Challenges and Response Strategies for China' s Broadcast Television Cable Network: Postprint

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Abstract

This study examines and analyzes the current development challenges confronting broadcast cable networks, and proposes recommendations for their future development from the perspectives of integrated upgrading of "cloud, network, and terminal" , construction and operation of broadcast 5G networks, and promotion of technological iteration and upgrade reconstruction.

Full Text

Challenges and Response Strategies for China's Broadcasting Cable Networks

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Abstract: This paper examines and analyzes the current development challenges facing broadcasting cable networks, and proposes recommendations for future development from the perspectives of integrated "cloud, network, and terminal" upgrades, construction and operation of broadcasting 5G networks, and promotion of technological iteration and upgrade reconstruction.

Keywords: cable network; broadcasting; 5G; challenges; response strategies

1. Current Challenges

1.1 Sustained User Loss and Intensifying Competition

According to National Bureau of Statistics data, by the end of 2021, China' s cable television actual users totaled 201 million households, of which cable digital television actual users numbered 195 million. Both cable digital television actual users and paying subscribers have shown continuous decline, placing broadcasting network companies in an increasingly severe competitive environment. Intensifying competition from telecommunications operators has led to continuous cable television user attrition. In 2021, IPTV users maintained stable growth, continuously impacting cable television user development and exerting enormous pressure on existing cable television users—representing a significant factor in sustained user loss. Ministry of Industry and Information Technology statistics show that by the end of 2021, the three major telecommunications operators' total IPTV users had reached a substantial number, further squeezing the market.

Converged service development has fallen short of expectations. China' s total smart converged users exceed 39 million, accounting for 20.91% of total cable television users. Although local broadcasting network companies vigorously promoted "television + broadband + OTT" converged services in 2021 to retain and increase subscribers, results have been minimal with high operational costs. The converged service packages, brand building, and marketing capabilities still lag considerably behind competitors. Compared with the high bandwidth, low tariffs, and strong marketing of the three major telecommunications operators' broadband services, broadcasting broadband shows clear disadvantages, lacking advantages in product and marketing, making it difficult to break through bottlenecks and severely limiting competitiveness.

1.2 Mediocre B2C Performance and Low ARPU Value for Active Users

Overall, China' s broadcasting network companies demonstrated mediocre B2C business performance in 2021, with on-demand services remaining stable, broadband services declining, and converged services' market value yet to emerge. Data from Grains Research up to Q3 2021 reveals specific conditions. The cable ultra-high-definition user market proportion remains low: China' s total high-definition video on-demand users reached 87.82 million, while total 4K video on-demand users reached 31.446 million, representing only 16.91% of total cable television users. Although cable television high-definition trends are evident, the ultra-high-definition user proportion remains low, lagging behind industry development speed and user demands.

Broadband business faces upward pressure. Broadcasting broadband users experienced slight continuous loss, with broadband business development encountering rising pressures. Compared with the three major telecommunications operators, broadcasting broadband shows obvious gaps, lacking product and

marketing advantages, making business breakthroughs difficult.

1.3 Limited Diversity in Enterprise/Government Customer Business

In recent years, broadcasting cable network companies have vigorously developed advantageous enterprise customer businesses such as political-legal networks and "Xueliang Project" (Bright Snow Project) surveillance systems, innovating in government services and financial services to achieve large-scale revenue growth, making enterprise business a crucial revenue pillar. However, broadcasting cable network companies' enterprise business forms remain relatively singular, primarily focusing on party and government services, concentrated in vertical fields like smart party building and Xueliang Project, with many regions forming enterprise business matrices centered on the Xueliang Project. Under the new development situation where 5G enables thousands of industries, broadcasting cable network companies have insufficient participation in building smart cities, achieving rural revitalization, and expanding services across more industries, failing to fully seize opportunities for comprehensive business development.

Short-form video has rapidly developed, competing for user viewing time. Short-form video is gradually changing user viewing habits, occupying large amounts of users'fragmented daily time and squeezing large-screen viewing time. Industry active penetration rates have steadily increased, reducing user dependence on large screens and intensifying viewing fragmentation. Aurora Big Data statistics show that by the end of 2021, Chinese mobile internet users' daily short-form video viewing time accounted for 32.3% of total usage, with average daily usage reaching 225.9 minutes. In December 2020, monthly active users (MAU) year-over-year growth reached 23.8%, totaling 789 million users, with monthly active user scale showing overall growth trends.

1.4 Network Infrastructure Capacity Deficiencies and Funding Shortages

Ministry of Industry and Information Technology statistics show that by the end of 2021, the three major telecommunications operators' fixed internet broadband access users totaled 536 million, with a net increase of 52.24 million for the year. Compared with the three major telecommunications operators, broadcasting cable networks face issues of small user scale, weak network infrastructure, and non-unified technical standards, 主要体现在以下方面.

