Research on the Development and Application of Intelligent City Public Service System

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Abstract. The intelligent city is to use information and communication technology ways to sense, analyse and integrate various key information of the core system of urban operation, so as to realize intelligent response to various needs, including people's livelihood, environmental protection, public safety, urban services, industrial and commercial activities. Its essence is to use advanced information technology to realize the intelligent management and operation of the city, so as to create a better life for people in the city and promote the harmonious and sustainable growth of the city. Promoting the intelligent development of public services is an inevitable demand to adapt to the development trend of informatization and digitization,. It also can promote the wide and in-depth application of new generation information technologies such as big data, cloud computing, artificial intelligence, Internet of things and blockchain in the field of public services, provide people with more intelligent, convenient and high-quality public services. The intelligent urban public service system comprises a service platform, a charging terminal, a payment terminal, a reservation terminal and a mobile phone terminal. The service platform includes a server and a database, and it is respectively connected to the charging terminal, the payment terminal and the reservation terminal through the Internet. The payment terminal and the reservation terminal are respectively connected to the mobile phone terminal through GPRS module. Charging terminal, payment terminal and reservation terminal can be connected with the service platform through the Internet, so that people can enjoy public services in the city and realize intelligent charging, payment and reservation. By promoting the development of "Internet+ public services", we should promote online and offline interaction, support high-level public service institutions to link up grass-roots, remote and underdeveloped areas, expand the coverage of high-quality public service resources. Promote the application of artificial intelligence in the field of public services, can encourage and support the development of new industries and formats such as digital creativity, smart medicine, smart tourism, smart culture, smart sports and smart elderly care. The integration of big data with new technologies can effectively improve the scientific decision-making and management level of the government and enterprises, promote the transformation of industrial development, the reform of management methods and the improvement of social efficiency.

Keywords: Intelligent city · public service system · technology platform

1 Introduction

The intelligent public service platform should make use of modern communication technology and network technology to fully realize the networking and electronation of business exchanges between various government departments, enterprises and individuals. On this platform, we can achieve the basic functions of facing the public, online office, business reorganization and so on. It is a comprehensive application system platform. It is to streamline and reorganize various government management and services, comply with the overall requirements of the reform of the administrative examination, approval system and the transformation of government functions. It also can improve the E-government service system cantered on managing society and serving the masses, break the constraints of time, space and segmentation, realize them on the Internet after optimization and integration. By providing long-distance public services for enterprises and the public in the whole life cycle, so as to realize the "one-stop" online handling of service matters such as government administrative examination and approval, effectively supervise and strongly supervise various business operations of the government, improve the work efficiency of the whole government.

The Internet computer mobile phone can integrate the intelligent Internet service platform with the intelligent public service platform, computer can connect computer and laptop devices to the Internet. There are also two forms of PC client and mobile client to meet the office needs of different office equipment. Intelligent public service platform is the most basic and main automatic office system to facilitate individuals and enterprises to handle relevant affairs. It should have all the functions required by e-government. Therefore, the platform has fast speed, complete functions and simple operation. It is a popular form of e-government. As an integrated version, PC client not only has all the functions of web version, but also needs to have the function of instant messaging to facilitate real-time sending and receiving messages and transmitting files [1]. The development of mobile client needs to have a mobile client adapted to iPhone, iPad and a client adapted to Android mobile platform, which is convenient for individual and enterprise users to handle government affairs in real time.

2 Promote the Establishment of the Overall Framework of Intelligent City Public Service System

2.1 Promote the Construction of Intelligent Infrastructure

Infrastructure is the core of intelligent city, the life line supporting the healthy operation of intelligent city and the cornerstone of sustainable development. Its construction level directly determines the development prospect of intelligent city. Relevant studies have pointed out that intelligent city is a collection of hardware infrastructure (or material capital), the use and quality of knowledge communication and social infrastructure. The coordination and integration of traditional infrastructure through the use of new digital technology is an important way to promote the upgrading of intelligent city infrastructure.

