Research and Design for Hotel Security Experience for Women Traveling Alone

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Abstract. Hotel security has been a main issue for tourism. It is urgent for solo female travelers since more than 50% of women worldwide had travelled alone, and Chinese women take account for 42% of the business travels. Focusing on this issue, the main goal of this study is to study individual female traveler’s experience in terms of sense of security when staying in hotels in China. The study consist of two parts. Firstly, preliminary interviews and questionnaires are used to explore solo female traveler’s perception on hotel security and potential factors influencing such perception. In-depth interviews were adopted to achieve better understanding on the factors. Secondly, future-oriented techniques are adopted to provide directions for design. Main factors and corresponding scenarios are gathered and illustrated using customer journey map. Mirroring approach is then used to flip the problematic customer journey into wishful one from which design opportunities could be extracted. Main outputs include a facial recognition system for elevator, statistical identification system for the number of people entering the room, rescue word alarm system and intelligent door defense system. Subsequent design outcome has won UXPA award, indicating certain utility and value for future development.

1. Introduction
In recent years, the voice of women's safety protection on the Internet is growing. Hotel is one of the places where women are prone to danger. According to China's emergency response law, safety accidents in the hotel industry are divided into four types: accident disaster, public health event, social security event and natural disaster. According to the data of China tourism safety report, the number of hotel social safety accidents in 2011-2015 accounted for the highest proportion among the four categories of safety accidents. Among them, social security incidents mainly include: robbery, rape, theft, violence between the guest and the host, homicide, violence in the guest room and so on[1]. Such incidents are particularly dangerous for women. On April 3, 2016, a woman living alone in Beijing Wangjing 798 HEVI hotel was confronted with violence such as kidnapping and forced dragging by strange men, until a passer-by came to the rescue. As soon as the case happened, there was a heated discussion on the Internet[2]. How to ensure the personal safety of the guests in the hotel attracts people's attention. Women are in a weak position in the confrontation with men, and do not have an advantage in strength. They bear more safety risks in the process of traveling alone. Fifty-four percent of Chinese women have traveled alone. During the tour, their safety concerns mainly focus on hotel accommodation and transportation. [3].

2. Literature review
2.1. Increase in the proportion of women traveling alone
Female tourists are mainly divided into four categories: women who are on leisure travel alone, women who are on business trips, women who are travelling with their spouses or relatives and friends, and women who participate in tour groups. Among them, women on business trips are a new market with obvious growth trend in recent years[4]. This is closely related to women's frequent participation in social work. At present, the business trip population in China is mainly concentrated in the middle management level, mainly the people born in the 1980s and 1990s, of which women account for 58%[5]. Leisure travel alone has always been one of the important ways for women to explore themselves. British Airways released the Global Solo Travel Study and more than 50% of women in the world have chosen to travel alone, and 75% of them have plans to travel alone in the future. 59% of Chinese female tourists have experienced 2-5 independent trips[6]. Especially when traveling alone, women on their own have to be alert to all kinds of possible dangerous scenes. They are afraid of the threat of male violence. When going out alone at night, women's fear of the outside world will also rise. It can be seen that time limit is also one of the important factors affecting the activities of women[7].

Although the number of women has increased significantly in the tourism market, there is a lack of research on the safety experience of women traveling alone in China. Women's psychological sensitivity to unfamiliar environment is more sensitive, and the experience of travel security is more demanding. Therefore, the research on the experience of women's sense of security is more critical.

2.2. Existing hotel security service system
At present, in the hotel environment, monitoring and access control are widely used in the hotel security. The traditional Chinese hotel security system is still rely on personnel, equipment and system, and low management efficiency. The relevant security products are not able to give early warning to the dangerous situation in the hotel, so they can only provide the event information at that time after the accident[8]. But with the improvement of modern people's safety awareness, people's demand for security is also growing. Therefore, the hotel security needs to change to the intelligent security direction, to ensure the safety of hotel guests and establish a safe and reliable brand image.

3. Research purpose and significance
The purpose of this study is: to design the hotel security service system for independent women. Improve the safety problems in the independent women's Hotel, provide complete hotel security services, make design innovation based on the existing technology, make it a set of practical service system, explore its realizability, patent and diversified business value.

Based on the investigation of relevant literature and case analysis, this study aims at young women aged 18-26. Young women are active in social or school life, and they are the main group of business travel and leisure travel. And easy to become the target of criminals. The independent women in this paper generally refer to this kind of young women.

4. Research process and methods
From the perspective of user experience. Sort out the potential safety hazards in the hotel, collect the concerns of independent women about the safety of the hotel and the experience of staying in the hotel, and design the scheme. The research flow is as follows (as shown in the figure 1):
The methods used are summarized as follows:

- **Questionnaire (Introduction) interview**: The questionnaire part of this study mainly focuses on the factors to be considered when staying alone, the equipment and facilities that have the greatest impact on the safety of the hotel, and the expectation of staying experience of lone women. Get the user's evaluation of the hotel security service.

