

Research on the Problems and Countermeasures in the Construction of Smart Cities in Chengdu, a Representative City of the West

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Abstract. Since its proposal in 2008, the concept of smart cities has attracted widespread international attention and has continued to trigger a global trend in the development of smart cities. Smart cities have become a strategic choice for promoting global urbanization, improving urban governance, solving big city problems, improving public service quality, and developing the digital economy. However, as smart cities gradually become the main form of new urbanization construction, they also face many opportunities and challenges. The construction of smart cities in Chengdu started early and has achieved initial results. It is at the forefront of western cities and has played a demonstrative role, which is of great significance for enriching research on smart cities in China. However, overall, the construction of smart cities is still in its early stages. This article takes Chengdu as an example to study the current situation and existing problems of smart city construction in the city, and puts forward management suggestions. Deeply explore and discover many issues related to smart cities. By learning from the experiences of domestic and foreign cities such as Beijing, Guangzhou, and Singapore in the construction of smart cities, to obtain reference and inspiration. Finally, based on the analysis results, including rational design of measures, optimization of policy mechanisms, improvement of management level, and support of human resources, improvement suggestions and countermeasures are proposed for the smart city construction policy in Chengdu.

Keywords: Smart City, Chengdu City, Urban Governance.

1. Introduction

Smart cities are a new form of urban informatization development towards a higher level, and also a new direction for urban construction in the era of network information. Since the beginning of this century, the urbanization process in various countries around the world has been continuously accelerating, which has further put forward specific requirements for the management concepts, public service levels, and other capabilities of governments in various countries. In the 2022 government work report, it was explicitly proposed to actively layout the development of the digital information industry nationwide, build an integrated big data center system nationwide, promote industrial digital transformation based on the development of 5G technology, and strive to build important development goals such as smart cities and digital villages.

Smart cities represent new concepts and directions for urban development, and are also one of the core goals of China's urbanization. Various regions have accelerated the promotion and planning of smart cities, and the number of pilot projects for smart cities has steadily increased in recent years. According to the principle of "tailored to local conditions, one city, one policy", each city is carrying out smart city construction, highlighting its own focus and characteristics. In terms of smart city construction, some developed cities have made significant progress. With the successive release of the 14th Five Year Plan by the country and various provinces and cities, the construction of smart cities will receive clearer policy support and goal guidance.

As an important city in the western region of China, Chengdu is actively responding to the national strategy and accelerating the construction of smart cities to enhance urban management level and improve the quality of life of citizens. However, in the process of building a smart city, Chengdu also faces a series of challenges and problems, such as data security, technical standards, and infrastructure

construction. The article uses the method of literature review to fully collect and utilize a large number of domestic and foreign literature to study the problems in the construction of smart cities in Chengdu. Firstly, there are issues with data security and privacy protection in the construction of Chengdu's smart city. With the application of technologies such as big data and artificial intelligence, a large amount of personal and urban data is collected, stored, and analyzed. How to protect data security and personal privacy has become an urgent problem to be solved. Secondly, technical standards and interoperability are also challenges faced by the construction of smart cities in Chengdu. Smart cities involve multiple fields and systems, with inconsistent standards and poor interoperability among them, leading to information silos and resource waste. In addition, there are also a series of problems in infrastructure construction, social inclusivity, and data governance and management. Infrastructure construction requires significant investment and technical support, social inclusivity needs to consider the needs and interests of various groups, and data governance and management need to establish sound norms and mechanisms. This article aims to affirm the literature on the construction of smart cities in Chengdu, and then supplement and solve the unresolved problems or gaps in its research. Studying the problems and countermeasures in the construction of smart cities in Chengdu has important practical and strategic significance, which helps to promote the construction of smart cities in Chengdu to a higher level and make positive contributions to the sustainable development and comprehensive progress of the city.

