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Meaningful Experience in Service Design: Case Study of SAPAD Framework Application

Fei HU[a,1], Keiichi SATO[b,c], Kun ZHOU[a], Xi ZHANG[a] and Zhangsheng LIU[a]
[a] *School of Art & Design, Guangdong University of Technology, China*
[b] *Institute of Design, Illinois Institute of Technology, USA*
[c] *Department of Computer Science, UiT, The Arctic University of Norway*

Abstract. Service design methodology has been incorporating methods and tools from multiple disciplines such as ethnography, management, system design and interaction design. Service design tools can be divided into three categories: basic research tools, service analysis tools, and in-depth guidance tools. Although user experience considered to be a key concern of service design, there is a lack of methods to describe profound user experiences and reveal deep meanings to the user. This paper introduces Semiotics Approach for Product Architecture Design (SAPAD) that provides a framework for representing meanings of service activities by adopting Stamper's semiotic ladder model. The semiotic ladder model is composed of six levels: 1) Physical level, 2) Syntactic Level, 3) Empiric Level, 4) Semantic Level, 5) Pragmatic Level, and 6) Social Level. This framework enables thorough exploration of the deep meanings, value and potential contradictions of stakeholders in complex interactive relationships between many system constituents. Through the two case studies of service design for: a) a blood donation vehicle service system, and b) a community elderly rehabilitation service system, SAPAD framework was proved to be very useful and effective for analyzing system inquiry data and synthesizing comprehensive interpretation levels of user experience with clear meaning relevance. Especially representing and understanding profound experience can form a basis for effective integration of trans-disciplinary perspectives critical for achieving integrity and sustainability of service system quality.

Keywords. meaningful experience, SAPAD, semiotic approach, service design, user experience model

Introduction

Since the concept of "experience" gained a highlight in interaction design and regarded as a major driver for design and business innovation with the term Experience Economy in 1990s [1][2][3], experience (or user experience) has been considered as conceptual and methodological foundation in broad design areas ranging from HCI to industrial design, interaction design communication design and service design. Experience has become a key instrument of User-Centred Design addressing broad issues of human perspectives beyond usability and ergonomics. Yet, questions such as how can user experience be defined, represented, understood, interpreted and

[1] Corresponding Author, Mail philhu2002@hotmail.com.

enhanced?" are not well answered in methodological terms in design. Particularly the depth structure of experience such as the notion of meaningful experience or profound experience has not been well explored from design perspectives except for some important conceptual foundations introduced in multiple viewpoints (Stamper, 1996; Forlizzi et al, 2000; Liu et al, 2000; Jensen, 2014)[4][5][6][7]. Semiotic Approach to Product Architecture Design (SAPAD) [8] was developed to incorporate meaning generation and usage in human-system interaction into conceptual system design process. SAPAD framework facilitates to understand user's meaning generation or signification patterns and to use them to compose system concepts and architecture. In this research a case study of SAPAD application to service system design (the improvement of community healthcare and rehabilitation services for elderly people with disability) was conducted in order to further improve and extend the methodology regarding the interpretive mechanisms between user research data, user signification and service system design that enables meaningful experience generation.

1. The Meaningful Experience

Jordan defined the pleasure of using products as "the emotional, hedonic and practical benefits associated with products" in his "Experiential Economy [3], that includes sociopleasure, ideopleasure, physiopleasure and psychopleasure.

Hassenzahl regarded satisfaction as the summation of pragmatic and hedonic factors that forms a part of usability [9]. Hassenzahl et al. identified six needs; autonomy, competence, relatedness, popularity, stimulation, and security, as the potential sources of positivity, meaning and happiness [10]. They further pointed out that positive affect and meaning were two important factors of happiness, and stated "our approach to designing for happiness is to provide people with more day-to-day opportunities to engage in positive and meaningful, deliberately designed experiences." Forlizzi and Ford [5] used Dewey's concept of "an experience" [11], and described that it came from meaningful experience chunks and was demarcated a beginning and an end by something meaningful.".

