



THE INFLUENCE OF USER CHARACTERISTICS IN NEGATIVE USE EXPERIENCE AND THEIR IMPLICATIONS

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1. Introduction

Today a wide range of electronic products is being sold in the market every day. Once consumers purchase a product that they have never used before, they evaluate the product based on their expectations, which will lead to whether it is satisfactory or not. Commonly consumers tend to repurchase products which they have been satisfied with [Anderson 1998]. If a product does not deliver positive user experience, it would easily lead to failure in the market. This is why designers should take product use experience into consideration much in the product development process, [Schneider and Bowen 1999], [Bougie et al. 2003]. In fact, consumers go through both positive experiences and negative experiences at the same time [Geva and Goldman 1991]. Therefore, it is important to facilitate positive experience as well as to improve negative experiences with a product. Nevertheless, the industry has focused on how to increase positive user experience by trying to add more technology-driven features to their products rather than to understand their target user groups, feature their products, or investigate the situations their products will be used. Even design academia has paid more attention to and emphasized on design factors in relation to positive user experiences. This results in lack of studies on why people are not satisfied with their electronic products and how elements in designing a product such as user characteristics, time, use situation and product type are related to such dissatisfaction with the products Karapanos [2013]. At most, an increasing number of negative product experiences were identified and their reasons were not revealed in depth [Den Ouden et al. 2005]. We are sure that not only enhancing positive user experiences but also reducing negative user experiences could contribute to delivering better product experiences to the user at the end. Therefore, the study aims to identify what negative product experiences consumers have had with electronic products and how they are related to user characteristics and product type as an exploratory study.

2. Theoretical background

In the previous study, the authors tried to figure out what reasons had explained about the dissatisfaction of electronic product usage [Kim and Christiaans 2011]. Based on the reasons of dissatisfaction, three categories of consumer complaints, sensory, functional and operational problems, have been created:

- Sensory problems refer to the problems related to sensory perception and physical efforts, of which assessments are made through the structure, size, weight, noise, or touch of a product.
- Functional problems mean the problems related to the achievement of functional aim of a product. This dimension is evaluated through performance of functions, functional possibility, and the consumption of energy.

- Operational problems are related to user's cognitive spent during the use of the product. The user evaluates the quality based on ease to use and richness of feedback.

In addition to the categorization, the influence of user characteristics (e.g. age and gender) and product properties (e.g. interaction density and operational transparency) to particular categories were investigated in the studies [Kim and Christiaans 2012]. And also, the authors tried to figure out what reasons had explained about the dissatisfaction of electronic product usage. In the studies, user characteristics and product properties were mainly investigated with a wide range of electronic products. However, it was hard to compare differences of soft problems in terms of product type.

Similarly, with Karapanos [2013], the author saw diversity in user experience from the perspective of 'Individual', 'Situation', 'Product', and 'Time', which influence on interactive product. And also, some studies have revealed the relationship between consumers' preference and their characteristic [Sheth 1977], [Chen-Yu and Seock 2002].

Based on these studies, we built a conceptual framework of the study (Figure 1). First, we selected user characteristics which influence on negative product experience. It contains gender, cultural background, technology familiarity. According to the previous study, Leventhal et al. [1996] found that gender is more powerful factor than cultural background which effects on the preferred design. As one of factors explaining product properties, frequency of use was also included in the study because how often a product is used can differentiate between many electronic products. The interaction between the user characteristics and the product property is described in association with three types of negative use experience: sensory, functional, and operational problems based on the previous study [Kim and Christiaans 2011].

The main focus of this study is on identifying the relationship between user characteristics and three types of negative product experiences in relation to frequency of use.