At present, intelligent infrastructure mainly includes three aspects. First, the traditional infrastructure that has been intelligently transformed, including the perceptual

Table 1. Composition of intelligent city infrastructure

Infrastructure composition of new intelligent city	Transformation and upgrading of traditional infrastructure	Transportation facilities
		Underground pipe network
		Security facilities
		Power facilities
		Communication facilities
	Information network infrastructure	Broadband network facilities
		Triple play
		Wireless network facilities
	Information sharing infrastructure	Urban brain
		Spatiotemporal information cloud platform information
		Four basic databases
		Information security service facilities

and intelligent construction of water, electricity, gas and heat pipe networks, roads, bridges, stations, airports and other facilities; Secondly, information network infrastructure, including broadband, Internet of things and triple play, is the information transmission system of intelligent city; Thirdly, information sharing infrastructure, including Spatio-temporal information cloud platform and information security service facilities, is the public data storage, information exchange and operation support platform of intelligent city [2]. At present, the infrastructure construction of new intelligent city is deepening. The broadband China strategy has been steadily promoted and the 5 g pilot has been launched, further improving the capacity of urban information infrastructure. The new achievements of communication satellite and navigation technology have improved the ability of urban information acquisition and its application in urban construction, environmental monitoring, emergency disaster reduction and other fields. The continuous construction and evolution of big data centre and space-time information cloud platform has expanded the application of big data and cloud computing in the fields of intelligent government, intelligent urban management, intelligent transportation, intelligent medical treatment, intelligent elderly care, intelligent environmental protection and so on (Table 1).

2.2 Build an Integrated Public Data Platform

The construction of an intelligent city is a new goal for future urban development and a guarantee for more stable urban development in the future. Building an intelligent city requires practical applications in information and data transmission, management, application and storage. Therefore, to build an intelligent city, we should first build a perfect public service platform, so as to ensure the more perfect and all-round development of an intelligent city. The overall design of the integrated intelligent public data

platform takes the integration of resource management, directory, application approval and evaluation as the core. It aliso integrates the integrated digital resources based on the existing digital resources and the digital resources of counties and districts, constructs the integrated resource management service system of cities, districts and counties. At the content level of digital resources, create integrated digital resources, fully sort out the existing cloud resources, data resources, component resources and application resources, Carry out appropriate construction and development according to the actual needs of cities, districts and counties. Cloud resources are integrated according to the principles of physical separation and logical concentration, data resources are sorted according to the principles of synchronous update and efficient sharing. By continuously enriching components, provide public support for the development of business applications by departments at all levels, establish an overall coordination mechanism for application projects in relevant fields, improve the digital application of department core business, promote the realization of "innovation in one place and benefit the whole city". At the level of digital resource management, build a digital resource supermarket system, carry out systematic connection and integration by relying on the existing corresponding platforms and tools of various resources, carry out on-demand iteration according to the actual situation, so as to provide effective support for integrated digital resource management. Realize the visual global overview of resource operation monitoring through resource operation data monitoring and operation data analysis model. Provide decision support for the long-term operation and management of the integrated intelligent public data platform. Through the integration of application at all levels, the application and use of digital resources can be integrated at all levels, so as to provide an integrated platform for the application (Table 2).

2.3 Strengthen the Construction of Spatiotemporal Information Cloud Platform to Support Urban Management and Service Decision-Making

With the development of intelligent city, the geographic information public service platform in the digital city stage reflects some deficiencies, such as single data application content, single sharing mode, scarcity of real-time data, heavy operation and maintenance workload, which directly leads to the construction requirements of Spatio-temporal information cloud platform. Intelligent city Spatio-temporal information cloud platform is a widely interconnected, intelligent decision-making, flexible service, safe and reliable geographic information service platform formed by collecting all kinds of urban Spatio-temporal information in real time through new high-tech means such as ubiquitous network, sensor equipment and intelligent computing. Intelligent city is an important and basic content of geospatial information infrastructure. Smart city space-time information cloud platform has better experience, real-time, mobility and controllability. Through the construction of cloud platform, the wide sharing and full application of geographic information resources in intelligent city can be realized, the difficulty of obtaining information by various departments and industries can be reduced. From the perspective of technical architecture system, the new intelligent city space-time information cloud platform is based on Cloud Architecture and is composed of infrastructure as a service (IAAs), data-as-a-service (DAAS), platform-as-a-service (PAAS) and software-as-a-service (SAAS) (Table 3).

