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Analysis of Broadcasting and Television Engineering Technology in the Converged Media Era

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Abstract: In the era of converged media, broadcasting and television engineering technology faces new challenges and opportunities. Traditional broadcasting and television engineering technology is gradually transitioning toward digitalization, networking, and intelligentization to meet market demands. This paper explores the development trajectory, core elements, and common issues of broadcasting and television engineering technology in the converged media era, such as funding shortages, signal transmission interference, and a lack of specialized technical personnel. To address these challenges, this paper proposes optimization strategies including increased funding, adoption of advanced transmission technologies, cultivation of high-caliber talent, and promotion of content innovation. Looking ahead, broadcasting and television engineering will leverage network platforms, integrate live streaming technologies, and widely adopt intelligent broadcast systems to achieve more efficient, intelligent, and interactive development.

Keywords: Converged media era; Broadcasting and television engineering; Optimization strategies

1. Introduction

Against the backdrop of the converged media era, broadcasting and television engineering technology is undergoing unprecedented transformation and advancement. With the rapid development of information technology, the boundaries between traditional broadcasting and new media are increasingly blurred, making converged media the new trend in the industry. As a vital pillar of media dissemination, the innovation and advancement of broadcasting and television engineering technology play a crucial role in enhancing program quality, expanding distribution channels, and enriching user experiences. This paper aims to conduct an in-depth analysis of the current state, challenges, and developmental trends of broadcasting and television engineering technology in the era of converged media, providing theoretical underpinnings and practical guidance for the transformation and upgrading of the broadcasting and television industry.

2. Overview of Broadcasting and Television Engineering Technology in the Converged Media Era

2.1 Development History of Broadcasting and Television Engineering Technology

(1) Key Characteristics and Achievements of Traditional Broadcasting and Television Engineering Technology. Traditional broadcasting and television engineering technology centered on analog signal transmission, characterized by stable transmission and extensive coverage. During this phase, broadcast media delivered audio-visual signals to households nationwide via radio waves and cable networks, enabling widespread information dissemination. Traditional broadcasting

and television engineering laid a solid foundation for the media industry's development, produced numerous classic programs, and enriched people's cultural lives. (2) New Changes and Trends in Broadcasting and Television Engineering in the Converged Media Era. Entering the converged media era, broadcasting and television engineering underwent profound transformation. Driven by digitalization, networking, and intelligent advancements, broadcasting engineering has transitioned from analog to digital signal transmission, significantly enhancing transmission efficiency and quality. Concurrently, the deep integration of broadcasting with the internet has spawned new media formats, propelling innovative development in the media industry. Moving forward, broadcasting engineering will evolve toward greater efficiency, intelligence, and interactivity.

2.2 Core Elements of Broadcasting Engineering in the Converged Media Era

(1) Key Technological Elements 1) Signal Transmission Technology: Responsible for efficiently and reliably transmitting audio-visual signals from production to reception. In the converged media era, this technology must support high-definition and ultra-high-definition signal transmission while ensuring stability and security. 2) Data Processing Technology: Compresses, encodes, and decodes transmitted audio-visual signals to enhance transmission efficiency and reception quality. Additionally, data processing technology involves analyzing and utilizing big data to support targeted program delivery and personalized services. 3) Broadcast Distribution Technology: Distributes processed audio-visual signals through multiple channels like television and the internet. In the converged media era, this technology must support cross-platform and cross-device broadcasting to enable diversified content dissemination. (2) Significance and Application Scenarios. These technologies hold significant importance in the era of converged media, not only enhancing the production and transmission efficiency of broadcast and television programs but also expanding their distribution channels and audience reach. They are widely applied in scenarios such as live news broadcasts, sports event transmissions, and online video releases, providing audiences with richer, more convenient, and personalized audiovisual experiences[1].

3. Common Issues in Broadcasting Engineering Technology in the Converged Media Era

3.1 Lack of Development Funding

(1) Impact of Funding Shortages on Broadcasting Engineering Technology Development. Funding shortages directly hinder R&D, equipment upgrades, and maintenance in broadcasting engineering technology. Without sufficient capital, broadcasting institutions struggle to adopt advanced technologies and equipment, leading to unstable signal transmission and poor program production quality. Furthermore, limited funding restricts the innovation capacity and market competitiveness of broadcasting and television programs, hindering their ability to meet the evolving demands of the converged media era. (2) Causes and Solutions to Funding Issues. Funding challenges primarily stem from declining advertising revenue, reduced government subsidies, and rising operational costs. Addressing this requires broadcasting institutions to broaden financing channels, such as through corporate partnerships and diversified business operations. Concurrently, governments should enhance support for the broadcasting industry by providing necessary policy and financial assistance.

