



Digital Economy Cooperation between China and ASEAN: Motivations, Current Status, and Challenges

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Abstract. In recent years, major global actors have successively launched bilateral and multilateral digital economy cooperation initiatives. As representatives of emerging and developed digital economies, respectively, ASEAN and China's digital economic cooperation has attracted widespread attention. China-ASEAN digital economic cooperation is a natural outcome of bilateral relations and a necessary choice for digital economic development in both regions. China and ASEAN countries have significant complementarities in digital economic cooperation. Based on mutual benefit and win-win cooperation, China-ASEAN digital economic cooperation can promote economic growth and achieve a win-win situation. Moreover, China-ASEAN digital economic cooperation is conducive to maintaining a digital strategic balance in the Southeast Asian region. China-ASEAN digital economic cooperation has achieved significant results in various fields such as policy planning, digital investment, digital infrastructure construction, digital technology application, and digital talent cooperation. However, factors such as the constraints of ASEAN's internal mechanisms, the impact of geopolitical competition, and the need to improve both sides' digital governance capabilities have hindered the further development of China-ASEAN digital economic cooperation.

Keywords: China-ASEAN relations; digital economy; regional cooperation.

1 Introduction

The digital economy is becoming the new engine of global economic growth. As of 2022, according to the World Bank, the digital economy accounts for more than 15 percent of global GDP and has grown 2.5 times faster than the GDP of the real economy over the past decade. Deemah Al-Yahya, Secretary General of the Digital Cooperation Organization (DCO), expects the digital economy to grow significantly, contributing 30% of global GDP by 2030 (World Economy Forum, 2022). A report released by China shows that in 2022, the digital economy of 51 major economies around the world will account for 46.1% of GDP, and the year-on-year caliber of the previous year will

be 44.3%, an increase of 1.8 percentage points, and the position of the digital economy in the national economy is steadily increasing (China Academy of Information and Communication Research, 2024:16).

In order to better promote the development of the digital economy and explore the potential value of the digital economy, China and ASEAN countries have launched a series of cooperation. ASEAN is China's largest trading partner and plays a crucial role in the construction of the Belt and Road. Strengthening digital economy cooperation with ASEAN countries and building a "Digital Silk Road" will bring new momentum to the economic growth of both sides and add new impetus to the development of the "Belt and Road". Deepening digital economy cooperation has become an important consensus between China and ASEAN countries, and digital economy partnership is an important dimension of their comprehensive strategic partnership (Ministry of Foreign Affairs of the People's Republic of China, 2024). Therefore, this paper will analyze the challenges encountered by China and ASEAN in this field on the basis of analyzing the motivation and current situation of China-ASEAN digital economy cooperation.

2 Motivation for Digital Economy Cooperation between China and ASEAN

The digital economy has become an important growth area for the economies and trade of the world's major economies. Cooperation in the digital economy, like cooperation in other areas, can bring mutual benefits to both sides. Cooperation between China and ASEAN in the digital economy is a natural extension of the development of bilateral relations. Both sides have mutual advantages in the digital economy, which can complement each other's strengths and bring mutual benefits, and cooperation between China and ASEAN countries in the digital economy is conducive to the maintenance of the digital strategic balance in the Southeast Asian region.

2.1 China-ASEAN Digital Economy Cooperation is a Natural Outcome of the Development of Bilateral Relations

China-ASEAN countries' digital economy cooperation is a natural result of the development of bilateral relations and an inevitable choice for the development of their digital economies. China and ASEAN (Association of Southeast Asian Nations) relations have made remarkable progress over the past 30 years, establishing a close partnership. China-ASEAN relations began in 1991, when China established a dialog with ASEAN countries. On the basis of mutual respect, equality and mutual benefit, the two sides have continuously deepened political mutual trust, promoted economic cooperation and jointly maintained regional peace and stability. In terms of economic cooperation, China and ASEAN have complementary industrial structures, and there is extensive room for cooperation between the two sides in areas such as manufacturing, infrastructure construction, new energy, etc. In 2012, ASEAN initiated the Regional Comprehensive Economic Partnership (RCEP), and China responded positively and made the RCEP a reality in 2019. In 2013, China put forward the proposal of building a common

Belt and Road Initiative, ASEAN was one of the earliest supporters, and today 10 countries have signed relevant cooperation documents. In November 2021, at the 30th anniversary summit of the establishment of dialogue between China and ASEAN, President Xi Jinping proposed to build the “Five Homelands” of peace, tranquility, prosperity, beauty and friendship. “Five Homelands” and announced the establishment of a comprehensive strategic partnership with the leaders of ASEAN countries. Bilateral trade reached 6.41 trillion yuan by 2023, with ASEAN retaining its position as China's top trading partner for four consecutive years, and China being ASEAN's top trading partner for many consecutive years (People's Daily, 2024). Therefore, the development of China's ASEAN bilateral relations is all-round, multi-disciplinary and deep-level, and with the development of the digital economy on both sides, it will naturally become an important area of bilateral cooperation. According to a report released by China, the size of China's digital economy reached \$53.9 trillion in 2023, an increase of \$3.7 trillion from the previous year. China's digital economy accounted for 42.8% of GDP (China Academy of Information and Communication Research, 2024:3). For its part, ASEAN, in its ASEAN Digital Masterplan 2025, had noted the advantages of digitization in economic activities: digitization could help to increase business productivity, strengthen its position in the value chain, prosper the ASEAN economy and reduce trade frictions (*ASEAN Digital Masterplan 2025*, 2021:4). The ASEAN digital economy reached US\$282 billion in 2022, creating 160,000 high-skilled jobs and indirectly supporting nearly 30 million jobs, and the digital economy is expected to grow to US\$1 trillion by 2030. Therefore, cooperation between the two sides in the field of digital economy is also an inevitable result of the development of digital economy. China-ASEAN cooperation has broad prospects and great potential, and the two sides have huge advantages in terms of geographic location, industrial resources, market size, policy support, cultural exchanges, etc., which are expected to become a global level and jointly promote the development of global industries.