Table 2. Data standard specification system

Data standard specification system						
Service application layer	Smart government	Intelligent emergency	Intelligent transportation	Intelligent supervision	Smart agriculture	other
	Client third party					
	Large screen computer tablet app wechat					
Decision analysis layer	Business side	data retrieval	Comparative study and judgment	Group portrait	Trend analysis	Prediction and early warning
	Functional side	Fixed report	Chart analysis	Ad hoc report	Multidimensional analysis	3D visualization
		Agile Kanban	Kanban collection	Leading cockpit	One map of GIS	analysis report
Data center	Data modeling				Data mining	
	Subject table, data mart, dimension table, cube				Visual modeling, mining algorithm library, data preprocessing, relational network analysis	
	Data integration		Extraction, cleaning, conversion, scheduling and monitoring			
Data source	Department business system	Government data center	Data sharing platform	Internet data	file data	
Safety and operation and maintenance guarantee system						

With the deepening of new intelligent city planning and construction, China has set off an upsurge of building a new intelligent city space-time information cloud platform. Jining City, Ningbo City, Wuhan City, Zhengzhou City, Yunnan Province and other places have successively launched the prelude to the construction of intelligent city space-time information cloud platform [3]. In October 2017, Xiongan new area held the "high-end forum on intelligent space-time big data helping the construction of Xiongan New Area", proposed to build an "intelligent Xiongan space-time big data and cloud platform", carried out demonstration applications in spatial planning, ecological monitoring, intelligent community, public services and other aspects. At the same time, it is required to carry out the demonstration of new basic surveying and mapping construction in Xiongan new area. We will innovate and establish a new type of basic surveying and mapping products that are materialized, three-dimensional, spatiotemporal and integrated above ground and underground in Xiongan new area. At the beginning of November 2017, "intelligent Wuhan space-time information cloud platform" was built as the first intelligent city space-time information cloud platform in China. The platform takes space-time information as the carrier, integrates 8500 items of basic information such as urban population, legal person and housing, accumulates 1803 layers of special information in urban planning, land and resources management, social management innovation, intelligent taxation, intelligent water. It has been applied in more than 30 fields, such as online mass service, intelligent urban management, emergency command

Table 3. New intelligent city space-time information cloud platform architecture

Application layer	Livelihood services	Urban governance	Industrial economy	ecological environment
	via a single website	Government Affairs Office	Smart Park	Smart community
	One yard General Office	Intelligent transportation	Smart Logistics	Energy environment
	No. 1 General Office	Leading cockpit	Smart manufacturing	Smart Tourism
Platform layer	Application support platform	Big data platform	Public support platform	
	Apaas	Data exchange	Unified information	Unified user
	Mobile Base	Data governance	Unified entrance	Unified security
	Development framework	data Integration	Unified access	Unified process
Data layer	Basic data	Legal Person Library	Government theme	Livelihood theme
	Electronic certificate Library	Credit bank	Economic theme	Traffic theme
	Geographic database	Project library	Security theme	Regulatory theme
Foundation layer	Computing storage	Computing resources, storage resources, software resources		
	Urban network	5g, government affairs network, Internet, Internet of things, edge network		
	Equipment layer	Mobile phone, computer, sensor, camera, non-standard equipment		

and public service. At the end of November 2017, the "national pilot project of intelligent Chongqing space-time information cloud platform" passed the acceptance. Relying on new technologies such as cloud computing, Internet of things, big data, intelligent computing and mobile Internet, the platform is an important space-time infrastructure for information construction in Chongqing and the only authoritative platform for sharing and exchanging social public information resources in the city.

