

Research on the Construction of Smart Cities

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Abstract

With the emergence of problems such as the increase in urban population, the shortage of urban resources, and the aging of urban governance models, the construction of smart cities is becoming imperative. At present, China's smart city industry is developing rapidly and appears favorable, but there are still some deficiencies that can be improved. This paper analyzes the development status and existing problems of smart cities in our country and proposes countermeasures based on domestic and foreign construction experience.

Keywords

Smart city, governance modernization, urban digital construction.

1. Research Background

The development of smart cities is in the ascendant. In terms of technical support, the current world is entering the post-financial crisis era, and various scientific and technological fields have shown signs of revolutionary breakthroughs. The pursuit of technological innovation by various countries has laid a solid foundation for the development of smart planet and smart cities [1]. The high speed evolution of the Internet has provided overwhelming technical support for establishing government's electronic government affairs. Cloud computing, big data, and the Internet of Things have gradually played an irreplaceable role in the government's smart governance. In terms of public services, with the progress of the times, citizens have put forward higher and more specific requirements for the quality and efficiency of urban public services. However, due to problems like the backward public service modes, fragmented governance, and loose connections between different departments, the government has been unable to meet their increasing demands, which requires the advance of government electronic governance in the field of public services [2]. In terms of urban life, China's urbanization rate will reach 63% in 2020 [3]. The rapid increase in the urban population has led to the shortage of public resources and the destruction of the natural environment, which has brought huge economic and social challenges to urban governance. How to make use of limited resources to ensure the sustainable development of cities has become the primary issue facing urban governance [4].

After the Fourth Plenary Session of the 19th Central Committee of the Communist Party of China, General Secretary Xi Jinping pointed out during an inspection in Shanghai: "Urban governance is an important part of promoting the modernization of the national governance system and governance capabilities", and he emphasized the need to "improve the modernization level of urban governance"[5]. The meaning of smart cities is highly valued and has been elevated to the national level. Our country's smart city industry is developing rapidly. At present, 95% of the sub-provincial cities and 76% of the cities above the prefecture level in the country, a total of more than 500 cities have proposed or are building smart cities. It is estimated that China's smart city markets will reach 1.6 billion in 2021[6]. This paper aims to discuss how to promote the construction of smart cities through the comparison of domestic

and foreign cases and propel the realization of urban smart, convenient, low-carbon, and sustainable development.

2. Literature Review

The essential concept of the smart city is to combine human wisdom with IT technology, bringing humanistic care and technical support side by side. The smart city's characteristics are high intelligence, interconnection and integration, exchange and sharing, and related applications [7]. The concept of the smart city is derived from the "smart planet" proposed by IBM in 2008, and its core is "perception", "interconnection" and "intelligence" [8], which focus on the comprehensive application of the Internet, Internet of Things and cloud plans. Smart city, like smart planet, emphatically integrates advanced information and communication technologies with advanced city service ideas to digitally manage resources, economy, environment, and society, etc., to promote intelligent decision-making and action to achieve the goal of sustainable development [9]. The essence of the smart city industry is to invest in information and communication technology to improve the quality of life of residents, and promote sustainable economic development as well as the rational deployment of natural resources. Domestic scholars such as Shengwu Wu and Honghua Qin attach the importance to the interaction and coordinated operation methods among various entities like the government, enterprises, and the public. They believe that smart cities mean to use the new generation of information technology to change the interaction mode between those entities and to make every function departments of cities work in coordination with each other in virtue of systematic management methods [10]. In the complete linkage of multiple vertical intelligent systems in smart cities, the upstream and downstream industrial chains are gradually improved, and synergy effects in various fields have been gradually formed [11].

