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AN ANALYTICAL FRAMEWORK FOR CHINA'S SMART CITIES ECONOMY

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Abstract:

Smart cities are critical to country development. Several nations made significant investments in constructing smart cities to provide maintainable living in recent years. China has developed mature core technological services and platformsof applications, and associated technologies are extensively employed in economics, government, and everyday life. This study provides empirical insights into smart city development at the local level in China, as well as the challenges that it faces and the larger implications that it has. The major goal of the study is to look at the possible influence of smart city deployment on the Chinese economy. The rapid advancement of advanced technologies and their application have a significant impact on the development of smart cities. The smart economy is a major aspect of a Smart City. We review the evidence that smart city is having a large effect on the economy. This work used a literary survey to collect data and information from different resources. The approach relied on international organizations' statistics on the smart city economic performance correlation to obtain smart data. Specific data sources belonging to the latter category included the International Business Machines (IBM) ; Smart City Research Institute; Deloitte.com; Qianzhan Industry Research Institute (QIRI) ;and The Ministry of Industry and Information Technology of China (MIIT)

Keywords: Smart city; Digital Economy; knowledge economy; China

1. INTRODUCTION

Over than half of the people around the globe already exist in cities, and they arepredictable to rise to 70% by 2050. (Ritchie & Roser,2018). China's urban population accounts for 60% of the national total in 2020, and is expected to reach a very ambitious rate, 80%, by 2050 (Deloitte, 2018). Beijing, Shanghai, and Shenzhen, for example, all have populations of more above 20 million people (Wang et al., 2021). With today's tremendous advancements in science and technology, digital technology has emerged as a major driver of economic and social progress. The use of information technology, as well as changes in economic and social activity, are all part of the digital economy which in particular, has the potential to alter economic size, industrial structure, and people's activities. The Belt and Road Initiative, particularly its "Digital Silk Road" element, was launched by Beijing, which offers high-level backing for Chinese enterprises' involvement. At the 2017 Belt and Road Forum of 2017, the Chinese President Xi Jin ping wanted cooperation in "digital economy, artificial intelligence (AI), nanotechnology and quantum computing" and "the development of big data, cloud computing and smart cities" (He & Tritto, 2021).

The China Academy of Information and Communications Technology showed that the digital economy was worth 22.4 trillion Chinese Yuan Renminbi (CNY) in 2016 and 35.8 trillion CNY in 2019 about 36.2 percent of the country's Gross Domestic Product (GDP) (Li et al., 2021). Smart city initiatives aim at enhancing urban performances via employing data, information and communication technology (ICT) to give citizens with more exceptional service, to oversee and manage existing infrastructure, to enhance cooperation among various economic players, and to stimulate creative business prototypes in the commercial and public sectors (Marsal-Llacuna et al., 2015). IBM accomplished more than 100 smart city projects around the world between 2010 and 2017, covering subjects such as administration, citizen involvement, growth ineconomy, developments in education and workforce, the environment, public safety, social services, transportation, and urban planning (IBM, 2017). Based upon the 2019 China Smart City Development Report, more than 700 cities