Jensen regarded human experiences as the starts and ends of this possibility-driven approach [7], and thought that experience-based designing would "again affect the society as a whole, seeing that increased meaningfulness of products might prolong their use, which could lead to less consumption". Further, Jensen distinguished the totality of an experience with three dimensions: 1) the instrumental representation, that concerned with the product that facilitates the other dimensions; 2) the use-experience, which Forlizzi and Battarbee described as three categories of the fluent, the cognitive, and the expressive experiences; 3) the profound experience, where the meaning we found once we become fully immersed [12].

2. Service Design Methods

Service design is defined as designing overall interaction, experiences, and relationships with internal and external stakeholders to efficiently and effectively deliver service propositions perceived by the service receiver, and to achieve long-term strategic bottom-lines through value co-creation and networks or constellations [13].

Service design adopts numerous derivative methods and tools from various subjects such ethnography [14][15], information management science [16][17] and interaction design [18][19]. In order to enhance the development of this new transdisciplinary discipline, some service design organizations have been compiling useful methods and tools from different disciplines for public usage. Example sources are Open Service Design Knowledge Platform and Service Design Toolkit by SPIDER (Supporting Public Service Innovation using Design in European Regions). In such effort, tools and methods are categorized for different activities and purposes in service design processes. For example, Engine, a service design consulting firm, categorizes service design tools into three categories: basic research tools, service analysis tools and deep-level guide tools [20].

It can be found out that: (1) Most of basic research tools come from sociology with the purpose of exploring the service context. (2) Service analysis tools are mainly developed within service design or service science, such as the typical blueprint and customer journey. Service analysis tools can conduct systematic study centering service and visualize the interaction, touch point, time and field of the service through behavior clues. Therefore, these tools have effectively demonstrated the scope of analysis and seized the key elements and the whole picture of the service system. (3) Deep-level guide tools conduct research from the human perspective and attempt to explore the deep-level service demand and in-depth human experience The existing tools include participant journals, video diary and blog/BBS writing. However, as these tools can only search and record the data of users and lack the guiding capability for insight and depth, the quality of the service design study tends to rely on the capacity of the researchers. Therefore, service design tools need to be improved in terms of the presentation of analysis language and exploration of in-depth demand. At present there are numerous available service design tools, yet specialized, adaptable and insightful ones are rare.

Jensen found while they were very beneficial in designing for the use-experience they did not focus on meaning structures and reveal the reasons [7]. Jensen therefore developed the Experience Scope Framework (ESF) to explore a broader scope of the experience at a profound level. Jensen defines that profound level of experience is “a higher level offering of meanings in that particular moment, which the use-experience and instrumental representation are the means to enable”. ESF was a qualitative two-by-two matrix. For one thing, although it had already touched on some part of profound experience, but it did not cover the whole of profound experience. In fact, nobody could explain any of profound experience; so the framework would be better if it is more open. For another, ESF just showed the clues in profound experience, but it could not explain the relationships among instrumental representation, use-experience and profound experience. Both behavior and meaning were emerging synchronically; profound experience usually flashed upon use-experience. Hence, although the ESF was “considered a valuable tool to identify and visualize the meaning structures of an experience”, it could not be applied as a deep-level guide tools to dig profound experience in service.

3. SAPAD: A Framework for Designing Meaningful Experience

The framework of Semiotic Approach to Product Architecture Design (SAPAD) attempts to explain the relationships between the object, behavior and signification

dimensions [8]. For a relatively simple activity such as tea-making and cooking, the dimension of "Object" can be structured with four levels: assembly, object, unit and component [21]. "Behavior" dimension can be also structured with a hierarchical structure for example, with four levels, activity, process, action and operation [22]. However different disciplines have different definitions of terms representing levels of objects and behavior. Therefore SAPAD chose the term "activity" and ith-level action for multiple levels of "behavior" dimension, and the term "system" and ith-level object or ith-level subsystem for "object" dimension.