2.2 China-ASEAN Complement and Benefit from Each Other's Strengths in Digital Economy

China and ASEAN countries have huge complementarities in digital economy cooperation. China-ASEAN digital economy cooperation can promote economic growth on the basis of mutual benefit and win-win situation. In 2023, the size of China's digital economy reached \$53.9 trillion, the total amount of which is firmly ranked second in the world, second only to the United States. Compared to most ASEAN countries, China has obvious advantages in the areas of digital infrastructure construction, digital industrialization, industrial digitization, and digital system exploration. China's digital infrastructure is more advanced, and China has built the world's largest fiber-optic and 4G networks, transforming the mega-market and demographic dividend into a data dividend. China also has a large number of 5G bases and a large number of 5G users. China is a large human resource country with a huge scale of digital talents, and in 2022 the scale of digital talents in China reached 5,292,000 people (*Talent Blue Book*, 2023). China has made important breakthroughs in frontier technologies such as artificial intelligence, big data and cloud computing, and has a number of globally competitive

digital enterprises and innovation platforms. Moreover, China actively participates in the construction and improvement of the global digital economy governance system, and has made positive contributions to the synergistic development of the global digital economy through its participation in the formulation of digital trade rules, the promotion of cross-border data flows and other initiatives. China's development in all these areas constitutes China's advantages in the digital economy. China-ASEAN share a huge market. ASEAN has great potential for development in areas such as mobile communications and smart homes, while China has advantages in electronic information technology and digital economy. ASEAN has certain production capacity in certain electronic components, such as Thailand in electronic components, semiconductors and other fields, while China has a complete layout of electronic information industry. Secondly, there is talent complementarity, ASEAN has rich talent resources in the field of electronic information, especially in language, culture and other aspects of the advantages, while China has advantages in talent training, technological innovation and other aspects.

In contrast, there is still room for ASEAN to develop in all areas of the digital economy. In terms of the size of the digital economy, ASEAN countries are still relatively small despite rapid growth, with the size of the ASEAN digital economy reaching US\$194 billion in 2022, a 90% increase from 2019. The size of the digital economy in the ASEAN region is expected to reach US\$1-2 trillion by 20230. Despite the strong growth, there is a large gap with China in terms of scale and volume. And there are gaps with China in digital infrastructure development, digital industry, industrial digital transformation, and digital governance. The technology gap and scale difference between the two sides in the digital field, as well as the strong digital demand of ASEAN countries, have combined to drive cooperation between the two sides in this field. In recent years, ASEAN countries have initiated digital strategic transformation, expecting to use digital methods and digital economy to enhance productivity, reshape national economies, bring new employment opportunities, and promote social change. China's first-mover digital advantage can help ASEAN countries realize digital strategic transformation.

Table 1. Digital Strategy Transformation in ASEAN Countries in Recent Years.

Thailand	Digital Thailand 4.0 Strategy	Cambodia Digital Economy and Social Policy Plan (2021-2035)
Vietnam	Vietnam Industry 4.0 Strategy and Vietnam Digital Transformation Strategy	
Cambodia		
Laos	Development Vision 2030 and the 10-year Strategic Development Plan (2016-2035)	
Malaysia	Malaysia National Industry 4.0 Policy	

Indonesia	Towards a Digital Vision 2020
Singapore	Smart Nation 2025 Initiative
Philippines	ICT Initiative and National Broad-band Plan
Brunei	National Digital Strategy (2016-2020)

ASEAN aims to leverage China's expertise to drive its digital transformation and foster the integration of its digital market. The ASEAN Economic Community Blueprint 2025 outlines the goal of building a secure, sustainable, and transformative digital economy in ASEAN, utilizing information and communication technologies to create an innovative, inclusive, and integrated ASEAN ("AEC Blueprint 2025", 2025).

The Digital Integration Framework and its Action Plan 2019-2025 (DIFAP) set out the overall blueprint for ASEAN's digital integration. However, ASEAN's digital transformation and integration have been slow, and there is still no coordinated digital regulatory framework. Different ASEAN countries have adopted vastly different approaches to infrastructure, spectrum sharing, and spectrum trading (Soon & Dobberstein, 2020:30). Against this backdrop, Chinese investment is crucial for ASEAN's digital transformation. Statistics show that foreign direct investment (FDI) into ASEAN reached \$174 billion in 2021, with the information and communication industry ranking fifth among all invested industries, at \$74.47 billion, accounting for 4.2%. Among the FDI in ASEAN's information and communication industry, China invested \$24.392 billion, Europe invested \$20.235 billion, and the United States invested \$11.129 billion (UNCTAD, 2022).

