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# Research on Chinese Urban Planning Strategy Against the Background of Smart City Construction

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**Abstract.** With the support of national policies, the construction of smart cities in China is booming, there is a greater impact on the urban spatial cognition, planning and design methods, and program implementation evaluations in the urban planning process. Therefore, from the three aspects——thinking, technology and management, the urban planning strategies such as “crowd funding planning”, “data precision design”, and “dynamic process planning” are proposed.

**Keywords:** smart city construction; urban planning; “crowd funding planning”; “data precision design”; “dynamic process planning”.

## 1. Introduction

The “smart” in Smart city was first applied to the urban context as the “smart growth” movement that emerged in the United States in the late 1990s. In 2008, IBM put forward the concept and plan of “Smart Earth”, and explained the “smart city” —— “make full use of information and communication technology to sense, analyze, and integrate the key information of the core system of urban operation, to respond intelligently to various needs including people's livelihood, environmental protection, public safety, urban services, industrial and commercial activities, and creates a better urban life for mankind, so as to create a better urban life for mankind” [1]. It makes the “Smart city” link to the development of future cities and was widely disseminated, triggering an upsurge in the construction of “Smart City”.

Under the background of the information age, the concept of smart city provides a new vision for urban planning and development. A new round of urban planning based on the concept of smart city and information technology becomes an important way for cities to optimize their spatial structure and achieve planning innovation [2]. Through combing the status quo of smart city construction in China, the impact of smart city development on urban planning is analyzed, and urban planning strategies against the background of smart city construction are discussed.

## 2. Smart City Construction in China

### 2.1 National Policies Promote Smart City Construction

In 2012, the Ministry of Housing and Urban-Rural Development of China issued the “National Smart City Pilot Management Measures”, emphasizing that smart cities are a new urban planning and construction mode, this new construction mode comprehensively uses information technology, integrates business resources, and coordinates management applications. In 2014, the State Council of China issued the “National New Urbanization Plan (2014-2020)”, this policy officially introduced the construction of smart cities into planning.

Policies play a decisive role in urban planning. With the support of national policies, many cities regard the construction of smart cities as their future development priorities [3]. The construction of smart cities in China has formed an overall construction pattern blooming everywhere, in addition to the three major economic zones in the Bohai Rim, the Yangtze River Delta, and the Pearl River Delta, the construction of smart cities in the central and western regions such as the Chengdu-Chongqing Economic Circle, Wuhan City Cluster, Poyang Lake Ecological Economic Zone, and Guanzhong-Tianshui Economic Circle has shown a good development trend.

### 2.2 Current Status of Smart City Construction in China

China makes many achievements in the development of smart cities, but there are also certain problems.

The main achievements are that the concept of smart city development has become a consensus in the field of urban planning, China has the largest number of smart city pilots in the world, the level of urban wisdom and digital management has been greatly improved, and some leading companies have reached the international leading level in model innovation [4].

There are three main problems. First, the asymmetry of information and unbalanced access to resources among different regions, groups of people, and departments hinder the integration and sharing of information technology. Second, due to the lack of national overall planning, different regions and departments have different levels of understanding of smart cities, and they do not fully understand and master the process and components of smart city construction. Third, the current Chinese smart city construction is mainly led by the government, it makes the management mechanism too simplistic, resulting in the lack of diversified monitoring and evaluation subjects in the process of smart city construction.

## 3. The Impact of Smart City Construction on Urban Planning

### 3.1 Smart City Construction Changes the Perception of Urban Space

The "Internet +" in the information age realizes the instant connection of technology (Internet technology, cloud computing, Internet of Things and big data technology, etc.), scenarios, and participants (people, things, institutions, platforms, industries, and systems). Relying on the Internet, a virtualized network space with multiple functions such as commodity trading, social communication, leisure and entertainment, business office, resource sharing and storage is formed, it results in a greater impact on the urban spatial structure of commerce, industry, and public service facilities [5]. Therefore, the construction of smart cities will inevitably have a huge impact on traditional urban planning with physical space as the object of work.

