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Chinese Digital Economy: Current Situations, Problems, and Recommendations

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Abstract: The rapid development of the digital economy is transforming global business models and social interactions. By 2025, global e-commerce transactions are anticipated to reach $6.86 trillion, underlining the importance of the digital economy as a major force for economic expansion. China's digital economy, having reached RMB 50.2 trillion in 2023 and comprising 41.5% of its GDP, is notably advancing, catalyzing the transformation of traditional industries and fostering new business models. Significant investments in digital infrastructure such as 5G, big data centers, AI, and the industrial internet underscore China's commitment to technological innovation. Despite these advancements, challenges remain, including talent shortages, data security, and privacy concerns, as well as the digital divide. Addressing these issues involves enhancing digital talent training and introduction, improving data security regulations, and promoting coordinated regional development. This study is of great practical value in guiding policy formulation, optimizing resource allocation, and promoting the inclusive application of digital technologies, which will help promote the healthy and rapid development of China's digital economy, ensure that all levels of society can benefit from the advancement of the digital economy, and achieve comprehensive economic and social transformation and upgrading.

Keywords: Digital economy, China, E-commerce.

1. Introduction

The rapid advancement of the digital economy is not only an important current trend but also a reflection of the profound changes in the global economic structure. With the rapid progress of information technology, e-commerce, big data analysis, artificial intelligence, and other technologies are redefining business models and social interaction. According to Statista, global e-commerce transactions are expected to reach approximately $6.86 trillion in 2025, reflecting the fact that the digital economy has become an important driver of global economic growth [1]. The widespread use of big data technologies in business is also driving efficiency and innovation. According to McKinsey, Big Data analytics can help businesses achieve up to 20 percent cost savings and 30 percent efficiency gains [2]. These technologies not only improve market insights but also facilitate the development of new products and services, thus significantly enhancing their competitiveness. The rapid growth of smart cities further highlights the potential of digital technologies to improve the effectiveness of city management and the quality of life of residents, according to a report by Deloitte Insights, which

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shows that innovative applications such as intelligent transport and energy management systems are optimizing the processes of city operations and maintenance and improving the efficient use of resources [3]. So, the digital economy is not only driving transformation and innovation in the global economy, but also bringing tremendous growth opportunities and benefits to various industries. This trend signals that digital technology will continue to lead the global economy in the future.

China's digital economy is booming at an impressive pace, and its growth trajectory, which highlights the huge potential of innovation and technology convergence, has caught the world's attention. The leap in this area has not only accelerated the transformation and upgrading of traditional industries but also spawned new businesses and models, injecting strong momentum into the Chinese and global economy. Against this backdrop, in order to further understand the uniqueness and challenges of this process, this study therefore focuses on the Chinese context. Specifically, this study focuses on analyzing the current situation of China's digital economy, exploring in detail the problems it faces, and proposing a series of targeted and feasible countermeasures, with the aim of providing valuable insights into the promotion of China's sustainable advancement of the digital economy.

2. Current situation

2.1. Scale and Growth Trend

The extent of the digital economy is often considered a pivotal gauge for assessing the advancement of a nation's or locality's digital economy. This gauge not only mirrors the comprehensive capacity to generate value from digital economic activities but also signifies the depth of digital technology adoption, the evolution of industrial frameworks, innovation capacity, and market demand across various facets.

In 2023, China's digital economy surged ahead, hitting a staggering RMB 50.2 trillion, as depicted in Figure 1. This marked a notable 10.3 percent uptick from the previous year and constituted a significant 41.5 percent chunk of the gross domestic product (GDP). Such robust growth not only outpaced traditional economic sectors by a considerable margin but also reflects the pulling effect of the digital economy on the broader economy.

