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Exploring Opportunities and Challenges for Broadcast Convergence through 5G-Accelerated Internet of Vehicles Applications: A Postprint

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Abstract

This year marks China' s inaugural year of entering the 5G era, with broadcast media convergence development simultaneously transitioning from 1.0 to 2.0. At this critical juncture, 5G commercialization will inject new impetus and opportunities into broadcast convergence development. Leveraging technological support to create audio content tailored for diverse "listening scenarios," satisfy personalized audience demands, and secure a strategic position within Internet of Vehicles (IoV) intelligent terminal systems—these factors render the development space for broadcast converged media highly imaginative. However, how broadcast converged media, characterized by relatively low levels of marketization and capitalization, can cooperate and compete with automobile manufacturers and commercial platforms constitutes the most significant challenge confronting broadcast convergence development in the 5G era.

Full Text

Preamble

Title: Accelerating Connected Vehicle Applications Through 5G: Opportunities and Challenges for Broadcast Media Convergence

Abstract: This year marks China' s entry into the 5G era, coinciding with broadcast media' s transition from convergence 1.0 to 2.0. At this juncture, commercial 5G deployment will inject new momentum and opportunities into broadcast convergence development. Supported by technology, creating audio content for various "listening scenarios" to meet audience personalization needs and establishing a strategic path into connected vehicle intelligent terminal systems opens vast possibilities for broadcast media convergence. However, how can broadcast media—characterized by low marketization and capitalization—

cooperate and compete with automakers and commercial platforms? This represents the greatest challenge facing broadcast convergence in the 5G era.

Keywords: 5G; connected vehicles; broadcasting; convergence development

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Introduction

On June 6, 2019, China' s Ministry of Industry and Information Technology issued 5G commercial licenses to China Telecom, China Mobile, China Unicom, and China Broadcasting Network, officially ushering the nation into the 5G era. Commercial 5G service launched on October 31, 2019. The adage "4G changes life, 5G changes society" reflects how 5G' s characteristics—high data rates and low latency—will drive Internet of Things applications and truly realize the interconnectivity of all things. The coming years are predicted to be a golden opportunity period for 5G applications across industries. On July 10, 2019, BMW (China) Automotive Trading Co., Ltd. announced a 5G mobile communication partnership with China Unicom, demonstrating how the automotive industry is accelerating its layout in the connected vehicle market—a primary development direction for broadcasting. For broadcast media undergoing convergence transformation, this presents both opportunities and challenges. The opportunity lies in leveraging cross-industry collaboration to enter connected vehicle content production, in-vehicle entertainment, and service markets, potentially achieving a "corner overtaking"in media convergence development. The challenge is that automakers and commercial platforms will not readily share the commercial value of massive data generated by future in-vehicle intelligent terminals. How can broadcast media with low marketization and capitalization enter and segment this market? The path forward is both exciting and fraught with obstacles.

1. 5G Accelerates Connected Vehicle Applications

1.1 What is 5G?

5G stands for the fifth generation of mobile communication technology, following the evolution through 2G, 3G, and 4G eras. Over the past three decades, mobile networks have undergone repeated innovations, with a new generation emerging approximately every decade to deliver leaps in social efficiency and user experience. The 1G era liberated us from fixed-line telephones, initiating the mobile phone age. 2G improved upon 1G' s call quality weaknesses and

added SMS functionality. 3G opened a new multimedia era. 4G built a mobile internet, extending 3G' s simple multimedia capabilities across the entire network. With 5G' s arrival, the door to a true Internet of Things world will open, achieving universal connectivity—an outcome determined by 5G's inherent characteristics.

1.2 5G Characteristics

High Data Rates: 5G network speeds can reach 10 to 100 times those of 4G, enabling real-time transmission of 8K resolution 3D video. Downloading a 3D movie takes six minutes on 4G but only six seconds on 5G.

Low Latency: Face-to-face conversation involves a sound transmission delay of 140 milliseconds, which humans tolerate without perceiving significant lag. However, the International Telecommunication Union' s vision for 5G latency aims for 1 millisecond or less. To illustrate: if controlling an unmanned vehicle, a 140-millisecond reaction delay would propel the car 200 meters forward before braking, while even a 20-millisecond delay would carry it over ten meters. One-millisecond latency enables virtually instantaneous response to commands.

Ubiquitous Network: This refers to network presence in every corner of social life. Achieving a smart society with universal connectivity requires seamless, dead-zone-free coverage. Consider a future smart car returning to its garage after a day' s operation: it must use navigation to locate its parking space while charging equipment automatically identifies and charges the vehicle—impossible without network connectivity.

In summary, high data rates enable seamless integration of VR, AR, and cloud technologies into daily life; low latency makes autonomous driving feasible; and massive terminal networks create a broader, more open Internet of Things, making smart homes and cities possible.