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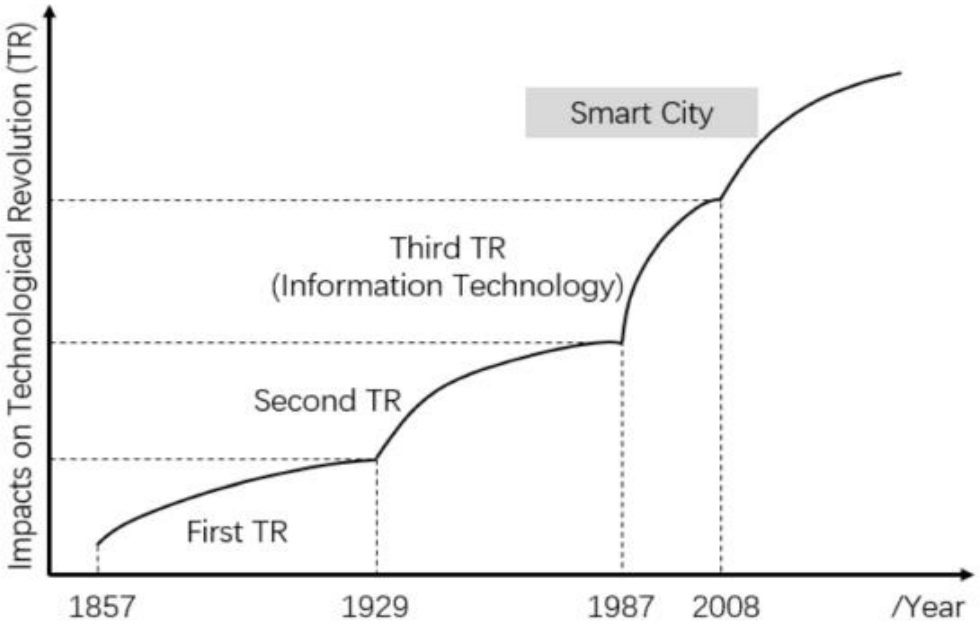
in China suggested or are executing smart city plans as of February 2019, such as 100 percent of sub-provincial cities and 93 percent of prefectural level cities (Hsu,2021). China's smart city market expenditure will reach $ 25.9 billion in 2020, increasing 12.7 percent yearly, larger than the world average, and the second-biggest spending nation behind US, according to the Smart City Spending Guide issued in July 2020 (Wang et al., 2021). This study provides factual insights into smart city development at the local level in China, as well as the challenges that it faces and their larger consequences. This concept has become popular in cities worldwide since its first proposal. It is regarded as a strategic choice to increase the quality of public services and the effectiveness of city government, as well as to promote urban industrial transformation and urban sustainable development. This paper proposes a framework used by researchers to analyze the same cases. The remaining part of the research is structured as follows. In Section 2, the theoretical foundation. In Section 3, work methodology, In Section 4, the results are shown, and the last section is the conclusion.

2. THEORETICAL BACKGROUND

According to the concept of "smart earth," IBM formally introduced the concept of "Digital city" in 2009. A smart city, it was stated, ought to be able to maximize the use ICT, intelligently reacting to diverse demands of people's livelihoods, environmental protections, public securities, urban services, and industrial and commercial operations, resulting in a better urban living for humans. Don Tapscott, the "father of the digital economy".The digital economy, according to this definition, is an evolving economic approach built on digital network applications and expanded human capitals, defined by digitization and intelligence, and capable of achieving global economic interconnectedness through self-learning and innovation. (Tapscott,2015). Technological revolutions are frequently triggered by global economic crises. For instance, the international economic crisis of 1857 sparked the first technical revolution, the second technological revolution in 1929 sparked the second technological revolution, and the information technology revolution in 1987 sparked the third technological revolutions (see Figure 1). With IBM's classic study Smart Planet, smart cities have been a universal subject since the financial crisis of 2008. Smart Planet promotes the widespread next-generation information technology usage across all industries, spawning concepts like smart cities and digital cities. The notion of smart cities has no clear and statical definition in today's world. Smart cities, on the other hand, are extensively interwoven with ICT and the Internet of Things, as evidenced by their multidisciplinary development (IoT) (Wang et al., 2021).

