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Research on Extension Innovation Model in the Creation Process of Service Design

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Abstract

Under the background of economic transformation, service design has played a critical role in promoting the development of service economy. However, the creation process of service design is still unclear. This paper aims to use extension innovation methods to guide the creation process of service design, expanding designers' thinking to generate systematic creative ideas. Finally, we propose an “extension service creation method” based on the “extension innovation four-step method”, and analyze it through a case study. The applications has proved that the extension method system can be effectively applied to the service design process and improve its efficiency.

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1. Introductions

With the transformation of the industrial paradigm from the manufacturing industry to the service industry [1], service economy and experience economy has become an important part of the national economy. The development of the service economy has promoted new changes in society, economy, technology, and daily life, and has also injected new content into the design industry [2]. As an important driving force for the development of the service economy, service design has received more and more attention worldwide.

At present, scholars at home and abroad have extensively studied the innovative methods of service design. British psychologist Tony Buzan created a graphical tool called “MindMapping” that effectively expresses divergent thinking. Kawakita Jiro, a Japanese scholar, created the “Affinity Diagram method”, which records

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opinions through cards and sticky notes and summarizes them according to affinity to help designers generate ideas. Liu Yi [3] et al. proposed a service design method based on users' satisfaction.

Although considerable research has been conducted on service design methods at home and abroad, little attention has been paid to the research on the formalized and modular design and creation methods of service design, due to the complexity of the stakeholders and the entire service system. Many service design processes just rely on the experience of designers. Therefore, in order to fill the gap of the above research, this paper proposes an Extenics-based method, which is used to expand service designers' thinking, so that they can view service design in a more comprehensive manner and generate creative ideas in a systematic way.

2. Extenics and Service Design

2.1. Introduction on extension innovation method

Extenics is an original discipline founded by Cai Wen to study contradictory problems. Its goal is to use computers to deal with contradictory problems in all walks of life, which is called the intelligent processing of contradictory problems [4]. Extenics reveals the laws behind contradictory problems through formalized and modular ways to enhance the dimension of thinking.

Extension innovation method is the method system of Extenics to solve contradictory problems. In addition, Extenics researchers have established an innovative thinking application method named "Extension Innovation Four-step Method", on the basis of basic methods. It mainly consists of four steps: "Model", "Expand", "Transform" and "Evaluate".

2.2. Compatibility analysis of Extenics and service design

Firstly, Extenics and service design are both highly intersecting disciplines. Extenics is an emerging discipline at the intersection of mathematics, philosophy and engineering [4]. Service design is also an interdisciplinary practice and research field [2]. Therefore, Extenics and service design are highly compatible with each other. Moreover, as a discipline of studying contradictions, Extenics aims to solve contradictory problems in all walks of life. Its original intention is to apply extension innovation methods to other professional fields.

Although the research on the intersection of Extenics and service design is still rare, there has been some similar research. For example, some scholars such as Yoshiki Shimomura et al have used computers to help service design, taking advantages of computers in optimizing algorithms [5]. Some scholars have also proposed to apply "TRIZ theory" to the innovation process of service design to give designers guidance and assistance [5]. These positive attempts have provided more possibilities for the combination of Extenics and service design.

2.3. Analysis of the combination point of Extenics and service design

This paper takes service design as the main body, and integrates the extension innovation method into the process of service design. Therefore, it is necessary to analyze the process of service design in order to find out the combination point of Extenics and service design.

At present, there is still no globally unified standard for the process of service design. Many different organizations have put forward different views. The most famous one is the "Double Diamond Design Process" summarized by "the British Design Council", which turns the chaotic thinking into a prismatic thinking with divergent and convergent processes [6]. In addition, the American "IDEO company" also proposed three stages of service design, that is, "Hear", "Create", and "Deliver". According to the book, *this is service design thinking*, the four steps of the iterative process, "Exploration", "Creation", "Reflection" and "Implementation", are a basic

method to form a complex design process. Among them, the creation process is a vital stage in generating ideas and strategies. Therefore, this paper takes the creation process of service design as the combination point to integrate the extension innovation method into the process of service design.

3. Extension service creation method

3.1. Conjugation analysis of service system

The conjugation theory includes four aspects: the materiality of the virtual and the real, the systemicity of the soft and the hard, the dynamics of the covert and the overt, and the opposition between the negative and the positive [7]. Through the conjugation theory, we can view the service system from different angles, so we can form a comprehensive understanding of the service system before generating ideas. The conjugate analysis of the service system is shown in Figure 1.