In the "signification" dimension, SAPAD uses the Semiotic Ladder framework introduced by Stamper with six levels of signification: physical, syntactic, empiric, semantic, pragmatic and social levels, which are described as Table 1 [4].

Table 1. The styles defined in IOSPressBookArticle.

	Six Levels of Significations in SAPAD	**Experience**
Physical level	about objects' physical attributes which are related to enabling elements of functions such as material, signals, traces and physical distinctions.	instrumental representation
Syntactic level	about "how" to connect with each other between objects or the function modules.	instrumental representation
Empiric level	about "how" to connect the subject with object. It is related to construction of logic, which focus on the operation, control and use of object, and the users' experience such as mode, way, noise, redundancy and efficiency.	instrumental representation and use-experience
Semantic level	about "why" to interact between individual and object, which relates to emotional experience and focus on emotion, character and persuasiveness of object, such as theme, expression and intention.	use-experience and profound experience
Pragmatic level	about "how" to communicate and spread between one and another in interactions, which focuses on sub-culture and group identity.	profound experience
Social level	about social attributes in the activity, which focuses on value and ideology and relates to beliefs, expectation, commitment, contract, law and cultural convention.	profound experience

The process of SAPAD framework application consists of three phases with eight steps. In order to effectively follow through this process, templates and tools for information acquisition and analysis have been developed.

Phase 1: Behavior observation and analysis

1) Object Analysis produces an architectural description of a product or a service that represents its topological configuration of subsystems and components of the current system or practice.

2) User Observation intends to capture the actual situation of product or service system usage. It attempts to capture the usage process, users' states, various environments such as physical, social and cultural by videos, photos, notes and other means. Questionnaire survey and interviews before and/or after the observation can be also used in order to construct thorough information for deeper understanding of the user behavior.

3) Behavior analysis is to identify a structure of user's behavior (activities, processes, action and operation).

Phase 2: Signification analysis and construction.

4) Excavating the under meaning of the user's behavior by analyzing physical level, syntactic level, empiric level, semantic level, pragmatic level and social level.

5) Signification construction. Making sure of the accuracy and availability of signification through interviewing user again, at the same time, reconstructing signification cluster, insight into the crucial meaning of behavior and core values of the user and possible design directions by hierarchical clustering on the DSM.

Phase 3: Service/Product construction and design:

6) Signification-Objects Mapping. Combining with 4, 3, 2 to determine the mapping among signification cluster (four levels) and things, defining the key objects of signification.

7) Service/Product architecture DSM based on signification clusters. Evaluating the strength of the relationship between object-signification with integer value {0, 1, 2, 3} and identifying object clusters and developing a new system architecture.

8) Design opportunities. Introducing new function and new architecture of the system, compelling design opportunities and concrete paths for innovation based on the new configuration of components, units, objects and assemblies.

4. Case Study: the Rehabilitation Service Design for the Elderly [23]

4.1. Step 1. Observation and User Behaviour Analysis

This case study observed and examined living conditions and medical activity of a solo-living elderly woman with hemiplegia (Ms. A) in a major city in central China. Ms. A (76 years old) is a laid-off worker and lives a penurious life. She had difficulties in walking after the stroke, and now in the post-hospital long-term nursing stage for her chronic disease. Although a full-time housemaid was hired by her children to look after her daily life, the rehabilitation treatment and nursing in home still cannot reach the professional level at the hospital. Stroke paralysis shows different symptoms in different stages and needs suitable rehabilitation methods. In order to help the patient to have better rehabilitation through out the recovery process, hospital, family, and community organization should take their responsibilities respectively to provide the medical and care service. Using the non-participatory observation method, this project traced one-day life of Ms. A, mainly on her rehabilitation activities at home and in the community. Then, depth interviews with Ms. A and her housemaid were conducted to better understand the rehabilitation-related activities. The timetable of Ms. A's typical one-day life was composed (Fig. 1), and the rehabilitation-related activities were identified in order to understand the signification behind them.