2. Literature Review

At present, research on smart cities in China involves multiple disciplines, including urban planning, information technology, social sciences, etc. In recent years, it has received widespread attention and research in the academic community and industry. These studies mainly focus on digital technology, data management, and information security. In terms of digital technology, Literature has studied the application of digital technology in ecological protection of smart cities and found that it has significant effects in environmental protection, improving regulatory level, reducing management costs, and reducing disaster occurrence [1]. Some literature aims to emphasize that deepening the development of China's smart cities requires empowering the real economy through the digital economy. Taking car parking lots and high-speed ETCs as examples, promoting the integration of digital technology and industry, and encouraging urban digital transformation [2]. Some literature has explored the integration elements of China's new smart cities and digital economy, believing that the construction of smart cities provides development opportunities for innovation in the digital economy, and the continuous development of the digital economy also provides technical support for the construction of smart cities [3].

On the other hand, there is literature that vigorously and fully studies and explores the problems in China's smart city construction from the perspective of data management issues. He expressed that China has the problem of "emphasizing technology, neglecting security, and neglecting human centered" in the construction and operation of smart cities. There are problems such as data being monitored and controlled at the edge perception layer, and data leakage and theft at the network transmission layer. The research aims to firmly establish the concept of secure development and the people-centered development concept, accelerate the construction of an independent, controllable, proactive defense, and integrated data security system, focus on the de identification of personal information and the application of new data security technologies, strengthen the supervision of algorithm applications and security testing and monitoring, and enhance the standardization and inclusiveness of data standards in smart cities [4]. Further literature has explored the applications of transportation, monitoring, and medical fields in data management, exploring how to effectively improve the security and privacy of smart city data. Drawing on its research experience, this study explores the issues of smart cities in Chengdu from the perspectives of information security and data management [5].

Through the induction and sorting of existing literature, it is found that although the above studies have made contributions in different fields, there are still shortcomings in their comprehensive application. For example, some studies focus on the application of digital technology and the digital economy, respectively, but have not been fully integrated. Some scholars have focused on analyzing the problems in China's smart city construction from a national perspective, exploring the theoretical, technical, and practical issues of smart city construction from different perspectives, providing rich theoretical support and experience for smart city construction [1]. However, it is still necessary to conduct a comprehensive analysis of the actual situation of the problems in the construction of smart cities in various regions and regions. Therefore, this study will attempt to integrate existing literature and conduct a detailed, comprehensive, and comprehensive study on the problems existing in the construction of smart cities in Chengdu.

3. Current Situation of Smart City Construction in Chengdu

3.1. Relevant Policy Planning and Goals of Chengdu Smart City Government

The People's Government of Chengdu issued the "Fourteenth Five Year Plan" for New Smart City Construction in Chengdu, the "Action Plan for Smart City Construction in Chengdu (2020-2022)" and the "Action Plan for Internet plus City" in Chengdu (2017-2020) "and other relevant policy plans. The 14th Five Year Plan period is the first five years of embarking on a new journey to comprehensively build a socialist modernized country and advancing towards the second centenary goal. It is also an important five years for Chengdu to accelerate the construction of the Chengdu Chongqing dual city economic circle, Chengdu metropolitan area, and park city demonstration areas that practice the new development concept [6].

By 2025, Chengdu will basically achieve intensive sharing of digital infrastructure, and the operation center of Smart Rongcheng will operate efficiently. The level of intelligence in the fields of public management, public services, and public safety will be significantly improved. The digital economy will be deeply integrated with the construction of smart Chengdu, and security guarantees will be more solid and reliable.

By 2035, to comprehensively achieve intensive sharing of digital infrastructure, form a comprehensive operation and management service system for smart Rongcheng, integrate intelligent applications in public management, public services, and public safety into the lives of citizens, and achieve high-quality development of the digital economy. Gradually realizing the happiness and satisfaction of the people.

During the 14th Five Year Plan period, Chengdu constructed a smart city construction framework to achieve specific goals for that period.