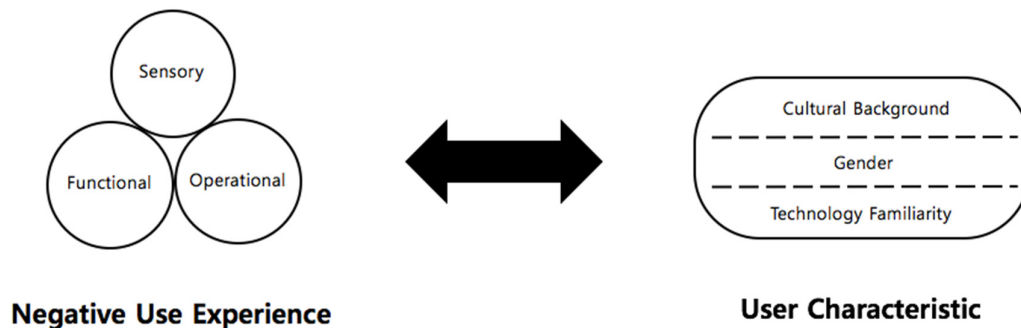


Figure 1. Conceptual framework of the study

3. Research methods

3.1 Participants

A total of 54 participants were recruited in the study. 24 participants from South Korea, which consisted of 15 females and 9 males, and 30 participants from the Netherlands, which consisted of 14 females and 16 males. The reason why the two countries were chosen is that cultural background is one of elements that characterizes user and two countries have distinctive differences in cultural dimensions representing Western Europe and Far East Asia respectively [Hofstede 2001]. They all were university students from various majors. Their age ranged between 20 and 30 years old at the time of the survey. The young generation was chosen because they got used to electronic products and it was easy to obtain information of rich experience, per se.

3.2 Apparatus

Negative use experiences are a function of both user characteristics and product properties. In order to see how user characteristic influence negative use experiences, products having the same properties as

well as many use problems had to be compared. So, 10 consumer electronic products were chosen based on the previous study, in which it had been found as most annoying 10 products (Figure 2)[Kim and Christiaans 2011].



Figure 2. Top 10 annoying electronic products: mobile phone, desktop computer, all-in-one printer, digital camera, DVD player, laptop computer, microwave, digital audio player, vacuum cleaner, and remote controller [Kim and Christiaans 2011]

To measure negative use experiences of the 10 products and the other information of participants such as user characteristics and product property, a questionnaire was developed. Among many user characteristics, cultural background, gender, and technology familiarity were selected. To figure out technology familiarity and negative use experiences of participants, questions were developed (Table 1). Technology familiarity was measured on five Likert scales according to the extent to which they got familiar with operating electronic products. For frequency of use, another question was used to ask how often the participant had used the particular product. In the questionnaire, there was an open question asking what kind of complaint the participant had had in using the particular electronic product. Demographical information such as age and gender was lastly asked right after answering the questions in the questionnaire. The interview was conducted to check whether all answers were clearly made and identify exactly what problem she/he had experienced.

Table 1. Questions and scales for measuring technology familiarity, frequency of use and negative use experience

Item	Question	Scale
Technology familiarity	How much are you familiar with operating electronic products in general?	Not at all Familiar / Somewhat Familiar / Moderately Familiar / Familiar / Very Familiar
Frequency of use	How often have you used the product?	Everyday / 3-4 times per week / 1-2 times per week / 2-3 times per month / less than 1 time per month
Negative use experience	What kind of complaint have you had in using the electronic product?	Open-ended

3.3 Procedure

Dutch participants were individually invited to the Product Innovation Lab at TU Delft, the Netherlands where is made like a living room (the left one in Figure 3). And South Korean participants were invited to the Home Lab at UNIST, South Korea which also has one room apartment look (the right one in Figure 3). An instruction for the survey was given before the participants started to fill out the questionnaire. After they completed the questionnaire, it was followed by a retrospective interview.



Figure 3. An example of Dutch participant (left) and South Korean participant (right) filling out the questionnaire

3.4 Data analysis

The complaints made by the participants were coded into one of three soft problem types: sensory, functional or operational problem. User characteristics such as gender and cultural background were statistically analyzed to figure out how they are related to particular types of negative use experience. Technology familiarity, another variable of user characteristics and frequency of use, the other variable of product properties apart from product type were on ordinal scale and thus descriptive analysis was conducted only for those two variables.