Urban space is one of the core elements of urban planning. In the industrial age, due to the dependence of economic operations on urban space, "the process of agglomeration and diffusion follows the law of decreasing spatial distance". In the information age, the Internet greatly improves the location freedom and spatial interaction of various functions of the city, thereby weakening the relationship between spatial interaction and distance [6].

For the development of urban space in the information age, academic circles have two opinions —the decentralization school and the reorganization school. The decentralization school believes that in the Internet era, economic and social activities increasingly rely on information networks, the influence of location is weakened, the development pattern of the city circle is broken, and a multi-center network development pattern is formed. The reorganization school believes that the impact of information technology on urban spatial organization strengthens the aggregation and high-intensity development of the central area, such as improving the accessibility of the CBD by improving the transportation system [466].

### 3.2 Smart City Construction Reforms Urban Planning Methods

From the perspective of development and evolution, urban planning can be roughly divided into three stages.

The first stage of urban planning focuses on urban material forms and buildings, traditional architectural drawing methods are adopted [8]. Although statistical analysis is used to assist urban planning and design, it is mostly based on linear or quadratic models to calculate and analyze design elements, and it is not accurate and efficient. The second stage of urban planning focuses on urban structure and organization8. With the rise of computer-aided design (CAD), geographic information system (GIS) and quantitative geography, urban planning model systems, urban

operation simulation models and urban traffic simulation models are emerge, these models undoubtedly promote the effectiveness of planning. However, limited to traditional technologies and methods, it is impossible to effectively analyze and process massive and complex information and data, as a result, decision makers and planners can not effectively identify the complexity, diversity, and uncertainty of the urban system, this affects their predictions of urban development goals and deployment of urban development strategies, thereby reducing the scientific of urban planning decision-making. The third stage of urban planning focuses on urban humanities and public participation [8], modern information technologies such as big data, cloud computing, Internet of Things, and geographic information integrate massive and diverse data are comprehensively applied. Through the analysis and mining of big data, the public's diversified participation is implemented in the stages of on-site exploration, plan design, and plan implementation, making the urban planning plan more scientific and reasonable.

The first two stages of urban planning are the incremental planning paradigm from being dominated by expert experience to being influenced by the measurement revolution, and the latter stage of urban planning is the communication and cooperative stock planning paradigm that focuses on the return of humanism influenced by the construction of smart cities.

### 3.3 Smart City Construction Improves Urban Planning Process

Urban planning is a process with stages including investigation, analysis and forecasting, proposal of solutions, performance of results, implementation and evaluation. Therefore, urban planning has two attributes, one is the technical “blueprint”——the planner’s ideal assumption of the urban planning plan, the other is the evaluation of the implementation of the urban planning plan——the effect of the implementation of the urban planning plan after considering the interests of the main bodies in the city.

The previous urban planning plan, after passing the review, the actual effect of the implementation does not need to pass any evaluation procedures, so the planners mostly make “bold predictions” and qualitative judgments in pursuit of the grand blueprint and ultimate goal. Some planning goals lack quantifiable realistic data as the support, and lack the process of scientific derivation, as a result, planners can not directly understand the factors and conditions that affect the implementation of the plan, and it is difficult for them to grasp the process and law of the transformation of planning goals into decision-making and implementation behaviors, making the planning goals lack of rationality.

The application of big data and the construction of information system platform in the development of smart cities provide conditions for quantitative analysis of urban planning implementation evaluation [9]. Planners can judge the implementation effect through the comparative analysis of the current implementation situation and the planning index system [10], find the problems of the urban planning plan and implementation, and put forward suggestions for planning optimization, so that the planning can be continuously improved, and the implementation of the plan can be promoted [11].

## 4. Urban Planning Strategy Against the Background of Smart City Construction

### 4.1 Urban Planning Thinking Strategy: From "Elite Planning" to “Crowd funding Planning”

Urban planning is always regarded as the professional action of planners (“elite planning”), planners rationally formulate action plans to achieve planning goals through different auxiliary decision-making techniques. They pay more attention to the improvement of the physical space environment and the optimization of the urban spatial structure, and ignore the effective participation of the public and enterprises and other urban entities. It is easy to cause the planning schemes to fail to meet the demands of the people, and the feasibility and effectiveness of planning

implementation are poor, so the urban planning scheme is a blueprint-style depiction of a beautiful vision.