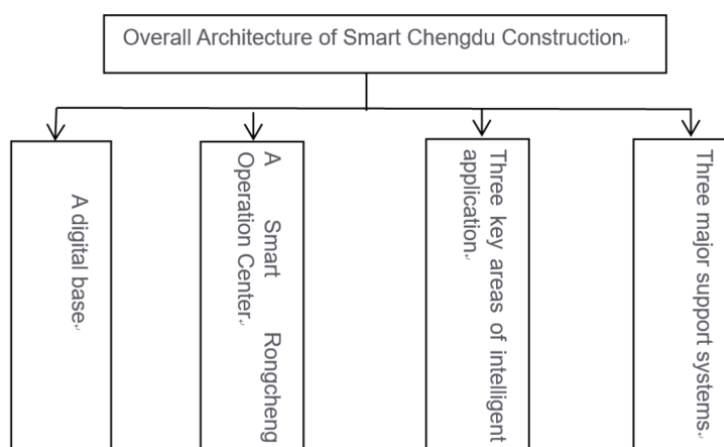


Figure 1. The overall architecture of the construction of Smart Chengdu City

A digital base, Chengdu will focus on urban intelligent infrastructure, data resource system, and digital enabling platform, building an integrated, intelligent, and intensive urban digital base (figure

1). A smart Rongcheng operation center will be established to build a three-level smart Rongcheng operation management platform, enhance the monitoring and early warning level of urban signs, and enhance the ability to handle events and command and dispatch. Three key areas of intelligent application as shown in table 1, focusing on public management, public services, and public safety, will promote the construction of urban intelligence. Three major support systems, the first is a two-way empowerment support system. The second is the global security support system. The third is the collaborative support system [6].

Table 1. The main indicators of smart city construction in Chengdu City

Number	index	2020	2025
1	Number of 5G base stations (10000)	>3	9
2	Public satisfaction with digital travel and transportation services (%)	-	85
3	Number of demonstration smart community constructions	20	100
4	Digital campus coverage rate in primary and secondary schools (%)	-	100
5	The proportion of three-star smart hospitals built by tertiary public medical institutions (%)	-	60
6	Population coverage rate of applying for electronic social security cards (%)	30	67
7	Number of smart nursing homes or nursing communities constructed	-	23
8	Coverage rate of smart security community construction (%)	-	100
9	The proportion of added value of core industries in the digital economy to GDP (%)	8.23	Around 14
10	Number of digital agriculture pilot demonstrations (units)	5	25

3.2. Development Status

In recent years, Chengdu has made significant progress in the construction of smart cities. Through innovative applications in areas such as information technology, smart governance, and infrastructure construction, the level of urban management and the quality of life of citizens have been improved. However, the construction of smart cities still faces many challenges.

3.2.1. In terms of information technology applications

Chengdu has taken multiple measures in smart transportation, effectively alleviating urban traffic pressure. By constructing an intelligent traffic management system, real-time monitoring of traffic flow and intelligent signal light regulation have been achieved, significantly improving traffic operation efficiency. In addition, Chengdu has promoted smart public transportation and shared bicycle systems, providing citizens with more convenient and green modes of transportation [7].

Smart healthcare is another important area of smart city construction in Chengdu. By establishing electronic health records for citizens, cross hospital and cross regional medical information sharing has been achieved, facilitating the medical treatment process for citizens. At the same time, Chengdu vigorously promotes remote medical services, especially in remote areas, achieving the popularization of high-quality medical resources. The construction of smart hospitals, such as intelligent guidance and online appointment and registration systems, has improved the efficiency and quality of medical services.

3.2.2. In terms of smart governance

Build a unified government cloud platform for the entire Chengdu city, carrying 1277 non confidential applications at the city and county levels, and basically achieve the unified construction and sharing of government information infrastructure at all levels. Citizens can conveniently handle various public affairs through the Internet, improving the efficiency and transparency of government services. The establishment of a data sharing mechanism between government departments has promoted cross departmental and cross regional information connectivity and collaborative management [8].

The promotion of intelligent security systems and community comprehensive service platforms in Chengdu has improved the level of community safety and the quality of life for residents. Through video surveillance, intelligent access control and other technological means, the smart security system provides a safer living environment for community residents.