3.2 Signal Transmission Vulnerability to Interference

(1) Potential Interference Issues During Signal Transmission. In the era of converged media, broadcasting and television signal transmission may encounter various interference problems, such as electromagnetic interference, equipment malfunctions, and weather factors. These interferences can cause signal interruptions, degraded picture quality, and other issues, severely impacting audience viewing experiences. (2) Causes of interference and its impact on broadcast programming. Primary causes include aging equipment, unstable transmission lines, and complex electromagnetic environments. These issues not only degrade transmission quality but may also trigger audience dissatisfaction and erode trust in broadcast institutions. Therefore, enhancing the stability and interference resistance of signal transmission systems is crucial.

3.3 Shortage of Professional Technical Personnel

(1) Constraints of Professional Talent Shortage on Broadcasting Engineering Development. Professional

talent serves as the core driving force for broadcasting engineering advancement. A lack of skilled personnel not only stifles technological innovation, affecting program production quality and transmission efficiency, but also hinders broadcasting institutions' ability to address challenges posed by technological transformation. (2) Causes of Talent Shortage and Importance of Talent Development. Key factors include intensified industry competition and inadequate talent cultivation systems. Strengthening talent development requires educational institutions to enhance teaching quality in relevant disciplines, while broadcasting organizations must intensify internal training and establish robust incentive mechanisms. Attracting and retaining talent also presents a significant challenge for these institutions.

3.4 Lagging Content Innovation and Production Quality

(1) Potential Issues in Content Innovation and Production Quality of Broadcasting and Television Programs. In the era of converged media, broadcasting and television programs face challenges such as content homogenization and subpar production quality. These issues not only diminish program appeal and competitiveness but may also lead to audience fatigue and attrition. (2) The impact of these issues on broadcasting and television engineering technology development. Lagging content innovation and production quality not only affect the market performance of programs but may also constrain the advancement of broadcasting and television engineering technology. Without high-quality content and production standards, it becomes difficult to attract audience attention and investment, thereby dampening broadcasting institutions' motivation and investment in technological innovation. Therefore, strengthening content innovation and enhancing production quality are pivotal to the development of broadcasting and television engineering technology.

4. Optimization Strategies for Broadcasting Engineering Technology in the Converged Media Era

4.1 Increasing Funding Investment and Ensuring Efficient Utilization

(1) Strategies and Recommendations for Increasing Funding Investment. To drive innovation and development in broadcasting engineering technology, adequate financial support must first be secured. Governments should increase fiscal subsidies to the broadcasting industry, encouraging technological innovation and equipment upgrades. Simultaneously, special funds can be established to support broadcasting enterprises' investments in R&D and content innovation. Furthermore, broadcasting enterprises should actively explore diversified financing channels, such as attracting social capital investment and applying for bank loans, to secure funding for technological innovation. (2) Methods for Evaluating Funding Efficiency and Effectiveness. To ensure funds are used appropriately, rigorous financial management and auditing systems must be established. Broadcasting enterprises should develop detailed funding utilization plans, clearly defining budgets and purposes for each expenditure. During fund utilization, strict approval procedures should be implemented to ensure funds are directed toward critical R&D, equipment upgrades, and content innovation. Concurrently, regular audits of fund usage should be conducted to evaluate input-output efficiency, enabling timely adjustments to funding strategies to ensure optimal allocation and utilization.

4.2 Adoption of Advanced Transmission Technologies

(1) Advanced Technologies like Fiber Optic Communication and Satellite Transmission and Their Application in Broadcasting Engineering. Fiber optic communication plays a vital role in broadcasting signal transmission due to its high speed, large capacity, and low loss characteristics. Fiber optic networks enable stable transmission of high-definition, ultra-high-definition, and even 4K/8K ultra-high-definition signals, delivering clearer and smoother viewing experiences to audiences. Additionally, fiber optic communication offers advantages such as strong interference resistance and long transmission distances, enhancing broadcasting signal coverage and transmission quality. Satellite transmission technology utilizes geostationary satellites as relay stations to achieve long-distance broadcasting signal transmission. This technology is particularly suitable for signal coverage in remote areas or across national borders, helping to broaden the audience reach of broadcasting. Simultaneously, satellite transmission features high real-time capability and superior transmission quality, meeting the demands of programs requiring high immediacy, such as live sports events and major news coverage[2]. (2)

Enhancing signal transmission efficiency and stability. The adoption of advanced technologies like fiber-optic communication and satellite transmission significantly enhances the transmission efficiency and stability of broadcast signals. On one hand, these technologies substantially increase transmission speed and capacity, ensuring the stable delivery of high-definition and ultra-high-definition signals. On the other hand, they offer robust interference resistance and transmission stability, maintaining signal clarity and smoothness even in complex environments. This is crucial for improving the viewing experience and audience satisfaction of broadcast programs.

