

Conception, Characteristics, Challenges, and Recommendations of the Digital Economy

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Abstract—With the advent of the new generation of information and communication technology, the digital economy has emerged as a crucial driving force for economic transformation and high-quality development in the contemporary era. This paper analyzes the conceptual connotation and core characteristics of the digital economy and proposes recommendations to fortify legal and regulatory frameworks, foster integrated development between digital technology and industries, as well as safeguard data security. These are vital measures to address the challenges posed by digital governance, data gaps, and data security.

Keywords—digital economy, digital governance, digital Divide

I. INTRODUCTION

In the 21st century, the rapid advancement of big data, Internet of Things (IoT), Artificial Intelligence (AI), blockchain, and other technologies has brought about significant transformations in the global economy. The digital economy has emerged as a pivotal driver for national economic growth, revolutionizing not only traditional industries' operational paradigms but also giving rise to numerous emerging sectors that infuse fresh dynamism into the global economy. Governments and enterprises worldwide have strategically prioritized the development of the digital economy, fostering novel models and a thriving landscape.

Behind the surge of the digital economy, we must maintain a clear-eyed perspective on the challenges and risks it confronts, rather than blindly exuding confidence and admiration. The popularization and application of digital technology still face significant gaps, with certain enterprises yet to achieve complete digitization, necessitating the establishment of a comprehensive digital industry ecosystem. Moreover, frequent occurrences of cyber attacks, data breaches, and other security incidents result in substantial losses for individuals, businesses, and nations alike. Simultaneously addressing issues such as inadequate laws and regulations as well as lagging talent development is imperative.

To address these challenges, it is imperative for governments to take the lead in implementing regulations, enterprises to foster collaboration in driving innovation, and individuals to enhance their digital literacy. Only through such concerted efforts can we effectively tackle the forthcoming challenges and facilitate the sustainable and robust development of the digital economy.

II. CONCEPTION AND CHARACTERISTICS OF DIGITAL ECONOMY

The term “digital economy” has been defined in different ways throughout history, with no single standard definition. In its early stages, the focus was on using digital technology to transform industries and create new market models. As technology has advanced and expanded its applications, the digital economy has become a new economic system that includes digital production, consumption, marketing, and more.

A. The Scientific Implications of the Digital Economy

The 1990s marked the onset of the digital economy. The term “digital economy” was first used in a report published by The San Diego Union-Tribune in 1994. In 1995, Don Tapscott introduced the concept in his book “Digital Economy”, describing its characteristics without providing a clear definition.

The definition of the “digital economy” is not fixed and varies among international and domestic official institutions. In 2016, the “G20 Digital Economy Development and Cooperation Initiative” established the first unified definition at the official level. According to this definition, the digital economy is an economic activity mainly driven by digital knowledge and information. In 2018, the OECD and the Bureau of Economic Analysis of the US Department of Commerce provided their own definitions. They determine whether an economic activity falls under the digital economy based on its involvement with ICT transactions. Additionally, the China Academy of Information and Communications Technology considers the digital economy as an economic form that encompasses four aspects: data value, digital industrialization, industrial digitization, and digital governance (CAICT, 2020).

Scholars have defined the digital economy from various perspectives. Don Tapscott proposed that the digital economy exhibits certain characteristics, such as knowledge-driven, digitalized, virtualized, modularized, and integrated and interconnected work processes. It also involves disintermediation and aggregation of resources, innovation-driven dynamics, consumers participating as producers in value creation activities, timeliness in operations and decision-making processes, globalization of markets and operations while facing inconsistencies and challenges (Tapscott, 1996).

According to this definition, the digital economy encompasses four core elements: (1) Digital information-content stored on a virtual medium that can be repeatedly utilized in various formats, including images, texts, and

sounds; (2) Internet platforms-carriers formed by the internet infrastructure that facilitate market organizations' activities and enable the transmission of digital information. Examples include sharing economy platforms and e-commerce platforms; (3) Digital technology-next-generation information technologies capable of analyzing and processing vast amounts of data, such as Artificial Intelligence (AI), blockchain technology, cloud computing, and big data analytics; (4) The emergence of new economic models-the result of the innovative integration of digital technology with traditional industries, leveraging digital technologies to drive transformation and upgrade in traditional sectors.

B. The Fundamental Attributes of the Digital Economy

The digital economy can be visually demonstrated in three dimensions, showcasing its expansion and transformation of traditional economic theory.