Certainly, as a region with a massive population and a growing middle class, ASEAN represents a significant opportunity for China. China is keen to share in ASEAN's digital economic dividends and values ASEAN's position in the digital economy's value chain. The digital market in Southeast Asia offers vast prospects and is growing rapidly. Except for Laos and Myanmar, the internet penetration rate in major ASEAN countries reached 75% in 2021, with a total user base of approximately 440 million. In 2022, the number of internet users in Southeast Asia is expected to grow by 3.1% year-on-year, making it the second fastest-growing region globally (Cheung, 2022). Relevant data shows that as of 2022, the smartphone penetration rate in Southeast Asia has reached a high of 97%, exceeding the global average. In terms of mobile app downloads, the Southeast Asian market is enormous, with countries like Indonesia, Vietnam, the Philippines, and Thailand ranking among the top 20 globally.

With a population of over 600 million, ASEAN countries still represent a vast blue ocean for global e-commerce. Meanwhile, Southeast Asia boasts 460 million digital consumers, and online shopping demand is growing robustly. In 2022, the Southeast Asian e-commerce market was valued at approximately \$131 billion. By 2025, this figure is expected to reach \$211 billion, representing a total growth of 61% and a compound annual growth rate of 18%. Globally, this is the fastest-growing e-commerce market.

Moreover, ASEAN has become a crucial link in the new round of global semiconductor supply chain adjustments. Semiconductors are essential components of various electronic devices and underpin digital economic activities. ASEAN countries have become one of the world's leading suppliers of semiconductors and printed circuit boards. In 2019, ASEAN was already the world's second-largest semiconductor exporter, accounting for 22.5% of global semiconductor exports. Among ASEAN countries, Malaysia, Singapore, Vietnam, the Philippines, and Thailand are leading in research and development and integrated circuit design. In 2020, Singapore contributed 12.4% to global semiconductor exports, while Malaysia contributed 6.3% (Gaikwad, 2022).

Therefore, China and ASEAN not only maintain close cooperation in traditional areas such as trade and investment but also continuously strengthen cooperation in the digital economy. China and ASEAN enjoy strong complementarity, vitality, and potential in industrial cooperation, making it one of the most meaningful and productive cooperation models in the Asia-Pacific region, and even globally.

2020 was designated as the "China-ASEAN Year of Digital Economy Cooperation," during which both sides jointly issued the "China-ASEAN Initiative on Building a Digital Economic Partnership." In 2022, the two sides adopted the "Implementation Plan of the China-ASEAN Digital Economic Partnership (2021-2025)," further strengthening cooperation in areas such as smart cities, 5G, artificial intelligence, e-commerce, big data, blockchain, and telemedicine. China continues to promote cooperation with ASEAN countries in cybersecurity and actively explores.

2.3 China-ASEAN Digital Economic Cooperation Contributes to a More Balanced Digital Strategic Landscape in Southeast Asia

The robust growth potential of the digital economy in ASEAN countries has made Southeast Asia a crucial arena for major powers' digital economic and technological competition. Global actors are vying to strengthen their digital ties with the region. ASEAN countries, adhering to their traditional "balancing policy," navigate among major economic powers such as the United States, the European Union, China, and Japan. Developing a comprehensive and in-depth digital economic partnership with China is clearly beneficial for ASEAN countries in maintaining their digital strategic balance.

The United States has also been increasing its cooperation with ASEAN countries in the digital economy, while simultaneously promoting the "securitization" of the digital realm and pursuing digital hegemony, exerting pressure on ASEAN countries to restrict China's digital development in the region. During the Trump administration, the United States proposed the Clean Network Initiative, using the pretext of protecting human rights and privacy to pressure Southeast Asian countries to replace their digital equipment suppliers. The Biden administration has attempted to build a technology alliance to counter China's "Digital Silk Road" and restrict China's technology exports to the region. Additionally, the Quad Technology Network (QTN), led by Australia and involving the United States, Japan, and India, has been constantly drumming up concerns that China's digital economic investments in Southeast Asia could pose cybersecurity threats to the region, calling for necessary regulations to ensure that no specific actor dominates the Southeast Asian digital economy (Ray et al., 2021).

To strengthen its digital influence in Southeast Asia, the EU launched its "Connecting Europe and Asia—Building blocks for an EU Strategy" in 2018, clearly stating its intention to link up with backbone networks in Asia and other third countries to form an interconnected information and communication technology environment (The European Commission, 2018). In 2021, the EU released its "EU-Indo-Pacific Cooperation Strategy Report," elevating digital governance and digital partnership development to priority areas, expanding its network of digital partnerships with Indo-Pacific partners, and exploring the possibility of establishing new digital partnership agreements, with a particular emphasis on secure maritime communications lines and capacity building (The European Commission, 2021). In 2022, on the 45th anniversary of EU-ASEAN relations, the EU proposed a €10 billion investment plan, which, as part of the Global Gateway initiative, would accelerate investments in digital infrastructure in ASEAN countries, support the interconnection of ASEAN power grids, and invest in digitalization, including interconnectivity through submarine cables, while promoting environmentally, economically, and socially sustainable value chains (The European Commission, 2022).

