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Analysis on the Development and Progress of Tianjin's Digital Economy

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Abstract: In the modern era, the digital economy has emerged as a pivotal driver propelling global economic advancement. The rapid evolution of the digital economy has underscored Tianjin's notable domestic competitiveness. This study conducts a comprehensive analysis to delve into the prominent challenges permeating the development of Tianjin's digital economy. The analysis reveals that Tianjin is contending with several critical hurdles, including a sluggish pace of disciplinary development, constrained innovation capabilities, limited diversity of disciplines, and environmental pollution. Drawing inspiration from the accomplished strategies of digital economy front-runners in Beijing, Zhejiang, and Shanghai, this research distills three key characteristics that underscore successful digital economic growth. Based on these insights, the paper formulates a set of recommendations tailored to enhance the quality of Tianjin's digital economy expansion. By drawing parallels between effective strategies and the unique context of Tianjin, this study aims to contribute to the augmentation of its digital economic landscape.

Keywords: digital economy, economic development, success experience, Tianjin

1. Introduction

Since the beginning of the 21st century, the digital economy has flourished all over the world, the world economic system and industrial pattern have undergone profound changes, and the digital economy has become a key force for economic growth and social development. The concept of "digital economy" was first proposed by American new economist Tapscott [1]. Digital economy is a series of economic activities based on information digitization and knowledge. China attaches great importance to this and has introduced policies to support the development of the digital economy. As the largest international port city in northern China, Tianjin plays an important role in promoting the "One Belt, One Road" strategy [2]. Therefore, Tianjin firmly grasps new opportunities for the development of digital intelligence and has a rapid development of digital economy. This paper aims to examine the current state of Tianjin's digital economy using a literature-based approach. The initial phase involves dissecting Tianjin's economic growth, identifying the influencing factors on the city's digital economy progression, and synthesizing successful practices from technologically advanced regions. The study also addresses the prevalent challenges within Tianjin's digital economy development, culminating in the formulation of pertinent recommendations. These recommendations are designed to propel the advancement of Tianjin's digital economy to greater heights.

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2. Overview of the Development of Digital Economy in Tianjin

In 2020, Tianjin's digital economy was vigorous and its scale accounted for 48% of GDP [3]. As an important trade port in the Beijing-Tianjin-Hebei region and the nearest outlet to the sea from Beijing, Tianjin Port accounts for about 60% to 70% of the annual import and export trade value of the Beijing-Tianjin-Hebei region [4]. Tianjin has made significant strides in the development of its digital economy, leveraging the presence of over 10 information technology industrial parks, including Binhai Innovation and Entrepreneurship Park. This progress has set the stage for a comprehensive digital transformation, characterized by a developmental trend that can be summarized as "Binhai leading the way, extending its influence to the surrounding regions, establishing focal points in various areas, and advancing collaboratively [5]."

The development advantage of Tianjin's digital economy lies in the Beijing-Tianjin-Hebei integration and the strong support of relevant policies. From 2010 to 2020, the registered capital of digital service enterprises in the Beijing-Tianjin-Hebei city cluster has shown an overall upward trend. Among them, Tianjin increased from 16.532 billion yuan to 148.902 billion yuan, with an average annual growth rate of 24.58%. Besides, more than 160 Beijing-Tianjin-Hebei enterprises established the Tianjin High-end Equipment and Intelligent Manufacturing Talent Innovation Alliance at the end of 2020. To date, a remarkable total of 45 scientific research achievements have undergone successful transformation [6]. This achievement has played a pivotal role in facilitating the seamless integration of the industrial chain, innovation chain, and talent chain across the Beijing, Tianjin, and Hebei regions. Visualization results in 2019 showed that the stimulating effect of the digital economy on sustainable development in Beijing-Tianjin-Hebei has improved significantly, indicating that the stimulating effect of the digital economy has gradually spread to the north and west [7]. In 2021, the "Tianjin Three-year Action Plan for Accelerating Digital Development (2021-2023)" was formulated and implemented, and it is planned that by 2023, the added value of the digital economy will account for no less than 55% of the gross regional product (GDP)[8], a digital life enjoyed by all people will initially take shape, and a new pattern of integrated social governance centered on people will be formed. It will provide strong support for comprehensively building a modern socialist metropolis.

