Digital Transformation of Smart Industries and Transformation of Smart City Governance Models in the Context of Internet Technology and Digital Economy

Han Zhu

School of Finance, Taxation and Public Administration, Shanghai Lixin University of Accounting and Finance, Shanghai, China

Keywords: Internet Technology, Digital Economy, Smart Industry, Smart Cities, Digital Transformation.

Abstract: New digital technologies are profoundly influencing the process of industrial transformation and urban governance, as well as proposing new models and paradigms for smart city governance. How to digitally transform smart industries and govern smart cities in the context of Internet digitalization is an important issue to promote the modernization of national governance system and governance capacity. Based on the concepts and theoretical foundations related to the digital economy and Internet technology, this study is based on the vision of the digital industry transforming the governance system, deeply grasping the impact of the Internet, blockchain, big data and other technologies on the governance of smart cities and examining the laws of digital transformation of smart industries and the models of urban governance respectively. The study aims to grasp the logic and evolutionary laws of smart city governance and provide research directions and ideas for subsequent institutional research.

1 INTRODUCTION

As a spatial structure where different factors and resources and economic activities are highly concentrated (Yi, 2019), cities play an important role in the economic and social development of a country. As a new production factor and strategic asset, data has become a fundamental resource for urban development (Wang, 2020). With the application and development of big data, cloud computing and industrial internet, data technology has been deeply embedded in all aspects of urban governance, becoming an important means and carrier for fine urban management, and thus smart city governance has come into being. At the same time, emerging technologies are profoundly influencing social innovation and the transformation and development of urban governance. The digital transformation of smart industries and the transformation of urban governance arising from the fusion of data and emerging technologies are major issues in promoting the development of smart cities. Promoting the modernization of the national governance system and governance capacity and strengthening the construction of smart cities will become important symbols of the overall deepening of reform, while strengthening the construction of digital government, digital cities and digital industries, and enhancing the digital intelligence of urban public services and social governance will also become important conditions for the construction of new cities. In this context, the digital transformation of smart industries and smart city governance are integrated and developed (Yao, Zhen, 2022), promoting each other, interdependent and, under certain conditions, mutually constrained. This study focuses on the digital transformation of smart industries in the context of smart cities and the characteristics of the model of smart city governance on this basis, in order to deepen the understanding of smart industries and smart cities, which has important theoretical significance and practical value.

2 DIGITAL TRANSFORMATION OF SMART INDUSTRY

The degree of digital transformation in the smart industry is characterized by a progression from strong to weak, in the order of element transformation, structure transformation, strategy transformation and location transformation(Fig.1).
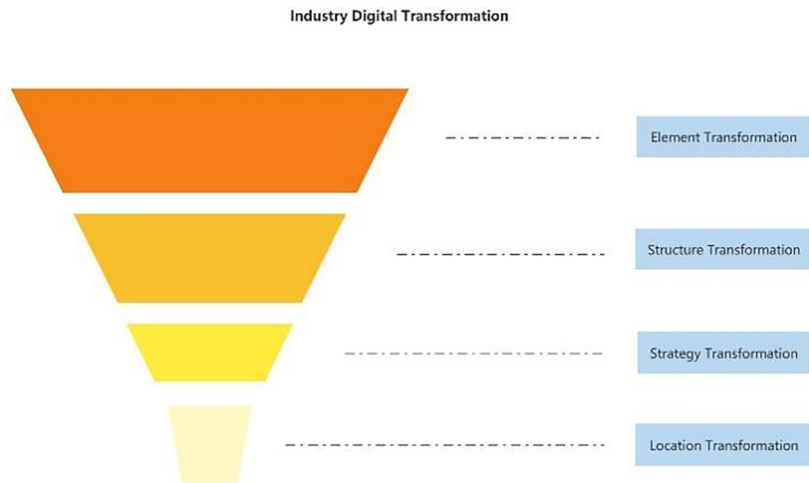
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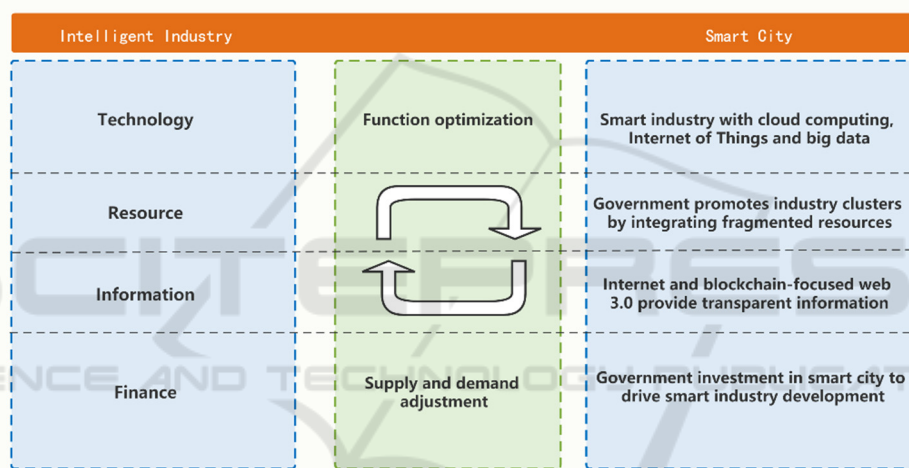Figure 1: Industry Digital Transformation. [Self-painted].

