Affective Engineering Approach to Understand Servicescape Effects

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Abstract

Purpose – Although numerous articles emphasize the importance of servicescape, methodological approaches to understand and reflect affective needs of customer and employees to the design of the servicescapes have not been fully captured by the existing studies. The aim of the paper is twofold. First is to discuss the role of affective engineering for servicescape design and second is to explain the underlying structure of Kansei (feeling) and related design attribute interactions based on design of experiments modelling.

Methodology/Approach- In this research, the Affective (Kansei) Engineering is proposed to examine the interaction between servicescape design attributes that may affect affective values for the service itself and the service provider. Further a case study is presented applying Affective engineering to identify and design a certain feeling found as important for a servicescape environment.

Findings- The role of Affective Engineering methodology is discussed in a framework for management on how the servicescape be designed to distinguish between functional and affective dimensions (Kansei) of the servicescape and to show how the two dimensions interact. It is suggested that interaction between designs attributes need to be considered to understand and reflect human feelings in servicescape design.

Research limitations/implications- This paper discusses a framework on integrating Affective Engineering methodology.

Practical implications- This study provides useful insights for integration of affective needs for design of physical surroundings of services.

Originality/value-This paper makes an original contribution to propose Affective Engineering methodology for management considerations on design of servicescapes.

Keywords: Service quality, Kansei interactions, design attribute interactions

1. Introduction

Customers judge the quality of services based on their perceptions of the *technical outcome* provided, *the process* by which that outcome was delivered and *the quality of physical surroundings* where the service is delivered (Zeithaml and Bitner, 2003). Service quality is a focused evaluation that reflects the customer's perception of elements such as interaction quality with the staff, physical environment quality and outcome (technical) quality (Brady and Cronin, 2001).

There exist about 20 different service quality models in the literature (Seth et al., 2004). An overview of these models highlights that the customer's expectations towards particular services change with respect to factors like time, increase in the number of encounters with a particular service, competitive environment, etc (Seth et al., 2004).

In one commonly cited of service quality model approaches, the service quality dimensions are defined by Grönroos (1998) as *what the customer receives* and *how the customer receives*; respectively the technical result or outcome of the process (outcome quality) and the functional dimension of the process (functional quality). One of the most applied service quality models in the literature proposed by Parasuraman et al. (1988) defines five dimensions of service quality as *reliability, responsiveness, assurance, empathy and tangibles*.

In addition to that Grönroos (2001) proposes that the dimension *where* needs to be added to the "*what* and *how* dimensions of service quality" (based on Rust and Oliver (1994)). This dimension can be labelled as "servicescape quality" (Grönroos, 2001). The term servicescape was introduced to the service marketing literature by Bitner (1990) to represent physical surroundings in which a part of healthcare services are delivered, perceived and where the health staff and patients interact and to describe various elements of the physical environment of the service encounter.

This study thus focuses on the servicescape dimension of the service quality. The servicescape or service setting plays a critical role in shaping customer expectations, differentiating service firms, facilitating customer and employee goals, and influencing the nature of customer experiences (Bitner, 1992). An extensive review by Dijkstra (2006) points out the possible interactions between different environmental stimuli, and it is likely that the effects of different environmental stimuli will reinforce or weaken another.

In this research, the Affective (Kansei) Engineering methodology is proposed to examine the interaction between servicescape design attributes that may affect affective values for the service itself and the service provider.

The overall aim of this study is to discuss the role of Affective Engineering as a methodology for servicescape design. The aim of the paper is twofold. First is to discuss the role of affective engineering for servicescape design and second to explain the underlying structure of Kansei (feelings) and related design attribute interactions based on design of experiments modelling. Further a case study is presented applying affective engineering to identify and design certain feelings of a servicescape environment.

The plan of this paper is as follows. Section 2 describes a framework that proposes Affective Engineering as a methodological approach for an integrated servicescape framework. In Section 3 Kansei (feelings) and factors presented in the framework have been modelled by experimental design to show the complex interactions of Affective engineering. Next in Section 4 a case study based on an empirical investigation is proposed to approach the problem of interaction complexity for feelings and design attributes in the servicescape. The paper is concluded with theoretical and practical implications of the study.