3. Challenges Faced by Tianjin in Developing Digital Economy

3.1. Insufficient University Discipline Construction and Industry Development

First of all, the university disciplinary advantages are not outstanding, and there is a lack of disciplines, industries and products that lead the country in the field of digital economy. Secondly, the combination of disciplines and industries is not enough, and there are not enough innovative subjects in the field of digital economy, and even fewer leading enterprises. For example, Hefei focuses on the development of quantum communication and electroacoustic integration, and has cultivated a number of leading enterprises in the field of digital economy such as HKUST Xunfei. However, the key disciplines supported by the state in Tianjin University and Nankai University are mainly concentrated in traditional fields, and the integration of industry-university-research is not deep enough in the discipline construction of new fields and the development of characteristic industries [9]. In general, Tianjin's digital economy currently faces a twofold challenge: the absence of significant scientific and technological breakthroughs aligned with national strategic requirements and the absence of industry-leading enterprises that can spearhead innovation and drive the digital economy's growth, akin to the influential roles played by companies like Huawei in Shenzhen and Tencent in Hangzhou. These influential entities have a pronounced ripple effect, particularly in empowering small and medium-sized enterprises (SMEs).

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3.2. Environmental Pollution Problem

Although the digital economy can significantly promote green growth, the massive energy consumption in the construction and operation of its infrastructure also brings a lot of carbon emissions, causing environmental pollution. High concentrations of air pollutants can harm human health, such as causing cardiac disease [10], damaging the human respiratory system [10,11], and so on. The NO2 concentration limit (40 μg/m3) was exceeded in Tianjin in 2020[12]. At present, the carbon emission of the digital economy has not yet entered the stage of rapid growth, but with the further development of the digital economy, it may become one of the main sources of carbon emission growth in Tianjin.

3.3. Insufficient Innovation in Manufacturing

Tianjin's manufacturing industry has a relatively complete foundation, and industrial digitalization is a vital breakthrough point in promoting the establishment of the manufacturing industry. However, due to the high cost of digital technology applications and the lack of digital capability, traditional enterprises still have a large room for improvement, and the supply capacity of new digital infrastructure still has shortcomings. The core industries of the digital economy in Tianjin are currently experiencing challenges related to their innovation capacity, export capabilities, and the risk of bottlenecks in critical core segments. Moreover, there is room for improvement in the understanding of the importance of scientific and technological innovation, particularly the role of original innovation in driving development. Additionally, the perception of the digital economy often remains limited to the application level, highlighting the need for a more comprehensive understanding of its broader implications and potential for transformative growth. In the rapidly evolving landscape of information technology, there has been a notable absence of revolutionary shopping, payment, communication, and entertainment methods akin to platforms like Taobao, WeChat, and Douyin. Consequently, there is a dearth of digital economic breakthroughs capable of significantly propelling the development of a city or region.

4. Suggestions on Developing Digital Economy in Tianjin

4.1. Create a Complete Innovation Ecology and a Good Entrepreneurial Environment

The importance of the entrepreneurial environment to economic development is self-evident. Take Beijing for instance, its digital economy accounts for the largest proportion of GDP in China. Beijing has a complete innovation ecology, and has formed a multi-level collaborative innovation system of organizations, talents, technologies, business formats and capital, providing unique conditions for digital technology innovation to lead. In addition, Zhejiang has emerged as a prominent hub for the advancement of the national Internet industry, capitalizing on its pioneering position in the consumer sector. Notably, it has fostered the growth of numerous Internet and high-tech enterprises, with Alibaba standing at the forefront, not only within China but on a global scale. Due to the good "Internet +" entrepreneurial innovation ecosystem, new technologies and new business forms such as unmanned supermarkets and internet hospitals have taken the lead in Zhejiang. Consequently, it is imperative for Tianjin to establish a thriving innovation ecosystem. This involves incentivizing prominent enterprises to establish technology development hubs, enhancing the proficiency of foundational hardware and software services, and fortifying innovation-oriented support services encompassing product adaptation and incubation.

