

# Digital Technology Empowers China's Service Sector Growth: Mechanism and Implementation Path

Xia Jiechang<sup>\*1</sup> and Xiong Qiyang<sup>2</sup>

<sup>1</sup>National Academy of Economic Strategy (NAES), the Chinese Academy of Social Sciences (CASS), Beijing, China

<sup>2</sup>School of Applied Economics, University of Chinese Academy of Social Sciences (UCASS)

**Abstract:** Digital technology is an instrument and vehicle for digital empowerment and the development of the digital economy. Digital applications in the service sector have spawned new business modes over recent years such as industrial internet platforms, new retail and online education, which have contributed to China's service sector growth and transition. With the help of digital technology, the service sector has maintained rapid growth, improved in terms of structure, quality and efficiency, increased public welfare, and enhanced indigenous innovation. In light of inadequate and uneven progress of digitalization and insufficient factor support and government incentives, we suggest that the government further advance digitalization development across the board, bolster factor support, and enhance policymaking.

**Keywords:** Digital technologies, service sector, transition and upgrade

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## 1. Introduction

The COVID-19 pandemic and complex geopolitical situations pose numerous challenges to China's socioeconomic development while the world faces changes unseen in a century. In particular, offline economic activity has suffered heavily with unfolding ramifications. Meanwhile, the digital economy has registered substantial growth thanks to the ubiquitous applications of new-generation digital technologies (Zhong and Wu, 2022). The *White Paper on China's Digital Economy Development (2021)* estimates China's digital economy to be worth 39.2 trillion yuan, or 38.6% of its GDP. With a rapid growth rate of 9.7%, China's digital economy has served as a vital force in stabilizing economic growth. Digital technology is a core productive force for the digital economy to operate and create value (Chen, 2018). As a technology factor, the digital technology contributes to production and significantly boosts productivity by upgrading traditional manufacturing technology. Digital technology has also reshaped socioeconomic development, and supercharged the digital economy by incubating a flurry of new business modes via industrial integration (Hu, 2022).

Since the 13<sup>th</sup> Five-Year Plan period (2016-2020), China's service sector has made up a growing share of the economy, producer services have developed towards professionalization, and life services have improved in terms of quality. According to data from the National Bureau of Statistics (NBS), China's service sector value added accounted for 53.3% of China's GDP in 2021 and contributed 54.9% - or

\* CONTACT: Xia Jiechang, email: xiajiechang@126.com.

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4.5 percentage points - to economic growth, outpacing those of the secondary industry by 13.9, 16.5, and 1.4 percentage points, respectively. These figures suggest that China has entered a service-based development stage, and the digital economy has transformed the non-storable and non-tradable nature of services (Jiang and Luo, 2019), presenting a new opportunity for service sector development. It is of great theoretical and practical significance, therefore, to uncover the intrinsic characteristics of digital technology, discuss how it empowers service sector growth, and explore pathways for its applications in the service sector based on the current development environment and future trends of the technology revolution.

## **2. Digital Technology Empowers Service Sector Growth: Basic Implications and Theoretical Basis**

### **2.1 Concepts and Characteristics**

#### *2.1.1 Evolution of digital technology*

As an instrument and vehicle for digital empowerment and digital economy development, digital technology catalyzes supply-side reforms for industrial development in the era of economic transition and a trailblazer for demand-side reforms. With changing times, digital technology has undergone continuous renewals. In the 1990s, the internet comprised the backbone of the digital economy. Nowadays, cloud computing, big data, the internet of things (IoT), artificial intelligence (AI), virtual reality (VR), blockchain, 3D printing, and other digital technologies have emerged as key drivers for integrated digital economy development. With the integration of digital technology and the IT industry, the wave of digitalization has swept across the world and transformed people's ways of life and work. New-generation information technologies led by mobile internet, big data, and cloud computing have spurred the reconstructive innovations of digital applications, information systems, and smart infrastructure in social and economic spheres.

#### *2.1.2 Implications and characteristics of digital technology*

Digital technology is generally considered to have originated from a group of new technologies including computer, microelectronic, and modern communication technologies. In terms of functions, digital technology enables information identification, conversion, storage, communication, and applications. Other academics consider that with the sophistication of electronics, the scope of information and communication technologies (ICT) narrows down to such functions as data transmission and processing, i.e. digital technology in the broad sense.

Given the typical and general-purpose nature of digital technology, its technological and economic characteristics are manifested in penetrability, substitutability and synergy. Penetrability means that it may intervene in such links as production and distribution directly or indirectly and lead to continuous socioeconomic empowerment via integration with the real economy, thus broadening growth potentials. Substitutability means that digital technology capital can substitute other capital as a more stable and reliable engine of economic growth. Synergy means that it facilitates mass production via network-based coordination and generates different sorts of "chemical reactions" that change the characteristics, size, and structure of production factors, contributing to productivity improvement.