2.4 Build a Intelligent Urban Management Big Data Platform to Improve the Quality of Urban Management

Urban management is the basic guarantee for the healthy operation of cities and the sustainable development of economy and society. The digitization, refinement, intelligence

and socialization of urban management are the major requirements of new intelligent city development strategy. With the continuous advancement of urbanization process, urban management is facing a series of challenges under the new situation. In order to solve the dilemma of urban management, intelligent urban management came into being. In essence, the construction of intelligent urban management originates from digital urban management, which is the sublimation and expansion of digital urban management. It refers to making full use of the new generation of information technologies such as Internet of things, cloud computing and mobile Internet to strengthen the automation of information acquisition, refinement of supervision and management, coordination of business functions, diversification of service means, intellectualization of auxiliary decision-making and humanization of law enforcement means. Finally, all-round wisdom of urban management elements, urban management process and urban management decision-making will be realized. Intelligent urban management is an important part of intelligent city construction. In intelligent city construction, further rational use of urban management information technology will continuously improve the detection indicators of urban economy and environment, promote the management of auxiliary cities. Intelligent urban management is based on the overall architecture of the Internet of things [4]. From bottom to top, it is divided into perception layer, transmission layer, support layer and application layer. At the same time, it is supported by the construction of security system and standard specification system. Through the construction of intelligent urban management big data platform, we can integrate urban management resources, standardize urban management behaviour and improve urban management efficiency. With the help of urban management map, scientific deployment and intelligent command are realized to meet the requirements of all-weather, seamless and fine management of the city. It adopts the "10000-m unit grid method" to realize the management of urban components and events, timely find and deal with all kinds of urban problems, improve the efficiency of urban management. Intelligent urban management has become an important part of intelligent city construction. In intelligent city construction, further rational use of urban management information technology will continuously improve the detection indicators of urban economy and environment, promote the management of auxiliary cities.

In 2017, the intelligent city management platform in Yuhua District was officially put into operation, realizing the intellectualization of information collection, realizing the "big urban management", integrating urban management, sanitation and gardens into unified management, connecting the system with the "Skynet" of the public security department, enabling unmanned aircraft to implement real-time monitoring of key areas and management blind areas. In December 2017, Xiuzhou District of Jiaxing officially launched the intelligent urban management system, forming an efficient urban management mode of "sky eye monitoring, mouse patrol, intelligent order distribution and personnel disposal" through video monitoring points, UAVs, mobile terminals and other mobile terminal equipment, monitoring platform, case handling system, approval system, order distribution system and other functional blocks (Table 4).

2.5   Build a New Wireless City and Realize "One-Stop" Public Services

Wireless city refers to the use of low-cost wireless access technologies such as WiMAX and Wi-Fi, combined with VoIP technologies such as Skype, to achieve wireless network

Table 4. Intelligent urban management Internet of things specification and standard system

Smart urban management Internet of things specification and standard system	application layer	Analysis, judgment and comprehensive decision-making				Smart urban management Internet of things security system
		public service	Command and dispatch	Patrol monitoring	Comprehensive law enforcement	
	Support layer	Electronic form	GIS services	Workflow	Data center Business data shared data	
		Cloud computing, cloud storage, cloud services				
	Ransport layer	E-government network		Wireless Broadband Private Network		
		Government IOT data private network		Mobile public network		
	Perception layer	Audio perception		Video perception	Position perception	
		Stream of people perception		Information acquisition	Can influenza know	

coverage throughout the city, so as to provide faster wireless Internet services anytime and anywhere. The requirements of the intelligent city for the infrastructure network layer are high broadband, wide coverage, massive data, mobile status and collaborative work. The wireless city construction based on optical cable, WLAN and 4G/5G solves the infrastructure network construction project in the intelligent city. Wireless city can not only bring rich and colourful network life to intelligent city, but also bring powerful new driving force for social development. For example, combined with modern service industry, it can comprehensively enrich the business functions of modern service industry, improve the knowledge content of modern service industry and promote the rapid development of modern service industry.

At present, many large and medium-sized cities in China are actively building wireless city networks to facilitate citizens' shopping, travel, study, education, health care and other aspects. In January 2017, Shanghai plans to invest more than 30 billion yuan in the next three years to build a new wireless city, including five areas: network, platform, demonstration, industrial agglomeration and public service platform building. In May 2017, Shanghai built a new wireless city framework, proposed to build a wireless broadband network system with optimized 4G network coverage and 5G network, built a public welfare WLAN network service system with I-shanghai as the core, achieved the goals of Gigabit access broadband network system with full coverage in urban and rural areas. In Tong Zhou District, Beijing, 416 "my Beijing" free wireless internet access outlets have been built, 11 service halls have been opened for free wireless internet access, realizing the basic coverage of 89 main roads, with a total of 416 Internet access outlets.

