently facing grassroots city and county media convergence. Content homogenization refers to both internal content homogeneity within a single media organization and homogenization trends across different media outlets. A prominent manifestation of outdated development concepts is the inability to conduct strategic positioning based on actual conditions, instead blindly imitating other media's experiences. Such approaches often result in stalled convergence development, making effective conceptual innovation urgently necessary to resolve content homogenization.

2.2 Technology-Content Mismatch: Failure to Deeply Exploit Existing Media Advantages

Against the backdrop of in-depth media convergence, the importance of deep technology-content integration is self-evident, with numerous case studies emerging from explorations of their integration relationship. The starting point and purpose of media convergence are to consolidate strength and revitalize mainstream media's communication power, influence, and credibility in the public opinion arena. Therefore, deep integration must genuinely focus on this logical starting point. Technology-content integration must first clarify the correct direction, leveraging mainstream media's positive propaganda and public opinion guidance functions. This requires maintaining attention to and examination of content during transformation, properly calibrating the "intensity" of deep integration.

Technology-content mismatch refers to the binary opposition and incompatibility problems in transformation, manifesting as uniform media construction and severe content homogenization. Some media organizations, in exploring technology-content integration, adjust models without regard for actual conditions, neglecting prior technological reserves while blindly imitating internet "marketing accounts" and "self-media," resulting in vulgarized and homogenized content production. Such practices neither provide sustainable momentum for media transformation nor blur the authoritative image of mainstream media while dispersing traditional high-quality content resources. Another dimension of this problem is that traditional mainstream media possess quality content resources and certain technological reserves but lack deep excavation of these resources, ignoring the importance of secondary dissemination and activating user-generated secondary creation, preventing progressive enhancement of communication effects. Simultaneously, technology-content mismatch leads to neglect of local users' content needs and deviation from actual content advantages—a problem particularly prominent on short-video and live-streaming platforms such as Douyin, where deep integration degenerates into mere "content porter" practices.

2.3 Talent Shortage: Imbalanced Talent Quantity and Structure

A talent team for deep technology-content integration constitutes its foundational support. In current media convergence practice, talent shortage often represents a critical constraint, encompassing two categories: specialized technical talent and content-technical talent. Specialized technical talent refers to professionals capable of developing and maintaining frontier media technologies, while content-technical talent denotes hybrid professionals who understand new media and technologies and can innovate content through technological application.

Both categories suffer from uneven distribution and irrational structure. Central and provincial media, leveraging their scale and financial advantages, at-

tract large numbers of specialized technical professionals, leaving other media organizations with scarce technical talent. In practice, central or provincial media often provide talent assistance and technical guidance to other media, but this fails to fundamentally solve the problem. Established technology platforms frequently fall into disuse and await debugging and maintenance due to the absence of resident technical specialists.

For hybrid technical talent, professional technical ability is merely one aspect; more crucial is the capacity to integrate technology and content innovation. Such talent currently remains “rare as phoenix feathers” across the media landscape. This scarcity stems from two sources: first, traditional mainstream media lack reasonable talent introduction and incentive mechanisms, with inadequate supporting measures for salaries and training; second, problematic employment mechanisms subject talent discovery and appointment to administrative constraints, causing media talent structures to become rigidified. Although some media have begun experimenting with news studio systems, a long journey remains before truly resolving technical talent issues.

3.1 Steady and Far-Reaching Progress: Uphold Integration Orientation to Avoid Technological Pitfalls

Deep media convergence represents an urgent task for China’s traditional mainstream media, concerning both future sustainable development and the defense of national public opinion positions. Deep technology-content integration must first clarify the blueprint, guarantees, and drivers behind integration, understanding the practical problems requiring resolution, thereby summarizing correct practical pathways.

Without top-level design guidance, deep integration easily falls into narrow, partial convergence states where dominance by either technology or content proves detrimental to sustained development. Therefore, China’s mainstream media must consistently maintain correct integration orientation when advancing deep integration. The *Guidelines* explicitly state: “Uphold positive energy as the overarching requirement, effective management as the hard principle, and proper utilization as the true test of capability; adhere to the correct direction.” Upon this foundation, a new landscape of deep integration should be constructed. Intelligent technologies and algorithmic recommendation represent important drivers for deep integration, but unchecked autonomous technological evolution may foster a “traffic-only” content industry 格局. Thus, a crucial practical pathway for maintaining integration orientation involves properly regulating technology’s disorderly tendencies to ensure frontier technologies genuinely serve and benefit the people. Furthermore, deep integration’s important manifestation lies in constructing new mainstream media, using new concepts and positioning to resolve directional issues in technology-content integration.

3.2 Structural Transformation: Reform Management Mechanisms to Overcome Systemic Barriers

Media convergence itself is a systematic project involving multiple integration elements across geography, hierarchy, department, and format. To effectively enhance deep integration outcomes, we must fundamentally address the systematic project itself, with holistic thinking better examining connections among various functional media elements. Traditional mainstream media often neglect corresponding institutional and mechanism reforms during technology-content integration, frequently encountering difficult integration dilemmas. Looking forward, deep integration should focus on overall structural transformation, carefully examining factors including content production, talent management, compensation distribution, and integration incentives to propel the deep integration process.

For deep integration, technology upgrading and content mining represent two crucial directions. Technology upgrading requires media organizations to establish dynamic and forward-looking management systems, forming internal convergence development think tanks composed of professionals to provide feasible technical roadmaps and development timelines. Content mining demands media consolidate traditional content advantages, continuously producing distinctive and competitive media content products tailored to their domains and positioning to avoid cross-platform “acclimatization” issues. Therefore, from these two dimensions, deep integration requires management system reform guided by dynamic, in-depth, and precise thinking in future development, fully activating technology and content advantages to overcome existing systemic barriers.

3.3 Ecosystem Construction: Deeply Activate Content to Adapt to Future Patterns

Based on structural transformation, ecosystem construction becomes essential for deep integration. Technological development brings more diverse communication platforms, media, and discourses, with different elements recombined through technology to generate ecological patterns distinct from traditional media. Specifically, frontier technologies’ impact on the media industry manifests primarily in content expression and intelligent patterns. Driven by artificial intelligence and other technologies, production dominated by humans with computer assistance is gradually transitioning to machine-dominated production with human risk control—a prototype exemplified by *People’s Daily’s* “Creative Brain.” In future media ecology, machine-production-based media will occupy important positions, with users themselves able to intervene in machine production processes, forming a superimposed state of simultaneous “decentralization” and “recentralization.” Multi-element competition and cooperation in ecological patterns will become the normal and stable state of deep media convergence development.

After clarifying this future ecological pattern, we return to current pathway ex-

plorations. Traditional mainstream media must clearly define their attributes and positioning, consciously participating in media ecosystem construction. An ecosystem solely driven by internet platforms may lack endogenous momentum for sustainable development. Media should therefore explore communication models and discourses aligned with future trends based on their own practices, conducting authoritative and leading content production from an ecosystem governance perspective. Technology elements will gradually become deeply embedded throughout the entire media development process. Deep technology-content integration will ultimately achieve an intelligent, interconnected, and dimensionally upgraded future media ecological pattern through developmental trends of human-machine collaboration, contextualization, and ecosystematization.

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

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