A Brief Discussion on the Technological Transformation of Audio Media in the Century Since the Founding of the Communist Party of China: Postprint

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Abstract

Audio media holds extraordinary significance in the century-long communication undertaking of the Communist Party of China, and tracing its evolutionary history is a necessary scholarly endeavor. This article adopts a technological perspective to delineate its developmental stages. In the 1920s, radio broadcasting stations emerged; while production and transmission technologies underwent successive transformations, their enduring roles as a bond linking the Party and the masses, a carrier for knowledge and education, and a bridge for cultural transmission remained constant. At the end of the 20th century, the rise of internet audio featured social attributes aligned with user needs, cross-terminal transmission that enhanced efficiency, "video-ization" that extended audio formats, AoIP technology that improved broadcasting models, the evolution of digital signal broadcasting into digital multimedia broadcasting, and the gradual popularization of in-vehicle internet audio as the primary listening domain. In the 21st century, smart audio has come to the fore, with deep learning empowering machine-based sound transmission, in-vehicle audio systems becoming increasingly open and scenario-based, and 5G technology accelerating multi-domain smart audio dissemination. Usability is the primary criterion for smart audio, content is paramount, companionship is a fundamental need, and distribution is the crucial instrument. However, issues such as information cocoons and privacy leaks that smart audio may cause remain a cause for concern.

Full Text

A Brief Discussion on the Technological Transformation of Audio Media in the Century Since the Founding of the Communist Party of China

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Abstract: Audio media has played an extraordinary role in the century-long communication endeavors of the Communist Party of China, making it essential to systematically review its evolutionary history. This article attempts to use technology as an entry point to outline its developmental stages. In the 1920s, radio stations emerged, and while production and transmission technologies underwent several transformations, what remained constant was their role as a bond connecting the Party and the masses, a vehicle for knowledge and education, and a bridge for cultural transmission. At the end of the 20th century, network audio rose to prominence, with its social attributes meeting user needs, cross-terminal transmission improving efficiency, "visualization" extending audio formats, AoIP technology improving broadcasting models, digital signal broadcasting gradually evolving into digital multimedia broadcasting, and in-vehicle network audio gradually becoming popular and emerging as the primary listening platform. In the 21st century, smart audio has highlighted its advantages, with machines empowering sound transmission through deep learning, in-vehicle audio systems becoming increasingly open and scenario-based, and 5G technology accelerating the multi-field dissemination of smart audio. For smart audio, ease of use is the primary criterion, content is the key to victory, companionship is the fundamental need, and distribution is the crucial weapon. However, problems such as information cocoons and privacy leakage potentially caused by smart audio still require vigilance.

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Introduction

The year 2021 marks the 100th anniversary of the founding of the Communist Party of China. The magnificent century-long history of the Party is also

a pragmatic history of media transformation, in which audio media, with its irreplaceable characteristics, has made monumental contributions to influencing human life and has become an indelible sound recorder of Party history. Meanwhile, technology has undoubtedly played a structurally significant role at critical junctures. This article analyzes the development and transformation of sound transmission from broadcasting to network audio and then to smart audio over the century since the Party' s founding. It should be noted that these three stages are not mutually exclusive replacement relationships but rather dynamic adjustments where one rises as another declines. That is, in the network audio stage, broadcasting still exists, but its networked characteristics become prominent, while smart audio uses the internet as its fundamental transmission infrastructure.

1. The 1920s: The Beginning of Radio Broadcasting

Broadcasting represents a creative achievement in human development. On December 30, 1940, Yan' an Xinhua Broadcasting Station went on air, marking the birth of the Chinese people' s broadcasting 事业. Since then, it has changed names several times, from Yan' an Xinhua Broadcasting Station to Beiping Xinhua Broadcasting Station, and eventually integrated with China Central Television (China International Television), Central People' s Broadcasting Station, and China Radio International to form the China Media Group.

