

SUNING LOGISTICS: TRANSFORMATION OF RETAIL LOGISTICS

Haifen Lin and Li Li wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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In October 2018, Yao Kai, the general manager of Suning Logistics, a retail logistics enterprise, was reviewing the company's retail logistics strategy. Located in Nanjing, Jiangsu, China, the company was registered in 2012 and was a subsidiary of Suning Holdings Group (Suning).¹ Suning Logistics provided the core competitiveness of Suning and occupied the leading position in China's retail landscape. Suning Logistics repeatedly upgraded its logistics model to support its transformation from a physical retailer to an online retailer. Due to China's *new retail*² wave, experiential shopping and digital consumption posed challenges to the upgrading of logistics. To win a competitive advantage, Suning Logistics had to choose between two transformational directions: should the company improve the logistics efficiency of its multi-channel retail, or explore a reverse supply chain with the support of emerging technology?

BACKGROUND OF THE LOGISTICS INDUSTRY IN CHINA

The demand for external logistics in China increased steadily from 2000 onward, reaching ¥283.1 trillion³ in 2018⁴ (see Exhibit 1); however, the logistics cost proportion of the gross domestic product (GDP) declined from about 17 per cent in 2010 to 14.6 per cent in 2017. Although the efficiency of China's logistics operations dramatically improved, a large gap existed between China and developed countries. With the advent of e-commerce in 2005, China's express delivery market experienced explosive growth. Logistics services became the key to dominating the online market when the first e-commerce festival, the Double 11 shopping festival, opened in 2009. The total revenue for third-party logistics companies increased from an original ¥416.7 billion in 2009 to ¥1241.1 billion in 2017, significantly exceeding those of Japan and European countries such as Britain, Germany, and Russia.⁵

The Competitive Landscape of the Logistics Industry in China

Logistics operations in China mainly involved *third-party logistics*, *alliance logistics*, *self-built logistics*, and *instant distribution*. Regarding third-party logistics, competitive rivalry emerged between SF Holding Co. Ltd. and Three TOs and One Da (i.e., YTO Express Co. Ltd., STO Express Co. Ltd., ZTO Express Co. Ltd., and Yunda Holding Co. Ltd.), which operated on a receiver–collection–delivery basis. Their market share indexes in 2019 were 7.6 per cent, 14.3 per cent, 11.6 per cent, 19.1 per cent, and 15.8 per cent, respectively.⁶ Alliance logistics, represented by Cainiao Logistics, provided supply chain services by

building a logistics data-sharing platform for e-commerce merchants, logistics enterprises, retailers, and consumers. In addition, since e-commerce logistics increasingly depended on point-to-point service from storage to customers, storage conditions became an important factor affecting delivery efficiency. Some logistics companies established their own logistics centres to supply goods; JD Logistics, Suning Logistics, Pinjun Logistics (which relied on the business-to-consumer [B2C] platform of JD Logistics), Suning Tesco, and VIPShop were typical cases of self-built logistics. Flash express, UU Paotui, Fengniao Supply Chain, JD Daojia-Dada, and Suning were the competitive enterprises for instant distribution, which was the market share that shifted from online-to-offline (O2O) delivery logistics.⁷

Logistics Development Driven by Retail and Technology Upgrading

Retail trade changes and technology upgrades were the key elements driving the development of the logistics industry. The transformation from bricks-and-mortar to O2O retail catalyzed a new round of changes in logistics models. The sales volume of China's large offline supermarkets declined at a rate of 13.57 per cent from 2015 to 2017, but online sales remained above 34 per cent until 2017, declining to 19.41 per cent in 2018 (see Exhibit 2). The transformation of O2O retail drove changes in logistics from physical storage to modern logistics systems that integrated cutting-edge technology. As China engaged with Logistics 4.0,⁸ innovative developments, such as intelligent logistics, multimodal transport, and the legalization of car-free carriers, gradually penetrated every aspect of logistics. Investment in advanced technologies profoundly improved logistics efficiency. Meanwhile, the Internet of Things (IoT) enhanced real-time management and visibility. Using global positioning systems, satellite navigation and positioning technology, radio frequency identification technology, and sensing technology, logistics enterprises achieved real-time vehicle coordination, goods monitoring, online scheduling, and distribution visualization.

