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Research on nucleic acid detection product design driven by service design in post epidemic Era --Take FengHuangZhou community in Nanchang as an example

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Abstract: *Since May 2020, China's epidemic prevention and control has entered a stable stage. The overall trend is that the epidemic situation rises and falls from time to time. It may break out on a small scale at any time, return from foreign countries and have seasonal attacks, which will have a far-reaching impact on all aspects. In this study, the community nucleic acid detection products and service system in such a "post epidemic era" as the breakthrough point, through qualitative and quantitative research methods, using issue Map, user interview, data crawler, emotional data analysis and other research tools are used to analyze and integrate the existing community collective nucleic acid detection process, basic user groups, stakeholders and so on. After having a good understanding of the existing service system and products, the outstanding problems of the service system are further optimized, focusing on solving process visualization problems and special crowd services Problems, online product optimization. Build a new stakeholder system, user journey, prototype, and carry out prototype testing to get feedback, in order to provide reference value solutions to deal with large-scale public health problems in the future.*

Keywords: *nucleic acid detection, epidemic Era, public health*

1. Challenge and demand of epidemic Era

1.1 Current situation of epidemic prevention in China in the post epidemic Era

As far as the current situation is concerned, the "post epidemic era" is not an era in which we originally imagined that the epidemic situation would disappear completely and return to the original situation, but an era in which the epidemic situation would rise and fall from time to time, small-scale outbreak might occur at any time, return from foreign countries and seasonal outbreak, and delay for a long time, which would have a far-reaching impact on all aspects. In the "post epidemic era", people attach great importance to public health and safety, pay attention to personal hygiene and prevention, tend to a healthier lifestyle and pursue "healthy community"; At the same time, in order to reduce the close contact between people during the epidemic period, convenient intelligent unmanned products are applied to the bus, warehouse transportation, express delivery and other businesses. In the "post epidemic era", people's acceptance of unmanned products continues to improve, and the online lifestyle continues to deepen.

In this context, China's response to the epidemic has distinct characteristics of epidemic prevention measures, such as: hierarchical centralized management: different epidemic prevention measures according to different risk levels; refinement to individual: refinement to individual: refinement to individual unit to ensure the implementation of permanent population registration to individual; grid community epidemic prevention mode: realization of resource grid, management grid, service grid and responsibility network The following is a comparative analysis of the distribution of settlements in China and the United States. It can be seen that the grid management mode adopted in China is the product of originality and adaptation to local conditions.

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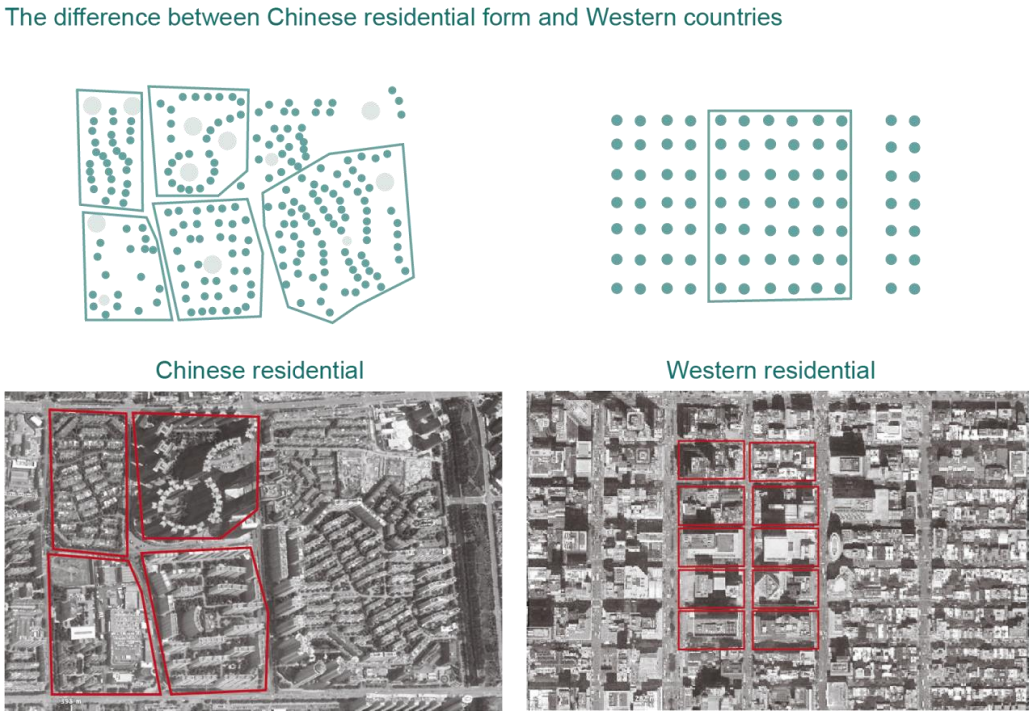

Figure 1: Analysis of regional location (image source: self drawn by the author)

1.2 Analysis on the current situation of foreign epidemic prevention in the post epidemic Era

In novel coronavirus pneumonia, Trump, President of the United States, formally declared the United States into a "state of emergency" at the White House South Lawn press conference in March 13th. The federal government has opened 50 billion US dollars to deal with the outbreak of the new crown pneumonia. The fund will be used to establish emergency centers for COVID-19 in all States. In March 27th, novel coronavirus pneumonia signed by the US President Trump signed the $2 trillion stimulus package to deal with the impact of the new crown pneumonia epidemic on the US economy. At the same time, with the surge of demand for medical professionals, the Immigration Department issued an announcement on the Internet to encourage medical professionals seeking jobs in the United States, especially medical professionals with experience in the prevention and treatment of new coronavirus, to contact the U.S. Embassy directly if they are interested. A few days ago, trump said that at present, the United States can test 300000 copies a day, ranking first in the world. The virus detection rate in the United States is 12%, which is 36000 cases per day. Although the U.S. authorities have taken some remedial measures at the macro level, it is obvious that the management of most continents and regions do not have a high awareness of prevention and control, and rely more on the consciousness of the masses. Moreover, there are many problems in nucleic acid testing and vaccination, such as insufficient supply, low efficiency, and so on. The relevant work is more to deal with emergencies than to build a complete system the good service system has not really prepared for the long-term coexistence of New Coronavirus and mankind.

