Supply Chain Economics and Its Transformation and Innovation brought by Artificial Intelligence under the Influence of COVID-19

Yongjiang Chen[1,*], Sophia Ruiqi Cao[1]

[1]*Economics University of Washington(UW), Seattle, Washington state, the United States, 98105*
[1]*The Affiliated High School of Peking University Beijing, Beijing, China, 100080*
**Corresponding author. Email:chenyj2017@yahoo.com*

ABSTRACT
The year 2020 is destined to leave a colorful mark in the history of China's development with all eyes on it. However, a sudden new epidemic has slowed down our progress. In the face of the new epidemic, all industries have been working together, and our logistics and transportation industry has made an indelible contribution to the resumption of production and the fight against the epidemic. However, in the face of sudden events such as COVID-19, the logistics industry still has many shortcomings that need to be improved. How the logistics industry can respond to emergencies faster and better, improve efficiency, and focus on quality and weight, is a very important research topic in modern logistics. This paper talks about the challenges for the logistics industry in the face of sudden epidemics, starting from the logistics and transportation industry under the COVID-19. In the new area, development of the logistics industry drives economic development and improves human's quality of life. Starting from smart logistics, this article discusses many problems that exist in today's logistics after the outbreak of the epidemic, COVID-19, and puts forward the view that smart logistics can be used on a large scale to improve the quality of logistics services. During the research, using case study method becomes a better way to make conclusions. There are many realistic cases related to smart logistics in the market, which are helpful to get the results. Finally, The article proves that smart logistics can effectively improve logistics efficiency from the perspective of technology and service. This article predicts that the future development trend of smart logistics is very optimistic, because the development of today's technology is very suitable for the advancement of smart logistics. For example, the RFID technology and robotics technology mentioned below are very helpful in the smart logistics area. In addition, people are paying more attention to the smart logistics, especially the governments. The development of smart logistics will occupy a significant proportion of the national soft power in the future.

Keywords: *COVID-19, smart logistics, transformation, technique and service, challenges*

1. INTRODUCTION

China's logistics and transportation industry has entered an era of rapid development in the 21st century. Especially in recent years, Chinese people began to vigorously promote the transformation of traditional logistics to modern logistics. The logistics industry is a comprehensive service industry that integrates many industries, and it occupies an increasingly important position in people's daily lives. Nowadays, within the arise of e-commerce platforms, such as Taobao, JD, Chinese logistic market has becoming more popular. Accompanied with the rising price of labor, the traditional logistics industry, which is mainly a labor-intensive industry that prefer face-to-face delivery, has been unable to meet people's expectations. In particular, the outbreak of COVID-19 in 2020 has shown people that the traditional logistics industry still faces many shortcomings in the face of sudden events, like epidemics: backward logistics technology, inadequate professional staff and professional equipment have been exposed. This requires researchers to analyze the problems exposed in the logistics industry during the epidemic, but it still needs more analysis and research in this field. This paper discusses challenges faced by the logistics industry under the epidemic, and analyzes some specific parts related to smart logistics, which are helpful to solve the problems during COVID-19.

2. PROBLEMS FACED BY THE LOGISTICS INDUSTRY UNDER THE COVID-19 EPIDEMIC

The logistics industry was hit hard in the early days of the new epidemic. When it was during the Chinese New Year festival, the most important time of the year for Chinese people. The Spring Festival provided a lot of customers and orders for the logistics industry. With households closed and traffic in all provinces and cities under strict control, and people's desire to shop online diminished. For some large logistics companies, the impact of the new crown epidemic has led to a surge in costs, and it is not easy to tide over the difficulties.

The epidemic has had a considerable impact on all aspects of warehousing, transportation and distribution. For the warehouse, many seasonal preservation time is short, deterioration, coupled with many goods are not essential to life, due to traffic control, people's desire to buy greatly reduced, which caused many warehouses appeared "burst" phenomenon, a large number of goods backlog, can not sell, management costs have increased, the loss of a lot of money.

In transportation, mainly due to traffic control, a large backlog of goods, can not be sent out, or orders sent out, but the logistics of transport is too slow, especially fresh vegetables, fresh costs and transport pressure is more than several times the normal state.

For distribution, the epidemic has also revealed many problems. At the beginning of the epidemic, remote distribution was reduced, but there was a large increase in same-city distribution and online orders, especially for families with chronic diseases, which are much more difficult to buy drugs than under normal conditions; and many businesses have insufficient reserves, poor emergency response capabilities and insufficient transportation equipment, all of which have brought enormous pressure on distribution.