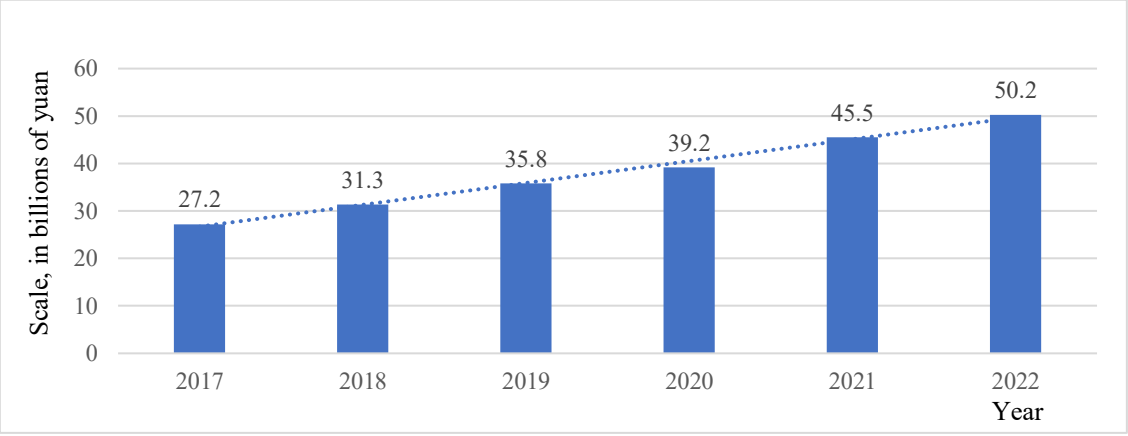

Figure 1: Scale of China's digital economy
Sourced: China Academy of Information and Communications Research (CAICR) [4]

As the scale of the digital economy grows, China's digital economic landscape is undergoing transformation. This evolution encompasses digital industrialization, which pertains to sectors producing digital goods and services such as IT manufacturing, telecommunications, and software

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services. Simultaneously, there exists industrial digitalization, which means the incorporation of digital technologies into traditional sectors to enhance efficiency and encourage creativity.

As Figure 2 shows, within the framework of the digital economy, industrial digitization continues to stand as the core driving force, commanding a vast 41 trillion-yuan sector, encompassing over 80% of the digital economy. Concurrently, digital industrialization, amounting to 9.2 trillion yuan, forms a complementary force, collectively shaping a dual-engine model for advancing the digital economy. Notably, the burgeon of the digital economy not only amplifies its scale but also redefines economic structures and bolsters production efficiency.

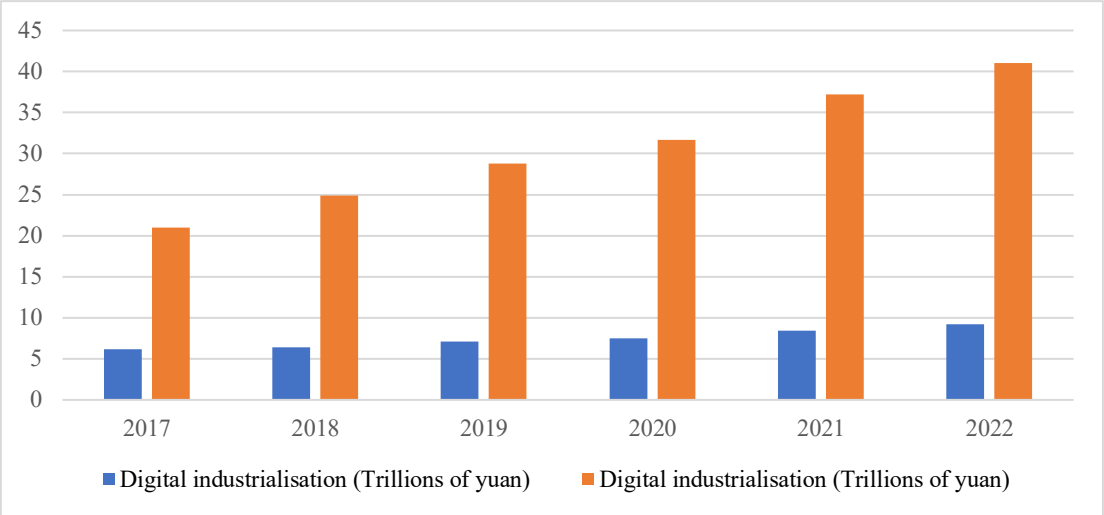

Figure 2: Scale of digital industrialization and industrial digitization in China
Sourced: China Academy of Information and Communications Research (CAICR) [4]

