

Practical Research of Intelligence in Epidemic Prevention Product Design

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Abstract. The epidemic of infectious diseases is a public issue that should be taken seriously. Novel coronavirus pneumonia is sweeping across the world, focus on the related intelligent product design which can play a key role in the epidemic control is urgent and essential. This article based on the intelligent product design, by analyzing the current epidemic situation to find the weak-points in the process of epidemic prevention, then using the user behavior analysis research and persona to pitching in, establish a certain resupply vehicle design "Helper" that may inspire the Novel coronavirus pneumonia epidemic control and the infectious diseases may happen in the future.

1 The Research Background

1.1. Current Situation Analysis

1.1.1. Recent Status of Novel Coronavirus Pneumonia. Novel coronavirus pneumonia is spreading from person to person throughout the world. As a member of society and a link in the transmission chain, each person's behavior plays a crucial role in the prevention and control of the epidemic.

Since late January, the rapid spread of novel coronavirus pneumonia has caused a severe short-term impact on industrial production. In the first two months of 2020, the added value of industries above the designated size declined significantly, and the production of most industries and products declined. However, the growth of people's livelihood was steady, and the production of epidemic prevention supplies grew rapidly. Since mid-to-late February, the resumption of production by enterprises has been accelerated, and industrial production has resumed at a faster pace. So far in March, the overall epidemic situation in China has been basically stable, but imported cases still exist in various regions. The epidemic situation in other countries and regions around the world is still not optimistic.

1.1.2. Transmission Path Analysis. Novel coronavirus pneumonia has a variety of ways of transmission, including droplet contact, aerosol, fecal mouth transmission etc. The conclusion of researchers so far shows that respiratory droplets and close contact transmission are still the main transmission path of novel

coronavirus, and the people who got sick can be traced back to having close contact with confirmed cases.

A "close contact" is a person who has one to two meters of close contact with a sick or suspected patient in an unprotected situation, such as living together, working together, eating or shopping in public places, or using the same vehicle. Without living with a confirmed or suspected case and working from home, the average adult resident may be infected with the virus in their daily life.

- Cross-infection risk of elevator buttons with high frequency of contact.
- Direct droplet infection caused by staying in a crowded place.
- The possibility of fecal oral transmission in public places.
- The possibility of direct transmission by potential delivery personnel and indirect transmission by packaging when taking out food.
- During the process of touching the door handle or express box in a public place where virus droplets are attached to the surface, the contaminated hands will contact the mouth, eyes and other mucous membranes, resulting in indirect infection.

1.2. Overview of Intelligent Products

1.2.1. Intelligent Product Design. Intelligent products can process human-computer interaction, automatic link in and network interconnection. It can be the bridge of communication between the products and users, so that people's needs can be perceived by the products and realized in the interaction. Intelligent, efficient and convenient, and also possible to meet the potential needs

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in people's daily life. Intelligent design follows two main principles: human-centered, taking user needs and feelings as the first priority in the process of product using, and realizing the interaction between people and products under the principle of humanization to improve user experience; Information interconnection, can be wireless connected between products and the Internet, pay attention to the physiological and psychological needs of users other than the surface behavior of users, provide more secure and fast automatic integrated control.

1.2.2. Significance of Design to Epidemic Control.

From the perspective of preventing transmission, the implementation efficiency of epidemic prevention and control measures should be improved by updating the functions of current relevant products; From the perspective of personal protection, the design of the product can effectively reduce the frequency of people

going out for lack of suppliers to cut down the risk and probability of virus infection.

2 Design Process

2.1 Design Analysis

2.1.1 User Behavior Demand. Take users' needs as fist priority, the persona was established to analyze the demand by listing the user's one-day behavior and travel radius.

The persona shows that the main sources of infection risk caused by surface adhesion or improper handling of susceptible substances (such as used masks, long-distance goods and public goods, etc.) as well as the potential risk of infection caused by being in crowded public places or be in contact with susceptible person.



Figure 1. PERSONA (by the author)

2.1.2 Product Value. Functional; can give a certain solution to the epidemic situation. Practicality; To ensure that the designed product can be used not only during the epidemic, but also in the daily use after the epidemic.

2.2 Design Concept.

The design of an intelligent "helper" machine can not only solve the problem of disinfection and disposal of affected materials, but also reduce the travel frequency

and necessary activity radius of individuals by acting on their own, thus reducing the risk of close contact between people and droplet transmission.