The Ms A's rehabilitation-related activities can be classified into 9 categories: 1) taking medication for lowering blood pressure and blood glucose; 2) taking medication for cerebral infarction (after breakfast); 3) indoor walking; 4) exercise in the community square; 5) measuring the blood pressure at the community health center (CHC); 6) taking physiotherapy at CHC; 7) attending the rehabilitation knowledge lecture in the community; 8) communicating her health condition with children or friends; 9) taking medication for heart (after dinner).

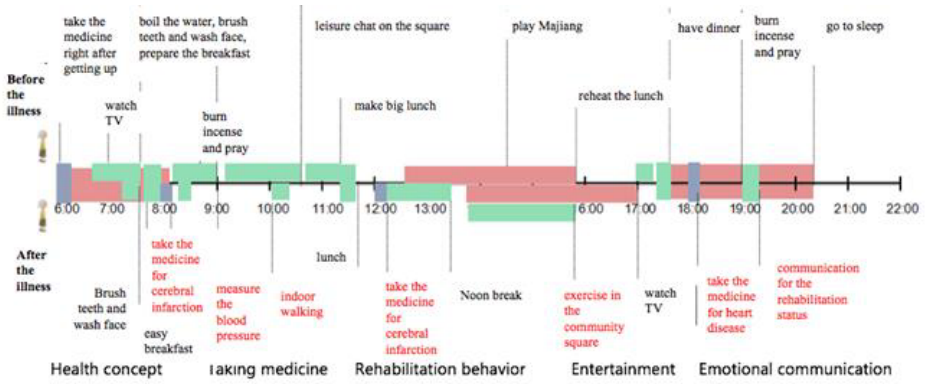

Figure 1. Elderly person's one-day-life activity tracking data.

4.2. Step 2. Behavior and Object Mapping

The 9 activities identified in the previous phase were decomposed into 22 tasks and 42 sub-tasks by Hierarchical Task Analysis (HTA). The objects related to rehabilitation behavior are identified in every sub-task. 41 objects were involved in the overall rehabilitation process.

4.3. Step 3. Behaviour-Signification Mapping and Signification Structure

Through the analysis of the signification mapping of the 42 sub-tasks in the six levels, there are 34 significations in syntactic level, 34 significations in Empiric level, 32 significations in semantic level, 15 significations in pragmatic level, and none signification appears in social level. A DSM representation of relations between 42 sub-tasks is used for the clustering sub-tasks. For example, Semantic level focuses on human emotion and characteristics. The cluster analysis generated 6 signification clusters: 1) the inconvenience in life caused depression; 2) convenient and fast; 3) joyful and happy; 4) desire for health; 5) pay attention to the rehabilitation therapy; 6) desire to acquire the knowledge for the rehabilitation. By extracting mainly from the pragmatic, semantic, and empiric level and analyzing it, the relationship between different signification clusters are also shown in Figure 2.

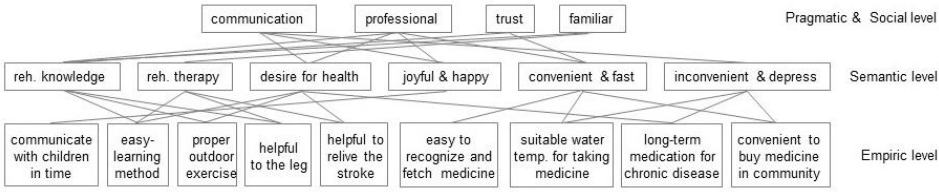

Figure 2. Signification module.

Among them, the core signification on pragmatic level is that the doctor prescribes the rehabilitation method and discusses the recovery status with the paralyzed elderly. The core signification on semantic level is to pay attention to the rehabilitation therapy, desire for the rehabilitation knowledge, depression, desire for health, convenient, fast, joyful, and happy. The core signification on Empiric level is that the outdoor exercise is good for the rehabilitation, easy method for leg rehabilitation, convenience for the

housemaid to buy medicine, and the easiness for recognition and fetching of the medicine. The signification structure illustrates all the core life significations in the community rehabilitation activities of the solo-living paralyzed elderly, from three dimensions: individual initiative emotion, focus point, and emotional significations.