2.2. Infrastructure and Technological nnovation

Advancements in digital infrastructure and technology are essential for propelling the expansion of the digital economy. The Chinese government highlights the importance of rapidly advancing the development of new infrastructures, including 5G networks, extensive data centers, AI, and the industrial Internet [5]. These efforts provide robust support for advancing the digital economy. In 2023, China's goal is to uphold its worldwide dominance in developing 5G networks, broadening capacities in cloud computing, and progressing AI technologies. These efforts not only bolster network reach and velocity but also function as important technological foundations for digital transformation across diverse fields. Meanwhile, Chinese enterprises have achieved significant milestones in areas such as artificial intelligence, semiconductor technology, and blockchain. Examples include Baidu's Wenxinyiyan Big Model and Huawei's Pangu Big Mode. These breakthroughs are rapidly transitioning into practical industrial applications, fostering deep integration between digital technologies and the real economy.

2.3. Data Factor Markets and Governance

In the realm of the digital economy, the exploration and application of data have risen to critical importance. The issuance of the Opinions of the Central Committee and State Council of the Communist Party of China on building a database system to better play the role of data elements by Chinese governments signifies a significant stride in enhancing the role of data components [6]. This initiative underscores China's advancement in market-based allocation of data elements, data circulation, and trading, and data security and privacy protection. By 2023, notable advancements are

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expected in developing the data element marketplace. Regulatory frameworks governing data rights, circulation dynamics, pricing mechanisms, and security protocols have steadily matured. The rise of data-sharing platforms and service providers has led to enhanced utilization of data resources, unleashing their intrinsic value. At the same time, a newfound focus on safeguarding data security and preserving personal privacy has played a crucial role in guiding the digital economy toward secure and enduring expansion.

2.4. Industry Applications and Digital Transformation

In the realm of industry application, the penetration and influence of the digital economy continue to expand. According to the 2023 Digital China Annual Report by First Financial, the utilization of AI technology in sectors such as healthcare, education, and finance, alongside initiatives in industrial Internet, smart cities, and digital government services, is rapidly gaining momentum [7]. For instance, AI applications in healthcare such as smart diagnostics, telemedicine, and electronic health records not only enhance diagnostic and treatment efficiency but also optimize the distribution of medical resources. Similarly, in the industrial field, advancements in intelligent systems have curtailed production costs and boosted efficiency. Across all sectors, digital transformation is now an essential strategy for enhancing competitive edge, companies have increased investment in science and technology to accelerate the pace of digital transformation to adapt to market demand and industrial upgrading.

2.5. Digital Governance and International Cooperation

Digital governance is crucial for driving the progress of the digital economy. Last year, China initiated a wide-ranging digital governance strategy, enhancing regulatory standards and fortifying the establishment of a digital governance framework. Notably, efforts such as the rapid expansion of digital public services highlight China's dedication to simplifying bureaucratic procedures, ensuring improved operational efficiency and accessibility. Internationally, China champions an inclusive, cooperative, and secure global digital governance framework, advocating for equitable digital regulations. Through active participation in global digital governance efforts, China strives to cultivate mutually beneficial digital partnerships worldwide. For instance, the Digital Silk Road initiative, part of the Belt and Road Initiative, bolsters digital infrastructure connectivity and fosters digital economic collaboration among nations along its route, showcasing China's proactive stance in shaping the global digital economy.

