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THE MECHANISM OF PROMOTING THE SOUND DEVELOPMENT OF THE DIGITAL ECONOMY THROUGH ICT STANDARD

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Abstract: The integrated innovation of new-generation information and communication technology(ICT), while releasing substantial industry benefits, also conceals risks of an equivalent magnitude. The sound development of the digital economy enables the nation to exploit these benefits more fully and minimize the corresponding risks to the maximum extent. Against this backdrop, ICT standard, with its unique guiding and regulatory mechanisms, can ensure device interconnectivity and data interoperability, drive technological research and application, strengthen security protection systems, optimize industrial agglomeration models, and enhance competitive advantages for enterprises, so as to facilitate the digital economy in terms of improving quality and increase efficiency, achieving inclusive and mutually beneficial outcomes, as well as maintaining stable and long-term development.
Keywords: ICT; Standard; Digital economy; Sound development

1 BACKGROUND AND CONNOTATION OF DIGITAL ECONOMY DEVELOPMENT

Since entering the second decade of the 21st century, China's digital economy has seen rapid growth in both quantity and quality. In terms of quantity, the scale of China's digital economy has grown from nearly 10 trillion yuan in 2011 to 53.9 trillion yuan in 2023, and its share of GDP has increased from 20.3 percent to 42.8 percent[1]. In the field of industrial scale, corporate expenditure, patent ownership, and platform value, it has formed a duopoly pattern with the United States[2]. In terms of quality, China's digital economy follows the two directions of digital industrialization and industrial digitalization, with ubiquitous interconnection of all things as the foundation, data integration and application as the impetus, and multi-layer collaborative intelligent computing as the core, promoting society into an era of digitalization, networking and intelligence.

The rapid development of the digital economy has provided major opportunities and opened up broad space for China to build a modern industrial system and promote high-quality economic development, but it has also brought unprecedented challenges. Compared with the traditional real economy, the digital economy is characterized by the continuous emergence of disruptive innovations, the platform economy driving super-fast growth, the "network effect" giving rise to winner-takes-all, and the "dandelion effect" leading industrial competition[3]. On the one hand, this puts forward higher requirements for technology and system integration, and on the other hand, it brings more challenges to the risk governance and ecological cultivation of the industry[4]. These requirements and challenges all need to be addressed by establishing "sound development" as the basic connotation of the development of the digital economy, in order to eliminate development risks, take the strategic initiative and ensure the continuous improvement of the digital economy.

The core of "sound development" lies in not only breaking away from the laissez-faire management model, the profit model that overly relies on the huge market, the evaluation model that unilaterally emphasizes economic benefits, but also paying more attention to the autonomy and controllability of the industrial chain, the safety and reliability of the products, as well as the cultivation of innovation capacity and innovation ecosystem[5]. As a result, the digital economy will, on the basis of rapid and large-scale development, further improve quality and increase efficiency, achieve inclusive and mutually beneficial outcomes, as well as maintain stable and long-term development. Therefore, sound development is an urgent requirement for the high-quality development of the digital economy, and promotes, supports, dynamically balances and evolves in tandem with high-quality development in terms of institutional design, technological governance and resource allocation[6].

2 CONSTRUCTION OF ICT STANDARDS FOR THE SOUND DEVELOPMENT OF THE DIGITAL ECONOMY

For the sound development of the digital economy, whether it is autonomy and controllability, security and reliability, or innovation capacity and innovation ecosystem, it cannot do without the boost and support of information and communication technology(ICT) standardization work. ICT standardization involves the collection, representation, processing, transmission, exchange, description, management, organization, storage, retrieval and technology of information, as well as the design, development, management, testing of ICT systems and products and the development of related tools. Since the 21st century, China's ICT standardization construction has widely mobilized and organized all stakeholders to systematically advance domestic and international standardization work around basic

commonalities, key technologies and key applications, achieving remarkable results. As of May 2025, China has issued 1,953 national standards for information technology (including current and upcoming standards, the same below), 1,762 standards for the electronics industry, 5,227 standards for the communications industry, and 337 standards for radio, television and online audio-visual industry, had established a comprehensive and wide-ranging IC standard system(Data source: National Standard Information Public Service Platform. https://std.samr.gov.cn/). During this period, China's ICT standardization work responded promptly to emerging market demands such as interconnection, full-process and full-network, digital content, and information accessibility, guided the promotion and implementation of various applications such as Internet of Vehicles, intelligent manufacturing, smart cities, and smart homes, and drove the integration and innovation of technologies such as the Internet, Internet of Things, big data, cloud computing, mobile communication, and artificial intelligence. It has provided a strong guarantee for the digital economy to grow from its initial stage.