1) Enhanced data support

The digital economy relies heavily on the virtualization of data. With advanced technologies for analysis and processing, large amounts of information can be seamlessly integrated to create valuable data assets. These assets allow companies to identify latent consumer demands, resulting in the development of innovative business models and product and service offerings. As digital technology continues to evolve, virtual storage improves efficiency in searching and reduces costs associated with creating value through data utilization (Goldfarb & Tucker, 2019).

2) Integrated innovation

Information and Communication Technology (ICT) clusters, when integrated with innovation, form the foundation of the digital economy. Next-generation information technology has surpassed temporal and spatial boundaries, transforming production, distribution, exchange, and consumption and increasing overall productivity. Digital technology promotes organizational decentralization, making knowledge sharing and collaboration more efficient. It fosters continuous innovation, allowing for rapid iteration of digital products and services (Lakhani & Panetta, 2007). Additionally, digital technology has created a coupling system between products and organizations, making product and service innovation more flexible and reducing the costs associated with organizational coordination and communication.

3) Data sharing

The importance of private property rights for data resources has decreased over time due to the widespread use of technologies like the Internet, blockchain, and big data. These technologies have created a strong network effect between industries. They have integrated production, circulation, service, and consumption into an open ecosystem platform, resulting in the organic fusion of online and offline resources. This integration has given rise to numerous innovative business models and formats that have facilitated the emergence of a platform economy (Hukal *et al.*, 2020). Network platforms function as open, collaborative ecosystems that bring new life to traditional economies. Their strong connectivity promotes cross-border integration and collaborative production among industries

while fostering industrial digitization and aggregation.

III. THE CHALLENGES ENCOUNTERED BY THE DIGITAL ECONOMY

The digital economy has become a crucial factor in the economic growth of many nations. Its rapid progress has brought significant changes in people's lives. However, it's essential not to ignore the challenges and potential risks associated with the digital economy. We must avoid showing blind confidence and admiration without considering the potential pitfalls.

A. The Governance Requires Enhancement

The development of information technology, including artificial intelligence, cloud computing, and big data, has made it easier for governments to improve their digital governance. If the government does not have a role in digital governance, it can lead to confusion in the market, greater risks to information security, and violation of consumer rights. The issues with government digital governance can be seen in the following ways: (1) inadequate policies and regulations. Digital governance policies and regulations are still incomplete, which increases risks in the digital world, causing significant threats to information security, privacy, data management, and other aspects; (2) lack of transparency and openness. In the digital age, the government's access to, use of, and management of data must be more transparent and open to public participation and scrutiny. However, issues remain regarding the imbalance of information and opaque decision-making processes that can result in power abuse and corruption, affecting public interests.

B. The Potential for Further Industrial Digitization Remains Untapped

Different regions and industries have varying digital resources, which worsens the gap in industrial digital development. (1) The digital economy amplifies the economic imbalance between regions in China, creating a phenomenon known as "strong south, weak north, strong east and weak west". The eastern and southern regions have an advantage in the digital economy, while the central and western regions dominated by traditional economy face difficulties in surpassing them due to the market stickiness of the platform economy. This results in significant disparities between highly developed and underdeveloped regions, known as the "Matthew effect". (2) Currently, the digital economy is mainly concentrated in fields such as e-commerce, knowledge dissemination, and commodity sharing based on internet platforms. However, there is ample room for development in areas such as product innovation, technological advancement, design, and manufacturing processes. In particular, AI technology can play a significant role in constructing an "AI economic ecosystem". developing new application scenarios, and facilitating the transformation of traditional industries. (3) In rural areas where infrastructure lags behind urban areas, due to institutional obstacles stemming from the urban-rural dual structure along with limited access to digital applications or skills among farmers, a "digital divide" hampers the flow of urban-based digital elements into rural communities.

C. The Conduct of Platform Monopolies Must Be Curbed

In the development of the digital economy, some digital platform enterprises use their data and traffic advantages to pursue excessive profits and engage in disorderly expansion, which seriously distorts the market competition mechanism and harms the interests of operators and consumers. These enterprises initially use their financial superiority to offer substantial subsidies to suppliers and customers, gradually phasing out these subsidies once they establish a stable market position. As a result, marketing costs for merchants on these platforms arise, while benefits decrease. Meanwhile, the high commission rates and “either-or” scenarios lead to economic chaos, undermining the welfare of operators and consumers and impeding an effective cycle of production and consumption. By the end of 2019, digital platform enterprises accounted for eight out of the top ten global companies in terms of market value, representing nearly 90% of total market value. These colossal digital economic entities (e.g., BAT) can construct self-reinforcing monopolistic barriers through their vast user data reserves and robust algorithmic advantages that restrict competition significantly, making it arduous for smaller enterprises to survive. Such monopolistic behavior not only harms consumer interests but also disrupts market order leading to increasingly severe abnormal competition within the realm of the digital economy.