Figure 2: Integration of smart industries and smart cities. [Self-painted].

2.1 Element Transformation

Smart industry is the basis for the development of smart cities, while smart cities provide space for the development of smart industry. However, the interconnection and integration of the wisdom industry and the wisdom city are influenced by many other elements, the main ones being technology, resources, information and capital, which intermingle and promote each other to jointly promote the development process of the wisdom industry and the wisdom city and facilitate the digital transformation of the wisdom industry. The development process of smart industry and smart city is to make full use of these influencing factors to form a reasonable structure of smart industry and the spatial layout of smart city, and to realize the integration and progress of smart industry and smart city(Fig.2).

2.1.1 Technology Elements

The birth of big data technology, artificial intelligence technology, edge computing technology and blockchain technology has further promoted the development of the digital industry while optimizing the functions of smart cities. since 2010, the smart industry has gradually emerged as a new industry in the country. Numerous companies have entered the smart industry, their technologies cover a wide range of fields, and their mature scientific achievements have been effectively utilized in the construction of smart cities. In line with the six dimensions of the digital industry (Fig.3), many digital and intelligent transformations and upgrades based on data have emerged.

For example, virtual spaces are gradually shifting from "visual scenes" to "governance scenes" driven by technologies such as artificial intelligence and
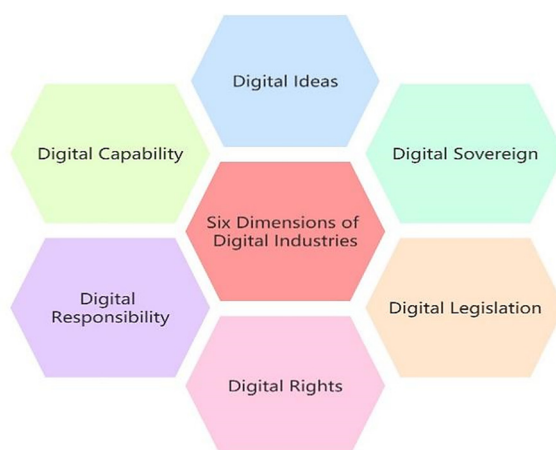
Figure 3: Six Dimensions of Digital Industries. [Self-painted].

digital twins (Wang, 2022); RFID identification technology is already widely used by customs; mobile IOT technology is helping smart streetlights to be deployed on a large scale on the city's roads; cloud computing technology is being used to provide a wide range of services. The government cloud based on cloud computing technology is widely used by government departments; big data technology and artificial intelligence technology are rapidly promoting the transformation of data center wisdom; blockchain technology helps promote the sharing, utilization and security of information between regions, departments and enterprises; digital interaction system and government-citizen interaction platform, which are logically constructed in two-dimensional space such as digital city and big data, greatly improve the efficiency of government operation. The three-dimensional space with virtual reality and metaverse as the underlying logic provides a more ideal paradigm for future government-enterprise collaboration. The current application of wisdom industry in a series of municipal projects has also gradually created a wisdom city platform capable of providing wisdom services to the government, enterprises and citizens, which provides a broader space for the digital transformation of industries, including the wisdom upgrading of new wisdom industries and traditional industries