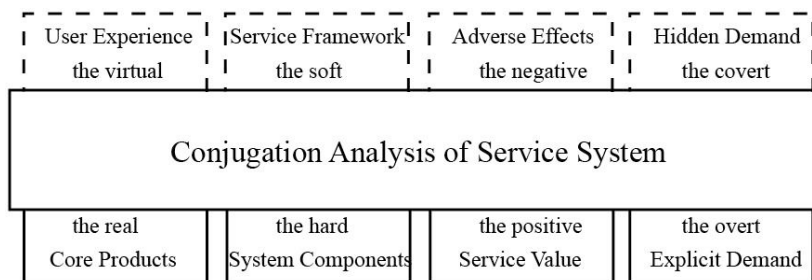


Fig. 1. conjugation analysis of service system

According to the Extenics, the conjugate parts of things can be transformed into each other under certain conditions. For example, hidden demands can be transformed into explicit demands under certain conditions. In order to find feasible service design schemes, it is necessary to focus on the virtual part, constructing the soft part, evading the negative part and transforming the hidden demand into an explicit one.

3.2. Establishing the basic element model of service system

Extenics established the concept of “basic-element” as the basic logical cell to formally express the contradictory problem and its solution process [8]. The basic-element can be divided into three basic types: “matter-element”, “affair-element” and “relation-element”. For service design, we can also model its information from the perspective of “matter-element”, “affair-element” and “relation-element”. Taking the online shopping service as an example, the service system is modeled from the three levels of “matter-element”, “affair-element”, and “relation-element”, as shown in Figure 2.

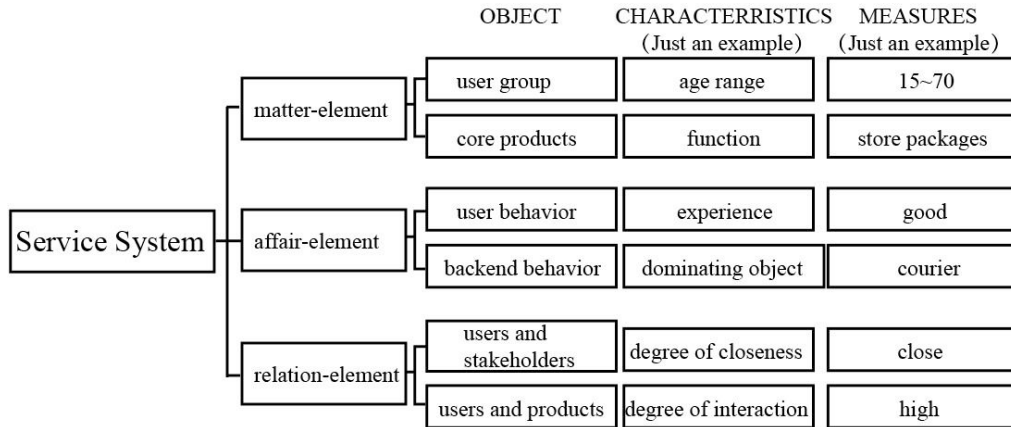


Fig. 2. the basic element model of service system

At the level of “matter-element”, the core user group can be analyzed from the perspective of multi-dimensional matter-element. In this way, we can simply and accurately express the basic information of the core user group. We call this method “the persona of matter-element”. At the level of “affair-element”, we can analyze various behaviors that occur in the service system, including the front-end users’ behavior and the behavior of other stakeholders in the back-end of the service. At the level of “relation-element”, we can analyze the relationship in the service system, including the relationship between stakeholders and the relationship among human, machine and environment.

3.3. Establishing the model of service creation process

Through the investigation for users and the definition of core problems in the exploration process, we can establish the matter-element model of users’ expectations and service status. When the service status matches users’ expectations, the problem is called “compatibility problem”. It can be used as one of the service prototypes. When they do not match, the problem is incompatibility problem. To match the service status with users’ expectations, we use extension transformation method from the perspective of objects, criteria, and domains. After that, a variety of ideas will be generated. But, only a few of them can be used as service prototypes after evaluation and screening.

