

ORIGINAL RESEARCH ARTICLE

Future of urban architectural design based on the concept of smart city

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ABSTRACT

Urbanization is an unstoppable global phenomenon, with over half of the world's population now residing in cities. This rapid urban growth presents both opportunities and challenges for architects and city planners. The concept of the smart city has emerged as a promising approach to address these challenges and transform our urban environments into more efficient, sustainable, and livable spaces. Smart cities leverage advanced technologies to enhance various aspects of urban life, including transportation, energy management, healthcare, and public services. The quality of urban architectural design directly determines the city's development and the people's quality of life. Today, the concept of a smart city puts strict requirements for urban architectural design. To fully meet the actual needs of social development, it should be reasonably applied to urban architectural design to provide strong support for architectural design. Based on this, this article mainly analyzes the key points and required conditions of urban architectural design under the concept of a smart city, and finally puts forward some effective application countermeasures.

Keywords: smart city; urban; architectural design; design performance

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1. Introduction

Smart cities have the characteristics of intelligent services and rich information resources, which can be reasonably applied to urban architectural design to provide residents with a warm and comfortable living environment^[1]. The sustainable development of society and economy has prompted people to have a deeper understanding of the concept of smart city, and it is gradually being integrated into the overall construction and design of the city while high-tech benefits human beings, there are also many drawbacks^[2,3].

The general idea of public facilities design under the concept of smart city is to use high technology to realize the intelligence of all aspects of citizens' life, truly make the design of urban public facilities people-oriented, green and environmental protection, and realize the sustainable development of urban facilities and resources^[4]. Generally speaking, the design of public facilities under the smart city concept includes the design of road traffic facilities, medical facilities, educational facilities, cultural entertainment and tourism facilities^[5]. The design of these facilities takes into account both their technical nature and the artistic and cultural qualities necessary for modern urban facilities^[6-8]. These facilities are combined by various sensors and signal systems through the internet and Internet of Things technologies to form an intelligent and integrated urban application system, and finally realize a highly coordinated and well-interacted customized

urban public facility system, which truly improves the city's experience of all aspects of residents' life^[9]. At present, the technical and artistic integration of facility design is not satisfactory. Although many urban facilities have been put into use, they are very poor in appearance and humanization^[10]. Ideal, resulting in a relatively low utilization rate, resulting in a large amount of capital investment and a serious waste of technology research and development costs. The design and research of public facilities under the background of smart city is not only to explore the new direction of future development of the city, but also to inject vitality and vitality into economic construction.

In practical work, high-tech and urban architectural design should be deeply integrated, and the concept of smart city should be integrated into it to promote the development of cities in a diversified direction. Therefore, relevant personnel should fully clarify the key points of the smart city concept in urban architectural design, and conduct in-depth analysis of its application details in urban architectural design, to provide a strong guarantee for its development.

2. The key element of smart city architectural design

2.1. Environmental protection

Under the concept of smart city, urban architectural design needs to attach great importance to the concept of environmental protection development, and reasonably apply environmental protection to the design scheme, so that it can fully meet the actual needs put forward by urban development, and develop in the direction of green, energy saving and emission reduction, to provide strong support for promoting the construction of smart cities^[11,12]. Therefore, it is necessary for architects to abide by the concept of "people-oriented" in the process of designing urban buildings, and organically combine convenient and intelligent services in smart cities with green and environmental protection. Analyze the relationship between them, reasonably apply leading technologies, and formulate a scientific, reasonable and comprehensive construction plan through construction raw materials, building modeling, construction and many other aspects, and at the same time, it should be combined with the current regional weather conditions, and actively refer to the leading design scheme and design concept as shown in **Figure 1**.



Figure 1. The combination of intelligent services and green and environmental protection.

2.2. Diversity

The level of science and technology is gradually improving. In this environment, people's way of life and living environment have undergone tremendous changes, and the value of modern service facilities has been demonstrated^[13]. However, in the process of urban architectural design, the planning and design modes of

different regions are not very different, and the architectural design of different cities shows the problem of homogeneity. Based on this, the author makes a summary based on practical experience, introduces intelligent concepts and related technical means, improves the wisdom of urban architecture as much as possible, and comprehensively improves the application level of urban architectural design, so that it can meet the needs of the people. For example, the owner can introduce an intelligent control system in their own home. If there are foreign visitors but the owner is not at home temporarily, the owner can obtain specific information in real time by ringing the doorbell, so as to know whether there is a visitor in the home; or add a camera to the doorbell, which can realize remote video communication with the owner. Therefore, relevant personnel should conduct in-depth research on it, strengthen the rational application of smart city concepts in urban architectural design, and fully reflect the intelligent characteristics of urban architectural design itself, in order to make the final architectural design meet the needs of the people. Demand continues to grow as shown in **Figure 2**.



