

Digital blueprints for the urban future: a study on the transformation of urban planning with examples from China and Singapore

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Abstract. Digital technology is one of the most important topics of research today. The rapid development of digital technology has caused major reforms in urban planning and other fields. This digital method is widely used in data collection and artificial intelligence, helping urban planners collect and analyze data more efficiently, thereby making the city operate and develop better. It also enhances citizen participation through online platforms and mobile applications, helping to build a more inclusive and sustainable city. This study mainly evaluates the impact of the combination of digitalization and urban planning, especially in terms of traffic management and public life. This article aims to explore how a combination of digitalization and urban planning can be used to create a more efficient, democratic, and sustainable urban environment. This study uses case analysis and systematic review methods to explore in depth the impact of digital technology and urban planning on urban traffic management and residents' lives. The research results show that a good combination of digital technology and urban planning transforms the efficiency of urban operations and the quality of life of residents, improves the sustainable development of the city, and enhances the efficiency and democracy of urban intelligence. This combination is expected to continue to affect the future development of the city and will bring more opportunities and challenges to urban planning.

Keywords: Digital technology, urban planning, traffic management, residents' life.

1. Introduction

With the rapid development of digital technology, the field of urban planning is undergoing a revolutionary change [1]. This change is mainly reflected in problems such as traffic congestion, environmental pollution, and uneven resource distribution. Currently, these problems can be improved through digitalization for data analysis, simulation, and prediction.

Firstly, digital technologies enable urban planners to collect and analyze data more efficiently as a way of understanding how cities work. These data can also help planners formulate more effective urban development strategies. Secondly, it is inextricably linked that digital technologies such as artificial intelligence (AI) and big data analytics can make cities more efficient [2]. For example, a digital transport system can reduce traffic congestion, while digital life can improve the quality of life of residents, and so on. In addition, digitalization also promotes citizen participation. Allow more citizens to participate in urban planning decisions through online platforms and mobile applications. This participation promotes transparency and accountability, helping to build more inclusive and sustainable cities. In summary, integrating digitalization into urban planning is a key strategy to face current urban challenges. Digitization can not only make cities operate more efficiently, improve citizens' quality of life, and enhance their sense of participation, but also promote sustainable development of cities. As technology continues to evolve, the potential for digital urban planning will become even greater.

The core of this research is to understand and evaluate the advantages of digital technologies in urban planning, especially in public life and traffic management. The research aims to explore how these technologies can contribute to the realization of more sustainable, efficient, and democratic urban environments. Specifically, the study focuses on how digital technologies can be used to optimize traffic flow management, reduce congestion, improve traffic safety, and enhance the

efficiency and reliability of public transport, as well as the convenience and efficiency of residents in their future lives.

To achieve the research purpose, this study adopts a combination of case analysis method and systematic review. By synthesizing existing literature, this paper provides an in-depth study of the broad and far-reaching impacts brought about by the integration of contemporary digitalization and urban planning. The study concludes that the amalgamation of digital technology and urban planning has profoundly altered the functioning of contemporary cities and the quality of life. It has improved urban sustainability while enhancing the efficiency and democracy of urban intelligence. This trend will continue to shape future urban development, creating more opportunities and challenges for the sustainable development of cities.

2. Digital City

With the development of technologies such as the Internet, big data, and artificial intelligence, the concept of digital cities has gradually taken shape and has received widespread public attention. With the rapid development of information technology and the Internet, people have begun to explore how to apply these technologies to urban management and services. The digital city, as an advanced concept in the 21st century, represents a new direction for modern urban development. "Digital city" generally refers to a city that improves the city's operational efficiency, sustainability, and residents' quality of life by integrating various digital technologies, information systems, networks, sensors and other advanced technologies.

First of all, digital cities not only focus on the optimization of infrastructure but also focus more on how to use data to drive the execution of decisions, thereby improving the quality and efficiency of public services and bringing residents a more secure and comfortable living environment. Secondly, digital cities also focus on the sustainable use of urban resources and environmental protection. Through smart sensors and data analysis, energy usage, water quality, air quality, etc. can be monitored in real time to make timely adjustments to ensure the efficient use of resources while reducing the environmental pollution.

Digital cities also encourage citizens to participate in city management. Through various digital platforms, citizens can provide real-time feedback on issues, make suggestions, and interact with the government and other citizens, making urban management more democratic and transparent. In addition, digital technologies provide companies with new business models and innovation opportunities and drive economic growth. Digital cities create a favorable environment for entrepreneurs and investors, promoting both the research and development of technology and its practical application.