In the face of the new challenges and requirements for the sound development of the digital economy, the ICT standard system should be further improved and the construction of ICT standards should be further strengthened. A standard is a normative document formulated by consensus and approved by recognized institutions for common and repeated use in order to achieve the best order within a certain scope[7]. ICT standards, with their unique functional attributes, can play a fundamental and leading role in five aspects of the digital economy: common elements, innovative vitality, risk governance, ecological structure, and active subjects(Figure 1). The following will discuss the role that ICT standards play at each of these levels.

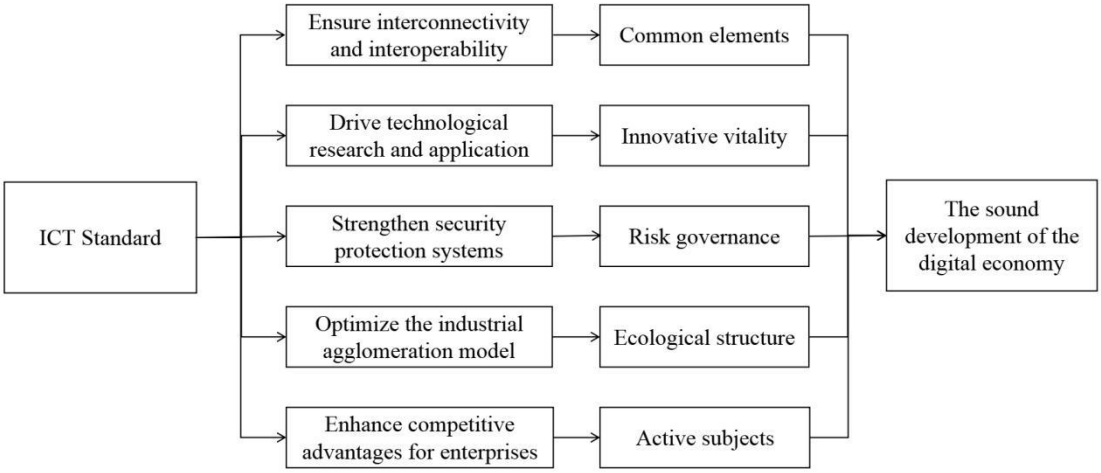

Figure 1 The Mechanism of Promoting the Sound Development of the Digital Economy through ICT Standard

3 THE SPECIFIC ROLE OF ICT STANDARDS IN PROMOTING THE SOUND DEVELOPMENT OF THE DIGITAL ECONOMY

3.1 Ensure Device Interconnectivity and Data Interoperability Focusing on the Digital Economy's Common Elements

The integration scope, innovation capacity and empowerment efficiency of the digital economy largely depend on the maximum interconnection and intercommunication among data, networks, systems and devices. The Internet, which has flourished based on the unified TCP transmission protocol, is the most powerful proof. The current digital transmission's dominant architecture is evolving from interconnection of human to intelligent interconnection of all things, and how to handle data heterogeneity, network switching, the complexity of terminal devices, and the large-scale integration of application systems will be the decisive factor for the in-depth expansion of Internet of Things technology, applications, and industries. Consequently, the sound development of the digital economy demands highly compatible ICT standards to connect and invoke multiple types of data interfaces. By conducting modularization, serialization, and generalization operations on ICT, the underlying architecture for data exchange and interoperability among systems and devices should be unclogged, eradicating the "information isolated island" phenomenon that emerges during the process of digital construction, and laying a solid foundation for the sharing and co-creation of data resources and the in-depth mining of data value.

3.2 Drive Technological Research and Application Focusing on the Innovative Vitality of the Digital Economy

Firstly, standardization often assumes the form of standard systems, series, and collections, constructing interrelated structures among standards that are mutually cooperative, consecutive, and guaranteeing. As a result, an innovation achievement can drive a group of technological and application innovations through standardization, thereby facilitating the formation and development of emerging industries. Secondly, against the backdrop of the digital economy, the network effects, transformation costs, policy dividends, market dividends, and related external environments formed around technological and application innovations are highly uncertain. Thus, ICT standards, with their functions of

unifying, coordinating, simplifying, and optimizing technologies, will play an increasingly significant role in the digital economy's innovation ecosystem[8]. Thirdly, the technological and application innovations of ICT are characterized by diversified entities and networked collaboration. Meanwhile, ICT standards can offer relatively clear behavioral references for the R&D and production activities of various innovation entities and influence them to clarify the key points and objectives of R&D and production centered on core technical standards. Finally, the dissemination and diffusion of new technologies and applications are of paramount importance for achieving innovation goals, obtaining innovation benefits, and forming innovation cycles. Standardization, with its high distinctiveness and credibility, is a reliable approach to promoting social acceptance and recognition and boosting the dissemination and diffusion of innovation achievements.