Within the framework of its "Indo-Pacific Strategy," Japan is comprehensively deepening cooperation with ASEAN countries in the digital economy, such as artificial intelligence, semiconductors, and chips, thereby strengthening its comprehensive strategic partnership with ASEAN. In fact, there is also an underlying intention to counter China and constrain the building of a China-ASEAN community with a shared future.

Therefore, whether from a purely economic perspective or from a political and security perspective, China's participation in the development of Southeast Asia's digital economy is conducive to forming a digital strategic balance in Southeast Asia, avoiding Southeast Asia's deep dependence on any one side in the digital economy, and enabling it to possess more independent and flexible digital sovereignty.

3 The Ongoing Cooperation Between China and ASEAN in the Digital Economy

China and ASEAN countries have established a comprehensive partnership in the digital economy, with cooperation spanning policy alignment, digital infrastructure development, platform construction, and the application of digital technologies.

3.1 Policy Planning Dimension

A distinctive characteristic of China-ASEAN digital economic cooperation is the strong alignment of their development strategies and the high level of commitment to cooperation. Both sides have placed the digital economy at the center of their future development plans and are keen to explore new growth opportunities in this field. To facilitate this cooperation, China and ASEAN have prioritized policy alignment, aiming to establish a shared vision for digital economic cooperation and use this as a framework for future collaboration. Since 2017, nine high-level documents related to digital economic cooperation have been jointly signed by the two sides (see Table 2). Furthermore, China

has established bilateral digital economic cooperation mechanisms with seven ASEAN countries, including Cambodia, Indonesia, Laos, the Philippines, Singapore, Thailand, and Vietnam.

Table 2. A List of Documents Governing China-ASEAN Cooperation in the Digital

Time	Name of Documents	ASEAN Countries Involved
2017	Belt and Road Initiative for International Co-operation on the Digital Economy	Laos, Thailand
2018	China-ASEAN Strategic Partnership Vision 2030	Ten ASEAN countries
2020	Regional Comprehensive Economic Partnership Agreement (RCEP)	Ten ASEAN countries
2020	China-ASEAN Initiative on the Establishment of Partnership on Digital Economy	Ten ASEAN countries
2022	Plan of Action on China-ASEAN Comprehensive Strategic Partnership (2022-2025)	Ten ASEAN countries
2023	Joint Initiative on Jointly Promoting the Implementation of the China-ASEAN Science and Technology Innovation Enhancement Programme	Ten ASEAN countries
2023	China-ASEAN Initiative on Strengthening E-Commerce Co-operation 2023	Ten ASEAN countries
2023	Beijing Initiative for International Cooperation on the Digital Economy under the 'One Belt, One Road' Initiative	Cambodia, Laos, Malaysia, Myanmar, Thailand
2023	Framework Initiative for International Economic and Trade Co-operation on Digital Economy and Green Development	Brune, Cambodia, Laos, Myanmar, Philippines, Thailand

In 2020, which was designated as the "Year of China-ASEAN Digital Economic Cooperation," both sides jointly issued the "China-ASEAN Initiative on Building a Digital Economy Partnership," aiming to forge a mutually beneficial, inclusive, innovative, and win-win digital economic partnership. At the 17th China-ASEAN Expo, President Xi Jinping proposed to "deepen digital economic cooperation" and "build a digital Silk Road" with ASEAN countries. The initiative called for China and ASEAN countries to work together, seize the opportunities presented by the new round of technological revolution and industrial transformation, leverage their complementary advantages, focus on win-win cooperation, and create more new cooperation highlights in areas such as smart cities, 5G, artificial intelligence, e-commerce, big data, blockchain, and telemedicine, while strengthening data security protection and policy coordination to cultivate

more new growth drivers for the economic and social development of both sides (Xi, 2020).

In November 2021, the two sides planned to promote the alignment of the "ASEAN Digital Masterplan 2025" with the "China-ASEAN Initiative on Building a Digital Economy Partnership" and its action plan (Ministry of Foreign Affairs of People's Republic of China, 2021). In November 2022, the two sides adopted the "Implementation Plan of the China-ASEAN Digital Economic Partnership (2021-2025)," continuing to strengthen cooperation in areas such as smart cities, 5G, artificial intelligence, e-commerce, big data, blockchain, and telemedicine.

China and ASEAN have been continuously establishing and improving their cooperation mechanisms in the digital economy. The two sides have formed a multi-level and multi-channel cooperation mechanism with the China-ASEAN Leaders' Meeting, the China-ASEAN Telecommunications Ministers' Meeting, and the China-ASEAN Digital Ministers' Meeting as the main platforms, and cooperation mechanisms between China and ASEAN countries, industries, organizations, and think tanks as supplements. For example, China has established a "Ministerial Dialogue Mechanism on Digital Economy Cooperation" with Thailand, signed "Memorandums of Understanding on E-commerce Cooperation" with Vietnam and Cambodia, and launched the process of signing a bilateral cross-border e-commerce cooperation memorandum of understanding with Malaysia.