Figure 2. Diversified buildings in smart cities.

3. Necessary conditions for the development of urban architectural design

3.1. High-tech support is required

In recent years, the quality of life of the people has been significantly improved, and strict requirements have been put forward for the living environment and living quality^[14]. Therefore, urban architectural design should fully meet the requirements of the people for functionality and comfort as shown in **Figure 3**.



Figure 3. The high-tech for effect of “smart city”.

3.2. Architectural designers with enhanced comprehensive literacy

Architectural designers, as direct participants in urban architectural design, their own design concepts and design thinking directly affect the result of architectural design to a certain extent. If the architects themselves lack the leading urban architectural design concepts and related design work experience, the urban architectural design will not be able to fully meet the current sustainable development of the city, and at the same time, it

will not be able to fully meet the actual needs of the people. Therefore, architectural designers should continuously improve their comprehensive quality and professional skills, actively use the concept of smart city to conduct comprehensive analysis and research on architectural design, and organically combine modern information technology with urban architectural design.

4. The concepts and application of smart city in urban architectural design

The core of smart city architecture is to endow life with digital characteristics and improve the humanization level of various types of buildings, that is, to add a set of nervous systems on the basis of existing buildings, so that they can sense external factors and make flexible adjustments. Relying on scientific and technological means to create convenience for people's lives. The smart city design concept focuses on the theme of "flexibility, safety and efficiency", so as to create an excellent urban living environment. Among them, flexibility refers to the city's ability to deal with various emergencies, and timely and scientific adjustment strategies can be adopted according to on-site resources^[15].

4.1. Improve designers' awareness of smart cities

In the process of urban architectural design, in order to effectively integrate the smart city design concept, first of all, designers need to improve their own understanding of the smart city, and rationally integrate and apply the smart city concept during design. At the same time, it is also necessary to provide learning opportunities for relevant designers to learn domestic and foreign smart city concepts through exchanges and communication on various platforms, find practical cases of applying smart city concepts, conduct in-depth analysis and understanding of them, and combine them. Its own design cases carry out design innovation, so as to improve the scientificity and rationality of urban architectural design as shown in **Figure 4**.



Figure 4. The improve designers' awareness of smart cities (Baghdad).

4.2. Application of building safety design

The safety is the primary premise in determining urban construction. In addition to human factors, security needs should also fully consider property and other aspects. The continuous development of modern high-tech has enabled urban architectural design to achieve more breakthroughs in many aspects, but the accompanying safety hazards, such as building material poisoning, are not uncommon, resulting in dizziness, breathing difficulties and other symptoms of occupants. After the introduction of the smart city concept, it can provide more support for urban architectural design, taking into account the requirements of safety and reliability. From the perspective of external architecture, in terms of color, shape, etc., materials are required to have excellent light absorption, and buildings in the same area should maintain specific intervals. In addition, the design parameters can be reasonably optimized to make the spacing between buildings more scientific and ensure that the building can be fully illuminated, as shown in **Figure 5**.



Figure 5. Schematic diagram of building lighting (Baghdad).

4.3. Building environmental protection

Energy conservation and environmental protection is one of the key development goals of the country, and it is also the main development concept of the society. In the process of architectural design, the concept of environmental protection design has gradually become one of the key design concepts. In the process of integrating and applying the concept of smart city and architectural design, a series of contents such as air-conditioning application and lighting application in the design link have different depths. Therefore, the environmental protection effect of architectural design application is improved and intelligent and automatic system equipment is adopted for fine adjustment according to the overall application situation **Figure 6**.



Figure 6. Building environment protection (Baghdad).

4.4. Application of internet of buildings smart system

Under the influence of the development of the current social environment, the network is gradually integrated into the overall social environment. Based on the network environment, the Internet of Things application technology has been widely used and recognized by people. The continuous development and progress of the Internet of Things industry have promoted the relevant content of smart city construction, making the construction era move towards renewal and development. In the stage of application of the smart city concept for architectural design and implementation, the Internet of Things technology can be appropriately combined and applied.

In the actual design process, the Internet of Things technology is fully applied so that the building occupants can rely on the Internet of Things environment to observe the basic situation of the family, such as the doorbell. The system can transmit information so the user can call the camera equipment to the visiting. For simple observation, personnel can communicate with visiting personnel through remote voice dialogue.

At the same time, it can also rely on the Internet of Things technology to design some sensing devices to be applied to indoor spaces to form a temperature sensing system and a sensing system. It can be automatically adjusted, as shown in **Figure 7**.