#### *2.1.3 Implications of service sector growth*

The Report to the 19<sup>th</sup> CPC National Congress called for a "two-step" goal to turn China into a prosperous, democratic, civilized, harmonious and beautiful modern socialist country by the middle of this century. In building a modern socialist strong country, we must rely on the modern industrial system, of which the service sector is a key component. The service sector is the mainstay of national

economic development and the foundation for building a strong modern country. In recent years, deepening integration between digital technology and services has given rise to new business modes and services through competition and cooperation, galvanizing China's service sector growth and upgrade. As China's economy enters the new normal, the 14<sup>th</sup> Five-Year Plan period is a critical one for advancing innovation-driven supply-side structural reforms. It is also a critical period for the service sector to develop with higher quality. In this sense, we refer to "service sector growth" as one in which industrial expansion, structural improvement, and indigenous innovation lead to quality and efficiency gains and better quality of life.

#### *2.1.4 New service sector characteristics under digital technology*

Digital technology has transformed the nature of services in a service-based society. First, a myriad of information services derived from digitalization has changed the way information and knowledge communicate. Web search, for instance, is an information service provided to consumers at a low cost.

Another change is the way service is delivered. With digitalization, service production is divided into numerous specialized links spread across different parts of the world with advantageous human capital, cost, market access, and economies of scale. Meanwhile, those nodes of production are integrated into a holistic system using information technology.

Third, the process of knowledge production is reorganized. Knowledge is coded and standardized with information technology, and knowledge-based services are decomposed into modules or segments using R&D, design, and programming, which are dispersed and connected via network as the communication medium.

Fourth, the internet connects service producers and consumers across distances, allowing consumers to choose suitable service providers on a global scale and service providers to serve global consumers. Thanks to the digital revolution, the service sector has gained an opportunity for self-renewal, and service innovation has emerged as a new engine of economic growth, underpinning the service-based society.

## **2.2 Theoretical Basis**

### *2.2.1 "Cost disease" hypothesis of the service sector*

(1) Digital technology may induce productivity improvement in the service sector using indirect empowerment by changing the tools and infrastructure for ancillary activities without directly changing the means of production for service production and supply *per se*. One example of such indirect empowerment is constant improvements in transportation technology. Digital technology creates great conveniences and efficiency gains in our social and economic life. Digital technology reduces the cost of time by shortening the distance between people and equipment; it also conserves the labor force. Tencent Meeting, for instance, allows service activities to be carried out remotely without the physical movement of people.

(2) Digital technology may boost service productivity via direct empowerment. Once applied in the basic activities of the service value chain, it will increase productivity while creating complete service values. For instance, digital technology and smart robotics have deepened the service sector division of work and even replaced human workforce. Integration of digital technology into traditional services has transformed characteristics of services such as intangibility, heterogeneity, simultaneous production, consumption, and non-storability, and redefined the business operation and management of service enterprises, making service supply less costly and more efficient.

### *2.2.2 Theory of information asymmetry*

(1) Digital technology facilitates access to information by helping consumers search and analyze

goods and services to match them with demand-side services throughout the value chain. By gathering demand information and capturing consumer behaviors, digital technology based on social data resources allows customized services to be supplied on both supply and demand sides.

(2) Digital technology boosts service sector productivity via direct empowerment, i.e. direct application of digital technology in the service value chain to raise productivity in creating complete service value. For instance, digital technology and smart machines have deepened the service sector internal division of labor and replaced numerous jobs. Digital applications in traditional services have transformed the traditional characteristics of services such as intangibility, heterogeneity, synchronous production and consumption, and unstorability. Digital applications redefine the operational and managerial modes of service enterprises and help reduce the unit cost of service supply and raise productivity.

### *2.2.3 Theory of transaction costs*

(1) Digital technology may reduce demand-side transaction costs. In the current stage, China's principal social contradiction has evolved into one between the ever-growing material and cultural needs of the people and backward social production. That means consumers are no longer satisfied with basic goods and services and call for better quality, efficiency, and customization. With the applications of digital and smart technologies, service platforms have acquired increasing computing power. Against this backdrop, the manufacturer-to-consumer (M2C) mode may become a common mode of production and consumption to reduce the cost of transaction, and optimize resource allocation.

