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Concept of Satisfaction

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Abstract: This article examines the concept of satisfaction from various viewpoints including linguistics, psychology, and philosophy as well as Kansei engineering and will pursue how the design of artifacts that will bring the satisfaction can be realized and how the evaluation of satisfaction can be achieved. Of course, there have been some satisfactory measurement scales such as SUS, SUMI and WAMMI. But they simply measure the degree of resulting satisfaction and does not consider the relationships between the satisfaction and other quality characteristics. What is needed is the measurement of satisfaction based on the consideration on the conceptual network including relevant quality characteristics.

Keywords: Satisfaction, UX, usability

1. INTRODUCTION

In the field of user experience (UX), it has not yet clarified how we can measure the quality of UX. Because the UX is an experience of an individual as is stated in UX White Paper (Roto et al. 2011), the measurement should be on the subjective aspect. There are many quality characteristics including both of objective ones and subjective ones. Objective quality characteristics will be independent variables for the measure of UX and some of subjective quality characteristics can be the dependent variable while others will be independent variables.

This paper deals with the concept of satisfaction as the best relevant candidate for the dependent variable of UX and discuss its definition and the temporal structure of dynamic process.

2. CONCEPT DEPENDENCY ANALYSIS

Regarding the concept of satisfaction, one of the authors have proposed the diagram as shown in Figure 1 since 2006. The main purpose of this figure was to re-examine the concept and sub-concepts of usability. “Satisfaction” that was located as one of the sub-concepts of usability in ISO9241-11:1998 seemed to the authors much more fundamental and important concept than to be included as a part of usability.

