



Design Research for Disability: A Case of Airport Service Design

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Abstract. 1980s, North Carolina State University developed the concept of universal design under the auspices of the federal government of the United States. It has passed through nearly half a century of development. After the concept of barrier-free has come into the field of sociology, it has gained wider social recognition and entered the field of public social policy formulation. Barrier-free design has become the foremost choice of public policy. There are two meanings of barrier-free research in the sociological field: it is the social model of barriers; the second is the birth and research of the universalism of barrier experience; for this reason, the analysis will be carried out from three perspectives: the study of social discrimination against disabilities and the development of barrier-free design research. In today's digital society, digital means and services have covered all aspects of our lives. It covers from public government services to the general social needs of the individual. However, digital products and systems in these fields are designed on the basis of "robust constants". It does not take into account how disabled people integrate into the digital society. Concepts such as universal design and barrier-free design only focus on the relationship between people and objects in physical space. And the interaction between human and physical interface in the process. They have not put forward rational solutions and design ideas for the disabled with digital interfaces and products. Taking the airport service design as an example, this paper tries to put forward new solutions for the disabled on the airport digital travel. From the point of view of system thinking and service, combined with the design method of Internet product experience, the general design based on physical space in the past is moving towards the direction of digitalization and service systematization.

Keywords: Disability · User experience · Universal design · Barrier free

1 Social Concern and Current Situation on Disability

With the development of social modernization, the social "demand" for products and spirit has gradually surpassed the simple material and basic life satisfaction, and then moved to a richer spiritual level. Moreover, the groups concerned by the society are gradually transiting from the mainstream group to the vulnerable group and minority group. The book *Fourth Consumption Age* (2012), by Miura Atsushi, a Japanese sociological scholar, clearly describes the development and formation of consumer

society since the Industrial Revolution. And he divided the consumer society into four stages. The first consumption age defined by Miura Atsushi was the 30 years from 1912 to 1941. In the past three decades, urban population was growing, and the city-centered business model began to take shape, including the birth of department stores, popular magazines, chain stores and modern apartments. The first consumer society formed a city-centered consumption era, which only accounted for one to two percent of the middle class of the society at that time. But from here, a modern westernized way of life has come into being. However, in the first consumer society, most workers provide services for the production of goods for a small number of people above the middle class. That is to say, the enjoyment of services is limited to the middle class living in the city or above. The 30-year period from 1945 to 1974 was defined as the second consumer society. In the second consumer society period, the population gradually gathered to cities. Meanwhile, the mass production Commodities represented by household appliances began to be popularized and promoted throughout the country. If the main object of the first consumer society is still a few elites in society, then the second consumer society benefits from the real development of modern industrialization and the gradual popularization of mass production of goods in all corners of life. Ultimately, it benefits a wide range of mainstream social groups. During the 29 years from 1975 to 2004, economic growth slowed down. The society began to attach importance to the rights and interests of individuals, human rights awareness and so on. As a result, consumption began to shift from family to individual. This kind of individualized change not only exists as a unit of consumption, but also expands the danger of social isolation. Individual egoism has increased. The individualization trend got gradually changed since 2000. Especially the global financial tsunami in 1997, the SARS epidemic in 2003, and the Wenchuan earthquake in 2008, a series of global disasters make people feel the changeability of consumer society. At the same time, people also realize how important it is for families, neighborhoods, society, volunteer organizations, NGOs and other associations to connect. Since then, people have begun to re-examine the consumer society and pay more attention to broader social services. The research on social vulnerable groups has also become the social mainstream concern. Such topics as “fairness”, “rights and interests” of vulnerable groups and their convenience in social life have become new research subjects in the academic circles. Also in this period, the design field began to develop interest in “service”, and the subject of service design began to be established, which realized the transformation from material to service, and made human beings more concerned.

According to the sociological research and analysis of consumer market, we can divide the market development into four stages macroscopically: National (focusing on the state), Family (focusing on the family), Individual (focusing on the individual), and finally Social (focusing on the society). The word “society” in Latin means “partner” and “connection”. However, in the past various stages of market development, with the development of the consumer market, people’s personal awareness has increased excessively, and it is more and more difficult for people to realize the connection between themselves and others. While being in society, we do not feel connected to others. Or there are estrangements and communication barriers in social relations. The current service design is the key to solve this contradiction.