3.2.3. In terms of infrastructure

Build a unified identity authentication platform, fiber optic broadband network, and 4G network covering urban and rural areas throughout the city, with a mobile user base of 27.06 million households and more than 30000 5G base stations. There are over 8000 base stations with narrowband Internet of Things (NB IoT) service capabilities. Classify and promote the construction of perception systems in areas such as municipal facilities, rivers, lakes, forests, and public security prevention and control, continuously improving the intelligent perception capabilities of cities.

4. Existing Problems

4.1. Strengthen Smart City Construction Synergy

Lack of departmental collaboration, smart city construction involves multiple government departments, enterprises, and social organizations. Due to unclear division of responsibilities and imperfect collaborative mechanisms among departments, problems such as information silos, duplicate construction, and resource waste have emerged in the actual implementation process [9].

Resource integration is inadequate, and smart cities need to integrate various resources, including funds, technology, data, and human resources. However, Chengdu faces certain challenges in resource integration and cannot fully leverage the comprehensive effects of various resources. For example, the cooperation between technology enterprises, research institutions, and government departments is not close enough, and the efficiency of resource utilization is low.

Insufficient policy support. Although Chengdu has introduced some policies in the construction of smart cities, the level of policy support and specific implementation effects still need to be improved in practical operation. Some policies lack long-term planning and specific implementation rules, leading to difficulties in the actual implementation process. Compared with the government policy support of first tier cities in Beijing, Shanghai, and Guangzhou, the policy system of first tier cities is more complete, with more sufficient government funding and multi-channel fundraising for construction, forming a strong financial support system. However, Chengdu's investment in smart city construction is relatively limited, and the participation of social capital needs to be improved.

4.2. Improve Urban Intelligent Perception System

The coverage of sensing devices is insufficient, and the urban intelligent perception system needs to widely deploy various types of sensors. However, currently, the coverage range and density of sensing devices in Chengdu are not comprehensive enough, especially in some edge and non-core areas, where the coverage rate of sensing devices is relatively low.

The data collection and processing capabilities are limited, and the intelligent perception system needs to collect and process a large amount of real-time data. At present, the technology and equipment in data collection and processing in Chengdu still need to be improved, with problems such as untimely data collection and insufficient processing capabilities, which affect the accuracy and real-time performance of data. Compared to first tier cities in Beijing, Shanghai, Guangzhou, and Shenzhen, these cities have advanced data centers and high-performance computing facilities. Beijing and Shanghai, as national data centers and core nodes, have abundant computing and storage resources, while Shenzhen and Guangzhou have also made significant investments in cloud computing and big data [10].

4.3. Insufficient Support Level of Smart City Platform

Lack of comprehensive coordination ability, the central platform needs to coordinate various intelligent applications and systems, but currently, the collaboration and integration between systems are not high, resulting in information silos and data fragmentation, leading to low overall coordination efficiency.

The application support capability is limited, and the hub of the smart city platform should support the development and deployment of various innovative applications. However, the smart city platform in Chengdu has limited capabilities in application support and lacks a comprehensive development environment and tools, which affects the rapid launch and promotion of innovative applications [10].

4.4. Lack of Innovation in Smart City Application Scenarios

There is a lack of diversity in application scenarios. The smart city application scenarios in Chengdu mainly focus on traditional fields such as traffic management, environmental monitoring, and public safety, while there are relatively few innovative applications in education, culture, and entertainment, which cannot fully meet the increasingly diverse needs of citizens.

The participation of citizens is not high, and the construction of smart cities cannot be separated from the extensive participation and support of citizens. At present, the understanding and participation of citizens in smart cities are still insufficient, and many smart applications have not been effectively promoted and used, resulting in some application scenarios not being able to play their due role.

5. Suggestions for Countermeasures

5.1. Establish an Efficient Collaborative Mechanism

It is suggested to establish a leadership group or specialized agency for smart city construction, responsible for coordinating and coordinating the work of various departments and relevant units. The city should clarify the division of responsibilities among departments, establish cross departmental collaborative work mechanisms, regularly hold joint meetings, and promptly solve problems in the construction of smart cities.