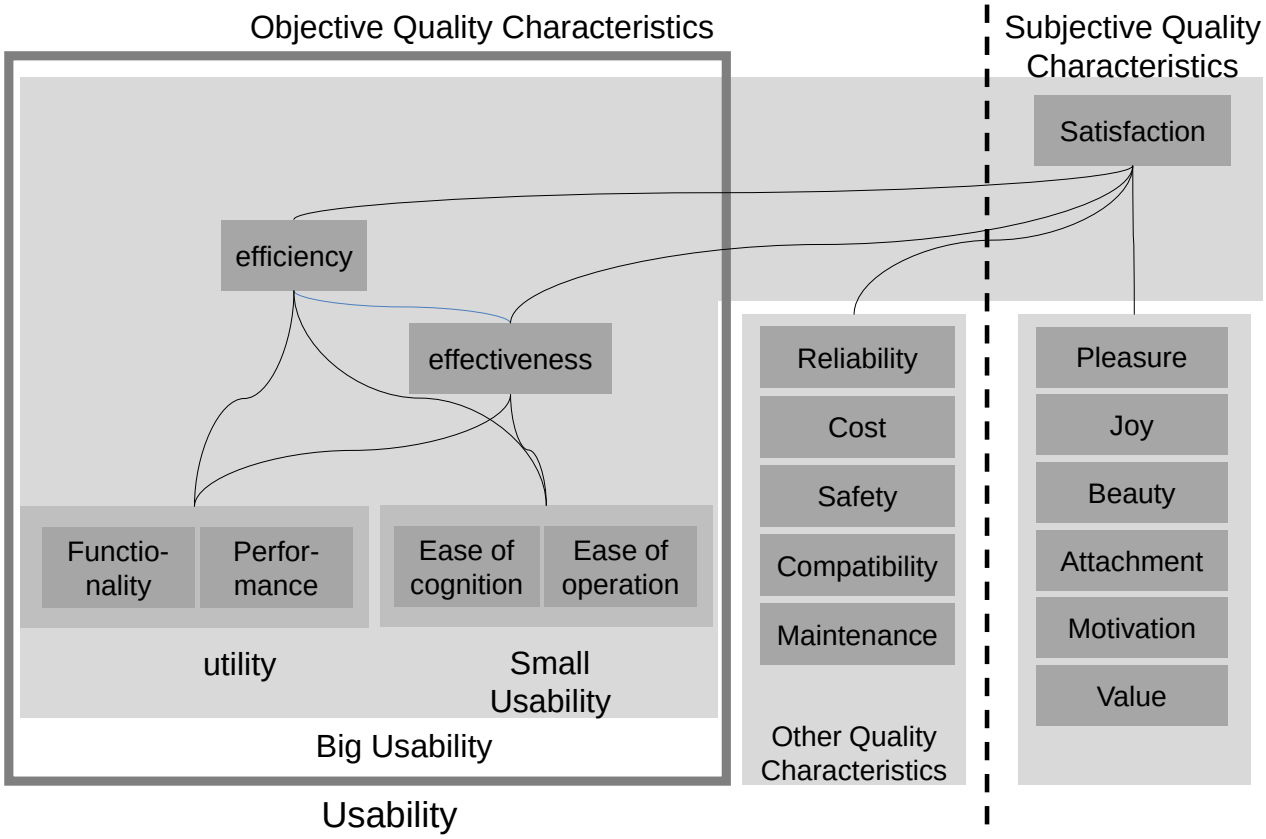

Figure 1. Concept of usability and satisfaction (Kurosu 2006)

The figure simplifies the network structure among objective and subjective quality characteristics and the network relationships were constituted based on the Concept Dependence Analysis (CDA) of which authors have proposed. The idea and the procedure of the CDA is quite simple. Take two concepts and inspect their mutual relationship as

Can concept A always be approved when concept B is achieved? (1)

Can concept B always be approved when concept A is achieved? (2)

Take the relationship between the satisfaction and the effectiveness as an example. When the effectiveness is achieved, the satisfaction will always be approved because the effectiveness will always satisfies people. But the opposite is not true. When the satisfaction is achieved, the effectiveness will not always be approved because the satisfaction can be achieved by other quality characteristics such as the efficiency, reliability, safety, beauty, etc. As a result of the tests between all possible pairs of quality characteristics, the satisfaction was regarded as the top level concept. Thus the satisfaction can be regarded as the dependent variable and the rest including all the objective quality characteristics and other subjective quality characteristics will be regarded as the

independent variables for the satisfaction. And this figure, though putting much emphasis on the usability, can be regarded as the concept structure for the measurement of the UX.

A bit more explanation on the CDA will be explained here. There are 5 dependency patterns as in Figure 2.

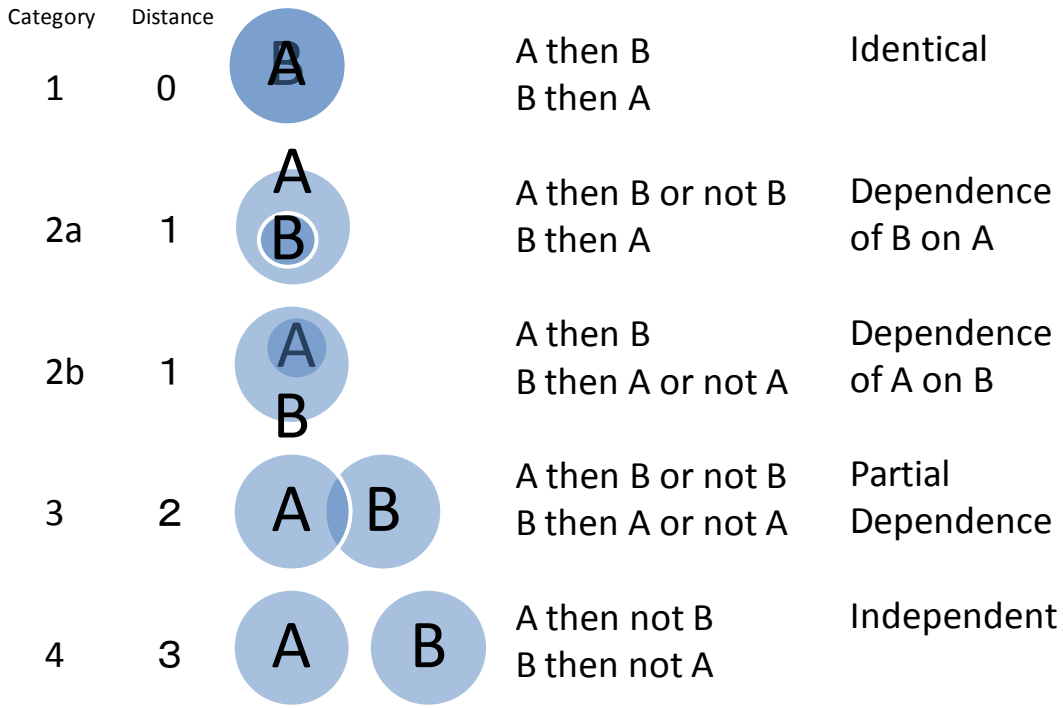

Figure 2 Dependency patterns of concept A and concept B

Table 1 is the dependency distance matrix for concepts described in Figure 1. Each cell contains the distance between concept A and concept B based on the pattern classification on Figure 2.This table is the symmetric matrix because each entry represents the dependency of A on B as well as the dependency of B on A. In figure 2, category 2a and 2b are symmetrical by including the relationship of A to B as well as that of B to A.

