



Reshaping the "New Infrastructure" for Public Cultural Communication: Analysis of the Development and Optimisation Path of Digital Bulletin Boards.

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SUMMARY: *In the age of deep media integration, both the form and function of digital bulletin boards have changed significantly. Based on the SWOT-PEST model framework, this paper will introduce the micro and macro environments of operation for digital bulletin boards, explain the reasons for the changes in their forms and functions, and analyze the strengths and weaknesses resulting from political, economic, social and technological factors. It lists the chances and problems that need to be addressed, and puts forward some ideas for developing a "new infrastructure" for public cultural communication.*

KEYWORDS: *Integrated media, digital bulletin board, SWOT-PEST, cultural communication*

1 Introduction

In January 2019, Chinese President Xi Jinping pointed out at the 12th collective study session of the CPC Central Committee's Political Bureau that digital bulletin boards are a new type of media communication. He asked for more efforts to sum up experiences and explore new ideas, institutions and ways. In other words, he pointed out that these systems need to be extended to the grassroots level, expanded in office buildings, and brought closer to the people so that more high-quality cultural and information services can be provided to the public. Given the deep media environment now, it is necessary to further develop the field of digital bulletin boards and carry out deep research on their cultural communication functions, operational difficulties and innovative paths. Actively plan and reshape "new infrastructure" and new scenarios for the public cultural sector to optimise the ecosystem of public cultural services, expand the chain of the cultural industry, and promote the construction of an all-media communication system. Research has recently explored the issues of digital public services and digital public infrastructure; generally, accessibility, interoperability, stable governance and user experience have been considered core indicators of public value [1-7].

2 A Review of Digital Bulletin Boards

Digital bulletin boards are outdoor information display terminals that use digital and communication technologies, and have integrated screens and lightboxes for content presentation. In line with the national omni-media strategy, they are now important platforms for spreading the Party's ideas, promoting advanced culture, and extending the Party's public communication capacity. They are also to promote the integrated development of urban and rural public cultural services and to build new types of cultural spaces. Both the industry and

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academia have shown keen interest in the construction and operation of digital bulletin boards for more than a decade.

In 2008, under the leadership of the China Newspaper Association, the first National Conference of China Newspaper Bulletin Board Outdoor Media Collaboration Network was held in Zhengzhou to build a cooperative platform. In 2010, the China Newspaper Association took the lead in conducting a survey on the development of newspaper bulletin boards of more than 70 provincial and municipal Party newspapers across the country, and proposed to relevant central departments that Party newspaper bulletin boards be included in urban planning and that a specialized national industry organization be established. In 2018, the scholar Zhou Qiang published a paper that showed that the overall construction rate of public cultural facilities, such as newspaper bulletin boards, cultural activity rooms and reading rooms, in rural China was about 40 per cent. However, there was a regional disparity: the east and south were developed more rapidly than the west and north. Wu Wenxia of Jiaozuo Daily introduced the approach of a newspaper in 2022, that is to say, identify users first and then build bulletin boards to avoid operational risks. In addition, media organizations such as Shenzhen Press Group, Panzhihua Daily, Xiaoshan Daily and Yantai Daily, along with multimedia production enterprises like Henan Tongda, have also explored how to communicate and run digital bulletin boards.

In recent years, the development of digital bulletin boards has been relatively fast, and many advanced functions and enhancements for urban and rural areas, as well as the breadth of services provided, have emerged. Research by scholars and practitioners at home and abroad has shown some constructions and operating modes for these technologies, but a lack of systematic research is still a major problem. With the help of mobile Internet technology, electronic information technology and digital publishing technology, digital bulletin boards have used cloud-based big data and AI initiatives to develop into effective "cross-screen interaction" terminals that integrate television media, print media, and Internet media. Research the current situation and future development plans of new media release terminals, including their communication and operation features, in support of the "Digital China" initiative and promote all-weather cultural prosperity in urban and rural areas.

Recent English-language studies have indicated that, at present, the value of public digital cultural services is not only determined by the presence of a digital interface but also by users' continuous engagement, place-based accessibility, and the capacity of public institutions to translate digital provision into perceptible public value [8-11]. For rural and township areas, the reasons for adoption include users' information worlds, satisfaction with public cultural services, demonstration-zone effects, and the spatial distribution of public cultural facilities [12-16]. Based on the above evidence, the current study will no longer treat digital bulletin boards as standalone display devices but will study them as local public-cultural terminals that combine media content with government services and other urban information. Research on public service media has also shown that platformisation has changed the purpose, content strategies and relationships with audiences for public-service media organisations [17-20]. The above results are relevant because digital bulletin boards inherit the authority of Party newspapers but have also joined the platform ecosystem of clients, social media accounts, short-video interfaces and service portals. Research on digital signage and public displays also indicates that interactive screens perform better when the content is tailored to the environment, people's needs and mobile phone-assisted interaction [21-25]. Therefore, the following revision adds visualised analytical results to clarify the function logic, risk structure and optimisation path of digital bulletin boards. The figures do not substitute for the qualitative discussion in the SWOT-PEST analysis; rather, they provide empirical indicators

of this conclusion: connectivity, inclusiveness, maintainability, content governance and service conversion.