2. Proposed Framework

A framework for management on how can the servicescape be designed to enhance customer satisfaction and retention is suggested in Figure 1. This revised framework from Bitner (1992, 2000) integrates the social environment as a dimension of the servicescape and explicitly acknowledges the

reciprocal and transactional relationship between environmental influences and human behaviours (Bitner, 2000).

The framework consists of three key management questions *what can be controlled, what can be understood in a servicescape* and *what are the desired outcomes*.

As can be seen from Figure 1 there is a need to distinguish between functional and affective dimensions (Kansei) of the servicescape and to show how the two interact. Therefore as a methodological approach to understand the desired outcomes stated in the framework the Affective Engineering methodology to understand employee and customer responses to the servicescape is suggested.

The Kansei Engineering methodology is suggested to examine the interaction between servicescape design attributes that influence affective values of servicescapes. In further sections the framework and the role of Affective Engineering will be described and a case study will be presented.

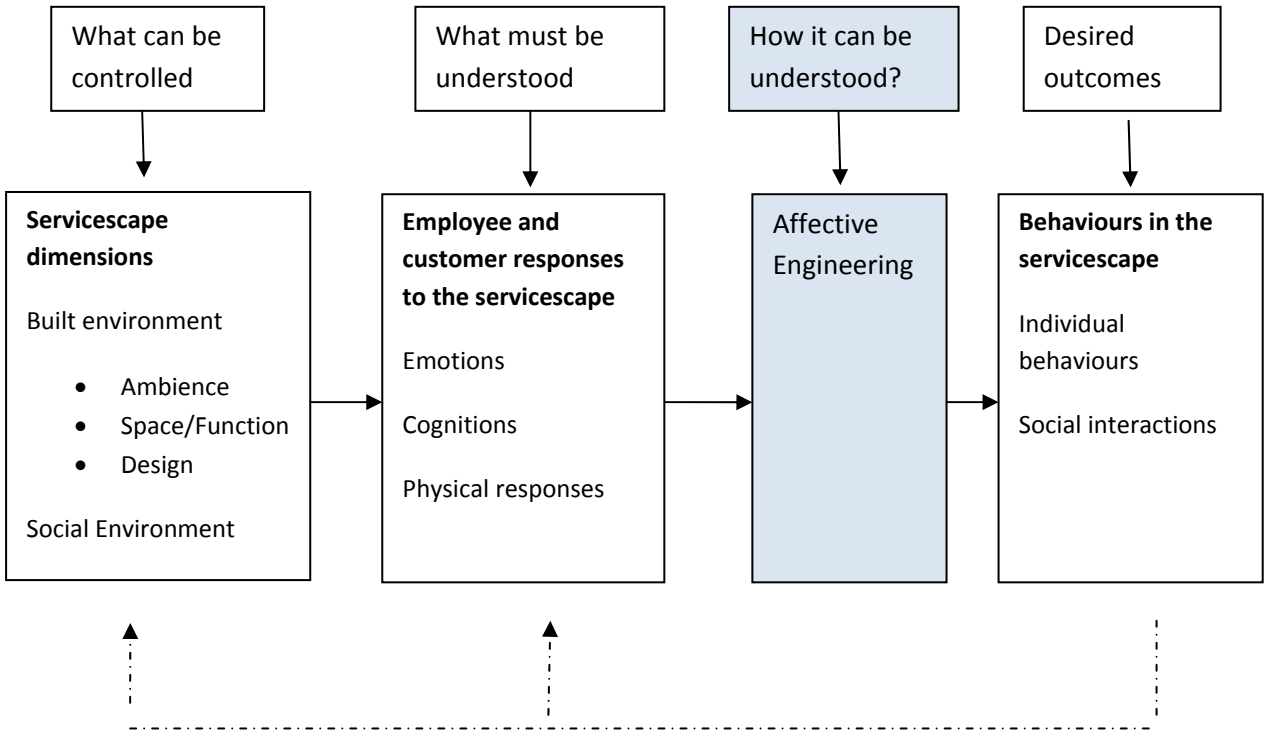

Figure 1. The servicescape: An integrated framework for managers

What can be controlled in servicescapes?

