



Research on System Design of “Shared” Smart Kitchen in Youth Apartment in the Era of Internet

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Abstract. A challenge for kitchen designers, manufacturers and installers is to think in terms of kitchens that are more flexible and adaptable to people’s changing needs. This study develops this work by reviewing current problems and offering recommendations that others could follow without necessarily redesigning the whole kitchen. The participatory design method is adopted to study the “shared” smart kitchen system. Young people in the youth apartment in the era of Internet are studied for an investigation into the status of their lives, work and entertainment, by means of interviews and observations, so that their eating habits and social needs can be further understood. By finding out the balance point of young people between high-quality diet activities and fast-pace life style, a new social platform is designed based on kitchen activities, and a design scheme for the “shared” smart kitchen system is proposed for the youth apartment in the era of Internet.

Keywords: Smart kitchen system · Participatory design · Young people · Youth apartment · Share

1 Introduction

Kitchen is an indispensable part in daily life, and the further kitchen will not only be a place to cook delicious food, but also a place for people to exchange feelings, to have fun and to share life [1]. The public demand for kitchen is also sublimated to the emotional level, and users have paid more and more attention to the human-computer interaction and emotional exchanges between each other when they use the kitchen, while experiencing the life in the tiny area [2]. However, the current kitchen products and appliances have met the needs of users to the highest extent, and kitchen design has attached greater importance to spatial distribution, structure and other functions, but there is a lack of interactive design of mental function in terms of emotional interaction [3, 4].

In view of the situation, this study adopts participatory design [5] to study the design of the “shared” smart kitchen system for the youth apartment in the era of

Internet [1, 6]. Participatory design can be used in various stages of design, playing different roles. Users are introduced in the initial stage of design to view the product from the perspective of the master, while playing an active role in the selection and determination of the design direction. In the process of design, users can personally provide a design scheme and ideas through in-depth participation, so that they will not only fill in questionnaires and have interviews passively, but will also give play to their own initiative and become the changers and creators of products. It is a common method to introduce user participation in the stage of design evaluation in the traditional approaches of design and development, while users find out the deficiencies of products by trying products, which also enable designers to understand the wide gap between products and user cognition, so as to take more effective measures to improve the products [7–11].

With the increasing focus on human-centric approaches, the scope of Participatory Design has engulfed a wider spectrum of design and developmental processes [5, 7]. The goal of our research project is to understand the interactions happening in the home, in particular in the kitchen. The kitchen is one of the most important places in the family home and a place where a large variety and number of interactions take place every day. We want to understand what shapes the interactions and how the interactions connect with the everyday life and activities of the users [12–14]. While most of the existing work focuses on special user groups, such as the elderly (e.g.,) [15], people with disabilities [16] and technology-savvy customers [17], we focus on the young users, which usually represent the majority of users.

Therefore, the participatory design method is adopted to design the smart kitchen system.

2 Design Process of Smart Kitchen System Based on Participatory Design

2.1 Relation Analysis of Participatory Design in the Smart Kitchen

We analyze the relations between the user, the designer and the kitchen in the process of users participating in the design of the smart kitchen in accordance with PD (participatory design) and EPUI design (exploration, participation, understanding and integration) [12]. The user communicates with the designer concerning the experience in use in real time, and then chooses the model for building based on their own needs. Users participate in the scenario of constructing the kitchen and describe how they feel after using it. As for the relations between the designer and the kitchen, the designer constructs the model of the kitchen scenario and analyses the user’s behavior and psychology through user participation. The relations between the three are shown in Fig. 1.