With the structural adjustment, transformation and upgrading of economy, new business forms put forward new demands for the innovation of payment methods, which provides a strong driving force for the rapid development of mobile payment [5]. According to the 2017 China intelligent life report, 84% of Chinese people go out without cash. It is reported that by the end of November 2017, the number of Alipay merchants in Xi'an has increased by 53%, 76% of the offline stores have access to mobile payment. In December 2017, the app of Xiamen citizen card was officially launched, unifying the electronic identity of citizens. Through the app, citizens can experience credit travel before payment, QR code scanning payment and self-service code scanning loan and return books, enjoy convenience in medical and health, government services, life services and other fields. In 2017, Hangzhou became a "mobile payment city". Mobile phone is only a new norm. All the bus routes in the main urban area of Hangzhou will be covered by public transport card + Alipay + silver link flash payment and mobile payment.

Many cities have carried out practical exploration activities for the construction of "urban brain", accumulated rich experience and achieved remarkable results. Since Alibaba built the "urban brain" in Hangzhou in October 2016, it has integrated and managed 128 signal intersections in Hangzhou, more than 100 intersections have realized no control of signal lights, saving 4.6 min of travel time on elevated roads. In the main urban area of Hangzhou, the average number of traffic incident alarms per day reached more than 500, with an accuracy rate of 92%, which greatly improved the efficiency and directivity of law enforcement. In August 2017, Suzhou "urban brain" project has collected, gathered, cleaned and stored all kinds of data involving public security, city appearance and municipal administration, transportation, tourism, rail transit companies and other departments. Three major operators and major Internet enterprises, processed more than 300 billion pieces of historical business data, opened the real-time data transmission channel, gathered 680 million pieces of data every day and promote the development of intelligent urban governance.

Some of the data we get often exist in many fields, but the data in some fields is meaningless or of little significance to the results, but they will also participate in the calculation in the process of machine learning, which will have an adverse impact on our final analysis results. We should reduce the dimension of the data according to the actual situation to make the calculation process easier. Assuming that the data is a low-dimensional manifold uniformly sampled in a high-dimensional Euclidean space, manifold learning is to recover the low-dimensional manifold structure from the high-dimensional sampled data, find the low-dimensional manifold in the high-dimensional space, and find the corresponding embedded mapping to realize dimension reduction or data visualization.

2.6 Accelerate the Construction of Information System of Command Hall

It includes distributed integrated management system, LED large screen display system, professional sound reinforcement system, paperless conference system, video conference system, console design, generic cabling system, computer network system, lightning protection and grounding system and equipment room construction. The distributed integrated management system adopts a pure distributed architecture, which is based on

the network architecture, decentralized and not limited by physical regions. The system is composed of switches and distributed nodes. Taking the enterprise level switch as the exchange medium, the input node and output node are connected through network cable or optical fibre to form a LAN of command integrated management system. The system is composed of TCP/IP network equipment, distributed agent input node, distributed agent output node and management platform. Distributed agent input/ output node, distributed input/output node: in the whole distributed system, each node has its address, and the IP of each distributed node can be found by background software. Distributed seat input node and distributed input node: collect and encode the audio and video signals, keyboard and mouse USB signals of the operating computer of each seat, connect the network signals to the switch through the network cable. The distributed seat output node /distributed output node can take over and switch all audio and video signals or key mouse USB signals encoded as network signal type into the distributed system anytime and anywhere and output them to the seat display device. The system platform supports a set of mouse and keyboard to control 8 display devices; The configuration user interface can be realized through the same non web interface; Support mouse shortcut key positioning, the transmission of HDMI, DVI and DP video formats, the synchronous transmission of audio, seamless video switching, HDR, hdmi20, DP1.4, HDCP2.2. Agreement,4-picture split display control of single display, EDID management, a set of keyboard and mouse for real-time operation of no less than 8 displays, seamless cross screen of the mouse, shortcut keys to quickly locate the mouse, the storage and calling of seat and large screen plans. It supports mis operation protection and two modes: manual screen locking and automatic screen locking, 1080p true colour 32-bit OSD menu, signal push between seats and users, active and passive modes according to authority management.