1.3 Design challenge and value in post epidemic Era

Since the outbreak of the "post epidemic era" occurs at any time and may erupt at any time, we need to make preparations for the long-term co-existence of New Coronavirus and human beings. When constructing a service system for nucleic acid detection and vaccination, we should consider the cooperation between community services and medical work in order to serve residents more reasonably and efficiently. Therefore, this paper focuses on how to solve the problems of process visualization, special crowd service and online product optimization.

The purpose of this study is to build a relatively perfect community public health service system to cope with the development of corresponding medical work in the "post epidemic era", build a bridge between community service and medical toilet, drive the innovation of public health with design, and facilitate the orderly and efficient development of medical detection, vaccine planting and other work in the community environment.

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The purpose of this study is to build a new stakeholder system, user journey, prototype, and test the prototype to get its feedback, in order to provide reference value solutions to deal with large-scale public health problems in the future.

2. Research path and method

First of all, based on the analysis of the epidemic prevention situation and design value at home and abroad in the post epidemic era in the previous chapter, the author obtains the current situation and people's needs of the community public health service system in the post epidemic era. The current situation and needs are more complex, so this study decided to adopt the cross research tool method, that is, qualitative and quantitative research methods.

Because the research subject is relatively clear, so in this research process, we use the research path of combining qualitative and quantitative research, through qualitative research tools such as issue Map, semi-structured user interview, questionnaire survey, situational map; and quantitative research tools such as data crawler, emotional data analysis and other research tools and methods are used to analyze and integrate the existing community collective nucleic acid detection process, basic user groups, stakeholders and so on.

It involves qualitative research micro tools, such as issue map. In the process of raising questions, through the analysis of the problems, it interprets and analyzes the problems of people, people and environment, people and interface. After summarizing and analyzing the problems, it comes to the three problems that need to be solved, namely: process visualization problem, special crowd service problem, and online product optimization problem. As well as semi-structured user interviews, we conducted semi-structured user interviews for the elderly (70 +), children (14 and below), office workers (national legal holidays standards), medical staff and community volunteers, the questions are as follows:

Semi structured user interview

	Over 70 years old	Children under 14	Working workers (national legal holiday standard)	Medical staff	Community volunteers
QUESTION 1	Why do you do nucleic acid testing?	How old are you?	Why do you do nucleic acid test?	What's special about the post epidemic period for you	What is the ratio of community staff?
QUESTION 2	Do you test by yourself? Who's with you	Why are you doing nucleic acid testing?	Do you know the nucleic acid testing process?	What problems do you have at work? (pain point)	What are the epidemic prevention measures in the community? (what are the problems / pain points?)
QUESTION 3	Do you know the inspection process?	Who are you with?	How do you understand the inspection process?	What is the nucleic acid detection process? What are the problems / pain points in management	How many residents are there within the management scope of this community? What areas are covered? (population / region)
QUESTION 4	What links do you think you need assistance in the testing process?	Do you know how to do nucleic acid testing?	Why did you choose to come here for nucleic acid testing?	Who are the inspectors? How many people a day? How many at most?	How many staff are there? How many professionals are there? How many staff are needed to carry out community inspection and investigation? (efficiency)
QUESTION 5	What are the inconveniences in the testing process?	Do you know where to do nucleic acid test?	What's your experience with nucleic acid testing?	What are the new problems in the post epidemic period? (others)	What are the responsibilities of volunteers?
QUESTION 6	Do you know when and where to query the test results?	Who would you ask if you had any questions?	Are you satisfied with the nucleic acid detection process? Why?		What problems will you face in your work?
QUESTION 7		Do you know what else to do after finishing?	What time period do you usually choose for nucleic acid detection?		What's your average working time? (time period)

Figure 2: Interview questions (image source: self drawn by the author)

The sample base of the questionnaire survey is 66, mainly for residents to further investigate and analyze the problems that may exist in the current community nucleic acid testing process, aiming at the five dimensions of appointment form, resident type, queuing time, testing process publicity, testing place to have a more perfect understanding of the community testing process.

Based on the investigation and information collection of the existing community nucleic acid testing service process, the author sorted out the description and description of the scene map of the whole process from the beginning of receiving the report, the relevant staff and volunteers to carry out all kinds of preparatory work, to the residents' experience and testing process until the results are obtained, and explained the problems faced by different groups.

In view of the evaluation of community nucleic acid detection process published by people on the major social platforms, the author analyzed the emotional data of the evaluation in accordance with the process order, mainly in the positive and negative aspects, and in different links, different people also face different problems and pain points.