Network and terminal technical standards lack uniformity. Due to historical development constraints, national, provincial, municipal, and county-level broadcasting cable networks and terminal technical standards are not unified, with provincial and municipal cable television networks segmented, varying network quality, standards, CA platforms, and terminal interfaces. This technical system diversity creates difficulties for network upgrade transformation and national network integration operations, increasing both complexity and costs.

Network facility carrying capacity urgently needs improvement. With growing demands for broadcasting full IP 化, broadband, high-definition/ultra-high-definition, and intelligence, broadcasting cable network infrastructure' s service carrying capacity and technical support capabilities require urgent enhancement. The evolution from DVB-C to full IP 化 and from CMTS/EOC to FTTH must be completed to fully support 4K/8K ultra-high-definition, interactive video, immersive video, VR/AR video, cloud gaming, and other advanced video services.

Broadcasting 5G network construction needs acceleration. Broadcasting 5G network construction follows a two-phase approach: phase one uses "co-construction and sharing," while phase two implements "on-demand construction" after network maturity. In phase one, China Broadcasting Network' s cooperation with China Mobile has entered substantive construction. However, due to China Broadcasting Network' s late entry and weak foundation in mobile communications, overall 5G network construction progress significantly lags behind telecommunications operators.

New business support platforms require upgrades. New cloud platforms are the cornerstone supporting broadcasting innovation services. Currently, most provincial broadcasting cable networks' new business support platforms need further upgrading and improvement to implement integrated "cloud, network, and terminal" upgrades, thereby adapting to support innovative smart broadcasting business expansion.

Network construction funding is scarce. Broadcasting cable network IP 化, fiberization, and intelligent upgrades require substantial construction funds. However, broadcasting cable network business profits are relatively limited, making it difficult to cover enormous network construction costs through operational revenue alone. Consequently, funding shortages represent a primary factor affecting broadcasting cable network upgrade transformation speed.

1.5 Incomplete National Network Integration and Unrealized Scale Benefits

Currently, the radio and television industry is accelerating transformation toward scale, intelligence, and ecological construction. Broadcasting network companies can only survive and develop in increasingly fierce market competition through national network operations, intelligent upgrades, and business model innovation and ecological construction. However, due to policy impacts and constraints in human, financial, and material resources, the national broadcasting cable network integration process remains incomplete.

Integrating listed broadcasting network companies presents considerable difficulties. In 2021, China Broadcasting Network initiated integration of nine listed broadcasting network companies (excluding Gehua Cable). Since listed broadcasting network companies involve public listing equity, equity integration operations are complex. The primary challenge facing China Broadcasting Network

is the shell-preservation demands of some listed broadcasting network companies, as business spin-offs and strategic transformations undertaken by listed companies to preserve their listing status slow integration progress. For example, Wasu Media may spin off its cable network business, making IPTV and OTT TV its main listed business, which would prolong national network integration.

Content integration has failed to proceed as scheduled, with substantive integration facing a long and arduous road. Content integration represents a key focus of China Broadcasting Network' s business integration. In April 2021, China Broadcasting Network issued the "Notice on Launching Intensive Audiovisual Content Operations" to its holding subsidiaries. According to the plan, China Broadcasting Network would implement unified centralized content procurement, complete on-demand platform and dedicated zone construction and operations, and introduce CCTV channels "3, 5, 6, 8" and internet content. However, corresponding work has not been fully implemented as scheduled. Moreover, due to broadcasting networks being built bottom-up with non-unified technical standards and diverse business forms, achieving truly substantive cable television network integration according to the requirements of "unified construction, unified management, unified standards, and unified branding" remains a long and challenging journey.

2. Response Strategies

2.1 Implement Integrated "Cloud, Network, and Terminal" Upgrades and Advance National Network Integration

With explosive growth in advanced video services and changing user demands, broadcasting network companies should base themselves on collaborative "cloud, network, and terminal" upgrade transformations, promoting mutual integration and intelligent allocation of "cloud, network, and terminal" resource elements. They should emphasize synchronized technology and business planning, accelerate construction of national cable television network interconnection platforms and broadcasting network resource big data platforms, and enhance national network integrated service carrying capacity and broadband network capabilities.

First, reasonably construct a national interconnected cloud platform system. Broadcasting network companies should rationally layout large, medium, and small data centers nationwide, build hierarchical CDN centers, and consolidate the foundation for "cloud, network, and terminal" collaboration. They should construct "five horizontal and five vertical" evolving to "seven horizontal and seven vertical" cable television backbone networks, broadcasting cloud platforms and operation support systems serving broadcasting convergence development, and broadcasting broadband data networks. This involves promoting bidirectional and broadband transformation of cable networks and terminal intelligence upgrades, while constructing and transforming relevant infrastructure such as

machine rooms.