2.2 EPUI Design Model Targeted at Smart Kitchen Design

Based on the EPUI design method proposed by Researcher Damjan and Emilija [12], we discussed the EPUI model of the smart kitchen based on the characteristics of the

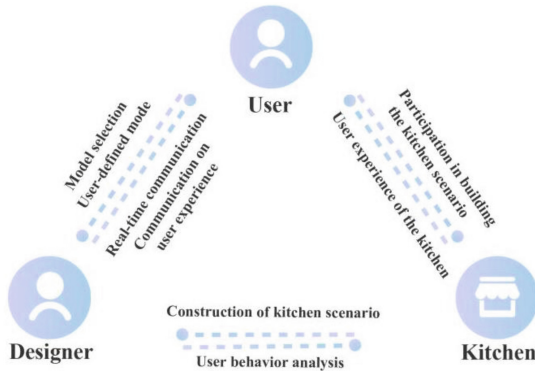


Fig. 1. Relations diagram of participatory design in the smart kitchen

smart kitchen, and put forward our own ideas, including the ways in the user exploration stage. User exploration is the foundation for the implementation of the entire project and the most important stage. The core work of this stage is to tap the existing kitchen-related activities and experience of target users, to analyze user needs and to develop creative concepts through user research. In the 2D concept development and design stage, we will build a 2D model for specific users, so that users can participate in the conceptual design, and users and kitchen appliances will work together to find out some problems in design and use. The development and design of 3D concepts are the deepening of 2D concept development and design. Next, we will build a 3D model, aiming to solve the problems found in the process of 2D concept development and design and build the immersive design. System integration and collaborative design is to conduct more refined interaction, operation and system design based on the development and design of 3D concepts, as shown in Fig. 2.

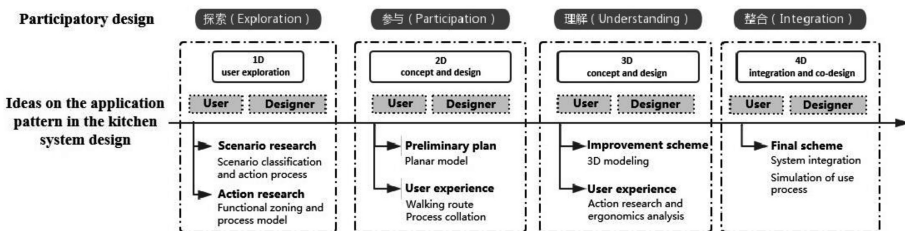


Fig. 2. Participatory design model of the smart kitchen

Based on the model of participatory design of the smart kitchen in Fig. 2, we analyzed both the roles of designers and users, and the detailed design tools in each stage, as shown in Fig. 3.

To be specific, in the user exploration stage, we first conduct a series of studies on scenario interaction on target users, and then build a 2D model on these users, enabling

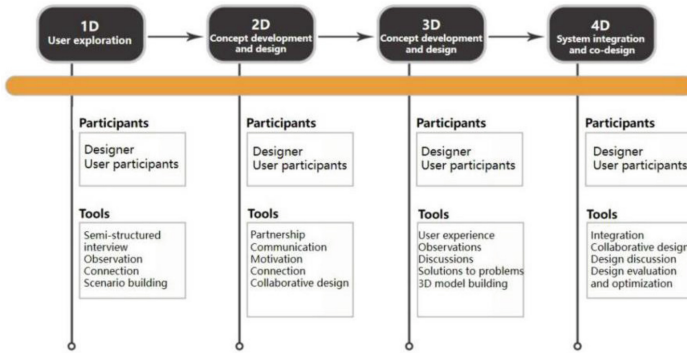


Fig. 3. Tools in various stages of participatory design

users and kitchen appliances to interact with each other to find out some problems in design and use. Next, we build a 3D model, aiming to solve the problems found in the construction of the 2D model and build the immersive design. Finally, the system integration is carried out to complete the design of the whole kitchen system.

3 Participatory Design of “Shared” Smart Kitchen System Targeted at Youth Apartments in the Era of Internet

In the context of youth apartments, this project mainly studies young people. It reorganizes the role of kitchen in life, and attempts to build a new social platform around kitchen activities, in order to find out the balance point of young people between high-quality diet activities and fast-paced life style, and to attract more young people to increase their exchanges and interaction with others while enjoying themselves in cooking. Its purpose is to improve the quality of life of young people, increase their communication and interaction, and explore a more interesting, comfortable and harmonious diet and lifestyle.