The research of this topic is based on the service design of airport public service. In the scope of the study, we focus on the special groups in airport services. As mentioned above, airport service is an important scenario of today's social system which pays attention to society. Therefore, the study of public service design based on airport service has important reference and guiding significance for service design in other fields. Airport scenario is a manifestation of a variety of needs and contradictions. Airports are different from general government public services. General government public services are compulsory, such as taxation, civil affairs, transportation, safety and so on. This type of government public service emphasizes the subjectivity of service institutions, for example, "taxation is the duty of every citizen" - tax declaration work of the tax bureau is more about persuasion. In public service institutions such as airports, the status and role of service providers are weakened. The user in the service chain is the main body. Therefore, in this service system, we need to pay more attention to users' feelings and experiences. Design and Improvement of Service System shall be centered on traveling users. However, airport services are not the same as general commercial services. Airport services are partly mandatory because of security and other reasons. It is not entirely based on the wishes of consumers. In addition, the airport is a window unit for the outside world, which reflects the values and tolerance of a region and society to various ethnic groups, cultures and strata. Therefore, the degree of concern and care for people with behavioral disabilities at airports has a direct impact on the perception and understanding of the city's tolerance and civility of people for people around the world to a certain extent.

2 Social Policy Concerns for Disabilities

The definition of people with behavioral disabilities includes the elderly, children and the disabled. Since 1999, China has entered into aging society. It is estimated that by 2025, the elderly population in China will reach 280 million, accounting for 18.4% of the total population, and by 2050 it will reach about 400 million. According to the Second National Sample Survey on Disabilities organized by the State Council in 2006, the population of disabled persons in China reached 82.96 million. A total of 70.5 million households with disabilities account for 17.8% of the total number of households in China. The elderly and the disabled are citizens without general behavioral abilities. Therefore, paying attention to the needs of these two groups has a special indicative role in the design of people with behavioral disabilities. At the same time, the elderly and the disabled have many similarities in some characteristics such as lack of physical characteristics, so they can be regarded as one group in study. Children are not exactly equal to adults in mental and behavioral abilities. But they are often accompanied or assisted by adults when they travel. Therefore, in design research, this kind of demand can be regarded as a group behavior.

The state has promulgated many laws and social norms for the protection of the elderly and the disabled since 2010, including the Law of the People's Republic of China on the Protection of the Rights and Interests of the Elderly, the Law on the Protection of the Disabled etc. On the one hand, the promulgation of such laws and regulations has improved the care for special groups in all aspects of social life. On the

other hand, it defines the new latitude and direction of public social services for special groups from a more macro perspective. In conclusion, there are five main principles:

- (1) Independence Principle: People with behavioral disabilities should be regarded as individual citizens with independent behavioral abilities, and entitled to social services without discrimination. At the same time, they can do things independently without additional assistance.
- (2) Participation Principle: to let people with behavioral disabilities participate in the normal group, instead of separating them from other groups. Especially in the interaction of all aspects of public service, they should be involved in the process of experience.
- (3) Care Principle: they should be taken care of and protected by family and society. At the same time, to ensure their privacy needs and quality of life;
- (4) The principle of self-realization: people in special groups should be allowed to fully seek opportunities to reach out to society and obtain the educational, cultural, spiritual and service resources provided by society;
- (5) Principle of Dignity: people in special groups should enjoy dignity and protection of their rights and interests in life. They should be guaranteed not to be abused and treated unfairly, and not to be evaluated on the basis of their economic contribution.

In August 2001, the Ministry of Housing and Construction, the Ministry of Civil Affairs and the China Disabled Persons Federation issued and implemented the Code for Barrier-free Design of Urban Roads and Buildings. In 2012, the latest edition of the Code for Barrier-free Design (GB0763-2012) was issued, which is a compulsory standard throughout the People's Republic of China. It can be seen that our country and society are gradually increasing the attention on people with behavioral disabilities.

Influenced by the government's advocacy and the mainstream orientation of society, various industries in the market have made many new attempts and explorations in the care and services of people with behavioral disabilities. Banks have begun to develop special service processes for users in special groups, set green channels, special counters for special customers, and even provide door-to-door services for customers in need. Railway systems across the country have correspondingly set green channels for special groups. In the international community, accessible facilities such as parking spaces, seats and corridors for the disabled have become the standard configuration of any public service. In the United States, Germany and other places, buses must be equipped with a device called Kneeling bus. Through this device, people with disabilities can easily take public transport. In American supermarkets, shopping carts and elevator fixtures for the disabled have also become standard configurations. In the international community, the introduction boards and guidance systems of scenic spots must include Braille. Moreover, the design and production of each guide plate deliberately makes the graphics into a perceptible concave and convex feeling, which is convenient for blind users to use and recognize through tactile sensation.