3.2 Digital Investment Landscape

With the deepening of China-ASEAN economic and trade cooperation, as of July 2023, the cumulative two-way investment between China and ASEAN countries exceeded US\$380 billion. Bilateral investment cooperation has been steadily expanding in manufacturing, agriculture, infrastructure, high-tech, digital economy, and green economy (Li, 2023). According to the ASEAN Investment Report 2023 released by the ASEAN Secretariat and the World Investment Report 2023 published by the United Nations Conference on Trade and Development, in terms of investment sources, the United States is ASEAN's largest source of foreign direct investment (FDI), with an investment of US\$37 billion, mainly in the financial and manufacturing sectors. China is the fourth largest source of FDI in ASEAN, with an investment of US\$16 billion, mainly in manufacturing, electric vehicles, digital economy, and real estate.

Chinese companies have primarily adopted mergers and acquisitions to cooperate with Southeast Asian companies in areas such as ride-hailing, online travel, online food delivery, and online gaming. For example, Didi and SoftBank Group jointly invested US\$2 billion in Grab, the largest mobile transportation platform in Southeast Asia; Tencent invested in Gojek, an Indonesian ride-hailing platform; Tencent invested in Garena, a Singaporean online gaming brand; Tencent held a 39.8% stake in Sea, a Singaporean internet giant, when it was first established, and the company has become the only Singaporean company listed on the US stock market with a market capitalization of over US\$100 billion; JD.com participated in the financing of Traveloka, a leading tourism platform in Southeast Asia.

3.3 Aspects of Digital Infrastructure Development

Digital infrastructure construction has emerged as a priority in China-ASEAN cooperation. A majority of these infrastructure projects involve transportation, power, telecommunications, and data centers, yielding significant interim results. ASEAN countries have witnessed a continuous improvement in digital connectivity.

Currently, China and ASEAN have jointly built 12 international terrestrial optical cables, 13 international communication nodes, one national domain CN top-level node, and three overseas cloud computing centers. Notable examples include the completed China-Thailand-Singapore submarine cable project, the capacity expansion and commissioning of the China-Myanmar and China-Vietnam cross-border optical cables, and the launch of the China-Singapore International Internet Data Dedicated Channel, China's first dedicated data channel established with a foreign country. Additionally, the construction of the SEA-H2X international submarine cable system connecting Hainan, China, Hong Kong, and ASEAN countries such as the Philippines, Thailand, Malaysia, and Singapore, as well as the Sihanoukville Port-Hong Kong submarine cable project in Cambodia, has commenced.

Major Chinese telecommunication operators like China Unicom, China Mobile, and China Telecom, along with technology companies such as Huawei and ZTE, have actively participated in the investment and operation of ASEAN's digital infrastructure, achieving positive progress. In September 2020, Huawei established a 5G Innovation Center in Thailand to foster local SMEs and startups, and plans to drive Thailand's Industry 4.0 development through investments in innovation. Chinese companies have built and operated a number of data centers in ASEAN countries, including overseas cloud computing centers in Laos, Cambodia, and Myanmar. In the cloud computing sector, Alibaba Cloud has successively added data centers in Indonesia, the Philippines, and Thailand; Tencent Cloud has added a data center in Bangkok, Thailand; and in April 2021, Tencent Cloud announced that its first cloud computing data operation center in Indonesia was fully operational, supporting the rapid digital transformation of enterprises and organizations in the region. In July 2019, China Mobile International Limited officially launched its self-built and self-operated data center in Singapore; and Huawei Cloud announced in September 2023 that its new 3AZ node in Indonesia is about to start service.

Furthermore, China has launched a series of Beidou application activities targeting Indonesia, Laos, and other countries, and cooperation projects have entered the substantive stage. China has assisted Thailand in building a 5G smart demonstration factory. Malaysian enterprises and Chinese companies have jointly built Malaysia's first artificial intelligence industrial park, and the National University of Singapore and Suzhou Industrial Park have jointly established the "NUS Artificial Intelligence Innovation and Incubation Center".

3.4 Application Digital Technology

In terms of realized digital trade cooperation in the ASEAN region, China and ASEAN countries have frequent trade exchanges and have reached significant cooperation in

numerous digital trade industries. Since 2016, ASEAN has consistently ranked as China's ninth largest cross-border e-commerce trading partner and has become China's third largest export market for cross-border e-commerce. For example, China and Malaysia have jointly agreed to build an e-commerce platform, and China has become Malaysia's second largest digital trade exporter of halal food products. Both sides are actively promoting online marketing of products through digital trade. China is Cambodia's largest trading partner, and Cambodia has achieved significant results in exporting agricultural products to China through digital trade. The Cambodian government has announced its intention to cooperate with China in e-commerce, fintech, and other areas through domestic digital enterprises.

In recent years, Chinese technology companies have supported the growth of the ASEAN digital economy through investment, technology support, and other means. Many important platforms in the e-commerce and mobile payment sectors of the ASEAN market have the participation of Chinese internet companies. Chinese internet giants such as JD.com, Alibaba, and Tencent have begun to expand into ASEAN countries. For example, Alibaba Group has invested in Lazada, the largest online shopping website in Southeast Asia, and Tokopedia, the largest e-commerce platform in Indonesia. In 2017, the Malaysia Digital Free Trade Zone was fully operational, driven by full cooperation between the Malaysian government and China's Alibaba, marking the first overseas launch of the Electronic World Trade Platform (eWTP). In 2022, China's Alibaba Group cooperated with Thailand to establish Thailand's first digital free trade zone (eWTP), significantly improving the efficiency of cross-border e-commerce logistics between China and Thailand. China has successfully replicated the cross-border e-commerce model in Thailand through digital free trade zones. JD.com has launched the "JD Global" and "JD Center" e-commerce platforms in Indonesia and Thailand, respectively, while Tencent has become the largest shareholder of the Shopee e-commerce platform.