2.1.2 Resource Elements

Resources mainly include R&D resources and human resources. R&D resources give rise to human resources, and human resources can make better use of R&D resources to maximize their effectiveness. In recent years, China has gathered many universities and

new R&D institutions to create national key laboratories, national technology centers and a large number of enterprises with independent R&D capabilities. By integrating R&D resources to create a closed loop of R&D-talent, a virtuous cycle is formed. In terms of human resources, by actively building a wisdom talent pool, strengthening the interaction between the government, enterprises, universities and research institutions, building an integrated platform for industry-university-research, promoting talent innovation and exchange, and promoting the integration of wisdom industry and wisdom city development talent is a key element in determining the construction of wisdom cities and wisdom industry innovation, and talent capacity building is indispensable. In the process of promoting the development of wisdom industry and wisdom city, there are two main paths to strengthen the construction of talents. (Xu, Zhang, Zhang, 2013) One is to gather talents from outside. Cities need to attract and gather talents by creating a good physical environment and cultural atmosphere. To strengthen the introduction of talents, the city has taken the lead in formulating and continuously optimizing settlement and housing policies for high-level talents, domestic and foreign university graduates and foreign talents, so as to provide convenience and protection for their work and life. To promote the development of smart industries, talent policies should focus on entrepreneurial talent and scarce talent in key industries and promote the flow of talent to companies related to smart industries. Secondly, the government needs to cultivate talents from within. It needs to uphold the concept of openness and innovation, encourage universities to cultivate talents in line with industrial trends, and actively guide the community to jointly cultivate the key talents needed for smart industries and smart cities.

2.1.3 Information Elements

Information has a high strategic position as an important resource for innovation and development in today's society, and some scholars believe that it is the basis for innovation and competitive advantage, as the unique ability to disseminate, store, organize, process and analyze information becomes a good condition for constituting a modern think tank. (Peng, Chen, Li, 2021) The information element has contributed to the flourishing of think tank construction. Information think tanks serve public policy, and as think tanks, they have tremendous information support for the digital industry in both political advice and academic research and theoretical innovation; information think tanks allocate human, material and financial resources rationally so as to carry out human resource management, fund management, project management and results management and other related work, improve efficiency and shorten the process, and can develop and utilize information to the greatest extent The information think tank plays the functions of planning, organizing, implementing and controlling, effectively integrating the research resources of the think tank, making full use of the expertise and research capabilities of the intellectual subjects, forming an efficient and high-quality knowledge production process, producing high-quality knowledge products, and delivering them to the government, the public and the international community through different ways, channels and media to realize the value of the results The project will also promote the digital transformation of industries.

2.1.4 Finance Elements

Funding is the material basis for supporting the construction of smart cities and the development of smart industries. At the early stage of smart city construction, the government promoted the construction of smart cities through investment, which in turn led to the development of smart industries. In recent years, China has actively promoted the integration of industry, academia and research, which has led to the development and growth of the wisdom industry and the formation of a complete upstream and downstream industrial chain. In the late stage of smart city development, China has made full use of the advantages of high management efficiency and strong technical innovation capacity of institutions and social capital and the leveraging and amplifying effect of financial funds to promote the construction of smart cities in China, relying on the Internet, big data, cloud computing, block chain, artificial intelligence and other financial technologies to vigorously develop Internet finance and promote the flow of financial capital to industrial construction and urban governance, thereby realizing the smart industry The promotion of smart city construction. At the same time, financial technology has greatly reduced the operating costs and access threshold of inclusive finance, realized measurable, asset-based and data-based credit systems, and enabled everyone to participate in urban construction and industrial development through financial investment. It has effectively promoted urban infrastructure construction and economic and industrial development in numerous fields such as road transport, new district development, ecological protection, cultural tourism, biomedicine, software and information services and education and healthcare.