BACKGROUND OF SUNING LOGISTICS

Corporate Background

Suning Logistics was the logistics division of Suning that integrated retail operations. Suning Logistics was founded in 1990 in Nanjing city, Jiangsu, China, and was registered as an independent third-party logistics enterprise in 2012. In 2015, Suning Logistics Group was founded to provide logistics services and collaborative supply networks. Suning Logistics committed to building an agile supply chain with the help of digital technology and a national warehouse network that comprised central warehouses, city warehouses, store warehouses, and front warehouses.⁹ In December 2019, Suning Logistics operated 57 logistics bases in 44 cities, with 12.1 million square metres of storage and supporting facilities and 25,881 express delivery outlets. More than 90 per cent of these 57 logistics bases were self-built logistics networks and, supported by a Tianji system, a Legao platform, and a Tianyan platform,¹⁰ Suning Logistics offered one-hour delivery covering 150,000 communities, six-hour delivery covering more than 90 per cent of cities, and township delivery covering 98.8 per cent of the country.¹¹ The incomes of the logistics services were ¥1.9 billion, ¥2.8 billion and ¥3.2 billion in 2017, 2018, and 2019, respectively.¹²

Development History

The transformation of Suning Logistics was due to Suning's retail business. After 2009, with the development of e-commerce, Suning Logistics expanded its online logistics business, based on warehouse and distribution services that had been developed for offline physical retailing. The e-logistics business mainly served Suning Tesco, a B2C online shopping platform covering traditional household appliances, 3C (computing,

communication, and consumer) electrical appliances, general merchandise such as textile, clothing, and daily necessities, and other products. After more than 20 years of development, Suning Logistics had established a national three-tier logistics system covering regional distribution centres, urban distribution centres, and distribution locations by 2014. In the next two years, Suning Logistics made great efforts to transform its logistics business with an infrastructure and services driven by technology and efficiency. Cloud warehouse,¹³ the largest intelligent logistics system in China, began operating in 2016 and, with Suning's proposal to introduce smart retail in 2017, Suning Logistics committed to building a smart logistics system to serve the O2O market. To strengthen its terminal distribution capacity, Suning Logistics acquired Tiantian Express Co. Ltd.¹⁴ and integrated it into the original self-established logistics system in 2017.

Business Operations

Suning Logistics' business consisted of express delivery, same-city distribution, rural logistics, cold chain logistics, and supply chain plus operations. First, Suning Logistics express operations provided standard door-to-door and 24/7 services covering 98 per cent of the nation's cities. Specific types of logistics services included half-day delivery, on-time delivery, next-day delivery, appointment delivery, contract delivery, and large-appliance delivery with installation. Second, same-city distribution provided clients with multiple delivery options within three kilometres; for example, urban community logistics provided customized real-time delivery services for both online and offline businesses. Third, the rural logistics operations included service stations in towns or villages and reverse logistics covering 90 per cent of the country's towns. Fourth, with the launch of Su Fresh in 2015, Suning Logistics realized full-process cold chain distribution of fresh food in Shanghai and Hangzhou positioning Su Fresh as an O2O boutique supermarket. Finally, supply chain plus services included warehouse allocation, multi-warehouse stocking, transshipment, and cross-border logistics.

THE TRANSFORMATION OF RETAIL LOGISTICS

Physical Retailing: Traditional Enterprise Logistics Distribution

Single Customer Distribution: Front Shop and Back Warehouse

Suning Appliance Co. Ltd., Suning's first physical retail shop, was established in Nanjing in 1990, specializing in air conditioning products. The warehouse was located behind the shop, but the goods were inspected, tested, and paid for by customers in shop itself, then delivered. Since air conditioner retail stores were characterized by large volumes, heavy goods, transportation difficulties, and the need for after-sales installation, this manual decentralized logistics model involved high logistics costs and provided meagre profits in the household appliances retail industry.

Centralized Distribution: Distribution Centres and Logistics Parks

Suning Appliance (Group) Co. Ltd. opened the first of its national chain retail stores in 1996. With an investment of ¥30 million and 36 acres of land, Suning established a first-generation logistics and distribution centre near Jiangdong Gate, Nanjing. The primary business was coordination, distribution, and after-sales service for orders placed in chain retail stores. Suning set up 10 after-sales service sites in Nanjing in 1998. In so doing the company reduced the time cost of air conditioning distribution and installation from four or five days to less than three days. Alongside its gradual construction of nationwide retail stores, Suning built logistics parks in February 2006 and established a logistics base in the Yangtze River Delta region to provide logistics services for stores within a radius of 100 kilometres. Confronted with the explosive development of e-commerce, Suning Logistics extended its logistics sites throughout the country to provide efficient retail distribution services for customers.