Display screen is designed in the command centre hall according to the use environment, which is mainly used to display the text, pictures, video pictures and signals of the command hall. The LED display screen in the command centre hall adopts indoor full-colour small spacing LED display screen (upside down COB package), the point spacing is about 0.95 mm, the size is about 15.6 m * 4.38M, the area is about 68.4 m^2, and the display resolution is 11520 * 4320. The LED display screen in the expert consultation room adopts indoor full-colour small spacing LED display screen (upside down COB package), the point spacing is no more than 0.95 mm, the size is about 3.6 m * 2.025 m, the area is about 7.29 m^2, the display resolution is 3840 * 2160. The HD controller supports image windowing, window superposition, window roaming, window scaling, character superposition, scene saving, scene reading and image interception. Support splicing output synchronization and no tearing EDID editing function, misplaced splicing, irregular splicing and arbitrary layout of multiple splicing screens with different resolutions. The platform needs to establish and improve public data classification and classification, authority management, technology prevention and control, abnormal risk identification and other systems. The purpose is strengthened data life cycle security management, build a strong data security defence line and ensure data security.

2.7 Improve the Evaluation Index

The National Standardization Administration Committee issued the national standards intelligent city - technical reference model and evaluation index of new intelligent city. Among them, "intelligent city - technology reference model" points out the conceptual reference framework of intelligent city, stipulates the business framework, knowledge management reference model and technology reference model of intelligent city supported by information and communication technology, as well as the technical principles and requirements of intelligent city construction. The new intelligent city evaluation index includes eight first-class evaluation indexes, people-friendly services, precise governance, ecological liveability, intelligent facilities, information resources, network security, reform and innovation and citizen experience. It is the main basis for the evaluation of new intelligent cities and an important means to guide the healthy development of new intelligent cities in all parts of China (Table 5).

Table 5. Evaluation index of new intelligent city

Evaluation index of new intelligent city	Benefiting the people	Government service
		Transportation services
		Social security services
		medical service
		Educational services
		employment service
		Urban Services
		Assistance services
		E-commerce services
	Precise management	city management
		Public safety
	Ecologically livable	Intelligent environmental protection
		Green energy saving
	Intelligent facilities	Broadband network facilities
		Spatiotemporal information platform
	information resources	Open sharing
		Development and utilization
	network security	Network security management
		System and data security
	Reform and innovation	Institutional mechanism
	Citizen experience	Citizen experience survey

3   Conclusions

The government's intelligent public service platform takes big data as the core, integrates resources of various departments and facilitates people's livelihood. The Internet mode has advanced the construction of intelligent public service platform by using advanced Internet technology. It is not only enabling the individuals and enterprises to carry out the examination and approval of online business well, but also better exercise the functions of government's management and service. Another important function is to quickly and effectively collect and share scattered data, manage and analyse the collected data, make scientific decisions based on the analysis and judgment of objective data and the opinions of all parties, identify the direction of policy improvement and adjustment, build a more comprehensive service.

The mode of "Internet intelligent public service platform" will be based on a unified intelligent public service application platform to develop and deploy various business subsystems by using Internet technology, reduce investment and speed up construction cycle, support all kinds of government applications, improve level of information sharing. Basically, realize the media of information disclosure, online work flow, real-time interactive communication and platform transformation integration, significantly improve the substitution rate and solution rate of online work and interactive communication. Citizens and enterprises can participate in the affairs of all government agencies anytime and anywhere, interact with the government and put forward suggestions. The emergence of intelligent cities just caters to the needs of new urbanization development. The great development of modern scientific and technological means (including big data, Internet of things/mobile Internet, cloud computing, etc.) provides support for the construction of intelligent cities. A new round of scientific, technological and industrial revolution is booming. The integration of big data with new technologies such as cloud computing and the Internet of things can not only produce a multiplier effect, but also promote the use of new ideas and tools to solve various problems such as transportation, medical treatment and education. Effectively improve the scientific decision-making and management level of the government and enterprises, promote the transformation of industrial development, the reform of management methods and the improvement of social efficiency.

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