

Architectural Design Strategies for Smart Cities

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Abstract: The rapid development of science and technology in China has given rise to the concept of a smart city. A smart city has certain characteristics of integration and extensiveness, making it a popular topic for discussion. The emergence of smart cities brings about changes to people's lifestyles, promotes economic development, and results in the innovation of environment protection work. Therefore, urban buildings should be designed based on the smart city concept to better meet people's demands. Therefore, this article describes the definition of smart buildings and smart cities, the characteristics of smart city concepts, and the importance of smart city concepts in architectural design. Lastly, smart city architectural design strategies are proposed.

Keywords: Smart city; Architectural design; Elevator system

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1. Introduction

Given the rapid urbanization of China, the number of migrant workers in cities has been increasing, bringing massive human resources to the construction and development of cities. However, the rapid development of cities and the gradual increase in population have also led to some problems, including damage to the urban environment and traffic congestion, which have greatly impacted people's lives. Therefore, improving the urban environment and scientifically and rationally planning urban spaces have become a common concern of the Chinese government and relevant experts and scholars. Reasonable planning of urban spatial layout can not only meet the demand for living spaces but also allow the analysis of issues such as urban environmental protection and environmental pollution from a macro level, therefore improving the living environment of the citizens. Smart cities involve creating an excellent ecological environment with healthy citizens to achieve the common development of economy, ecology, and environmental protection.

2. Definition of smart buildings and smart cities

(1) Smart building

Smart buildings, as outlined in the "Smart Building Design Standards," are characterized by utilizing buildings as service systems rooted in diverse intelligent information types. These buildings integrate

capabilities in coordination, perception, reasoning, and storage. The primary goal is to offer individuals a harmonious, rapid, efficient, and sustainable living environment. For example, smart apartments can provide a safer and more comfortable environment for urban residents to work and live in. During the project construction, each node must be adjusted according to the latest social development to better serve the community, thereby achieving the goals of digital and intelligent infrastructure construction ^[1].

Smart building is a new type of residential building that is energy-saving, efficient, and environmentally friendly. While the functions of some ordinary residences cannot be adjusted independently, resulting in a large amount of energy and resource waste, smart buildings have complete communication functions and power functions. Various key parameters can be set in advance to achieve high efficiency, energy conservation, and environmental protection. A smart building design should include a comprehensive power distribution system. This system should seamlessly integrate the installed flow and total flow of the weak current system throughout the entire building and enable effective adjustments to the current system.

(2) Smart city

As a new way of urban construction, a smart city is not just a perception or a form of analysis, it should also be integrated into the core information of urban operation and management. Smart cities can not only save resources but also reduce management costs. The application of intelligent systems can address the actual needs in environmental protection, civil engineering, information security, industrial production, commercial services, urban and service engineering, etc ^[2].

3. Characteristics of smart city concepts

(1) Diversity

As people's quality of life continues to improve, the demand for modern services gradually increases. The concept of smart cities coincides with people's daily needs and can provide technical support for the development of many industries. It can also provide new ideas for architectural design. Therefore, enterprises and the government must continue to promote research on smart concepts and apply them to urban architectural design to improve the overall quality of urban buildings and better meet the people's needs.

(2) Environmental protection

The surrounding natural environment should be taken into account when constructing urban buildings to minimize the impact on the environment, thereby better adapting to the needs of urban development while achieving energy conservation and reduced emissions. Therefore, in urban development, in addition to making the citizen's lives easier, environmental protection should also be considered. For example, advanced technology and environmentally friendly materials should be used, and environmental friendliness should be emphasized when formulating construction plans ^[3].

(3) Intelligence

The construction of smart cities requires advanced technology. Therefore, information technology should be used in urban building design, so that the design data can be screened properly and the needs of residents can be well-understood, resulting in better construction work. Besides, it is also necessary to establish a platform for real-time communication with the construction team, so that problems arising during the construction process can be dealt with promptly, thereby improving the efficiency of construction and ensuring that the project can be completed on time.