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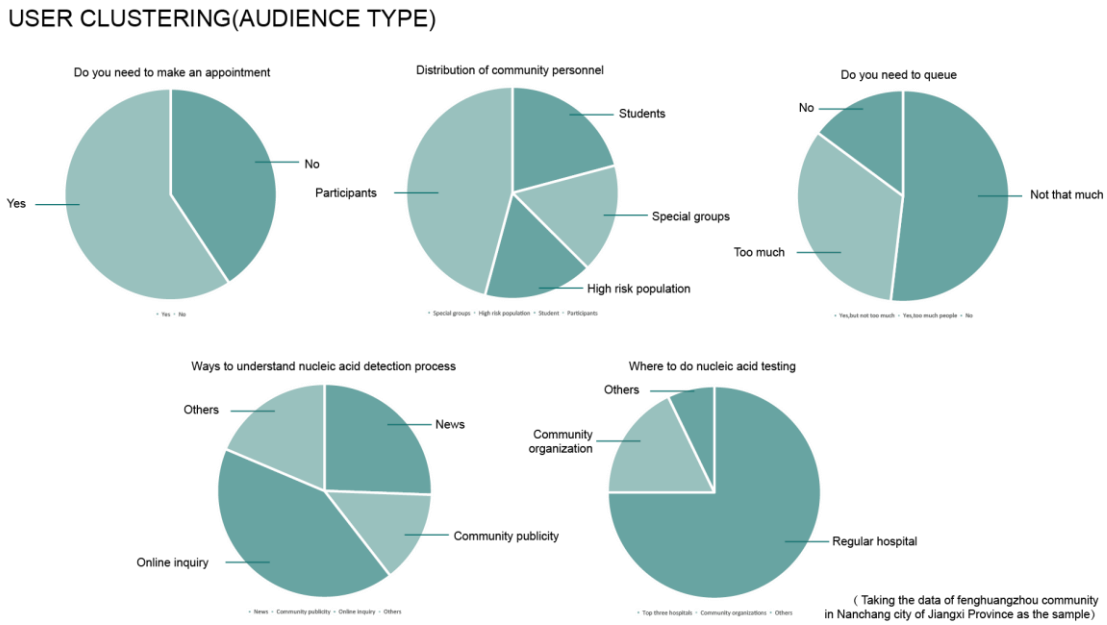

Figure 3: Data chart of the questionnaire (image source: self drawn by the author)

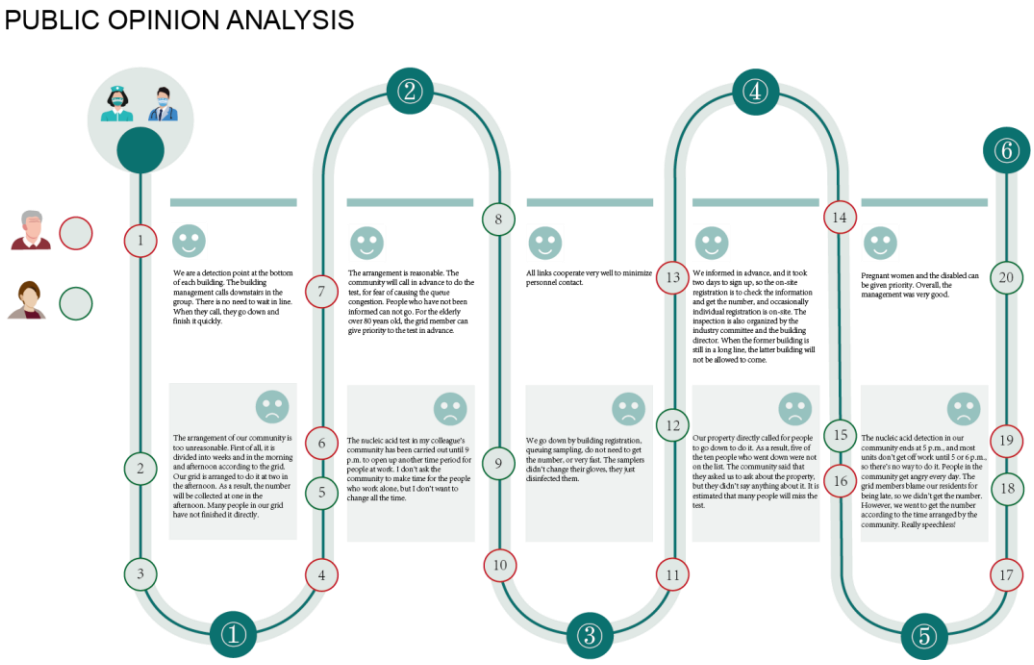

Figure 4: Analysis of emotional data (image source: self drawn by the author)

3. Analysis of community nucleic acid detection service system

3.1 Basic service system and user analysis

The research team tracked the basic user's selection of typical samples, listed each scene and link of community nucleic acid detection in chronological order, and explained the details and tandem relationship in detail.

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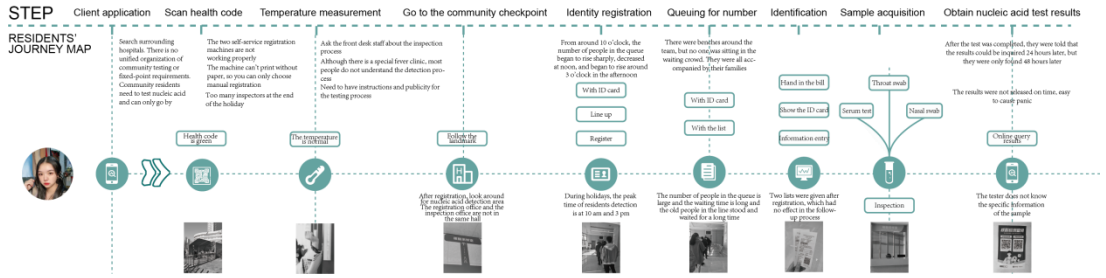

Figure 5: Map of residents' journey (image source: self drawn by the author)

In the whole process, first scan the health code, test the body temperature, and then find the corresponding fever clinic for registration. The list obtained by registration goes to the corresponding area for queuing. After entering the laboratory, first confirm the identity information through the ID card, and the medical staff asks for the reason for nucleic acid detection. After detection, self scan the QR code, and then go online for 6 to 8 hours Query the results on your own.