Figure 7. Schematic diagram of IoT technology.

4.5. Application of big data security system

In the application process of the smart city concept, through the establishment of the big data security system, it can play a good intelligent effect and security protection effect in the application process of urban architectural design. In addition to using traditional security equipment as the basis, through the concept of smart city buildings, big data security systems can also be integrated into the interior of building security equipment. With big data technology as the basic platform, relevant personnel can investigate and analyze potential safety hazards in the surrounding environment. Scientific and reasonable location selection and performance selection for security devices, and can also automatically find and analyze various hidden dangers, improve the overall data analysis accuracy and efficiency, and allow end users to be under the supervision and maintenance of the big data system at all times. The environment is shown in **Figure 8**.



Figure 8. Smart city intelligent security system.

5. Coordinated development of smart city planning management

5.1. Improve smart city planning management mechanism

In urban planning and construction, we should pay attention to the key role played by urban planning management, increase the investment of various resources in urban planning management, and organize relevant professional and technical personnel to actively participate in the investigation and analysis of urban planning and construction, aiming at Based on the current situation of urban planning management, we should optimize the urban planning management plan based on relevant national regulations, give full play to the

effect of industry norms, and continue to carry out urban planning management work. In addition, it is necessary to implement urban planning management plans, innovate the urban planning management mechanism, identify deficiencies during the operation of the mechanism, and improve the standardization and rationality of urban planning management processes and standards to ensure the operation of the urban planning management mechanism. Effectiveness, implement various responsibilities, and promote the improvement of urban planning management efficiency. In addition, it is necessary to create a complete supervision and management mechanism and evaluation and review mechanism to ensure the meticulousness, standardization and transparency of urban planning management work, and appropriately expand the scope of urban planning management supervision, guide urban residents to actively participate in urban planning management, and provide urban planning and provide suggestions for urban architectural design for reference by designers^[16].

5.2. Innovative smart city planning management model

When carrying out urban planning work, we should follow the development situation of the times, formulate urban planning plans based on the current status of urban socio-economic development and the actual ecological environment, adhere to the concept of sustainable development, and innovate the traditional urban planning management model^[17]. In urban construction and development, it is necessary to pay attention to ecological environment protection and management, and effectively integrate traditional urban planning concepts with modern urban characteristics. At the same time, focus on demonstration projects, and fully demonstrate the historical and cultural characteristics of the city by integrating various urban characteristic elements. In many urban constructions, local historical and cultural elements can be integrated into it, and refined designs can be carried out accordingly to enrich urban cultural functions. At the same time, we vigorously develop urban tourism resources and promote the development of urban tourism. In addition, it is necessary to rationally plan the urban environment and increase the urban green area. In the production and development of all walks of life in our country, the concept of sustainable development should be vigorously promoted. In urban planning, we should strictly follow the regulations of relevant departments, rationally utilize various resources within the city, strengthen technology sharing and innovation, and actively promote urban development. Plan to develop in the direction of low carbon and energy saving, improve the level of urban planning and construction, and provide a basis for urban architectural design and construction.

5.3. Achieve sustainable planning

When carrying out urban planning and design work, it is required to use the concept of sustainable development as a guide. Especially in urban planning, the content involved is diverse, including urban architectural design, infrastructure design, road engineering design, etc., as mentioned above. In factor planning and design, not only professional design theoretical knowledge is required, but also the value of urban planning must be maximized^[18]. As the contradiction between urban socio-economic development and the ecological environment becomes more and more prominent, urban planning and management should proceed from the perspective of sustainable development, strengthen guidance, properly coordinate the relationship between different disciplines, and focus on the problems encountered in urban planning and management. The complex problems encountered shall be properly solved in strict accordance with laws, regulations and technical measures to promote the improvement of urban planning management level.

5.4. Promote the integration of smart city planning and architectural design

In the process of urban building design, we should first analyze the actual urban planning and layout, and then determine the functional requirements of the building, and carry out targeted design accordingly to ensure the practicality and safety of the building on the premise of meeting the functional requirements of the urban building^[19]. Optimize the allocation of various resources in building construction and promote the improvement of urban planning and management levels. There is a mutually reinforcing relationship between

urban planning management and urban architectural design. In terms of urban planning, it is necessary to analyze the actual situation of construction project design, and comprehensively consider the surrounding resources and environment to ensure the quality of construction projects, improve the aesthetics of the building appearance, and improve urban style, showing urban cultural characteristics through urban architecture. In the new era, my country actively advocates green building planning and design, and the interaction between urban planning and urban architectural design has been significantly enhanced. When carrying out urban architectural design, renewable resources should be rationally utilized to improve the aesthetics of construction projects and enrich building functions create a good usage environment for users.

