

New Requirements of the Digital Economy for the Development of Vocational Education in China

Zhimin Lu

Baise University, Baise, Guangxi, China

Abstract: The digital economy constitutes a novel socio-economic formation currently undergoing rapid global development. This paper first reviews the historical evolution of digital economy domestically and internationally, highlighting its transformation from an emerging concept to a mainstream engine of global economic growth and a focal point of international competition. Second, by referencing published data, it delineates the current landscape of digital economy development worldwide and in China, emphasizing its continuous expansion and growing economic share. Third, through synthesizing research on vocational education's relationship with national economic development, it establishes vocational education as a significant catalyst for economic progress. Fourth, the paper identifies dual challenges in China's digital economy development: insufficient supply of high-skilled talent in both quantity and quality, which severely constrains its sustainable advancement. Finally, it proposes that China's vocational education system must urgently implement reforms—including establishing new digital economy-related programs, expanding enrollment in relevant disciplines, and enhancing digital talent cultivation quality—to effectively underpin the high-quality development of the digital economy.

Keywords: Vocational Education; National Economy; Digital Economy; Talent Reserve

1. Historical Development of the Digital Economy

The digital economy is a novel socio-economic development form following agricultural and industrial economies. The concept of the digital economy first emerged in the United States in the 1990s. According to the Oxford English Dictionary, the term "Digital Economy" initially appeared in a report by the San Diego

Union-Tribune in the United States on March 1, 1994.

In 1995, Canadian business strategy authority Don Tapscott published the book *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*, providing a detailed description of the digital economy and establishing "digital economy" as an established term.

Subsequently, important works such as Manuel Castells' *The Information Age Trilogy* and Nicholas Negroponte's *Being Digital* were published, drawing further attention from academia and industry to the phenomena and trends of the digital economy. In 1998, the U.S. Department of Commerce released the *The Emerging Digital Economy* series of reports, proposing that the digital economy was a significant factor in the prosperous growth of the U.S. economy in the mid-to-late 1990s, and officially heralded the advent of the digital economy era from a governmental perspective.

After entering the 21st century, with the innovation and diffusion of internet technology, major international organizations and national governments began shifting their policy focus toward the digital economy, intensifying research efforts with the aim of leveraging the digital economy to promote industrial innovation and stimulate economic growth.

According to the OECD Digital Economy Outlook 2015 Report, as of 2015, 80% of Organisation for Economic Co-operation and Development (OECD) member states had formulated national strategic frameworks for the digital economy. In September 2016, the G20 Digital Economy Development and Cooperation Initiative released at the G20 Hangzhou Summit became the world's first digital economy policy document jointly signed by multiple national leaders. After more than 30 years of development, the digital economy is transitioning from an emerging phenomenon to a mainstream force, becoming the predominant model for global economic innovation and

development.

2. Current Status of Digital Economy Development

On July 2, 2024, at the main forum of the 2024 Global Digital Economy Conference, Yu Xiaohui, President of the China Academy of Information and Communications Technology (CAICT), released the 2024 Global Digital Economy White Paper. He noted that in 2023, the digital economy continued its rapid development across major global economies. The combined digital economic output of the United States, China, Germany, Japan, and South Korea exceeded US\$33 trillion, representing a year-on-year growth of over 8%. The digital economy accounted for 60% of global GDP, marking an increase of approximately 8 percentage points compared to 2019.

The development trajectory of China's digital economy commenced in 1994 through internet industry growth, culminating in its current status as an internationally recognized digital power.

Hu Wen (2018) divides the development history of China's digital economy into three stages:

Germination Period (1994–2002): In 1994, China formally connected to the international internet, entering the internet era. Characterized by the rise of the internet industry, a large number of pioneering enterprises including Sina, Sohu, NetEase, Baidu, Tencent, Alibaba, and JD.com were successively established.

High-Speed Development Period (2003–2012): With the sustained double-digit growth of internet users, e-commerce represented by online retail took the lead, driving the digital economy from the germination period into a new stage of development. Subsequently, the popularity of self-media such as "blogs" and "Weibo" and social network services (SNS) brought significant changes to interpersonal communication methods, closely linking social networks with social relationships.