In terms of digital payments, Chinese companies are also rapidly expanding. In terms of UnionPay, the coverage rate of UnionPay cards in the ten ASEAN countries has exceeded 80%, and China UnionPay International has issued more than 40 million bank cards in ASEAN, with the RMB cross-border payment system achieving full coverage (Xia, 2022). In terms of Alipay, Ant Group has supported Indonesia, Malaysia, the Philippines, Singapore, Thailand, and other ASEAN countries in building localized "Alipays" through "strategic investment + technology support". Ant Group's wholly-owned subsidiary Starry Digital Bank has opened in Singapore, providing currency exchange and payment services to more than half of ASEAN countries. In terms of WeChat Pay, local Malaysian users can now use the local currency, the Malaysian Ringgit, to complete payments and transfers within the WeChat app.

3.5 Digital Talent Cooperation

China and ASEAN are also collaborating in the cultivation of digital talent. Both China and ASEAN countries are facing a shortage of digital talent. Many Chinese companies have launched joint digital talent cultivation programs in ASEAN and even globally. For instance, Huawei has established ICT knowledge transfer projects involving major

ASEAN countries such as Cambodia, Indonesia, and Laos, with these countries joining Huawei's "Seeds for the Future" program. Thailand and Huawei Technologies (Thailand) Co., Ltd. have jointly built the first 5G Innovation Center in ASEAN, aiming to train 500 technology talents and develop more than 20 innovative patents annually. Alibaba Group has partnered with companies in Malaysia, Thailand, and other countries to cultivate digital economy talent, forming a global digital economy education alliance.

In November 2022, then Chinese Premier Li Keqiang proposed at the 25th China-ASEAN Summit in Phnom Penh, Cambodia, the implementation of a "China-ASEAN Digital Talent Cultivation Plan," aiming to train 1,000 digital talents for ASEAN countries over the next three years. It is foreseeable that China and ASEAN will empower post-pandemic economic recovery through the digital economy, injecting new vitality into regional economic development.

4 Obstacles to China-ASEAN Digital Economy Cooperation

While China and ASEAN countries have made strides in digital economy cooperation, various obstacles hinder further progress. These include limitations in the business environment, intensifying external interference, and a shortfall in regional digital governance.

4.1 ASEAN's Internal Mechanisms Constrain China-ASEAN Digital Economy Cooperation

ASEAN's organizational structure has hindered its digital economic cooperation with China. As a loose regional organization, ASEAN's decisions are based on consensus and consultation, and its resolutions are not legally binding. Consequently, member states may interpret collective decisions in light of their own national interests and take actions that best serve their individual objectives. This often leads to a significant reduction in the effectiveness of ASEAN decisions at the implementation stage, making it difficult to achieve substantial progress. For example, while the Master Plan on ASEAN Connectivity 2025 (MPAC) mentions the need to improve the quality and coverage of fixed and mobile broadband infrastructure, some ASEAN member states still select suppliers based on their national interests (Priyandita et al., 2025:10-15). The ASEAN Secretariat is not a supranational body but merely provides administrative support for intergovernmental cooperation. ASEAN lacks both the legal authority and sufficient budget.

Moreover, the lack of digital coordination among ASEAN member states, significant disparities in digital infrastructure, varying levels of digital economic development, differences in digital economic development concepts, and gaps in digital economic rule-making have all hindered the development of China-ASEAN digital economic cooperation. The disparate levels of digital economic development within ASEAN have led to divergent policy orientations among member states. More developed digital econo-

mies such as Malaysia and Singapore focus on digital talent training, while less developed digital economies like Indonesia and the Philippines prioritize infrastructure development. This has posed significant challenges to China-ASEAN digital economic cooperation.

From a global perspective, ASEAN's digital infrastructure development is also relatively lagging. According to the International Telecommunication Union's 2017 Global ICT Development Index, out of 176 countries and regions, only four ASEAN countries ranked in the top 100: Singapore, Brunei, Malaysia, and Thailand. Among ASEAN countries, Singapore ranked the highest at 18th globally, while Laos ranked the lowest at 144th (International Telecommunication Union, 2017). Additionally, although Southeast Asia is one of the fastest-growing regions for internet development, there is still a long way to go in terms of internet speed and affordability. According to ASEAN's 2020 data, Singapore had the highest fixed broadband speed at 181.47 Mbps, followed by Thailand at 47.35 Mbps, while Laos had only 13.11 Mbps. Among ASEAN member states, Singapore had the lowest internet cost at just US\$0.05 per megabit per month, followed by Thailand at US\$0.42, while Laos had an average cost of US\$425 per megabit per month (The ASEAN Post, 2018). To truly elevate the level of cooperation between the two sides, ASEAN countries must first strengthen their key infrastructure, including communications and logistics.