Expanding Online Retail: Networked and External Logistics

Failure of Online and Offline Parallel Logistics

With the launch of online Suning Tesco in 2009, Suning Logistics started developing e-logistics to serve Suning Tesco (see Exhibit 2); however, Suning Logistics was not capable of operating O2O logistics, resulting in severe customer dissatisfaction, and its net profit decreased by 44.37 per cent in 2012 and 86.32 per cent in 2013;¹⁵ Suning Logistics therefore implemented two logistics plans for large household appliances and small goods, respectively. For the former, Suning Logistics integrated its online and offline businesses, uniformly conveying orders to the distribution centre; for the small goods, Suning Logistics launched rapid delivery, half-day delivery, and self-pickup to meet consumers' demand for time-limited distribution. Simultaneously, Suning's offline physical stores provided warehousing, distribution, and self-pickup facilities for small goods. The improved distribution process involved the offline physical store closest to the address providing the logistics service, and the central warehouse despatching the goods.

The Formation of Self-Built Networked Logistics

The national distribution of consumers and the increasing variety of products drove Suning Logistics to accelerate the pace of integrating logistics centres in different regions to achieve networked logistics. Data showed that a typical logistics network in 2014 consisted of 8 procurement hubs, 57 regional distribution centres, 352 urban distribution centres, and 1,583 express delivery sites.¹⁶ According to the logistics links of warehouse, transport, and distribution, Suning Logistics was subdivided into three networks—warehousing, trunk and branch transportation, and terminal service networks. Warehousing consisted of regional warehouses, urban distribution warehouses, urban distribution centres, and store warehouses. To upgrade storage efficiency and reduce human error, Suning Logistics believed that high-density storage, and efficient goods delivery and sorting allocation, were crucial. For trunk and branch transportation, Suning Logistics established a logistics network covering regional distribution centres, urban distribution centres, and transfer centres on a nationwide scale. This network supported many long-haul, short-haul, and retail delivery logistics services for households. The average distribution radius was 200 kilometres and the daily maximum distribution capacity was more than 800,000 items.¹⁷ The logistics services for terminal delivery included express delivery, an express smart cabinet (a self-service device for delivering and picking up express items), and the Suning Bangke service.¹⁸

The Development of a Logistics Network

In 2014, Suning Logistics transformed its operations from enterprise logistics to third-party logistics, providing external logistics services such as warehousing, transportation, and parcel express. In 2015, it then opened a logistics cloud platform to the merchants—upstream suppliers and social enterprises—of Suning Tesco, creating win-win supply chain relationships. With the help of the logistics cloud, Suning Logistics integrated all logistics links, after-sales service, and data into the supply chain, connecting the consumers and service provider systems, to the logistics cloud. After three years, Suning Logistics expanded its services from the 3Cs of traditional home appliances to multiple fields, including supermarket, household, sports, and other consumer goods. More than 2,000 enterprises, such as Midea, Sharp, Panasonic, Amway, China Resources, and Yonghui Superstores, cooperated logistically with Suning Logistics. Excluding the express services, the external revenue of Suning Logistics increased by 320 per cent year-on-year in 2016 and maintained a year-on-year growth rate of 192 per cent and 152 per cent in the first and second quarters of 2017, respectively.¹⁹

New Retail: Smart Logistics Systems

According to the data, online consumer traffic in China reached a peak in 2017 and, thereafter, the growth rate gradually slowed. A bottleneck of online user growth resulted from the increased cost of attracting customers and the reduction of online efficiency. To deal with this situation, Suning proposed a smart retail strategy²⁰ in 2017. This strategy would use information technology to identify consumption habits, predict consumption trends, and guide production to provide diversified and personalized services for consumers. Suning group buying,²¹ Suning shops, and Suning retail cloud stores became the star avenues for the redirection offline traffic to Suning smart retail. To support the smart retail strategy, Suning provided physical stores with Internet facilities and promoted O2O logistics services through big data, cloud computing, the IoT, and artificial intelligence (AI). At the same time, Suning logistics provides differentiated logistics services for different multi-channel retail.

Online-to-Offline (O2O) Multi-Channel Logistics Service

Suning group buying was officially launched on August 8, 2018. On this day, the order volume exceeded five million orders, the number of users reached two million, and the average delivery time for each order was three hours.²² Suning group buying connected consumers directly with the suppliers, which not only lowered the purchase price for consumers, but also helped suppliers to garner maximum profits—a minimalist base of Suning group-buying consumers was established.