However, digital cities also face challenges. Data security and privacy protection are the most critical issues. At the same time, how to ensure that technology benefits everyone equitably and avoid the digital divide is also a difficult problem that needs to be solved. Among major cities around the world, Amsterdam is a typical representative of digital cities. Although it has experienced many changes in user interface technology, from the initial text interface to the later picture interface, and then to the final 3D simulation interface, its essence has always been an information provision and interactive center divided into categories. The naming of these sections refers to the physical urban space, and together with various other sections, they form a visual virtual city, that is, a digital city [3]. With the further development of technology and the participation of more cities, we are expected to enter a digital era that is more intelligent, efficient, environmentally friendly and humane.

3. Analysis of the advantages of combining digitalization and urban planning

With the rapid development of contemporary technology and a wave of digitalization all over the world, urban planning has also entered a new era. Urban planning has unfixed scale forms and is very complex. According to the different periods of development and economic conditions of social

change, urban planning also presents a dynamic development [4]. Combining digitalization and urban planning doesn't just represent an innovative tool. At the same time, it means the birth of a whole new way of thinking and philosophy. It emphasizes more than simple land use and physical layout but uses data as the core to achieve intelligent deployment and optimization of urban functions, resources, and activities.

3.1. Take Singapore as an example

As a cosmopolitan city-state, Singapore faces unique transportation and urban planning challenges. Due to its small and dense geographical characteristics, an effective, efficient, and safe transport system is essential for maintaining the proper functioning and development of the city. To address these challenges, Singapore has become a leader in transport technology and urban planning innovation. Especially in the application of intelligent traffic management systems. Singapore has integrated various high-end technologies to create an intelligent transport system that aims to tackle traffic congestion, improve traffic mobility, and increase road safety, as well as promote the use of public transport. By incorporating the latest technologies and management strategies, Singapore provides the world with an example of how to manage urban transport effectively, efficiently, and safely.

Currently, in most cities, there is often extensive congestion in city centers and on major roads due to the morning and evening rush hours. And in the process of congestion, it not only brings about loss of time, and pollution to the environment but even leads to the waste of fuel, which has adverse effects on the economy, society, and the environment. Singapore uses a combination of digital technology and transportation systems to drive economic incentives through Electronic Road Pricing (ERP), allowing drivers to consider traveling during off-peak hours or using other modes of transportation, thereby reducing traffic demand during peak hours. The purpose is that the government does not want people to travel by car, so it deliberately charges higher tolls to discourage people who drive by themselves [5].

In addition, in urban planning, traffic congestion during morning and evening rush hours has become a challenge faced by most cities today. As a highly urbanized country, Singapore has chosen to adopt the Expressway Monitoring & Advisory System (EMAS). It uses various sensors and camera systems to collect traffic information on the road and communicates real-time road information to drivers through various communication means to ensure smooth and efficient road traffic [6]. This system serves 10 major arterial highway corridors, enhancing the dissemination of information and improving traffic flow on the island-wide highway network. Mainly reflected in accident management and accident clean-up. In the first instance, for incident management, EMAS can detect accidents, vehicle failures, and other incidents promptly, ensuring a rapid response to restore normal traffic flow. It helps to manage traffic efficiently by providing journey time information before entering the motorway and on signs along the motorway. Secondly, in the event of a traffic accident, the EMAS system's vehicle recovery trailer works in conjunction with the police of the Land Transport Authority (LTA) of Singapore to clear the accident quickly. Stalled vehicles are towed to the nearest designated car park free of charge, minimizing congestion and inconvenience to other motorists. In addition, the LTA Traffic Police are responsible for on-site traffic control and preservation of evidence for minor accidents to reduce clean-up time [7]. All these highlight the effectiveness of the system in maintaining traffic flow and safety on Singapore's motorways.

3.2. The Case of China

In China, the digital transformation of urban transport planning is also underway and significant progress has been made so far. In Shenzhen, real-time dynamic resource allocation has been perfected, through the use of intelligent traffic sensor network construction and continuous observation, fully realized on the "people - vehicles - road - Traffic Events" characteristics of the comprehensive capture and activity trajectory of the restoration, so that the people and traffic for refined management, a comprehensive grasp of the regional traffic situation. Secondly, taking Chongqing as an example, this

city has established a comprehensive transport information platform, including three modules for data aggregation, processing, and application development. The foundation of big data and advanced information technology has improved the efficiency of transport planning and management in Chongqing [8].