It is no coincidence that the new crown epidemic not only affects the domestic logistics and transportation industry, but also changes the international logistics market. The CEO of "transport to which" Zhou Shihao once said, under the influence of the new crown epidemic, the international logistics market in 2020 has three situations: First, the container export delivery prices rose sharply, the second is a lot of routes burst cabin lack of cabinets, the third is a sharp decline in the rate of permitted classes. These appearing problems should trigger us to think and take warning.

3. REVIEW OF THE INFLUENCE OF THE EPIDEMIC ON LOGISTICS IN CHINA AND COUNTERMEASURES

Sudden public events, such as the New Crown epidemic, can add more costly expenses to logistics business sites and have a non-negligible impact on warehousing, distribution, transportation management, and supply chain [1]. However, sudden events are opportunities and challenges, and we need to start from ourselves to identify the shortcomings and have the corresponding problem-solving ability and countermeasures to promote the development of logistics industry for the better.

From the study of the China Logistics Information Center group, we can learn that although at the beginning of the year, the logistics industry was affected by the epidemic from the new crown, but the whole country made concerted efforts to fight the epidemic, and the logistics operation of the whole year 2020 was good, the scale of logistics increased again compared with previous years, and the total income was improved to a certain extent, and the logistics enterprises did not lose vitality because of the epidemic, but were revitalized, and also the logistics enterprises did not lose their vitality because of the epidemic, but were revitalized, and also led to employment and quality development [3]. However, at the end of the article, they also point out that there are still greater pressures in the operation of logistics, with higher costs resulting in lower profits and more inventory in warehouses.

The journal article Yiqing Xia Guoji Wuliuye de Bianhua yu Weilai published by Tianjin Navigation analyzes the impact of the epidemic from the perspective of international maritime transport. The article points out that the international maritime transport and its logistics industry showed different trends in the first and second half of the year due to the impact of the new crown epidemic at home and abroad, especially in the second half of the year, the container export freight rates rose sharply, many routes saw a burst in the warehouse, and the supply of empty containers for Chinese exports exceeded the demand [5].

In the face of the epidemic, there are three changes and four trends in the international logistics industry [7]. This makes "Made in China" better to the world, from "Made in China" to "Made by Chinese", a word difference, but also represents that we will have a number of global service. This is a breakthrough, but also pressure, which requires Chinese logistics must go out of the country, to the world, to establish a global transportation network, we are duty-bound.

By studying the above representative articles, we can see that under the influence of the new crown epidemic, China's logistics in the domestic and international development changes, opportunities and challenges, which has a strong reference value for the transformation of modern logistics industry.

4. SMART LOGISTICS ANALYSIS

People used to be familiar with the express delivery

method that couriers delivered from face to face, but now the emergence of the COVID-19 has broken the original express delivery method and introduces a new method, which is Smart Logistics. What is Smart Logistics? This word was proposed by Dieter Uckelmann in 2008 in his article a Definition Approach to smart logistics [2]. He gave comprehensive definitions in this article. A few important points are excerpted here.

(1) Smart Logistics embraces Smart Services as well as Smart Products within Logistics.

(2) Smart Logistics frees humans from (control) activities that can be delegated to Smart Products and Services.

(3) Smart Logistics integrate existing logistic technologies, such as material handling systems, and enable these to react and act in a correspondingly smart manner [2].

In conclusion, Smart logistics is a new type of logistics method. It not only combines existing logistics methods but also integrates them with new technologies, which greatly saves people's time and improves efficiency. The following content focuses on one new express delivery method, which belongs to smart logistics, that has emerged in this COVID-19, contactless express. It shows that how this method work and how they play an important role in COVID-19 from two main parts: technique and service.

4.1. Contactless technique

The rapid progress of science is one of the most important reasons to promote the development of smart logistics. Among them, the invention of RFID technology has greatly improved the efficiency of logistics and made a huge contribution to this epidemic. First, RFID technology is a wireless communication technology that can identify specific targets and read and write related information through radio signals [4]. It does not require human intervention in the recognition process and can recognize multiple tags at once, which greatly increases efficiency and reduces possible errors in human eye recognition. RFID technology has been widely used in smart logistics. In the article "What Is RFID Asset Tracking & How Does It Work?" proposed whether RFID has an impact on retailers, as shown in Figure 1 below.