Figure 1. Effects of Global Economic Crises upon Technological Revolutions



Source: Wang, et al., 2021

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The concept of "smart" refers to the use of information technology to guide municipal operations, such as observing, predicting, and real-time management. The integration of IoT with AI, with IoT indicating sensors or hardware and AI denoting back-end algorithms (Wang et al., 2021), can displace traditional management methods, the IoT, like government big data and cloud computing (Atha et al., 2020). The notion of smart is no longer restricted to intelligence, but completely encompasses the involvement of inhabitants or users, thanks to technological advancements and increased awareness among smart city citizens. Giffernger (2007), indicates a full illustration of smart city with hexagonal aspects; smart economy, smart governance, smart environment, smart people, smart mobility and smart living. That would be a more functional concept that is critical in driving smart city activity. The use of ICT infrastructure to increase economic efficiency and promote social, cultural, and urban development is a distinguishing aspect of a smart city. It makes use of the new technology revolution characterized by ICT, IoT, and cloud computing, that has allowed cities to increase their capabilityofobserving, interpreting, integrating, and using data in order to cope with more complicated challenges (Qin & Qi,2021). A city may be governed in a variety of ways in order to become a smart city. It will be able to steer its aims along this route using six main action directions (Figure 2), (Svobodová & Bednarska-Olejniczak, 2020).

Figure 2.The Six Action Areas of Smart Cities

Source : Svobodová & Bednarska-Olejniczak, 2020

Ji & Jinbiao (2021), also describe the features of smart cities in terms of six importantscopes: quality of life (Smart Living), competitiveness (Smart Economy), social and human capitals (Smart People), public and social services, and citizen participations (Smart Governance), transportation and communication infrastructure (Smart Mobility), and natural resources (Smart Environment) (Smart Environment).

Deloitte (2022), identifies three critical characteristics of a smart city: I Life quality; (ii) Economic competitiveness; and (iii) Longevity. Cities have traditionally been major hubs of trade and business, taking advantage of the closeness of

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different populations to assist fuel an innovative economy.A smart city is business-friendly that ensure employment and tax revenueswith strong economic foundations." Cities serve as "economic growth engines" that dominate local and national economies (Kumar & Dahiya, 2017). Smart cities are viewed as "Intelligent Communities," collaborative ecosystems that encourage innovation by forming links between individuals, government, corporations, and educational institutions, according to Ji & Jinbiao (2021), These innovative clusters promote the growth of "knowledge economy" activities with high added value. When gadgets become intelligent, the ecosystem of devices that surrounds them becomes smarter as well.The growth of such a development creates what is known as a smart city, which is an entire metropolis that runs at high or peak efficiency thanks to electronics. According to a new whitepaper, smart cities would see yearly economic growth of 5%, translating to over $20 trillion in ten years. This confirms that smart cities are an excellent investment that may have a good influence on the economy (Svobodová & Bednarska-Olejniczak, 2020).The central government's recent Premier Li Keqiang's14th Five-Year Plan reveal that digitalisation and technological innovation will remain a top priority, with a strong emphasis on Information Technology (IT), the proliferations of fifth-generation application, and digital governance (Große-Bley & Kostka,2021). China's defense corporations have also taken use of their own skills as systems integrators to enter the smart city sector in the country. China Electronics Technology Group Co., Ltd. (CETC), a state-owned defense electronics conglomerate, established its own Smart City Research Institute in April 2016, at the time collaborated with the governments of the city in Shenzhen, Fuzhou, and Jiaxing to make and conducttypical smart cities in these cities (Atha et al., 2020).

3. RESEARCH METHODOLOGY

The data collection was prepared of printed copies were supplied by the experts. This work used a literary survey to collect data and information from different resources, with the consideration of the published resources, the impact factors of the reviewed articles and the governmental statistical . The collected information used to answer the research questions, and help to draw the conclusions. The major goal of the research is to look at the possible influence of smart city deployment on the Chinese economy. The effort relied on international organizations' statistics on smart city economic performance correlation to acquire smart city economy data. IBM, Smart City Research Institute, Deloitte.com, QIRI, and MIIT were among the data providers in the latter category. The final phase focuses on summarization and discussion of findings gained from the research

4. RESULT AND DISCUSSION

According to influence assessment of 44 main digital cities in China from five elements: people, environment, economy, governance, and information (Shen et al.,2018). The smart environment outcome is also at the minimum (see fig. 3). Smart city is a section of the physical ecosystem that focuses solely on the urban, but there is a scarcity of the research and support of the interplay between the city and entire ecosystem. Its role and impact are restricted, which is not lead to the sustainable development of the smart city.