4. Results

4.1 Negative use experience and product type

All the negative use experiences were categorized into one of three problems by the authors and an external researcher and they are illustrated per product type shown in Figure 4.

4.1.1 Sensory problems

Products that were rated as most dissatisfactory were in the order of vacuum cleaner, laptop computer and desktop computer. First, noise and weight were the major reasons why the participants complain about the vacuum cleaner. Heaviness of and heat emission from laptop computers took the majority of their complaints. On the other hand, the characteristics of taking much space and hard-to-adjust screen explained the sensory problems related to desktop computers.

4.1.2 Functional problems

Mobile phone, all-in-one printer and laptop computer were top three of dissatisfying products in terms of functional quality. Firstly, the participants complained of the slowness and short battery sustainability with their mobile phones as well as laptop computers. With all-in-one printers their major complaints were about paper jam and problems occurring trying to connect to the other devices. Furthermore, the color output of the printer did not meet the expectations of some of the participants.

4.1.3 Operational problems

Products that had the most dissatisfaction rating were remote controller, all-in-one printer, and microwave oven. Confusion due to too many buttons was the main reason why they were dissatisfied with remote controller. Lack of universal design between diverse remote controllers explained why there were a number of complaints with the product. All-in-one printers' dissatisfaction resulted from both unfriendly user interface and hard-to-use the scanner function. Lastly, the microwave oven was one of annoying products because it was hard to identify whether or not food was cook, and also difficult to figure out what each function of the product was for.

It turned out that the percentages of types of negative use experiences somehow vary between product types. It implies that each type of negative use experiences with a product is dependent on its product type.

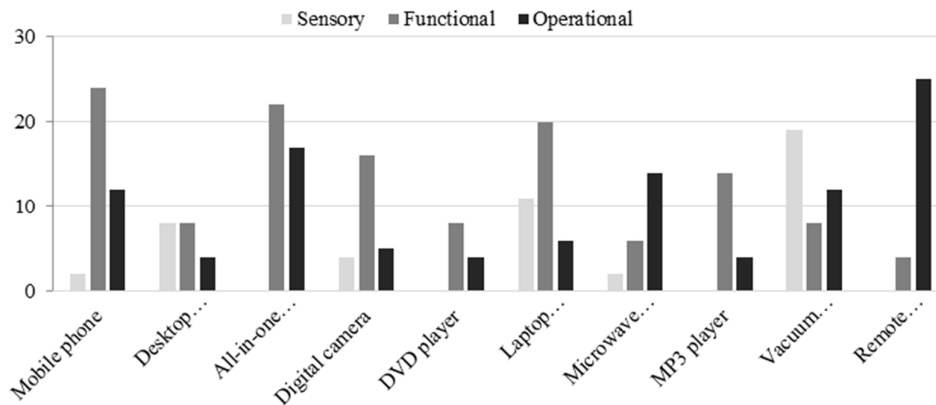


Figure 4. The frequency of negative product experience in terms of the categorization per product type

4.2 Type of negative use experience and user characteristics

4.2.1 Cultural background and gender

To identify the relationship between type of negative use experience and demographical aspects such as cultural background and gender, the Chi square analysis and Fisher's exact test were conducted. According to the results, there was only one statistically significant relationship between type of negative use experience and the demographic factors. For laptop computer, there was a statistically significant relationship between cultural background and type of negative use experience. By Fisher's exact test, there was 99.6% correlation ($p=0.004 < 0.05$). The reason why this test was used was because 2/3 (66.7%) of the whole cells had an expected frequency of less than 5.

Through frequency analysis, it was also found out that South Korean participants had more dissatisfaction on the sensory and operational problems than Dutch participants. On the other hand, the Dutch was more dissatisfied than the South Korean in terms of functional factors (Figure 5). This pattern appeared across all the products. Regarding gender, female participants had more sensory and operational dissatisfaction than male participants throughout all the products (Figure 6).