3 New Functions of Digital Bulletin Boards in the Context of Integrated Media

With the development of omni-media in recent years, digital bulletin boards have also changed in form and function significantly during this period.

3.1 From a Single Model to a Linked Platform of Newspapers, Websites, and Screens, Strengthening Platform Guidance

As a new terminal for integrated communication, digital bulletin boards can be equipped with high-definition outdoor LED screens and connected to various client platforms such as Weibo, Weixin, Toutiao, live-streaming platforms, etc., for functional aggregation. For example, the People's Daily digital bulletin board can show the day's pages and also display content from top-tier publications such as Qiushi Journal and other media under the umbrella of the newspaper, as well as access information on the Xuexi Qiangguo platform operated by the Publicity Department of the CPC Central Committee. In addition, at important times or during special activities, the board will provide multiple channels and many voices for real-time live streaming and rolling updates, such as live broadcasts of the "Two Sessions" (the National People's Congress and the Chinese People's Political Consultative Conference) or sporting events, to expand the audience reach. Integration and interaction among various media on the bulletin board platform have expanded the channels for communication and addressed the diverse needs of different groups of people. At the same time, the bulletin board platform will be employed to spread the news and organize information among the public. In the event of a local emergency or other changes that affect public opinion, promptly release the correct and necessary information through the platform to inform the public promptly and enable them to take timely countermeasure measures.

3.2 From Communication to Service, Technology Empowering Improved Service

As media has taken on more roles in social governance and services, so have people's demands. They no longer wish to spread, publish and discuss all kinds of information widely through the media. Instead, they hope that the media can offer detailed explanations of the Party's policies and decision-making processes at all levels of the government, as well as personalised services based on user needs. Digital bulletin boards have met the above requirements and are now serving as the "last-mile" delivery system for primary-level communities. First, based on the "news + government + service" model, develop custom-designed services for government departments via digital bulletin boards. For example, they help ministries and government departments spread good images of their work, explain policy changes or decisions, present key results achieved by the government, and publish industry development statistics to inform the public promptly. Second, use AI and big data to build a recommendation algorithm that offers personalised services for users in various areas via the bulletin board. For example, in a crowded commercial area, users can obtain detailed information on the surrounding map, dining options, shopping facilities, transport links, entertainment venues, and other places, thereby expanding the chain of "news + government + service + business". Third, record the reading and inquiry behaviour of users in detail, and

then use analysis tools in the bulletin board's back end to study these behaviours. Therefore, we can tailor the release of information and the function positions of different bulletin boards in various parts of the country to meet local needs more precisely and improve service quality.

3.3 From an Information Corridor to a “Public Forum”: Enhancing Social Consultation through Debate

Digital bulletin boards are frequently placed in the village's open area and at the office of the village committee in rural China. These places are also becoming new cultural and social centers for the people. The news and other information shown on these boards are often the talk of the town. Jürgen Habermas's theory of the public sphere believes that public space is not only a physical place but also a site for free expression of public opinion and deliberation on values. Digital bulletin boards, however, are not the public sphere that Habermas described for the public. Thus, they have developed into "public forums" for conversation rather than simple information conduits. Although most of the topics debated by the public will never appear in the media, they can still be discussed in detail in local areas to form public opinion about important and complicated problems, or even sensitive ones. This can help people learn about real-life issues better and gain some knowledge about the media. Moreover, although these discussions may not directly result in changes at the government level, they also act as an indirect regulatory force to promote a healthy, cooperative relationship between the government and the public in governance. It provides some direction for bulletin board operators as well: they need to be aware of the public's problems and interests, put forward suitable topics, and provide relevant information.

3.4 From One-time Communication to Multiple Communications: Enhancing the Media Brand’s Reputation and Value

Digital bulletin boards have enabled print media, such as the Party's newspapers, to build a new publicity network and, by changing the traditional model of single-format newspaper reading, have offered the public many choices for outdoor reading. Throughout the city, many bulletin boards in the free outdoor reading spaces have always served as visual "reminders" for a large number of people and thus extended the reach of print media, especially Party newspapers. Therefore, more people have come to know about the brand through reading. Party newspapers are very popular and influential; therefore, advertisers want to place their advertisements in the digital bulletin boards of the newspapers to gain economic benefits. Party newspapers are authoritative, reliable and have serious brand identities; thus, when they are read, readers often also present and reflect their own selves.