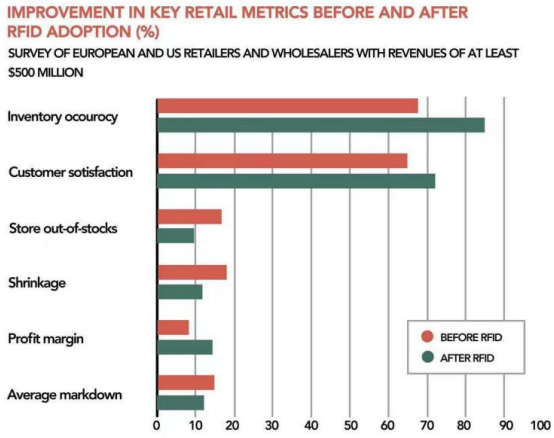

Figure 1 Improvement of key retail indicators before and after the adoption of RFID [8]

There is a set of data worthy of attention, that is inventory accuracy. It is obvious that the benefits of after having RFID (about 84%) is far greater than the benefit of not having RFID (about 68%) as shown in figure 1 above. This also applies to the express delivery industry. In the past 5 years, the probability of people receiving the wrong delivery has been greatly reduced. This benefits from the popularization of RFID technology.

Secondly, RFID technology also solves many complicated problems in inventory counting, which can save most of the time. Through the picture from "What Is RFID Asset Tracking & How Does It Work?", as shown in Figure 2.

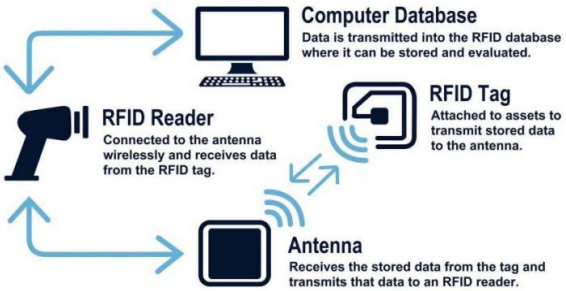

Figure 2 How Does RFID Asset Tracking Work [8]?

It can be clearly found from figure 2 that RFID technology can be fully connected with computer technology, which greatly reduces the time for people to count inventory information. For example, Tmall Logistics is one of the most developed logistics companies in the world. On November 11, 2016, (Black Friday in China), a total of 557 million parcels were generated. These parcels were sent to the distribution center together. The number of parcels received on that day had far exceeded the demand, so the delivery speed should be reduced accordingly, but surprisingly the result was that the delivery speed was twice as fast as usual [9].

There were many factors that caused this situation. RFID was one of them. It can be seen from the Figure 2

that when people place an order online, the product data will be uploaded to the computer, and then the computer will print the corresponding barcode and store the corresponding product information in the barcode. After that, the information in barcode can be used by the corresponding courier when the RFID reader scans the barcode. Consequently, they can quickly go to the corresponding container to pick the goods. This greatly shortens the time it takes for the courier to find the goods in a huge warehouse, which is the distribution center here.

At last, RFID also provided great help in this pandemic. The biggest advantage of RFID is that almost all procedures are carried out under contactless conditions. People often do not need to communicate with each other during the process. Additionally, RFID technology greatly shortens the contact time and evaluation rate of personnel. It can be shown from the Figure 3 below. it shows the time saving by using RFID technique.

Figure 3 Scneario 1-Cross supply chain value (retail) [3]

It is important to focus on the data in the item, Check items with ship list and Check shelf inventory. As shown in Figure 3, the time for the upper is 15 sec for RFID and 203 sec for Barcode. It is interesting that RFID can save almost 190 sec, which is greater than 3 minutes. The time for the latter one is 15 sec for RFID and 144 sec for Barcode. The time saving for RFID is about 2 minutes in the latter one. In such a small sample, using RFID can save almost 9 minutes, which is a huge number in logistics. If people continue to use the previous method, the 9-minute stay in the warehouse is likely to cause the epidemic to get out of control. The reason for using RFID to save time is when the couriers receive the orders and scan the barcodes, they can clearly know their destinations. The information in it can guide them to corresponding containers quickly. They do not have to ask questions to workers in warehouse, which can reduce the possibility of the spread of the epidemic. Sometimes for some large warehouses, the information in the barcode tell courier the route to the containers so that they can successfully and quickly find the belonging containers for items. They do not have to contact with other couriers that can greatly keep the warehouse safe from the spread of epidemic.