The regulatory frameworks of ASEAN member states vary significantly. For instance, Vietnam and Indonesia do not have specific personal data protection laws, while Indonesia and Malaysia lack dedicated cybersecurity laws (Erh, 2021). The lack of a coherent digital regulatory framework across the ASEAN region has led to divergent cross-border data flow regulations among member states. Companies in the region are constrained by fragmented, rather than unified, national-level digital regulations, preventing them from expanding beyond local markets and providing digital goods and services to consumers outside ASEAN.

Furthermore, there are significant disparities among Southeast Asian countries in terms of internet access, speed, and cost. The differences in internet access and quality are particularly pronounced between urban and rural areas. The extent to which member states use digital payments also varies greatly. Although the ASEAN e-Payments Coalition was established in March 2019, a region-wide digital payment system has yet to be established. These internal differences within ASEAN necessitate a tailored approach to cooperation with China, making it difficult to treat ASEAN as a single entity in policy implementation and thus impacting cooperation efficiency.

The rapid growth of the digital economy in ASEAN countries has led to a widening gap between the supply and demand of digital talent. According to the 2021 World Economic Forum survey, less than 50% of respondents in ASEAN countries consider themselves proficient in digital skills. Among those who believe digital skills are important, 70% reported that they are not proficient in digital skills (World Economic Forum, 2021). The digital divide within ASEAN is widening, with a shortage and uneven distribution of digital talent, as well as a scarcity of opportunities for digital skills learning and training. The lack of digital talent also hinders high-level digital economic cooperation between China and ASEAN.

4.2 Geopolitical Competition is Undermining China-ASEAN Digital Economic Cooperation

In recent years, the digital technology revolution has been reshaping the global economic landscape, adjusting the world's rules and order, and competition over core digital technologies has become a focal point of great power rivalry. The struggle for digital power among major countries has heightened concerns about the security of the international digital economy. Western developed countries view the digital economy as a means to continue manipulating the international system and maintaining their international leadership.

The ASEAN region has experienced rapid development in digital technologies and the digital economy, making it a crucial area for investment and competition among major world economies. The ongoing US-China strategic competition continues to impact the geopolitical and economic environment in the Asia-Pacific region. The politicization and securitization of digital technologies are spreading, posing significant challenges to China-ASEAN digital economic cooperation.

With the development of information technology and its deep integration with industries, the digital economy has become a new form of global economic development, and competition in the digital economy has become increasingly fierce. The core of the US-China competition in the digital economy is primarily based on competition over data elements, algorithmic technologies, development models shaped by evolutionary paths (Li & Yu, 2021), as well as competition for digital economic rules and discourse (Li, 2023).

The United States has initiated the Indo-Pacific Economic Framework (IPEF) in Asia and Oceania, aiming to expand the influence of American rules through a broad economic cooperation framework or commission, thereby dominating the future development of the digital economy and sustaining American digital hegemony. The digital economy component of the IPEF covers five areas: digital environment, emerging technologies, infrastructure, regulatory measures, and sustainable development. Under this framework, the US is restraining China-ASEAN digital economic cooperation in four aspects: industry, technology, investment, and trade. The US believes that China's promotion of digital economic cooperation with Southeast Asia and other regions will harm its economic benefits (Harding, 2019), challenge its dominance in digital technology standards and rule-making, and undermine the values it advocates. To this end, the US has conducted digital economic diplomacy in the Indo-Pacific region, including ASEAN, focusing on four areas: trade, infrastructure, supply chains, and standards (Li, 2022), which are also the main areas of competition between the US and China. The US is attempting to regain its right to formulate regional economic rules, reshape China's strategic environment (Wang & Ma, 2022), and engage in clearly exclusionary and containment activities against China in its digital economic diplomacy with ASEAN (Li, 2022). The IPEF will pose a direct threat to China in key areas such as supply chains, the digital economy, and technology (Gu et al., 2022). In the Indo-Pacific region, China faces the risk of marginalization in terms of building digital trade facilitation systems, setting standards for emerging technologies, and cooperating with small

and medium-sized enterprises. The formulation and promotion of digital rules have become important means for countries to enhance their international influence and compete for the global digital market. The US is relying on the IPEF to implement "friend-shoring" and to politicize and securitize regional economic cooperation in the Asia-Pacific region. The Biden administration is working hard to win over allies and partner countries to establish trade rules and technology standards systems in the digital economy and emerging technologies that are in line with US preferences. The achievement of US-ASEAN digital economic cooperation under the IPEF will not only use investment and digital technology exports to hinder China's digital cooperation with ASEAN but will also export digital development concepts to ASEAN, exacerbating the "digital divide" between China and ASEAN and undermining the digital economic partnership formed around the Regional Comprehensive Economic Partnership (RCEP).

Furthermore, Southeast Asia is a key region for US digital diplomacy. Through the US-ASEAN Connectivity Cooperation Framework's "Innovative Connectivity" initiative, the US engages in digital diplomacy with ASEAN countries; it strengthens cooperation with ASEAN countries in areas such as smart public transportation, cybersecurity, water treatment, and data centers through the US-ASEAN Smart Cities Partnership; conducts cybersecurity policy dialogues with ASEAN countries; and provides technical and personnel training to ASEAN countries. As the first and second largest digital economies, China and the US have different interests and positions on digital trade rules. The US, together with the EU and Japan, is pressuring China under the guise of defending "digital freedom" to maximize its own interests. The goal of the Indo-Pacific Economic Framework in the digital economy is to promote free and open digital governance rules to maximize economic benefits and maintain US digital hegemony.