In 1906, American Lee De Forest began transmission experiments using radio and music, after which radio technology was extensively researched. Radio broadcasting emerged as a notable achievement because it could transmit continuous radio waves with specific amplitudes and frequencies. In the 1920s, radio broadcasting was introduced to China, laying the cornerstone for the early development of domestic radio stations. In the early 1930s, Mao Zedong emphasized in a published article: "Radio work is more important than any partial technical work," a statement that clarified the fundamental nature and lofty status of China' s radio stations—that people' s broadcasting is the voice of China. In 1940, the Comintern provided China with a radio transmitter, which was timely assistance for the Chinese Communist Party with its weak broadcasting equipment. At the end of 1940, Yan' an Xinhua Broadcasting, with the call sign XNCR, officially began broadcasting, marking the formal establishment of the Party' s first people' s radio station. At that time, the equipment was extremely rudimentary, consisting only of worn-out microphones and old hand-cranked phonographs. However, despite the harsh technical conditions, the establishment of the wireless radio station greatly encouraged the entire Party, as the voice of truth could thus be more widely disseminated, enabling people across the nation and around the world to gain fuller understanding of the Communist Party of China and its base areas.

After the founding of the People' s Republic of China, everything awaited revitalization, and individual citizens were urgently needed to devote themselves to national construction. Therefore, the transmission of Party Central Committee

policies from top to bottom brooked no delay. However, it is understood that at the time, only one out of every five people was literate. How to effectively convey the spirit of documents to grassroots masses and deeply resonate with them became a difficult problem facing decision-makers. An effective solution was to develop a broadcasting 事业 that audiences could understand without needing to read. Based on this, from the central government down to villages, the broadcasting 事业 was elevated to a historical priority. However, at that time, the nation had only 49 radio stations, with problems such as backward technology and low transmission power being prominent, making the import of foreign professional radio equipment the inevitable choice.

The Soviet Union, as a pioneer in broadcasting 事业, provided strong support for the technological innovation of China' s mass communication 事业. In the 1950s, the Chinese Communist Party imported tape recorders from the Soviet Union to facilitate the production of recorded programs. In terms of sound recording, China' s broadcasting equipment underwent technological changes from wire recorders to tape recorders to recording workstations. In terms of receiving terminals, in 1953, China began to have domestically produced radios—the "Red Star" brand—giving the masses a more convenient way to listen to broadcasts. At that time, the "four major items" known as "three rotations and one sound" were a sign of family prosperity, where "three rotations" referred to bicycles, sewing machines, and watches, while "one sound" referred to radios. This also indicates that although domestic radios had emerged, not every household could afford them. It was not until 1998, when the "Village Access" policy was officially implemented, that the problem of difficult broadcast access in rural areas was solved, and listening freedom was basically achieved. From this, we can assert that the growth path of China' s broadcasting 事业 was like crossing the river by feeling the stones. Thanks to countless broadcasting workers who diligently studied technical issues, the voice of truth became clearly audible.

By the early 1970s, tape recorders used by broadcast journalists gradually became popular, but due to their bulkiness, they were inconvenient to carry around or record news instantly, especially when encountering breaking events. In the 1990s, DAT digital tape recorders and MD magneto-optical disc recorders emerged competitively. Technological changes not only made equipment more portable but also improved sound transmission quality. Two-channel stereo was no longer just a concept. With the successful launch of the "Dongfanghong-1" satellite, digital satellite technology spread to the broadcasting industry, and satellite broadcasting emerged.

1.2 Discussing the Impact of Broadcasting Broadcasting serves as a bond connecting the Party and the people. Radio stations have transmitted political, economic, and cultural information of various eras to the Chinese people, providing solid guarantees for China's social development. The historical achievements of broadcasting cannot be casually denied by any individual. After the 1950s, following the victory in the Korean War, national economic recovery became

an important priority. Land reform was promoted downward, and supporting propaganda was essential. Radio stations at all levels actively responded to the call, transmitting information from top to bottom according to central directives and fulfilling their due functions. During this period, radio stations launched many programs of different forms and content in response to various reform and development policies, such as "Capital Newspaper Summaries" and "National People' s Radio Stations Joint Program."

Broadcasting is a vehicle for knowledge and education. Since its birth, broadcasting has shouldered the glorious mission of transmitting information and educating the public. In the early days of the People' s Republic, educational conditions in all aspects were still imperfect, with family education and campus education being generally concerning and illiteracy being widespread. Therefore, broadcasting became a shortcut for many people to receive education, and even the only way. On September 4, 1956, the Central People' s Broadcasting Station officially launched the educational program "Little Trumpet" specifically for preschool children. "Little Trumpet" provided artistic enlightenment and ideological guidance to children, allowing them to receive educational information subtly. Patriotic feelings entered their ears with every sound, and people' s broadcasting became more lively and lovely because of the "Little Trumpet" program.