(4) People-oriented

In smart city construction, people-oriented designs are advocated in the design of urban buildings, with an emphasis on providing people with a living experience and care. Therefore, the impact on residents' lives must be fully considered in processes like choosing the construction materials and protecting the surrounding environment. It is important to minimize the impact on the surrounding environment while ensuring the quality of the construction, so as to create a safe and comfortable living environment for residents. By doing so, the idea of being people-oriented idea be fully manifested ^[4].

4. The importance of smart city concepts in architectural design

(1) Promoting sustainable development of the industry

The demand for urban services has been increasing in view of urbanization. If traditional building construction methods are still used, not only will it not be able to solve the actual needs of residents, but it will also affect the development of various industries. Therefore, it is necessary to adopt smart city concepts in building construction, which can not only accelerate urban development and construction but also make building design much more efficient. In this way, the quality of architectural design will be improved, further enhancing the city's image and promoting the development of urban construction.

(2) Improving architectural design

Information technology must be fully utilized to break through traditional architectural design methods and overcome the shortcomings of traditional architectural design. Information technology enables designers to have a more detailed and accurate understanding of relevant information, allowing them to discover existing problems and adjust their design plans to ensure the smooth progress of the construction. It is necessary to utilize scientific and technological means and formulate feasible construction plans on the basis of protecting the environment to ensure the outlook and practical value of urban buildings ^[5].

(3) Expanding communication channels

Architectural design is at the forefront of a city's development, thus it is ever-evolving. Therefore, architectural designers must always keep abreast of the latest technologies and theories. As the concept of smart cities continues to develop, staff engaged in architectural design should conduct in-depth research on various materials and communicate with other practitioners through social media platforms to make further progress, learn from each other, and promote the development of urban construction in China.

5. Architectural design strategies for smart cities

(1) Big data security system

When building smart cities, in addition to meeting people's aesthetic and living needs, safety issues also need to be taken into consideration. Smart cities are built on the basis of big data. Therefore, applying big data technology to the security system can increase the safety of building design and provide more safety measures for buildings. Big data technology should be used to strengthen the safety facilities and safety system to ensure the safety of houses. Secondly, the surroundings of the building should be surveyed with advanced technology so that potential dangers, accidents and high-risk areas can be identified. At the same time the surrounding environment should also be monitored constantly. In this case, big data can be used to analyze sounds, images, etc. in surveillance videos. People and vehicles

entering and exiting the building should also be registered into the system to eliminate potential dangers. When an emergency occurs, an alarm can be issued quickly to alert the residents ^[6].

(2) Intelligent elevator system

The use of elevators has been increasing along with the heights of buildings. The control methods of elevators have become increasingly advanced, making people's lives much more convenient. With smart elevators, the speed of the elevator, the door motors, and temperature of the motors can be monitored by installing sensors in the elevator. Relevant data can then be transmitted to the terminal equipment through cloud computing, thereby avoiding congestion of elevators during peak hours.

Furthermore, this system can monitor the operational status of elevators. By utilizing an intelligent information circulation system, it imports relevant parameters of the elevator's operational status into the system's dynamic model. Through continuous monitoring and calculations, it can identify the operational status of the elevator and pinpoint any issues with the equipment. This enables timely repairs and maintenance, ensuring the safety of users. The widespread adoption of smart elevators not only enhances building utilization rates but also reduces wait times for elevators, providing robust support for the development of smart cities and thereby enhancing social and economic benefits.

(3) United cloud computing

The integration of cloud technology and smart city concepts is an important aspect in the current urban planning and development of China. Cloud computing has been used more extensively in urban construction, garnering widespread attention. However, it is necessary to build a complete cloud computing platform to collect, organize, classify and screen relevant data, to make the data acquisition process more effective and efficient. Secondly, research should be conducted on the combination of cloud computing and smart buildings to design new products suitable for building smart cities. An urban architectural design data sharing system based on cloud computing should be established for designers to keep up with the latest technologies and trend in urban development. In this way, designers can integrate smart city concepts into urban architectural design under realistic conditions and continually come up with innovative solutions to meet urban development needs, further contributing to the evolution of smart cities.^[7]