3. Problems

3.1. Digital Talent Gap

Digital talents are crucial for advancing China's digital economy. However, according to McKinsey's How to Help Companies Fill China's AI Talent Gap report, the demand for AI developers will surge sixfold to 6 million by 2030[8]. It is driven by companies eager to harness AI's potential $1 trillion value in China. But the reality is that domestic and international universities and existing top AI talent are only expected to provide about 2 million people, leading to a shortage of 4 million AI jobs. Meanwhile, this situation has been exacerbated by declining fertility rates, with fewer students entering universities to study related subjects in the future, further tightening the supply of AI talent. The lack of digital talent is more evident in the agricultural digital economy. Based on findings from China's third agricultural census, in 2016, merely 7.1% of agricultural workers possessed education up to high school or junior college level, with a mere 1.2% holding a bachelor's degree or higher [9].

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This shows an extreme lack of well-educated agricultural and digital talents. This circumstance severely hampers ongoing innovation and growth within the digital economy of agriculture.

3.2. Data security and privacy protection issues

From Table 1, it can be found that 34,032,372 accounts were affected by online data breaches in China in 2022, ranking first in the Asia-Pacific region. This indicates that China urgently needs to address data security issues in the country [10]. The challenges are multifaceted. First, there are problems regarding the inadequacy of legal frameworks and poor implementation. Qu and Huo note China's accelerated legislative efforts on personal information protection since 2013, including the 2017 Cybersecurity Law [11]. However, despite legislative progress, the absence of a unified personal information protection law and shortcomings in regulatory capacity, technical infrastructure, and inter-agency coordination impede effective enforcement. Secondly, existing regulations are fragmented across various government bodies without a centralized oversight authority [12]. This regulatory fragmentation has contributed to issues surrounding the collection and utilization of personal data by major internet firms like Alibaba, Baidu, and Tencent. For instance, Alibaba's privacy policies lack clarity on handling user data during policy or ownership changes, and there's inadequate disclosure on sensitive data management, such as religious beliefs and health records. Furthermore, insufficient attention has been paid to managing cross-border data transfers and changes in corporate ownership.

Table 1: Number of accounts exposed in online data breaches in the APAC in 2022, by country

Country	2022
China	34,032,372
Indonesia	14,741,554
India	4,739,039
Australia	3,381,898
Taiwan	2,892,967

Sourced: https://www.statista.com/statistics/1400182/apac-number-of-accounts-exposed-by-country/ [10]

3.3. Digital Divide

The primary issue lies in the disparity between the countryside and the cities. regarding China's burgeoning digital economy, where information and communication technology (ICT) adoption and application vary significantly. Based on the research of Peng and Dan, a U-shaped correlation between China's digital economy evolution and the urban-rural income gap [13]. Initially, advancements may narrow the gap, but after reaching a certain stage, they will instead exacerbate inequality due to accumulating technological advantages. So, despite digital technologies enabling cross-boundary opportunities, rural areas often fail to fully benefit due to inadequate networks and low-tech penetration, perpetuating the urban-rural digital divide. Moreover, uneven regional development amplifies this gap, as eastern coastal regions, with robust infrastructure and high urbanization, outpace the central and western regions in digital economy advancements. In JING's analysis, it is noted that the eastern part of the country excels in the adoption and utilization of digital economy initiatives, contrasting sharply with the western region, which grapples with pronounced disparities in investment and income levels [14]. For instance, Internet penetration statistics highlight significant discrepancies: Beijing, Guangdong, and Shanghai collectively represent 12.39%, 9.69%, and 8.97% of national Internet usage, while Tibet, Qinghai, and Ningxia lag far behind at mere 0.03%, 0.31%, and 0.48% respectively. Such disparities not only manifest in the total economic volume but

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also in the scope and application of digital technologies, exacerbating regional development gaps. This phenomenon ultimately contributes to a decline in household consumption levels. The digital divide also has a significant impact on household consumption patterns. Research conducted by Wang, Yin, and Jiang revealed that disparities in digital access contribute to lower household spending, particularly among households lacking computers, smartphones, or access to digital payment systems [15]. This lack restricts their consumption choices and diminishes diversity in spending. Thus, unequal digital access not only impacts economic engagement but also impedes the enhancement and diversification of household consumption, thereby obstructing models of economic growth reliant on consumption.