(2) Digital technology may reduce supply-side transaction costs. Data empowerment has shortened service delivery. Modularized goods and services are reassembled for delivery to users in a quality and efficient manner. By accessing social information appropriately, digital technology not only enables a swift response to user demands, but reduces manufacturing costs by eliminating opportunism and uncertainty in the transaction of goods. While matching supply with demand means cheaper transactions, digital technology leverages big data for a more accurate and individualized supply of goods and services.

### *2.2.4 Service innovation theory*

(1) Digital technology empowers service-based manufacturing innovation and development, enhancing manufacturing connectivity, data, algorithm, computing power, and processing capabilities. With the support of new-generation digital technology, manufacturing enterprises are transitioning from service-centric to data-centric user services to enable service-based manufacturing on a mass scale.

(2) Digital technology empowers public service innovation and development. With the rapid development of information technology, Internet+ plays an increasingly significant role in public administration and services. Digital technology applications in public services have breathed life into new service modes like e-government, digital governance, and smart cities. Those service modes - as manifested in rapid emergency response, automation for expedited procedures, and broader channels for citizen feedback - have facilitated cross-sectoral information sharing, simplified administrative procedures and increased departmental coordination, resulting in better public services.

## **3. How Digital Technology Empowers Service Sector Growth**

### **3.1 Service Sector Growth**

#### *3.1.1 Quantitative expansion beyond historical limitations*

From the founding of the People's Republic of China in 1949 to the eve of reform and opening up in 1978, China's service sector had been focused on a few sectors such as trade, logistics, and transportation

services, and dominated by small and fragmented operators. Digital technology has inspired new service modes and broadened the scope of services. One example is the rise of e-commerce, IT services and their derivatives. In 2020, China's e-commerce business revenue amounted to 5.45 trillion yuan, showing a 21.88% year-on-year increase. Moreover, the operating revenue of e-commerce transaction services reached 1.15 trillion yuan, up 36.33%; basic services such as e-commerce payment, delivery and IT services saw their operating revenues rise against the headwind and reach 2.10 trillion yuan, up 16.73%; derivative services also recorded growing operating revenues, which totaled 2.21 trillion yuan, up 20.30%.<sup>1</sup> The penetration of the digital economy in China's service sector stood at 40.7% in 2020, up 2.9 percentage points from 2019, and emerging services like information, software and IT services have recorded business revenue growth by 19.4% on an annual average for four straight years, reflecting China's service sector economic growth.<sup>2</sup>

### *3.1.2 Promoting trade in services beyond temporal and spatial limitations*

The internet and information technology have transformed the inefficient and non-tradable nature of traditional services. As a result of thriving service globalization in the internet era, the volume of trade in services has increased consistently. Since 2012, China has registered rapid growth of trade in services, outpacing the global average by 3.1 percentage points. In the first half of 2022, China's imports and exports of services totaled 2.9 trillion yuan, up 21.6% from the previous year, with service exports at 1.4 trillion yuan, up 24.6%.<sup>3</sup> Digital technology has transformed the traditional face-to-face mode of cross-border trade and digitally connected global users. Not only have services become more tradable, the boundary of industrial innovation for trade in services has also widened, bringing global trade in services to a record high.

## **3.2 Structural Improvement**

### *3.2.1 Digital technology as a driver of service sector upgrade*

Convergence between factors of production has led to an increasing sophistication of China's service sector structure, as manifested in the rising share of modern services relative to the decline of traditional services led by wholesale and retail, transportation, and warehousing. Ever since 2G communication and PC internet became ubiquitous, ICT applications have swept across the demand side, creating economies of scale. Extensive applications of 4G, optical fiber and smart devices have made service information accessible at fingertips. A combination of sensing, cloud computing, virtual reality, big data, AI, and other digital technologies has led to 5G information network, which holds great promise for service experience to improve and for new service modes to emerge. Digital tourism, for instance, offers a boon to consumers for managing and virtually enjoying their travels, representing a structural upgrade of the tourism industry.

### *3.2.2 Service-manufacturing integration driven by digital technology*

First, digital technology applications are permeating into various industrial sectors, causing a productivity-boosting effect. Technology diffusion will encourage competition and cooperation that drive down the technical threshold for service provision by manufacturing enterprises, thus overcoming barriers to the integration of services and manufacturing.

Second, digital technology applications at the front end allow firms to become nimbler and more

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<sup>1</sup> Foresight Industry Research Institute, Report of Development Tendency and Investment Strategic Decisions Analysis on China Electronic Commerce Industry(2022-2027).

<sup>2</sup> Foresight Industry Research Institute, Analysis Report of Market Prospective & Investment Strategy Planning on China Digital Economy(2022-2027).

