Review and Prospect of Smart Cities in China

LIU Zhaohui,

CTO of China Eco-City Academy
Executive Board Member, Chinese Society for Urban Studies (CSUS)
Deputy Chairman of CSUS - Urban Big Data Technical Committee

Scene-setting

Since 2008, smart city has gradually become a trendy concept in China. Especially after the launch of the National Smart Cities Pilot Initiative in 2012, more than 600 cities have announced their smart city projects. The 10-year practice of smart cities has achieved fruitful results, which has played a significant role in improving urban management efficiency.

Smart City Experiments in China

In terms of institutional setting, many provinces and cities have established special data resource management agencies to coordinate government and local data resources, optimise various work processes, and often organise various special teams to bring different government departments together to implement specific projects jointly.

In terms of system reform, to achieve digital transformation, many processes have been redesigned. Many redundant and mergeable steps have been cancelled. Most verification processes were simplified, and the original fuzzy process became apparent. For example, the "One-stop services model" originated in Zhejiang, and the "one-window government service" started in Guangzhou has significantly changed China's government service standards. "Whistling and Report" Mechanism began in Beijing to ensure that communities initiate urban management cases. All responsible government departments must be transparent about the relevant tasks to the community.

In terms of urban management, many successful experiences show that smart cities can effectively improve efficiency in transportation, municipal facility operation, disaster prevention, drainage management, etc.

Smart transportation greatly improved parking efficiency, optimised traffic flows and stimulated alternative transportation modes. For example, Hangzhou east railway station has significantly increased its turnover efficiency of parking spaces and the proportion of free parking users with the help of a credit account and rodless parking system; the on-street parking monitoring and billing system in Beijing have significantly improved the turnover efficiency of parking spaces and reduced illegal parking. Many cities use artificial intelligenceoptimisemize traffic lights, which

significantly improves the traffic capacity of road systems. The internet-based bicycle sharing system has brought bicycles back to big cities, which solves the problem of the last kilometre problem and encourages low-carbon travel. The smart water supply system reduces the leakage rate of pipe network from 15% (national average) to 3%, and the smart heating system can save energy by 30%. This greatly contributes to the improvement of service, development of green city and reduction of air pollution.

China´s Approach to Envisioning a Smart City

Generally, we can see five characteristics of China's smart city experiences. Firstly, it emphasises top-level, systematic design. Secondly, a smart city is widely accepted and practised by the whole society, therefore, stimulating a large number of innovations. Thirdly, the efficiency of governments has been significantly improved, which brings better urban governance, e-government and a business environment. Fourthly, mechanism optimisation is the key, and information technology plays a great role. Fifthly, connectivity is still an important issue, e.g., how data is used and protected since the value of data is generally acknowledged.

Although it has achieved significant successes, there are still some problems which are not unique to China to a certain extent. The basic assumptions that actually dominated the practice of smart cities have never been explicitly examined. The first assumption is that a smart city is only a government affair. Still, in fact, the government is often not the best answer to the problem because of the limitation of its authority and efficiency. The second assumption is that the data may be fully aggregated. However, in reality, data is always insufficient, and decisions are always made with inadequate information. The third assumption is that a city can be fully controlled, but the city is not a machine that can be commanded. The fourth assumption is that resources allocated to smart cities can be supplied sufficiently. However, we all know that resources are always limited.

Lessons and Suggestions Based on Chinese Experience

In order to achieve a better smart city system, there is a need for a new understanding of smart cities. First, cities are self-organising and adaptive that many elements can autonomously reach a certain balance and resilience to external interference. Second, the future of smart cities should be rediscovered within the framework of the relationship between physical space, cyberspace and human society. Third, it should accommodate the contributions of the whole society towards smart cities so that it can adapt to the complexity and diversity of cities.

Therefore, we must pay more attention to strategic design, that is to consider how smart technologies can support the strategies of the city, what changes in industry and lifestyle will be brought about, and whether it is necessary to redefine the original strategy, what are the key constraints and supporting factors for smart city, what are the perceived

value of the smart city and what actions, policies and regulatory mechanism are needed to ensure its realisation.

The future smart city should have diverse and modular information system architectures. Centralised architecture may suit large cities, while cloud service is a better choice for small cities due to the limited market size. In addition, an open and collaborative smart city system should be formed on the principles that resources can be accessed, capacities can be enhanced and distributed, and modules can be completed and developed.

We also must pay attention to the regulatory design for a smart city. Such rules can be categorized into three types. Type I is about right and responsibility, which should be mandatory. The type II is about trust and certification, which are the public goods in the digital age. The type III is about cooperation and transaction, which are instructive and incentives based.

Finally, we should focus on scenario design rather than smart technology application. When we think about smart cities from the perspective of scenarios, we will find that we must pay attention to who the users are, what their challenges are and what solutions we can find for them.

By data-based decision making, process re-engineering, experience re-designing and information symmetric, we expect the future smart cities can be rational, reformative, innovative and transparent.

Discussions

After the presentation, Dr. Liu discussed the application of big data and the significance of human wisdom to smart cities with the participants.

Some participants believe that big data theory is based on relevance and has no reasonable explanation for causality. In the urban field, big data cannot explain the occurrence mechanism of urban problems and the dynamic mechanism of urban operation. Dr. Liu believes that it is undeniable that big data has huge defects in causal interpretation. However, big data still provides good tools for urban studies and urban governance. First, in the past, there was hardly any means for urban planners and operators to understand the real situation of the flow of various elements in the city. Today, with the help of big data, these invisible urban movement phenomena have

become visible; Second, big data can help us to examine whether various theories and assumptions are in line with reality and how to improve them; Third, through applying big data, human becomes more intelligent. Human intelligence rather than machine intelligence is the most important part of a smart city. Human beings have unique values, which determines the goal of all decision-making; Human beings have unique resiliency and creativity and can deal with all possible situations; And the smart city is the congregation of human wisdom.