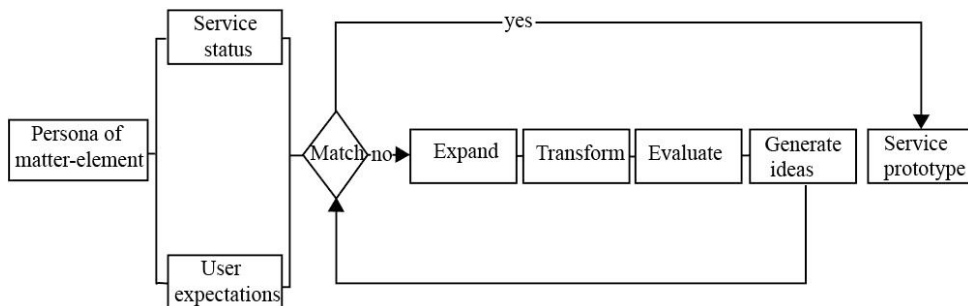


Fig. 3. the process of extension service creation method

The extension service creation model takes the “extension innovation four-step method” as the main framework and combines the tools and language of service design in form. In content, it follows the user-centered principle of service design. Starting from the users’ pain points and the service status, it expands to other stakeholders and the entire service system through divergence, implication, and correlation analysis. From the individual to the whole, ideas are generated and the users’ expectations are finally achieved. The extension innovation method provides a new way of thinking for the creation process of service design and opens up a new path for the realization of intelligent service design.

4. Case study

4.1. Problem discovery

This paper takes the service design project “vegetable supply service design” as an example. The target group of this service design is office workers in the first-tier cities. Through literature surveys, it is known that office workers are generally facing sub-health threats, and many sub-health problems are related to irregular eating habits, while regular consumption of vegetables can effectively provide the nutrients needed by the body and reduce the risk of illness. After the preliminary investigation, it was found that only less than half of the respondents would choose to go to supermarket to buy vegetables. They prefer to order take-away food.

The reasons for this phenomenon are as follows: 1. It is very troublesome to go to the supermarket after working for a long time. 2. The prices of vegetables are relatively high. 3. The vegetables are usually not only limited in variety but also not fresh after work. 4. The food could easily go bad if you can't eat them up at one time.

4.2. Basic-element analysis of core users

Based on the above survey results, we apply the “extension service creation method” to solve the problem. The results of the matter-element analysis of the target user group are as follows:

$$M = \begin{bmatrix} \text{office worker,} & \text{age,} & 25\sim50 \\ & \text{place of residence,} & \text{city} \\ & \text{working status,} & \text{busy} \\ & \text{eating habits,} & \text{rarely eat vegetables} \\ & \text{state of health,} & \text{sub-health} \end{bmatrix}$$

The service status G_0 and the users’ expectations L_0 could be expressed in terms of affair-element:

$$L_0 = \begin{bmatrix} \text{buy vegetable,} & \text{dominating object,} & \text{office worker} \\ & \text{receiveing object,} & \text{unfresh} \\ & \text{time,} & \text{after work} \\ & \text{place,} & \text{supermarket} \\ & \text{experience,} & \text{bad} \end{bmatrix}$$

$$G_0 = \begin{bmatrix} \text{buy vegetable,} & \text{dominating object,} & \text{office worker} \\ & \text{receiveing object,} & \text{fresh} \\ & \text{time,} & \text{free time} \\ & \text{place,} & \text{near home} \\ & \text{experience,} & \text{good} \end{bmatrix}$$

4.3. Conjugation analysis of existing similar services

According to the thinking of the “second creating method”, conjugate analysis is carried out on the existing vegetable supply service models, such as “Fresh hema” and “Duoduo Grocery”. From the perspective of virtual and real conjugate, what users buy is the real part, which is the vegetables, but what users really need is the virtual part, which is the nutrition and health brought by vegetables. From the perspective of positive and negative conjugation, the positive part is the low price and convenient grocery shopping experience for users, and the negative part is the environmental damage caused by vegetable packaging and the safety hazards brought by the delivery staff due to rush orders. The overt part is the user's explicit demand, such as the users' demand for the freshness of vegetables and the convenience of buying vegetables, whereas the covert part is the users' hidden demands. Meeting the users' implicit demands can create a scheme that exceeds the users' expectations.

4.4. Implication analysis of core users' behavior

Starting from the users' pain points, we have established the basic-element model of users' expectations and service status. The service status does not match the users' expectations, so we conduct the implication analysis to expand core users' behaviors. Tracing the origin of the previous service model, a vegetable must go through at least “planting”, “transportation”, “storage”, “sales” and other links from its production to customers. We need to expand the service from the core users to other stakeholders. Among them, vegetable farmers, salespersons and core users have a relatively high degree of association. The implication analysis is shown in Figure 4.