3.1 User Exploration

In today’s fast-paced life, dietary activities, which are extremely important for human beings, are a suitable opportunity to increase the communications and interactions with each other. With the improvement of living standard and the change of thinking mode, young people have regarded the kitchen as an integrated and multi-functional place from a basic place for cooking, changing from adequate food to a dual enjoyment of body and mind.

We use interviews, observations, contacts and scenario building. Firstly, through in-depth interviews, typical young users are investigated. We interviewed 8 young singles, including 4 male users and 4 female users. They are all aged between 22 and 30 years old, and live in single youth apartments. They are mainly young white collars, postgraduates living alone and designers in cities.

User exploration is mainly carried out from the following three perspectives:

1. to describe user demand for the kitchen and the purpose they want to achieve in using the kitchen;
2. to observe the process of users using the kitchen, and explore the problems existing in the current kitchen by observing the users' behavior and emotions;
3. to know the users' expectations for the future kitchen.

Through interviews, we learned that our target users are the post-90s who have just started to work and lived in single apartments on their own. These young people have led to instability in their places of residence, and their busy work has resulted in the fact that they have little time to cook. They are willing to cook with their friends, hoping that more friends can participate in the kitchen activities and that there will be an interesting and interactive "shared" smart kitchen.

As for the expectations and pain points of design of the users as summarized above, it becomes particularly important to design a social "shared" smart kitchen for young people to communicate and interact with each other.

3.2 Conception of "Shared" Smart Kitchen System Targeted at Youth Apartments in the Era of Internet

Users are invited to participate in building the 2D model of the kitchen. In this stage, we establish a good partnership with our users, and communicate with, contact and motivate them in a timely manner, and then propose a 2D design concept.

The product is positioned to design a "shared" kitchen system for single apartments of young people. Through the construction of mobile APP, users can order the kitchen and materials, the youth apartment is equipped with a public space and a mobile "shared" kitchen. Merchants distribute the materials ordered by tenants, and the kitchen is recovered, cleaned and maintained by a special person, so as to maximize the use of resources. And the public kitchen is suitable for many people to cook together. When friends or tenants prepare meals here, the public kitchen becomes a very important communication platform, which provides a suitable social space and opportunity for young people to not only enjoy the fun of cooking, but also to enhance their affections.

Construction of the Mode of Saving Preparation Time Before Meals and Cleaning Time After Meals. The "shared" kitchen prepares materials in advance. As long as the user orders the recipe and the number of people on the APP, the APP can automatically convey the data to suppliers and distributors. The supplier provides the original materials for the shared kitchen and the distributor preliminarily processes the materials, such as washing and cutting, and then delivers the processed materials and the product to the public space offered in the apartment. The public space is equipped with food storage cabinets to keep the materials fresh and store them for a short time. Users can open the corresponding cabinet by using their mobile phones, which will greatly save the time for users to purchase and process the materials.

Construction of Interesting and Interactive Kitchen Experience. Through the interviews with users in Sect. 3.1, it can be seen that many young people hope to enjoy interesting and interactive kitchen experience with friends. We design a mobile app, in

which users can order the shared kitchen and materials, and contact the distributor. It is also equipped with an online platform and a mobile client. The APP is like a virtual community, where users can share the experience of public kitchens in shared apartments, make friends with users in the same community to share the cooking experience with each other, while inviting their friends and neighbors to cook and have meals together.

Construction of a Complete Smart Kitchen System. Many young people love cooking, but they have no time to think about what to cook, so they are eager to be able to have some smart recipes and enjoy different user experience in conjunction with the complete smart kitchen system. Mobile shared kitchen is designed as a complete smart kitchen system, while there are complete functions, which can be used separately. The folding storage method is adopted to compress the space to the greatest extent so as to provide a variety of functions. The cooking utensils can meet various functions of steaming, boiling, frying, stir-frying and roasting. When ordering different dishes, users can be provided with corresponding appliances.

3.3 Concept Development and Design Stage

Next, we carry out conceptual development and detailed design to show the characteristics of the concept, participants, usage environment and other data information as comprehensively as possible. In the design scheme, we divide the “shared” kitchen system targeted at the youth apartments in the era of Internet into two parts of hardware facilities and software interface. The design shows the whole process from analysis, to process to preliminary design, and finally to in-depth design.