3.5 From Urban Decoration to Urban Furniture: Digital Bulletin Boards Enhance the City’s Aesthetic and Significance as a “Cultural Symbol”

Urban furniture is a type of infrastructure in cities that helps to create good public areas for the people. Recently, urban governments have been working to build "micro-environments" and enhance cultural landscapes in the cities. Digital bulletin boards are a type of "cultural symbol" for urban furniture and have thus garnered the attention of the public. Especially with the personalisation of the new digital bulletin board, many different design styles have been added in addition to local features and ethnic elements, and the light effects at night are both beautiful and vivid. It will offer the public some good spiritual and visual stimulation and also create a new scene for public spaces to be viewed by the people. Thus, digital bulletin boards can boost the beauty and quality of life for the people in a city, contributing to the construction of a national model city and fostering a clean city.

3.6 Visualized Result of Functional Evolution

To make the functional division clearer, Figure 1 is presented below. As shown in Figure 1, the traditional bulletin board model and the current integrated terminal model are compared, and the four operating layers that determine whether the board can transition from an outdoor display to a public cultural facility are specified.

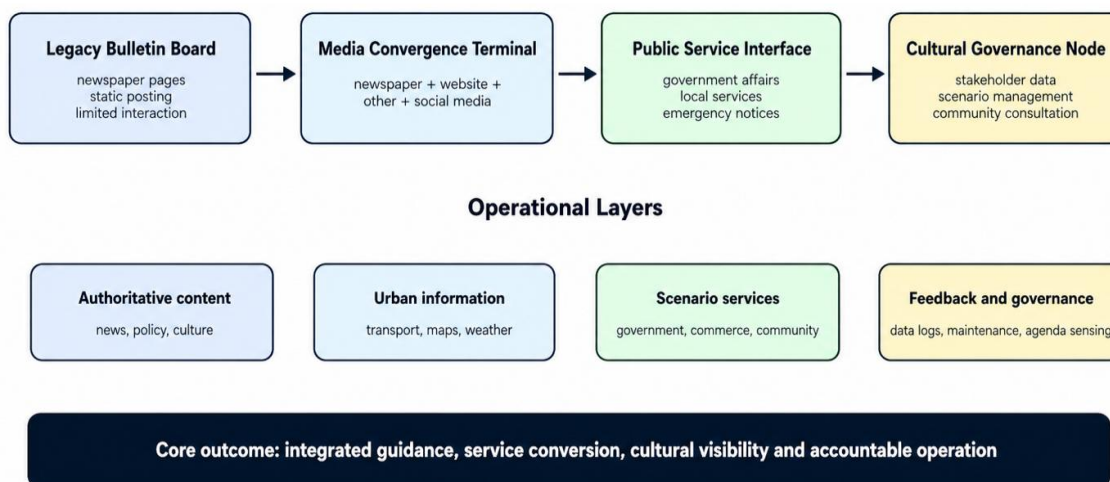


Figure 1: Functional Evolution and Integrated Service Logic of Digital Bulletin Boards.

Figure 1 shows that it is not merely a technological replacement of paper with a screen. A traditional board focuses on one-way publication; a digital board organises official information, urban services and situations, and data feedback into a single public window. Therefore, the function will be shifted from 'display' to 'coordination', and thus the terminal will not be judged based solely on the size of the screen, advertising reach or installation volume. A high-value terminal should be able to connect reliably with public-facing political communication, convenience and emergency information dissemination, cultural vitality projects, and responsible governance. The feedback layer is necessary to collect users' questions, how long they stay on the site, which services they use, maintenance records, etc., to adjust the release time, service type and position of boards. Therefore, the digital bulletin board serves as a small-scale public platform for cultural governance and is not a decorative medium.

4 Analysis of the Strengths and Weaknesses in the Development of Digital Bulletin Boards

We can use the SWOT model in conjunction with PEST analysis to incorporate PEST factors into the SWOT framework and build a SWOT-PEST model. The purpose of this paper is to conduct an all-encompassing study of the internal and external environment of digital bulletin boards as a new kind of public cultural facility. Analyze the strengths and weaknesses of the four factors of politics, economy, society and technology to identify their opportunities and risks in the future, and then explore different development models for the upcoming period. The SWOT-PEST model matrix for the digital bulletin board is as follows:

Table 1: Digital Bulletin Board SWOT-PEST Model Matrix

Factors	Politics (P)	Economy (E)	Society (S)	Technology (T)
Strengths (S)	SP	SE	SS	ST
Weaknesses (W)	WP	WE	WS	WT
Opportunities (O)	OP	OE	OS	OT
Threats (T)	TP	TE	TS	TT

4.1 Strengths

4.1.1 Cultural and Political Support and Administrative Regulation Promotion

The Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and the Long-Range Objectives through the Year 2035 of the People's Republic of China propose to optimise the allocation of urban and rural cultural resources and promote the integrated development of urban and rural public cultural services. Further promote reading across the country to create a nation of avid readers in China. The Public Cultural Service Guarantee Law of the People's Republic of China explicitly enumerates public bulletin boards as one type of public cultural facility and stipulates policies, guarantees and other legal liabilities for their construction and operation. This top-level design offers support for the development of media and construction operators from all levels of government and establishes policies and standards for promoting and building digital bulletin boards.

