Research on Urban and Rural Planning and Smart City Construction in Big Data Era

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Abstract: Recent years have witnessed faster information development and the wide application of big data, Internet of Things (IoT) and other intelligent technologies, which has laid a solid foundation for the development of new technologies and new environment. [1] Countries and regions around the world are promoting the digital smart development strategy with the hope of building smart urban and rural areas. In big data era, the main task of smart city planning and construction is the integration of data resources and the open sharing of data information. Therefore, information technology is indispensable for the planning and construction. Proceeding from the big data era, the paper explores technical details related to smart city planning and construction, aiming to create a more comfortable and livable environment for people and promote the overall improvement of China’s urban construction. [2]

1. Introduction
With the advent of big data era, the technology is gradually being applied to various fields. Big data era has an obvious influence on people’s lives and has promoted the research motivation of scholars in many aspects. [3] In this era, smart city research has won wide recognition and it is an important research focus of the comprehensive urban-rural planning in China. The integration of the advanced technologies used in urban-rural planning with big data can ensure the planning is science-based.

2. Overview of smart city in big data era
For smart city planning and construction, what needs to be planned with big data first is infrastructure. Only by comprehensively constructing infrastructure can we ensure the full coverage of big data. Sound infrastructure can improve the overall data collection speed and can also realize the rapid processing of data at different stages. For big data, the most fundamental infrastructure is the Internet. For many foreign cities, Internet is the fundamental infrastructure and has been well developed. And the ultra-high-speed broadband and network settings are very convenient. [4] For many foreign cities, mobile phones have become an important facility for big data. By opening corresponding data platform, people’s opinions and advice can be collected and the services can be visualized. Many aspects are involved in urban planning and construction. Urban planning, geographic information, population density and information technology are all main factors for big data construction. The planning and construction of smart city means to intelligently process and analyze complex information by combining modern information processing technology and big data, thus the overall requirements of modern urban planning and construction can be met,
3. **Opportunities brought by big data for urban-rural planning**

Big data has promoted the planning scale and method innovation. On one hand, big data has promoted the changes of planning scale and perspective. In the past, urban-rural planning data were mainly obtained by census and sampling. Census data covers a long period of time while sampling data has a high cost. But big data technology can effectively shorten the time scale and significantly expand spatial scale. On the other hand, big data has promoted the method innovation of urban research. For example, GIS can effectively improve the precision of planning data collection; combining GIS/GPS with weblog can expand the scope of data collection and improve the real-time performance of data collection; the spatial links between urban and rural residents’ activities can be obtained with Weibo, Twitter and other APPs; the mapping analysis of human activity in urban space can be completed with Google-Map, as shown in the following figure.

Big data has diversified the sources and access to data. On one hand, big data has enriched the sources of spatial information in urban-rural planning research and broadened the channels of information sources. On the basis of massive data, the extracted “organic data” of relevant problems can be analyzed and utilized. Thus the authenticity of data is greatly improved. On the other hand, big data has diversified the access to data. Crowdsourcing refers to outsourcing businesses like data research and acquisition to the public and other professionals with interest. The practice can help maximize the efficiency of data acquisition and further expand channels of “organic data” and improve data quality.

In big data era, the specific thought on urban-rural planning and smart city construction can be discussed.

4. **Intelligent management with big data**

Intelligent management is important for the construction of smart city. In the broad sense, a city is actually an information base, which is composed of many pieces of data. By integrating and analyzing data, a city’s construction situation can be reflected. Information must be integrated into urban management. Cameras and remote sensing technology can be used to strengthen monitoring on cities and deal with emergencies. By doing so, people’s safety can be guaranteed and a harmonious smart city can be built. Enhancing people’s participation and their sense of social responsibility and strengthening intelligent management can promote smart city construction.

5. **Comprehensive development of urban and rural planning**

With the development of information era, new technologies represented by science and technology have caught the attention of the public. Besides, the faster economic growth and its integration with science and technology have made urban-rural planning more science-based. To ensure the smooth development of urban and rural planning, relevant departments must correctly understand the new philosophies. In the information age, the improvement of urban service quality and people’s living standards have become the priority of urban planning. In urban-rural planning, government departments should strengthen communication with citizens and meet people’s needs on the basis of science-based planning. How to ensure government departments have an equal-footed communication with citizens? This can be achieved by establishing information exchange platform with big data. The needs of residents of different social classes can be investigated with database and then urban planning can be designed so as to ensure the planning is comprehensive. In the urban-rural planning, class contradictions and top-down control should be weakened and participation of all classed should be encouraged. At the same time, more need to be done to improve the correctness and chart the course for urban-rural planning. From this we can know that information sharing of big data can ensure the effective communication between governments and residents. Besides, data information can be fed back to people concerned, thus improving the efficiency of urban planning.