US measures to compete with China in technology have spillover effects, negatively impacting cooperation between China and ASEAN countries in areas such as digital infrastructure and digital technology services. For example, Vietnam's Military Industry Telecommunications Group, Singapore's three major telecommunications companies, and Malaysia's National Digital Corporation have all chosen not to partner with Huawei for 5G. In addition, Chinese companies are facing increasingly intense competition in the digital technology sector in Southeast Asia. In November 2022, the US and ASEAN upgraded their bilateral relations to a comprehensive strategic partnership, with investment in sustainable infrastructure, digital economy and digital trade standards, and the ASEAN SME Academy 2.0 as the main economic cooperation topics. US companies have a significant advantage in the digital technology services sector. It is estimated that in 2021, the top four cloud service providers and their market shares in Southeast Asia's public cloud "Infrastructure as a Service" market were Amazon (43%), Microsoft (22%), Google (18%), and Alibaba Cloud (7%).

The US-initiated digital economic security, which targets China, not only drags the new era of US-China relations into a vicious cycle of competition but also places Southeast Asian countries, which have always adhered to a policy of balancing major powers, in a tense situation of international digital economic security, forcing them to formulate digital economic security strategies out of security concerns and to participate in the

process of international digital economic security. By introducing digital economic security from the international level to Southeast Asia, the US intends to prevent this geostrategically valuable region from tilting towards China, contain the spread of China's digital "power" to Southeast Asia, and maintain its absolute advantage and hegemony in the digital field.

4.3 The Digital Governance Capabilities of China and ASEAN Require Improvement

The inadequacy of digital governance capacity will also constrain bilateral digital economic cooperation. Currently, many Southeast Asian countries are in the initial stages of digital transformation, with enormous growth potential yet to be realized. However, the lagging of relevant digital governance rules has become a bottleneck for the rapid development of the digital economy. Digital governance encompasses many issues such as cross-border data flows, digital trade rules, digital trade facilitation, and emerging technology standards. In the digital economy era, data has become an important strategic asset for creating both private and social value. After being processed and transformed into intelligent information, raw data can be monetized and generate economic value. Due to its economic value, data has become a new arena for competition among countries. Major economies have significant differences in governance models for data flows and the broader digital economy, and no consensus has been reached at the international level. China has not yet reached bilateral or multilateral agreements on cross-border data flows with countries and regions along the Belt and Road Initiative. China and ASEAN countries have not yet formed unified rules on data collection, personal privacy, and data security. Currently, the differences in national conditions and economic development levels among ASEAN countries make it difficult to reach digital governance rules in the short term.

A cross-border data flow rule system is an important guarantee for the development of the digital economy. In addition to physical infrastructure, the development of the digital economy also requires rules and regulations for the network market to ensure the free flow of data, protect consumers and producers, and guarantee free trade and investment, thereby ensuring the smooth and orderly development of the digital economy. Influenced by the trend of global digitalization, large-scale cross-border data transmission is inevitable. Many countries have established rules for cross-border data flows through domestic legislation and the signing of international agreements. For example, the EU has issued the General Data Protection Regulation (GDPR) and the US has established the Clarifying Lawful Overseas Use of Data (CLOUD) Act, both of which are actively promoting the construction of global cross-border data free flow rules dominated by themselves. Affected by many factors such as national security, personal privacy protection, and differences in digital technology levels, China and ASEAN have not yet reached a consensus on rules for free cross-border data flow. Under these circumstances, "important sensitive data" with the core concern of "national security" will become the main constraint on deepening China-ASEAN digital economic cooperation. At the same time, as the "limited characteristics" of cross-border data flow and the digital economy become more apparent, some ASEAN countries, out

of consideration for national security interests, will impose more or less policy or legal restrictions on cross-border data flow, thus hindering the deepening of China-ASEAN digital economic cooperation (Jiang, 2020). In summary, although China and ASEAN have carried out close cooperation on cybersecurity governance, the two sides have not yet reached effective cross-border data rules, which will hinder the further deepening of China-ASEAN digital economic cooperation.

5 Conclusion

China and ASEAN countries, geographically proximate and with complementary industrial structures, have a solid foundation for cooperation. China and ASEAN are important trading partners for each other, and cooperation in the digital economy can further deepen this connection. As the world enters the digital age, Southeast Asian countries have an increasing demand for digital technologies and solutions. Southeast Asia has also become an important destination for digital investment and cooperation from countries such as China, the United States, the European Union, and Japan. China is promoting the construction of a digital Silk Road with ASEAN countries to strengthen the interconnectivity of digital infrastructure within the region. Cooperation between China and ASEAN has covered multiple areas such as e-commerce, fintech, and cloud computing and continues to expand.

Although China and ASEAN countries have achieved significant progress in digital economic cooperation, they also face challenges such as the lagging development of digital infrastructure in ASEAN countries, imperfect internal ASEAN mechanisms, the impact of geopolitical competition on digital economic development, and imperfect digital governance systems. The China-ASEAN digital economic cooperation is still in its early stages, and higher-quality digital economic cooperation relies on both sides to solve various difficulties on the basis of consolidating existing cooperation and bring more benefits to both sides.

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