Under the impetus of policy environment and social trend, the design of special groups has become an important link and part of consideration of any product or service. However, as for the relevant design of the disabled groups, the existing

category still focuses on the exploration of the shallow needs of the disabled groups. There is lack of research and attention on the deep psychological needs of the disabled, such as fairness, participation, dignity and self-realization, which are required by national and international trends. The solution of these problems is not simply the design of a single product, but also systematic study and even changes of the whole service system and process. The research of this subject is based on this point.

In the development and research of foreign enterprises. Softbank also offers new exploration and solutions to the cognitive gap between the elderly living alone and digital products. Old people are “new immigrants” in the digital world. The life style and interaction mode they are familiar with are still in the “simulation” era [1]. From desktop telephones, tape recorders, players to telegrams and newspapers in public services, etc. These old models and products constitute their experience and perception of the world. In the current digital mode. They naturally feel strangeness and distance. Therefore, using the old people’s familiar interaction mode and cognitive model to reconstruct the digital world, create a familiar environment for them can let them enjoy long-distance chat of social interaction, the convenience of online video, let them perceive the affection of offspring from other places through the digital world, and let the new technology bring them the joy of being in the digital society again, which is an important Design Proposition in the digital society.

3 Study on Travel of Disabled Persons at Airport

3.1 Methodology

This project adopts participatory design method. By inviting disabilities to participate directly in the field research of the airport, we can directly obtain the measurement data of the physical and behavioral characteristics of the disabled in the scene. At the same time, during the whole process of accompanying the disabled, we pay attention to obtaining the thoughts of the disabled people in the process of traveling. By combining with the objective observation data, we compare the objective observation data with the subjective data of the disabled people to obtain our insight into the travel behavior of the disabled at the airport [2].

In terms of research methods, the research group adopted the method of a combination of observation with interview, while serving multilateral relationship in the process of designing the methodology of the subject. In practice, the disabled affairs in society should include three main aspects: the supervision of service - the government, the service provider - the airport and other service agencies, and the service receiver - the special group. Therefore, in this topic, we have conducted a survey on the various interests of the design of disability services [3]. For the government, which is in the supervision of service, the team interviewed the leaders of Guangzhou Disabled Persons Federation, and made a basic understanding of the protection, regulations and current situation of the disabled in public space. As a semi-official organization, the Guangzhou Disabled Persons Federation naturally has the background of the government. Therefore, interviews with the Disabled Persons Federation can obtain the government’s thoughts and opinions on the relationship, importance and development

direction of the cause of disability in the government's public service. In the research and investigation of service provider, we interviewed and observed the airports, airlines and the relevant functional personnel of various departments connected with the airport, so as to obtain further operational data and practical insight. For the service receiver, we invited the disabled people on the reception side and visited the whole service flow of the disabilities at the airport, tested and recorded all contacts.

3.2 Travel Procedure for Airport Disabilities

The travel process of the disabled at the airport is not much different from that of the normal people. But in terms of service supervision, service provision and service receiving needs. Although they have implemented their respective work within their respective duties to the extreme, there are still great service misunderstandings. As a result, it has always been difficult to improve services for the disabled in public.

Ideas and Opinions from Service Supervision Side

Service supervision of special population has always been the responsibility of Guangzhou Disabled Persons Federation. During the visits to the Disabled Federation and the focus group research on the disabled, the research group received many valuable advice and opinions.

Relevant needs of the disabled have been the focus of government work in recent years. In terms of public services, the government has promoted barrier-free facilities standards and formulated standards for passengers with disabilities in the field of public transport. In the field of laws and regulations, the government makes every effort to provide relevant laws and regulations to protect the interests of the disabled. However, in terms of standards for service implementation, no relevant implementation norms have been introduced from the government level. For example, although there are service standards for the disabled, but not specific description and definition of the classification standards for the disabled. Therefore, in society, there are many problems that needs of the disabilities are occupied by others, which are often in conflict with other needs in society. At this time, it is more necessary for all disables to work together to screen and analyze the needs, and to make compromises of the relevant needs of the disabilities. For example, in the research, we found that with the popularization and application of modern motor and battery technology, electric wheelchair has been deeply favored by the disabled for its convenience and mobility. However, in the airport travel scenario, the airport's restrictions on batteries are based on the characteristics of power bank products. As a result, all disabled people's electric wheelchairs cannot be consigned or transported by airlines in China.