D. The Issue of Data Gap Requires Urgent Resolution

The digital divide refers to the unequal distribution of access to information technology, which highlights the inequity among different societal groups in terms of New Information Technology (NTIA, 1999). This disparity exists not only across various regions and countries but also within all levels of society. China exhibits a significant regional discrepancy in its digital economy, with the eastern coastal region far surpassing the western region, resulting in structural imbalances where well-developed provinces or cities continue to thrive while underdeveloped areas deteriorate further. The reasons for this digital divide are multifaceted. (1) Disparities in data flow mechanisms and network infrastructure among different regions lead to variations in both quantity and quality of information accessibility. (2) Insufficient popular education on digital knowledge and technology prevents certain groups from accessing, comprehending, and utilizing digital information. (3) Some individuals struggle to keep pace with rapid technological advancements, exacerbating the extent of the digital divide. (4) Elderly people are weakened or even deprived of informational power by the digital divide, rendering them vulnerable groups within an information-driven society.

E. The Prominence of Data Security Issues Is Steadily Growing

The security of information in the digital economy era is a major concern that involves personal data, enterprise data, and government data. Within digital economic activities, issues about data security have become increasingly prominent. Some businesses use user profiling technology to gain access to personal information, exploit default privacy clauses and arbitrary terms to acquire user

information, or even obtain personal information without proper authorization. Criminals use vulnerabilities within information systems and hacker technologies to illicitly procure information for financial gain. These problems pose a significant hindrance to the development of the digital economy. Many manufacturing enterprises have created digital systems where all components are interconnected, but the level of data security remains limited with an inherent risk of cyber attacks and breaches. For example, in July 2021, the REVIL ransomware group executed a supply chain attack utilizing KASEYA remote management software. This attack spread across 17 countries resulting in millions of devices being rendered unusable due to encryption while thousands of enterprises and institutions were adversely affected. Therefore, it is essential to address how best we can harness and utilize the value of data while ensuring open sharing whilst safeguarding against potential threats for the development of the digital economy.

IV. SUGGESTIONS

The digital economy is a result of the information technology revolution, which has brought about industrialization and marketization. Compared to the traditional economy, it offers several advantages like faster information transmission speed, reduced data processing and transaction costs, and precise resource allocation. To promote its high-quality development and address the challenges and risks it faces, we can focus on the following aspects:

A. Enhance the Construction of the Legal System and Cultivate Corporate Social Responsibility

The role of the government in public administration and its impact on businesses is known as government governance. The digital economy has both positive and negative effects. While it promotes economic growth and improves people’s lives, it also creates security risks, moral decay, and ethical abnormalities. To maximize the benefits of the digital economy while minimizing risks, it is necessary to strengthen policy guidance and legislative processes related to this field. The government should standardize tax policies in the digital economy sector, actively engage in international cooperation efforts, and punish platform companies involved in tax evasion. Governments must also enhance anti-monopoly laws and regulations to limit platform monopolies and protect the legitimate rights of platform operators and consumers. Governments must expedite legislation on Artificial Intelligence (AI) and establish mechanisms for algorithm review and accountability supervision, achieving multi-party collaborative governance over AI technologies. They must also supervise the market by implementing comprehensive multi-level oversight systems that regulate data markets. It is essential to optimize supervisory technologies to curb monopolistic behaviors, profiteering activities, malicious speculation tactics, and unfair competition practices. Governments should rectify improper conduct such as using vulgar plots for attracting traffic or engaging in false advertising. They should promote the healthy development of online live streaming platforms and short videos and encourage standardized operations among enterprises.

Governments should ensure that enterprises consciously assume social responsibilities arising from the development of the digital economy by integrating “individual autonomy” into the governance process. The concept of “individual autonomy” emphasizes that enterprises should cultivate their motivational mechanisms for fulfilling social responsibilities through self-action, self-regulation, and self-management. This means awakening corporate ethics and moral force and reorienting stakeholder relationships, while enabling enterprises to adhere to rational motivation through appropriate tools for social responsibility (Quinn & Jones, 1995).