A \ B	functionality	performance	ease of cognition	ease of operation	effectiveness	efficiency	reliability	cost	safety	compatibility	maintenance	pleasure	joy	beauty	attachment	motivation	value	meaningfulness	satisfaction
functionality	0	3	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	1
performance	3	0	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	1
ease of cognition	2	2	0	3	2	2	3	3	3	3	3	3	3	3	3	3	3	3	1
ease of operation	2	2	3	0	2	2	3	3	3	3	3	3	3	3	3	3	3	3	1
effectiveness	2	2	2	2	0	1	3	3	3	3	3	3	3	3	3	3	3	3	1
efficiency	2	2	2	2	1	0	3	3	3	3	3	3	3	3	3	3	3	3	1
reliability	3	3	3	3	3	3	0	2	2	3	3	3	3	3	3	3	3	3	1
cost	3	3	3	3	3	3	2	0	3	3	3	3	3	3	3	3	3	3	1
safety	3	3	3	3	3	3	2	3	0	3	3	3	3	3	3	3	3	3	1
compatibility	3	3	3	3	3	3	3	3	3	0	2	3	3	3	3	3	3	3	1
maintenance	3	3	3	3	3	3	3	3	3	2	0	3	3	3	3	3	3	3	1
pleasure	3	3	3	3	3	3	3	3	3	3	3	0	0	2	3	2	2	3	1
joy	3	3	3	3	3	3	3	3	3	3	3	0	0	3	3	2	2	3	1
beauty	3	3	3	3	3	3	3	3	3	3	3	2	3	0	2	2	2	3	1
attachment	3	3	3	3	3	3	3	3	3	3	3	3	3	2	0	3	3	3	1
motivation	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	0	2	2	1
value	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	2	0	2	1
meaningfulness	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	0	1
satisfaction	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0

Table 1. Dependency Matrix

The clustering (Group Average Method) was applied to the dependency matrix in Table 1. Although the clustering method itself does not process the directional data, table 1 represents the mutual relationship of dependency hence the clustering method could be thought to be valid to process the data. The resulting dendrogram is shown in Figure 3.