Views on Service Provider Side

Service providers are mainly divided into two parts in the domestic aviation industry: airlines and airport services. Airport services mainly provide ground services for passengers and docking airlines. Therefore, airlines and airports need a complete process docking. Airport service process for ordinary passengers is a complete set of service process, which has been verified and used for a long time by most airports in the world. It is a mature and efficient service system. This set of processes has been integrated and linked with various systems of airports and airlines and become an

important link for the normal operation of the huge Airport system. However, services for the special population are neglected and missed in the software and hardware systems of airport services.

In recent years, various social service fields have started a large-scale “information” wave of products and services. From domestic tax service, public transport service to all levels of people’s social life, “autonomous” and “digital” services have begun. In general, this reduces the time cost and operation cost of the public in the field of public services. However, from the perspective of the disabled, the digital life has brought new difficulties to their already extremely inconvenient accessible social life. Airport travel scenario is also an important example. At present, the airport began to promote “self-check-in” on a large scale, so that ordinary passengers can quickly print itineraries, check baggage and board. However, this “self-help” process has brought many problems to the disabled.

From the perspective of service provider, the self-service they provide for passengers is universal. For the disabled, they think that most of them will be accompanied by people with good mobility because of the inconvenience of travel. Therefore, all the facilities provided by the airport can only be operated by normal people. For the disabilities traveling alone, airports are more inclined to provide one-to-one service for these special passengers. But such services consume more resources and cost more. Therefore, one-to-one airport services need to be booked in advance by telephone and website. For all airports responding to the needs and services of the disabled, the fundamental logic lies in the attribution of the problem of disability and the question of which party should be responsible for the problem. Airports are more inclined to attribute the problem to the disabled themselves: because they do not have the ability to behave, they need to use their own resources to make up for the deficiencies, including accompanying and caring by healthy relatives. At the same time, in order to provide better services for the disabled, the airlines also specifically limit the number of disabled people on different types of aircraft (Table 1).

Table 1.

Model	Limit number of persons	Remark
A330	4 Disable Peoples	Only economy class available for all models. No unaccompanied children are allowed in first class or business class
B737	3 Disable Peoples	
B777	5 Disable Peoples	
A380	8 Disable Peoples	
B787	4 Disable Peoples	
A321/320/319	3 Disable Peoples	
E190	2 Disable Peoples	

The Disabilities' Views on Airport Travel

Through research, it is found that there are great differences in the aspects of concept consciousness, cognitive behavior and human-machine relationship scale for airport travel between the disabilities and the service providers. Through the perspective of the disabilities, we can see that the designers designed the airport design process for the convenience of the disabilities [4]. But from the perspective of the disabilities, these processes create a lot of inconvenience for them. We elaborate on the study of this group from three parts: concept consciousness, cognitive behavior and human-machine relationship scale (Table 2).

Table 2.

Scene	Pain points	Remark
Metro Exit B	Take a circle to the escalator after leaving the subway gate	Their habit has always been to look for escalators through blind paths
Escalator (No. 1)	1. The button on the middle floor of the escalator shows the arrival of the parking lot it is opposite direction of the people stream when walking out of the escalator 2. No further instructions were given after leaving the staircase or escalator. it is opposite direction of the people stream when walking out of the escalator	
Explosion proof inspection (1st floor)	No signs of how to get to the hall after the explosion-proof inspection, and searching of the escalator	
Escalator (No. 2)	After finding the escalator, the front and back of the escalator are not obvious. At first glance, one cannot tell which side the door is	Walk straight to the door of the escalator, but the interviewee goes around to the back of the escalator before he realizes the position of the door
Departure Hall (3rd floor)	There were no clear instructions when we arrived at the departure hall	Interviewee's demand for arrival at departure hall is to avoid extra roads but to be accompanied by airport personnel during the whole journey is not necessary
Service counter	Without low counter	The back of the escalator is facing the service counter, so when you first see the service counter, you go straight towards it

