Research on Evaluation Index System of Smart City

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Abstract:

With global economy development, people begin to take care of the quality of their life. "Smart City" is mentioned and paid great attention to by many different national governments and a lot of social organizations all over the world. In western countries, many specialists have researched it, in order to weight and evaluate people's normal life. In China, it was focused on a little late. First, the author introduces experience of these west countries, such as GNP, IUP and ICF. Second, he analyzes the research situation in China smart cites now. In the end, the author thinks, it is essential to set up a complete set of smart city index evaluation system, in order to evaluate "Smart City" in China. The indicators in the system are selected should be appropriate, scientific, effective and comprehensive. The paper focuses on how to build and evaluate our smart city standardization. Studying on other countries experience and our policies, the author tries to put forward effective index system to evaluate our smart cities in China.

Keyword: *Smart city, GNP, IUP, ICF, Evaluation Index System*

1.INTRODUCTION

The concept of "Smart City", was proposed for the first time in IBM annual forum in 2008, when the global financial crisis broke out. IBM put forward the idea of "Smart Earth", so that people could get rid of or avoid the great crisis. They already realized people should elect optimal resource allocation and efficient urban management through information means. Later, it has gradually spread, expanded and evolved by governments and organizations around the world, such as the Us, Germany, South Korea, Japan, Singapore and many others countries. Some governments have researched and acted many corresponding development strategies, and elected some developed cities to do the experiments and demonstrated project construction, etc. In a word, they want to closely integrate smart city with the capacity of public services and social governance.

On December 5, 2012, the Ministry of Housing and Urban-Rural Development officially issued the "Notice on Carrying out national Smart City Test Work", in order to standardize and promote the healthy development of smart cities with Chinese characteristics. In the notice, "Smart City" is the first time issued by our government. is stepping up, bringing both opportunities and challenges to smart city development. During the 14th Five-Year Plan period, the construction of smart city in China will be guided by the requirements of modernization of national governance, based on the needs, combined with the characteristics of urban capabilities, conform to the development trend of information technology, deepen

digital infrastructure, improve service level, accelerate data governance, and build collaborative mechanism.

2. THE EARLY THEORETICAL ANALYSIS

Smart city is a hot topic in the field of urban development. The idea of smart city is found in many countries and places around the world. It has been widely recognized and has been supported by governments and industries. At the same time, it attracts many research institutions and a lot of experts. Smart cities are mainly designed to deal with the normal problems in life and work, such as traffic congestion, environmental pollution, governance chaos etc.

It is essential to construct a complete set of smart city index evaluation system for smart city. And the selected indicators in the system, it should be appropriate, scientific, effective and comprehensive. Many experts are from research different fields of telecommunication science, urban planning, management and many other disciplines all over the world.

Early in 1950th, It was mainly represented by advanced countries such as the United States and Japan, many famous scholars, Machlup and Kiyosuke etc. put forward system models, mainly including Machlup method, Borat method and IUP model, etc.

2.1 Machlup's calculation formula

Machlup's calculation formula is: GNP=C+I+G+(X-M) [1]. Machlup method mainly describes the function and contribution of information resources indirectly by measuring the proportion of information industry in GNP, the proportion of the employment of information sector and the proportion of the income of information sector in the total national income at a macro level. Machlup mainly investigated the function and significance of information industry in economic development, studies the structural proportion of information industry in national economy, analyzes the economic mechanism of knowledge production and distribution, and puts forward a set of theories and methods to measure the scale of information economy.

2.2 Borat method

Borat method is the earliest measurement method of informatization. It inspects the degree of social informatization from the perspective of economy [2]. It selects the proportion of added value of information industry in GNP and the proportion of information workers in the total labor force as specific indicators to measure the level of informatization.

2.3 IUP

Kiyosuke's index method of information variables mainly is from the post and telecommunications, radio, television news and other industries to select the amount of information, information equipment rate.

The IUP (infinite urbanization process) model has a supervised topic model to explore potential urban

functions and predict the popularity of urban areas [3]. A hierarchical Bayesian non-parametric priori, related to spatial distance in urban area division is used to generate clustering and urban functions of managed urban areas.

3.STUDY THE CONTEMPORARY EVALUATION MODELS

With the progress of science and technology, the development of the Internet, the new city has entered a new era, smart construction evaluation index system of city also is in rapid development, but due to different countries different national conditions, urban scale, urban development center of gravity is different, and many other factors, caused it is hard to have a set of traffic guidance, measure the world, even the development of smart cities within the same country.