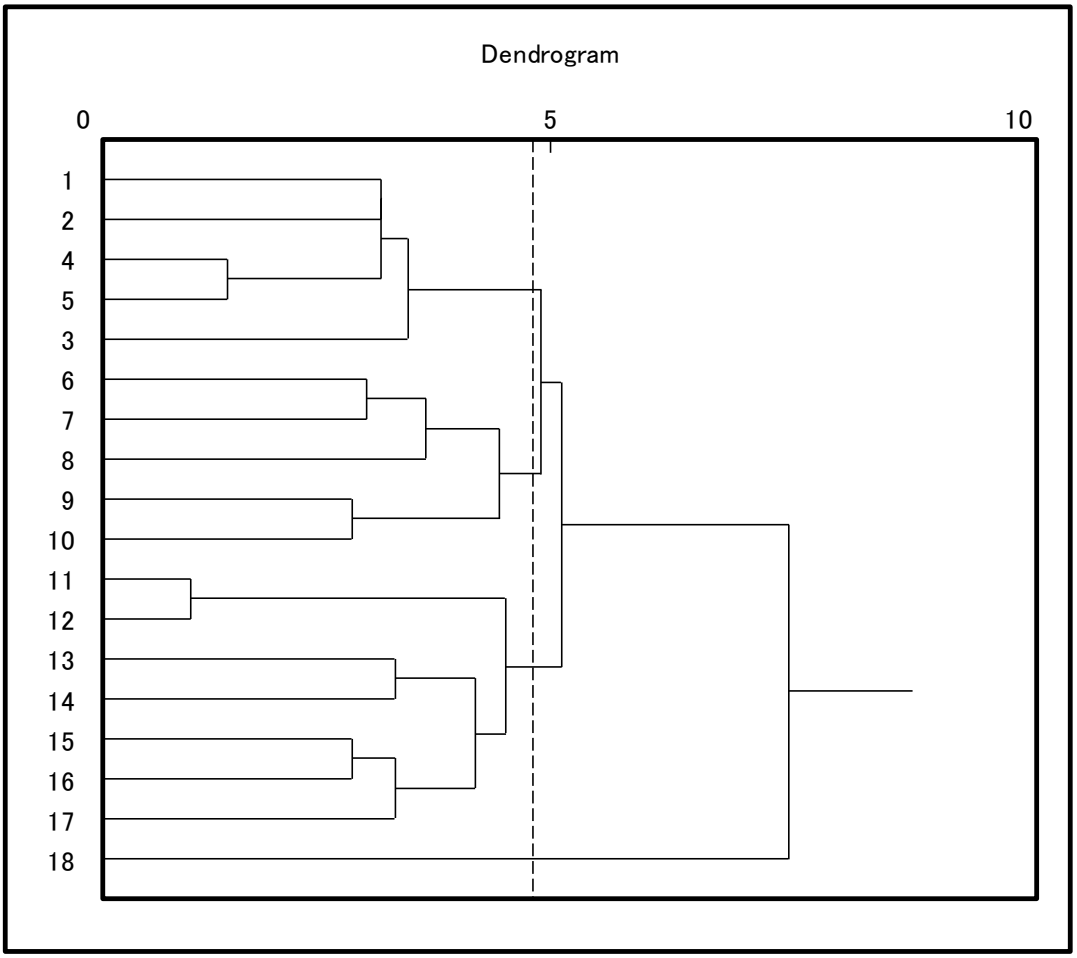

Figure 3 The dendrogram showing clusters among 18 quality attributes.

It is obvious that the satisfaction (No. 18) is regarded as the ultimate dependent variable among 18 quality attributes.

3. LINGUISTIC ANALYSIS

According to “The Random House Dictionary”, the word “satisfaction” means “1. the act of satisfying; fulfillment; gratification. 2. the state of being satisfied; contentment. 3. the cause or means of being satisfied. 4.confident acceptance of something as satisfactory, dependable, true, etc. ..”. And the verb “satisfy” means “to fulfill the desires, expectations, needs, or demands of a person, the mind, etc.); to give full contentment”. A Japanese dictionary “Kohjien (広辞苑)” lists almost the same definition to the word “manzoku (満足)”. Hence, we can almost neglect the linguistic difference between the connotations of these two words; one in English and another in Japanese.

4. CONCEPT OF SATISFACTION

4.1. Satisfaction in ISO Standards

In ISO9241-11:1998 on the usability engineering, the satisfaction is included in the concept of usability because the artifact that has the effectiveness and the efficiency will give users the satisfaction. This notion has been inherited to succeeding standards such as ISO13407:1999 (now

revised as ISO9241-210:2010), ISO/TR18529:2000, ISO/TR16982:2002, ISO20282-1 to 4:2006 to 2007, and ISO25010:2011.

On the contrary, the author has been claiming that the satisfaction is not such a small concept but the top level concept regarding the total quality of artifacts as can be seen in Figure 1. It is because the user can be satisfied by other objective quality characteristics such as reliability, cost, safety, compatibility and maintenability as well as the subjective (Kansei) quality characteristics such as pleasantness, joy, beauty, attachment, etc. in addition to the usability.

The satisfaction, in this sense, is not just a subjective (Kansei) quality but an integrated notion covering both of the objective and the subjective quality and is different from other subjective (Kansei) qualities. In other words, objective quality and subjective quality are mutually independent.

4.2. Framework for the Experience Engineering

Furthermore, authors proposed the concept of experience engineering. The idea of experience engineering emerged based on the consideration that the concept of UX does not cover the whole everyday experience of the people but only the experiences with the products and the systems. As is stated in ISO9241-210, we should include the service activity when considering the daily experience. But in the field of service engineering, people are not the users but are the customers as can be found in the term of customer experience (CX).

Furthermore, based on the idea that good experiences can only be achieved when products, systems and services are meaningful. Meaningless products, systems and services will not bring good experiences even though they are full of usability, Kansei quality, etc. Meaningfulness is strongly related to the real (and in most cases covert) needs of the people and will bring the significance in the real life.

This idea is shown in Figure 4 and the revised version is shown in Figure 5 where the objective /subjective quality characteristics and meaningfulness are categorized as independent variables and the satisfaction is located as the dependent variable.