(continued)

Table 2. (continued)

Scene	Pain points	Remark
Enquiry counter	There are high and low counters, but they did not make inquiries there	The inquiry counter is opposite the service counter, that is, ahead of the user's left-hand direction, which is far away, so it is not seen
Self service check-in	<ol style="list-style-type: none"> 1. To get close to the check-in machine, the wheelchair will lean towards the machine, so will the body. One needs to look up at the machine, and you can't see the screen clearly due to reflecting light 2. When looking for self-service consignment, the self-service check-in machine blocked the self-service consignment cabinet and one has to search for a long time. (sight limit for people on Wheelchairs) 	
Self service consignment	<ol style="list-style-type: none"> 1. There is a height difference in front of the self-service consignment machine, and the cushion is not suitable for wheelchair movement 2. The baggage tray is a little heavy 3. One has to look up to the machines for self-service consignment 	<ol style="list-style-type: none"> 1. A person travels with a backpack (a bag can be held in his hand and a bag hung behind his wheelchair). It is not easy to take out the backpack behind the wheelchair, but she could manage even if it was heavier 2. The machine interface of self-service consignment is operable 3. The existing wheelchair consignment still has to go to the manual counter. If the wheelchair self-service consignment cannot be solved, she will not choose self-service, it is more convenient for her to go directly to the manual counter 4. After taking the tray for luggage, she pushed the checking machine by hand so that her wheelchair could slide backwards

(continued)

Table 2. (continued)

Scene	Pain points	Remark
Manual counter	<ol style="list-style-type: none"> 1. At the low counter, the staff need to stand up to pass the certificate to the interviewees 2. Check the size, weight and power supply of wheelchair when checking in wheelchairs 3. Wheelchairs can now be assigned for replacement of airport wheelchairs, or can be checked in at the boarding gate after being checked for compliance 	<ol style="list-style-type: none"> 1. Interviewees preferred to use their own wheelchairs and check them in at the boarding gate because she felt that the wheelchairs at the airport were unsafe and the size was too large (the same size as international passengers) 2. When choosing to check in the wheelchair at the boarding gate, you need to apply/check/make notes on the check-in system (sit on your wheelchair and check). The batteries of the electric wheelchair needs to be checked. Large wheelchairs also need to be checked at the oversized luggage counter 3. It takes 20–40 min to wait for the wheelchair at the airport 4. Wheelchair consignment is not packaged, only wrapped with tape, many disabled passengers are not confident about wheelchair consignment, especially for expensive folding wheelchairs, they prefer to take on the plane
Barrier-free toilet	<ol style="list-style-type: none"> 1. The interviewees did not find that the barrier-free toilet door was open 2. Barrier-free toilets do not show whether anyone is using them 3. Barrier-free toilet available sign is not obvious 4. At the top of the sign, there was no sign of Barrier-free toilet. The interviewees did not know whether there was a Barrier-free toilet 	<ol style="list-style-type: none"> 1. When the interviewees were using the bathroom, two cleaning staff did not notice they were in the bathroom. They roughly tried to open the door handle of the bathroom and made loud noises 2. Interviewees spent 20 min in the bathroom 3. The door needs to be pulled outward, which is more difficult at this time, and it is more convenient to push out
Food and beverage department	<ol style="list-style-type: none"> 1. The restaurant lacked instructions and route guidance 2. The toilet near the restaurant also lacks instructions, and toilet route guidance 	<p>Interviewees mentioned that the existing shopping mall K11/Hai zhu City in Jiangnan Xikou is better, and the elevators are fast; while Guangbai does well, but it takes long time to wait for the elevators</p>

(continued)

Table 2. (continued)