4. Recommendations

4.1. Talent Training

4.1.1. Skills of Existing Employees

Amidst the rapid expansion of the digital economy, organizations grapple with a significant challenge: aligning their workforce's skills with the ever-evolving technological landscape. Maes and Sawaya underscore the necessity for companies to craft personalized training initiatives tailored to the digital readiness of their teams across different developmental stages [8]. For firms categorized as "traditionalists," typically in the nascent phases of digital transformation, the emphasis lies in cultivating proficiency in data analysis and interpretation. This strategic focus ensures that business units not only comprehend but also enthusiastically embrace emerging digital and AI ventures. Establishing an internal analytics academy enables firms to seamlessly blend theoretical education with practical applications, thereby accelerating the transformation of knowledge into expertise. Such an approach not only enhances training effectiveness but also promotes knowledge exchange across departments, establishing a robust groundwork for digital transformation.

4.1.2. Diverse Talent Sources

Amid China's forecasted shortfall of AI expertise, estimated to reach a staggering four million by 2030, Maes and Sawaya highlight the necessity for organizations to innovate in addressing this talent deficit [8]. Strategies like outsourcing and mergers and acquisitions (M&A) are recommended for acquiring essential technologies and skilled personnel. Multinational corporations (MNCs) benefit uniquely by leveraging their global networks to import expertise from diverse regions, including emerging markets such as Vietnam and India. Furthermore, collaborations with IT services and SaaS providers in specific industries offer swift access to ready-made AI solutions and talent pools, accelerating digital transformation for businesses. Enterprises must carefully assess the flexibility and regulatory compliance of their partnership models when selecting collaborators, ensuring perfect integration and adherence to local laws.

4.1.3. Education System and Enterprises

SUN et al. propose a transformative approach for undergraduate institutions to narrow the divide between academia and industry [16]. They advocate for an overhaul of the curriculum, emphasizing practical education that fosters digital awareness and an innovative mindset, crucial for meeting the demand for digital talent. This necessitates deep collaborations between educational institutions and businesses to co-develop curricula aligned closely with market needs. Implementation involves diverse partnerships, including internships and project collaborations, enabling students to tackle real-world challenges, thereby enhancing their practical skills and employability.

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4.1.4. Policy Support and Incentive Mechanism

According to HUANG, collaboration between government and businesses is essential to foster an environment that benefits to cultivation and introduction of digital talents [17]. This involves offering incentives like tax incentives and research funding to encourage companies and individuals to invest in the learning and developing of digital skills. The government could improve talent mobility and allocation by creating a digital talent database and establishing a platform for talent exchange. Additionally, the government could boost support for digital skills certification and enhance global recognition of talent.

4.1.5. Elite digital talents

To address the scarcity of high-end digital talent, HUANG proposes creating a specialized talent development system focused on strategic sectors [17]. This entails beginning at the national strategic level, consolidating educational resources, establishing dedicated institutions or research centers for digital technology, and concentrating on nurturing high-end digital technology talents with global perspectives and innovation capabilities. Simultaneously, efforts should be made to enhance the service capabilities of high-end digital technology talents, optimize the labor market structure, and foster a supportive external environment for their growth through policy backing and market mechanisms. Then, it will ensure that these high-end digital talents can play a leading role in promoting the digital transformation of the economy and society.

4.2. Regulatory System for Data Security and Privacy Protection

4.2.1. Legislative and Regulatory Framework

Further enhancing the legal system for the protection of personal information is crucial, ensuring robust laws and regulations to govern data handling activities. China has expedited its legislation on personal data protection with initiatives like the Cybersecurity Law (enforced since 2017) and the Personal Information Protection Law [11]. Yet, there remains a necessity to refine these regulations to ensure rigorous enforcement and effective oversight, including enhancing scrutiny over corporate data practices and penalties for violations.