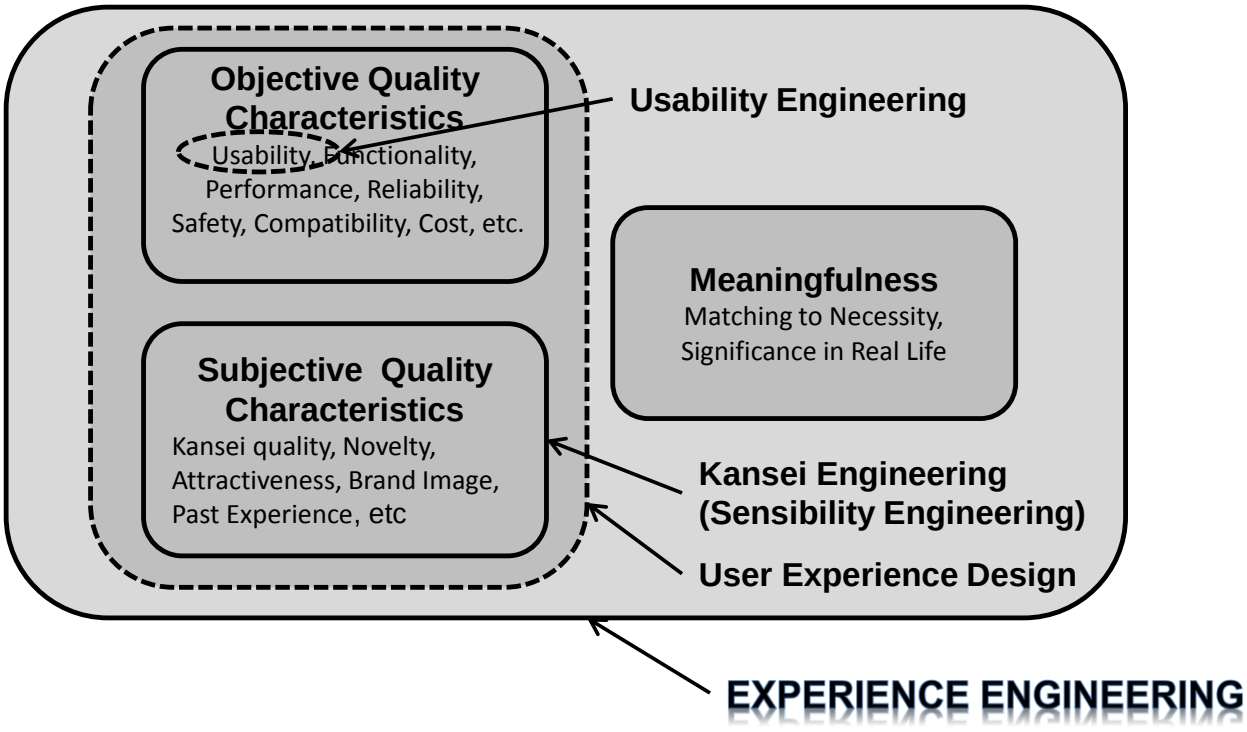

Figure 4 Key Concepts of Experience Engineering (Kurosu 2013)