<sup>3</sup> Website of the Ministry of Commerce, <http://mo.mofcom.gov.cn/article/tjsj/zwfengsu/202208/20220803339820.shtml>.

responsive to a changing market by shortening the production cycle. At the rear end, those applications make it cheaper and more efficient to search for information and match products or services. This helps promote service-manufacturing integration.

Lastly, digitalization unlocks potential demand for services. Free access to IT knowledge and data will increase public awareness and create demand for new products, and the extension of the consumption boundary will, in turn, make the case for service-manufacturing integration.

### 3.3 Efficiency Improvement

#### 3.3.1 *Transforming service efficiency*

According to the Baumol-Fuchs (Baumol, 1967) hypothesis and the experience of developed countries transitioning from an industrial economy into a service-based one, traditional services tend to be less productive than manufacturing and grow at a much slower pace. Thanks to increasing service sector productivity, China's economy continued to grow rapidly amid the shift from an industrial to a service-based economy.

With its broad scope and modest marginal cost of application, digital technology gives rise to economies of scale in consumption, manufacturing, and distribution, transforming the intangible, synchronous, non-storable, and heterogeneous nature of services. As a result, matching supply with demand has become cheaper, less time-consuming, and spatially feasible. By making it more efficient and precise to acquire, process and analyze data, digital technology is conducive to the reasonable temporal and spatial allocation of service capabilities, which means faster and more accurate service delivery and less waste. Big data helps restaurants, for instance, analyze and forecast order trends to prepare for dine-in and delivery orders and plan for staff shifts. Digital technology also serves as a tool for firms to integrate resources and streamline business processes.

#### 3.3.2 *Step change in service sector equality*

Platform apps allow consumers to read reviews left by others and post their own reviews about a service. In the current wave of platform-based services, consumers can read and post comments about a service on a mobile app. For the service sector, standardization enabled by digital technology helps overcome service variability and enforce quality control. The Online Food Delivery Information Description as China's first national standard for the online food delivery industry prescribes the terminologies, definitions, and requirements for the description of basic information about online food delivery services on internet platforms. Complete information disclosure drives merchants to offer better services. Mainstream service platforms with over 100 million users in China generate a wealth of user reviews daily, which help clean up the market by weeding out inferior service providers. Second, consumer demand is sent to merchants via big data or C2B (Customer to Business) for them to refine and customize their services. Once combined with digital technology, service becomes a unique commodity that is less labor-intensive and more knowledge-intensive. Thanks to higher value-added, high-end services have thrived.

### 3.4 Increasing Welfare

#### 3.4.1 *Service sector digitalization is conducive to job creation*

Service digitalization is a new source of job creation. In 2021, the digital economy accounted for 60.2% of all jobs in the tertiary sector, which was far higher than the shares (7.1% and 0.1%) in the secondary and primary industries, respectively.<sup>4</sup> Not only are jobs created by service digitalization

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<sup>4</sup> Foresight Industry Research Institute. *Analysis Report of Market Prospective & Investment Strategy Planning on China Digital Economy(2022-2027)*.

more plentiful and better paid than in the secondary and primary industries, but those jobs are also more flexible. One example is food delivery drivers. Assisted by mobile internet, digitalization matches workers with jobs in the catering industry, allowing gig workers to earn incomes from low-frequency and non-essential positions. In 2019-2021, for instance, the number of food delivery drivers registered at an online delivery platform in China jumped from 3.987 million to 5.27 million, up 645,000 on an annual average basis, or 5% of China's national urban job growth, outpacing the annual growth of 200,000 jobs in the parcel delivery industry during the same period.<sup>5</sup> From order-taking to dish serving and payment, digital technology has made catering service less onerous and more efficient. Amid the COVID-19 pandemic, the gig economy has provided the cyclically unemployed with short-term jobs through "talent sharing" to ease labor shortage in various sectors.

### *3.4.2 Service digitalization galvanizes high-quality public services*

From 2012 to 2021, internet users in China increased from 560 million to 1.032 billion. With an internet penetration of 73%, China has built the world's largest online education platform and a national medical insurance information platform. Telemedicine is accessible in over 90% of counties and districts across China.<sup>6</sup> The initiative to connect impoverished areas to the internet has helped win the battle against poverty. China has made solid progress in building a digital countryside to share the benefits of digital development among both urban and rural residents. From telemedicine to online education and smart elderly care, digital technology allows residents across regions to access satisfactory public services. For China's agriculture and countryside to improve quality instead of simply expanding output, the role of innovation is pivotal. Amid digitalization, new-generation information technologies such as blockchain and AI provide a new impetus for countryside vitalization. Take traceability in agriculture for instance, for geographical indication products such as Dangshan Pear and Anji White Tea, their planting, warehousing, and logistical information is uploaded via the internet for intelligent production and management. Such traceability also brings brand value premium and economic benefits.