- **Interview method**: In this study, face-to-face semi-structured interviews were used to collect information in the form of chatting, and the user data in the questionnaire results were verified twice through in-depth interviews[9].

- **User journey map**: The user journey map is used to describe the user's stage status in the process of consuming or experiencing a service. In this study, users' activities after entering the hotel are divided into different stages for analysis, mainly including: user behaviour, emotional experience, pain points, user needs, opportunity points, etc[10].

- **Mirror theory**: Mirror theory is a thinking tool (as shown in the figure 2). Including systematic operating procedures, which can effectively guide the design direction. This study uses the mirror theory to flip the pain points in the user experience process and find out the expectation of users for hotel safety in different stages. Combined with the corresponding technology, build an ideal hotel security service system[11].

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**Figure 1. Research framework**

**Figure 2. Mirror theory**

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### 5. Research result

#### 5.1. Questionnaire

In this study, 216 questionnaires were sent out on the Internet, and 181 valid questionnaires were recovered. The main issues focus on age, whether there is a single occupancy experience, considerations of single occupancy, facilities and equipment that have a great impact on the safety of the hotel, and expected occupancy experience.

The statistical results of the questionnaire are as follows:
• The respondents are young women aged 18-26, whose income is directly proportional to the hotel price they choose.
• More than 60% of women have experience of living in the hotel alone.
• The main factors to be considered when staying in the hotel are sanitary conditions, geographical location, hotel price, security system, equipment and facilities.
• The highest proportion of the facilities that affect the safety of the hotel is room lock, emergency call facilities, monitoring system and hotel elevator.
• For single occupancy, the most desirable experience for women is safety and convenience, accounting for 73.04%.

Combined with the analysis of questionnaire results and related literature survey, three factors of women's travel alone are summed up: business travel, travel, learning. The business travel is a passive travel, women's independent choice is small, can not choose hotels according to personal needs or preferences. The hotel can be selected according to personal itinerary and preference, mainly focusing on learning and travel.

5.2. In-depth interview
In order to confirm the authenticity of the user needs in the questionnaire and describe the user experience more specifically, 16 young women aged 18-26 were randomly selected for in-depth open-ended interviews. The interview focuses on the links of staying in the hotel, the relevant factors affecting the safety of the hotel and the expected experience of staying in the hotel.

5.3. User journey
Based on the results of questionnaire and interview, the user's journey is drawn (as shown in the figure 3), and the customer's concerns and needs are integrated into the process and scene sequence of staying in the hotel, which is sorted out. It is divided into five stages: check-in, go to the guest room, enter the guest room, receive visitors and go out for a short time, and draw the user's emotional fluctuation experience curve to provide direction for subsequent design.

Figure 3. User journey map
This study found that in all aspects of the existing hotel service, users have varying degrees of uneasiness. The main expectation of users is that the hotel can provide timely rescue in case of danger rather than obtain evidence after the accident. According to the deficiencies in the existing security and the pain points in the user's journey, we can summarize the problem scenarios into five categories:

- **Check in.** When women check in at the hotel alone, they are easy to be the targets of criminals.
- **Encounter a dangerous situation in the elevator.** It is easy to be violated in elevator confined space.
- **Encounter a dangerous situation in the corridor.** Strangers impulsive crime, forced drag women into the guest room.
- **Stalking.** Women who return to their rooms alone tend to be targets of stalking and violence.
- **Attacked indoors.** When encountering a premeditated ambush and violence, they can't ask for help from the outside world in time.

For single occupancy, the most desirable experience for women is safety and convenience, accounting for 73.04%.

### 5.4. Mirror theory

The dangerous scene is sorted out and the user's complaints about the dangerous scene are collected. The ideal wish is flipped by using the "mirror theory"[11] (as shown in the figure 4.5).

| Activities            | Problems                                      | Complaints                                      | Journey                                                 | Wish Model                                               |
|-----------------------|-----------------------------------------------|-------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------|
| Check-in              | Check-in                                      | Full of insecurity in unfamiliar environment    | Unable to quickly register and view room information in real time | Fast and convenient registration mode, real-time confirmation of room information |
| Take the elevator     | Encounter a dangerous situation in the elevator | Fear of being attacked in the elevator          | Can't confirm if the person taking the elevator is a hotel guest | Ensure that all passengers taking the elevator are registered |
| Going to guest rooms  | Encounter a dangerous situation in the corridor | Afraid of being dragged by bad people           | Don’t know how to escape when being pulled by criminals | In case of danger, inform the security personnel immediately for rescue |
| Enter guest room      | Stalking                                      | Afraid of being followed into the room          | Assaulted in the room unable to ask for help from the outside world | Security personnel can find out the dangerous situation immediately |
| Receiving Visitors    | Attacked indoors                              | Worried about strangers posing as workers       | Unable to confirm the real identity of the visitor      | Be able to confirm the real identity information of visitors in real time |
| Go out for a shot time| Attacked indoors                              | When go out, the room is infiltrated by outsiders| Unable to call for help in time in the room             | In the room can also timely and effective to the outside world for help |

**Figure 4. Mirror theory**

From the flipped conclusion of the mirror theory, the user's most expected wish model is obtained, and the real core value behind it is explored through the wish model. Core values mainly include:
• Safe and convenient check-in experience: women are easy to become targets of criminals when they register alone. The hotel can use face recognition equipment for registration, making the check-in process more convenient for users. When criminals commit crimes, they will deliberately avoid the input of face information, so that they cannot enter the hotel, which has the effect of preventing criminals from entering the hotel.