The physical and the social environment are the two controllable aspects which, individually and as well interaction wise, have an effect on the customer's experiences from the servicescape. According to Bitner (1992), the physical environment is considered in terms of three physical factors: the ambient conditions; the spatial layout and functionality; and the signs, symbols and artefacts.

Ambient conditions consist of background characteristics of the environment such as temperature, air quality, noise, music, odours, scent and colour, while space and function includes layout, equipment and furnishing (Bitner, 2000).

All of these factors may profoundly affect how people feel, think and respond to a particular service environment based on our five senses (Bitner, 2000). Mood-enhancing strategies by testing different stimuli in this way have shown considerable results such as women exposed to orange odours found to have a lower level of state anxiety, a more positive mood, and a higher level of calmness in dental waiting rooms (Lehrner et al., 2000). High and large windows with pleasant views or pictures on the waiting room walls proved to yield positive effects in waiting rooms (Cameron et al., 2003). Use of music was related to decreased stress and increased relaxation in comparison to times with no music (Routhieaux and Tansik, 1997), and using poems in the waiting room enhanced the experienced value of the patient's visit to the waiting room (Tyson et al., 2002).

The majority of research on care environments has employed experimental designs to test different environmental variables, for example sound, colour and architecture, in relation to patient outcomes such as recovery, pain and blood pressure (Edwardsson et al., 2006). There is, however, little research-based understanding of the meanings of being in these environments.

The influence of the social environment may also determine both the customer's internal response and outward behaviour (Tombs and Mccoll-Kennedy, 2003). In addition to customer, employee and environment interaction the interaction with other customers in the environment may also play a role in the perception and satisfaction of the servicescape (Bitner, 2000).

What must be understood in servicescapes?

In order to manage the physical and social dimensions of the servicescape the emotional, cognitive and physical customer and employee responses to the servicescape must be understood. From a cognitive perspective servicescapes can effect the beliefs about product and services, and may also have emotional effects on customers and employees that affect their behaviours and feelings for the service and the environment (Bitner, 2000).

How employee and customer responses to the environment can be understood?

In order to understand servicescape effects, environment surveys, direct observation, experimental methods and photographic blueprints are used (Zeithaml and Bitner, 2003).

Environment surveys ask people (customers or employees) to express their needs and preferences for different environmental configurations. An advantage of these surveys is that sample size can be large and many environmental variables can be explored simultaneously; the primary disadvantage of such surveys is that the results may be less valid then other methods because the survey questions and answers may not truly reflect how people feel or how they will behave.

The advantage of direct observations is that it is done by highly trained observers making detailed notes of environmental conditions. The disadvantages are primarily relates to time and costs, and if observers can interpret the environment in a right way.

The experimental method involves groups of customers exposed to different environmental configurations and measurements of their reactions. The advantage of this method is the validity of results. Disadvantages are time and costs.

Photographic blueprints provide a visualization of the service to the customer at each step and are useful for unambiguous documentation of the physical evidence of the service.

It is important to take affective responses into account in service quality evaluations (Grönroos, 2001). The scales used in literature, such as SERVQUAL (Parasuraman et al., 1988), PANAS (Watson, 2000), cover just limited exploration of moods related to service quality dimensions. Moods may have positive or negative effect on customer's evaluations. However emotions that customers feel when consuming a service have not been included in service quality models or in models for measuring satisfaction of services (Grönroos, 2001). Method developments seem to be needed in this area, and an approach for such development is presented in case study. Exploring the interaction effects of design attributes for a servicescape in relation to affective judgements have not been captured fully by the methods suggested in the literature (Osgood et al., 1957; Küller, 1980, Russel et al., 1981).

Considering the methods presented above, to get associations of the relation of service and physical environment design features to customer feelings and values, comprehensive methodological approaches are needed.