4.1.2 Continuous Increase in Cultural Funding

Fiscal investments in public cultural services by the government have risen year by year. For example, the total amount of central government subsidies for the construction of local public cultural service systems in 2023 reached 14.963 billion yuan, up from 14.509 billion yuan in 2022 and 12.687 billion yuan in 2021. At the same time, according to the National Basic Public Service Standards (2021 Edition), public bulletin boards (screens) should be established in busy areas of cities, public venues and residential areas to present information on current events, farming, science and culture, life, etc. The Standards also provide for the responsibility of both the central and local governments for funding.

4.1.3 Society-wide Support for Public Cultural Services

At the national level, the government will continue to increase fiscal support for public cultural services and encourage private capital to participate in the same way legally. Government purchase of services will be organised to attract all kinds of market participants to undertake the transfer of some public service functions, thereby promoting socialised and market-oriented investment, management and operation of these services. As one of the main links in the modernisation of China's system and capacity for governance, media have gradually permeated all areas of public cultural services and taken on various roles in environmental monitoring, social organisation, cultural dissemination and entertainment. At the individual level, the public's demand for a better life has led to a greater need for rich and personalised spiritual sustenance provided by the government and media.

4.1.4 Technology Empowering Public Cultural Services

With the help of cloud-based big data and artificial intelligence, and the development of cloud services, electronic information technology and 5G communication, public cultural institutions such as reading rooms, cultural activity centres and digital bulletin boards have improved service efficiency and reduced the space-time constraints of cultural access.

Multimediu digital bulletin boards can be used to publish newspapers in a digital form and, at the same time, serve as live video display areas. They are integrated media service platforms that can connect to third-party systems, such as the police, fire department and TV station. The above platforms have a large number of modules for map navigation, government openness, and public information, and are also interactive for users.

4.2 Weaknesses

4.2.1 Incomplete Supporting Policies and Implementation Standards for Public Cultural Services

In addition to the top-level Design and general demands for the development of public cultural institutions, some special supporting policies need to be introduced for actual implementation. Otherwise, there will be no progress in the field. For example, due to a lack of explicit policy support, multiple departments have had to cooperate to construct a digital bulletin board; there is no effective procedural system for this, and as a result, the approval process has been delayed. In addition, the newly released National Basic Public Service Standards (2021 Edition) urgently need to be converted into detailed implementation measures at the levels of provinces, municipalities and especially county governments so that the policies for the people are implemented effectively.

4.2.2 Insufficient Social Investment

Given that public cultural facilities are for the public and provide services, the government will be the main funder, and other social investment sources will supplement the funds. However, due to their advertising functions, the local governments are generally not market-oriented for digital bulletin boards and do not encourage the operating of a "self-sustaining" model by market participants. Most of the current digital bulletin boards are run by the Party's newspapers. Some of these newspaper organisations have little experience in managing outdoor media and, in the beginning, set up only 20-30 boards as a trial. Due to insufficient investment, these boards have not reached a scale where they can achieve economies of scale and thus fail to generate substantial advertising income.

4.2.3 Inadequate Management and Maintenance of Public Cultural Facilities, Damaging the City's Image

Many of the public cultural institutions are outdoors, and poor operation and maintenance may be done. As outdoor digital bulletin boards, they are exposed to the elements and are at risk of damage due to vandalism; therefore, continuous daily inspection and care by a dedicated team are required. Some cities have insufficient funds and staff, so management and maintenance are relatively poor. Therefore, there are problems such as dirty and disordered environments, delayed newspaper updates, or even the display of unsuitable advertisements; thus, the image of the digital bulletin board is damaged, and complaints may be raised by the public.

4.3 Opportunities

4.3.1 Strategic Opportunity of Media Convergence Development

Since the 18th National Congress of the Communist Party of China, the central government has given high priority to media convergence and focused on top-level design and the construction of new communication platforms to build new mainstream media. As a result of

this deep integration of media, the digital bulletin board has appeared as an important new form of media. This is an urgent problem that the central government has asked all media departments at all levels to address in the present day.

4.3.2 Platform Leadership and Active Promotion

Since the first National Conference of China Newspaper Bulletin Board Outdoor Media Collaboration Network in October 2008, several more sessions have been organised in the following years, and these have promoted the rapid development of digital bulletin boards. Through detailed discussion, information sharing, and other ways, the good results achieved in the construction of digital bulletin boards by members of the China Newspaper Association have been spread to other places in the country. Therefore, the development of outdoor digital bulletin boards in China's newspaper industry has been promoted.

4.3.3 Specialized Funding to Support Self-sufficiency

Daily operating expenses of a digital bulletin board generally include costs such as new paper, electricity, etc. Advertising income cannot meet all the expenses of some media companies by itself. To better organise and promote the work of these newspaper boards, newspapers such as the Henan Daily, Shiyuan Daily of Hubei, and Lianyungang Daily of Jiangsu have applied for and been approved by the government for special cultural industry funds. Therefore, the long-term development of the digital bulletin board will be more stable.