Maturity Period (2013–present): Since the scale expansion of mobile internet users, the internet industry has entered the mobile era, and the fundamental framework of China's digital economy has been established, entering a mature stage[1].

On August 27, 2024, at the China International Big Data Industry Expo, Wang Zhiqin, Deputy Head of the China Academy of Information and Communications Technology, released the China

Digital Economy Development Research Report (2024). The report indicated that in 2023, China's digital economy reached a scale of 53.9 trillion yuan, accounting for 42.8% of GDP. The growth of the digital economy contributed 66.45% to GDP growth, effectively supporting the stabilization and recovery of the economy.

3. Research on the Role of Vocational Education in Promoting National Economic Development

Internationally, it has long been noted that there exists a positive relationship between vocational education demand and economic development levels [2], and that vocational education can better meet regional development needs and promote regional economic development [3]. Research suggests that the economic development of Germany and Japan benefited significantly from vocational education [4]; vocational education was also an important factor in enhancing Malaysia's economic productivity [5]; Nigerian experts argue that comprehensive vocational education is the fundamental solution to the country's economic development problems [6]. Research on the contribution of Singapore's vocational education to economic development calculated a direct contribution rate of 21.1% from 2010 to 2020 [7].

Domestic research on the relationship between vocational education and national economic development is even more extensive.

Scholars have established a significant positive correlation between China's vocational education and economic development. Wang Yijun and Zhao Jin's (2017) research confirms statistically significant positive effects of vocational education scale on economic growth at both national and regional levels [8]. Concurrently, Qi Zhanyong and Wang Zhiyuan (2020) identify vocational education as the educational sector most intrinsically linked to socioeconomic advancement, serving as a dynamic catalyst for economic and cultural development [9].

Notably, comparative studies reveal stronger vocational higher education-economic linkages than those of general higher education. Xu Ling's (2013) analysis demonstrates tighter integration between China's economic growth and vocational higher education relative to general higher education [10]. Through empirical examination of 1978-2019 data, Li Li et al. (2021) validate vocational higher

education's substantial socioeconomic promotion effects, particularly within agriculture and service sectors [11]. Tang Wenzhong's (2015) Cobb-Douglas modeling further corroborates its positive yet diminishing marginal economic returns [12].

Regionally, Zheng Yumei and Zhou Wangdong quantify a 0.8516% GDP increase in Hunan Province per 1% vocational enrollment growth [13]. Zhang Jia's (2014) contribution rate analysis reveals stronger economic impacts in eastern/central China versus western regions [14]. Complementary findings by Deng Peng et al. (2016) highlight agricultural disciplines' greater responsiveness to vocational inputs compared to engineering fields.

4. New Demands of the Digital Economy on China's High-Skilled Talent Supply

The essence of vocational education lies in supplying high-caliber, practically-oriented professionals for socioeconomic development, playing a distinct and vital role in the advancement of the national economy. For China to achieve its digital economy transformation, it must vigorously develop vocational education. This is mainly manifested in:

4.1 Quantitative Requirements

The Digital Economy Employment Impact Research Report released by the China Academy of Information and Communications Technology (CAICT) stated that by 2020, China's digital talent gap had approached 11 million. With the rapid advancement of digitalization across all industries, the talent demand gap is expected to continue widening. The digital talent shortage has become a major bottleneck constraining the development of China's digital economy [15]. Experts believe that, under the trends of informatization, digitalization, networking, and intelligence, relevant authorities should continuously explore talent market demands, advance the education and cultivation of digital talent, improve the supply level of the digital economy labor force, and add momentum to China's economic digital transformation [16].

4.2 Qualitative Requirements

The 2019 National Implementation Plan for Vocational Education Reform clearly requires "significantly enhancing the modernization level of vocational education in the new era to provide high-quality talent resources for promoting

socio-economic development and improving national competitiveness."