4.4. Step 4. Signification-Object Mapping

Through the mapping relationship of signification-object (Table 2), 18 key objects are confirmed. They are related to the core significations in the pragmatic, semantic, and empiric level: doctor, housemaid, rehabilitation suggestion, cup, medicine box, medicine pill, housemaid, uncomfortable illness, health issue, handbook, physiotherapy device, pharmacy, medicate card, friends, telephone, medicine time, community square, walking stick.

Table 2. Analysis of signification and object mapping.

Signification Cluster	Sub-task	related objects of the signification	Key objects for the signification
Desire to communicate the disease with the doctor – discuss the disease with the doctor – the doctor provides the method for rehabilitation	E) T-1-1 introduce the physical condition to the doctor	doctor, physical condition, office desk, chair	Doctor
	F)T-1-1 explain the uncomfortable feeling to the doctor	uncomfortable feeling, doctor, chair	uncomfortable feeling, doctor
	E) T-3-1 the doctor gives the suggestion to control the blood pressure	Office desk, sphygmomanometer, doctor, chair	Doctor
Consulting the rehabilitation issue – the doctor propagates the rehabilitation knowledge – rehabilitation information exchange – trust the doctor	G) T-1-2 the old woman consult the common health issues	heath issue, microphone, rehabilitation suggestion, doctor	Doctor, health issue
	G) T-1-1 a professional doctor teaches the rehabilitation nursing knowledge for the elderly	doctor, microphone, chair, desk, handbook, other old men/women, housemaid	Doctor, hankbook
	F) T-1-2 the doctor gives suggestions to the uneasiness of the old women	Rehabilitation suggestion, doctor, chair	Rehabilitation suggestion, doctor
	F) T-2-1 the doctor prepare the physiotherapy	doctor, physiotherapy device, bed, glove, disinfectant	Doctor, physiotherapy device

Further, key touch points in service system are identified by the key signification and its related behavior, in order to reconstruct the functional service module in pragmatic level.

The examination of relations between pragmatic level and objects-key behaviors identified 6 key behaviors: 1) acquiring diagnosis, 2) providing rehabilitation suggestion, 3) propagating rehabilitation knowledge, 4) providing rehabilitation therapy, 5) managing purchased drugs and 6) assisting medication. These 6 key behaviors were then translated to the following 12 core functional service modules: communicating recovery status, enhancing doctor's diagnosis, conducting rehabilitation therapy, providing rehabilitation suggestion, assisting rehabilitation exercise, consulting rehabilitation issues, propagating rehabilitation knowledge, comparing and choosing medicine, assisting medicine purchase, reminding medication, enhancing communication with friends and children.

4.5. Step 5. Design Opportunities and System Architecture

The construction of core significations clarified the life significations and goals in the daily rehabilitation behaviors of the paralyzed elderly. This structure becomes a guiding mechanism for designing the architecture of the community-based elderly rehabilitation service system from the perspective of the elderly users.

In the constructing process, we have found that the professional rehabilitation and nursing is the core of community rehabilitation service. However, the community currently cannot secure the necessary nursing staff, operation process, status evaluation, or facilities for the professional rehabilitation. Designing and establishing a community rehabilitation service center (CRSC) is vital for the rehabilitation need of the elderly. A service system that integrates function modules across CHC, CRSC, and community care service needs to be introduced to provide effective, efficient and sensible services for the elderly (Figure 3).