3.1 ICF

The Intelligent Community Forum (ICF), was headquartered in New York. It is the first organization in the world to evaluate smart city construction and development. It was in 1999 that ICF established an assessment of the intelligence community through sharing and exchanging the successful experiences of various cities in promoting smart city construction through conferences, research exchanges and publications. The organization created a "selection, Analysis, evaluation and award" process, which first selected the Smart 21 from the nominated cities around the world, then ranked the Smart 21 through questionnaires and expert scores, and selected the Top 7[4]. Finally, third-party research institutions and forum panel were commissioned to further analyze the seven selected cities, and the annual "Smart Community Award" was selected based on the results of field visits.

Now it mainly has five dimensions, including Broadband, Knowledge work, Innovation, Digital inclusion, Marketing and advocacy. These five dimensions are subdivided into 18 secondary indicators to evaluate the development level of smart communities.

The evaluation system was forward-looking to a certain extent at that time, but the indicators were difficult to be quantitatively analyzed, lacking service concept [5].

3.2 Evaluation indicators of medium-sized smart cities

In 2007, Professor Rudolf Giffinger leaded some experts from Vienna University of Technology regional Science Centre, the Department of Geography at the University of Ljubljana and the Research Institute of Architecture and Urban Mobility at Delft University of Technology to structure the model. It contains 6 first-level indicators, 31 second-level indicators and 74 third-level indicators. They think, the development level of Smart city can be evaluated from Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart environment, Smart Living and other.

Seventy medium-sized cities were selected from about 1600 cities in the database of ESPON spatial Planning project to evaluate the level of urban intelligence under three conditions: the urban population is between 100,000 and 500,000, there is at least one university in the city and the traffic population is less than 1.5 million. The medium-sized city wisdom evaluation index system of evaluation index is more mature, more thoroughly understand the connotation of the intelligent city, index set up comprehensive and

meticulous, more focus on people's experience, and easily quantified processing, strong operability and ease of use, but the secondary index number is more, the difficulty of data acquisition in [6].

The system standard involves diversified evaluation of smart city development, and the index coverage is extensive, but there are serious problems such as European regional characteristics and unscientific allocation method of index weight.

3.3 Smart City Wheel

It was in 2012, Dr. Boyd Cohen took urban innovation and sustainable development as the standard, comprehensively considered all important factors in the history of creating smart city, and referred to the indicators of innovative city, regional green city, quality of life, digital government and so on. Smarter Cities Wheel is proposed and the "Smart City Wheel" evaluation index system is published. This index includes 6 first-level indicators, including smart economy, smart citizen, smart government, smart mobility, smart environment and smart life. Each first-level indicator corresponds to 3 second-level indicators, making a total of 18 second-level indicators and 27 third-level indicators [7].

Bode Cohen's assessment of global smart cities was mainly based on various rankings launched by other institutions [8]. The original data was not first-hand data, but mainly from the research data of other institutions, which was a relatively big limitation.

4. SMART CITY EVALUATION INDEX SYSTEM IN CHINA

With these theories and models of western professors, the Ministry of Housing and Urban-Rural Development put forward management measures and a series of related indicators for China's smart city construction, and officially issued interim Management Measures for National Smart City Pilot and National Smart City (District, Town) Pilot Indicator System (Trial) in November 2012[9]. The trial index system puts forward four dimensions to evaluate the level of smart city construction, namely security system and infrastructure, smart construction and livable, smart management and service, and smart industry and economy. These four dimensions evaluate the construction of smart cities from the perspectives of urban infrastructure construction, comfort of living environment, urban management and service level and economic development speed. The index System divides the four first-level indexes into 11 second-level indexes and 57 third-level indexes in detail [10]. The system focused on government services, transport services, social security services, medical services, education services, employment service, help services, city management, public safety, smart and environmentally friendly, green energy saving, broadband facilities, open share, develop and utilize, institutional mechanism and E-commerce services etc. But different characteristics of different districts, in different economic level, different thought and culture, people want different things and different sprits. Although the coverage of this indicator system is relatively wide, the specific indicators are not further refined.