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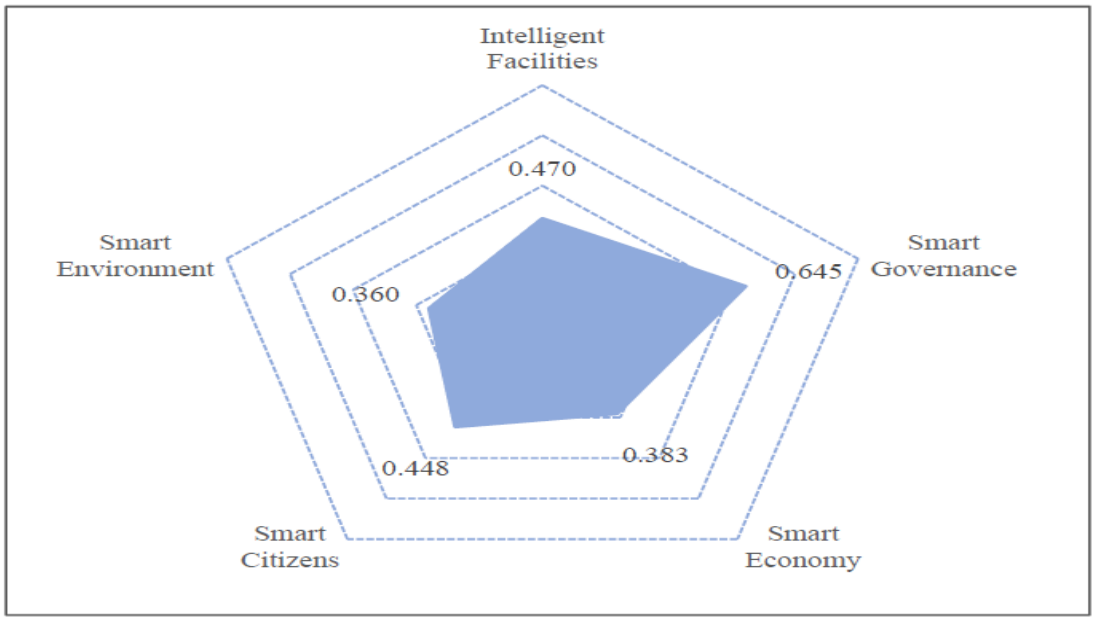
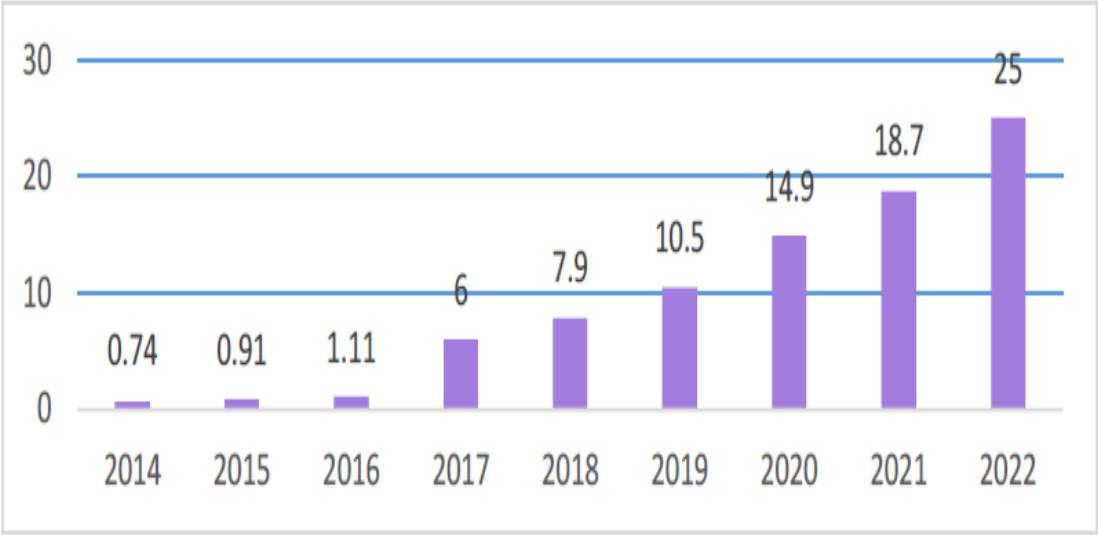
Figure 3. The Smart Indicators of Major Cities in China