3. How customer and employee responses be understood in servicescapes?: Affective Engineering

In this study Affective (Kansei) engineering is proposed as *a methodology to understand and address employees' and customers' emotional needs*. In recent years affective design has increasingly been applied in product development to fulfil customers' and users' emotional needs and preferences. Emotions are in Japanese referred to as "Kansei", which is defined as "an individual's psychological feeling and image resulting from a series of information processes from a certain artefact, environment, or situation" (Nagamachi, 1999).

In Japan the translation terminology for "Kansei" draws back to Amane Nishi (1829-1897), the first person who used Kansei as a philosophical term for "sensibility" (Nagasawa, 2004). In 1921, Teiyu Amano used the German term "Sinnlichkeit" (sensitivity) in Critique of Pure Reason (Kant, 2003) to translate the word Kansei. As an opposite term of Kansei "Risei" (close to "Logic process", reason (Nagasawa, 2004) is also argued by Levy (2007).

However the words "sensitivity" and "sensibility" alone are not exact meanings of Kansei. It is argued that 'to Kansei' means "to feel to the core" (Nagasawa, 2004). The word of Kansei, if used in engineering and business, should be considered to be a series of information processing processes of sensation, perception, cognition, sentiment and expression (Nagasawa, 2004).

Kansei later is described by Nagamachi (2001) as a Japanese word for "individual's subjective impression from a certain artifact, environment, or situation using all the senses of sight, hearing, feeling, smell, taste as well as recognition". It is then explained as the mental process of experiencing the product and described as "psychological feelings and image regarding a product" (Namagachi, 2002).

"Kansei" feelings can be captured in several ways, according to Nagamachi (2001):

- People's behaviours and actions.
- Words (spoken).

- Facial and body expressions.
- Physiological responses (e.g. heart rate, body temperature).

Kansei Engineering is widely used in Asian region, while there is no single unified word for Kansei Engineering in English or western countries. The German philosopher Baumgarten and his work AESTHETICA (1750), which was the first study that influenced Kansei Engineering (Harada, 1997). However, current Kansei Engineering is defined as the transdisciplinary engineering that extends over humanities, social and natural science. (www.jske.org, 2004). Mr. Ken'ichi Yamamoto, Former President of Mazda Motor Co used "Kansei" (1986) in international context when giving lectures on the design success of Japanese cars by Kansei Engineering in U.S.

Kansei Engineering was proposed as a methodology for affective design of products in the early 1970'es (Nagamachi, 1995). The methodology aims at translating human psychological processes, such as feelings and emotions, into appropriate product design elements, such as size, shape, and surface characteristics. The main challenge of this methodology originates from difficulties in mapping Kansei to perceptual design elements (Jiao et al., 2006).

The most common tools for linking the Kansei feeling words with physical product attributes are:

- Regression Analysis /Quantification Theory Type I (Komazawa and Hayashi, 1976 Nagamachi, 2001)
- Genetic Algorithm (Nishino et al., 1999, Tsuchiya et al.,1996; Tsuchiya et al., 1999)
- Fuzzy Sets Theory (Shimizu and Jindo, 1995; Tsuchiya et al., 1996)
- Neural Networks (Ishihara et al. 1995; 1997, Chen et al., 2006)
- Rough sets analysis (Nishino et al. 2001; Nagamachi et al., 2006; Nishino et al., 2006; Okuhura et al, 2005)

If it is assumed that a set of high level words about feelings (kansei) represent emotional needs are determined (see above discussion on Kansei and common tools for Kansei Engineering), *what are the ways to identify and choose between important aspects in relation to give design solutions for servicescape design?*

Figure 2 below may be seen as a model of the value chain in a person's mind consisting of Kansei/ feeling characteristics and the related attributes of the product(including services). The model shows a grouping of feelings, their interactions and the design attribute interactions for certain feelings.

Looking at the extracted feelings specifically consider the interactions between feelings in the first level and the upper level interactions with their (2, 3,.., n) relative design attributes are examined.

The highest level of affective values can be explained as "core Kansei" to show high level feelings representing values for a servicescape.