(1) Exploration and discovery of core issues

After the research and analysis of basic user scenarios and a large number of field research, the problems observed are described and classified in detail, from people to people, people to environment, people to interface. Finally, through the integration of the summary, it is concluded that the focus is on problem solving.

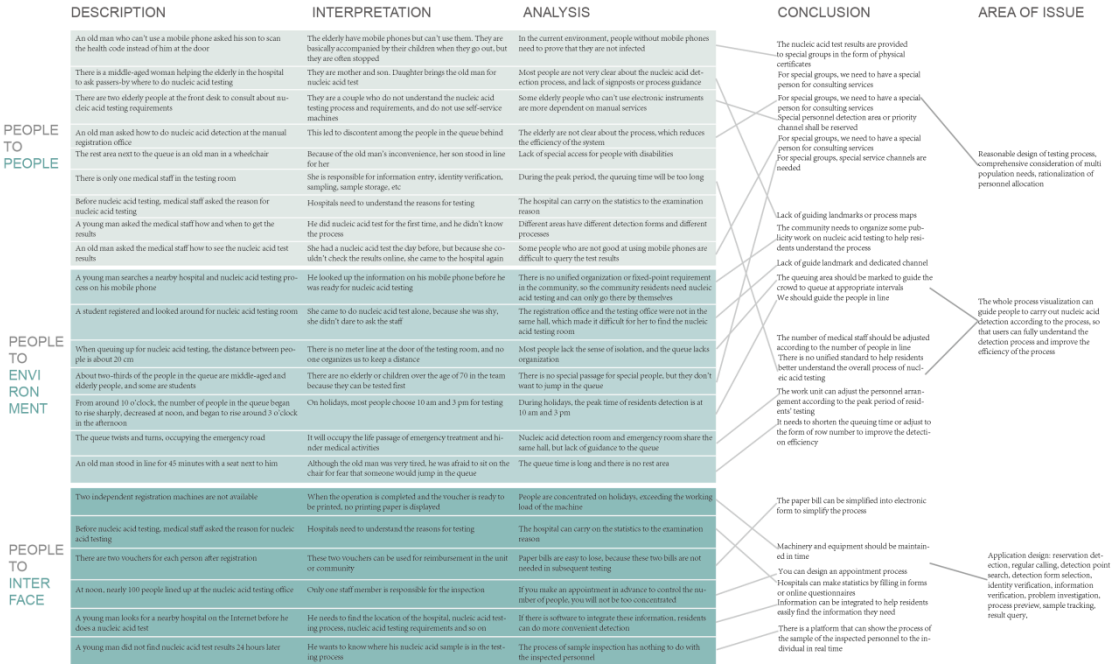

Figure 6: Problem statement (image source: self drawn by the author)

(2) Stakeholder construction

Before constructing the stakeholder chart, I first conduct semi-structured user interviews with stakeholders in each link. After understanding the interest relationship, I show these crowd relationships in the form of charts.

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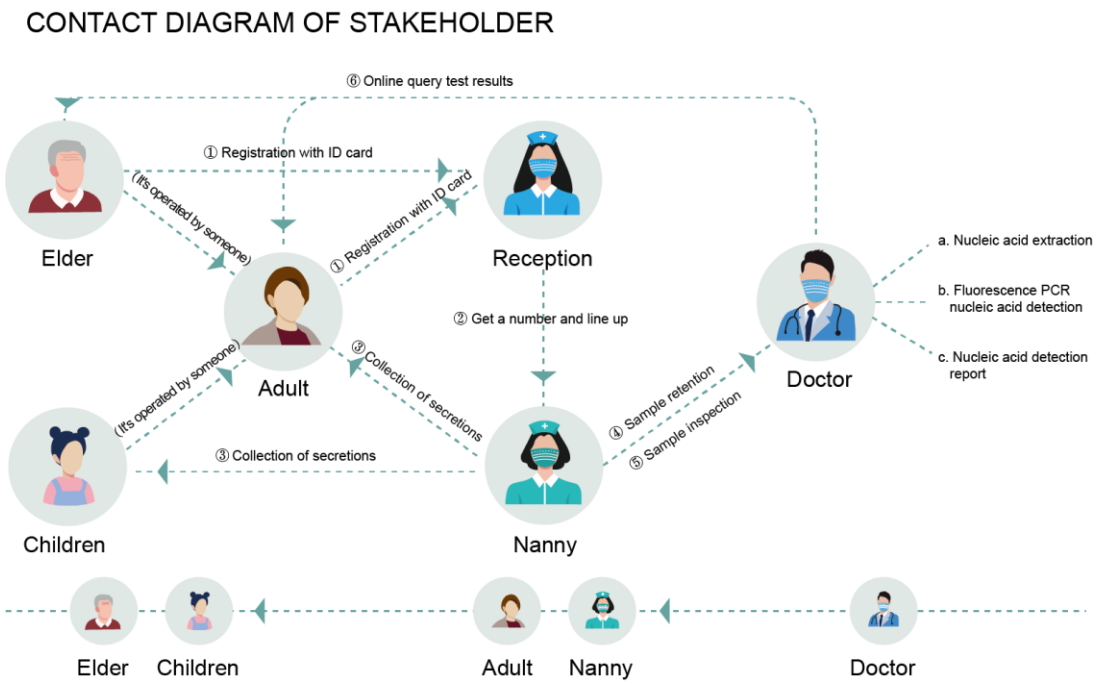

Figure 7: Stakeholder map in normal case (image source: self drawn by the author)

In the stakeholder chart, young and middle-aged people play the role of a bridge. Most of their special groups use young and middle-aged people as a contact bridge to connect with medical service personnel. Under the guidance of volunteers, residents complete the registration, registration, nucleic acid testing and other processes under the guidance of medical staff. How to strengthen the connection between special groups and medical workers is the problem that we need to improve and solve through the design.