Source : Shen et al.,2018

According to QIRI (2019), Investing has aided the development of a Chinese marketplace for smart city solutions. There is a greatvariance in the estimations of the size of the Chinese smart cities marketplace (see Figure 4). One Indian market research firm estimated the industry to be worth $30.4 billion in 2018 and predicted that it will expand to $59.9 billion by 2023, with a compound yearly growth rate of 15.4 percent (MarketsandMarkets ,2020). Even while this figure represents a significant share of what other sources assess to be the worldwide worth of the smart cities industry, Chinese news agencies such as China Daily have published significantly higher figures,observing that Chinese consulting companies value the smart cities marketplace at renminbi (RMB) 7.9 trillion ($1.1 trillion) and RMB 25 trillion ($3.5 trillion) in 2018 and 2022 respectively, mirroring an expected 33% complex yearly growth rate (Atha et al., 2020).

Figure 4.Assessed Size of Chinese Smart Cities Market (RMB trillion)



Source: QIRI, 2019

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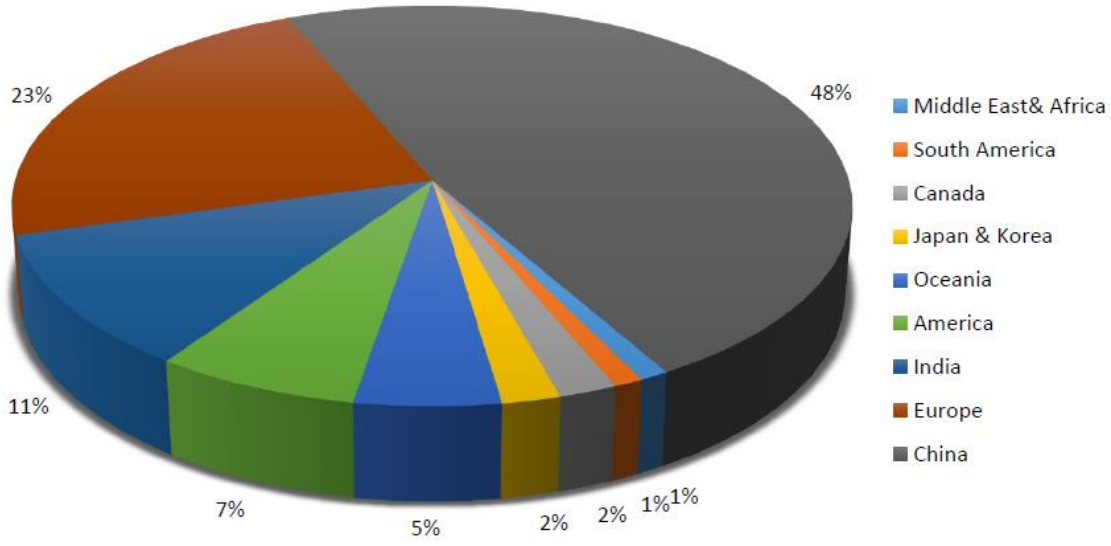
Significant national and local government funding has aided China's smart city development ambitions. To far, smart city pilot programs are believed to receive RMB1 trillion ($139.9 billion) in government funding, with 1 marketplace intelligence projection predicting that government paying for smart city efforts in China will reach $38.92 billion in 2023 (Atha et al., 2020). The priority categories of resilient energy and infrastructure, data that are driven by the public safety, and intelligent transportations are likely to receive more than half of these funds, although smart city investments are anticipated to broaden over time. The use of modern technology to promote maintainable urban development is turning the predicted best answer; in particular, the smart city, which is equipped with artificial intelligence, will pave the road in upcoming city development. The digital economy, that is focused on data collecting and processing, would hasten the operativethe digital economy insertion into the smart city constructions. More than half of the people around the globe already live in cities, who are predictable to rise to 70% by 2050 (Ritchie & Roser,2018**).** Asia, which includes China and India, would be the world's most quickly urbanizing area. Most nations in the globe, from wealthy Europe and USA to underdeveloped Africa and portions of Asia, are dynamically involved in the creation of smart cities (see Figure 5), with Europe, North America, Japan, and Korea setting the pace. (Rong,202).