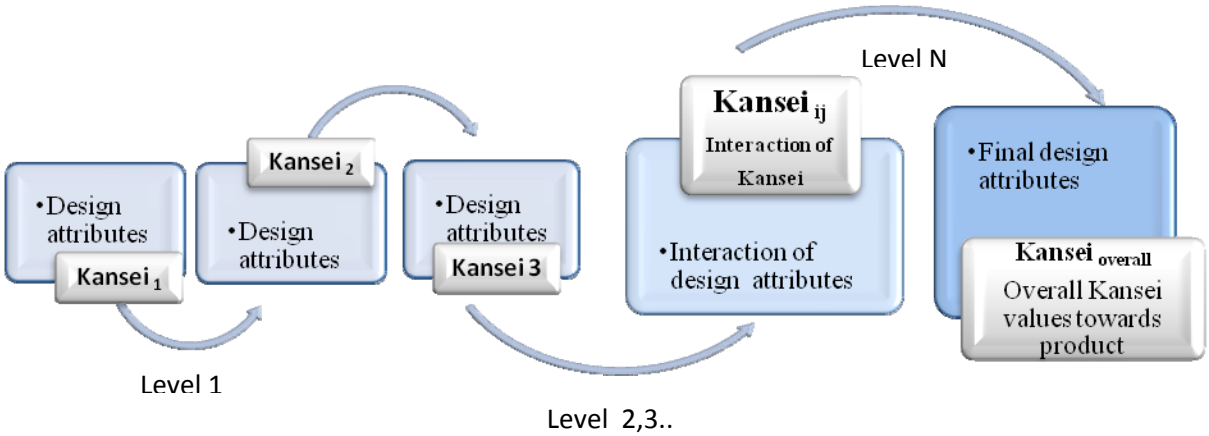

Figure 2. Kansei value chain model.

To explain the role of Affective Engineering waiting areas were selected to study servicescapes (Ayas et al., 2008). The study was undertaken at six primary healthcare centres representing socially and regionally distinct areas in the Östergötland county of Sweden. The aim of the case study was twofold. The first aim was to explore how patients relate their affective responses to physical and service design attributes in waiting areas. The second aim was to identify interactions between physical design attributes and affective values.

As an example the set of high level Kansei Feelings for design of waiting rooms were obtained as: calming, welcoming and safety-security. These feelings were obtained in a previous study (Ayas, 2008) from the commonly desired feelings for patients and staff. We can assume that these feelings represent the highest level of Kansei.

According to the study results to give calm feeling to the patients *privacy, colours, plants, location of play areas for children good design of lighting, small sitting groups and minimal noise* are interacting design attributes.

To give welcome feeling the previous study results show that *nice and comfortable furniture, warm colours and staff behaviours towards patients* are important.

To give safety-security feeling *stable furniture, easy to access to the facilities and staff attention* are important.

It can be seen from the specific characteristics for each type of feeling presented above that some attributes interact with each other. Small sitting groups are needed to give *calm feeling*, however to give *welcome feeling* and to give *security feeling* the furniture characteristics chosen need to be comfortable and need to be stable.

As described above the level of a design attribute (a) for a Kansei feeling (K1) may have opposite interaction with the selected level of another design attribute (b) which is necessary for another desired feeling (K2) (see Figure 3).

Appropriate solutions in such an engineering problem may require justifying product attribute levels to optimize the contrary interactions. Moreover to apply a creative problem solving tools such as Heuristic Redefinition, Classic Brainstorming, Brainwriting 6-3-5, Imaginary Brainstorming, Word Picture Associations and Analogies, TILMAG, Morphological Box, for design of a new physical attribute if the attribute levels chosen are not adequate enough or if they do not exist.

As an example for furniture design in waiting rooms a comfortable armchair can be needed as both soft or hard to keep human body stable. The design of such an armchair may require different product characteristics for hygiene and comfort which interact with softness or hardness of the material.