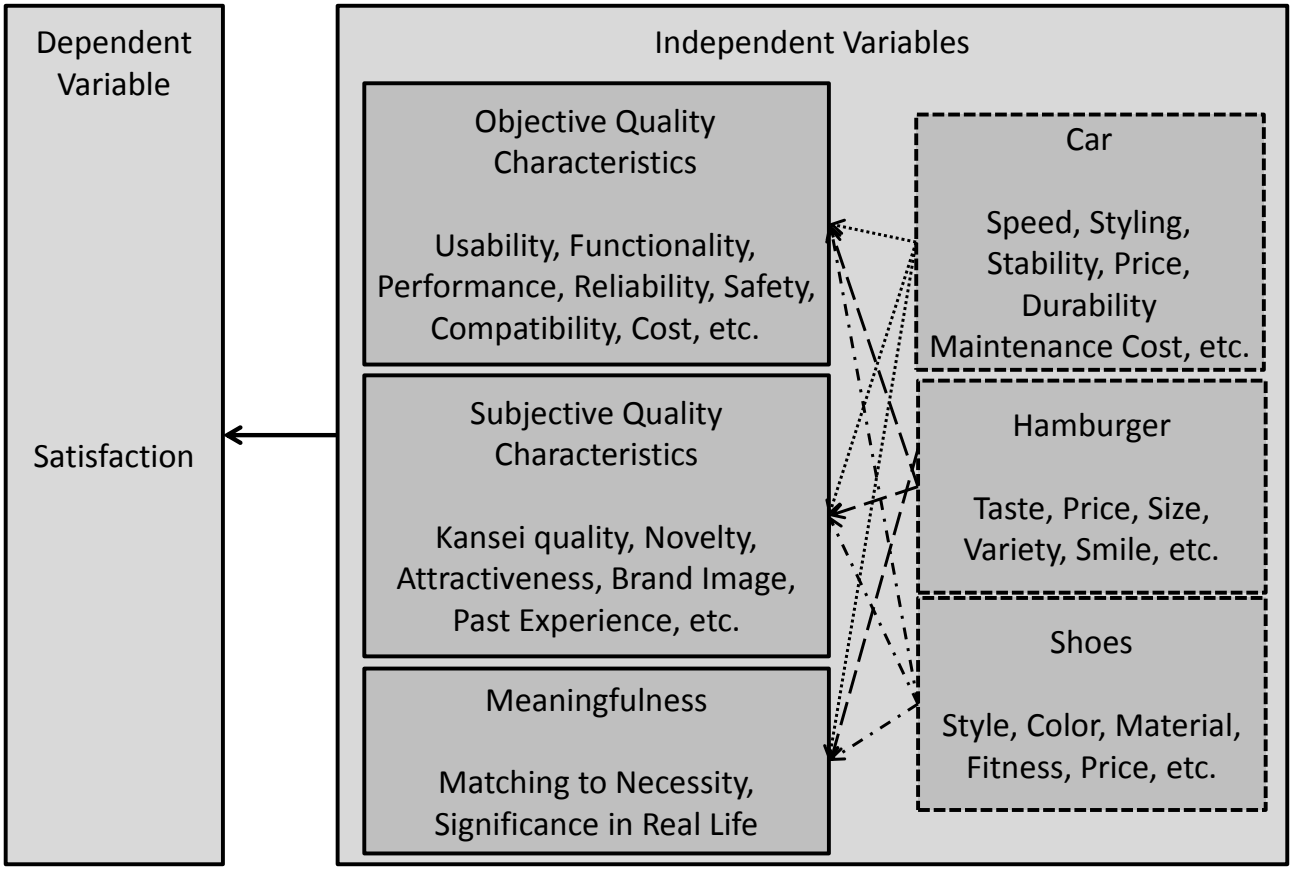

Figure 5 Objective Quality Characteristics, Subjective Quality Characteristics and Meaningfulness as Independent Variables and the Satisfaction as the Dependent Variable

As can be seen, the objective quality characteristics include usability, functionality, performance, reliability, safety, compatibility, cost, etc. and the subjective quality characteristics include Kansei quality, novelty, attractiveness, brand image, past experience, etc. Meaningfulness is the degree of matching to necessity and is the significance in the real life.

The figure also includes three examples; the car, the hamburger, and the shoes. Quality characteristics that are important for each of them are different. For example, speed, styling, stability, price, durability, and the maintenance cost are important for cars, but the taste or the material are not important for them. The importance of these characteristics may vary depending on the type of products and systems, and finally will be converted into the objective/subjective quality characteristics and the meaningfulness.

4.3. Dynamic Process of Satisfaction

In Figure 6, temporal processes in the industry and in the market are described. The process in the market can be regarded as the temporal process of the UX where the previous process, the obtaining process and the post process are included. The previous process is mainly the expectation, the obtaining process is mainly the direct impression at the purchase, and the post process is mainly the accumulation of impression in the course of the long-term usage.