4.4 Threats

4.4.1 Ineffective Legal Environment and Damage to Public Service Facilities

Digital bulletin boards built by the Laiwu Daily of Shandong have been severely damaged by vandalism; 21 of them had their high-strength compound glass screens shattered within a year and accounted for 27.6% of the total. The reasons for this damage are numerous: some are caused by the deliberate destruction of the boards by individuals lacking a sense of social responsibility, and others are due to conflicts of interest, industry competition, insufficient technical equipment and poor supervision.

4.4.2 Obstacles Affecting the Construction and Development of Public Service Facilities

The Construction and Development of Public Service Facilities involve many departments, so coordination is difficult. The construction and operation of digital bulletin boards also involve many other tasks, such as site selection, design and installation, lighting setup, newspaper and advertisement updates, sanitation, inspection, etc. Coordinate the above departments and agencies in the urban planning, city management, housing and urban-rural development, traffic police, municipal services, landscaping, publicity and education departments, etc. If any of the above departments are delayed, then the entire project will be delayed. For example, whether the local government office will promote the use of a digital bulletin board and what its purpose is, or even changes in the media operators, can affect whether the project is approved and whether its original intent can be realized. Similarly, for issues such as the final electricity supply point and whether it will be a street light, a traffic light or another source, many parties need to be engaged in discussions and agreement negotiations, including the street light office, the traffic department, local businesses, etc., to ensure stable operation and continuous power supply.

4.4.3 Lack of Industry Standards Increasing Risks for Equipment Purchasers

Many manufacturers have built digital bulletin boards in China, but there is no standard for their production or construction. There are no standard rules, and some manufacturers have used poor materials and processes. Many buyers, many of whom are new to this field, have fallen for misleading advertising and cannot tell the difference between a genuine high-quality manufacturer and a low-quality one. Therefore, the actual equipment purchased may not meet the manufacturer's specifications; as a result, there will be an increase in failure rates during operation and a reduction in the return on investment. Construction standards are also absent, so the foundations, installation depths and construction methods for the different models of bulletin boards are inconsistent. The two are not in line and thus will pose a risk of reduced safety and lifespan for the board under strong winds or earthquakes.

4.5 Visualized SWOT-PEST Analytical Results

The SWOT-PEST matrix shows the political, economic, social and technological factors listed above, but it is also in a categorical form. Figure 2 thus transforms the qualitative judgment into a score-based visual representation. The scores are interpretations of the above textual analysis and not independent survey data. A positive value is supportive or favourable; a negative value indicates a restriction or risk. The above method can present the comparison results clearly and identify both the promoting factors and constraints.



Figure 2: Qualitative SWOT-PEST Analytical Results Matrix for Digital Bulletin Boards.

Figure 2 shows the two primary modes. First, the primary reasons for the positive response are political and technical. This corresponds to policy attention on public cultural services, media convergence and digital government, as well as to the maturity of cloud services, mobile communication, interactive screens and data management. Second, the main deficiencies are the economic and technical problems. Construction, power supply, cleaning, content updates, network security and after-sales service are all continuous expenses that cannot be solved by a one-time installation. Therefore, to ensure the stable operation of a digital bulletin board and guarantee public-cultural value, policy support, equipment procurement and daily operation should not be separated. The development of these will be jointly driven by an administrative authorisation that aligns with reasonable technical

standards, and supported by a stable revenue-collection and maintenance system for public services. According to the threat scores, vandalism and a fragmented approval process are also relatively serious problems without industry standards. They directly determine whether a board is still a trusted public service terminal or has fallen into disuse and is now an underused outdoor advertising carrier.

5 Development Strategies for Digital Bulletin Boards

Based on the SWOT-PEST analysis above, digital bulletin boards in the era of integrated media need to make full use of the existing opportunities, enhance their strengths, address deficiencies, and actively attract resources to create a favourable environment. Only in this case will they be able to choose a path of development that suits them better.

Figure 3 links the strategic suggestions to the implementation by presenting an optimisation route after the previous analysis. The six adjustable tasks of the path are: standards and approval; content governance; service integration; operation and funding; data feedback; and public participation. These tasks can be audited by the following specific indicators: approval duration, frequency of content updates, equipment fault rate, power supply stability, service-click data, complaint response time and maintenance completion rate.