4.2.2. Transparency and Informed User Consent

Improve the transparency of corporate privacy policies to ensure users fully grasp how their personal data is gathered, utilized, stored, and shared. Simplify privacy terms, explicitly disclose data purposes, and secure explicit user consent before handling sensitive information [12]. Additionally, bolster procedures enabling data subjects to exercise rights such as access, rectification, and deletion.

4.2.3. Public Privacy Awareness and Education

To enhance public awareness of data security and privacy protection, and to raise users' awareness of data protection and self-protection capabilities through education and publicity activities, to enable the public to manage their personal information better and understand the value of individual privacy rights.

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4.2.4. Data Security Technologies and Standards

Promote the adoption of cutting-edge data encryption, anonymization techniques, and other technological measures to safeguard personal data and minimize the threat of data breaches. Provide data manipulation guidelines for companies to enhance data protection standards [11].

4.2.5. Self-regulation and International Cooperation

Promote the establishment of self-regulatory mechanisms of conduct among Internet businesses and industry associations to foster the exchange of best practices in safeguarding data. Additionally, bolsters collaboration with global partners and international bodies. For example, drawing insights from frameworks like the EU's GDPR to advance the global alignment of China's data protection framework may be a proper choice [11].

4.2.6. Regulatory Capacity and Law Enforcement

Upgrading the technical method and enforcement capabilities of oversight bodies to ensure the relevant regulations are effectively enforced. Stringent legal actions must be implemented for breaches of personal privacy and data security to elevate the consequences of legal violations and ensure corporate adherence to regulations.

4.3. Bridging the Digital Divide

4.3.1. Infrastructure Construction and Popularization

The Chinese government has recognized this issue and A number of solutions were proposed. For instance, the State Council of China proposes augmenting the connectivity between public data and government information systems, hastening the consolidation of government information platforms, and promoting the sharing of data resources [18]. Besides, it also needs to boost investments in network infrastructure in rural and remote regions, including broadband networks and 4G/5G mobile communication base stations. These initiatives aim to furnish rural residents with essential access to digital services, promote the adoption of digital technologies, and narrow the connectivity divide between the countryside and the cities.

4.3.2. Enhancing Digital Literacy and Education Popularization

Spread awareness about digital technologies through educational programs in schools and adult training sessions to bolster the digital resilience of individuals and communities. By expanding digital proficiency training for rural and economically disadvantaged populations, people can enhance their capacity to leverage digital technologies, facilitating smoother integration into the digital economy [14].

4.3.3. Coordinated Inter-regional Development

Promote progress in central and western China and rural zones with tailored policies. It means addressing diverse regional development levels in digital economy strategies and implementing targeted support measures to bridge regional digital gaps [13]. Enact specialized initiatives for underdeveloped areas and set specific digital economy milestones to ensure equitable national digital benefits. Yet, fostering the digital economy is crucial to narrowing the digital gap. In bridging this divide, it would be a mistake to focus on bridging the digital divide at the expense of prioritizing the development of the digital economy. The digital divide is correlated with the digital economy. As the

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digital economy grows, the digital divide may initially widen but gradually narrow at a later stage. People therefore need to persevere in the development of the digital economy and not let the issue of the digital divide slow them down in digital economy development efforts.

5. Conclusion

By analyzing the current status of China's digital economy in detail, this paper points out the role of its rapid growth in driving the transformation and upgrading of traditional industries and the development of emerging business models. Despite China's remarkable achievements in digital infrastructure construction, technological innovation, and the scale of the digital economy, it still faces challenges such as the digital talent gap, data security and privacy protection issues, and the digital divide. To this end, this paper proposes a multi-level digital talent training and introduction system, improved data security and privacy protection regulations, and enhanced inter-regional coordinated development. These measures will not only help cope with the current bottlenecks in the development of the digital economy but will also further promote the sustainable development of China's digital economy. In the coming years, as digital technologies continue to advance and be applied, China's digital economy is expected to continue to lead global economic growth, bringing greater innovation and development opportunities to various industries. By optimizing policies and strengthening international cooperation, China can play a more active and leading role in global digital economy governance and promote the coordinated growth of the worldwide digital economy.

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