Second, build an intelligent converged network integrating 5G, cable, wireless, and satellite. Broadcasting network companies should coordinate the utilization of cable, wireless, satellite, and internet resources to promote collaborative carrying and interconnection, focusing on constructing high-speed, ubiquitous, intelligent, and secure smart broadcasting networks. This will create a more powerful mainstream media convergence dissemination network, digital culture dissemination network, and basic strategic resource network, providing intelligent network carrying for public opinion guidance, broadcasting public services, converged media services, information data, and communication services.

Third, deploy intelligent converged terminals. Broadcasting network companies should actively utilize intelligent interaction technology, service adaptation technology, and intelligent recognition enhancement technology to build intelligent converged terminals. They should promote cloudification, softwareization, and convenience of intelligent converged terminals, innovate business models and service modes based on intelligent converged terminals, and make them important entry points for smart broadcasting services and information hubs for smart homes, continuously enhancing carrying capacity for smart broadcasting services and applications.

2.2 Leverage Unique 700MHz Advantages for Differentiated 5G Construction and Operation

According to the cyclical pattern from construction to application, 5G commercial value has not been fully realized and the industrial ecosystem remains under construction. However, the major trend of industrial digital transformation is irreversible, and broadcasting network companies will embrace a new communications dividend era by enabling thousands of industries. To this end, broadcasting network companies should seize the opportunity to advance national cable television network integration and broadcasting 5G construction as an integrated development, fully leveraging 700MHz frequency advantages of wide coverage, rapid deployment, and low cost to differentiate 5G network construction and operation.

First, fully exploit spectrum resource advantages. Broadcasting network companies should implement National Radio and Television Administration plans, utilizing low-band wireless spectrum to promote 5G interactive broadcasting construction, achieving broad coverage of broadcasting television audiovisual services, and ensuring mainstream public opinion dissemination, public audiovisual services, and emergency broadcasting services. They should use high-band wireless spectrum to promote modern communication services for broadcasting television and smart broadcasting services with high-performance new media businesses.

Second, build 5G-based converged media cloud platforms. Broadcasting network companies should construct intelligent converged media platforms based

on 5G+AI+4K/8K, focusing on functions such as AR/VR/MR content production and broadcasting, digital intelligent public opinion management, and big data analysis services. These platforms should provide content production, creation, and distribution support for radio and television stations and content production institutions at all levels, promote innovation in high-quality all-media content production models, and advance deep media convergence.

Third, undertake more secure public service platform construction tasks. Currently, China Broadcasting Network has launched national-level industrial internet network security public service platform construction and actively promoted national cultural big data system construction. Next, broadcasting network companies should utilize their network security advantages to undertake more national and local-level secure public service platform construction tasks.

Fourth, promote integrated innovation and development of broadcasting "5G + Industrial Internet."Broadcasting network companies should focus on developing vertical industry applications in media convergence, security monitoring, electric power, emergency response, agriculture and forestry, and other fields, promoting evolution of "5G + Industrial Internet" converged applications from single-point and local to multi-point and comprehensive deployment. They should exert efforts in network construction, technology convergence, open platforms, and ecological cultivation to drive integrated innovation and development of broadcasting 5G and industrial internet.

2.3 Promote Technology Iteration and Upgrade Reconstruction to Accelerate Broadcasting Cable Network IP 化

The new round of information revolution has brought revolutionary changes to technical routes and breakthrough innovations in production models. Diversified demands such as ultra-high-definition content production and broadcasting and multi-converged services have placed higher requirements on broadcasting cable network architecture. Broadcasting cable networks should focus on constructing a new network architecture based on "cloud, network, and terminal," promoting IP 化 and fiberization of broadcasting cable networks, continuing to promote large-scale IPv6 deployment and application, and building secure, reliable, manageable, controllable, flexibly schedulable, high-speed, and intelligent transmission and data networks integrating cable and 5G.

First, upgrade and transform network technology architecture. Accelerate the transition of production and broadcasting systems to full IP 技术架构, constructing IP 化 high-definition/ultra-high-definition/advanced video production and broadcasting systems for next-generation media production and broadcasting networks. Promote construction of IP 化 production and broadcasting standard systems for internet and cloud platforms, and accelerate formulation of full IP 化 production and broadcasting standards. Broadcasting cable network companies should accelerate transformation toward fiberization, IP 化, and cloudification, actively applying cloud computing and big data technologies to upgrade broad-

casting cable network architecture, focusing on resolving resource bottlenecks and multi-service evolution challenges.