The Organisation for Economic Co-operation and Development (OECD) believes that by 2030, with the development of the digital economy and the proliferation of digital technologies, more than 35% of professional positions will undergo fundamental changes, and career transitions will become more frequent. Against the backdrop of the digital economy, over 50% of manufacturing positions will require practitioners to possess vocational skills and literacy at the undergraduate university level [17].

5. How Vocational Education Can Adapt to the Needs of Digital Economy Development

As the primary incubator for high-caliber technical talent, vocational education has significantly bolstered economic development across nations. However, when confronted with the accelerated advancement of the Digital Economy, it exhibits systemic misalignment in aspects including training capacity, responsiveness, and talent quality. Accelerating the digital transformation of vocational education to enhance its capacity to support the Digital Economy is imperative.

Scholars uniformly identify digital disruption as reshaping industrial skill requirements. Xue Xinlong (2019) contends that vocational systems must reconfigure talent development structures, program designs, and curricular content to address digital industry needs, thereby bridging the digital skills gap and aligning with contemporary economic paradigms [18]. Echoing this imperative, Zhang Xiaohua (2021) advocates for continuous optimization of technical talent cultivation models to improve their congruence with evolving industrial and employment structures [19].

The digital economy's accelerated development further intensifies talent specifications, presenting novel challenges to vocational pedagogy. As Xiao Yu and Ji Minxia (2022) demonstrate, responsive innovation in talent development frameworks is essential to meet transformed competency demands in the digital era [20].

To align with the digital economy development strategy, vocational schools should actively apply to add new majors related to the digital economy, expand the scale of talent cultivation integrating digital skills with industry, and accelerate the elevation of vocational education

academic levels and the improvement of talent cultivation quality.

5.1 Improve Digital Economy-Related Programs

The characteristics of China's economic industrial structure and market demand provide clear signals for vocational education program development. China's Education Modernization 2035 proposes to "accelerate the development of modern vocational education and promote the organic connection and deep integration between vocational education and industrial development". To adapt to the needs of digital economy development, vocational education institutions need foresight in aspects such as undergraduate program development, discipline setting, curriculum content, and teaching methods. They should actively add new majors related to digital skills cultivation, continuously increase the popularization, promotion, and application of digital technology knowledge and skills, and enhance the digital capabilities of vocational college students.

The Undergraduate Specialty Catalog of Regular Higher Education Institutions (2025) released by the Ministry of Education shows that in 2024, Chinese universities added 76 new undergraduate programs in "Digital Economy," second only to "Artificial Intelligence" (91). As of April 2025, a total of 299 universities nationwide have established undergraduate programs in Digital Economy, with a total of 302 program points [21].

In this regard, vocational colleges must have a sense of urgency and catch up in program setting. The development of the digital economy requires not only talents in economics but also a large number of talents in emerging fields such as blockchain, artificial intelligence, the Internet of Things, and robotics. Based on the current establishment of digital economy-related majors in domestic and international general universities and higher vocational colleges, the majors required for developing the digital economy mainly include: big data, artificial intelligence, blockchain, Internet of Things, VR technology, e-commerce, integrated circuits, metaverse, cloud computing, and integrated media.

As the main battlefield of local economic development, vocational education can better serve the local economy only by continuously optimizing its professional structure and deepening all-round cooperation between

schools and enterprises in practice, scientific research, curriculum development, and implementation. In terms of program setting, vocational colleges should proactively integrate with the characteristics and advantages of local industries and enterprises, be guided by market demand, innovate and optimize program settings, and open new paths for industry-education integration. By strengthening characteristic programs and aligning with advantageous programs, vocational colleges can enhance their sensitivity and predictive ability toward local advantageous industries, thereby improving the adaptability of talent cultivation, cultivating talents needed by the market, and better realizing the deep integration and parallel development of vocational colleges and industrial demand [22].