(3) User journey map analysis

Due to the diversity of users in the community, the research team selected two types of typical users to construct the user journey map for their action points and action sequence in the nucleic acid detection process in the community.

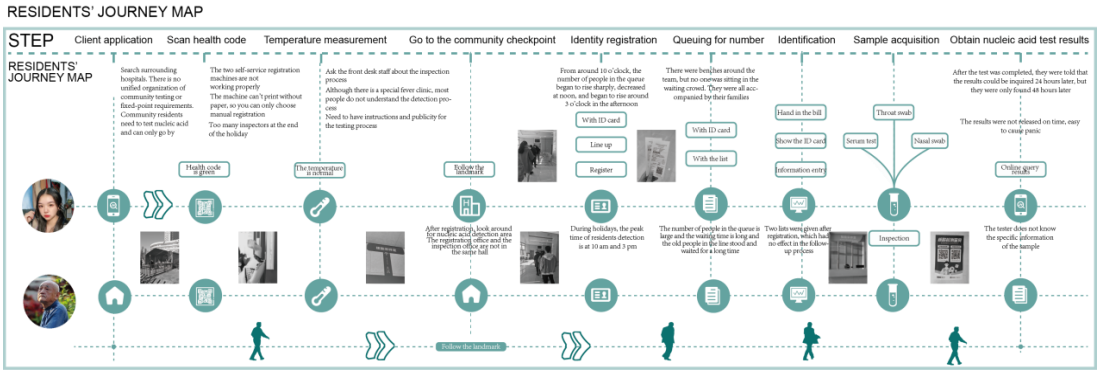

Figure 8: Comparison Chart of special user journey (image source: self drawn by the author)

In the user journey map, the ordinary user process is to scan the health code at the beginning, test the body temperature, and then find the corresponding fever clinic for registration. The list obtained by registration goes to the corresponding area for queuing. After entering the examination room, first confirm the identity information through the ID card, and the medical staff asks for the reason for nucleic acid detection. After detection, they scan the QR code by themselves, and check it After 6 to 8 hours online self query results. For some special groups or people without mobile phones, they can first go to the corresponding kiosks to find volunteers or staff for help. After identification by ID card, the staff will directly guide them to wait in line outside the detection room. For the elderly over 80 years old and children under 14 years old, the disabled and soldiers, they can get priority detection without waiting in line, and the final detection will be completed As a result, we still have to use mobile phone to scan the code and search online.

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(4) Analysis and deconstruction of core issues

In the process of community collective nucleic acid detection, the research team analyzed the survey data and constructed a relatively perfect user profile for the following four types of users:

Among these four groups, special groups and high-risk groups need special attention. Due to the particularity of special groups, they may need the assistance of staff or volunteers to carry out some operations, so they need to be considered in the link design. Because of its particularity, high-risk groups need to be isolated by certain measures to ensure a reasonable distance from other residents. Students and office workers, due to the regularity of their time schedule, can open up a special period of time within the set range to carry out testing services.

3.2 Construction of "community nucleic acid detection" service system under conventional mode

Based on the investigation and information collection of the existing community nucleic acid testing service process, I sorted out the service system description of the whole process from receiving the report, the relevant staff and volunteers to carry out all kinds of preparatory work, to the residents' experience and testing process until the results are obtained, and explained the problems faced by different groups.

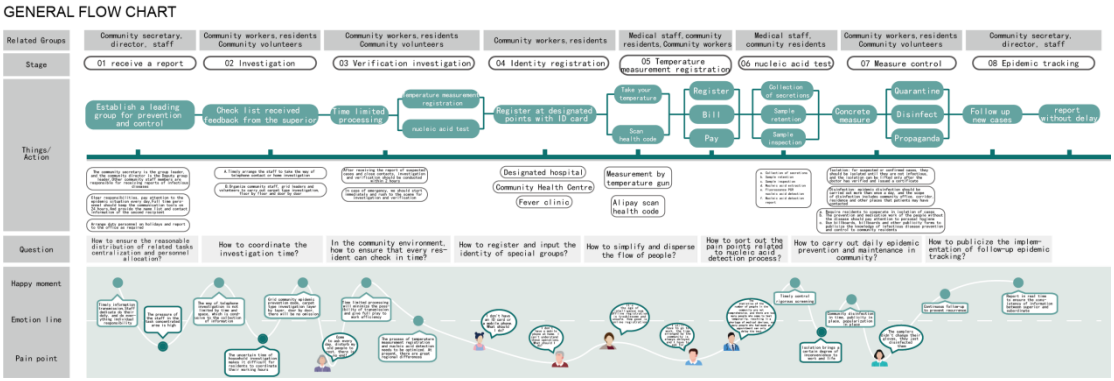

Figure 9: Nucleic acid detection user journey map (image source: self drawn by the author)

In the whole process of epidemic prevention and control, the first is to receive the report, investigate, set the processing time limit and control measures, and do a good job in isolation and disinfection publicity. After the outbreak of infectious diseases, the staff track the occurrence of epidemic heart disease every day, and isolate the corresponding communities and conduct centralized nucleic acid detection and investigation. In the process of centralized nucleic acid detection and screening, residents participate in it and are called service objects. In this process, residents have many pain points, such as there is no special channel for special groups, high-risk and low-risk groups are not isolated for testing, the testing time of office workers and students is in conflict with the volunteer working time, and so on. In the subsequent sample submission and result feedback process, there is also a lag we should pay more attention to the problems of sex, low efficiency and so on.