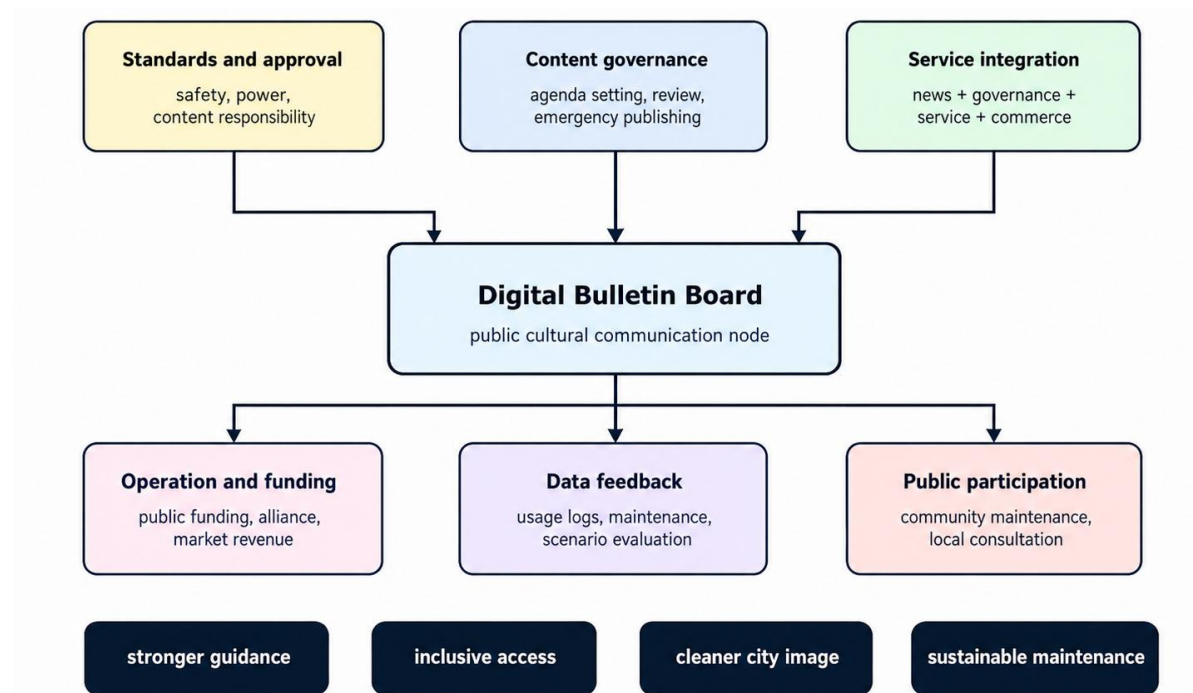


Figure 3: Optimisation Path for Digital Bulletin Boards as Public Cultural Communication Infrastructure.

As shown in Figure 3, the top-level design should not be a general policy declaration. It should be converted into specific indicators for site selection, screen brightness, wind resistance, power connection, interface readability, content review, data security and emergency release. At the operational level, editorial responsibility should be separated from commercial operations; that is to say, the media organisation or authorised public body will be solely responsible for political, cultural and emergency information, and specialised companies may conduct equipment maintenance, advertising sales or scenario-based service

integration under contract. Reduce maintenance expenses and increase acceptance by involving the community. Local residents, property managers and community workers can report problems, supervise the cleaning in their areas, etc. Thus, the board will be a public space for information dissemination rather than a one-way medium.

A smaller, local project needs to build a minimal-operation dataset first before scaling up. The data may include the location of the installation, surrounding population structure, daily exposure period, number of content updates, number of government-service items, emergency release records, advertising occupancy rate, repair time, electricity consumption and complaint handling results. The above indicators are suitable for verification. They will not be regarded as good if only the number of newly installed boards is considered. A district with a small number of well-maintained terminals, timely content, clear public-service functions and stable community use will likely have a higher cultural communication value than a district with many unattended screens. Therefore, the evaluation unit will change from construction quantity to effective service capacity.

The contents of the board should be released at different times. Authoritative news, policy interpretations and emergency information need to be timely and accurate in terms of editing; cultural activities, reading promotion and civic education require visual clarity and regular updates; business and convenience information need to be location-relevant. These categories are not ordered; otherwise, the public will be wary. A practical approach is to set aside a fixed amount of screen time or a fixed display area for public-interest information, and limit the proportion, duration and content review rules for commercial information. Thus, market-oriented operations can provide financial support without damaging the public-cultural identity of the facility.

5.1 Strengthen Top-level Design and Implement Supporting Policies and Industry Standards

In terms of promoting the Party's policies, extending and expanding the influence of Party newspapers, and building new cultural service spaces, detailed regulations for the construction and management of public service facilities need to be issued. Add digital bulletin boards to the local government's livelihood projects and urban-rural development plans, and allocate specific funds for them. Set up some areas to be used as Party newspaper bulletin boards. The top-level design needs to address fiscal support for these projects and solve problems in the approval and installation of these boards. Strengthen the establishment of a unified industry standard for bulletin boards at present. Set a clear production standard for the digital bulletin board to guide the manufacture of such products by controlling manufacturers and ensuring their high quality; only those that meet the national requirements for quality and the environment and offer reliable after-sales service will be permitted in the market.