Suning shops were established in three main locations: community stores, central business district stores, and high-passenger-flow stores. Relying on a front warehouse and instant distribution (i.e., “Suning delivery in seconds”), Suning shops were capable of providing instant delivery services for community clients within 3 kilometres, taking only 30–60 minutes to deliver. Suning Logistics constructed an instant response formula (applications plus front warehouse),²³ which integrated online and offline retail logistics. Consumers within 3 kilometres could select goods on virtual online shelves through mobile terminals, collect the goods, and scan the bill code in offline stores. After the online order was placed, the goods were delivered from the front warehouse to clients via Wolong-1²⁴ within 60 minutes. To address consumers’ diverse shopping preferences, Suning shops improved their delivery efficiency and reduced their delivery costs.

The Suning retail cloud store was a franchise-style offline store that enhanced market segmentation in villages and towns. Through the integration of the supply chain, logistics, and finance, Suning provided these stores with abundant products and professional store-management systems. Goods were stored in Suning’s warehouse and delivered by Suning Logistics after the order was placed. The retail cloud store provided a series of online tools, such as cloud-shelf and cloud-store; offline stores were no longer plagued by the limitations of stock keeping units, and consumers could place simultaneous orders on Suning Tesco. Since Suning logistics shared its warehousing and logistics with Suning retail cloud stores, zero inventory could be achieved, because popular goods were displayed in physical stores, while other goods were ordered online through Suning Tesco and delivered by Suning Logistics.

Digital and Intelligent Logistics Operations

Driven by smart retail, Suning Logistics invested heavily in a super cloud warehouse, district warehousing centres, front warehouses, and store warehouses). The Shenyu Platform²⁵ helped the store warehouses to predict the delivery of goods and arrange storage in advance. After consumer orders were placed, goods were delivered from a nearby front warehouse. Also, many types of high technology equipment, such as a

MiniLoad high-density automatic box stacking machine,²⁶ an automated storage and retrieval system (AS/RS) pallet stacking system,²⁷ a storage control system (SCS) rotating shelf,²⁸ an automated guided vehicle (AGV) robot, and a high-speed cross sorter were integrated into the warehousing network. The Compass storage control and management system automated and integrated the logistics process, from receiving and shelving to storage, replenishment, picking, packing, labelling, and sorting. Furthermore, the Tianyan platform enabled Suning Logistics to monitor the whole logistics process and operational environment, accurately tracking and managing orders. Other big data platforms allowed Suning Logistics to implement intelligent warehousing, associated stock preparation, and predictive allocation in all its warehouses across the country. Transportation route planning and its dynamic adjustment could be realized through the Tianyan platform, which identified the shortest transportation distance, the lowest cost, and the best time using AI technology instead of traditional dispatchers.

Suning intelligent logistics utilized an automated closed-loop system for the warehousing, transportation, and distribution processes, which consisted of warehouses with AGVs, a truck line named Xinglong-1,²⁹ a terminal distribution system for robot-controlled vehicles named Wolong-1, and automated aerial vehicles. The earlier e-commerce shopping festivals had problems with slow despatch and slow delivery. For the Suning Tesco shopping festival on August 18, 2018, the completion rates for same-day despatches and deliveries were 99.8 per cent and 96.5 per cent, respectively, illustrating the high efficiency of Suning logistics.

RECENT CONCERNS

Suning was committed to building a multi-channel, smart-retail ecosystem and Suning Logistics was diligent in developing a smart-retail strategy. In the new retail boom, consumer experience and digitization became key factors enabling logistics enterprises to gain competitive advantage. With technology iterations and changes in consumption habits, a single online or offline retail model could no longer meet the consumer demand for personalized, scene-based shopping anytime and anywhere. On the one hand, the demands of consumers were evolving from a focus on product functions to product experiences; on the other hand, the move toward O2O retail and decisions based on customer data were reshaping the supply chain in reverse.

DECISION TIME

In this context, the following strategies might be vital for Suning Logistics' further development. One strategy would be to increase the distribution range and efficiency of terminal logistics to address the diversified scenario of new retail by focusing on the improvement of the self-built logistics system. In addition to enhancing the physical shopping experience of consumers, online and offline ordering could facilitate self-pickup and instant delivery within a certain range. Another strategy would be to expand the warehouse supply chain and build a C2M (consumer-to-manufacturer) logistics model with the help of the cloud platform, by further developing the upstream and downstream self-built logistics systems. In order to provide customers with cost-effective product and logistics experiences, logistics enterprises could provide personalized products and services according to the needs of consumers and direct the development of online and offline retail activities. Kai's challenge was to make that decision.

