The Path Towards Smart Cities in China: From the Case of Shanghai Expo 2010

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1 ABSTRACT

With the development of the digital technology, physical buildings are becoming more and more intelligent, high-efficiency and ecological; partial physical situational functions could be transferred to the virtual building world in a more efficient, intensive and convenient way. With these great achievement, we should believe that the digital technology will create more chances for the future of the smart buildings, and the smart city will be the most important foundation. To create the best human dwelling environment, we should construct smart buildings on the microscopic level and smart city on the macroscopic level. Smart city is not just about technology, but also the all-round innovation of the urban space, economic, society, system and management. The promotion for smart city will improve the quality of the urbanization, and the integrated development of the informatization, industrialization and urbanization, which will result in a wide influence on the city development and reform.

Being a developing country severely hit by information and technology revolution, China met a small climax of smart city construction after 2010 Expo. As the theme of 2010 Expo, the idea of 'better city better life' was implemented through the process of the planning, construction, development operation and utilization in the Expo Park of 5.28 km2 area, which made the best use of information and intelligent technology, as well as the idea of sustainable development. Intelligent and ecological buildings in Shanghai 2010 Expo have been the most important practice in China, which had effected profoundly on the construction of smart buildings and smart city.

At the beginning, this paper will introduce the background of of 'smart city', as well as it's meaning and feature. Then, through the case study of 2010 Expo, this paper will present a real scene of the development of smart cities in China. It reflected the path to smart cities in China, and the policies and achievements in large pilot cities during this process. It will also talk about the influence on urban planning and authorities. Obviously, when we talk about smart city, we should not only pay attention to its present, but also look forward to future, which is the last part in this paper.

2 SMART CITY

2.1 The background of smart city

With the growth of cities and urban population, city has been endowed unprecendent power on economic, politics and technology and plays a leading role in the world. According to historical experience, every global financial or energy crisis triggers a technical revolution competition, and the winner will lead the global economic development(figure 1). Traditional city development pattern based on straightforward resource use of industry revelution, electric revelution and information revelution, with the result of resource shortage and low potential of urban function promotin which has been the problems that people are working hard to overcome since the 20th century. 'Sustainable development', 'smart growth', 'intensive development' have been proposed by the governments academia and both domestic and abroad. Now, the focal point of resource scramble has extended from natural resource, high-tech products and financial capital to information resource. As the response, the concept of 'smart city' was proposed by IBM company at the end of 2009 following 'smart earth', and received attention of governments, scholars and citizens.

In China,‘smart' is a word which describes human's mental ability to understand and deal with things quickly, flexibly and correctly. From global perspective, as the residence container, urban also should have this ability to deal with urban problems. 'Smart city' was proposed based on the global energy crisis background, and the focus is on the promotion of urban operation quality and urban development policies which conforms to the complex concept of post-modern society.

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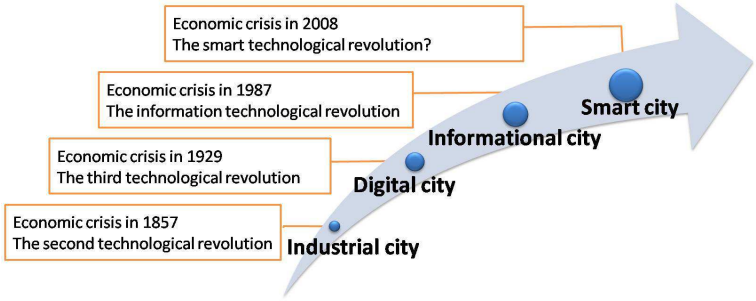

Fig. 1: The background of smart city.

2.2 The meaning and characteristic of smart city

Different with information city that relies on communication technology, smart city is proposed based on new generation of information communicaiton technology of IOT, cloud computing, etc., and has more detailed and accurate connovation. Meanwhile, compared with intelligent city that over-emphasized technicism, smart city pays more attention on the integration of the human-oriented and technical urban development. Entity city is the physical city which is conprized by governments, industry, citizen and infrustrcture. It's the main body and the goal; digital city is the method to control the entity city by communication, GIS, internet, etc.; while smart city is to link entity city and digital city with advanced technology(figure 2). Scholars such as Giffinger and Fertner consider that, smart city includes 6 dimensions: smart economic, smart transportation, smart environment, smart citizen, smart life and smart management; IBM thinks that, smart city is the core system integration of human, business, transportation, communication, water, energy, etc. based on advanced ICT technology, to enable city to operate smarter as a grand 'system of systems'. To be simple, the meaning of smart city is the coordinating operation of each smart subsystems—not just relys on technicism, but more important is the humanity factor throughout urban activities.