With the improvement of the city's economic level and the advent of the information society development model, the material and space problems faced in the past have been solved, the goal of planning turns to satisfy the people's pursuit of a better life, and the research content of urban planning becomes closely related to the living space of urban residents. It is necessary for China's urban planning to break through the original urban spatial structure planning model, and to emphasize the coordination of macro urban development and micro residents' daily life in the planning.

So, the thinking mode of urban planning shifts from "elite planning" to "Crowd funding planning". "Crowd funding planning"——urban planning with public participation, is an adaptation of existing planning ideas and an important direction for future urban planning transformation [12]. On the one hand, the sharing concept of smart city construction promotes the sharing, integration, mining and release of data in different industries and departments [13]. This makes urban planning shift from the professional technical field to the public field [14], and improves public participation in the planning process. On the other hand, the construction of the Internet of Things, big data and information platform in the construction of smart cities can integrate the expression, collection and integration of public opinions [15], and can quickly reach a consensus of public opinion. This enhances the public's ability to monitor and influence the urban planning decision-making process, and promote the transformation of planning preparation methods and planning decision-making paradigms.

The research team of Professor CHAI Yanwei, School of Urban and Environmental Sciences, Peking University, is committed to researching human-oriented smart city planning and management based on temporal and spatial behavior [16], and innovatively proposes a new framework for smart city planning and management based on urban residents' behavior rules and decision-making mechanisms [17] (Figure.1). First, large amounts of dynamic individual temporal and spatial behavior data with fine spatial information and various behavioral correlations, such as mobile phone call data, public transportation cards, parking cards, bank card data, electronic questionnaires, and social network data, are mined to analyze the decision-making mechanism of urban residents' daily activities and travel [18], and identify the constraints of urban residents' behavior, allowing the public to directly or indirectly participate in urban planning. Then the collected multi-source data is integrated, visualized statistical analysis, spatial analysis and other means are used to analyze the interaction mechanism between urban space and residents' behavior, and simulate different planning schemes and their response to urban residents' behavior at various stages of implementation. That can provide decision-making support for the evaluation and selection of planning schemes, and can make up the shortcomings of traditional urban research, such as incomplete analysis of urban residents' activity-movement needs and insufficient understanding of behavioral decision-making mechanisms, and promote the scientific and human-oriented urban planning.