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4.2. Foster an Enabling Environment for Nurturing and Harnessing Entrepreneurial Talent

To achieve high-quality economic development, capital and talent are indispensable. Beijing's good entrepreneurial environment and rich talent reserve have promoted the continuous emergence of a number of information technology enterprises, and formed a "gravitational field" that gathers high-end resource elements of the national digital economy. Similarly, Shanghai has laid the foundation for the high-quality development of the digital economy by concentrating a large number of digital talents and providing them with development paths. Studies show that the talent inflow/outflow ratio in Shanghai is 1.41. In addition, Shanghai has a high-quality investment and financing environment. There are 2,099 listed enterprises in Shanghai, accounting for 0.07% of all enterprises in Shanghai, much higher than the average level of 0.03% in China [13]. Therefore, Tianjin should formulate more policies to support digital economy and attract domestic and foreign financial institutions or social capital to invest in key projects of digital economy. In addition, Tianjin should establish a number of talent-training bases and accelerate the establishment and professional training of frontier fields, such as cloud computing, big data and artificial intelligence, to foster talents in the field of digital economy.

4.3. Strengthen the Development of the Real Economy

The real economy can not be ignored for the economic development of the city. Beijing takes the whole city as a super system to incubate and promote the digital industry. Both the construction of "three cities and one zone" (Huairou Science and Technology City, Zhongguancun Science and Technology City, Changping Future Science and Technology City, Yizhuang Economic and Technological Development Zone) and the Winter Olympics provide plentiful application scenarios for the digital industry. Furthermore, Shanghai's bustling commercial activity and high population density have created a wealth of application scenarios for the digital economy. This environment facilitates the seamless integration of online and offline activities, fostering the rapid development of new models and formats. Innovations such as online healthcare, fresh e-commerce retail, and online financial services are flourishing within the city. Besides, as a major province of traditional industries, Zhejiang is committed to deepening the all-round transformation of traditional industries by digital technology, actively cultivating a new model of "Internet + manufacturing", accelerating the digitalization and intellectualization of traditional industries, and comprehensively revitalizing the real economy [14]. The integration of the digital economy with traditional industries, agriculture, and the service sector holds the potential to revolutionize and elevate the entire social economy, fostering high-quality development. This integrated approach also presents fresh challenges that demand breakthroughs in digital technology to ensure a virtuous cycle of progress and iterative upgrading.Therefore, Tianjin needs to establish several distinctive and exemplary application scenarios to attract enterprises, in order to build the foundation of digital economy development.

4.4. Promote the Development of Clean Energy

As the digital economy continues to advance, the significant energy consumption associated with infrastructure operations could emerge as a primary contributor to carbon emissions growth in Tianjin. Therefore, there is an imperative need to enhance guidance and regulation to ensure a low-carbon and environmentally sustainable trajectory for the rapid expansion of the digital economy. To address the growing carbon emissions challenge stemming from the advancing digital economy, Tianjin must take proactive measures. It should focus on building an intelligent, agile, green, low-carbon, safe, and controllable digital information infrastructure. This infrastructure should be designed with environmental sustainability in mind, ensuring that it minimizes energy consumption and reduces its carbon footprint. Additionally, Tianjin should work on enhancing its regulatory framework to guide the low-carbon development of the digital economy. Stringent supervision and monitoring of

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enterprises should be established to ensure compliance with these standards and the adoption of eco-friendly practices [15].

5. Conclusion

In conclusion, this paper's examination of Tianjin's digital economy development has identified several existing challenges: (1) A limited number of leading enterprises with absence of dedicated R&D centers or expansive production lines; (2) High energy consumption contributing to substantial carbon emissions, causing environmental pollution; (3) Inadequate innovation capacity within core digital economy sectors, coupled with supply gaps in new digital infrastructure. Drawing insights from advanced digital development regions, this study proposes four recommendations. These include creating an innovative ecosystem to attract investment, nurturing multifaceted talents, establishing tailored economic development scenarios, and promoting the adoption of clean energy data. However, it is important to acknowledge limitations in research methodology. The study solely employs literature review to scrutinize Tianjin's digital economy development. Future research will encompass data analysis and a more comprehensive exploration of factors influencing the city's digital economy growth.

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