6. The impact of smart city planning on urban architectural design

6.1. Iconic architectural design

The city has unique historical conditions and characteristics, and has built landmark buildings. Through landmark buildings, the personality and connotation of the city are displayed. Landmark buildings can serve as city image business cards and can be associated with the city for the first time. Generally speaking, landmark buildings have historical factors, participate in urban construction and development, and reveal the vicissitudes of urban development. When optimizing the design of landmark buildings, transportation convenience should be fully considered to prevent the design and construction of landmark buildings from harming urban traffic and affecting people's travel. Landmark buildings have become important buildings in the city, providing convenience for tourists to visit and appreciate. Therefore, we must pay attention to transportation planning around landmark buildings.

6.2. Historical building design

The historical connotations, and the changes and development of cities will leave historical traces on the architecture. Through the architectural style and appearance, the urban development process can be recorded. When the historical characteristics of a building are significant, the research value is very high, and protection awareness must be strengthened and various protection measures must be implemented. Government departments attach great importance to the historical value of buildings. During the urban planning process, scientific measures are adopted to effectively protect historical buildings to avoid damage and impact on urban planning. The long-term development of the building contains rich history and culture. Therefore, historic buildings have very high historical value and are rich in artistic value, research value, and tourism value. When planning and designing urban buildings, in-depth analysis of architectural design factors is necessary in order to improve the inclusiveness of the construction industry. Scientific measures are adopted to integrate regional culture and national culture to display national history and culture.

6.3. Residential architectural design

In urban construction and development, we must pay attention to the value and role of people. The process of urban modernization is accelerating, which has correspondingly increased the urban population and intensified the sense of urban congestion. People have begun to pay attention to urban living issues. Currently, residential buildings are mainly residential areas, equipped with cultural facilities and basic service facilities for daily life to enhance the quality of life. In urban planning and construction, we must pay attention to residential building issues. When optimizing the design of urban buildings, the following should be taken into consideration: First, in residential buildings, public facilities should be optimally configured to meet the needs of daily life, including property departments, shopping malls, schools, etc. Second, for residential buildings, it is necessary to ensure the comfort of the living environment, pay attention to issues such as greening, ventilation, environment, and lighting, maintain the rationality of the content, and at the same time improve the comfort of residential buildings. Third, maintain the safety of living quarters and reduce the rate of safety

accidents. Regarding the quality of residential buildings, they should meet application requirements, increase earthquake resistance and safety guarantees, and maintain the safety of the living environment.

6.4. Clarify the direction of urban planning and design

In the development of urban modernization, the direction of urban planning and design, that is, setting goals in advance, can implement various management goals and models. Clarify the direction of urban planning and design, and do a good job in project planning and design. According to the regional economic level and geographical resources, the quality of life and economic level can be guaranteed. When planning scenic spots in the city, it is necessary to clarify the scenic spot management plan, transportation facilities, living facilities, etc. When carrying out urban planning, the actual situation of the scenic spot should be combined to comprehensively improve the planning and design effect. At the same time, the direction of urban planning and design will also be affected by urban planning management. Only by ensuring the coordinated progress of the two can the steady development of the city be promoted.

6.5. Clarify urban planning and design principles

In order to carry out urban planning and design work smoothly, the principle of standardization must be followed. When planners violate this principle, they cannot take into account urban location and geological conditions in planning and design work. Due to the large differences in the development direction and economic level of different cities, during the urban planning and management period, the adverse effects caused by planning and design should be reduced. During the urban planning management and design period, relevant design plans will be prepared based on actual conditions. At the same time, planning and design must match urban economic development, make urban layout and urban development adapt to each other, optimize the allocation of urban resources, and achieve scientific development.

7. Conclusion

The concept of smart city is the key to help urban development, and can provide reliable guidance for urban architectural design. From the perspective of practical application, the basic premise should be technical feasibility, and the concept of energy saving and environmental protection should be integrated on this basis. Based on intelligent technical means, coupled with the flexible use of various high-tech equipment, it provides support for urban architectural design, expands urban functions and improves urban comfort. To sum up, at this stage, the organic combination of smart city concepts and modern urban architectural design has become an inevitable trend in the development of architectural field. Through the combination of the two, it can be found that it can provide certain convenience for the people's daily life. Therefore, designers should attach great importance to the key points of smart city architectural design, and strive to build a comfortable and warm living environment for the people.

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Conflict of interest

The author declares no conflict of interest.

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