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Analysis of Antibiotic Purchasing Service Design based on SAPAD-AHP Method

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ABSTRACT

In order to improve people's experience in the process of influenza drug purchase, reduce people's choice of non-essential antibiotic drug treatment, and expand and improve the monitoring of drugs issued by medical and health institutions, the service system of people's drug purchase process was studied.The observation method and user interview method were adopted to obtain the process of user drug purchase in common influenza. The user behavior was disassembled based on the SAPAD model framework, listing the people and things involved in the drug purchase process, and completing the mapping of behavior-object-significance.Each significance cluster is calculated to obtain the core meaning cluster.To study and reconstruct the service design system of users buying drugs in the process of common influenza through user needs, summarize and design key elements, and improve the service function module of online drug purchase and online consultation and consultation.In the study, the SAPAD-AHP method improved the service system function of the antibiotic purchase process, designed and produced the APP, effectively improved the users' cognition of the abuse of antibiotics, strengthened the supervision of antibiotics issued by doctors, and provided an effective solution to improve the problem of excessive use of antimicrobial drugs in primary medical institutions and rural areas.

Keywords: Antibiotic purchase service system, SAPAD model, AHP, Service design

INTRODUCTION

In China, about 50% of hospital outpatients use antibiotics, while the problem of antibiotic overuse is more prominent in grassroots hospitals in less developed western regions (Zhang et al., 2019). According to authorities, China is one of the most serious antibiotic abuse countries in the world, and if it will fall into a tragedy without medicine (Zhang et al., 2019). Therefore, improving people's awareness of the harm of antibiotic abuse, reducing people's choice of antibiotic drug treatment in grassroots hospitals, can effectively improve people's medical and health level.

Semiotics Approach of Product Architecture Design (SAPAD) (Chen et al., 2018) is a user-centered model framework for solving practical problems. It was co-created by Professor Hu Fei and Professor Sato. Based on the product semiology theory, the SAPAD framework can analyze, cluster and reorganize the meaning behind the behavior layer by layer, and finally tap into the real needs of the users. Hierarchical analysis method (Analytic Hierarchy Process, AHP) has the characteristics of combining qualitative and quantitative

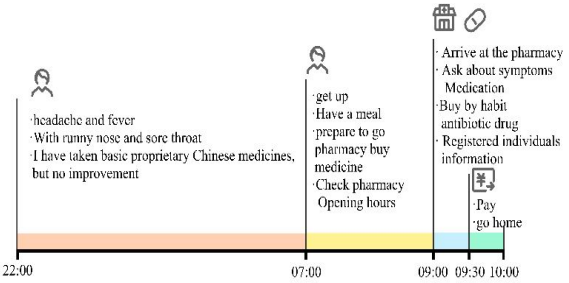

Figure 1: User A's drug purchase path.

analysis, systematization and hierarchy, which can exclude subjective factors to the maximum extent based on the SAPAD framework, obtain clear and accurate results, and make it more objective. By introducing the hierarchical analysis method, it can solve the more subjective problems of the SAPAD framework analysis process, so as to provide a reference for improving the SAPAD framework (Feng, 2017; Long, 2007).

DESCRIPTION OF SAPAD-AHP METHODS

The SAPAD model first disassembled user behavior, gradually decomposed into tasks and sub-tasks; and then lists the objects (people and things) involved in the sub-task one by one, forming a behavior-object mapping. Meaning is divided into physical layers, language structures, empirical layers, semantic layers, pragmatic layers, and social layers according to the hierarchy, mapping tasks with these six levels, forming a behavior-meaning mapping. Then significance clustering analysis for these 6 levels to obtain significance clusters.

The analysis of the significance clusters obtained from the cluster analysis combined with AHP divides the significance clusters and the corresponding significance into the criterion and scheme layers. The expert method is used to compare the index at each level to form a judgment matrix, through which the weight occupied by each index is calculated through the judgment matrix (Long, 2007).

SAPAD-AHP DESIGN EXAMPLE ANALYSIS: TAKE THE PROCESS OF BUYING ANTIBIOTICS BY THE GRASSROOTS PEOPLE AS AN EXAMPLE

Through the preliminary user interview, it was finally determined to take a user A in a county seat in Weihai City to conduct in-depth research.

User A, female, 50 years old, living in a county seat in Weihai City, is a professional financial officer.Members of the family will have cold and fever symptoms in the process of changing seasons, and the frequency of daily drug purchase behavior is normal.Track the cold-drug purchase process of user A through non-participatory observation method, and then conduct in-depth interview with user A to fully understand the details of the whole process

Table 1. Behavior to object mapping analysis.

Activity	Environment	Task	Subtasks	Behavioral correlates
Consult symptom medication	Home	Online medical consultation	Query online medical consultation channels Query doctor information Consultation on medication	Doctor/Mobile/Computer Doctor/Mobile/Computer Doctor/Mobile/Computer
	drugstore	Consult medication advice	Choose an offline pharmacy Ask about medication	Pharmacy/Doctor/Mobile Pharmacy/Medicine/Doctor/Mobile
	hospital	Register to consult a doctor	Online/offline registration Doctor's appointment Consult a doctor Get medication advice	Hospital/Mobile/Staff/ Registration Machine Hospital/Mobile/Staff/ Registration Form Hospital/Mobile/ Registration/Doctor Hospital/Mobile Phone /Registration List/Doctor/Drug List

from the beginning stage of cold to the end of drug purchase. See Figure 1 to map the drug purchase path of A.