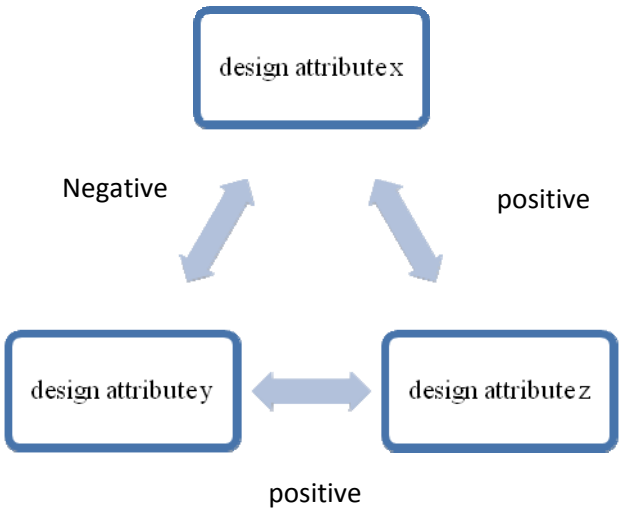

Figure 3. e.g. Representation of some possible correlations between 3 design attributes.

The problems related to the possible interactions presented above are formulated in the following sections with a Design of Experiments approach (DOE).

In complex products the knowledge of interaction between feelings are more useful compare to understanding main Kansei factor effects. To give an example; high level of calmness can be related to high level of privacy and low level of bracing feeling in a service environment. To wrap up this discussion arousing and calming states interact with each other, they do not exist alone in a person's psychological state.

The different levels for Kansei can also be explained as shown below. According to this assumption e.g. second level Kansei is comprised of second level interactions. Third level Kansei is comprised of second and third level interaction effects and so on.

If we think about the waiting room example the three feelings identified with this study are calm, welcome, safety-security. Overall Kansei is assumed to be comprised of these feelings.

The second level interaction helps us to consider the possible effects of interaction between calm and welcome feelings and what the combination of two feelings means for patients. This feeling structure can give us a learning of a higher level perception on human Kansei. As an example a low level of calm feeling may have a negative effect on welcome feeling therefore we learn that to give calm feeling is related to convey welcome feeling in the waiting rooms.

The third level interaction helps us to consider the possible effects of interaction between calm, welcome and safety security feelings and what the combination of three feelings means for patients.

Each person relates his/her Kansei to different product attributes where there are possible interactions between those attributes that need to be considered as explained below. Therefore Kansei research approach take into account such product design complexity.

If the aim is to understand the overall Kansei, the objective function for such an engineering problem is considered to include possible feelings for Kansei. The objective function may change according to the aim with the study.

In the following phrases we can see several Kansei feelings that construct the desired Kansei for a product and each feeling is connected to a possible combination of design attributes and their interactions. The engineering problem here is how to choose the design parameters from *within and between interactions* of design attributes. Let's assume that following design attributes are needed for design of following Kansei feelings in waiting rooms. The design attribute *lightning* interacts both for calm, welcome and safety-security feelings in the environment.

- calm⇨less lighting&warm colours&soft seating material
- welcome⇨ lighting&staff behaviours
- safety-security⇨ stable furniture& easy to access to the facilities&staff behaviours

4. Case Study

Developing healthcare services from an understanding of patients' needs in waiting areas is a growing concern (Arneill and Devlin, 2003; Leather et al., 2003). However, exploring Kansei values and needs for design of waiting areas in primary healthcare are not given the same emphasis.

Waiting environments were selected to study servicescapes (Ayas et al., 2008). The study was undertaken at six primary healthcare centres representing socially and regionally distinct areas in the Östergötland county of Sweden. The aim of the case study was twofold. The first aim was to explore how patients relate their affective responses to physical and service design attributes in waiting areas. The second aim was to identify interactions between physical design attributes and affective values.

A qualitative research with face to face interviews was conducted in the waiting rooms of selected healthcare centres. The earliest interviews in the first healthcare centre played an important role to get a sense about the number of interviewees. The total number of patients interviewed was 60, and the total number of staff was 28 working in different positions (chef of the healthcare centres, doctors, receptionists and nurses).

The perceived affective qualities from the interviewees were analyzed by Correspondence Analysis (CA), which can be seen as a generalization of principal component analysis when the variables to be analyzed are categorical instead of quantitative (Abdi and Valentin, 2007). Correspondence Analysis is a technique that represents graphically the row and column categories and allows for a comparison of their "correspondences", or associations, at a category level (Beh, 2004).