3.3 Extraction of opportunity points in community nucleic acid testing service design

Combined with a variety of cross analysis tools, the core pain points of community nucleic acid detection service in the current state are obtained,

(1) Under the normal circumstances, nucleic acid detection in the community mostly uses centralized call, which is inefficient, increases the risk of exposure, and is inefficient. There are some problems, such as the conflict between the detection time of office workers and students and the working time of volunteers, the shortage of medical supplies, the obvious difference between the peak hours of medical staff and so on;

(2) Special people can't enjoy special services, such as people without mobile phones, people with disabilities, etc. they need online and offline services to meet the needs of different residents in the community;

(3) There is no special channel for special groups, and high-risk groups and low-risk groups are not isolated for detection, so the hardware products of existing detection points need to be optimized.

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4. Service experience friendly community nucleic acid detection service system construction

4.1 Experience friendly community nucleic acid detection service system construction

4.1.1 Experience friendly new stakeholder system

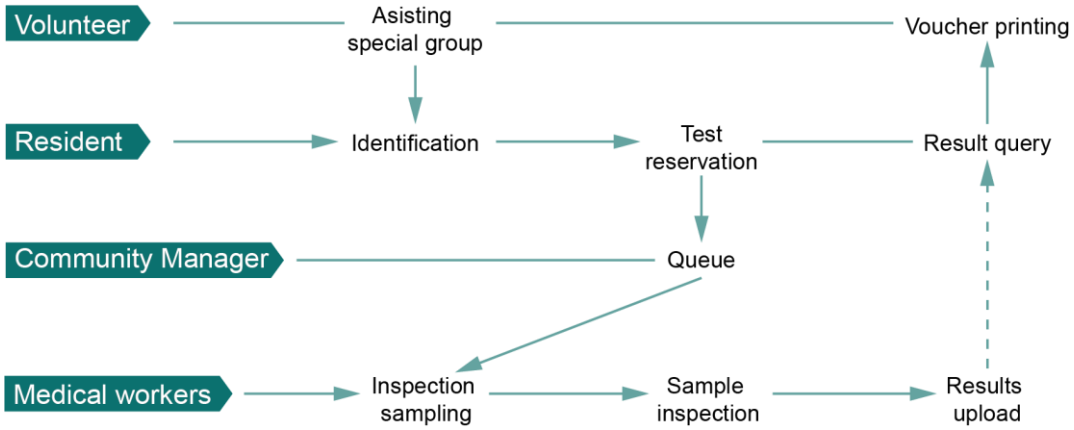

Figure 10: Stakeholder map (image source: self drawn by the author)

The author matches and optimizes the process of nucleic acid detection between stakeholders and residents, divides residents into two categories, those who can complete the inspection independently and those who need the assistance of staff, and then divides and integrates the process, so as to obtain an experience friendly new stakeholder system.

4.1.2 Experience friendly new user journey map

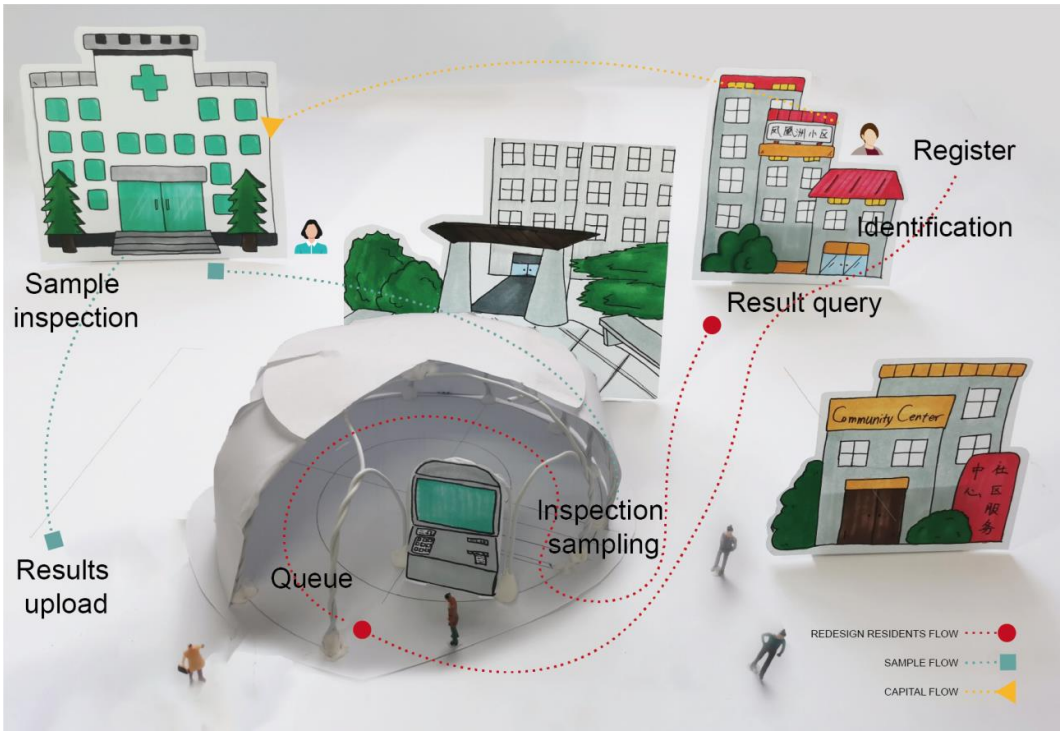

Figure 11: User scenario map (image source: self drawn by the author)