3.3 Strengthen Security Protection Systems Focusing on the Digital Economy's Risk Governance

Network and information security serves as the bedrock of all digital economic activities. Despite the incalculable innovation space and application prospects of the new generation of information technology, security has emerged as the critical constraint impeding the realization of its potential. Particularly as a core constituent of the new infrastructure, the application domains that information technology pertains to often concern the most fundamental well-being of the people. Hence, the fundamental experience of China over the past two decades, which entailed weakening certain security requirements in the Internet domain to fulfill development demands, is not replicable in the current information technology sphere. In the future, whether the digital economy can achieve a high-level coordination and dynamic equilibrium between security and development will constitute a restrictive factor for its sound development. Moreover, ICT standards can exert their regulatory function by integrating security standards into various standard systems. Through classifying security levels, clarifying security requirements, formulating operation guidelines, and guiding testing and certification, they impose restrictive effects on all aspects such as related infrastructure, system architecture, networks, businesses, applications, terminals, and management.

3.4 Optimize the Industrial Agglomeration Model Focusing on the Digital Economy's Ecological Structure

Firstly, ICT standards have effectively enhanced the support system for technological and application innovations, thereby exerting a driving force on the evolution of the ICT industrial cluster model. During the process of developing, releasing, and implementing one or a series of ICT standards, the standard owners often expand the usage of the standards through granting patent licenses externally and form standard alliances[9]. This subsequently triggers related upstream and downstream enterprises to undertake extensive, imitative, and compliance measures centered around this standard, establishing an extensive ICT standard cooperation network[10]. Consequently, what is carried by standardization is no longer merely an individual innovation outcome but rather an efficient, mutually beneficial, and symbiotic cooperative relationship, thereby playing a distinctive role in connecting and integrating the formation, evolution, and optimization of the ICT industrial ecosystem. Secondly, the rapid advancement of the digital economy is propelling the international digital governance system into a transitional and window period marked by alterations in power relationships and shifts in the power center. Among these, the rule discourse power related to ICT governance constitutes the focus of international competition, and the sequence of "technological patenting - patent standardization - standard internationalization" represents the key path to acquiring the rule discourse power. Therefore, the collaborative mechanism composed of standards and patents can solidify and expand the "technical solutions" featuring Chinese wisdom and characteristics into "technical facts", thereby seizing more opportunities and resources for industrial promotion and commercial implementation on a global scale.

3.5 Enhance Competitive Advantages for Enterprises Focusing on the Digital Economy's Active Subjects

Enterprises actively engage in standardization activities, heightening their participation and discourse power within the standardization process, and facilitating the transformation of their enterprise standards into group standards, national standards, and international standards. This is conducive to the ripening of achievements, the opening up of markets, and the stimulation of trade. Throughout the entire life cycle of ICT standards, the starting point lies in the research and development of new technologies and new applications; the midpoint is the formulation of standards and the establishment of standard systems; and the endpoint is the promotion and dissemination of technical standards, as well as the production of products and services related to the standards. Especially considering that behind specific standards, several related technology patents may be bound, the promotion and dissemination of standards will also lead to the large-scale utilization of patents, thereby generating considerable revenues for enterprises[11]. Hence, an increasing number of enterprises are currently applying for patent protection for their innovative achievements on the one hand, and developing standards based on them on the other hand, while striving to make them prototypes of group standards, national standards, and international standards. Once such a standardization strategy succeeds, it will play a significant role in consolidating the industry's dominant position, expanding market share, and enhancing economic benefits.

4 CONCLUSION

The sound development of the digital economy will enable all industries and fields to exploit these benefits more fully and minimize the corresponding risks hidden behind these benefits to the maximum extent[12]. By forming guiding and

normative mechanisms as mentioned above, ICT standards can support the organic synergy among various production departments, the efficient allocation of production factors, and the sequential connection of production links in the digital economy. As a result, ICT standards can facilitate the alignment of security requirements and development demands in the digital economy, the correspondence between innovation-driven and market-driven forces, and the integration of social and economic benefits, thereby promoting the sound development of China's digital economy in the digital realm.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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