Second, consolidate new IP 化 production and broadcasting network foundations. Broadcasting cable network companies should strengthen research on IP 化 production and broadcasting network infrastructure architecture for high-definition/ultra-high-definition/advanced video fusion production. They should research software-defined full IP 化 production and broadcasting network solutions, networking protocols, address planning, scheduling and switching, clock synchronization, and other technologies. They should also research network solutions that achieve professional production and broadcasting requirements for large bandwidth, low latency, and high security through 25/100/400G and next-generation communication technologies, formulate relevant industry standards, and promote research and development of related technical equipment.

Third, accelerate broadcasting cable network IP 化 transformation. Broadcasting cable network companies should accelerate high-definition, IP 化, and intelligent transformation of cable networks, rapidly complete backbone network cloudification, fiberization, and IP 化 transformation, and enhance national network integrated service carrying capacity and broadband network capabilities. Through shared co-construction methods, they should accelerate broadcasting 5G 700MHz network and national broadcasting network interconnection 5G 承载网 and IP 数据网 construction, vigorously developing 5G new applications that can fully demonstrate advanced video services.

2.4 Accelerate Data Center Infrastructure Construction to Consolidate Smart Development Support Foundation

Currently, China's digital economy is accelerating deep integration with the real economy, increasingly becoming a new engine for China's economic recovery and growth. As the core production factor of the digital economy, data infrastructure will become a solid foundation for digital transformation and innovative development. Data storage, computing, value mining, and management present new opportunities for broadcasting network companies, which should accelerate data center infrastructure construction to consolidate the data foundation for digital economic development.

First, accelerate broadcasting 5G network construction to build a foundation for enabling thousands of industries. The dual gigabit network combining 5G and gigabit optical networks built by broadcasting network companies features ultra-large bandwidth, ultra-low latency, and advanced reliability, representing an important component and transmission channel of new infrastructure. China Broadcasting Network should collaborate with local broadcasting network companies to actively integrate into new development patterns, accelerate broadcasting 5G network construction, leverage advantages in broadcasting 5G network coverage and media ecosystem resources, cultivate industrial ecosystems, and promote network-level, platform-level, and application-level development.

Second, accelerate data infrastructure construction to consolidate the foundation for broadcasting business development. Broadcasting broadband services, advanced video services, media convergence services, and upcoming voice services all rely on network resource support. High-quality IDC and CDN are prerequisites for all broadcasting development. Facing fierce market competition and users' growing demands, broadcasting network companies should further strengthen national backbone networks, access networks, data centers, and other infrastructure construction to consolidate the foundation for broadcasting business development.

Third, empower industrial internet and serve digital economic development. With deep integration of the digital economy and real economy, data infrastructure represented by data storage, computing, value mining, and management has become a new engine for industrial digital transformation. Broadcasting network companies should accelerate data center and other infrastructure construction, participate in industrial internet digital transformation, accelerate "5G + Industrial Internet" converged applications, and strengthen new drivers for digital economic development.

2.5 Leverage Broadcasting Cable Network Advantages to Actively Participate in National Cultural Big Data System Construction

National cultural big data system construction represents new infrastructure for the propaganda and cultural front, as well as a major measure to consolidate the foundation for propaganda and cultural development and informatization. The national cultural big data system has become a key project in the cultural field, which can be called the "new infrastructure" of the cultural domain, with broadcasting networks having become a core force among participants. As the "new infrastructure" and key production factor in the cultural field, national cultural big data system construction needs to grasp realistic opportunities, address innovation challenges, and lead high-quality and green development in the cultural field while balancing social public value and commercial economic value. Overall, deep integration between the cultural big data system and broadcasting cable networks represents an important direction for both parties' future sustainable and innovative development.

National cultural big data system construction is a comprehensive, systematic project involving wide-ranging areas, long construction cycles, and sustainability. Since broadcasting cable networks constitute national strategic resources, their closed operation without foreign capital access ensures cultural data security and provides technical guarantees for copyright protection, making them the most suitable carriers for undertaking national cultural big data system cloud construction. Collection data from various cultural institutions, after cleaning, sorting, and annotation, is stored in root servers to form their data centers. Data centers from tens of thousands of cultural institutions constitute the front-end of the national cultural big data system. Front-end collection data information annotated according to international standards is aggregated in the

cloud through broadcasting cable networks, with terminals connected to broadcasting cable networks accessing the front-end through the cloud. Front-end, cloud, and terminal constitute a secure and trustworthy cultural production closed-loop system through broadcasting network interconnection.

Driven by innovations promoting deep media convergence development, broadcasting network companies explore building interconnected and interoperable big data systems through integrated promotion of broadcasting 5G network construction and national "network integration," expanding broadcasting + government, civilian, and commercial services. This aligns with and highly complements national cultural big data system construction needs. Continuously innovating and developing broadcasting cable networks can become the cloud connecting and running through the supply, production, and consumption ends of national cultural big data system construction, satisfying interconnection needs at different levels, for different entities, and for different tasks.

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