Broadcasting is a bridge for cultural transmission. From spiritual values to lifestyles, the influence of broadcasting on Chinese culture cannot be ignored. Countless excellent broadcasting works have been recorded in history. For example, Qi Yue' s broadcast character communication "Jiao Yulu—A Role Model for County Party Secretaries" became a famous work in broadcasting history, and more and more people began to consciously learn Mandarin under the inspiration of sound and devoted their lives to broadcasting as a career. Another example is the literary work "Ordinary World," which attracted little attention when first published, with sales of less than 3,000 copies. However, because it was produced and broadcast on radio media, it ultimately achieved an impressive audience of 300 million listeners.

2. Late 20th Century: The Rise of Network Audio

Network audio refers to software designed by internet service providers, using network mobile terminals as carriers and employing streaming media and internet technology to distribute content to audiences in real time. Network audio is not only an aggregation field for sound content—where program formats such as audiobooks and podcasts produced by professional producers and ordinary people can be presented together—but also a new form of sound media. Its interactive nature reshapes the transmission model between users and sound. In the context of mobile internet, although radio broadcasting still exists, it has "changed its appearance." This is notably reflected in two aspects: first, audiovisual transmission, such as Beijing Youth Radio, which launched on June 26, 2017, and is called the first truly "full-frequency visual broadcasting integrated

media platform" in China; second, platform-based development, such as the "Yunting" App launched on March 5, 2020, which is a national 5G sound network media platform built by China Media Group.

2.1 The Beginning of Network Audio Network audio refers not only to the integration of traditional broadcasting with network media but also to the continuous emergence of network-native audio content, with audio production and aggregation platforms growing stronger. For example, after years of innovation, "Ximalaya FM" has become a peak in world audio. Network broadcasting began in 1995 when the American ABC network used internet technology to send out its first sound, marking the reality of networked broadcasting. The following year, Pearl River Economic Broadcasting Station launched an internet radio station, and Chinese broadcasting embarked on the journey of networking. In April 2004, Beijing Broadcasting Network attempted to set up a camera system in the broadcasting studio to participate in multiple broadcast activities. These various attempts broke through the characteristic of broadcasting as only an auditory medium, with visual symbols bringing people diverse freshness and authenticity. However, what is worth pondering is that while multi-scenario transmission is certainly new for broadcasting, the "visualization" wave often contains hidden concerns about weakening the essence of sound. In 2005, Shanghai Media Group launched interactive voice response mobile broadcasting. The interactive mode respects the subjectivity of listeners, enhances user participation, and mobile terminals as media strengthen users' sense of integration. However, by 2009, subscription services for network broadcasting and other audio programs were still uncommon, whereas today, audio platforms have developed rapidly, with audio technology breaking through the "comfort zone."

2.2 Technology and Content of Network Audio The social attribute meets user needs. As audio platforms such as "Ximalaya FM," "Lychee FM," and "Qingting FM" have gained popularity, their audio social attributes have become increasingly prominent, especially under the UGC+PGC content production model, where many self-media authors have attracted large numbers of online fans. For example, by setting up like and comment buttons, users can choose to like or engage deeply according to their preferences, which further stimulates users' desire to construct and maintain social relationships. Users can also share audio content to their social software through links, images, and text, facilitating rapid fermentation within social circles.

Cross-terminal transmission improves efficiency. Mobile media terminals are diverse, and the companion advantage of network audio is more obvious. In the past, people were accustomed to using "WiFi download, offline listening," but now, with the decline in network costs, online listening has become the norm. Additionally, network audio platforms combine cloud sharing, cloud computing, and algorithmic distribution technologies to accurately locate users' readable data, enabling information interconnectivity across different mobile terminals (tablets, mobile phones, laptops).