4.2. Contactless service

Regarding the service industry, it is particularly important to focus on changes in service models. COVID-19 pandemic has brought great challenges to the service model of the express delivery industry. Because of the outbreak of the epidemic, in order to avoid face-to-face contact as much as possible, consumers are more inclined to purchase daily necessities through e-commerce platforms. Therefore, a new mode of logistic service appeared, contactless delivery. Some apps such as Taobao, JD, Amazon, and Meituan competed with each other, wanting to seize this market as soon as possible. At last, on January 26, 2020, Meituan (one of China's largest online food ordering apps) took the lead in launching a contactless delivery service (CNS 2020a) in China. According to the "Contactless Delivery Report" released by Meituan, from January 26 to February 8, contactless delivery orders accounted for more than 80% of the total orders [6]. Some other companies have followed this suit and launched contactless delivery services.

According to the article China's logistics development trends in the post COVID-19 era, The authors have noticed that the difference between contactless delivery and traditional delivery is in 6 parts, which is Delivery process, people in contact with goods, Delivery equipment, Delivery time, Fixed investment cost and variable delivery cost [6]. Contactless delivery won 5 parts, but for only one-part, fixed investment cost, contactless delivery has a higher charge than traditional delivery. The authors did not have more details to show the reason. Here is a case in point which can show the reason why fixed investment cost is higher in contactless delivery and shows that this higher charge is very meaningful in the epidemic. During the epidemic, food delivery robots have been favored by many restaurants. According to the department leader in charge of Qinglang Technology, its annual shipments are about 3,000 units, mainly serviced for large chain catering institutions, such as Hidilao. The advantage of the food delivery robot lies in its high work efficiency and freeing more waiters. Then it is easy to find that its biggest advantage is contactless. During the epidemic, many restaurants are closed. Most of people's meals come from takeaways, but takeaways are no longer allowed to express face-to-face, so the food delivery robot solves this problem very well. The courier can put the food in the food delivery robot and let it be delivered to the customer. If A contactless express delivery is achieved, the epidemic can be controlled very well and people's needs can be met at the same time. Although the fixed cost for food delivery robot is a bit high, it is valuable for people to use this

delivery robot to prevent face-to-face contact during the epidemic.

5. CONCLUSION

This severe epidemic has made people realize the importance of smart logistics and understand that the previous way of accepting express delivery face-to-face is no longer the best way for people to use. The way of logistics needs to be transformed immediately. In the process of transformation, smart logistics has become a fairly good way. After countless failure attempts, people have discovered that smart logistics is indeed a convenient way of express delivery that combines technology and services together. This article discusses the application and future development trends of smart logistics. It has proved the importance of smart logistics in logistics from two aspects of technology and service. Combining with the current epidemic, COVID-19, this article has come to the view that smart logistics will be widely used in people's future lives. In the following research, more techniques in smart logistics can be researched, such as 5G network. For contactless delivery, this article pays more attention to one specific part, the change of service mode, in the following research, the robots from starship can be a better research direction.

AUTHORS' CONTRIBUTIONS

This paper is completed together by Yongjiang Chen and Sophia Ruiqi Cao.

ACKNOWLEDGMENTS

We would like to thank all the professors and teachers for their helpful guidance and instruction, they gave us inspiration for writing this paper and they also help us correct the mistakes in this paper.

REFERENCES

[1] A. Kawa. SMART logistics chain. Asian Conference on Intelligent Information & Database Systems, 2012, PP.433-438. DOI:10.1007/978-3-642-28487-8_45.

[2] D. Uckelmann. A Definition Approach A Definition Approach to Smart Logistics. PSPS, 2008, PP.1-27, http://www.logdynamics.de/.

[3] Hu & Meng. Analysis of Logistics Operation in 2020. Logistics Research, General, 2021(3): 1-4. DOI:2096-8698 (2021) 03-0001-04.

[4] Qin & Zhang et al. The Application of RFID in Logistics Information System. In: IEEE International Conference on Service Operations & Logistics, 2008(1): 534-537. DOI:10.1109/SOLI.2008.4686453.

[4] S. Zhou. Changes and future of the international logistics industry under the epidemic. China Water Transport News, 2021: 39.

[5] W. Liu, Y. Liang, X. Bao, J. Qin & M.K. Lim. China's logistics development trends in the post COVID-19 era. International Journal of Logistics Research and Applications. 2020. DOI: 10.1080/13675567.2020.1837760.

[6] What Is RFID Asset Tracking & How Does It Work? November 30, 2020. https://comparesoft.com/assets-tracking-software/rfid-asset-tracking/

[7] What Is RFID Asset Tracking & How Does It Work? November 2020, Data from: https://comparesoft.com/assets-tracking-software/rfid-asset-tracking/\

[8] Double 11 data live broadcast: Tmall double eleven transactions in 2016 exceeded 120.7 billion yuan, wireless transactions accounted for 82%. November 12, 2016. Http://www.199it.com/archives/535753.html