4.3 Cultivating High-Quality Technical Professionals

(1) The Importance of Technical Professionals in Broadcasting Engineering Development. Technical professionals serve as the core driving force behind the advancement of broadcasting engineering technology. They not only possess cutting-edge technical expertise and knowledge but also drive technological innovation and application based on industry trends and market demands. Therefore, cultivating high-quality technical professionals is crucial for propelling the development of broadcasting engineering technology[3]. (2) Strategies and Recommendations for Talent Development. To cultivate high-caliber technical professionals, the following strategies and recommendations should be implemented: First, strengthen the integration between higher education and vocational training to supply more professionals with specialized knowledge and skills to the broadcasting and television engineering field. Second, encourage internal corporate training to enhance existing employees' technical proficiency and innovation capabilities. Third, intensify exchanges and cooperation with domestic and international peers to introduce advanced technologies and management expertise, thereby elevating the industry's overall technical standards.

4.4 Promoting Content Innovation and Production Quality Enhancement

(1) Significance of content innovation and production quality enhancement for broadcasting and television engineering technology development. Content innovation and production quality enhancement serve as vital drivers for the advancement of broadcasting and television engineering technology. By innovating content and elevating production quality, greater audience engagement can be achieved, boosting program ratings and influence. Simultaneously, this propels continuous innovation and upgrading of broadcasting and television engineering technology to meet viewers' increasingly diverse viewing demands. (2) Specific Measures and Methods to Promote Content Innovation and Production Quality Enhancement. To advance content innovation and production quality, the following concrete measures and methods can be implemented: First, strengthen the development of program planning and creative teams, encouraging members to unleash their imagination and creativity; second, introduce advanced production technologies and equipment to enhance production efficiency and visual effects; third, intensify interaction and communication with audiences to understand their needs and preferences, providing inspiration and basis for content innovation; Fourth, establish a comprehensive program quality assessment system to conduct regular evaluations and improvements of production standards. Implementing these measures will drive significant progress in both content innovation and production quality for broadcast television programs[4].

5. Development Trends in Broadcasting Engineering Technology in the Converged Media Era

5.1 Achieving Converged Development Through Network Platforms

(1) The Driving Role of Network Platforms in Broadcasting Engineering Technology Development. Network platforms provide robust support for the advancement of broadcasting engineering technology. On one hand, they break through the geographical limitations of traditional media, enabling rapid global dissemination of broadcast programs and significantly expanding audience reach. On the other hand, these platforms offer rich interactive features, allowing viewers to participate in real-time program discussions through comment overlays and feedback, thereby enhancing program interactivity and audience engagement. (2) Future Trends in the Integration of Network Platforms and Broadcasting Engineering Technology. With continuous advancements in network technology, the integration between network platforms and broadcasting engineering technology will deepen

further. In the future, we may witness more innovative forms of broadcasting programs based on network platforms, such as interactive dramas and virtual reality live broadcasts. These new program formats will fully leverage the technological advantages of network platforms to deliver more immersive audiovisual experiences for audiences.

5.2 Converged Network Live Streaming Technology Becomes Mainstream

(1) Impact and Convergence Trends of Online Live Streaming Technology on Broadcasting Engineering. The rise of online live streaming technology has profoundly impacted broadcasting engineering. It has not only transformed traditional program production and broadcasting methods but also driven real-time interaction and personalized customization in broadcasting content. As online live streaming technology matures, it will integrate more closely with broadcasting engineering, forming entirely new program production and broadcasting models. (2) Application Prospects and Challenges of Online Streaming Technology in Broadcasting Programs. Online streaming technology holds vast potential for application in broadcasting programs, spanning scenarios such as news broadcasts, sports event coverage, and variety show livestreams. However, it also faces challenges including content moderation, copyright protection, and technical stability. To address these challenges, broadcasting institutions must enhance technological R&D and regulatory oversight to ensure legal compliance and technical reliability of online streaming content.

5.3 Widespread Adoption of Intelligent Broadcast Systems

(1) Application of AI, Big Data, and Cloud Computing in Broadcasting Systems. Technologies like artificial intelligence, big data, and cloud computing are increasingly integrated into broadcasting systems. These innovations not only enhance broadcast efficiency and quality but also deliver more precise content recommendations and personalized viewing experiences. For instance, analyzing audience viewing behaviors and preferences through big data enables tailored program suggestions. (2) Future Development Trends of Intelligent Broadcasting Systems and Their Transformative Impact on Traditional Broadcasting Engineering. In the future, intelligent broadcasting systems will undergo further development and refinement, becoming a key driver of technological innovation and transformation in broadcasting engineering. They will promote automation, intelligence, and efficiency in program production, reducing costs while enhancing program quality. Simultaneously, these systems will propel traditional broadcasting engineering toward digitalization, networking, and intelligent transformation.

6. Conclusion

In summary, the era of converged media presents unprecedented opportunities and challenges for broadcasting and television engineering technology. By intensifying technological innovation, optimizing transmission technologies, cultivating specialized talent, and driving content innovation, the broadcasting and television industry continuously enhances its competitiveness, broadens communication channels, and meets the diverse needs of audiences. Looking ahead, with the further advancement of intelligent and networked technologies, broadcasting and television engineering technology will continue to evolve, leading the media industry toward higher levels of development. We anticipate that broadcasting and television engineering technology will play an even greater role in this process, contributing significantly to cultural dissemination and societal advancement.

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