"Visualization" extends audio formats. Internet technology compensates for the disadvantage of broadcasting having sound but no image. For example, during the 2016 National Two Sessions, China Voice released four issues of live reports on its cloud platform, with 4 million readers and 3,500 GB of network traffic consumption, five or six times the readership of WeChat newspaper media. This shows that traditional radio stations are also using internet technology to develop new media platforms, create three-dimensional audio-visual communication, and maximize resource output. When China Radio International reported on President Xi Jinping' s overseas visits, it created a micro-live broadcast "Autumn Xi Comes," with 10 million online comments. Whether new media platforms or traditional radio stations, they both quickly transmit the new dynamics of the Communist Party of China to user terminals.

AoIP technology improves broadcasting models. AoIP (Audio over IP) technology is used to transmit audio signals with high fidelity, high speed, high bandwidth, high quality, and low cost. Among them, virtual sound cards can achieve audio cloud recording, ensuring efficient audio transmission. Additionally, the internet has powerful computing and storage capabilities, enabling real-time storage of audio files, which solves the problems of small storage space and slow speed in traditional media. With its powerful storage functions and efficient transmission models, AoIP technology is widely used in traditional radio broadcasting. For example, Central Radio used this technology for upgrade and revision in 2017 to better align with digital technology.

Digital Audio Broadcasting (DAB) gradually evolved into Digital Multimedia Broadcasting (DMB). The difference between the two is that the former uses sound transmission as its main means, while the latter integrates multimedia technology, blending video, sound, and data. Podcast platforms are new products born from internet technology, where users can gain attention by uploading works. For example, during the 2007 National Two Sessions, People' s Daily not only provided representatives with text-based "blog shows" but also voice-based "podcast shows."

In-vehicle network audio has gradually become popular and emerged as the main listening platform. Currently, private cars generally support in-vehicle audio and other technologies, bringing diverse scenario-based services. For example, users' listening scenarios have shifted to driving, reflecting randomness. Some vehicles also support mobile phone screen projection technology for one-click operation of network audio, enriching user experience. Meanwhile, audiobooks have become the new favorite in the network audio market. With the continuous updating of smart devices, audiobook apps have mushroomed, and major network audio platforms have entered the market one after another. Their production model is mostly UGC, accounting for about 70%, but the quality is uneven, which forces platforms to combine UGC with PGC to produce high-quality content for audiences. Digital reading platforms have also joined the audiobook ranks. For example, "QQ Reading" and "WeChat Reading" have developed machine reading functions, transforming reading into listening to meet users' diverse

usage needs.

3. The 21st Century: Smart Audio Highlights Advantages

With the iterative upgrading of media technology, artificial intelligence has gradually begun to master multiple technologies such as speech recognition, big data analysis, and intelligent interaction. Along with the widespread application of mobile devices, artificial intelligence has begun to deeply cultivate in the audio field, with corresponding breakthroughs from product facilities to mobile terminals.

3.1 Intelligent Empowerment of Audio Media Machines empower sound transmission based on deep learning. Artificial intelligence technology does not exist independently; it needs to be combined with other market applications. For example, implanting speech recognition technology into voice assistants has created devices like Siri and Xiaoai. Intelligent Q&A and emotional companionship have become sales growth points. Siri can help users set alarms and voice input. Microsoft' s robot Xiaoice has more than 100 million users, with over 30 billion conversations, and has reached cooperation with multiple integrated media platforms. Some voice assistants cooperate with smart homes, creating entities such as smart mice, smart wearables, and chatbots. The fifth-generation Microsoft Xiaoice can participate in conversations about human real life, possessing full-duplex voice and real-time streaming vision. For example, it can know users' birthdays and send timely blessings, and when it learns that users are busy with work, it will immediately cancel calls, which is another leading achievement in human-computer conversation.

In-vehicle audio systems are becoming increasingly open and scenario-based. In the past, audio listening scenarios were relatively single. The in-vehicle scenario is a listening scenario developed based on internet technology, where the audio-visual space is extended, and numerous audio platforms compete for the in-vehicle market. More advanced systems rely on global positioning systems to analyze users' vehicle location information to push content suitable for the scenario. For example, when driving by the sea, the in-vehicle audio will push relatively fresh and soothing content. In the past, people needed fixed radio frequencies or used mobile terminals to find interesting content. Now, smart in-vehicle audio will push personalized content based on user portraits and analysis of listening habits from big databases. In-vehicle live broadcasting is equipped with voice interaction functions to communicate with car owners in real time, using "visualized" audio as an innovative method to provide vivid live content for car owners. A typical case is NIO Radio in NIO cars, which has opened a 7$\times$24-hour interactive sound community.