2.2 Structure Transformation

The digital transformation of smart industries is a process of integration and development with cities. On the one hand, the development of smart industries stimulates demand on the socio-economic side, thus stimulating the intrinsic vitality of cities; on the other hand, the improvement of smart city functions will also provide conditions for the development of smart industries and enhance competitiveness. In the development process of smart industries and smart cities, the integration and development of smart industries and smart cities have formed different stages due to the fundamental change of their leading dynamics (Fig.4). In recent years, the integration and development of China's wisdom industry and wisdom cities has been deepening and has gone through three development stages in chronological order.

2.2.1 Policy-Oriented Stage of the Initial Transformation

The focus of this stage is on policy support, and the government needs to formulate relevant policies that are conducive to the digital transformation of the smart industry and use high technology to guide the gradual formation of the prototype of the smart industry, so that a cluster of smart industries can be formed. In terms of space, some scholars believe that modern urban space is gradually transforming towards the intelligent and digital elements brought about by the fourth industrial revolution, i.e., more attention is paid to the technological empowerment of urban space brought about by digital technology in the process of embedding in urban governance. At this stage, both smart industrial bases and smart urban areas formed by smart industrial agglomeration show a clustered distribution, and smart urban areas mainly
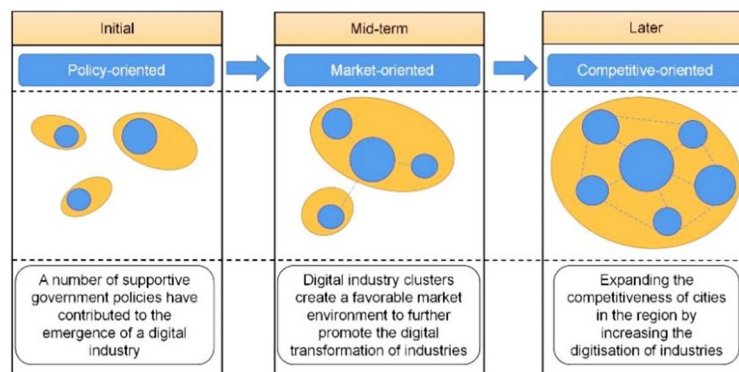
Figure 4: Structural transformation of the digital industry. [Self-painted].

expand around smart industrial bases, forming a one-dimensional urban space.

2.2.2 The Market-Oriented Phase of Mid-Term Integration

The focus of this phase is on market expansion. With the gradual development of the concept of smart cities, the focus of attention is no longer limited to the construction of infrastructure, but more on the market pull effect of the city. Whether the mid-term market expansion can be completed to lay the foundation for the later scale development becomes the key to the successful completion of the digital transformation of the smart industry at this stage. The construction of smart cities has led to the development of urban transport, education and finance, and the development of transport, education and finance has created a favorable environment for the market expansion of the smart industry, further promoting the digital transformation of the smart industry. Spatially, smart industry bases and smart city areas began to show a point-axis distribution, and smart industries and smart city areas began to expand along the axis, with adjacent areas connecting to form a two-dimensional urban space.

2.2.3 The Later Stages of Integration in the Competitiveness-Oriented Phase

This stage focuses on the creation of competitiveness, which is the ability of a city to attract, compete for, own and transform resources, occupy and control markets and its ability to create value and provide welfare for its residents in comparison with other cities in the development process. (Ni, 2001) The improvement of a city's competitiveness is mainly achieved through urban industries. The returns and influence of urban industries determine, to a certain extent, the city's ability to create value and reflect its

competitiveness. In the advanced stage of digital transformation of wisdom industry is to expand the competitiveness of the city in the region by improving the level of wisdom industry, so as to obtain more resources to promote the digital transformation of wisdom industry and the development of wisdom industry and wisdom city. Spatially, smart industry bases and smart city areas show a net-like and face-like distribution, with closer links between smart industry bases, forming smart industry clusters and neighboring smart city areas gradually forming three-dimensional urban spaces.

