Study based on contactless distribution patterns under the outbreak

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Abstract: As a new way of distribution, contactless distribution is widely used in special epidemic because of its advantages of less contact personnel and high efficiency of distribution. Based on the analysis of traditional face-to-face distribution, this paper points out the necessity of developing non-contact distribution during the epidemic. For contactless distribution, the article analyses the common contactless distribution methods and their respective advantages and disadvantages. In order to meet the distribution requirements under the epidemic, the way of contactless distribution has been further optimized in terms of technology. The aim is to reduce external exposure during epidemics and risk of disease.

1. Introduction
The outbreak of novel coronavirus pneumonia in 2020 has a profound impact on the development of China's logistics industry. Because of the large number of customers, the wide range of activities, the traditional face-to-face distribution is easy to cause cross infection and increase risk. In order to minimize novel coronavirus pneumonia risk caused by human contact, Contactless distribution was widely used during the outbreak. Compared with the traditional distribution mode, "non-contact distribution" avoids face-to-face contact, not only effectively prevents the spread of the virus, but also applies to the personalized needs of consumers to protect privacy and security during the non epidemic period. From this point of view, "non-contact distribution" is a special service in a special period, but it has its foundation, conditions and needs in the non epidemic period, so as to meet the diversified needs of the market and provide more perfect services.

2. Disadvantages of the current distribution model
The traditional face-to-face delivery mode requires the delivery staff to receive the express or goods directly face to face with customers.

"Last kilometre" logistics distribution is the only logistics link directly connected with customers. The traditional face-to-face distribution mode has the problems of high cost and low efficiency, which greatly restricts the whole efficiency, and has the following five shortcomings[1].

1) Distribution efficiency is low. The time conflict of delivery, low efficiency of delivery, difficult to ensure the safety of goods, and low convenience of delivery, which makes the security and accuracy of express delivery difficult to guarantee.

2) Poor delivery security. Due to the low threshold in the field of logistics and distribution, the quality of distribution personnel is uneven, information security measures are not perfect, the information of both sides of the distribution is easy to leak. At the same time, during the outbreak, face-
to-face distribution mode distribution staff contact a wide range of people, a wide range of activities and a large chance of causing the distribution staff and customers cross-infection.

3) The distribution location is restricted. Because some receiving locations do not allow delivery personnel to enter, distribution personnel will place the express in other public places such as the community doorman, resulting in the delivery is not in place.

4) The quality of delivery service is low. The service quality of logistics terminal distribution is low, there are some problems such as distribution is not in place, distribution process is not standardized and so on, resulting in low customer satisfaction with the delivery service.

3. The need for contactless distribution development
"No contact distribution" through the distribution staff and user agreement, the goods placed in the designated location, such as the front desk of the company, the door or into the designated buffet counters, smart courier cabinets and other places, to reduce face-to-face contact, to ensure that the distribution staff and riders in the delivery, or receive the goods link of the safe distribution mode, This kind of distribution method does not need face-to-face, and does not need to deal with people, only to the designated place to complete the handover[2].

1) As an innovative model of end-of-line logistics services, "contactless distribution" has changed the conventional face-to-face delivery of goods, meeting the needs of users for the safety of logistics services at this particular time of the outbreak. If the user develops a habit, it is possible to continue to choose the "contactless delivery" mode after the outbreak ends.

2) Compared with door-to-door delivery and user check-in, due to the development of the epidemic situation and social control measures, the demand for contactless delivery has emerged again.

3) Starting from contactless distribution, fresh, takeaway-related enterprises can upgrade the process management of food production and distribution process, use technical means to establish a diversified management system, provide consumers with diversified monitoring tools, and open the last link of distribution services.

Experience during the outbreak shows that the logistics and distribution of "main road" outside the grassroots "capillaries", easy to become a logistics blind spot, and "no contact distribution" to solve many blind spots. Drones and unmanned technology have also played an important role in the outbreak response. So "contactless distribution" may become a future trend.

4. Contactless delivery mode
Non contact distribution avoids the direct contact between the distribution personnel and customers in the distribution process, ensures the safe distribution of the receiving ring, and reduces a large number of indirect contact of personnel. There are three non-contact power distribution modes.

4.1. Intelligent express cabinet delivery mode
Intelligent express cabinet is a set of 24-hour independent service equipment integrating express delivery, extraction and other functions. Express cabinet is composed of dozens of different sizes of equipment, with independent payment terminal in the middle (including touch screen, keyboard, payment terminal, QR code scanning area and strip exit), and video monitoring system on both sides. The courier must use IC card and password to open the grid, and the consumer needs to use QR code scanning and pick-up password to open the grid. By changing the way users access information during delivery. Reduce the face-to-face contact between users and distribution personnel to ensure the safety of users and distribution personnel in the process of receiving goods[3]. Figure 1 shows the delivery mode of the intelligent express cabinet.
The distribution mode of intelligent express cabinet has the following advantages.

1. More efficient delivery. To a large extent, it solves the problem of time node asymmetry between the delivery personnel and consumers. The courier and consumers can choose delivery and receiving time more freely, which can not only save time for consumers, but also reduce the second or even multiple delivery of the courier.

2. It’s more convenient to pick up a piece. From "waiting for express delivery" to more flexible and convenient self-service "pick-up" mode. At the same time of improving the efficiency of express delivery, it also brings more convenient self-service experience to the recipients. Through intelligent express cabinet storage and self-fetching has become the normal express delivery.

3. More secure delivery. Intelligent express cabinet is beneficial to the standardization of express store, and can play a role in protecting consumers' privacy and personal safety. At the same time, when consumers receive express mail, they only need to input password, scan code or pay attention to official account, then click confirm open door, so that express delivery can be found quickly and accurately, and will not be taken away. It brings convenience to consumers and enhances the user experience.