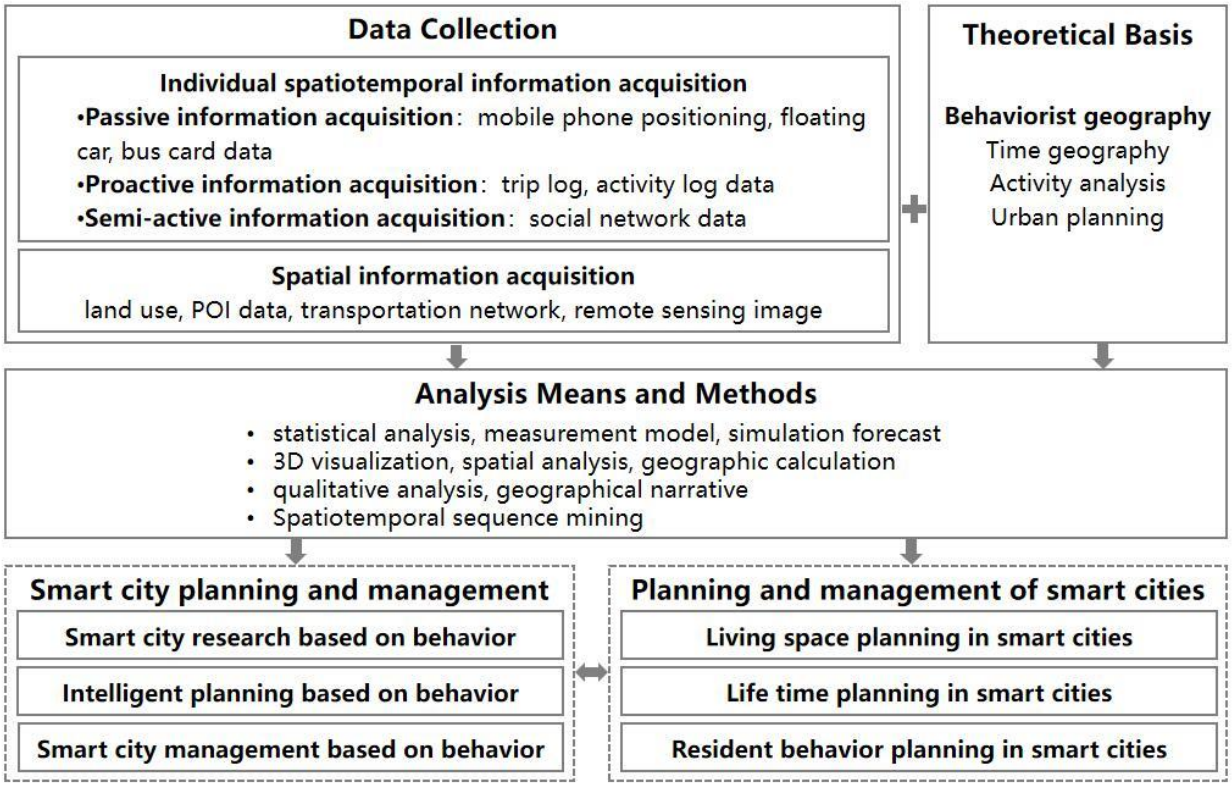


Fig.1. Smart city planning and management based on temporal and spatial behavior
Source: Reference [17]

### 4.2 Urban Planning Technology Strategy: From "Empirical Design" to "Data Precision Design"

In the past, urban planning mainly involved traditional planning territorial and socioeconomic data, and the formulation of planning overly relied on the personal knowledge structure of the planner, that is "empirical design". In the survey process, adopted relatively simple methods were adopted, and the planning results were displayed with simple geometric shapes, so the implementation effects of the final planning results could not be traced and understood due to various reasons.

The construction of smart cities relies on Internet technology to generate real-time data, that is big data. Big data has the characteristics of multi-source, human-centered, and temporal and spatial attributes, these characteristics are closely coupled with the essential attributes of urban planning and decision-making [19]. Big data technology can realize the scientific analysis and prediction of the development trend of urban elements and the relationship between the elements, and can analyze and study urban issues accurately, quantitatively and finely [20].

"Data Precision Design" based on big data, through the analysis, modeling, and prediction of traditional planning data and big data, can fully and real-time understand urban development changes and solve development problems in the process of urban planning research, analysis, plan design, and evaluation. That promote urban planning and design from empirical judgment to quantitative analysis, so that the use of social resources is more efficient, and service delivery is more accurate, thereby greatly improving the efficiency and scientific of planning preparation. Existing applications include the analysis of residents' temporal and spatial behavior, the optimization of the layout of urban traffic road networks, the division of urban functional areas, the analysis of regional connections and city levels, the management of urban ecological environment, and the delimitation of urban boundaries, etc [21]-[23].

The Beijing City Laboratory research team is committed to researching Data Augmentation Design(DAD). Data Augmentation Design(DAD) is a typical representative of "Data Precision Design", the specific planning and design support format of DAD is shown in Figure 2. Data Augmentation Design(DAD) is to support the generation of urban planning and design schemes through effective data analysis, and form more rational spatial decisions-making [24]-[25]. In the overall urban design of Tongzhou in Beijing, firstly, based on the scale of Tongzhou New City, the distance from the central city and the future planning and positioning, they identified three case cities——Yokohama in Japan, Almere in Netherlands, Marne-la-Vallee in France, then extracted the original spatial data of the three case cities and their mother cities. At the same time, in ArcMap application software, five types of data sets, including roads, land use, buildings, and POI(Points of Interest), were extracted according to the shape and function of the city, and five types of indicators such as traffic organization, road network characteristics, open space distribution, building texture, and urban function distribution were obtained. Secondly, by visualizing the spatial data of the three case cities and calculating indicators, the urban spatial structure and urban morphology of the case cities were abstracted, and the case city gene database was constructed. Finally, according to the population scale, land area, and rail transit planned for Tongzhou New City, the corresponding development intensity was calculated, then the various genes in the gene bank of the case city were compared, appropriate genes were used in the generation of the new town planning space plan. (Figure.3)