Through the user path analysis, five behavior modules were found: discover a cold, query pharmacy, go to drugstore to buy medicine, consult symptoms and medication, and buy medicine.Take the consultation symptom medication behavior module as an example, the consultation symptom medication behavior module can be divided into online medical consultation, consultation for medication advice, and registration consultation for doctors. Three tasks correspond to different sub-tasks (see Table 1).

The SAPAD framework is based on Stamper's symbolic ladder framework theory, which divides the meaning of user behavior into six levels, namely: physical layer, experience layer, language structure layer, language and meaning layer, language layer, and social layer (Chen et al., 2021) mapped the tasks with six levels to obtain a behavior-meaning mapping.According to the user 5 behavior module, 26 subtasks are divided into six meaning layer mapping, physical layer corresponds to 7 meanings, semantic layer to 18 meanings, verbal layer to 17 meanings, empirical layer to 8 meanings, and pragmatic layer / social layer to 12 meanings.

Clustering is the process of classifying the data into different classes or clusters. Data in the same cluster are strongly correlated and not between different clusters. Experience layer emphasizes the user's use skills and

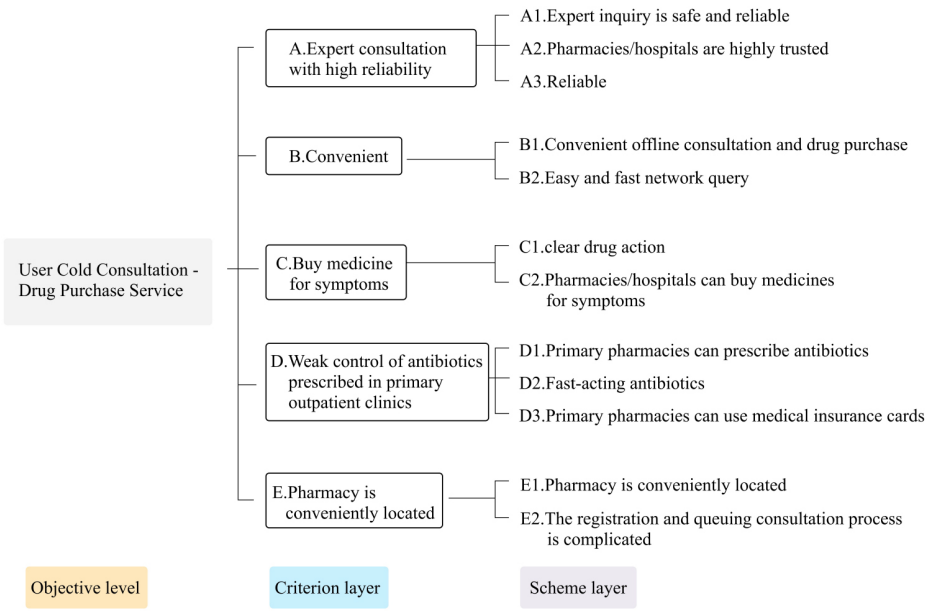

Figure 2: User A's drug purchase experience hierarchy model.

life experience. Through cluster analysis, 5 significance clusters: (1) rapid and convenient network access to information (including doctor information, medication advice, traffic conditions); (2) reliable offline consultation (including pharmacy consultation, hospital consultation); (3) rapid home drug preparation and treatment; (4) Chinese patent medicine has no effect; (5) pharmacies can issue antibiotic drugs.

The semantic layer emphasizes human emotion and personality.Cluster analysis obtained five significance clusters. The pragmatic layer represents the purpose of the symbol and the propagation effect of the group in the semitics, and here represents the user's expectations of the drug purchase experience. Cluster analysis has five significance clusters.

The significance clusters obtained from the cluster analysis were analyzed using AHP. The three-level division is shown in Figure 2.

Pairwise comparison of the five metrics of the criterion layer is performed using the Saaty scale. Weight calculated that R is 0.0429 <0.1, indicating that the consistency of the index is within the acceptable range and the weight value is valid. See Table 3 for arranging the index weights in the criterion layers from high to low.

Similarly, the CR value of the judgment matrix of the "user cold consultation-drug purchase service" scheme layer is 0.0079<0.1d, etc., indicating that the consistency of the scheme layer is within the acceptable range.

After the weight calculation of AHP, the core significance clusters are summarized as follows: rapid and convenient purchase of drugs, get appropriate drug diagnosis, antibiotic drug purchase to increase supervision.

By mapping the three core significance clusters-object-key behaviors (see Figure 3), 6 key behaviors for rapid and convenient drug purchase, 7 key

Table 2. Standardized judgment matrix.