5.2 Expand Enrollment Scale for Digital Economy-Related Majors

As a new form of social and economic development, the digital economy urgently requires a large number of interdisciplinary talents who are proficient in both the classical theoretical knowledge of various disciplines and internet and big data-related knowledge. Students cultivated by higher vocational colleges should possess solid economic knowledge, a systematic foundation in management, and strong capabilities in using data analysis tools. After graduation, they can engage in economic analysis, financial analysis, and industry management related to emerging fields such as blockchain, artificial intelligence, Internet of Things, robotics, and e-commerce. They should be able to flexibly apply their knowledge in areas such as digital asset management, community collaboration, internet financial services, and user value analysis, achieving the integration of theory and practice, while also possessing the ability to engage in research work. Between 2020 and 2024, the Ministry of Human Resources and Social Security, the State Administration for Market Regulation, and the National Bureau of Statistics successively released four batches comprising 56 new professions, the majority of which are related to the digital economy [23].

According to statistics, the process of setting up a completely new major, from research and demonstration to approval and announcement, takes at least half a year. Combined with the cultivation cycle for undergraduate and master's graduates, the initial talent cultivation for new

industries and technology fields takes at least 4.5 years, while master's and doctoral cultivation can take 6.5 to 9.5 years. In contrast, the talent demands of new models and formats in the digital economy have already undergone significant adjustments, making it difficult for the supply of high-quality talents to keep up with changes in demand [15]. Therefore, vocational colleges should increase the enrollment efforts for students in digital-related majors, shorten the replenishment time of graduates to the digital economy as much as possible, and reserve sufficient talent for the realization of digital economy development.

5.3 Improve the Quality of Digital Economy Vocational Education

Although vocational education is still sometimes considered secondary to academic university pathways, its indispensable role in national economic growth is increasingly evident in modern society. The digital age magnifies this value significantly. Therefore, accelerating the digital economy requires vocational colleges not only to launch relevant new programs and recruit more students but, crucially, to enhance educational quality. This is essential to meet the digital economy's need for highly competent technical professionals.

First, efforts to cultivate faculty strength in the digital economy should be intensified. On one hand, excellent teachers in digital economy-related fields should be recruited in large numbers to enrich the front-line teaching force; on the other hand, existing faculty should receive enhanced training in digital economy knowledge and skills to address the shortage of teachers for digital economy talent cultivation.

Second, the organic integration of digital economy teaching, scientific research, and practical training should be strengthened. Previously, vocational education often gave the impression of being strong in practical skills but insufficient in research. In the future, vocational education must address this shortcoming in research. While maintaining practical teaching, it should emphasize integration with the forefront of practice, focusing on solving key and difficult problems encountered in practice. This will position vocational education at the forefront of digital economy development, making it not only a supporter but also a leader of the digital economy.

Finally, the construction of standards for digital

economy talent cultivation should be strengthened. What kind of talents does the digital economy industry need, and what are the specific requirements? As the main front for cultivating skilled talents, vocational colleges should intensify research on the talent demands of the digital economy industry and understand the real needs of front-line enterprises. Based on the research results, standards and plans for digital economy talent cultivation should be formulated. During the talent cultivation process, strict adherence to these cultivation standards and plans should be maintained to elevate the academic level and comprehensive quality of talents, thereby providing high-quality professionals for the development of the digital economy industry.

6. Conclusion

After over three decades of incubation and development, the digital economy has now taken initial shape in China. The Chinese government regards the digital economy as a significant opportunity to achieve economic transformation and leapfrog development, vigorously promoting its expansion. Despite a relatively favorable start, China's digital economy faces a core bottleneck: a shortage of highly skilled digital talent (digital-skilled professionals), casting considerable uncertainty over its future trajectory. To meet the developmental demands of the digital economy, China's vocational education system urgently requires sweeping reforms. Vocational colleges and institutions must not only increase the establishment of digital economy-related programs and expand student enrollment but also significantly boost investment in teaching resources and faculty development, improve the educational environment, and enhance the quality of talent cultivation. The goal is to supply the digital economy industry with highly skilled, versatile professionals who possess both theoretical grounding and practical competence, coupled with outstanding professional ethics.