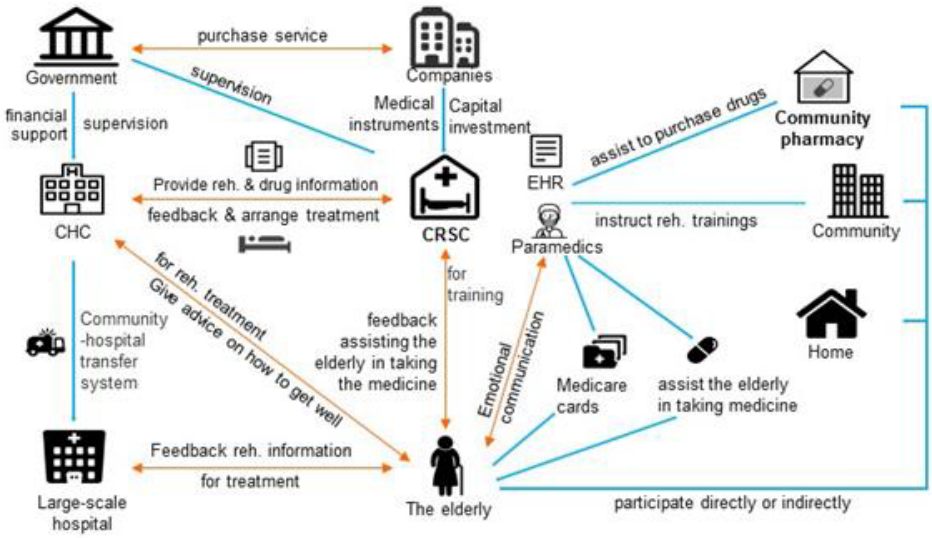

Figure 3. Service system of community rehabilitation service center.

Within the system, the existing CHC is responsible to provide rehabilitation therapy for the elderly in the community and follow up their recovery status. It also communicates with the elderly and provides the necessary rehabilitation advises. The CRSC's role is to guide the professional rehabilitation exercise, monitor all indexes of chronic disease for the elderly, make comprehensive assessment, and establish the digital rehabilitation record. The CHC could enact the rehabilitation plan according to the rehabilitation status. The CRSC provides the communication channel between nursing staff and elderly people. It also provides detailed rehabilitation information, conducts the therapeutic rehabilitation jointly with the CHC, and cooperates with the community pharmacy to support the medicine purchasing. Integration of these entities and introducing service coordination and management functions would maximize the utilization of the community medical resources. The doctors, social workers, volunteers, pharmacy stuffs, professional nursing staffs and offspring within the system are all the direct or non-direct service providers. The system has also considered the relation with other stakeholders, such as the government, enterprises, other hospitals, etc. Thus, a

complete rehabilitation service circle for the community-living elderly that integrated the rehabilitation therapy and exercise can be established.

4.6. Step 6. Service Blueprint and User Journey Map

In this case study, the electronic health record (EHR) was a key link between different kinds of service agencies and the elderly in the community rehabilitation service system. The team rebuilt the service blueprint including the interface design of the EHR, some new services would be developed; for instance, assist training system. At the same time, communication would be improved exponentially especially at such touch points as CRSC, CHC, community pharmacy and home.

5. Conclusion

Current communities lack the rehabilitation service for the elderly in China, especially for the elderly with disability. This case study applied SAPAD framework to incorporate the concept of meaningful experience in the rehabilitation service design for the elderly.

The semiotic ladder model used in SAPAD provides a guiding structure for sorting complex patterns of user's behavior with its six-layer categorization scheme. This structure facilitated identification of different types of significations or meaning generation by users. Currently these steps of interpreting user research data are dependent on individual designers' or researchers' experience. As a result, the quality and level consistency of signification requires significant coordination and time. In order to solve this problem, detailed guidelines for six-layer categorization and representation of significations.

For service system design, understanding deeper meanings that users generate on the elements of their experience including their actions, relevant objects and events and states of environments is critical for specifying service functions, their structure and the way delivered to users. Compared with some deep-level guide tools in service design such as participant journals and video diary, SAPAD framework was found to be more effective to capture deeper meaning that the service system needs to address as the core value to achieve. SAPAD framework has upgraded from product architecture that involves complex interactions to the service system that involves complex activities, to seek for meaningful experience in Husserl's Life-world.

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