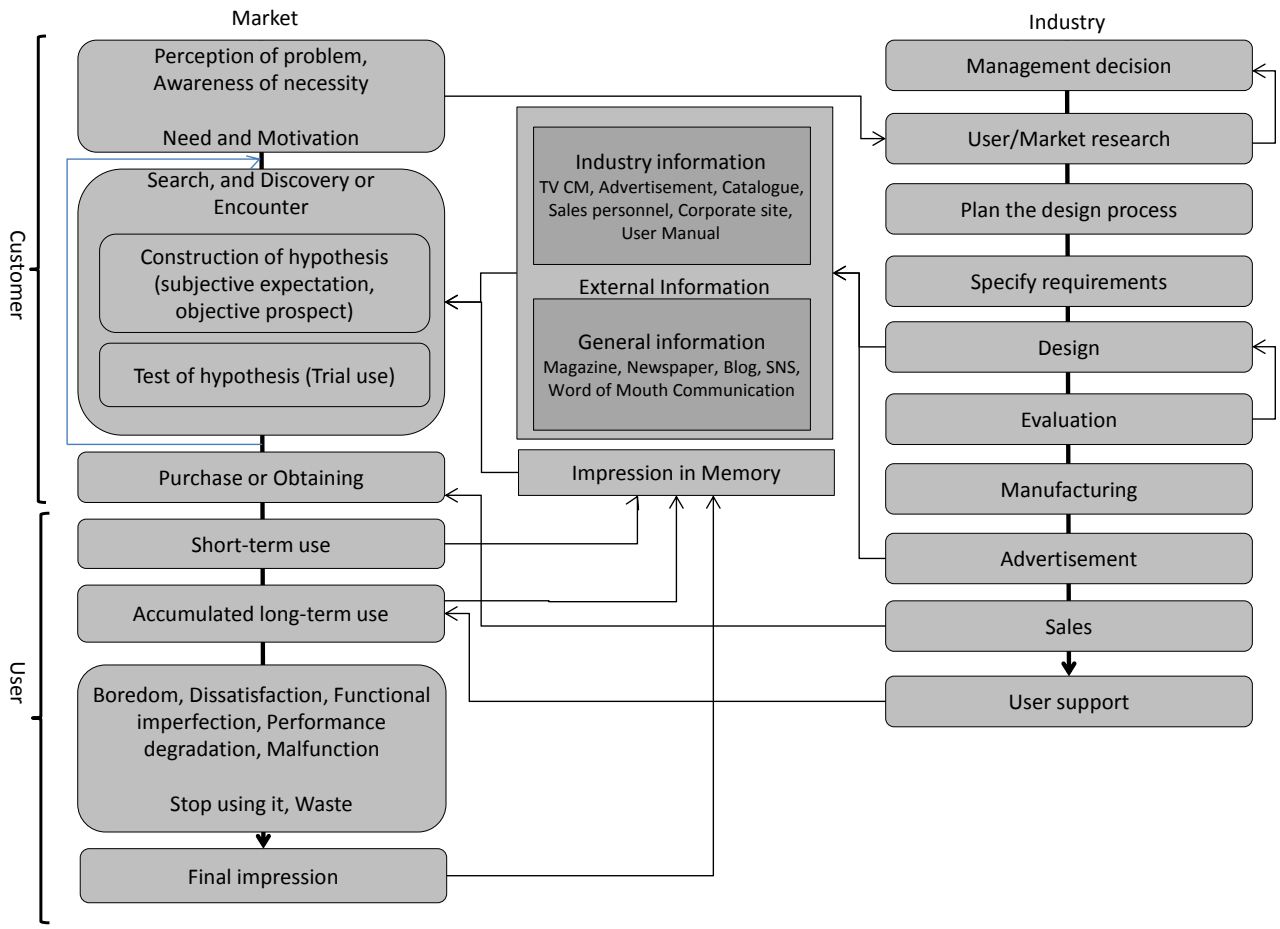

Figure 6. Temporal Process in the Industry and in the market for products. (Kurosu 2013)

In Figure 7, the dynamic process of satisfaction is described based on the concept of Figure 6. In this figure, three psychological concepts are included. The first one is the adaptation level by Helson (1948). The accumulation of past experience will form the frame of reference or the adaptation level (AL) and will bring the expected level of evaluation as

$$\log AL = \sum_{i=1}^{n} wi \cdot logAi \qquad \left(\sum_{i=1}^{n} wi = 1\right)$$

where Ai is the strength (of experience) of i-th experience and wi is the weight. The initial level of satisfaction will thus be the difference between the expected level (AL) and the actual level. And people can be satisfied if the difference is positive and be dis-satisfied if the difference is negative.

In this comparison process, the second psychological concept of the level of aspiration (Levin et al. 1944) is related. According to this concept, people may lower their expected level so that the result of subtraction be positive.