The city should develop long-term plans and specific implementation rules for smart city construction to ensure policy continuity and operability. It is suggested to strengthen policy promotion and interpretation, and enhance the execution ability of governments and relevant units at all levels, introduce a third-party evaluation mechanism to evaluate and provide feedback on the effectiveness of policy implementation, and adjust and optimize policies in a timely manner [11].

5.2. Expand the Coverage Range of Sensing Equipment

The city should increase investment in intelligent sensing devices and expand the coverage and density of sensor networks. Especially in edge and non-core areas, it is suggested to increase the deployment of sensing devices to ensure effective monitoring in every corner of the city, meanwhile, utilizing mobile sensing devices and drone technology to enhance the comprehensiveness and flexibility of sensing data.

The city should introduce advanced IoT, big data, and artificial intelligence technologies to enhance data collection and processing capabilities. It is suggested to build efficient data centers and cloud computing platforms to enhance data storage, processing, and analysis capabilities, strengthen the maintenance and upgrading of data collection equipment to ensure the accuracy and real-time performance of data collection [12].

5.3. Enhance Comprehensive Coordination Ability

The city should establish a comprehensive coordination mechanism across departments and systems to enhance the collaborative capabilities between various intelligent applications and systems. Through a unified data interface and communication protocol, the city should achieve data interoperability and resource sharing among various systems. It is suggested to promote the integration and linkage of various smart applications, improve overall operational efficiency and management level.

It is suggested to build a comprehensive application development and deployment environment, provide rich development tools and resources, and support the rapid development and launch of various innovative applications. The city should establish an application market and innovation incubation platform, encourage enterprises and developers to participate in the development of smart city applications, and enhance the platform's application support capabilities and innovation level.

5.4. Expand Application Scenarios

In response to the diverse needs of citizens, the city should expand the application scenarios of smart cities to fields such as healthcare, education, culture and entertainment. For example, developing intelligent medical systems to achieve remote healthcare, health monitoring, and optimized allocation of medical resources. In the field of education, it is suggested to introduce smart education platforms to provide personalized learning solutions and resource sharing. In the field of cultural and entertainment, utilizing augmented reality (AR) and virtual reality (VR) technologies to enrich the cultural life experience of citizens.

6. Conclusion

Smart cities are the overall trend of future urban governance and planning, and the development and progress of smart city construction in Chengdu have significant implications for people's lifestyles and social management. The construction of smart cities in Chengdu has made significant progress in recent years, covering many fields. These achievements have improved the efficiency of urban management, improved the quality of life of citizens, and promoted the development of the digital economy. However, through systematic analysis, it was found that compared to first tier cities, Chengdu has problems such as insufficient overall synergy in smart city construction, insufficient resource integration and government support, limited data collection and processing capabilities, insufficient comprehensive coordination capabilities, insufficient innovative development of application scenarios, and a lack of diversity in application scenarios. In response to these issues, this article proposes a series of countermeasures and suggestions, including establishing an efficient collaborative mechanism, expanding the coverage of sensing devices, improving data collection and processing capabilities, enhancing comprehensive coordination capabilities, strengthening application support capabilities, and expanding application scenarios. These measures aim to enhance the overall level of smart city construction in Chengdu and promote the intelligent development of urban management and public services.

This study has important practical and strategic significance for promoting the construction of smart cities in Chengdu. By analyzing the problems in the construction of smart cities in Chengdu, it will help to make greater progress in the future, enhance overall synergy, achieve efficient operation and sustainable development of smart cities, provide citizens with more convenient, efficient, and safe intelligent services, and enhance the sense of gain, happiness, and security of the people. In addition, this study also provides reference and inspiration for the construction of smart cities in other cities, which has an important impact on promoting the construction of smart cities nationwide.

The research in this paper has certain objective limitations, mainly reflected in the lack of comprehensiveness and real-time data, and some data may not fully reflect the latest construction situation. Future research can further strengthen the tracking and analysis of dynamic changes in the

construction of smart cities in Chengdu, provide more accurate and real-time research results, and provide more scientific decision-making support for the construction of smart cities in Chengdu.

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