Under the guide of the Ministry of Housing and Urban-Rural Development and some district governments, some new evaluation index systems of Smart City gradually rise. In 2016, Evaluation Index of

New Smart City was launched by National Development and Reform Commission, Cyberspace Administration of the Central Committee and National Standards Commission. It was made of 8 primary indicators, 21 secondary indicators and 54 third level indicators [11]. The two kinds were from our national governments. The system was not only focused on these indicators but also added city services, space-time information platform, open share, develop and utilize, network security management, system and data security, institutional mechanism and citizen experience survey.

But different characteristics of different districts, in different economic level, different thought and culture, people want different things and different sprits.

Overall evaluation index system of domestic wisdom city is located in the theory discussion stage, more for the evaluation under the government-led, focusing on the information infrastructure and its effect assessment, less involved in enterprise and the public perception of the wisdom urban construction. Although up to now, more than 200 smart cities have been piloted in China, each city is still in the stage of exploration and practice, and stakeholders involved in the construction. Neither we have formed a unified understanding of the connotation and construction path of smart city, nor have formed a batch of benchmark cities that can be copied and promoted. Without scientific evaluation, there can be no scientific management. Through sorting out and comparing the global representative development evaluation indicator systems of smart city, it can be found that the current representative smart city evaluation indicator system has inconsistent understanding of the connotation of smart city, and there are some differences in indicator setting. There are many indexes, so it is difficult to obtain the data. Some indicators lack foresight and guidance. There are too many indicators reflecting urban informatization, and less attention is paid to the benefits and effects of smart city construction. But in order to better reveal the wisdom of the city basic elements and inner essence, it is necessary to draw lessons from the domestic and foreign representative the wisdom of the urban development evaluation index system, taking the static evaluation and dynamic evaluation method of combining the, pay attention to the evaluation of existing wisdom city construction achievements, promote mutual learning between the countries and cities, summarize experience and lessons in time, It also provides guidance for the healthy and sustainable development of smart cities.

5.CONCLUSION

To construct the smart city evaluation index system, it is necessary to reposition the concept of county smart city from the perspective of development in the new era. The new smart county city should be a smart city integrating management, agriculture, medical care, transportation, culture, tourism and ecology, with its own unique and distinctive characteristics. At present, with the gradual advancement of the reform, urban reform has entered a critical period of overcoming difficulties, and at the same time, it is facing some bad problems such as imperfect infrastructure, slow economic growth, and serious damage to the ecological environment. Under the environment of overcapacity, crossover of production type and industrial derivation, the evaluation index system of new county smart city is constructed.

5.1 Based on the selection of indicators

The existing smart city evaluation indicator system is sorted out and classified according to different decision-making perspectives, which serves as the basis for the selection of evaluation indicators from the perspective of ternary principal decision-making. From the perspective of government-led perspective, it focuses on formulating clear strategic guidelines for smart city development; from the perspective of enterprise cooperation, it focuses on promoting the implementation of the new generation of information technology through the cooperation between government and capital; from the perspective of public participation, it focuses on the two-way communication between government, enterprises and the public, and focuses on whether the technological output meets the needs of public social life.

5.2 Principles of Index Selection

The smart city evaluation index system from the perspective of the three main bodies should take into account the interests of the government, enterprises and the public, and the selection of indicators should follow the principles of combining and representativeness, synergy and comparability, qualitative and quantitative, universality and pertinence.

5.3 The evaluation system combining and representativeness

Scholars should not only integrate the internal connections among the related fields of smart cities under the three-way decision-making of government, enterprises and the public, emphasize the integrity of the system, but also highlight the representativeness of a certain smart city field from a single decision-making perspective and reflect the personalized characteristics of each decision-making body.

5.4 The combination of synergy and comparability

To select indicators from the perspective of ternary principal decision-making, scholars should coordinate the contradictions among various principal indicators, so as to make the whole evaluation system shift from disorderly opposition to orderly coordination. At the same time, general relative indicators should be selected as far as possible, and absolute indicators should be selected less, so as to facilitate the determination of weight in horizontal and vertical comparison.

5.5 The combination of qualitative and quantitative

Adhere to quantitative, qualitative as a supplement. Quantitative indicators are used to objectively reflect the real construction situation and intuitively show the difference of wisdom in various fields. Qualitative

indicators are used to express the decision-making subject's digital perception of the city to make up for the inoperability of quantitative indicators.

The smart city evaluation index system should be universally applicable in a certain range of time and space, but should also be adapted to local and local conditions. Certain dynamic renewal space should be reserved according to the specific vision and advantages of the city, so as to guide the development direction of the city with distinctive characteristics.

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