Scene	Pain points	Remark
Security check	1. Security counter service personnel need to stand up and check certificates	1. Wheelchairs can directly pass through Security door 2. During the security inspection, the interviewees supported themselves with hands on wheelchair 3. Family members and special groups of passengers pass security inspection at the same passage
Private inspection room	1. The chairs in the examination room are not safe 2. Lack of relevant auxiliary facilities 3. Lack of warmth	1. Suggested that it was important to resettle special people 2. Some body AIDS need to be disinfected after they are removed and examined
Escalator	1. There are no instructions on the escalator 2. In the elevator, the interviewees were in the opposite direction to everyone else	1. Because there are no escalator and signs, after seeing the hand lift, you can only choose two roads: to the left or right to try to find the escalator
Special passenger rest area	Interviewees prefer to go directly to the boarding gate	1. Special passenger rest area, the middle has more seats, and the chairs are not for wheelchair users 2. The rest area is enclosed 3. At the special passenger lounge counter, you can check the change of the boarding gate and the delay of the plane. Special staff will remind passengers of flight information 4. A little earlier than ordinary passengers to reach the boarding gate for boarding 5. After security inspection, we rely more on the guidance of staff
Boarding gate	1. Face recognition is not suitable (requires more than 1.2 m) 2. Passengers use face recognition and do not know the need to scan tickets to get the tickets out	Special people use manual check-in channels, and enjoy priority in check-in boarding.

- **Concept Consciousness:** Disabled people do not think they are the weak in the real-life scene. In other words, in their view, they want society to treat them as normal people, rather than special people who need “special care” in society. Therefore, they insist that all facilities, buildings and products in society should meet their needs. What the normal people can handle should also be operated independently by the disabilities. “Help” in society is more like “discrimination” to them in a sense. People with disabilities need the society to treat them as normal people, rather than specialization.
- **Cognitive Behavior:** In the airport travel scene, the disabled people’s perception of information and symbols in the scene is quite different from that of normal people. Navigation is probably the most common problem users face in specific space and scenarios. At the airport, where should we go after the boarding pass and which route can we take to get to the security check-in and boarding gate? All of these require the guidance system in the scene. The information faced by the disabled is often different from that faced by the normal people. For example, consulting before boarding and baggage checking, if the disabled need manual assistance, they need to find a special “low counter” for related operations. Security checks are more different from those of healthy people. Disabled people have special access. Especially for disabled people with prosthetic limbs, there will be special private checkrooms at airports. However, as for the current guidance service system, the airport has not set up a guidance system for the disabled in line with their cognitive style. Just like the “bathroom” sign we often use. The sign of the bathroom for the disabled is different from that of the general one. But the bathroom sign of the disabled did not appear in the general guidance system of the airport. Moreover, wheelchair-bound disabled people usually have low vision. Therefore, the guidance information, flight information and signs set according to the normal value often cause trouble to them because of the problem of sight. The specific contents are shown in the table below.
- **Research on Human–Machine Relations:** From the perspective of human–machine relationship, we study and analyze every micro-contact in the system, and find that there are many misunderstandings in the use and design of equipment. For example, after ergonomic measurements of boarding pass printing equipment, we found that disabled users would not operate the equipment positively in the way we envisioned. According to their life experience, they will sit sideways in wheelchairs. Which means the data we got changed completely (see Fig. 1).

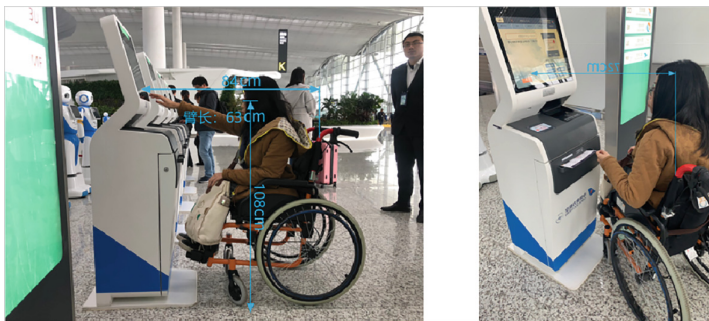


Fig. 1. The gesture of participator, when they approach to the automatic service machine.

When facing the device frontally, the disabilities need to reach their arms up to 84 cm to touch the bottom of the screen. the line of sight angle and the tilt angle of the screen are 120° [5]. Which makes it almost impossible for the disabled to read the information on the screen.

In addition, the size of wheelchair does not match the standard size of the security channel. Therefore, wheelchairs and people on them need to be separated when the disabled need to pass through the security channel. In this way, it will cause great trouble to the people who carry out security checks and the disabled. Through interviews with disabilities and data acquisition [6]. We have learned that disabilities usually arrive at the airport six hours in advance for relevant formalities and preparations. Which means it is two hours more than that of healthy people. There is still a lot of room for the airport to make adjustments and changes for the travelling of the disabled (see Fig. 2).