6. **Build an overall system framework**

Traditionally, urban and rural planning needs more detailed field surveys. The planning must be
improved through repeated argumentation and revision, which is not only time-consuming and strenuous, but difficult to ensure it is science-based. In big data era, with information technology, scientific urban-rural planning can be achieved rapidly. The information technology can improve the accuracy and the real-time performance of the planning and can effectively reduce resource consumption. But an overall system framework should be established first by using big data technology during the planning. On one hand, during urban-rural planning, the system should be improved with big data technology. All the aspects and contents that may be involved should be embedded into the system to achieve the sharing, smooth transmission and utilization of information and resources. Public interests should be reflected in particular in the system, thus ensuring the planning is science-based. On the other hand, we should make full use of big data technology to deconstruct the planning programs. Urban and rural planning is a systematic and complex project, so project-specific planning programs are needed. The planning based on big data technology is more scientific on the whole and more service-customized and practical.

7. Characteristics of Smart City

7.1 Coverage of information awareness network
The widely covered information awareness network is the foundation of smart city. The information resources of any city are massive. To obtain the city information in a timely and comprehensive way and judge the city more accurately, the central system of a smart city needs to be able to exchange the needed information of various elements. [5] The information awareness network of a smart city should cover dimensions of time, space and object. It should be able to collect information with different attributes, forms and density. The development of IoT has provided stronger support for information collection of smart cities.

8. Intelligent processing of information
Smart cities have huge and complex information systems, which are the foundation for decision-making and controlling. But to become a truly smart city, the city needs to process massive information intelligently. This requires the system to analyze the data according to various needs, extract needed knowledge and make judgements and predictions independently so as to realize intelligent decision-making and send control instructions to the corresponding execution devices. In this process, self-learning ability should also be reflected. Macroscopically, intelligent processing means the refinement of information, namely the information becomes more comprehensive, detail, easier to use and valuable after being processed and changing its form in the system. [6] Technically, the application model of new information technology represented by cloud computing provides strong support for intelligent processing.

9. Application of Smart City Information
Intelligent processing is not the end of the information utilization. Smart cities should also have the ability of open information application. They can send processed information through the network to demanders or directly operate control terminals to complete value-added utilization of information. The information application in smart cities should be open. It shouldn’t be controlled or distributed by governments or urban management departments. An open information application platform should be established, through which individuals and enterprises can contribute information to the system and individuals can exchange information. Such a platform will make full use of the system, significantly enrich information resources of smart cities and boost the appearing of new business models.

10. Problems of smart city construction in big data era
Undoubtedly, the smart city construction has brought great convenience to people’s life and greatly improved the speed of urban development. However, the construction is still at the trial stage. [7] Many problems still need to be solved and there is much space for improvement.
10.1 Security of personal information
In the big data era, smart city construction needs the support of new technologies like network technology and cloud computing, which can provide guarantee for the entire construction. The application of these technologies not only contributes to urban construction, but highlights the importance of information security. Once the information security goes wrong, urban management system will not run well. The smart city information system includes the information of government affairs, enterprises and citizens and livelihood data. [8] Once the information is stolen by lawbreakers, people’s life and economy may suffer, and in serious cases, socio-economic development may be plunged into chaos and long-term security and stability of the entire society will suffer. Therefore, information protection is very important for smart city construction.

10.2 Security of individual privacy
The construction of smart city has improved the efficiency of urban management and citizen service and made cities more intelligent. But it also puts cities in a complex network environment. This is also one of the challenges of smart city construction in big data era. [9] The construction can’t be completed without information technology and communication projects, but their network is often attacked by lawbreakers. The internet carries too much individual information because citizens’ contact details and personal information are all registered in the smart city management system and they are all stored in the cloud. Once the server is attacked, personal information of citizens will have the risk of being leaked, which will make people less determined to build smart cities and make information collection more difficult. Besides, with the development of communication, e-commerce, and mobile payment, people’s personal data has been completely exposed in the cyber space. These data may expose the life tracks of individuals, such as the long-term activity range, personal hobby and social relations. The leakage of personal information is bound to influence people’s life. [10] During the construction of smart cities, we should guard against data theft by criminals and prevent equipment failure and user operation errors. The leakage of individual privacy will challenge public trust and authority. Lacking public trust will directly affect smart city construction.

11. Incomplete information collection
The wisdom source of a smart city is the collection, analysis and counting of massive data. Through deep mining of data, valuable information can be obtained. Without enough information sources, the construction of smart cities will become impossible. If the massive data can’t be deeply mined, the construction will hit bottlenecks. With the development of smart city construction, information island problem becomes more acute and needs to be solved immediately. The phenomenon will lead to unreasonable allocation of hardware and scatter collected data information. Scatter data will make it more difficult to process data and provide timely information support for urban construction. [11] Besides, cities and industries and companies in the same industry are at different stages of development, so information island is a universal problem in smart city construction. If the problem can’t be solved, it is difficult to promote smart city construction. To popularize smart city construction, places must make joint efforts to break information island and achieve open sharing of data sources.

12. Conclusion
Smart city construction can’t be completed without big data and innovative application. Therefore, it is necessary to promote philosophy and method innovation of urban-rural planning based on big data. We can provide decision-making basis for governments through data mining, data analysis and comprehensive application. The innovation of urban management model and the upgrading of industrial structure must be promoted. We can promote economic development in urban and rural areas and optimize people’s life experience by reasonably allocating resources. By doing so, the target of smart city construction can be better achieved.
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