4. The cost of end distribution is lower. The express delivery can be completed in 30 seconds by express box, while the traditional delivery method takes more than 7 minutes on average. The courier can greatly increase the delivery volume without increasing the number of people.

5. 24-hour service. The intelligent express cabinet has the advantage of "24 hours off work", which can satisfy customers to pick up any time

6. Under the epidemic situation, avoid the contact between the delivery personnel and customers, carry out "contactless logistics", avoid the direct contact between the courier and the recipient, and prevent cross infection.

4.2. UAV distribution mode

"Uav delivery" means the use of unmanned delivery vehicle or uav, remote control by the delivery personnel, or according to the computer programming, according to the designated route automatic cruise, to arrive at the customer designated location, the customer through the relevant certificates, to obtain the goods[4]. The biggest characteristic of uav delivery is that the delivery personnel can complete the delivery without direct contact with customers. The distribution of valuable goods and remote areas have unparalleled advantages of other distribution methods.

4.2.1. Advantages of UAV delivery mode.

1. Drones deliver faster.
The use of drone delivery can quickly and easily realize business express logistics between cities. Drone delivery is not only unimpeded, but also can avoid ground traffic congestion, speed up delivery and improve delivery efficiency.

(2) The cost of UAV distribution is relatively low.
In rural areas. Because of the undeveloped transportation and scattered people's living, the express delivery line is relatively long and takes a long time, which leads to high distribution cost. For big cities, although the traffic is convenient, traffic congestion or regulation and other reasons will also increase many distribution costs. The use of UAV distribution reduces the cost of distribution, which is conducive to the development of rural express industry.

(3) It improves the delivery efficiency and service quality of express delivery.
(4) During the outbreak, avoid human to human contact and prevent cross infection.

4.2.2. Disadvantages of UAV delivery mode.
(1) Large upfront investment.
The initial investment of unmanned distribution equipment is large. In the early stage, a lot of money and experimental exercises are needed.
(2) Policy restrictions on UAV distribution
At present, there are no laws and regulations related to UAV delivery at home and abroad.
(3) The technology is backward.
The technology maturity and reliability of the unmanned distribution equipment are not high enough to ensure that it can automatically avoid obstacles and do not deviate from the route during the transportation process, and the battery endurance cannot guarantee that the UAV can complete the long-term flight.

5. Contactless distribution mode optimization

5.1. Smart courier cabinet

5.1.1. Optimisation of Smart Express Cabinets
(1) Smart express cabinet is divided into express cabinets and food cabinets. Express cabinet to receive daily express, food cabinet to receive takeaway food and fresh products. The smart courier cabinet is equipped with UV disinfection device sprigs in each small cabinet. Automatic disinfection is provided at the hatch.
(2) The express cabinet is disinfected with the express and the cabinet by using ultraviolet disinfection device after the express is placed, and then notifies the customer to pick up the goods.
(3) Food cabinet has two functions of refrigeration and heating choice. Fresh and need cold meal takeaways are stored in the cabinet before the cabinet and the goods are disinfected separately. The takeaway, which needs to be heated or insulated, is stored in the cabinet and disinfected simultaneously by ultraviolet light.

5.1.2. Smart express cabinet refrigeration and heating principle
The temperature control device of the inner grid adopts the Peltien effect device, as shown in Figure 2, when the n-type semiconductor material and P-type semiconductor material of the device are connected to the electrical couple, the DC current is connected, the current is transferred from the N-type element to the connector of the P-type element to absorb heat, become the cold end, from the P-type element to the N-type element joint release heat, become the hot end. The unit has two functions that both cool and heat, so it can replace discrete heating and cooling systems with a single device.
5.2. UAV distribution mode optimization

(1) Strengthen the research of UAV Technology

To solve the problems existing in the development of UAV distribution, we should strengthen the research of UAV technology. To solve the problem of short battery life and weak perception ability of UAV, we should strive to improve the ability of UAV to avoid obstacles, and at the same time, we should try to improve the bearing capacity of UAV, so that UAV can be better used in other express delivery, not only delivering lighter items.

(2) Relevant departments should improve laws and regulations related to UAV as soon as possible

At present, the biggest problem of UAV transmission is that the relevant laws and regulations are not perfect, and the field is fuzzy, which directly negates the application of UAV in transmission. Therefore, relevant departments of the state should timely introduce laws related to drones, improve laws and regulations related to drone delivery, and promote the development of drone logistics and distribution.

(3) Strengthen UAV distribution security

Safety barrier in UAV distribution:

① Falling hazard to ground safety due to extreme weather conditions.
② Drones are likely to be intercepted and distributed by others.
③ Once the withdrawal and distribution items are lost or dropped, it will not only cause safety hazards to the ground personnel, but also cause the owner's privacy disclosure and other situations.

These problems need to be solved. Therefore, in order to enhance the safety distribution of UAV, it is necessary to improve the obstacle avoidance ability and enhance the security function of UAV[5].

6. Conclusions

Based on the current situation of China's express delivery industry, this paper focuses on the analysis of the problems in the development of non-contact distribution mode. By analysing and comparing the advantages and disadvantages of traditional distribution mode and contactless distribution mode, the advantages and disadvantages of the two existing contactless distribution modes intelligent express cabinet distribution mode and UAV distribution mode are optimized, and according to the special requirements of the two contactless distribution modes under the epidemic situation, they are optimized from two aspects of technology and safety respectively to ensure the distribution safety of the epidemic situation.

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