(4) Intelligent parking system

As the number of household cars continues to increase, the problem of insufficient parking spaces has become increasingly prominent. Therefore, this makes parking spaces a very important issue in urban design. Designers should not only address the need for additional parking spaces but also prioritize the vehicles themselves. Leveraging smart terminals to alter a vehicle's driving trajectory not only saves time in finding parking spaces but also enhances overall parking convenience ^[8]. In a smart parking system, users can reserve parking lots, pay parking fees, and plan their routes through their mobile phones. Its operation involves three major platforms: positioning, background management, and smartphone terminals. The system comprises three key platforms: background management, positioning, and smartphone terminals. Geomagnetic detectors in the background management system detect parking space usage and transmit data on vacant parking spaces. This enables efficient allocation of parking spaces and vehicles by accurately assessing vehicle access conditions, ultimately reducing parking time ^[9]. The positioning system utilizes a positioning engine and server to access the internal status of the parking lot. This enables real-time information exchange, with relevant updates sent to the user's mobile phone, allowing them to stay informed about the parking lot situation in real time. The third platform involves smart terminal applications that offer users services like parking space inquiry

and reservation through a mobile application. After the user stops, the application transmits location information to the management platform, providing added convenience for users during the parking process.

(5) Smart home design

The current application of the Internet of Things (IoT) is no longer limited to large-scale buildings but also smart homes. Since traditional architectural design can no longer meet people's needs, architectural design needs to be carried out based on the IoT to better adapt to today's social trends. The IoT can create a monitoring platform for homes, ensuring homeowner safety. For instance, when someone rings the doorbell, a doorbell camera scans the visitor's face, collects information, and sends it to the homeowner's phone^[10]. Additionally, IoT-based devices for light and body temperature sensing can be implemented. Designers can use Internet technology to analyze users' real needs based on the urban environment, enhancing system flexibility and coordination. This approach aims to create a more comfortable living space and provide residents with high-quality life services.

6. Conclusion

In short, to improve the overall level of architectural design in China, designers should not only adhere to the idea of smart cities but also make full use of information technology in their designs. In this way, the functionality and aesthetic of the building can be ensured. Additionally, designers should consider residents' needs and incorporate available technologies, fostering the gradual development of urban buildings towards informatization and intelligence. This contributes to the ongoing progress and transformation of the construction industry.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Chen J, Huang S, 2023, Discussion on Field Technology for Census of Building Attributes in Smart Cities - Taking Langfang City as an Example. *Anhui Architecture*, 30(8): 186–187.
- [2] Guan J, Guan Q, 2022, Application and Development of Integrated Internet of Things and Edge Computing Technology in Smart Buildings in Smart Cities. *Intelligent Buildings and Smart Cities*, 2022(11): 168–172.
- [3] Yang C, 2023, Smart City Construction, Architecture and Decoration Empowered by Digital Twin Technology. *Building Materials and Decoration*, 19(17): 37–39.
- [4] Chen S, 2021, Research on Application Countermeasures of PPP Financing Model for Sponge City Construction Under the Background of Smart Buildings. *Smart Buildings and Smart Cities*, 2021(3): 70–71.
- [5] Jia N, 2022, Application of Building Mechanical and Electrical Engineering Technology in Smart Cities. *Science and Technology Innovation and Application*, 12(26): 164–167.
- [6] Zhu X, 2022, Development and application of EPS platform in smart city building census. *Surveying, Mapping and Spatial Geographic Information*, 45(10): 154-156.
- [7] Peng Y, 2021, Research on Smart Construction of BIM Technology in Prefabricated Buildings in the Context of Smart Cities. *China Construction Metal Structure*, 2021(7): 80–81.
- [8] Yu X, Zhou L, 2023, Characteristics of Smart City Concepts and Their Application in Urban Architectural Design.

Brick World, 2023(5): 23–25.

- [9] Zhu X, 2022, A Brief Analysis of Methods for the Penetration of Smart City Concepts in Residential Architectural Design. *Intelligent Buildings and Smart Cities*, 2022(1): 116–118.
- [10] Han L, Cai Q, You H, 2022, Analysis of Urban Architectural Design Issues Under the Concept of Smart City. *Architecture·Building Materials·Decoration*, 2022(5): 157–159.

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