The definition of smart city has not yet been unified, and the evaluation index system as a guide is relatively fragmented. Based on the "Smart City Index System 1.0", Shanghai Pudong New Area took into consideration the construction of the urban soft environment, and formulated the "Smart City Evaluation Index System 2.0" [12]. In the "Smart City Index System 2.0", there are totally 6 smart city evaluation indicators, namely, smart city infrastructure, smart city public management and services, information service economic development, cultural scientific literacy, democracy perception, and soft environment construction. Dedao Gu and Wen Qiao summarized them into seven aspects, including smart citizens, smart infrastructure, smart governance, smart livelihood, smart economy, smart environment, and smart planning and construction. Among them, humanistic care and economic construction are the two core evaluation indicators meaning the most [13].

The analysis of the content and realization path of smart cities by domestic and foreign scholars reflects the trend and characteristics of multiple perspectives, which signifies that the framework of smart city never belongs to any certain isolated discipline but requires multidisciplinary collaboration to ensure its development. Besides, the current academic research on smart cities can be mainly divided into five categories, including technology, governance, culture, economy, and domestic and foreign comparative analysis. Xibo Wu, Zaigao Yang and others analyzed how to win the initiative in development from the perspective of revolutionary innovation of science and technology and the interconnection of IT technology by constructing smart cities [14]; Gang Song and others researched how to use big data strategies to solve the complexity of today's city management [15], and based on this Xiaomi An and others paid attention to the importance of data resources to smart cities with a view to sustainable development [16]; Qing Li [17], Chongzhao Li [18] took the update of the urban governance mechanism as the starting point, expounding the modern management concepts and methods of smart cities to empower urban management and resolve external conflicts;

Guohua Wang [19], Qian Xie [20] and others focused on improving residents' life satisfaction and happiness, and hence called for the construction of humanistic smart cities; Honghua Qin [21] and Guangbin Wang [22] resorted to the method of case analysis to state the practical experience of smart cities at home and abroad, and then analyze the current status and problems of smart cities in China; Tianhang Huang paid attention to the adjustment of economic structure to make it more in line with the economic development low-carbon and environmental protection of smart cities [23].

Through literature research, it is found that the literature of smart cities almost covers every aspects, but mostly from the fields of science and technology, discussing the significance of big data and the information and communication. The gaps of city management belonging to public administration still need to make progress. Moreover, there is almost no comparative analysis and the research for reference of Taiwan, China, which actually ranks top 7 in global smart cities. This paper will focus on the relevant practical experience of Singapore and Taiwan, China, and further explore the construction of sustainable smart cities in the mainland.

3. Current Status and Existing Problems

3.1. The Connotation That Is Not Yet Unified

Smart city is the growing trend of modernization. And it represents the necessary measure to improve the urban system as well as the quality of urban life, promote the sustainable development of the urban economy, and solve various internal urban diseases. However, at present, academic circles have different definitions regarding to smart cities. China's scholar Shengwu Wu pointed out that there was no consistent specific definition of smart cities in our country[24], and therefore government officials in many cities, especially the leadership, couldn't aim at the significant fields of smart cities which require priority in development programs appropriately. Also, they have no tendency to understand the role and value of smart cities. Without targeted planning, no surprisingly there will be a lack of focus and advisable trade-offs so that repetitive investment and construction couldn't be avoided. As a result, it will be unable to quickly respond to various urban emergencies with precision and refinement, nor can it effectively solve problems such as traffic jams, housing shortages, environmental pollution and limited medical resources. Absence of scientific long-term goals will lead to the lack of overall top-level design, which will not only hinder the formation of a sound urban system, but will also to a large extent reduce the efficiency of the rational allocation of urban resources, and even affect the entire city collaborative and efficient operation of various industries and systems.

3.2. Insufficient Information and Data Sharing

All walks of life have long been accustomed to fighting on their own and for their own sake, leading to the major problem of "isolated islands of information" in the construction of smart cities. Nevertheless, information and data are the cornerstones of building a smart city, and this horizontal information barrier and fragmented development method does exist the defects due to data gaps, which will undoubtedly hinder the interconnection and resource integration of cities[25]. At the governance and management level, information barriers will affect the coordinated operation of various public service departments in the city, resulting in inefficiencies such as administration separation, management fragmentation, and governing in own way. What's more important, at the economic development level, it will affect the formation of vertically well-organized and horizontally coordinated complete industry chains both from upstream and downstream sides and the realization of the city's integrated intelligent system.