Fig. 2. The measurement of the airport security check room

4 Conclusion

Through the research and data acquisition of this subject, the team and the airport sorted out and analyzed the data collected, counted the airport service resources and the service costs that can be invested, and further studied flow characteristics, service demand and matching degree of service resources of peak and normal periods of airport services [7]. Through co-organizing workshops with various departments of the airport, we have agreed on the weight index system composed of several latitudes of “service cost”, “importance” and “proportion of service resources”, and screened out the executable service contacts. Combining with the improvement of the whole service process, we have obtained a new service design system for the disabled [8] (see Fig. 3).

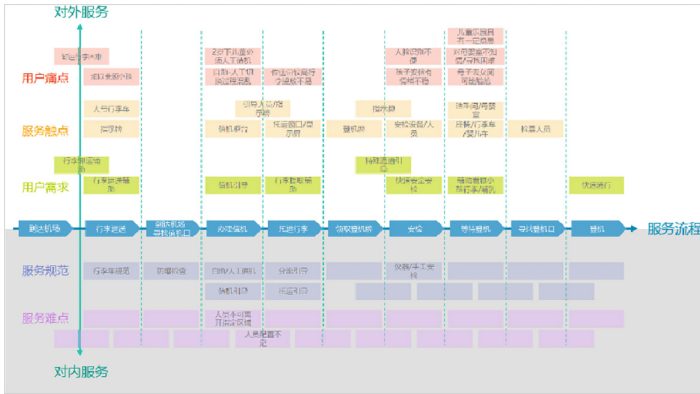


Fig. 3. The new blue print of airport's disable service (Color figure online)

The research of this project is based on the service system of airport. The research team made flexible use of research methods, comprehensive use of interviews, field research, human-machine relationship measurement and other methods into the research process. Based on the literature research methods and the basic theoretical framework of service design adjustment, this paper makes a macro-analysis of service system from a systematic perspective [9]. By integrating the details of the data in the micro contacts with the user's perspective, we can get a rich and complete picture of the service system from different perspectives, so as to provide a complete research framework and data support for the next service system design [10].

Although the airport service system is an individual case, through the design and research of the overall service flow of the airport, we can find many problems in the field of social public services for the disabled. The macro-adjustment of the service system, as well as the improvement and change of the micro-service contacts can all broaden the design thinking and methods of public services and product design. In the past, we tend to treat products as a separate product in barrier-free design. Barrier-free products are more about the "man-machine" relationship between people and products in design thinking. However, in the service system, every contact improvement is linked with other contacts [11]. Therefore, it is a new attempt of this project to consider the needs of the disabled systematically and to provide new design ideas from the design methodology of the system.

References

1. Gummesson, E.: Service design. *TQM Mag.* 2(2), 11–20 (1993)
2. Erl, T.: *SOA Principles of Service Design*. Prentice Hall, Upper Saddle River (2008)
3. Goldstein, S.M.: The service concept: the missing link in service design research. *J. Oper. Manag.* 20(2), 121–134 (2002)
4. Zomerdijk, L.G., Voss, C.A.: Service design for experience-centric services. *J. Serv. Res.* 13(1), 67–82 (2009)

5. Gordijn, J., Yu, E., Raadt, B.V.D.: E-service design using i* and e³ value modeling. *IEEE Softw.* **23**(3), 26–33 (2006)
6. Patrício, L.: Multilevel service design: from customer value constellation to service experience blueprinting. *J. Serv. Res.* **14**(2), 180–200 (2011)
7. Thompson, S.F., Johnstone, C.J., Thurlow, M.L.: Universal Design Applied to Large Scale Assessments. Synthesis Report, Disabilities, vol. 38 (2002)
8. Burgstahler, S.: Universal Design of Instruction (UDI): Definition, Principles, Guidelines, and Examples. *DO-IT 4* (2012)
9. Story, M.F.: Maximizing usability: the principles of universal design. *Assist. Technol.* **10**(1), 4–12 (1998)
10. Crews, D.E., Zavotka, S.: Aging, disability, and frailty: implications for universal design. *J. Physiol. Anthropol.* **25**(1), 113–118 (2006)
11. Meyers, A.R., Andresen, E.M.: Enabling our instruments: accommodation, universal design, and access to participation in research. *Arch. Phys. Med. Rehabil.* **81**(2), S5–S9 (2000)