5G technology accelerates the multi-field dissemination of smart audio. During the COVID-19 pandemic, 5G technology built a national emergency broadcast, with AI synthetic anchors fully deployed, using 5G+microwave to achieve the fastest voice transmission. The CCTV5 mobile client has achieved Dolby At-

mos immersive audio, and 5G technology can achieve low-latency, high-quality transmission, allowing users to have an immersive experience where both sound effects and picture fullness are like being on the scene.

3.2 Analysis of Smart Technology Advantages Ease of use is the primary criterion. Technological changes bring convenient experiences, and target users across age groups can quickly learn to operate smart applications. Taking Siri as an example, users only need to give commands to wake up the voice assistant and connect to smart portals. Xiaomi' s smart assistant "Xiaoai" can broadcast weather forecasts, traffic information, and memo reminders according to commands. The emergence of smart devices strengthens the practicality of sound as an accompanying medium, simplifies the operation process of traditional devices, and creates an integrated processing system.

Content is the key to victory. Intelligent media technology distributes content to mobile terminals. Whether it is traffic attraction or recommendation, content quality is the key to enhancing user stickiness. Therefore, audio content should avoid being boring and low-quality, and stably output diverse types of works. Artificial intelligence achieves intelligent distribution through accurate prediction, and audio platforms can achieve spiral ascent through content optimization.

Companionship is the fundamental need. The auditory organ "never rests," and some people are accustomed to listening to books on network audio platforms even when sleeping. Therefore, in recent years, functions such as making friends through listening, recognizing songs through listening, voice sleep assistance, and voice script murder have emerged. These seemingly non-visual functions can bring humans the most basic emotional companionship and constant presence. For example, in the voice dating software "Aowu," users can evaluate their own voices and then match with online friends through voice labels provided by the platform.

Distribution is the crucial weapon. Smart devices distribute content through big data, presenting users with multiple content choices in a scenario-based manner. Users can provide feedback and comments on the distribution results to evaluate the effectiveness of AI-distributed content. This is not only a distribution process but also a feedback mechanism and a learning process for smart devices. After countless cycles and training, artificial intelligence infinitely approaches human ideas and comprehensively grasps human emotional cognition to accurately provide content.

3.3 Problems of Intelligent Media Remain Technology is a double-edged sword. On the one hand, it provides users with great convenience, but on the other hand, it makes human existence increasingly technologized. Humans experience pleasure from technology time and again and thus inevitably become more dependent on it. In the era of weak artificial intelligence, the intelligent distribution of audio information cannot achieve refinement, and there are errors

in user information analysis and data calculation. Moreover, artificial intelligence will continuously distribute content based on certain user interest points, causing information narrowing and a certain degree of information cocoons. In fact, the ideal state of intelligent distribution is to have a comprehensive understanding of users' interests, emotions, and habits. This understanding should be dynamic and continuous, not instantaneous or time-limited, because users' interests and habits change and can be compared between different audio contents, with timely adjustments made.

After the emergence of smart audio devices or software, humans enjoy the convenience brought by high technology and experience the advantages of the internet of everything. However, information transparency has also become a major security concern. Some voice assistants continue working even after being turned off. For example, Zhihu was once exposed for automatically recommending relevant topics as long as users spoke near their phones, indicating that smart devices are not umbrellas for privacy protection and may even infringe on users' rights. Therefore, how to effectively prevent privacy infringement urgently needs to be resolved.

In 2021, China Media Group' s China Voice launched a 365-episode special report "Century Moments," using sound to record 365 wonderful moments in the history of the Communist Party of China. This makes people increasingly emotional: in the century since the founding of the Party, China' s audio media has experienced seasons of change with remarkable achievements. Reviewing the technological innovation of audio media is tracing the historical imprint of sound transmission, from radio to internet to artificial intelligence, from the founding ceremony speech to the voice of the Media Group. Audio media has contributed to the expression of the will of the Communist Party of China with its unique characteristics and deserves to be deeply remembered.

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