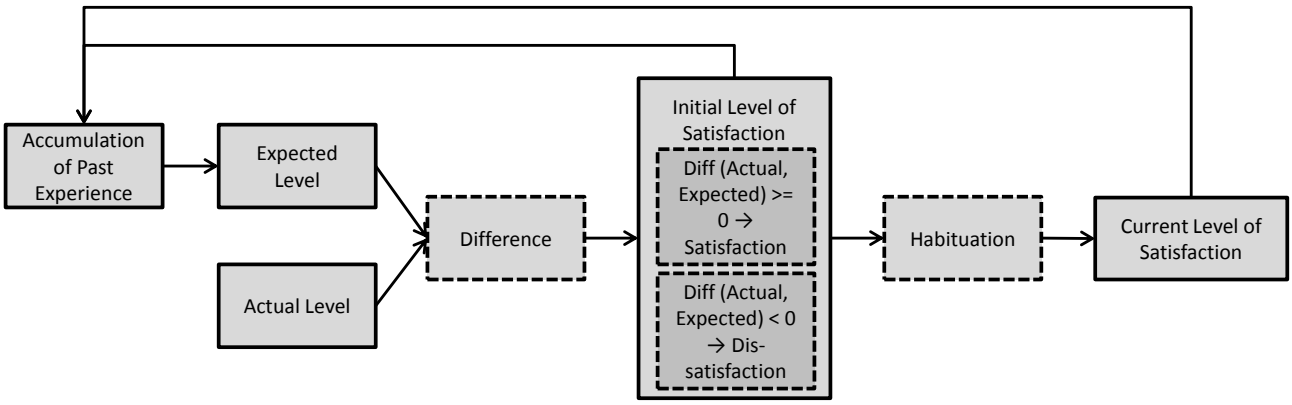

Figure 7. Dynamic Process of Satisfaction

The third psychological concept is the habituation that is defined as “the weakening of a response to a stimulus, or the diminished effectiveness of a stimulus, following repeated exposure to the stimulus” (APA Dictionary of Psychology). This tendency can generally be seen in the UX curve (Kujala et al. 2011) although, in some cases, the curve goes upward based on some positive event. The dynamic process of satisfaction, thus, can be expressed using three psychological concepts.

5. CONCLUSION

In this article, authors proposed that the satisfaction is the dependent variable that is representing the UX and all other objective/subjective quality characteristics are the independent variables. This functional relationship will depend on the temporal factors to which three psychological concepts are related, namely, the adaptation level, the level of aspiration and the habituation.

REFERENCES

Helson, H. (1948) “Adaptation-level as a Basis for a Quantitative Theory of Frame of Reference” Psychological Review, 55, p.297-313

ISO. (1998). ISO9241-11:1998 Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) -- Part 11: Guidance on Usability.

ISO. (2010). ISO9241-210:2010 Ergonomics of Human-System Interaction - Human-Centred Design for Interactive Systems.

ISO. (1999). ISO/IEC13407:1999 Human-Centred Design Processes for Interactive Systems.

ISO/TR 16982:2002 (2002) “Ergonomics of Human-System Interaction – Usability Methods Supporting Human Centred Design”

ISO/TR 18529:2000 (2000) “Ergonomics of Human-System Interaction – Human Centred Lifecycle Process Descriptions”

ISO 20282-1:2006 (2006) “Ease of Operation of Everyday Products – Part 1: Design Requirements for Context of Use and User Characteristics”

ISO 25010:2011 (2011) “Systems and Software Engineering – Systems and Software Product Quality Requirements and Evaluation (SQuaRE) – System and Software Quality Models”

Kujala, S., Roto, V., Vaananen-Vainio-Mattila, K., Karapanos, E. and Sinnela, A. (2011) “UX Curve: A Method for Evaluating Long-Term User Experience” Interacting with Computers,

Kurosu, M. (2006) “New Horizon of User Engineering and HCD” HCD-Net Journal

Kurosu, M. and Hashizume, A. (2013) “Descriptive Words for Various Experience” NES 2013 Proceedings

Lewin, K., Dembo, T., Festinger, L., and Sears, P.S. (1944) “Level of Aspiration” in Hunt, J.McV. (ed) “Personality and the Behavioral Disorder Vol.1” pp.333-378

Roto, V., Law, E. L-C., Vermeeren, A. and Hoonhout, J. (eds) (2011) “User Experience White Paper – Bringing Clarity to the Concept of User Experience” http://www.allaboutux.org/uxwhitepaper/

Stein, J. (1966) “The Random House Dictionary – The Unabridged Edition” Random House.

VandenBos, G.R. (ed.) (2006) “APA Dictionary of Psychology” APA Press

BIOGRAPHY

Masaaki Kurosu is a professor at the Open University of Japan, since 2009. He is also a President of HCD-Net (Human Centered Design Network). Based on his career as a usability professional in industry and academia, he proposed the concept of user engineering and the ADA (Artifact Development Analysis) and a new concept of experience engineering. He is an author of more than 40 books. For more information, visit http://user-engineering.net/masaaki/index.html.

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