The construction of the new user journey scenario map is still based on the existing institutional facilities, but the optimization of the process makes the online and offline can be parallel, which can give users a better sense of experience. The majority of normal residents can make an appointment through online registration, which greatly improves the detection efficiency. For a few special groups such as people without mobile phones or the elderly, the detection can be assisted by the staff Process and obtain physical evidence, reflecting the role of the special group friendly community service design.

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4.1.3 Experience friendly design prototype and test feedback

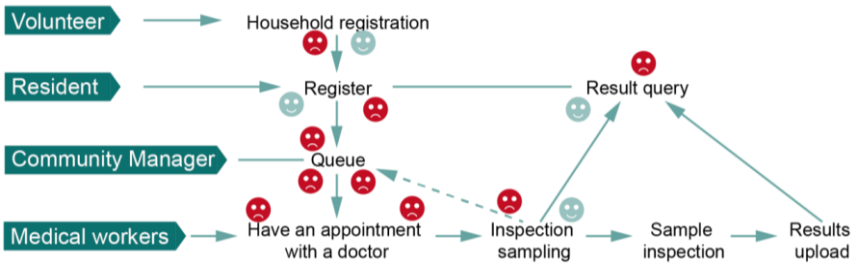

Figure 12: Original user scenario map (image source: self drawn by the author)

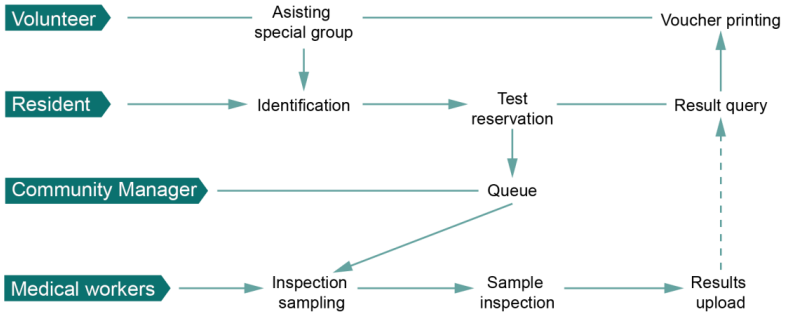

Figure 13: Optimized user scenario map (image source: self drawn by the author)

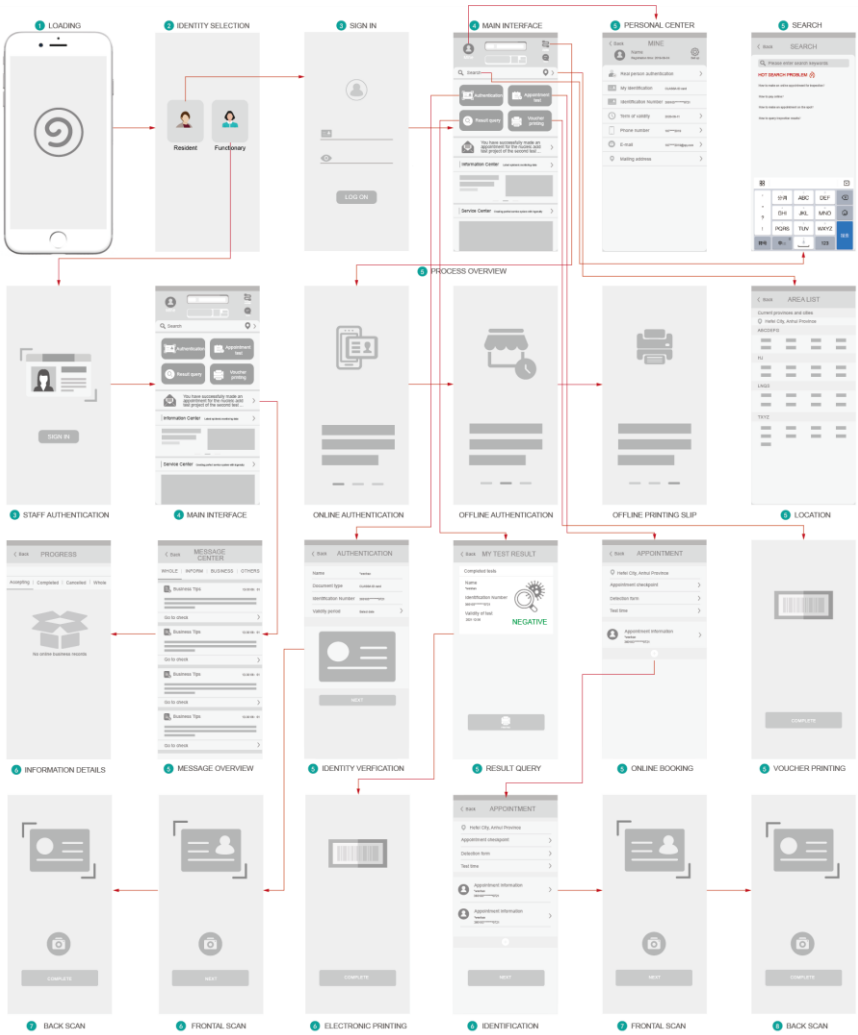

Figure 14: Prototype of experience friendly design (image source: self drawn by the author)