### *3.4.3 Service digitalization boosts government efficiency*

In 2021, China's national government service platform registered over one billion real-name users. Big data, cloud computing, and AI applications have supercharged e-government, which allows citizens to apply for government services of different departments and even provinces at their fingertips without the hassle of visiting separate offices. Digital tools such as the "health code" have been instrumental in curbing the spread of COVID-19. With the help of big data, Beijing municipal government, for instance, has identified the most pressing issues of public concern for targeted and efficient response. Public services are increasingly driven by public demand rather than limited by the availability of government resources. The government has found digital applications innovative and efficient tools for a wide range of areas such as public services, the development of small and medium-sized enterprises (SMEs), early warning of natural disasters, and emergency response management.

## **3.5 Digital Technology for Innovation**

### *3.5.1 Digital technology is a catalyst for new business modes*

**Sharing economy:** In an economic system, it is common for resources to be underutilized. With digital technology, idle resources can be put to effective use at a low cost. Examples include bed and breakfast-inns, ridesharing and bike-sharing services.

**Long tail market:** Without economies of scale, it would be costly to meet the demand for customized

<sup>5</sup> Meituan. *Corporate Social Responsibility Report*.

<sup>6</sup> CNNIC. *Statistical Report on Internet Development in China*.

and low-frequency services, especially those delivered face-to-face. By broadening access to service information and capturing low-frequency service demand, digital technology will minimize the threshold of the economic scale, allowing niche services such as escape rooms to thrive.

Cross-sector integration: Integration between business modes, between corporate internal and external value chains and between sectors, as well as the sophistication of modern technologies and networks, has led to new business modes such as e-sports and online video streaming.

### 3.5.2 Trade in services towards diversification

E-commerce has become a way of life. Since the 1990s, cross-border e-commerce platforms have become popular amid increasing internet penetration. Global digital markets and cross-border trade networks have brought together the information and market resources of countries in a cost-efficient manner. Cross-border e-commerce is evolving towards next-generation e-trade. From information intermediaries, cross-border e-commerce platforms have developed into a core commercial infrastructure offering everything from trade-related logistics, financial services, information, payment, settlement, credit reference, taxation and other ancillary services to customs clearance, forex collection and tax refund services (Wang *et al.*, 2020). For traditional service trade such as e-books and copyrighted music, domestic suppliers may satisfy individualized global consumer demand by providing a diverse range of differentiated goods and services and engender a long-tail effect in service trade to foray into new international markets. Hence, cross-border e-commerce platforms may expand service trade and promote service trade diversification by offering more types of service trade.

## 4. New Service Modes Emerging from Digital Technology Empowerment

### 4.1 Industrial Internet Platforms

The industrial internet is a critical network infrastructure for smart industries with low latency, high reliability, and wide coverage. It opens up a new ecosystem of digital technology for value co-creation and is a vehicle for applying new-generation ICTs in advanced manufacturing. As a key component of the digital new economy, industrial internet platforms empower industrial upgrade and high-quality economic development by supporting ubiquitous connectivity, elastic supply, and efficient allocation of manufacturing resources, enabling mass data collection, integration and analysis based on cloud platforms for design, production, distribution, consumption, and service (Li, 2019). With the world's largest industrial internet systems and the most numerous use cases, China is poised to develop world-class industrial internet platforms. In terms of top-down planning, the Chinese government has increasingly prioritized industrial internet. The industrial transition towards digital, network-based, and smart features has breathed innovation into business modes, engendering a new ecosystem of service-based manufacturing for value co-creation.

By connecting industrial equipment, products and services, industrial internet platforms allow information to be shared among manufacturers, third-party logistics companies, and users. As an industrial internet platform, the transportation cloud, for instance, helps increase vehicle load rate and monitor cold chain logistics. This is achieved by a combination of IoT-connected sensors, RFID, machine learning, and big data. Location-based services enable the real-time monitoring of equipment, production, energy consumption, and quality. By accessing equipment status via IoT, equipment manufacturers may perform predictive maintenance and avoid unscheduled shutdowns through remote monitoring and fault diagnosis. Such platforms also allow them to provide value-added services and sell spare parts and components.

Industrial internet platforms are a vehicle for integrated and intelligent producer services. In the digital economy era, they have transformed the pattern of industrial development, blurring the boundary between manufacturing and services. In the conventional industrial economy, contract manufacturers

receive raw materials and produce goods for brand owners, which then sell branded products to consumers via a labyrinth of distribution channels and retail outlets. This business model has been transformed by digital technology. Digital innovations in marketing, sales channels and interfaces have reorganized the sales force, merchandise, and sales venue, as manifested in the rise of online streaming sales during the COVID-19 pandemic.