1.3 What is the Connected Vehicle Network?

The connected vehicle network is defined as "the effective utilization of all vehicle dynamic information within an information platform through wireless communication technology installed on vehicles, providing different functional services during vehicle operation" [1]. Connected vehicles encompass smart cars that incorporate both autonomous driving technology and rich audio-visual content on in-vehicle screens to meet personalized needs of drivers and passengers while enhancing their experience.

1.4 5G Boosts Automotive Industry into Connected Vehicle Era

5G network speeds are approximately 100 times faster than 4G. 5G represents a critical enabler for connected vehicles, and as the technology matures, connected vehicle systems will become standard automotive equipment. Although widespread application of connected vehicles remains a long-term goal, visible

technologies like smart cars and autonomous driving are already paving the way. Recognizing this prospect, the Ministry of Industry and Information Technology issued the "Three-Year Action Plan for Connected Vehicle (Intelligent Connected Vehicle) Industry Development" at the end of 2018, explicitly proposing that by 2020, connected vehicle user penetration should exceed 30%, and new vehicle installation rates for connected in-vehicle information service terminals should surpass 60%, building a comprehensive application system covering information services, safety, and energy efficiency.

2. Broadcasting' s Survival Space in the Connected Vehicle Era

Broadcast development requires market and technology foresight. Notably, in-vehicle intelligent terminals— "in-vehicle large screens" —are increasingly appearing in smart cars. Domestically representative systems include BYD' s DiLink, SAIC Roewe' s Banma, Geely' s G-Store, and Dongfeng Fengshen' s WindLink. These screens have replaced traditional radio positions while integrating more entertainment functions. In the 5G era of universal connectivity, they will transcend conventional In-Vehicle Infotainment (IVI) systems, combining with artificial intelligence and internet technology to build a comprehensive human-vehicle-life application ecosystem through GID (Group Identification) interfaces that unlock numerous usage scenarios.

Does in-vehicle broadcast have survival space in this large-screen era? The answer is affirmative. Broadcasting must secure its place within the "in-vehicle large screen" to avoid being abandoned by connected vehicles—representing both an opportunity and a challenge for broadcast convergence development.

3. Opportunities and Challenges for Broadcasting Entering the Connected Vehicle Market

Qualcomm data projects that by 2035, 5G will create over $2.4 trillion in total economic output for the automotive industry and its supply chain—nearly one-fifth of 5G' s expected global economic impact. In the 5G era, broadcast convergence media will occupy the downstream supply chain of the connected vehicle market as content development suppliers or software technology exporters. This represents a major opportunity for broadcast transformation and the primary direction for future development. The commercial value lies in audio products serving as crucial content for connected vehicle intelligent entertainment functions. If connected vehicle technology and intelligent transportation applications constitute the hardware, then personalized, scenario-based audio products represent the software that endows vehicles with personalized value. User big data generated through audio product usage also holds significant commercial worth.

3.1 Opportunities

In the connected vehicle era, each smart car represents a mobile terminal, and the massive, diverse data generated during driving creates enormous commercial value. Research institutions project China' s smart car market will approach 60 billion yuan by 2020. However, this market remains immature and in its infancy —presenting an excellent entry opportunity for broadcast media.

From a service functionality perspective, automakers will certainly focus on deep development of intelligent transportation applications and autonomous driving technology, as these constitute core competencies whose data facilitates vehicle performance development and digital transformation. However, entertainment functions within connected vehicles may not be automakers' strength, whereas broadcast convergence media derived from traditional radio possesses professional audio content production and service capabilities. Cooperation in this functional area alone offers complete opportunities for cross-industry collaboration to enter the connected vehicle market.

Current industry initiatives include: China National Radio' s "China Radio" client, a cross-platform product encompassing mobile, in-vehicle, and intelligent terminals. Its in-vehicle version includes Ford, CarLife, Apple CarPlay, and China Mengjia series products, entering Toyota' s in-vehicle platform through the Smart Device Link (SDL) open-source alliance. Fujian Radio, Film and Television Group jointly developed the "Broadcasting Vehicle Box" with Fuxin Futong Network—a cloud rearview mirror integrating radio interaction, in-vehicle WeChat assistant, intelligent voice control, one-click capture and reporting, and HD driving recording, representing a "Broadcasting + Connected Vehicle" intelligent terminal product [2].

In recent years, broadcast media nationwide have accelerated convergence development. With financial support from local propaganda departments for media convergence since 2017, many broadcasters began "building ships to sail the seas" —creating independent, audio-centric clients. However, the substantial, sustained capital investment required poses a major obstacle to sustainable development. Government funding typically serves only as startup capital; once withdrawn, broadcast convergence media must become self-sufficient. Early technology innovators have explored mobile client products with mature promotion and technology export capabilities, while most broadcasters remain in the 1.0 exploration phase. Both categories can identify their positioning and seek opportunities in the connected vehicle market.