The classification of collected design attributes, based on two studies (Leather et al, 2003; Bitner, 1992), was by categories of Functionality*, Facility, Interior Appearance and Activity*. In order to investigate the second research question, the relation between design elements and feelings responses were analyzed by Rough Sets Method (Pawlak, 1982).

Table 2: Overview of the data collection and analysis approaches

Data Collection		**Analysis**	
Subjects	Type	Fieldwork	Experiment
Patient Personnel	Interviews (Text: open end)	-Data linking -Content analysis	-~ χ^2 Independency Tests - Correspondence Analysis -Rough Sets Analysis

Results

The results of the exploratory study on identifying Kansei values showed that three different quality dimensions interact with each other as important in feeling a waiting room's Affective Qualities, Technical Quality and Interaction Quality (Figure 4). These qualities were desired from patients and staff for the servicescape design. When these qualities interact with human's cognitive state based on personal characteristics such as experience, knowledge this interaction constructs the basis for the individual's Kansei.

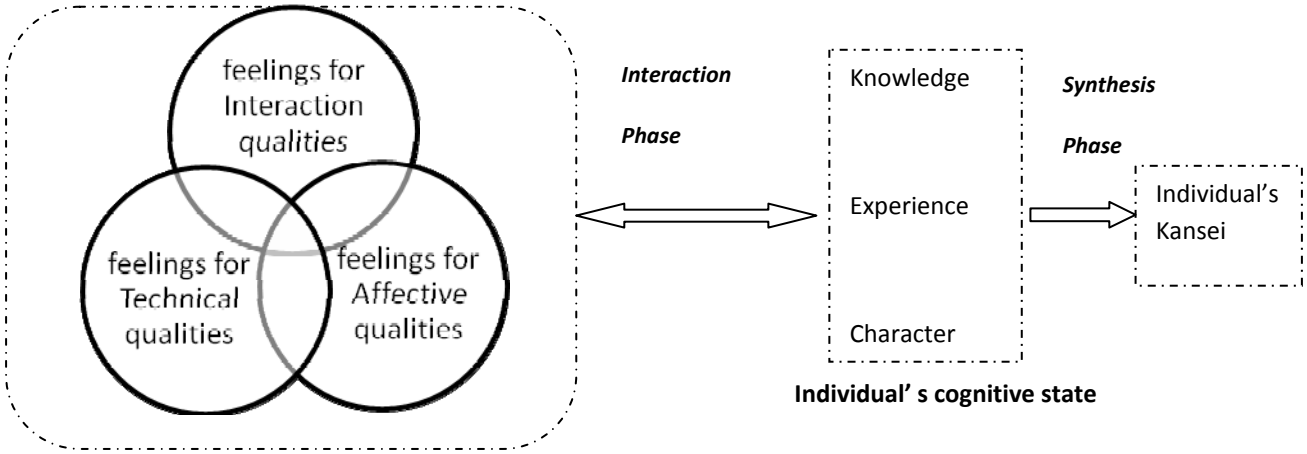

Figure 4. Kansei feeling space for a healthcare servicescape.

5. Conclusions

It is suggested in this study that interactions between designs attributes need to be considered to understand and reflect human feelings in servicescape design. With the case study it has been shown that Affective Engineering can provide methodological solutions towards understanding affective needs and values towards products responding to customer's needs.

More structured data collection methods are needed to understand customer's affective needs. With the approaches presented here the author wants to point out the needs for methodological developments to distinguish between functional and affective values for a service environment and to show how the two dimensions of values interact for future improvements.

Human nature has a complex and dynamic structure and due to this designing and developing products that will satisfy desires, wants and needs are usually difficult. This dynamic structure has been modelled in the present study by showing the interactions between human Kansei and between Kansei and product design attributes. In the broad level of environmental design taking positive-negative interactions both for feelings and physical design attributes into account is inevitable.

The framework proposed in this paper may be developed further in order to better handle studies of complex contexts and environments with extremely many design alternatives. It is argued that by distinguishing important feelings from intangible and tangible quality characteristics generating Kansei values, waiting experiences can be designed that connect with people on a deeper level transforming the environment into spaces of greater significance.

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