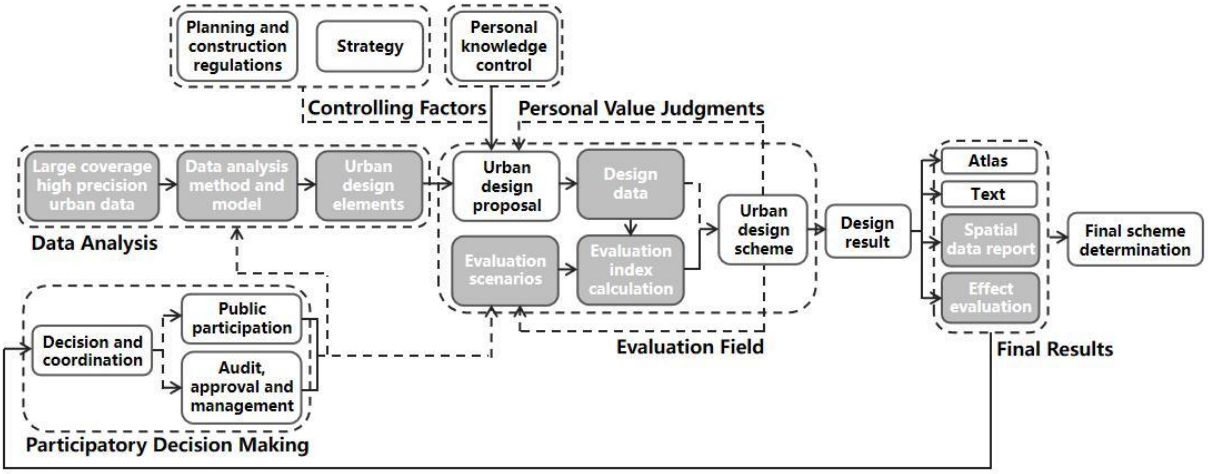


Fig.2. The specific planning and design support format of DAD
Source: Long Ying's report "Data Enhanced Design: Sustainable Urban Planning and Design Based on New Data" at the 2020 Computational Design Academic Forum and the Computational Design Academic Committee of the Architectural Society of China