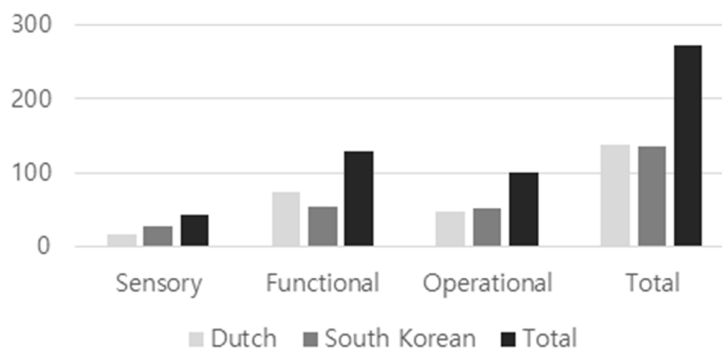


Figure 5. The frequency of types of negative use experience between South Korean and Dutch participants

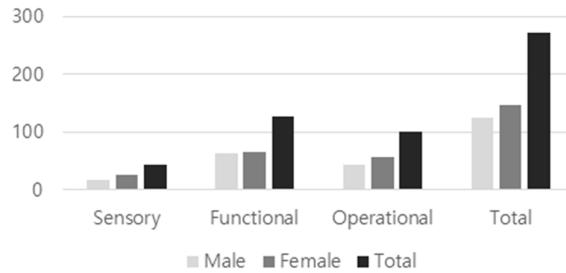


Figure 6. The frequency of types of negative use experiences between male and female participants

4.2.2 Technology familiarity

According to the results, as the participants became familiar with electronic products, their dissatisfaction levels increased. Especially, operational problems were much often observed than functional and sensory problems (Figure 7). It implies that technology familiarity has much to do with operational problems but it also influences the occurrence of functional dissatisfaction.

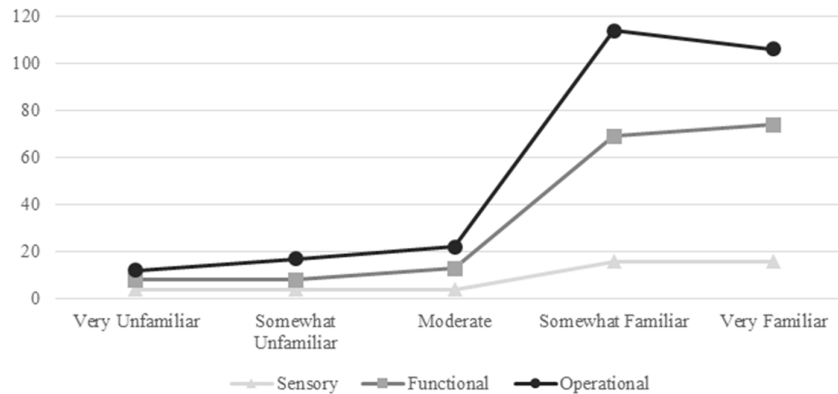


Figure 7. The frequency of types of negative use experience in terms of technology familiarity

4.2.3 Frequency of use

By analyzing the results of frequency of use, it was discovered that mobile phone, laptop computer and remote controller only have an increasing of dissatisfaction level with continuous usage (Figure 8). The most problems arose in the functional aspects of these products. On the contrary, with less frequent usage, digital cameras had an increasing dissatisfaction level especially with the functional problems (Figure 9).

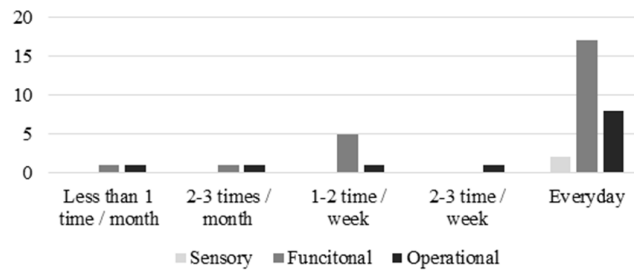


Figure 8. Increasing dissatisfaction with frequent usage (mobile phone, laptop computer and remote controller only)