The manifestation of digitalization in urban planning is not limited to transport planning. Likewise, it is more visible in the daily lives of the residents. First of all, digitization can facilitate public participation in the urban planning and design process. Through the use of online platforms and social media, the public can more easily understand the content and process of urban planning and design and express their opinions and suggestions. Secondly, digitization is also an important tool for urban planning, as it enables large, complex calculations and data analysis to be done in a short period of time. It can provide more accurate and reliable data and information to make urban planning more scientific and practical. Finally, there is digital energy. Finally, there is the aspect of digital energy. Digital technology can make urban energy use more efficient and sustainable, thereby reducing environmental pollution. The construction of smart grids can effectively manage energy distribution and reduce energy waste and environmental pollution.

3.3. Enlightenment for China

Nowadays, China is facing serious traffic problems. With the acceleration of urbanization, more and more people are pouring into the cities, resulting in increasing road traffic congestion. Especially in some first-tier cities such as Beijing and Shanghai, traffic congestion during rush hours is very serious. In addition, despite the large network of public transport systems in China, in many cities the public transport system is still under great pressure, especially the underground and buses are crowded during peak hours [9]. However, with the development of technology, the application of digitalization in the field of transport is becoming more and more widespread, such as Intelligent Transport Systems (ITS) and shared services. However, how to effectively integrate these new technological developments with the existing transport system is a huge challenge for China.

Of course, there are more challenges for China to face in the future. In response to these challenges, China is actively pursuing a full-scale digital transformation by introducing more intelligent traffic management systems to improve urban mobility and increase traffic efficiency.

In summary, the current situation of transport in urban planning in China shows that the combination of digitalization and urban planning can bring about higher efficiency in urban transport, whether in the developed city of Singapore or the diverse China. At the same time, the development of the city and the quality of life of the people have improved, but also in the future development of the challenges to be faced [8]. However, with its vast territory and diverse urban characteristics, China may require more detailed and varied urban planning strategies and solutions. But in any case, the technology that combines digitization and urban planning is key to planning for the city of the present as well as for its future development.

4. Conclusion

This article aims to explore the advantages that the successful integration of digitalization and urban planning brings to cities. This article focuses on a case study of a Singaporean city, but also analyses a selection of Chinese cities, showing the visible advantages that the combination of digitalization and urban planning can bring to a city. This article finds that these advantages are not only in the field of transport planning but also extend to improving all aspects of public life. The use of digital technology has enabled Singapore to develop an efficient traffic management system, and combining the two can bring benefits to the city, as these systems have greatly improved the efficiency of the city's traffic and reduced congestion. At the same time, China is undergoing a digital transformation, not only through the manifestation of digitalization in traffic management but also by integrating it into the daily lives of its residents, to improve the efficiency and sustainable operation of the city, as well as the quality of life of its residents. Singapore's successful experience can provide

empirical references and lessons for other cities, especially those that are facing urban transport problems and development challenges such as traffic congestion. Urban planners and policymakers can refer to Singapore's model of a digital transport city and adapt and then implement it according to their own city's situation.

Meanwhile, the potential of digital technology in urban planning is unlimited, which will help to better integrate digital technology and urban planning and face global popularization and promotion. Cities can be more proactive in adopting digital technologies to improve the efficiency of their respective management and the quality of life of their residents.

The current study is limited to analyzing the case of Singapore and some cities in China, so the conclusions drawn may have certain differences in applicability to other countries or cities. Different cities have different cultures, environments, stages of development, and so on, and all these factors may lead to different results. Despite these limitations, this study still provides some useful insights into the integration of digitization and urban planning and provides valuable reference points for future research and time. Future research should be able to expand the scope of the case studies, and by analyzing cases from different countries and cities, it will be possible to understand more comprehensively the effects of the integration of digitalization and urban planning in different urban contexts. This will make the results of the study more widely applicable. At the same time, future research could adopt more integrated research methods, including a combination of quantitative and qualitative analyzes, in order to gain a comprehensive understanding of the multidimensional impacts of combining digitalization and urban planning. This will also help to better promote the sustainable development of the city in terms of transport and the quality of life of its residents.

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