3.3. Lack of Available Resources

In the rapid development and industrial renewal of smart cities, the three core elements, personnel, capital, and technology, are the key to determining that they will not slip into the bottleneck period. However, in terms of personnel, there are very few high-end management ones who know both smart cities and administrative management. In addition to management personnel, technical personnel, especially high-end information personnel, are also scarce. In China's information industry, technician-level workers account for only 3.2% of skilled workers, while in developed countries it is generally between 20-40% [26]. This also directly leads to the backwardness of information intelligence such as e-government. In terms of capital, it is difficult for government finances to support the huge investment in smart cities alone all the time, and many cities have directly delayed the development of smart cities due to insufficient financial support and investment attraction.

3.4. Lack of Sustainable Development Ideas

The "National New Urbanization Plan (2014-2020)" clearly pointed out to accelerate the construction of green, smart, and humanistic cities [27]. However, in the process of economic development of smart cities, the natural environment still confronts daunting challenges, given that the ecological environment continues to deteriorate, and the green industry chain advocated by smart cities has not yet formed. Some traditional industries are accompanied by high resource consumption and high environmental pollution; the shortcomings, however, still cannot be curbed to realize the transformation and upgrading of the industrial model. In addition, the environmental friendly ideas conducive to sustainable development has not been deeply rooted in people's minds. Besides, because the smart city is a program of long-term investment and construction, the public cannot see a return and profits in the short run, which also leads to low participation and poor enthusiasm of residents and enterprises. And many of the government's constructive works for smart cities are just "face-saving projects", which don't intend to accomplish thorough publicity and institutional reform at all.

4. Domestic and Foreign Cases

4.1. Singapore [28]

4.1.1. Smart Government Affairs

In the process of building a smart city, Singapore is representative of the world. Singapore proposed the IT2000 plan in the 1990s with the intention of turning it into a convenient and intelligent island. From the realization of office automation in 1980 to 1985 to the "Smart Nation 2015" plan (IN2015) proposed in 2006 to 2015, Singapore has built an ideal smart city step by step according to the plan. In the construction of a smart city, smart government affairs are the beacon of top-level design [29]. Beginning in 1980, Singapore has streamlined 5,000 jobs in eight years during the period of fulfilling smart management, which was equivalent to 7.2% of the number of civil servants at the time. Singapore provides residents with 1,600 all-weather government online services to guarantee that residents' life requirements could be addressed in highly convenient ways, which emphasized the sense of ownership of residents as well as enhances the residents' consciousness of participation, and it also made contributions to the synergy and seamless connection of every administrative departments. In addition, Singapore has also established a separate e-government management system to keep professional, including the Ministry of Finance, the Singapore Information and Communication Development Authority, and the Public Domain ICT Steering Committee, etc. The complete and professional management system of "One Ministries, One Bureau, and Four Committees" provides the construction of smart government in Singapore with a sound management mechanism.

4.1.2. Smart Transportation

In terms of smart transportation, the construction of related projects in Singapore started early and reached wide coverage. Singapore implemented an electronic road toll system as early as the 1990s, and set off-peak pricing for different periods of time, successfully reducing the congestion on urban main roads. The Transportation Authority of Singapore has also installed Easy Pass card terminals in major public transportation facilities. The popularity of Easy Pass not only facilitates residents' travel, but also optimizes the public transportation network by collecting data, fully realizing intelligent and smooth travel.