Figure 5. Global Number of Smart Cities under Building by Country Share



Source : Rong,2021

According to (Figure 6), the number of smart cities built in China in recent years (A), the smart cities'investment scale of China (B), the number of smart cities built in main countries (C), and the percentage of smart city investment scale in main countries in the world (D), China's smart cities sprouted up quickly, creating many smart city clusters in Yangtze River Delta. Technology businesses like Huawei, Alibaba, and Tencent, who have inked strategic collaboration framework agreements with over 300 cities, benefit from a large marketplace scale and volume that provides extensive marketplace and development potential (Huang et.al., 2021). National-level statistics providing by the Rhodium Group's "U.S.-China Investment Hub" on Chinese Foreign direct investment (FDI),after the rise in the beginning of the decade, especially ICT, Chinese investment in USA in locationsrelated to smart cities has turned down rapidly over the last decade, from $10.41 billion in 2017 to $100 million in 2018 for transportations, constructions, and infrastructures and from $2.73 billion to $217 million in 2018 for ICT (Atha et al., 2020). According to Deloitte's figures, China's present smart city construction investment scale is more than $ 25.9 billion, with IT investment totaling more than $ 300 billion from 2011 to 2018. The market scale

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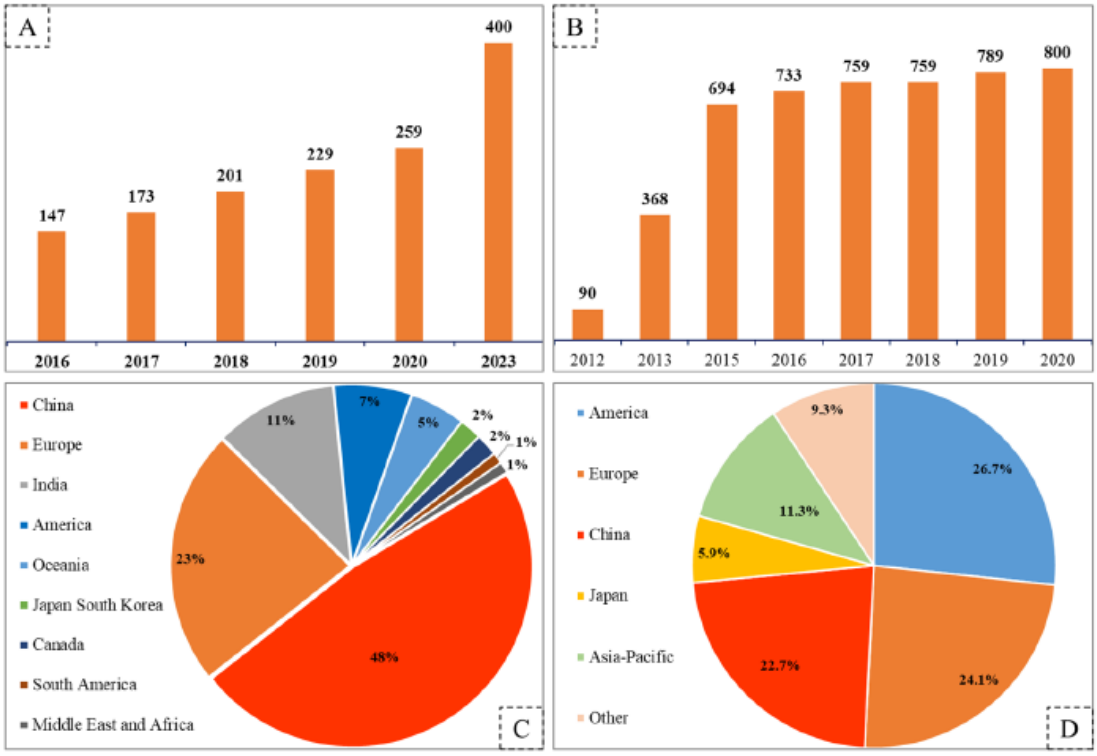
represented more than 22% of the globe, and the percentage will continue to grow. In 2023, the investment magnitude is expected to approach $ 40 billion (Huang et.al., 2021).