Index	A.Expert consultation with high reliability	B.Online consultation is convenient	C.Consultation can help to buy medicines for symptoms	D.Weak control of antibiotics prescribed in primary outpatient clinics	E.Pharmacy is conveniently located
A.	0.1875	0.2903	0.1163	0.2830	0.2632
B.	0.0625	0.0968	0.1163	0.0943	0.1579
C.	0.5625	0.2903	0.3488	0.2830	0.2632
D.	0.1875	0.2903	0.3488	0.2830	0.2632
E.	0.0375	0.0323	0.0698	0.0566	0.0526

Table 3. User cold consultation - order of weights of drug purchase service criteria.

Index order	Indicator name	Weights	CR
1	C. Consultation can help to buy medicines for symptoms	0.3557	
2	D. Weak control of antibiotics prescribed in primary outpatient clinics	0.2695	0.0429<0.1
3	A. Expert consultation with high reliability	0.2238	
4	B. Online consultation is convenient	0.1023	
5	E. Pharmacy is conveniently located	0.0486	

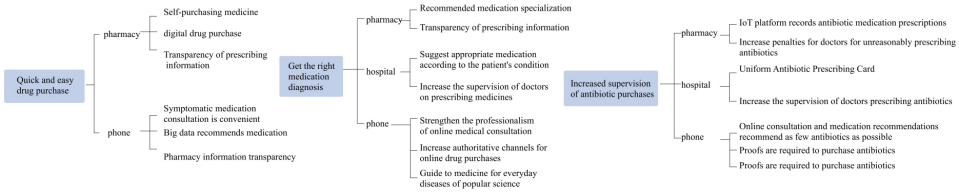

Figure 3: Core meaning cluster-object-key behavior mapping.

behaviors for appropriate drug diagnosis, and 7 key behaviors for increased supervision of antibiotic purchase were obtained.

USER COLD CONSULTATION-DRUG PURCHASE SERVICE DESIGN BASED ON "BEHAVIOR-MEANING-OBJECT"

The 20 key behaviors were summarized into five key behaviors, including transparency of drugstore drug prescribing information, recording of antibiotic drug purchase information on the Internet of Things platform, online medical professionalism, increasing the supervision of antibiotic drug prescribing, and popularizing the harm of antibiotic abuse. According to the summary, all parties in the society cannot meet the above five key behaviors at the same time, so they need to integrate all parties' information through the

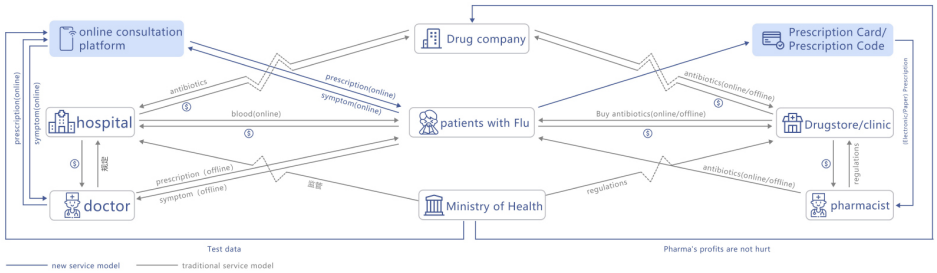

Figure 4: User cold consultation - drug purchase service system.

Figure 5: Online medical APP.

Internet of Things platform to achieve the transparency of drug information and supervise the drug prescribing behavior, and the service map is shown in the figure 4.

First, the service system introduces the official medical APP (as shown in Figure 5). Users can conduct online medical consultation through the APP, and consulting doctors can choose, which can solve the problem of "symptomatic medicine";at the same time, the online drug purchase service is provided, and users can consult doctors about the corresponding diseases through the online consultation function, so as to facilitate the purchase of drugs. The introduction of official medical APP has somewhat improved the professionalism of online medical treatment, and increased the supervision of antibiotics prescribing.

Second, the service system combines the Internet of Things platform to introduce the concept of electronic prescription card and associate the electronic prescription card with the medical insurance card.Users before buy antibiotic drugs need by qualified doctor approval, through online communication with the doctor, by the doctor to judge whether the user needs antibiotic treatment, if need to use antibiotics, doctors will submit drug application in the system, users through electronic prescription card to buy medicine.This method partly increases the necessary communication between users and doctors, greatly reduces the use of non-essential antibiotic drugs, and pharmacy prescribing records also become transparent.

CONCLUSION

This study combines SAPAD model and hierarchical analysis method to design the process of users purchasing cold drugs, and deeply studies the user behavior through SAPAD model to obtain the mapping of user behavior and significance.Combined with the quantitative research of the hierarchical analysis method, the core significance clusters of "rapid and convenient drug purchase", "appropriate drug diagnosis" and "antibiotic drug purchase increased supervision" were obtained, and guided the service system design of the user drug purchase process and the APP design of the online drug purchase consultation.In this study, the SAPAD-AHP method improved the service system function of the antibiotic purchase process, designed and produced the APP, effectively improved the users' cognition of antibiotic abuse, strengthened the supervision of antibiotics issued by doctors, and provided an effective solution to improving the problem of antimicrobial overuse in primary medical institutions and rural areas.

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