4.1.3. Smart Medical Care

Targeting at shortage of medical resources, Singapore has been committed to the construction of medical information platform with multiple information sources, which can provide data such as the number of patients and medical resources, ensuring the reasonable scheduling and allocation of medical resources, and guarantee the access to see a doctor. Based on this medical platform supported by big data, patients' medical records can be saved and clinical information data can be shared, so as to provide doctors with more comprehensive information to prevent medical errors. Moreover, considering the patients' income, the multi-resource information medical platform will also distribute reasonable subsidies based on the average payment ability of their family, proposing solutions for reducing the burden of expensive medical treatment.

4.2. Taiwan, China [30]

4.2.1. Smart Network

Taiwan, China has won many awards in the global smart city selection. From Taichung City ranking first in the world in 2013 to Taipei City's seventh today [31], Taiwan's smart city construction is worth learning and used for reference. After more than ten years of "coordinated development of digitization, network and intellectualization", Taiwan's network infrastructure has been striven to develop first. Take Taoyuan County as an example, Taoyuan County, which owns a population of 1.35 million, have installed over 30 WIMAX base stations, reaching a high average coverage rate per unit. Besides, the full coverage of wireless network hotspot also enables the government's electronic services to penetrate into all aspects of citizens' lives such as medical care, food, housing, and transportation.

4.2.2. Smart Ideas

Taiwan's idea of smart city construction is very consistent. Of course they know that the widespread use of the Internet will bring a lot of economic benefits, but they reckon that economic development is the responsibility belonging to the market, while the top priority the government should concern is social management. Therefore, Taiwan always regards "put the people first" as the basic concept in the construction of smart cities and strives to seek well-being for the society. In 2009, Taiwan set up the "Smart Life Science and Technology Movement Program Promotion Office" specifically to promote the development of smart cities, stating that smart technology should be applied to six areas such as agriculture, leisure, safety, and medical care. These six areas are all social issues closely related to people's livelihood, which reflects that they truly embody the guiding principle of "society first and people's livelihood first" in the construction of smart cities in Taiwan.

4.2.3. Smart Policing

The most important thing in residents' living and traveling is safety. Social safety and stability is the government's first concern. Taiwan has launched a smart policing strategy for ensuring public security. They handle cases intelligently by using high-tech preventive equipment and crime investigation tools to guarantee safe travel and safe living environment for residents. For example, according to Taiwan media reports, Hsinchu City, which has a population of 420,000,

equipped with 1,500 monitors and almost put an end to the car loss. Smart policing provides the solid security for people's livelihood.

5. Improvement Measures and Path Suggestions

5.1. Improve Data Information

China needs to formulate standards for the exchange of data and information as soon as possible, and realize information sharing and data linkage while ensuring the privacy of citizens to break horizontal information barriers, thus accelerating the construction of information integration, and lay a solid foundation for the systematic database of smart cities.

5.2. Cultivate High-end Personnel

The lack of urban personnel in the fields of management and high technology is the roadblocks of smart city construction. We should rely on local governments and institutions of higher learning to strengthen personnel training and personnel introduction, cultivate high-end leaders, and promote the establishment of sound management mechanisms as well as spur on key technological breakthroughs.

5.3. Guarantee Construction Funds

Smart city construction is a large investment and time-consuming project. Therefore, instead of bearing the financing responsibility alone, the government should encourage multiple market players to take part in investment, which will not only reduce the government's budget pressure, but also increase the enthusiasm of various entities to join in the construction of smart cities together.

5.4. Change the Thoughts of Citizens.

The construction of a smart city is a time-consuming and expensive project. On the surface, smart city is a vague and remote concept for citizens, and hence many of them hold superficial understanding towards them. Therefore, the government needs to speed up the transformation of the achievements of smart cities and apply them to the daily lives of citizens in a timely manner to impress citizens intuitively and enhance their sense of ownership.

5.5. Promote Industry Optimization and Upgrading

The government must do a good job of top-level design, promote the establishment of environmental friendly concepts with policies and regulations, integrate low-carbon sustainable ideas into economic development, encourage the emission reduction and transformation of high-polluting heavy industries, adjust the industrial structure, and push forward the optimization and upgrading of industries, creating a better living environment for citizens.

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