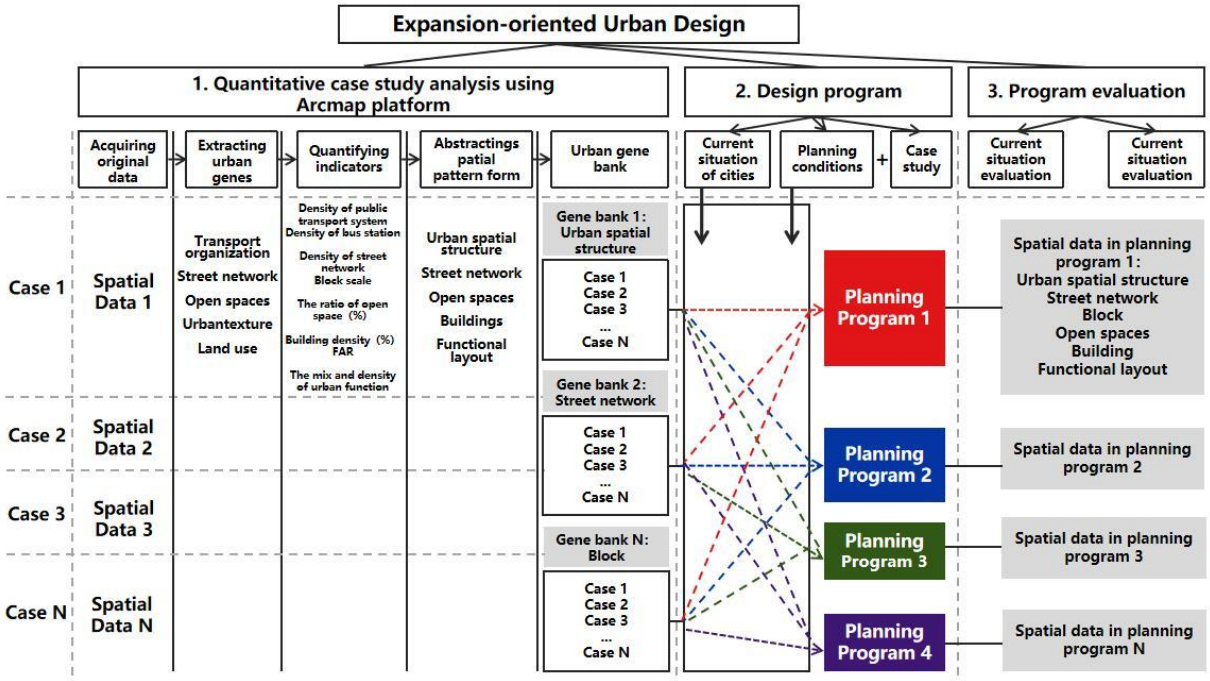


Fig.3. Research framework of the overall urban design of Tongzhou, Beijing
Source: Long Ying's report "Data Enhanced Design: Sustainable Urban Planning and Design Based on New Data" at the 2020 Computational Design Academic Forum and the Computational Design Academic Committee of the Architectural Society of China

### 4.3 Urban Planning Management Strategy: From "Static Blueprint Planning" to "Dynamic Process Planning"

Traditional urban planning pays too much attention to the physical form of the city, while being limited by technical methods and thinking concepts, and its results are mostly "static blueprint planning". In the era of global urbanization, economic development and social environment are facing rapid changes, and the form and function of cities are also undergoing profound changes. Planning methods oriented to people's needs, management, and inventory gradually become mainstream, and the planning content also transform from a single physical form planning to a multi-dimensional comprehensive planning of focusing on people's livelihood, society, and ecology. To ensure that planning implementation and planning objectives meet the new requirements of the new situation, planners, managers, and decision makers should establish a dynamic and effective feedback mechanism to enhance public participation, supervision and management in the entire process of urban planning research, planning, implementation, and evaluation, so as to realize the transformation of urban planning into "dynamic process planning".

In the construction of smart cities, technological innovation, knowledge update, planning network database applications, can realize the collection and mining of massive data, and establish an operation simulation platform and an early warning response system. They can dynamically diagnose and respond to various problems in urban development, thereby forming an intelligent feedback mechanism and realizing the dynamic adjustment of planning goals in the urban planning process [26]. The establishment of smart city business process management, mobile office and other platforms, through systematic data processing, can realize comprehensive informatization of the planning process, public consultation and decision-making implementation.This can mobilize the public to participate in urban planning, implementation and management to the greatest extent, and realize long-term real-time evaluation and rapid optimization of planning implementation effects, thereby improving the scientific, dynamic flexibility and implementation of urban planning.

Beijing Planning Institute proposes the concept of "cloud planning", build a comprehensive business support system for multi-department collaboration (Figure.4), and establishes a digital planning integrated management platform, including seven types of databases, three systems, six basic modules, and N functions (Figure.5). The digital planning integrated management platform breaks through the information barriers between the planning authorities, relevant management departments at all levels, and various relevant special departments, and realizes the mutual linkage of internal information, organization, and work content, so that planning goals and corresponding control indicators can be transmitted step by step. implement. Through the planning preparation approval platform, the supervision and evaluation platform, and the comprehensive data management platform, the whole planning process from planning preparation, parallel approval, implementation supervision, and physical examination and evaluation is realized to coordinate the implementation mechanism and optimize the approval process, this ensure the unity and smoothness of data transmission in all links. At the same time, the openness of the platform is valued, especially in the planning approval and implementation supervision links, the involvement of third-party professional forces(such as responsible planners and experts) and social supervision forces (such as the public and stakeholders) is emphasized to ensure the smooth development of bottom-up and public participation planning.