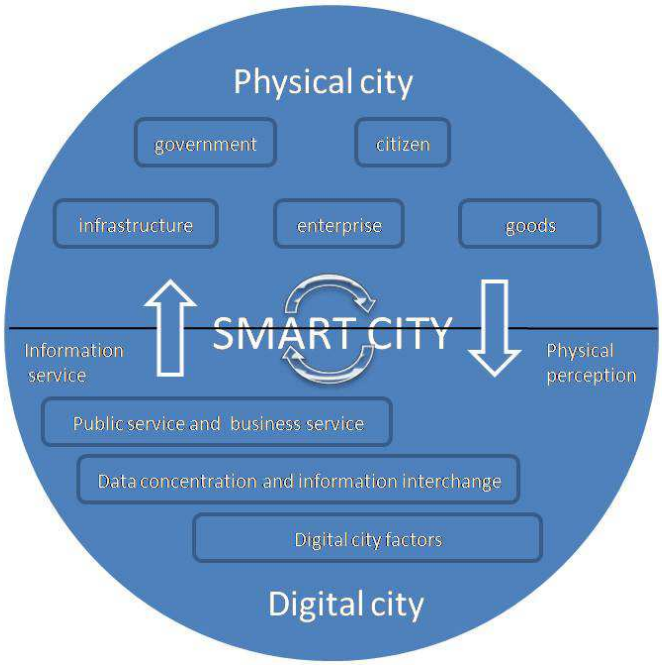

Fig. 2: The relationship of smart city, physical city and digital city.

3 SHANGHAI 2010 EXPO

3.1 The background

With the topic 'Better city, Better life' , the planning, construction, operation and pro exibition development of 2010 Expo park(figure 3), which covered 5.28 km2 area and has the biggest participation in the history of world exibition, aimed to implement the principles of smart and sustainable planning, applying information

and intelligent technology in order to become a model example. At the same time it provided valuable opportunities for its visitors to learn how to creat an eco-friendly building and clever solutions for smart city.

Fig. 3: The mast plan of 2010 Expo park.

3.2 Smart solutions for Expo 2010

In order to be visual, controllable, and sustainable, 2010 Expo provided high level planning information communication infrastucture and fully used information technology in the park construction¬. Nearly 40 information application systems were integrated into the Expo operation, supplying the model for the city administration, management, security, operation, transport and citizen service. As the common technical support, image information was not just for the security department, but also shared by transport, cleasing, equipment or other departments, and the intelligent image processing program was used as the basis for certificate system, passenger flow system, security system, traffic dispatching system, etc. In order to comprehensively command and coordinate, the intelligent transport information management system converged the real-time information of both inside and outside passenger flow and public transportation. The energy and environment monitoring system was fully used on the electricity, water, gas, operation of renewable energy, humidity, carbon dioxide, light pollution, noise, etc. reflecting the achivement on the energy saving and emission. Meanwhile, all of the the planning and design, construction, operation and exibition worked on an unified GIS system platform, which assembled the real-time information of security, tranportation, tickets, activity, energy, sanitation, logistics, visitors, organizers, etc., coordinating with the government, army and police systems, to command the normal operation and emergency in the Expo park. Even on the highest peak day of 1.03 million visitors, the park could also run orderly.

3.3 Towards smart cities in China

Actually, since the 1980s in China, the intelligent building standards have guided the public buildings or residence construction which operated in modern way. Early it was based on single buildings, until the recent years, intelligent buidlings construction is becoming the new trend. Moreover, the intelligent building construction is undergoing industry division which can provide personalized solution. Intelligent residence, hospital, museum, stadium, school, court,etc. are sprouting across the country. It's worth mentioning that the new concept of IOT and cloud computing technology was integrated into intelligent buildings as early as 10 years ago.