2.3 Strategy Transformation

2.3.1 Investment-Driven

This type takes deepening the supply-side structural reform as the main line, strengthens top-level design and overall coordination ability, and promotes the digital transformation and development of smart industries and the improvement of urban functions through project investment and construction to build a smart city. On the one hand, it promotes the development of wisdom industry through key projects, extends the industrial chain and improves the wisdom industry ecology. Focus on the development of core wisdom industry, through the injection of funds and technological innovation, focus on the development of software and information services industry, medicine and health, artificial intelligence, new energy vehicles, integrated circuits, smart grid, rail transportation, intelligent manufacturing equipment eight key industries, to build a "goose array" of industrial clusters; continue to promote industrial complementary chain to strengthen the chain Stabilize the chain, focus on building iconic major industrial projects starting from industrial demand, and cultivate a number of core enterprises that can drive the integration and per-

fection of the industrial chain and create a new intelligent industrial ecology. On the other hand, through investment and construction to improve the city's wisdom city function, strengthen the city's important carrier support. Coordinated planning of industrial structure and urban spatial layout, project access as a grasp of efforts to build a new carrier of urban wisdom industry with outstanding benefits of industrial clustering, through investment to promote the digital transformation of wisdom industry.

2.3.2 Consumption-Driven

This type aims to promote the digital transformation and development of smart industries by consumption, focusing on demand-side structural reform and management, expanding domestic demand for urban consumption, improving the urban consumption environment and enhancing the quality of consumption, forming a positive interaction between the supply and demand sides. On the one hand, it relies on new smart industries and the smart transformation of traditional industries to create new consumption growth points, promote economic development and optimize the functions of smart cities. Vigorously develop new smart industries, promote digital consumption, and support the development of online industries such as the layout of telecommuting, online education, telemedicine and online entertainment; guide the wisdom of traditional industries, and guide commercial enterprises to implement digital transformation. On the other hand, through the construction of a multi-level, integrated development of the smart city consumption carrier platform, to stimulate consumption enthusiasm, ensure consumer safety, promote economic development, and pull the transformation and upgrading of industrial wisdom. Expanding the spatial axis of consumption in the smart city, by building a brand publishing platform, establishing brand advantages, promoting the development of fashion characteristic industries and the improvement of business service systems, and pulling the digital transformation of smart industries through consumption.

2.3.3 Innovation-Driven

The type takes reform and innovation as the fundamental driving force, highlighting the core position of innovation drive in the process of digital transformation and development of the "wisdom industry. On the one hand, in order to promote the development of the smart industry, it focuses on differentiated support and diversified cultivation of innovation subjects, establishes a full-cycle and full-factor innovation sup-

port system oriented by market demand, and promotes the integration and development of the innovation and industrial chains. We will implement actions to improve the quality and efficiency of new R&D institutions, promote the exchange and cooperation of various innovation subjects, guide the flow of various innovation elements to the industrial end through government policies, and form a market-oriented model for the integration and development of industry-university-research; cultivate a matrix of science and innovation enterprises in a gradual manner, provide differentiated policy support and management according to the scale and development stage of the enterprises, and deepen the implementation of the plan to introduce high-level overseas talents and projects to effectively improve the programmed will also deepen the implementation of the scheme for the introduction of high-level overseas talents and projects, so as to enhance the innovative and entrepreneurial capabilities of talents. On the other hand, we will optimize the carrier function of the smart city by constructing a multi-level and three-dimensional innovation space, promote the development of smart city construction in the direction of marketisation, specialization and refinement, and enhance the scale effect, agglomeration effect and comprehensive effect of the smart industry. Promote the high-quality development of high-tech parks, enhance the level of co-ordination and coordination management of high-tech zones, create market-oriented, differentiated and distinctive high-tech parks through the integration of innovative resources and the coordinated layout of industries, enhance the overall economic benefits and development quality of parks, and promote the digital transformation of smart industries through innovation-driven.