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Through the comparison between the existing user profile map and the optimized user profile map, it can be clearly seen that in terms of process architecture, resident reservation can be divided into online and offline. For details of online reservation process, please refer to the following app low fidelity:

4.2 Construction of public health emergency design guidelines in post epidemic Era

Design highlights and process

(1) In view of the sudden public health problems, it is necessary to fully consider the needs of special groups of residents (no mobile phone group) in order to better serve the public. Designers use online self-service and offline staff to assist online operation, that is, most residents can choose to complete registration / login, online (for others) reservation nucleic acid detection, online results query and other operations on the app, while some residents who can not operate independently can be reserved by community volunteers. In order to improve the process efficiency through online process, we also pay attention to the special needs of some special groups in the community. After all, the public health audience is wide, so it is not suitable to fully use online appointment form, while ignoring the needs of some people without mobile phones.

(2) For the design of community facilities, it is necessary to realize the crowd diversion, so that the priority testing crowd can be distinguished from the routine appointment testing process through the special channel, so as to better serve the community residents. Compared with the single channel in the existing process, the design of dual channel or special channel can better realize the priority needs of special groups and reduce the staff density. Moreover, due to the inconvenient legs and feet of the disabled or the elderly, it is not suitable to stand for a long time, and a leaning structure or seat is needed in the waiting passage. At the same time, the centralized nucleic acid detection facilities in the community should meet the requirements of ventilation, easy disinfection and sterilization, with space landmark and other practical functions. And the structure of the whole facility should be easy to assemble and have a certain wind resistance.

(3) In terms of process, the traditional form of volunteers' door-to-door registration is optimized, and the efficiency of information entry is greatly improved by transferring from offline to online. All functions such as information entry, inspection appointment and result query are transferred to online operation. However, each registered user can make an appointment for nucleic acid detection for others. According to the previous stakeholder analysis, the research team found that among the residents with family as the unit, the majority are adults People usually act as the main operator, and almost all the information and process operation of children and the elderly in the family can be done by adults in the family. Therefore, online booking can be operated by the main body of the family for its members, which also avoids the trouble of repeated information entry. Other family members can directly go to the testing point for testing with their ID cards.

(4) Appointment slip and inspection results can be saved or printed online as the voucher for appointment queuing and submission of inspection results. In the early research process, the author found that there are some problems in the process of audit, such as appointment and lack of certificate of audit results. Therefore, the combination of online electronic certificate and physical certificate is more universal.

5. Summary and Prospect

Based on the qualitative research tool issue Map, semi-structured user interview, questionnaire survey, situational map, quantitative research tools, data crawler, emotional data analysis and other research tools and methods, it is concluded that the core pain point of community nucleic acid detection service under the current state is that the conventional community nucleic acid detection mostly adopts centralized call, which has low efficiency, increased risk of exposure, and low efficiency; there is no special channel for special groups; high efficiency The risk population and low-risk population are not isolated for detection, so the hardware products of existing detection points need to be optimized. However, the existing research and design are still relatively scarce. Researchers mainly focus on the design optimization of online process and offline hardware facilities, adopt the form of online independent service and offline staff assisted online operation, and pay attention to the special needs of some special groups in the community. Dual channel design can better achieve the priority needs of special groups, and reduce the staff density. Online booking can be operated by the family main body for its members, and other family members can directly go to the testing point for testing with their ID cards. Appointment slip and

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inspection results can be saved or printed online as the voucher for appointment queuing and submission of inspection results.

The purpose of this study is to build a relatively perfect community public health service system to cope with the development of the corresponding medical work in the "post epidemic era", in order to provide reference value solutions for dealing with large-scale public health problems in the future. However, there are still some deficiencies in this study. In the process of process optimization, we pay too much attention to special groups, and there are still some problems in the balance of service focus between most residents and a small number of special groups, which need to be adjusted in the process of practice.

This study builds a bridge between community service and medical toilet, uses design to drive the innovation of public health, facilitates the orderly and efficient development of medical detection, vaccine planting and other work in the community environment, and puts forward some thoughts on experience friendly medical service, so as to attract more excellent design about experience friendly medical service in the future reflection.

References

[1] Sun Y, Peng P, Guo R, Wang H, Li T.Exonuclease III-boosted cascade reactions for ultrasensitive SERS detection of nucleic acids, Biosens Bioelectron 2018 May 01; 104.
[2] Zhang M, Ye J, He JS, Zhang F, Ping J, Qian C, Wu J.Visual detection for nucleic acid-based techniques as potential on-site detection methods. A review, Anal Chim Acta 2020 Feb 22; 1099.
[3] Lu, R., Zhao, X., Li, J., Niu, P., Yang, B., Wu, H.et al (2020) Genomic Characterisation and Epidemiology of 2019 Novel Coronavirus: Implications for Virus Origins and Receptor Binding. The Lancet, 395, 565-574.
[4] Schoeman, D. and Fielding, B.C. (2019) Coronavirus Envelope Protein: Current Knowledge. Virology Journal, 16, Article No. 69.
[5] Siu, K.L., Chan, C.P., Kok, K.H., Chiu-Yat Woo, P. and Jin, D.Y. (2014) Suppression of Innate Antiviral Response by Severeacute Respiratory Syndrome Coronavirus M Protein Is Mediated through the First Transmembrane Domain. Cellular & Molecular Immunology, 11, 141-149.