B. Promote Industrial Digital Intelligence to improve Quality and Efficiency

With the rapid advancement of information technology, data has become an essential production factor. Initially, digital technology was mainly used in consumer goods. However, thanks to technological advancements and innovation, it has expanded its reach into the production sector. This integration of data elements with traditional production factors has resulted in a higher marginal growth rate for each factor, compared to endogenous growth theory. This phenomenon gives rise to amplification, superposition, and multiplication effects that significantly impact economic growth and change the input-output relationship (Ghasemaghaei & Calic, 2019). Consequently, this transformative process redefines the spatial scope of various industries by transcending traditional industry boundaries and enhances industrial synergy through restructuring production factors and reconstructing production links. Ultimately, it enables industries to engage in cross-border operations, facilitating new value appreciation and creation. To promote industrial digitalization, we must expedite the construction of high-speed, integrated, and secure information network infrastructure while actively advancing the research, development, and industrialization of next-generation mobile communication technology, next-generation Internet core equipment, and intelligent terminals. We will accelerate the implementation of the strategy for integrating the three networks to facilitate research, development, and demonstration applications in areas such as the Internet of Things and cloud computing. Our focus will be on cultivating key foundational industries like integrated circuits, advanced servers, and high-end software. Additionally, we will enhance information service capabilities, including software services and network value-added services while swiftly driving forward with intelligent transformation initiatives for critical infrastructure. Furthermore, we will vigorously promote cutting-edge technologies such as digitalization and virtualization to foster prosperous growth within cultural and creative industries.

The use of AI technology has become increasingly important in various fields. In March 2024, NVIDIA introduced the Blackwell platform, which aims to enable breakthroughs in data processing, engineering simulation, electronic design automation, computer-aided drug design, quantum computing, and generative artificial intelligence. This platform has the ability to create and execute real-time generative artificial intelligence on large language models

with trillions of parameters, while achieving significant cost and energy efficiencies.

C. Cultivate Digitally Individuals and Bridge the Digital Gap

Mike Ribble defines digital citizenship as the ability to exhibit appropriate and responsible behaviors while using technology and adhering to corresponding norms. Ribble (2011) further breaks down the essence of digital citizenship into nine components, including digital connection, digital consumption, digital communication, and digital literacy. The International Society for Technology in Education (ISTE) emphasizes that digital citizenship encompasses more than just online safety. It also involves leveraging digital technology to foster community development, express opinions through network connectivity, and drive public policy reform. To bridge the “digital divide” across industries and between urban-rural areas or different social groups, several efforts can be made (Digital Citizenship in Education, 2019).

(1) Personalized digital general education courses should be made available to enhance workers’ digital skills. Industry-academia collaboration for skill training can also be reinforced to mitigate structural unemployment. (2) New infrastructure such as 5G, Internet of Things, and blockchain should be constructed in rural areas, particularly in remote villages in western China. This can help establish digital villages and integrate the digital economy into agricultural land, farmers’ cooperatives, and family farms. (3) Comprehensive guidance and training on Internet applications should be provided to senior citizens to enhance information accessibility and bridge the digital divide. Through these efforts, it is possible to contribute towards mitigating the “digital divide” and promoting digital citizenship.

D. Protect Data Security and Safeguard Legitimate Rights

Ensuring data security is crucial for creating a favorable market environment. To achieve this, there are several steps that need to be taken. (1) It’s important to improve existing laws and regulations around data sharing, intellectual property rights, and data privacy. This should include clear legal definitions about data ownership, utilization rights, and profit distribution. (2) Comprehensive security measures for software and hardware need to be implemented, and advanced data encryption technology should be researched and developed. Emerging technologies like quantum technology, blockchain, and federated learning should also be adopted for data encryption and tracking. (3) Enforcement capacity of data security laws needs to be enhanced, and supervision and inspection across all stages of the data industry chain should be increased. A risk control-oriented regulatory approach should be adopted, and penalties for abuse or unauthorized use of data should be intensified. Illegal and criminal activities should be rigorously cracked down on. (4) Enterprises should prioritize the long-term interests of the industry over their short-term gains, and a favorable ecosystem for the data industry should be fostered. (5) Personal information privacy and self-determination should be protected by prohibiting excessive collection of personal information

through “package authorization” and forced consent. Entrusted individuals should be empowered to supervise market subjects’ processing behavior on behalf of personal interests.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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