The usage process consists of various parts from the user’s order of the number of people, recipe, taste, time and location, to the merchant’s confirmation of the order and distribution, and then to the user’s cooking based on the utensils, finally to the merchant’s recovery and maintenance of the kitchen, which will maximize the convenience of the users in the process and provide the best experience. Figure 4 shows the usage process.

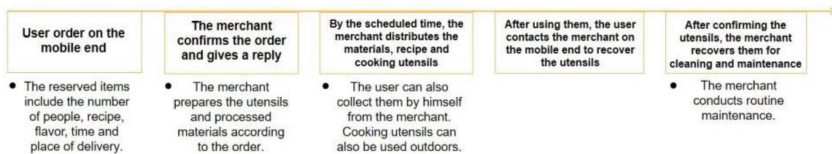


Fig. 4. Usage process

System design involves stakeholders in all aspects, including major stakeholders and minor stakeholders. Starting from the user’s order, material suppliers provide the original materials, and kitchen ware suppliers provide the kitchen ware, and the distributor is set up in the community to be responsible for processing the original materials and allocating proper kitchen ware. And then the materials and kitchen ware

are distributed to the user. The product will be recycled and cleaned after users use it. The conception of system design is shown in Fig. 5.



Fig. 5. Conception of system design

3.4 System Integration and Collaborative Design

Finally, users are invited to participate in the stage of system integration and collaborative design to help researchers in perfecting the design, so as to further enhance the value of the concept and rationality of operation. Through the integration of software and hardware system, we can complete the design of the mobile “shared” kitchen app.

Figure 6 shows the design process of the software app, which fully shows our design process and ideas on the app end, ranging from the design of login process, the process of kitchen reservation, as well as the content of personal records and the friend mode.

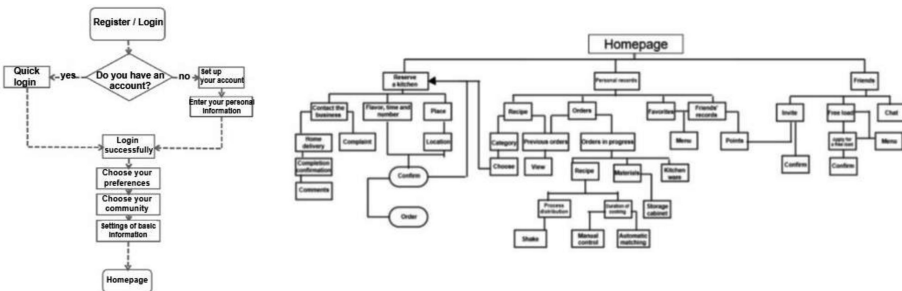


Fig. 6. App design process

Figure 7 shows the product scenario, and Fig. 8 shows the product usage scenario, including a cooking area, a preparation area and a storage area to maximize the use of inner space, and drawers are set to hold condiments, dishes and so on. It is simple and attractive in shape, easy to clean.



Fig. 7. Product scenario



Fig. 8. Product usage scenario

It is conducive to the sustainable development of the “shared” kitchen in youth apartments.

4 Conclusion and Future Work

In this paper, the method of participatory design is adopted to design the “shared” smart kitchen system targeted at youth apartments. Young people in the youth apartment in the era of Internet are studied in this paper for an investigation into the status of their lives, work and entertainment by means of interviews and observations, so that their eating habits and social needs can be further understood, and a design scheme for the “shared” smart kitchen system is proposed for the youth apartments in the era of Internet.

The mobile “shared” kitchen simplifies the mode of kitchen usage. Youth apartments are equipped with public space, and a mobile “shared” kitchen is provided,

where the reserved materials of the tenants are distributed and a special person cleans and maintains the kitchen after it is recovered, so as to maximize the use of resources.

In this study, we mainly explore the youth apartments in the developed areas of Eastern China. In the follow-up study, we will further study the behavioral habits and psychology of young people in the application of kitchens in other regions, and seek for more possibilities of the “shared” smart kitchen system for the youth apartments in the era of Internet.

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