Compared with brick-and-mortar stores, the online sales mode creates precise customer profiles using digital technology, interacts with customers continuously through digital content, and taps potential consumer demands based on AI algorithms. The traditional QCD<sup>7</sup> approach are characterized by the mass manufacturing of standardized items with a long delivery cycle, which are stored at the sales venues and offer consumers not much more information than quality and price. With the advent of social media and consumer internet, however, the flow of information is reversed and a new value addition process takes hold, in which manufacturers receive R&D, production, innovation, and other demand-based services, giving rise to a new QCD approach featuring small-batch manufacturing of numerous products with a short delivery cycle.

## 4.2 New Retail

The phrase “new retail” is a kind of business mode innovation based on digital technologies. With AI, big data and other digital technologies, enterprises upgrade various processes of the product lifecycle towards integrated smart management and autonomous business decision-making for a better consumer experience.

China’s retail industry has followed the footsteps of Western business modes from goods-centric shopping centers, department stores, supermarkets, convenience stores, and brand franchises to “one-stop” shopping complexes like venue-centric discount stores and warehouse outlets. Amid technological advancement and changing lifestyles after the dawn of the 21<sup>st</sup> century, consumer experience began to receive ever-greater attention, giving rise to the “customer first” concept. In Europe and North America, countries have built venue-centric “palaces of consumption” to export consumerism. McDonald’s, KFC, IKEA, and Sam’s Club, to name but a few, have transformed the pattern of global consumption. In the current “people-centric” new retail business mode, China’s retail industry is blazing its trail and evolving from a follower to a leader of global consumption trends.

New retail takes varied forms, ranging from the convergence of online and offline channel sales (O2O) to integrated experiential consumption or a “retail plus industrial ecosystem” mode of services. Unlike the traditional business model, the new retail business mode is less reliant on manufacturing channels and breaks free from the limitations of information asymmetry that besets traditional retailers. With the help of big data and IoT, online sales of spot goods along with modern logistics have reduced inventories and costs, and targeted marketing has contributed to enhancing consumer experience and welfare.

Amid the transition from brick-and-mortar stores to digitalization, the retail industry needs to embrace sweeping changes by adopting innovative business modes, reshaping customer relations, and creating business ecosystems. For instance, retailers have employed big data and advanced algorithms to address problems concerning the supply of raw materials, production management, product storage and logistics, marketing, and after-sales services, thereby achieving decentralization and autonomous decision-making. Moreover, AI and digital applications have linked consumer social media to the retail business ecosystem, industrial chain, and business operations. By sharing every facet of their life, consumers spread the word of mouth beyond the boundary between cyberspace and the real world. Image recognition, radiofrequency identification (RFID) and voice recognition technologies help capture consumer identities, shelf behaviors and facial expressions for targeted marketing.

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<sup>7</sup> QCD: Q for quality, C for cost, D for delivery.

### 4.3 Online Education

When it comes to e-learning or online education, China is a late starter. Massive Open Online Courses (MOOCs), which emerged in the early 1990s, opened a broad horizon for online education. Since 2000, online education began to integrate quality educational resources globally free from the boundary between conventional schools. Technological advancement - not least AI - means new possibilities for teaching and learning, making it possible for personalized education to be offered to the masses and with high quality. With the rise of virtual space for knowledge creation, consolidation and diffusion, the supply of educational resources and services is poised to become more flexible, fairer, better, and personalized, underpinning future educational reforms.

Online education in China has experienced four stages of development. In the 1990s, multimedia began to be applied in classroom teaching. With increasing internet penetration since 1999, online learning communities and teaching videos became popular, spurring the emergence of online schools. After 2010, the sophistication of mobile internet led to a stable business model of paid video courses. From 2013 onwards, knowledge payment platforms have mushroomed with smart features to meet personalized demand for knowledge. Rapid technological change has shortened the iteration cycle of online education. During the COVID-19 pandemic, college, middle school, and primary school students rushed to online education platforms. This shift from offline to online education has been induced by the application of new-generation digital technologies such as mobile internet, big data and AI, unveiling a golden era for the online education industry. According to statistics, mobile education app downloads in China peaked during the Spring Festival of 2020, along with registered users. Daily active users of online education apps jumped from 87 million to 127 million during the same period.<sup>8</sup>