2.4 Location Transformation

2.4.1 Digital Transformation of Smart Industries in the Old City

In the early stages of digital construction in the old city, there was a lack of guidance on the concept of smart city construction, and the digital construction of various departments was uneven, with poor links between departments, forming "information islands", which greatly reduced work efficiency and caused a waste of resources. In order to solve the above problems, we need to co-ordinate the wisdom construction of the old city and the digital transformation of traditional industries, and on the basis of the existing information construction and industrial transformation,

we should redesign the top level and build a centralized government data platform to interconnect the isolated information systems of various departments, so as to realize the interconnection and sharing of information between departments. At the same time, as the economic and cultural center of the city, the old city has many influential regional shopping districts that gather the best quality consumer markets, attract consumers from across the city and contribute the most to the city's commercial output. However, with the rise of the O2O model, the low-cost, high-efficiency and zero-inventory online retail industry began to emerge (Wei, zhen, Xi, Wang, 2013), the traditional circulation order and marketing model of commercial production and sales were broken, the traditional commercial space structure of the city faced impact, and the government began to explore and practice in the face of the new situation. In recent years, in order to accelerate the construction of smart cities, China has implemented infrastructure renovation and upgrading and data resource sharing and opening projects based on in-depth investigation and research in cooperation with smart city construction units, focusing on "data + governance" and "data + decision-making". In addition, the project will be managed in the whole process of project creation, implementation, acceptance and application of wisdom projects, so as to achieve the coordination of wisdom projects. At the same time, it will guide the cooperation between the Internet-based online industry and the offline shopping areas of traditional cities, jointly create new scenes, new experiences and new marketing, and data-driven online and offline operations in the whole area to create a new intelligent consumption model, lead the consumption trend and promote the digital transformation of the wisdom industry in the old city.

2.4.2 Digital Transformation of Smart Industries in the New City

Compared to the old city, the new city has a relatively weak industrial base, lacks leading industries, and originally had a low overall industrial level, weak consumption and weak markets. The digital transformation of the wisdom industry in the new city should give priority to top-level design and planning from the wisdom city aspect, co-ordinate the construction of a wisdom city service platform, provide better and more convenient services for enterprises, and create a good environment for the development of the wisdom industry. The new city should strengthen new wisdom industry landmarks, seize development opportunities, vigorously develop new wisdom industry systems,

focus on complementing and strengthening chains, creating new development platforms, developing new application scenarios, strengthening support for major projects, forming new growth points with explosive and leading power, deepening the integration of industry and city, and promoting the digital transformation of wisdom industry and the rapid development of wisdom cities.

3 A PARADIGM SHIFT IN URBAN GOVERNANCE

With the rapid development of intelligent technologies such as cloud computing, the Internet of Things and big data, the smart industry is not only at the forefront of modern industrial development, but also leading the development of human-centered smart city construction and new urbanization. The injection of smart industries provides the impetus for the development of the city's economy, and the economic development drives the infrastructure construction of smart cities, improves the functions of smart cities, optimizes the quality and layout of urban space, which in turn creates the flow and concentration of population and capital, increases the supply of labor, talent and capital for smart cities, and will also drive the demand for the economic, social, political, cultural and ecological functions of cities. The new demand and the existing foundation of smart city construction will in turn provide the impetus and guarantee for a new round of upgrading of the smart industry, thus forming a virtuous cycle of integration and development of the smart industry and the smart city. In this new era, as a result of the digital transformation of the smart industry, the governance model of the city has also changed from traditional governance to a new type of governance. Some scholars believe that the governance of a new type of city involves the comprehensive role of multidimensional factors such as values, institutions and technologies. (Yi, 2022) In the context of the development foundation and different stages of the integration of smart industry and smart city and the digital transformation of smart industry, according to the four core elements of value, politics, market and tools, this paper classifies urban governance models into four types, which are the innovative governance model with multi-sectoral collaboration, the innovative governance model with the participation of subdivided multi-dimensional subjects, the innovative governance model with a human-centered approach and the smart city The scientific assessment model of governance (Fig.5).
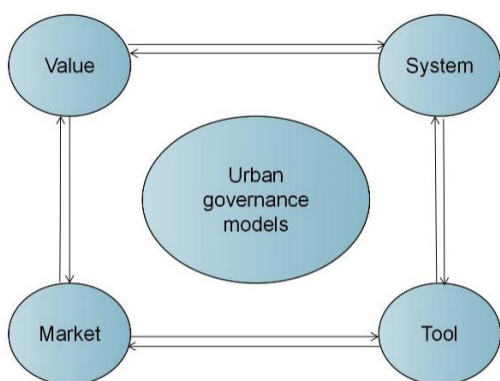
Figure 5: Four elements of the urban governance model. [Self-painted].