Figure 6. Smart City Construction in China



Source : Huang, et.al., 2021

In the past few decades, China has experienced rapid development in technology, such as the IOT, big data, cloud computing, and AI; this laid the foundation for smart cities (Qin & Qi,2021). Based upon 2018 study from the China Economic Information Service, China's IoT business expanded around RMB 200 billion ($28.0 billion) in 2010, and then IoT was named as a strategic growth goal, to almost RMB 1.5 trillion ($209.8 billion) in 2018. Moreover, the Ministry of Industry and Information Technology of China (MIIT) stated that IoT income climbed by 73 percent in 2018 compared to the previous year (Xinhua,2019). Giving to a research by China Electronic Information Industry Development (CCID), a think tank connected with MIIT, core sectors in the big data industry are expected to increase by approximately 25% to RMB 720 billion ($100.7 billion) by 2019.Based upon a 2017 MIIT growth plan, sales of big data earnings are expected to exceed RMB 1 trillion ($139.9 billion) in 2020 (Atha et al., 2020). China's public cloud market got to RMB 43.7 billion ($6.1 billion) in 2018, growing 65.2 % yearly, based upon a blank whitesheetout of the China Academy of Information and Communications Technology (CAICT), an MIIT research organization.According to CAICT, the marketplace would treble by 2022, reaching RMB173.1 billion ($24.2 billion) (Xinhua,2019).

5. CONCLUSIONS

The concept of smart cities is becoming increasingly significant in equipping people with sustainable living circumstances. The major components of smart city building are smart government, smart economy, smart environment, smart residents, smart living, and smart mobility. There are three important factors driving the development of smart cities in China: urbanization, policies, and technologies. China's race to fully deploy smart cities utilizing such technologies, as the global second-biggest economy and domestic to many of the global major cities, wouldinclude far-reaching consequences for both its own people and the rest of the globe. China has developed mature core technological facilities and application platforms, and associated technologies had beenbroadly employed in economics, government, and everyday life.

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Simultaneously, assessment of outcomes and long-term models are being investigated.China is interested in developing smart cities based on cutting-edge technology such as artificial intelligence, 5G, the Internet of Things, and cloud computing. Second, the majority of China's smart city initiatives are spearheaded by high-level administrations or ministries. China now leads the world in terms of smart city quantity and size, but the building quality of smart cities must be enhanced, necessitating a greater focus on the development meaning of smart cities. Apart from such successes, there are still impediments in building, technology, and administration, such as "information islands."These massive changes have prompted accusations of "labeling" and "urban marketing" against a segment of so-called smart cities, posing new difficulties to China's economic, legalsystems, and social systems. Many of these consequences will be unavoidable. Smart cities are a cornerstone of China's future economic and urban growth policies, and they're part of a decades-long push for digitalization and informationization to boost the country's overall power. According to the results of the study, it was found that organizational and information support for the development of a smart city strategy according to a balanced system of indicators is defined as a complex, open, integral, integrated system in external processes, which should be organically combined with the general strategy for the development of the city and ensure a balance of long-term goals for the sustainable development of the smart city in the digital economy. The smart city would undoubtedly bring about a better living transformation if scientific foremulation of digital development plans, gradual and long-term efforts are made.

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