3.1.1 Broadcasting Convergence Media Client + Automakers Broadcasting clients with autonomous technology cores and sufficient active user data can directly negotiate cooperation with automakers. When user profiles from broadcasting convergence media clients highly align with automotive brand positioning, such cooperation proceeds more smoothly, representing a strong alliance. On July 21, 2017, fashion self-media "Miss Fantasy" collaborated with MINI

to exclusively sell limited-edition vehicles, achieving a "100 units sold out in 4 minutes" case that demonstrates new media's high conversion commercial value. This requires media platforms to accumulate large numbers of highly trusted active users—what traditional marketing terms "loyalty."

3.1.2 Broadcasting Convergence Media + Third-Party Connected Vehicle Platforms Developing in-vehicle terminal systems is unrealistic for most broadcasters, but they can leverage professional, high-quality audio products to cooperate with third-party connected vehicle platforms by opening ports and loading directly as channels. This model must address "which party's backend retains the data." Without data access, broadcasters should participate through equity stakes or similar arrangements; otherwise, the cooperation holds limited commercial value.

3.1.3 Becoming a Professional Audio Content Supplier For most broadcasters in convergence development that have not achieved commercial or market transformation and lack even rudimentary operational concepts, the only opportunity to capture the connected vehicle market is becoming professional audio content suppliers. Automakers seeking to provide rich entertainment and interactive services through connected vehicle systems must possess massive audio content that meets personalized driver and passenger needs. Only by delivering "understands me" personalized experiences can connected vehicle systems gain competitive value. The "content is king" principle remains industry consensus and the foundation of traditional media. Attracting audiences with quality content remains the most important survival rule for all media, including new media.

5G technology accelerates connected vehicle system applications, making future automobiles more intelligent. Autonomous driving liberates drivers' hands, feet, and minds, making "how to prevent passengers from wasting in-vehicle time" a critical application scenario for next-generation in-vehicle infotainment systems. In this imaginative blue ocean, broadcasting has tremendous potential. Audio products are inherently scenario-based content. Creating audio content with "listening scenarios" means identifying or inventing content that solves audience pain points, enabling rapid acceptance and immersion. Traffic radio once provided innovative "listening scenarios" for radio content output. In the new media era, broadcasting must continue deeply considering "listening scenarios."

5G technology accelerates connected vehicle system applications, raising a critical question for the broadcasting industry: will future in-vehicle infotainment systems still include radio? When other traditional media suffered from new media impact and advertising revenue cliff-diving, broadcasting innovatively launched traffic radio scenarios to maintain relatively decent advertising performance. In the future, when radios are no longer installed in cars, whether broadcasting can graft into connected vehicle systems becomes key to gaining new market value-added space and the primary direction for deep convergence

development.

3.2 Challenges

3.2.1 Difficulty Competing with Market-oriented Commercial Platforms On October 28, 2019, audio community platform Lychee filed for IPO in the United States. If successful, it will become China's first publicly traded audio community platform, demonstrating domestic commercial audio platforms' strong capital integration and market operation capabilities. In contrast, broadcast convergence development faces stricter policy regulation that has significantly reduced cultural media industry M&A and listing activity. Broadcast institutions lacking market financing capabilities cannot compete with well-funded commercial platforms. Moreover, insufficient capital investment constrains platform technology iteration, creating significant user experience gaps compared to commercial platforms.

3.2.2 Difficulty Retaining User Data In the in-vehicle radio era, listening rate value contributed by users belonged entirely to broadcasters. In the connected vehicle era, big data value generated by users resides directly with connected vehicle mobile terminal owners. How can broadcasters share in this value? This requires wisdom and capability.

Connected vehicle concepts and R&D have existed in China for many years. Without 5G technology support during initial stages, the market had not found effective profit models. Loading rich, diverse interactive content onto connected vehicles to generate massive user data, then mining this data to create tailored precision services, represents a viable profit pathway. For example, connected vehicle backends can capture data on owner preferences for music, audiobooks, and dining—highly valuable for precision marketing. However, will terminal owners readily share such commercially valuable user data with broadcasters? Of course not. Without traffic guidance and user data, broadcast convergence media gains only promotional value without direct commercial monetization.

4. Countermeasures

4.1 Government Level: Promote Integration of Local Broadcasting and Automotive Industries from an Industrial Development Strategy Perspective

Many Chinese cities have established automotive industry clusters. For broadcasters in these cities, the shortcut to entering the connected vehicle market is establishing cooperation with local automakers. Strengthening top-level design to integrate upstream and downstream industry chains will expand and strengthen this cultural industry sector.

4.2 Broadcasting Itself: Enhance Corporate Investment and Financing Capabilities During Convergence Development

The special nature of traditional media dictates that broadcasting marketization follows an absolute holding model. During convergence development, broadcasters should strengthen investment and financing capacity building, establish modern corporate systems, and achieve capital market integration—strategically crucial for future commercial cooperation. Market competition requires following market rules.

4.3 Micro Level: Adhere to "Content is King" Production Philosophy and Develop Multi-scenario Listening Content

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

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