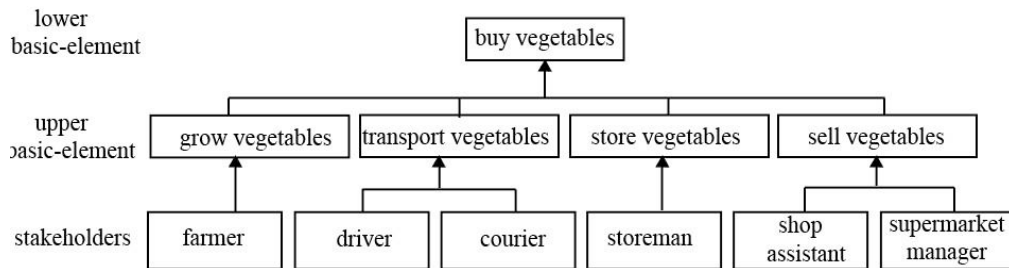


Fig. 4. implication analysis of users' behavior

4.5. Extension transformation

In order to achieve users' expectations for buying fresh vegetables conveniently, we expand and transform “objects”, “criterion”, and “domains” to generate feasible schemes. Some of the schemes generated by extension transformation are as follows:

Table 1. extension strategy generation

	object	criterion	domain
Substitution transformation	Buy vacuum-packaged vegetables that have a longer shelf life	Ensure the survival of vegetables, buy now and pick now	Adopt a new supply system to ensure the freshness of vegetables
increasing/decreasing transformation	Increase preservation equipment and transportation tools	Delete the Guidelines that customers must go to the supermarket to buy vegetables for dishes	Reduce some unnecessary process
expansion/contraction transformation	Move your home near the supermarket to shorten the distance	Expand the preservation of vegetables fresh time.	Expand the channels for users to buy vegetables.

- Use technology to increase the freshness of vegetables, and use more convenient transportation to buy vegetables.
- Buy fresh vegetables online.
- Buy fresh vegetables provided directly by farmers online.
- Move your house to the vicinity of the supermarket, and use fresh-keeping equipment to keep the vegetables fresh.

4.6. Priority-degree evaluating

In order to ensure the quality of the schemes, the schemes need to be evaluated and screened. The evaluation criteria are “novelty”, “feasibility” and “users’ experience”. The feasibility of “moving the house to the supermarket” and “adopting higher preservation technology” is not high. “Buying fresh vegetables online” is similar to “ordering take-way food”, which can solve the problem to a certain extent, but lacks novelty.

The third scheme is further extended. Urban office workers directly order vegetables from farmers in rural areas through their mobile phones. Then the vegetables will be transported to cities by a logistics company. The vegetables will be planted in a vegetable picking machine temporarily. The vegetable picking machines are set up in the community where the users live, so office workers are able to pick them by themselves at any time. This scheme not only enables office workers to eat fresh vegetables conveniently, but also allows them to enjoy the fun of picking. In addition, vegetable farmers directly provide vegetables to urban residents, reducing some intermediate links, which can lower the price of vegetables to a certain extent.

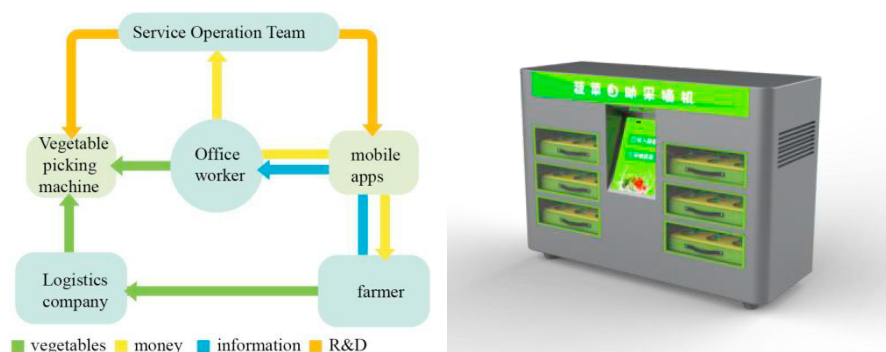


Fig. 5. (a) service system diagram; (b) vegetable picking machine

5. Conclusion

In this paper, we propose a method of service design based on extension innovation method and basic-element theory to make the creation process of service design more formalized and modular, so as to help designers generate systematic ideas.

In order to realize the intelligence of service design, we will conduct further research in the future. Firstly, we will establish a users' basic-element database and extension service creation program. Secondly, the database and program will be put on the Internet for more designers to use. So the computer could build the basic-element models of users' expectations and service status according to the information provided by designers. In addition, we will try to combine Extenics with the other process of service design and make Extenics work in the entire life cycle of service design.

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