3.1 Value: An Innovative Governance Model with Multi-Sectoral Synergy

In the context of a smart city, the subjects of urban governance include government departments, enterprises, the public and social groups, etc., but it is the government departments that play the leading role, so it is necessary to innovate the governance model, build an integrated, refined and visualized public information platform governance model, compose a public information system with spatial data, image data and monitoring videos of the governance tasks of each department, and construct a multi-departmental collaborative After acquiring information and data from the platform, the decision makers of smart city governance can conduct comprehensive analysis, unified scheduling and formulate measures. The collaborating departments can also exchange information and data in real time in the wisdom information platform, share resources and dovetail with each other to jointly manage problems, forming a pattern of multi-departmental collaborative governance.

3.2 Market: An Innovative Governance Model that Breaks down the Participation of Multiple Actors

In the context of smart cities, the governance of cities must be jointly participated by multiple subjects in order to achieve better governance results. The government should organically unify and coordinate multiple subjects to participate in urban governance together. Government departments should fine-tune the decomposition of the work involved in the governance subjects and refine the work tasks and spatial units of the subjects, so that the two can be effectively dovetailed and the "invisible hand" of the market can be used to reduce the waste of human, material and financial resources, so that the governance tasks can be completed in a very short period of time and the efficiency of urban governance can be improved.

3.3 System: An Innovative Model of People-Centered Governance

In the context of smart cities, the starting point of urban governance is to serve the public and improve their standard of living and quality of life. Therefore, an innovative people-oriented governance model should be established to involve more public participation. Publicity and participation are important features of smart cities, and all aspects of smart city governance should be open to the public, with improved public participation mechanisms and group efforts. The smart information platform should facilitate public participation in different time periods and spatial areas with the help of tools such as cloud computing, big data and the Internet of Things, opening up channels for reflection and improving governance effectiveness. (People's Daily, 2020)

3.4 Tool: A Scientific Assessment Model for Smart City Governance

In the context of smart cities, the government should adopt a scientific assessment model to evaluate whether the governance of the city is in place and whether the results are satisfactory. In the assessment, multiple methods should be used to make the assessment conclusions as authentic, objective and scientific as possible. The government should go deep into the governance scene and directly participate in the governance of the smart city; or use the interview method and questionnaire method to assess the effectiveness of the governance of the smart city, the method chosen must be scientific and effective, and can well control the real situation. If problems are identified in the process of smart city governance, relevant government departments, enterprises or social organizations should be instructed to rectify them in order to achieve better governance results.

4 CONCLUSION

Driven by smart technology, the digital transformation of smart industry and the integration of smart industry-driven smart cities are important ways of urban development in the new era. Taking the digital transformation of smart industries as an entry point, this paper summarizes the specific types of digital

transformation of smart industries in China in recent years and their influencing elements, and analyses in depth their intrinsic logic and influencing mechanisms. On the basis of a structured analysis of the development of multiple integration, it summarizes the four major modes of urban governance and their multiple integration development characteristics that have been demonstrated in smart cities influenced by the development of smart industries. In this new era, it is necessary to integrate the multiple elements involved in the development of smart industries and smart cities, to give full play to and balance the power of the government and the market, and to realize the digital transformation of smart industries and the efficient integration of smart industries and cities, so as to promote the overall improvement of the level of industrial development, the effectiveness of urban governance and the quality of social and economic development.

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