5.2 Leverage the Coordinating, Communicating, and Guiding Role of Industry Organizations

Industry organisations will help spread information widely, protect and promote the interests of their members, and address problems in the industry. In the construction of digital bulletin boards, the China Newspaper Bulletin Board Outdoor Media Collaboration Network has actively participated in cooperation to build a platform for mutual learning and development and promote the coordinated development of the digital bulletin board market across the country. Continue to make full use of the strengths of the collaboration network to expand the scale, strengthen the team, and improve the public image. Websites, applications and social

networks such as Weixin will also be used to issue broad-scale directives and organise cooperation for whole-industry problems. Research and analysis should be conducted at the same time, and the Collaboration Network should proactively represent its members to put forward suggestions for government departments and help promote the healthy, standardised and orderly development of the industry.

5.3 Innovating Management and Operational Systems

The construction, maintenance and operation of digital bulletin boards are all relatively expensive in terms of funds; thus, there is often a funding gap in the industry, and local and specific circumstances need to be considered in finding new solutions. Newspapers are a typical example of how construction, maintenance and operation of bulletin boards in China usually proceed:

The newspaper will have the bulletin boards constructed by another entity and grant them the right of use, though the original newspaper will retain the right to publish.

The newspaper will set up a subsidiary company for the market-oriented operation of the bulletin board.

The newspaper works with schools, hospitals, local publicity departments and large-scale social media platforms to establish a joint investment and publishing-rights-sharing model for distributing revenue, and cooperates to build and manage resources together.

In terms of content operation, integrated government affairs, business and services can be offered to provide customised services, such as showcasing the brand image and work of government departments. In addition, a joint venture will be formed to overcome the limitations on time and space, conduct real-time, whole-province and whole-country dissemination of content in unison, increase the network effect, expand coverage and enhance public awareness.

5.4 Creating a Favorable Development Environment

As part of public cultural governance and service projects, the construction, operation and management of digital bulletin boards are restricted by policies, funds, public awareness, governance modes and the overall social environment. Public satisfaction, the frequency of use by the public and promptness of service delivery are all related to the achievements of these boards. Bulletin boards in some areas have been damaged by malicious competitors due to a conflict of interest. Therefore, under the favourable conditions of favourable national and local policies, a good environment can be created.

A good legal system needs to be built at the grassroots level and a service-oriented, people-centred culture is required. For example, some operators have taken the initiative to work with the local community department to organise for the unemployed to manage the bulletin board, addressing problems such as timely newspaper replacement and board cleaning and maintenance. It can help solve local employment problems and foster community participation in the management of the boards to create a new multi-party governance model for the bulletin boards. Construction of a good development environment in the area can serve as an experiment to test the extent to which social governance, service capacity, and moral awareness of local governments and media organisations are functioning.

5.5 Conclusion

Given the in-depth integration of media, digital bulletin boards should be regarded as hybrid public-cultural facilities rather than enhanced newspaper display windows. The three first are leading-edge communication, urban services and cultural visibility, and local government

feedback. The analysis in this paper shows that the strong supporting factors are political legitimacy, public-cultural policy support and technological maturity; at the same time, the most serious deficiencies are fragmented approval, insufficient maintenance funds, unclear industry standards and poor cooperation among media organisations, government departments, equipment suppliers and communities. In addition, the following visual results also show that the functional improvements of the digital bulletin board can be considered connection, inclusion, ease of maintenance, content governance and service transformation. The above are the foundations for future empirical research.

Therefore, the optimisation of the digital bulletin board should move from a construction-oriented mindset to an operation-oriented governance mode. The local government should include these in the plan for public cultural services and urban public facility management; media organisations need to strengthen editorial responsibility and platform cooperation; operators should build a stable funding, maintenance and data-feedback mechanism; and communities should be involved in supervision and daily use. Under such circumstances, the digital bulletin board can also be used to spread news from the Party newspaper and provide the public with cultural materials, policy updates, discussion opportunities and practical services. This is the application of 'new infrastructure' in public cultural communication.

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References

- [1] Luna, D. E., Picazo-Vela, S., Buyannemekh, B., & Luna-Reyes, L. F. (2024). Creating public value through digital service delivery from a citizen's perspective. *Government Information Quarterly*, 41(2), 101928. <https://doi.org/10.1016/j.giq.2024.101928>
- [2] Zhang, Y., & Li, Y. (2025). The impact of artificial intelligence on government digital service capacity. *International Review of Economics & Finance*, 102, 104374. <https://doi.org/10.1016/j.iref.2025.104374>
- [3] Szedmak, B., Varga, L., & Szabo, R. Z. (2025). Digital transformation of public services: The case of the document management application. *International Journal of Public Administration*, 1-18. <https://doi.org/10.1080/01900692.2025.2520522>
- [4] OECD. (2024). Digital public infrastructure for digital governments. *OECD Public Governance Policy Papers*, No. 68. OECD Publishing. <https://doi.org/10.1787/ff525dc8-en>