Not only is online education capable of emulating and replacing offline education with the sophistication and extensive application of AI, metaverse, and other cutting-edge digital technologies, but it also holds great promise for efficient and personalized education to unlock the full potentials of all students. There is still room to beef up educational resources, adopt modern technology, and increase teacher-student interactions for China's online education at the postsecondary level. Challenges in those areas have received a great deal of attention from academics. Fudan University School of Management, for instance, has introduced an online education platform with the functions of course creation and management, virtual classroom, homework, exam, and questionnaires. It allows students to study efficiently according to schedule and provides administrators with an ocean of visualized data to support decision-making, management, and teaching improvement. As far as MBA education is concerned, online business schools are on the rise across the United States. Digital technology keeps students involved through adaptive learning, online questions, and student feedback. Extensive application of metaverse, virtual reality, machine learning, AI, and other cutting-edge digital technologies has enriched MBA learning experience with more interaction and better results.

## 5. Challenges to Digitally Empowered Service Sector Growth

Despite its considerable progress, China's service sector digitalization has yet to overcome challenges such as inadequate and uneven levels of development and insufficient factor support and government incentives.

### 5.1 Insufficient Digitalization and Uneven Levels of Development

#### 5.1.1 Modest user coverage of digital life services

In 2021, China's online shopping and payment users reached 812 million and 872 million,

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<sup>8</sup> QuestMobile. 2020 China Mobile Internet War Epidemic Report.

respectively; however, the coverage and vibrancy of life services remained modest. By the end of 2019, the daily active users of China's mobile life services stood at around 150 million, which means that only 16.6% of households accessed these services daily. Moreover, digital life services have yet to cover broader age groups. Young people born between 1984 and 2000 made up 71% of users of Meituan, one of China's largest online shopping apps for services; this is significantly higher than their percentage in the total population. Those aged above 35 years trail far behind millennials in terms of digital life service registrations and consumption; the growth of digital users in this age group is tepid.<sup>9</sup>

### 5.1.2 Level of digitalization various across sectors

In 2020, China's digital economy reached 39.2 trillion yuan, accounting for 38.6% of GDP. Among the primary, secondary and tertiary industries, digital life services boast the highest share of digital economy at 40.7%, which is higher than those of the overall economy (38.6%), industry (21.0%) and agriculture (8.9%). Sector-wise, however, significant gaps remain. While the hospitality and catering sectors have digitalization rates of around 35.2% and 15.1%, respectively, this figure is only about 3.5% for home services and less than 1% for elderly care.<sup>10</sup> The life services market is dominated by small and medium-sized enterprises (SMEs) and individual merchants that are scattered, uncompetitive and slow in the digital transition. According to the China Electronic Standardization Institute (CESI), 79% of China's SMEs are in the preliminary stage of digital transition, and most digital applications are related to marketing, service, and IT management for sporadic efficiency improvements without integrated digital solutions. Aside from technology barriers, corporate digitalization has been slowed by obsolete management concepts, a shortage of digital talent, and insufficient corporate funding.

## 5.2 Digitalization Requires More Factors of Production

In 2021, 79% of Chinese enterprises forayed into digitalization, down 10 percentage points from 2020, 12% actually applied digital technology, up from 4 percentage points from 2018, and 9% intensively applied digital technology, up 6 percentage points from 2015.<sup>11</sup> Despite this positive trend, most Chinese service enterprises remain in the early stage of digital transition. Due to limited resources, their overall level of digitalization remains modest.

### 5.2.1 Lack of funding for digital transition

For service-based enterprises, funding shortage is a common challenge to their digital transition. Most service-based enterprises are small, cash-strapped and face fierce competition. Their IT departments find it hard to make the case for digital spending to drive business, promote sales, cut costs, and boost efficiency. Moreover, the digital upgrade is a coherent chain that requires a high degree of consistency at the management, organizational, awareness and talent levels. During the ongoing COVID-19 pandemic, producer service enterprises have suffered significantly and they hesitate to invest in digitalization for fear of not being able to cover the cost of trial and error; as a result, they have missed an excellent opportunity for digitalization.

### 5.2.2 Shortage of digital professionals

In 2022, Chinese companies saw a steep fall in their business revenue and became more demanding for the overall competence of job applicants and not just their professional knowledge and basic skills. In this context, digital professionals are in short supply in the job market. In addition to information and communications technology (ICT) skills, digital professionals should apply digital technology fitfully

<sup>9</sup> CNNIC. *Research Report on Market Prospect and Investment Opportunity of China's Online Shopping Industry*.

<sup>10</sup> For instance, credit score can be calculated according to many factors related to personal financial history.