It integrates the functions of ultraviolet ray virus-elimination, following mode and obstacle climbing. Based on the IoT (Internet of Things) it performs precise and intelligent operation and completes relevant instructions for users to fetch supplies safely and efficiently. A assistant machine integrating intelligent elimination, following and storage functions into one.



Figure 2. Structure Inspiration



Figure 3. Shape Inspiration

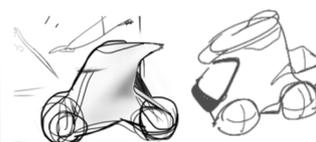


Figure 4. Sketch (by the author)

Develop the form through the inspiration drawing, pick the key sketch from the preliminary scheme sketch, and determine the development direction.

2.3 Presentation.

2.3.1 Rendering. Through the preliminary investigation and positioning and the development of sketches, the final scheme was determined, and Photoshop was used to render the final three-view scheme.



Figure 5. Rendering (by the author)

2.3.2 Functional Structure Description.

- The built-in ultraviolet disinfection and sterilization function can effectively eliminate the bacteria attached to the surface of the purchased materials, thus eliminating the usual disinfection of the materials with home alcohol and sun exposure, which is more efficient, convenient and safe.
- Based on the Internet of things, it is equipped with the function of intelligent sensor and video recording to effectively identify the road environment, detect the surrounding conditions and adjust the route in time, and interact with pedestrians in real time.
- Bluetooth realizes wireless charging mobile phone connection function, energy saving and environmental protection, lasting battery life.
- The multi-group connecting rod structure of the front wheel can effectively go up and down the stairs, while the caterpillar structure of the rear wheel can adapt to the complex and changeable terrain. It can effectively replace the daily collection of daily supplies of running errands for residents, reduce the necessary travel frequency of people, and thus reduce the risk of virus infection and the consumption of medical supplies such as disposable masks.

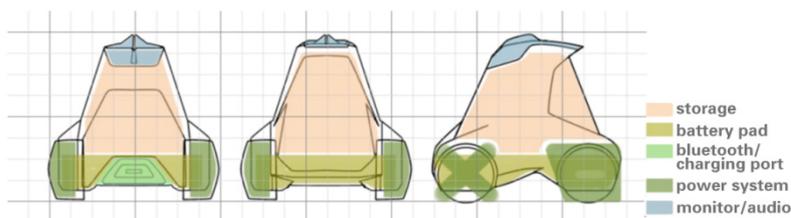


Figure 6. Package (by the author)

2.3.3 Using Process. For the purpose of reducing the activity radius, the functional flow of material collection:

- Start the "Helper", connect to Bluetooth, and set the destination; Take it to the elevator or staircase on the residential floor, and the "Helper" will automatically plan the route and go down.
- The "Helper" sends the estimated arrival time to the mobile phone terminal according to the road condition.
- Upon arrival at the destination, enable the monitoring and real-time communication function of the APP connected to the phone, and

communicate with the boss through scrolling subtitles or voice on the LED screen of the "Helper".

- Check the store information and payment code through the mobile terminal, transfer the money to the third-party platform of the APP, and complete the transfer at the same time after the "Helper" opens the storage box and detects that the goods are in place.
- "Helper" monitors and detects that the store owner beckons to plan the return route after the transaction is completed without dispute, and automatically locks the storage box;
- Waiting for the "Helper" to return, you can choose whether to carry out the UV disinfection

function at a fixed time in the return trip according to the needs of the mobile phone.

For the purpose of eliminating and killing infected materials, the functional of movable virus eliminating vehicle:

- Start the "Helper" mobile phone terminal, call "Helper" to make sure the Bluetooth is connected and set your location as the destination;
- The "Helper" will automatically plan the route and go downstairs;
- Open the storage bin by setting the phone and set the disinfection time mode
- The "Helper" takes the command and opens the storage bin
- Put in items for disinfection, after the end of time can be removed.

2.3.4 Using Scenarios. During the epidemic: hospitals and enterprises used for the transfer of medical supplies or office materials to avoid personal contact; Personal use for the purchase and collection of materials, the delivery of the delivery of goods and the cleaning and disinfection of the packaging.

Daily life: automatic meal machines in restaurants save labor; The enterprise is used for cross-departmental document approval and delivery and running errands to improve office efficiency; Personal use for short-distance travel food storage, following the shooting, running errands to get things, etc.

3 Conclusion

The design of intelligent epidemic prevention product is not only the practical design for novel coronavirus pneumonia, but also the embodiment of contemporary designers' social responsibility. At present, the epidemic situation in China is gradually steady, but intelligent epidemic prevention design is still of great significance for the prevention and control of similar infectious diseases in the future.

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