References

- [1] Hu Wen. Review and Prospect of China's Digital Economy Development. Cybersecurity and Civil-Military Integration. 2018(06):18-22.
- [2] Hurd, G. E. & Johnson, T. J. A Reply to Professor Foster. Sociology of Education, 1968(1).

- [3] Tilak, J. B. G. Vocational Education in South Asia: Problems and Prospects. *International Review of Education*, 1988(2).
- [4] Psacharopoulos, G. Vocational Education and Training Today: Challenges and Responses. *Journal of Vocational Education & Training*, 1997(3).
- [5] Mustapha, R. B. & Greenan, J. P. The Role of Vocational Education in Economic Development in Malaysia. *Journal of Industrial Teacher Education*, 2002(2).
- [6] Ohimrei, F. O. & Nwosu, B. O. The Role of Vocational and Technical Education in Nigeria Economic Development. *Educational Research Quarterly*, 2013(3).
- [7] Liu Lijian. Contribution of Vocational Education to Singapore's Economic Development: A Denison Factor Analysis Based on 2010–2020 Data. *Journal of Fujian Polytechnic Normal University*, 2021, 39(06):574-579.
- [8] Wang Yijun, Zhao Jin. Empirical Analysis of the Impact of Vocational Education Scale, Structure, and Quality on Economic Development. *Education Economics Review*, 2017(1):20-34.
- [9] Qi Zhanyong, Wang Zhiyuan. The Coupling Relationship Between Economic Development and Vocational Education and Their Synergistic Paths. *Educational Research*, 2020(3):106-115.
- [10] Xu Ling. Empirical Study on the Relationship Between Higher Vocational Education Scale and Economic Growth in China (1992–2010). *Higher Education Exploration*, 2013(5).
- [11] Li Li, Yu Guangxiang, Wu Haitian. Analysis of the Coordinated Relationship Between Higher Vocational Education Development and Economic Development. *China Higher Education*, 2021(07).
- [12] Tang Wenzhong. Theoretical and Empirical Research on Higher Vocational Education Promoting Economic Development in China. *Southeast Academic Research*, 2015(04):226-231.
- [13] Zheng Yumei, Zhou Wangdong. Analysis of Hunan Vocational Education Development Strategies. *Journal of Educational Science of Hunan Normal University*, 2011(5).
- [14] Zhang Jia. Empirical Analysis of Higher Vocational Education's Contribution to Regional Economic Development. *Vocational and Technical Education*, 2014, 35(10):45-50.
- [15] Zhang Lin, Wang Lixiang, Hu Yanni. Causes and Recommendations for China's Digital Talent Shortage. *Information and Communications Technology and Policy*, 2021(12):76-80.
- [16] Jin Chen. Vocational Education Embraces "Digitalization". *People's Daily Overseas Edition*, 2022-03-25(08).
- [17] Liu Chen. Vocational Education in the Context of the Digital Economy. *Journal of Renmin University of China*, 2020, 34(6):40-49.
- [18] Xue Xinlong. Development and Transformation of China's Vocational Education in the Digital Economy Era. *Information and Communications Technology and Policy*, 2019(09): 42-44.
- [19] Zhang Xiaohua. Research on the Adaptability of Higher Vocational Education Serving the Digital Economy-Based on Environmental Embeddedness Theory. *Theoretical Research: Innovation and Entrepreneurship Theory Research and Practice*, 2021, 4(13):1-3.
- [20] Xiao Yu & Ji Minxia. Innovative Research on Vocational Education Talent Cultivation in the Context of the Digital Economy. *Technology and Innovation*, 2022(20):138-142.
- [21] Digital Economy Major Experiences Rapid Development: 76 Universities Approved for New Major, Nationwide Total of 302 Program Points Established. https://news.sohu.com/a/888467047_121209066, 2025-04-24.
- [22] Zhang Shuyi. Research on the Adaptability of Higher Vocational Education and Local Economic Development. *Talent Development*, 2022(03):67-68.
- [23] Liu Fengkun, Long Kailin. Towards the Digital Economy: Evolution of Ideas and Path Innovation for Vocational Talent Cultivation. *Western Academic Journal*, 2025(12):140-143.