<sup>11</sup> CAICT. *China Digital Economy Development White Paper (2021)*.

in various business scenarios and contribute to managerial improvement and innovation. Take the retail sector for instance, as online traffic becomes saturated and customer acquisition and supply chain costs increase, enterprises employ big data analysis, artificial intelligence, and other cutting-edge digital technologies to upgrade supply chains, unveiling a “new retail era” by combining online services with offline experience via logistics. New retail, still in its nascent stage, has yet to develop more experience in various aspects of business operation ranging from product selection to warehousing, public communication, sales, and logistics. Given the surge in online orders for daily necessities and COVID-19 protection materials, retailers have to rely on professional multi-channel media operation, and digital logistics management professionals to cope with growing supply chain management pressures.

### **5.3 Government Support Needs to Strengthen**

China’s local governments have enacted a string of policies to shore up service sector growth since the eruption of the COVID-19 pandemic. In the Policies on Recovering the Development of Struggling Service Sectors issued in February 2022, the National Development and Reform Commission (NDRC) identified 43 initiatives to support struggling service businesses and contain the spread of COVID-19. Yet the policy initiatives were not fully publicized and made known to businesses. Moreover, it is prohibitively complex, protracted and demanding to apply for some policy preferences that are of modest value. Most businesses expect little from and are poorly informed about those policies. The broad scope of businesses involved also makes it hard for central and local governments to take everything into account. Meaningful and systematic policy design and targeted suggestions for implementation are absent, and targeted support is insufficient.

## **6. Implementation Path for Digital Technology to Empower Service Sector Growth**

### **6.1 Improving Infrastructure and Platform Development**

As the groundwork for service sector digitalization, “new infrastructure” should focus on the following priorities:

(1) Advancing infrastructure development such as 5G and data centers to support industrial digitalization. Digital technology R&D should be enabled to remove technology barriers to trade in services and reshape the international division of labor and distribution of trade interests.

(2) Tax preferences, fiscal subsidies and government procurement of services should be extended to encourage platform enterprises to provide targeted and convenient service digitalization infrastructure at reasonable costs. Incentives should be given to help service businesses access cloud services and increase the penetration of Software as a Service (SaaS) systems among SMEs and micro businesses.

(3) Open platforms for China’s service sectors should be improved, expanding pilot programs for the service sector, relaxing service sector market access, and importing more services of superior quality to meet domestic demand, and encouraging local services to emulate.

(4) Pilot programs should be implemented in key sectors. Tourist attractions, for instance, may adopt augmented reality (AR), virtual reality (VR), and artificial intelligence (AI) for digital and immersive experiences. Progress should be made in deploying autonomous vehicles and service robots as demonstration programs, as well as just-in-time distribution systems and smart catering solutions.

### **6.2 Increasing the Factors of Production**

(1) Greater support should be extended to forward-looking underlying technologies. Service sectors should be encouraged to deploy 5G, cloud computing, edge design, big data analysis, blockchain, and artificial intelligence. Low-cost digital solutions based on cloud technology should be adopted to lower the barriers to innovation and development.

(2) Digitalization calls for vigorous financial and fiscal support. Service enterprises, especially

cash-strapped SMEs, should be given greater financial support to access cloud computing and purchase digital equipment or services and be better funded for digital transition. Tax breaks should be offered to companies that spearhead the digital transition.

(3) Policy mechanisms, curriculums, and academic conditions should be timely established for the cultivation of professionals. Universities should produce versatile digital professionals. Local governments should attract and retain digital professionals essential to developing local industries. Enterprises should join hands with universities for intellectual support to digital transition.

### 6.3 Enhancing Policymaking

(1) Speeding up service sector digitalization. Local governments should work with leading enterprises, industry associations, and research institutions to develop industry standards for service sector digitalization. They should guide service sector digitalization, improve fiscal, talent, e-commerce, and logistics policies, coordinate upstream and downstream services development, expedite new infrastructure development, enhance digital services, and foster new business models.

(2) Creating a digital governance system. Inclusive and prudent regulatory policies should be implemented to facilitate modern service sector digitalization. The government should create an administrative mechanism for corporate digitalization, work properly with enterprises, and form a coordinated and interactive governance structure with a clear boundary of responsibilities. According to the laws of competition in the digital era, the government should work out a reasonable industrial organizational policy that serves consumer interests and promotes economies of scale without stifling competition.

(3) Proactively implementing international norms on digital services and taking an active part in their formulation. We should give full play to our national experiences and strengths in cross-border e-commerce, mobile payment, e-commerce services, and other frontier digital businesses, and go along with international service trade standards. Meanwhile, we should extensively discuss and research such issues as online consumer protection, labor rights, taxation of digital goods, data security, and digital currency management. We should advocate favorable international trade rules and have our say in setting new service trade standards. ■

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