EXHIBIT 1: EXTENT OF EXTERNAL LOGISTICS IN CHINA (2013–2018) IN TRILLION ¥

Year	2013	2014	2015	2016	2017	2018
Total social logistics accumulation	198	214	219	230	253	283
Growth rate	11.6	7.9	2.7	4.8	10.1	12.0

Source: “Analysis on the market Status and Development Prospect of China’s logistics industry in 2019” [in Chinese], December 6, 2019, accessed September 30, 2020, www.sohu.com/a/358777435_99922905.

EXHIBIT 2: ONLINE RETAIL TURNOVER IN CHINA (2013-2018) IN TRILLION ¥

Year	2013	2014	2015	2016	2017	2018
Turnover of online retail	1.89	2.82	3.83	5.33	7.18	8.57
Growth rate	42.67%	49.65%	35.71%	39.19%	34.65%	19.41%

Source: Sohu, “Suning’s Acquisition of Carrefour: Inevitable under the New Retail Model” [in Chinese], Sohu, October 2, 2019, accessed May 12, 2020, www.sohu.com/a/344787844_475636.

ENDNOTES

¹ Suning Holdings Group Co. Ltd. (Suning), an outstanding representative of China's retail industry, was established in 1990 and has been in business for 30 years. The company started as a small air-conditioned store and grew into a smart retail giant that is a leader in integrating online and offline sales.

² *New retail* refers to the cooperation between online-to-offline (O2O) retail and logistics using big data, mobile Internet, intelligent Internet of Things (IoT), and other technologies and advanced equipment.

³ ¥ = CNY = China yuan renminbi; all currency amounts are in ¥ unless otherwise specified; US\$1 = ¥ 6.8105 on September 30, 2020.

⁴ Sohu, "Analysis of the Development Status and Trend of China's Logistics Industry in 2019" [in Chinese], Sohu.com, November 7, 2019, accessed February 2, 2020, www.sohu.com/a/352230624_473133.

⁵ Wang Hui, "Third-Party Logistics Usher in Development Opportunities, Expected to Achieve a Market Size of 1.6 Trillion in 2020 [in Chinese]," Qianzhan, May 17, 2018, accessed February 20, 2020, www.qianzhan.com/analyst/detail/220/180517-cf5bbfc5.html.

⁶ Sina, "Yunda and Shentong Disclosed in the 2019 Financial Report that their Market Share is Accelerating the Concentration of Major Express Companies" [in Chinese], Sina, April 30, 2020, accessed August 5, 2020, <https://finance.sina.com.cn/roll/2020-04-30/doc-iiucyvi0713060.shtml>.

⁷ Flash Express, UU-paotui, Fengniao Instant Delivery, JD Daojia -Dada, and Suning Seconds Delivery were the project names of instant distribution—not logistics—companies. Their corresponding logistics enterprise names were Beijing Tongcheng Biying Tech Co. Ltd., Shenzhen Space-time Tunnel Information Technology Co. Ltd., Zaras Network Technology (Shanghai) Co. Ltd., Shanghai Jingdong Home Yuanxin Information Technology Co. Ltd., and Suning Logistics Group Co. Ltd., respectively.

⁸ Logistics 4.0 aims to improve the efficiency of industry by optimizing overall logistics processes and sharing data using intelligent technology.

⁹ The front warehouse is a small warehouse on the side closer to the consumer, based on the traditional distribution. By predicting the consumer demands around the location of the front warehouse, the merchant delivers goods to the front warehouse for storage in advance. When consumers place an order, the merchant can directly pick, pack, and distribute the goods from the front warehouse to ensure logistics efficiency.

¹⁰ These are logistics support systems or platforms independently developed by Suning Logistics.

¹¹ Sina, "Suning Logistics Accelerates 'Opening'" [in Chinese], Sina, June 15, 2020, accessed August 6, 2020, <https://finance.sina.com.cn/stock/relnews/cn/2020-06-15/doc-iiucyvi8584370.shtml>.

¹² Suning, *2019 Annual Report of Suning.Com Co. Ltd.*, April 2020, accessed August 6, 2020, www.suning.cn/static//snsite/contentresource/2020-05-22/2fb07c2f-79eb-4420-8e00-35cf9a973568.pdf.

¹³ Cloud warehouse is a new logistics warehouse system which uses cloud computing and modern management technology and relies on storage facilities for goods circulation.