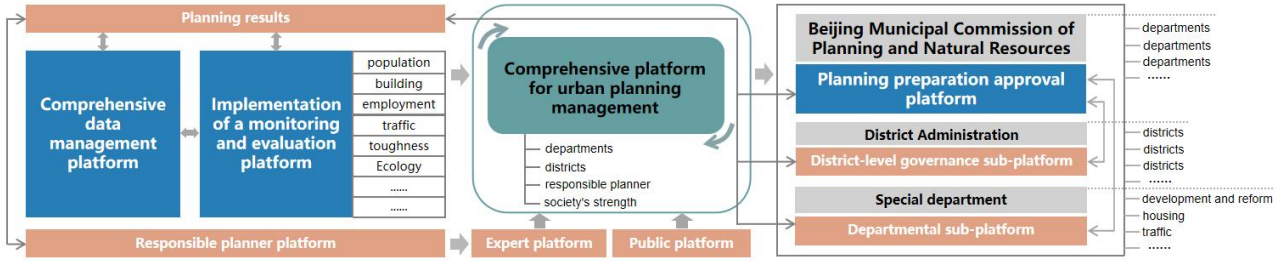


Fig.4. Comprehensive business support system for multi-department collaboration
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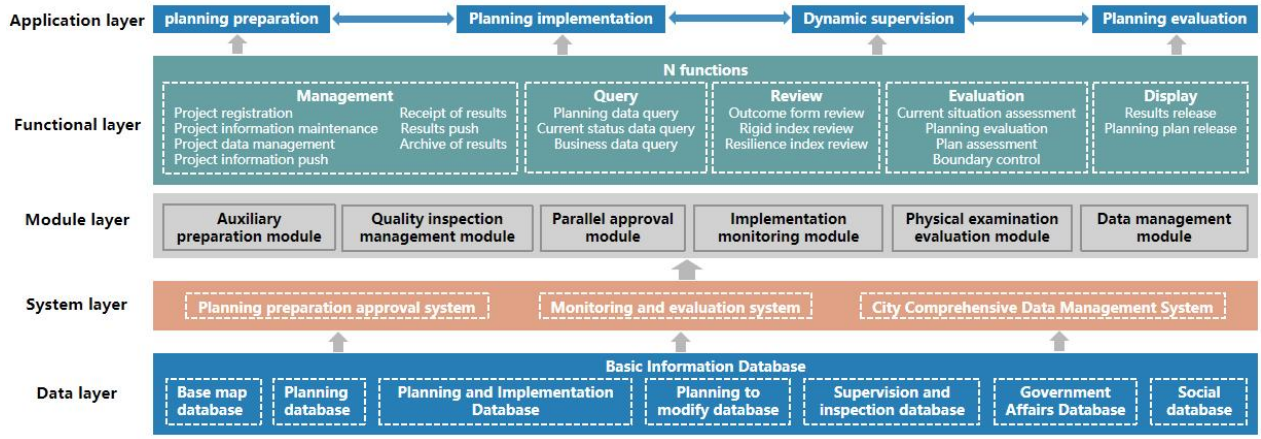


Fig.5. Digital planning integrated management platform architecture diagram
Source: https://mp.weixin.qq.com/s/hTu2hTb6VIMvXRXymeUM-A

## 5. Conclusions

If you follow the "checklist" your paper will conform to the requirements of the publisher and facilitate a problem-free publication process.

Smart city construction is based on people, supported by information technology, and using land as a carrier, it combines information technology with urban planning, urban construction and urban management, the construction of smart cities has a profound impact on the research content, technical methods, and management mechanism of urban planning [27]. Urban planning is a series of strategic deployments for studying the future development direction of cities, arranging urban spatial layout and construction, faced with the new normal of the city against the background of smart city construction, it should be reformed from the aspects of thinking, technology, and management.

In terms of planning thinking, it should shift from “elite planning” to “crowd funding planning”, to increase public participation in the urban planning process and reflect the people-oriented urban construction concept. In terms of planning technology, it should shift from “empirical design” to “data precise design” , to enhance the efficiency and scientific of urban planning. In terms of planning management, it should shift from “static blueprint planning” to “dynamic process planning”, to strengthen feedback and evaluation of the whole process of urban planning and improve the implementation of urban planning.

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