• Establish a visual security area to isolate the danger: women can't confirm the identity of fellow travelers in the process of taking the elevator alone, which is easy to cause tension. The hotel shall conduct registration verification at the front desk and isolate the unregistered personnel.

• When the danger occurs, it can be stopped in time. The existing hotel security is mainly based on monitoring, and can't find the dangerous situation in time. In case of danger in public areas, users usually pull with criminals or cry for help. Therefore, the first response of the user in an emergency can be taken as the starting point of the design.

• Accidents in non-public space can also be effectively called for help. Guests in the room may also face risks, such as intentional ambush of criminals. At this time, the women are usually coerced by criminals, so they can't effectively inform the security personnel when the danger occurs. According to the questionnaire survey, the hotel door lock is the key point of the safety facilities that users think. In case of indoor danger, users need to escape from the door, and the door lock is also the high-frequency contact point in the process of escape.

6. Security system design
By combing the scene extraction and core value, combined with the corresponding technology and product support, a visual and all-round hotel security service system is designed-RUNNING ANT hotel security system. It mainly includes four security systems, five types of security facilities and six security lines. The specific design is shown in the table below (as shown in the table 1):

Table 1. Security system design.

| Potentially dangerous scenarios | 6 security lines | Category 5 security facilities | Available Techniques |
|-------------------------------|-----------------|-------------------------------|---------------------|
| Check-in                      | Face recognition registration | Face recognition equipment | Safety protection system for passengers in elevator |
| Encounter a dangerous situation in the elevator | Permission authentication of being allowed to take the elevator | Corridor voice monitoring equipment | Security monitoring system in corridor |
| Encounter a dangerous situation in the corridor | Corridor voice monitoring | Corridor portrait recognition equipment | |
| Stalking                      | Identification of the number of people on the corridor | Door lock pull alarm | |
| Attacked indoors              | Door lock pull alarm | Intelligent protective door lock | |
|                               | Visitor identification | Visitor identification system | |

• Face recognition registration: after the guest enters the hotel, the personal information of the front desk will be registered through the face recognition equipment to obtain the access rights such as the elevator door lock in the hotel. Then, the front desk transmits personal data to the mobile app, where the guest can immediately confirm the room information, personal identity, visitors and other information.

• Authorization authentication of the allowed to take the elevator: when the resident enters the elevator, the face recognition equipment automatically recognizes the portrait information. If
there are unregistered personnel entering, the elevator will remain in the non-operating state. At the same time, the display panel inside the elevator will display the portrait of unregistered personnel to prompt other residents.

- Corridor voice monitoring: when a lone woman is dragged by criminals, she can shout for help words to help herself. The corridor voice monitoring equipment will recognize the keywords that can trigger the alarm and send the distress signal to the security department.

- Identification of number of people in the corridor: When the guest is followed by others, the corridor portrait identification equipment recognizes that the number of people entering the door does not conform to the number of people registered. The monitoring center transmits the room information to the security center, and the security center's telephone system automatically dials the corresponding room phone number. If the guest is hijacked and fails to answer, the alarm message will be played automatically, and the security personnel will be sent to visit.

- Door lock pull alarm: when a lone woman is in danger in the guest room, she can pull the smart door lock. When the pull sensor reaches the alarm threshold, it will automatically send a distress signal to the security system. (as shown in the figure 6.)

- Visitor identity authentication: visitors register information at the front desk. The front desk transmits the visitor data to the hotel service app. After confirming the information is correct, the visitor obtains the authority of the visitor in the hotel. When visitors arrive at the door of the guest room, they touch the doorbell of the smart door lock. The resident can view the visitor image in real time through the app to verify the identity of the visitor.

**Figure 6. Door lock pull alarm**

7. Conclusion
Enhancing the sense of psychological security and reducing the crime rate have an important impact on improving the travel experience. This study summarizes the important scenes of potential danger of lone women in the process of staying in the hotel, and puts forward practical solutions for each link. Based on the current market and technical situation, a forward-looking and preventive security design is extended to reduce the possibility of potential hazards and ensure the personal safety factor and psychological safety of users. This study also summarizes the important influencing factors of Chinese independent women's security experience, and then constructs an innovative hotel security system through the guidance of mirror theory. It points out that the development of the hotel security management system is possible, and the achievement has won the 11th user experience design award, hosted by UXPA China (user experience professionals' Association). The third prize in China, among which the relevant hardware has applied for one utility model patent. This system is not only used in the hotel scene, but also can be used in residential, hospital, office building and other places that need security, which has certain market potential and commercial value.

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