¹⁴ Tiantian Express was founded in 1994 and, in 2017, Suning Logistics wholly acquired Tiantian Express. In April 2018, Suning.com and Tiantian Express implemented a business integration. See China Sourcing News, "Tiantian Express Sells to Rival in China," China Sourcing News, January 4, 2017, accessed August 5, 2020, www.chinasourcingnews.com/2017/01/04/316781-tiantian-express-sells-to-rival-in-china/.

¹⁵ IT Times Weekly, "After Three Years of Transformation, Suning is in a Dilemma: Frequent Expansion has Shown Weakness, Slow Delivery Speed, Poor User Shopping Experience" [in Chinese], IT Times Weekly, August 20, 2014, accessed March 6, 2020, http://news.ittime.com.cn/news/news_1745.shtml.

¹⁶ He Shulong, "Can Suning Logistics Reengineer and Take the O2O Route to Counterattack JD?" [in Chinese], Linkshop, January 12, 2015, accessed February 16, 2020, www.linkshop.com.cn/web/archives/2015/314775.shtml.

¹⁷ Wulian Yuncang, "Suning Logistics Operation Mode? Multiple Modes Coexist" [in Chinese], Warehouse in Cloud, March 29, 2019, accessed February 28, 2020, www.50yc.com/information/hangye-wuliu/14802.

¹⁸ In terms of logistics for villages and towns, Suning Bangke provides integrated services, including package soliciting, warehousing, distribution, installation, sales, maintenance, cleaning, recycling, replacement, and other comprehensive services.

¹⁹ Gong Jinhui, "Suning Logistics' Small Goals in the Next Three Years: Go to Heaven, Go to the Countryside, Unmanned" [in Chinese], IResearch, August 12, 2017, accessed 25 February 2020, <http://column.iresearch.cn/b/201708/806891.shtml>.

²⁰ Suning smart retail is focusing on the retail industry, building offline-retail smart stores and developing an online-retail platform. Simultaneously, the company is relying on a logistics cloud platform, a data cloud platform and a financial cloud platform to realize the sharing of goods, information, and capital. Finally, it aims to service partners and consumers through its store, mobile, computer, and home outlets; Xinhuanet, "Suning smart retail opens a new chapter" [in Chinese], Xinhuanet, March 1, 2019, accessed September 30, 2020, www.xinhuanet.com/info/2019-03/01/c_137859355.htm.

²¹ Suning's operational approach to group-buying was to attract consumers who intended to buy the same product, purchase from suppliers, and enjoy lower-than-market retail prices. Its business was developed with the help of Suning's commodities, merchants, supply chain and OCO customer flow.

²² Yibang, "Suning's Daily Record: Orders have Broken through 5 Million" [in Chinese], Finance JRJ, August 9, 2018, accessed August 7, 2020, <http://finance.jrj.com.cn/tech/2018/08/09/113024930217.shtml>.

²³ Consumers within three kilometres could select goods on virtual online shelves through applications, collect the goods, and scan the bill code in offline stores. After the online order was placed, the goods were delivered from the front warehouses to clients via Wolong-1 within 60 minutes.

²⁴ Wolong-1 can make a seamless switch between indoor and outdoor scenes. Its routine procedures are order receiving, delivery, independent positioning, independent path planning and obstacle avoidance, and goods delivery.

²⁵ Shenyu Platform uses a data analysis model, based on the distribution freight volumes, distribution radius, and distribution capacity of express delivery points, to guide the intelligent layout of express points and intelligent itineraries for daily parcel

delivery routes; Tech China, Ali, Suning, and Tencent are showing off at the World AI Conference, with AI+ logistics playing a new game” [in Chinese], Tech China, July 10, 2020, accessed September 30, 2020, https://tech.china.com/article/20200710/072020_556840.html.

²⁶ A MiniLoad high density automatic machine is designed to facilitate access to cardboard boxes. The equipment can accommodate the double circulation of 1,400 boxes/hour (single circulation of about 1,800 boxes/hour), or roughly a million pieces of goods, through the warehouse every day.

²⁷ An AS/RS automatic palletizing system is designed for access to complete loading units and is primarily used for the storage of medium- and small-sized merchandise.

²⁸ An SCS rotating shelf system is a highly dynamic and fully automated storage system with separate automatic storage and retrieval devices. The equipment can process 250 boxes/hour of storage efficiency. Through integration with the warehouse control system, the equipment can sort products by timing, route, and batch, and carry out automatic batch shipments.

²⁹ The functions of Xinglong-1 included automatic obstacle avoidance, autonomous route planning, and automatic and accurate parking.