- [5] United Nations Department of Economic and Social Affairs. (2024). E-Government Survey 2024: Accelerating Digital Transformation for Sustainable Development. United Nations.
- [6] International Telecommunication Union. (2025). Building digital public infrastructure for cities and communities. ITU.
- [7] OECD. (2024). Enabling digital innovation in government. OECD Publishing. <https://doi.org/10.1787/a51eb9b2-en>
- [8] Liu, J., Sun, H. L., Kuang, L., & Zheng, J. (2025). A longitudinal study of user continuance intention to use public digital cultural services. *Library & Information Science Research*, 47(1), 101343. <https://doi.org/10.1016/j.lisr.2025.101343>
- [9] Zhang, Y., & Gao, J. (2025). Research on smart city construction in the context of public culture. *Telematics and Informatics Reports*, 17, 100187. <https://doi.org/10.1016/j.teler.2025.100187>
- [10] Moghayedi, A. (2025). Inclusive digitalized urban public facilities for sustainable cities: A comparative user-centered evaluation of benefits and challenges. *Sustainable Cities and Society*, 131, 106766. <https://doi.org/10.1016/j.scs.2025.106766>
- [11] Weber-Linhart, N. (2025). Social inclusion in the smart city: The role of digital applications in culture and the arts. *Innovation: The European Journal of Social Science Research*, 1-24. <https://doi.org/10.1080/13511610.2025.2591034>
- [12] Qian, J., Wang, M., Zhou, L., & Zeng, C. (2024). User adoption behavior of rural public digital culture services from a personal information world perspective: A mixed research in China. *Library & Information Science Research*, 46(1), 101282. <https://doi.org/10.1016/j.lisr.2024.101282>
- [13] Sheng, X., Zhou, Y., & Liu, Y. (2024). Can the National Public Cultural Service System Demonstration Zone promote the sustainable development of urban culture? *Sustainability*, 16(21), 9323. <https://doi.org/10.3390/su16219323>
- [14] Sun, C., Tan, G., Chai, X., & Zhang, H. (2023). Analysis on the satisfaction of public cultural service by township residents: A qualitative perspective. *Sustainability*, 15(9), 7302. <https://doi.org/10.3390/su15097302>
- [15] Ge, Y., Lu, C., & Gao, H. (2023). Constructing an indicator system for cultural sustainability in Chinese cities under the objective of urban renewal and capability measurement. *Sustainability*, 15(18), 13571. <https://doi.org/10.3390/su151813571>
- [16] Li, X., & Hou, J. (2025). Spatial differentiation characteristics and influencing factors of public cultural facilities in Xinjiang. *Sustainability*, 17(11), 4994. <https://doi.org/10.3390/su17114994>
- [17] Iordache, C., & Raats, T. (2023). The platformization of public service media: A comparative analysis of five BVOD services in Western and Northern Europe. *International Journal of Media & Cultural Politics*, 19(1), 3-22. <https://doi.org/>

10.1386/macp_00070_1

- [18] Dragomir, M., Rodriguez-Castro, M., & Aslama Horowitz, M. (2024). Public service media and platformization: What role does EU regulation play? *Journalism and Media*, 5(3), 1378-1394. <https://doi.org/10.3390/journalmedia5030087>
- [19] Larrondo-Ureta, A., & Alonso-Jurnet, A. (2024). Innovating public service media practice and mission: Transmedia campaigns for activist journalism and brand engagement. *Journalism Practice*, 1-20. <https://doi.org/10.1080/17512786.2024.2433249>
- [20] Lucas Zaragoza, M., Moreno Cano, A. M., & Angulo, L. (2025). Audiovisual content and transmedia narratives in European public service media. *Global Knowledge, Memory and Communication*. <https://doi.org/10.1108/GKMC-06-2024-0323>
- [21] Taskaeva, N., Shah, S. K., Verma, V., Jena, P. C., Arya, V., & Surekha, P. (2024). Public displays in smart cities: A user interaction and content impact analysis with the Public Display Interaction Test. *BIO Web of Conferences*, 86, 01103. <https://doi.org/10.1051/bioconf/20248601103>
- [22] Quan, L., Hong, I., Lee, T., & Yoo, C. (2024). Estimating the social value of digital signage landmarks as sustainable tourist attractions. *Sustainability*, 16(4), 1695. <https://doi.org/10.3390/su16041695>
- [23] Medina-Molina, C., Perez-Macias, N., & Rey-Tienda, S. (2025). Interested in interacting with digital signage? Analysing the relevance of smartphone psychological ownership through an integrated qualitative comparative analysis. *ESIC Market*, 56(3), e421. <https://doi.org/10.7200/esicm.56.421>
- [24] Schlegel, T., & Titov, W. (2025). A sustainable development process for visually interactive companions in ubiquitous passenger information systems. *Sustainability*, 17(17), 7699. <https://doi.org/10.3390/su17177699>
- [25] Weng, Q., Hou, Q., Chen, Z., Benediktsson, J. A., Gamba, P., Tuia, D., Zhang, F., Xu, Y., Wu, M., Li, N., & Batty, M. (2025). Urban visual-spatial intelligence: Linking human and sensor perception for sustainable urban development. *npj Urban Sustainability*, 5(1), 65. <https://doi.org/10.1038/s42949-025-00256-2>