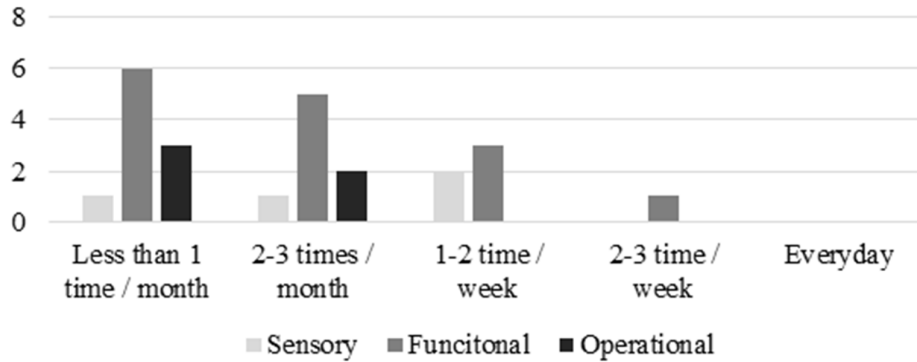


Figure 9. Decreasing dissatisfaction with frequent usage (digital camera only)

5. Discussion and conclusions

The overall findings of the study are that there is the relationship between user characteristics, product properties and particular types of negative use experience. First, types of negative use experience are dependent on product type. By identifying a type of the product we are developing and anticipating possible negative use experiences from the identification, a better product use experience can be created. For instance, it turned out that vacuum cleaners and computers had many sensory issues because they were big, noisy, and heavy. Therefore, making them quieter, lighter, and smaller would certainly improve the use experiences of such products in case of redesigning the products.

According to the results, cultural background makes a difference in particular types of negative use experience. In case of designing a product particularly for Far East Asian culture, operational and sensory issues should be taken more into account in comparison with West European culture. On the contrary, designing products for Europeans more attention should be paid to functional aspects (e.g. battery life, functional performance) of consumer electronic products. For example, a copier should be designed in a way to first consider the performance such as speed and efficiency especially for the Western European market. Similarly, the aspect should be prior to the other factors in case of trading off design elements.

The study also reveals that gender also plays a role in negative use experience. Females are more likely to complain about sensory and operational issues of consumer electronic products than males. Therefore, considering the gender difference designers should pay much more attention to sensory and operational qualities in case of designing products for female users.

It is interesting, however, that there are still distinguished differences between countries and between female and male users although homogeneity has become accelerated regardless of cultural or gender difference due to globalization and the prevalence of social networking services.

As the last factor of user characteristics in the study, technology familiarity also plays a role in particular types of negative use experience. With the higher technology familiarity, the more complaints on operational and functional qualities are expected. For example, it is anticipated that a user who is knowledgeable on operating home appliances such as microwave would easily complain about usability and performance of the product more than those who do not know about the product. It is somehow obvious because there are few things to complain if we have little knowledge about a particular thing. In this sense, it is necessary to identify the degree to which a target user group is familiar with technology products and paying more attention to the usability and performance of a product in case they have a certain level of knowledge to the product.

Regarding frequency of use, it is dependent on particular product type. The more frequently used, the more complaints on sensory quality are expected but this is observed only with products with many buttons such as mobile phone, laptop computer, and remote controller. In case of consumer electronic products less frequently used, no particular trend was identified. However, functional and operational problems are more often seen and this happens only with digital camera. A possible explanation is that people have a higher expectation on digital camera as their memory capturer but actually its technical

performance might not meet their expectation, and people do not remember how to use particular functions because digital camera is less often used but has complicated functions.

If the findings are provided with design practitioners and companies and are taken into consideration in the product development process, it would help increase satisfaction of users in operating consumer electronic products.

Although the interesting findings were made in the study, there are some limitations. First, the study invited a particular age and cultural groups and only with the sample the results could be biased although it was important to have more diverse and rich use experiences. Therefore, it will be necessary to include more diverse participants in terms of age and cultural background when designing a follow-up study.

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