Now, the successful application of intelligent buildings and planning of 2010 Expo has drived nationwide construcion of smart city, as well as the relative research. Many big cities in China set 'smart city' as the crux and breakthrough of transitional development. In Jan. 2013, the National Conference on Pilot Smart City

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Construction, organised by the Ministry of Housing and Urban-Rural Development, published the first 90 piolt smart cities construction, including 37 prefecture-level cities, 50 districts, 3 towns, which will be evaluated after 3-5 years. The conference pointed out that, new-type urbanization is the strategic plan for the formation of sustainable new-economy pattern which will integrate advanced concepts of intensive, low carbon, eco-friendly and smart city into the process of urbanaztion. The construction of these pilot smart cities will support from different angles to recognize smart development and planning—fine management in Beijing, informational development and strategy in Shanghai, smart logistics leading modernized international port city construction in Ningbo. At the same time, cities such as Shenzhen, Wuhan, Guangzhou, Nanjing have set their goals for smart city construction(table 1).

City	Main moves	Main achievements
Beijing	'Smart Beijing' progaganda on the 14th China Beijng International High-Tech Expo, aiming at 'smart life' for everyone.	First proposed 'Smart Beijing'
Shanghai	'Smart City Construction Promotion Act 2011-2013', including 10 IOT demonstration projects in transportation, medical, logistics, etc..	Explore comrehensive smart city construction.
Shenzhen	The development of IOT and RFID Standards Alliance support 'smart city'construction from science, humanities and ecological.	First proposed 'Smart Shenzhen'; most advanced IOT industry.
Wuxi	National sensor network industry model base; promoting the integration of TD and sensor network.	Acquired high reputation from Premier Wen; proposed 'Sensing China'.
Wuhan	Bring 'smart city' into line with the 12th Five-Years Plan; construct smart city infrustructure and smart processing platform based on 'China Cloud'.	Becoming the centre of national smart city technical innovation.
Nanjing	First published smart city specialized planning-'Nanjing IOT industry development planning', and specified 10 model industries.	Becoming 'Smart Nanjing', based on several model projects.
Ningbo	'Ningbo Municipal Government Decisions about Smart City Construction', 'Ningbo Master Plan of Smart City Development'.	Construct smart industrial cluster and smart Ningbo with international port city characteristics.
Shenyang	Ecological City United Institute combined with IBM and Northeastern Unversity to construct 'Eco Shengyang' with green science and smart smart technology.	Construct eco and smart city model.
Hangzhou	'Smart Hangzhou Master Plan(2012-2015)'.	Leading IOT economic and construct national e-commerce city model.

Table 1:The analysis of main moves and achievements in typical pilot smart cities in China

4 INFLUENCE OF SMART CITY DEVELOPMENT ON URBAN PLANNING

4.1 Influence on urban and urban planning system

Smart city not only opens up a new angle of view for urban cognition and development, but also becomes a new development model. The concept of smart city brings about reforms of urban development goals, urban space structure, management mode, etc. While the most notably effect on urban planning is the innovation of planning type and the improvement of urban plannnig system. The innovation of planning type is bound to brings about series of new related specialized planning types, such as 'smart city development strategic planning', ' smart city development overall planning', 'pilot smart city construction planning'. etc. Besides, even the related palanning has not been brought onto urban planning systems, smart city development demands the correction and renovation of traditional urban planning from the aspects of compiling technique, concept, contents, procedure, etc.

4.2 Influence on urban planning formulation authority

Smart city planning is a systematical project which has not been well studied on formulation mode, successful cases, systematical study in the world.The most direct effect of smart city on urban planning formulation authority is shown on the task type and quantity, including related planning and standards

formulation, new type of industry development planning and supporting policies. The indirect influence of smart city on the formulation authority is the profitability and operation benefit. While the study content extents to IOT development planning, new generation information technique development planning, as well as related supporting policies, such as smart city development policy study, typical pilot project study, sharing platform study, smart city construction standards study, etc.

5 CONCLUSION

Advanced technology such as IOT and clouds computing, the continuous publishing of smart city planning and development policies as well as the persistent hot rising of smart cities reflects that the world is ushering a new age of smart city. Nowadays, more and more smart cities have been constructed around the world. As the starting point, 2010 Expo has drived smart city development in China. It is a grand system project which cannot be completed without the integration of technology, ideology and practice, as well as the appropriate adjustment of our urban planning system.

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