

PRODUCT PROFILE TO REDUCE CONSUMER DISSATISFACTION IN TERMS OF SOFT USABILITY PROBLEM AND DEMOGRAPHICAL FACTORS: AN EXPLORATORY STUDY

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ABSTRACT

As consumer electronic products have increased in complexity and users of those products are still from a broad variety of the population, new complaints related to product usability are identified. Consumer dissatisfaction is increasingly caused by *soft* usability problems they experience, problems that have nothing to do with technical failure. This phenomenon bothers companies of electronic products because it will probably lead to a decrease of brand loyalty. Therefore, the paper explores the relationship between soft usability problems, demographical factors and product attributes through a survey of 102 users from the Netherlands and South Korea. The results reveal that product profiles in terms of product complexity and product intimacy are related with specific soft usability problems and some demographical factors. This finding implies that a product profile can be a useful source of understanding problems experienced with them. Moreover, it can help preventing usability problems leading to an increase of consumer satisfaction and brand loyalty.

Keywords: usability, user characteristics, product attribute, cross-cultural study

1 INTRODUCTION

Many consumer electronic products in use today are for some reason being returned to their manufacturers even though they work well according to their technical specifications [1]. These non-technical reasons resulting in consumer dissatisfaction are defined as ‘soft usability problems’, which is opposite to ‘hard usability problems’ such as technical malfunction or failure [2]. Product return must be a threat to the electronic product industry because it would end up with consumer disloyalty and a serious revenue loss to companies. Therefore, it is of importance to identify the causes of soft usability problems and find a solution in a way to increase consumer satisfaction. Presumably, there are several possible causes to prompt the occurrence of a soft problem. The majority of household electronic products are designed with only a generic, ideal user in mind while user populations are becoming increasingly diverse compared with the past [3]. Consequently, user diversity seems to play an important role in the phenomenon: for instance, in the past wireless communication technology was mostly used only for military, i.e. specific soldiers were the only user group for two-way radio. However, nowadays many people from all over the world use mobile phones since the technology was transferred to personal use. One single electronic product designed for an ideal user can hardly satisfy all multiple users since they have their own characteristics and preferences. Numerous studies have been conducted into the characteristics of target groups in particular use situations, Individual differences have mainly been dealt with in the field of psychology and marketing (e.g. personality and consumer complaint behavior). Few studies, however, were conducted on the interaction between individual differences and the use of consumer electronic products.

The topic of user diversity has a wide range of aspects, including personality, cognitive style, culture, age, gender, experience and so on. Recently, Kim et al [4] found out that certain types of soft usability problems are expressed by people with specific user characteristics. Howell et al [5] highlighted the importance of considering the effects of individual differences on the context of use in system design and evaluation. Goodman et al [6] and Kurniawan [7] emphasized in their studies that the design of mobile devices for use of a young population would not be acceptable for elderly people. Many

studies indicate that consumer dissatisfaction is significantly influenced not only by individual characteristics but also by product characteristics [8] as electronic products are becoming more diverse and complex. Product specific variables related to soft usability problems encompass for instance type of product [9], product costs [10], importance of the product to the consumer [10, 11], and frequency of use.

Electronic products designed for an ideal user would cause worries and frustration for non-ideal users, and discourage further use of those products. The costs of less-than-user-satisfying electronic products can be astonishingly high since the results would spend unnecessary consumer support costs and lose market share. In addition, users increasingly expect a high level of usability these days. Unfortunately, there apparently is a mismatch between users' expectations and companies'/designers' expectations. For reasons of human product interaction it is imperative to thoroughly investigate this interaction between user diversity, product characteristics and soft usability problems. In a previous study [2], soft usability problems were identified and classified according to categories (see 3.2 below). This research will provide a useful source to understand a target user in terms of demographical aspects and usability information on specific electronic products they are developing.

2 METHOD

2.1 Participants

Both South Korean and Dutch people were selected as subjects to a questionnaire survey because comparison on cultural aspects as one of demographical factors is part of the study. The total 117 people participated in the survey: 58 Dutch and 59 South Korean people, living in their home country, were randomly recruited through discussion forums on the Internet and also through the network of the researchers. Their ages broadly ranged from 20s to 60s and they consist of 70 male and 47 female. It turned out that 15 respondents reported that they had no complaints about their electronic products.

2.2 Data collection

The questionnaire survey was conducted to gather data about soft usability problems experienced by users. Two open-ended questions were formulated at the beginning of the questionnaire: The first question was with what consumer electronic product respondents feel most dissatisfied, other than its technical problems. In a second question respondents were asked to describe what specific dissatisfaction or complaints they had for the product mentioned in the first question. The other questions were about demographical aspects of the participants. All answers from the questionnaire were input into a SPSS data sheet and were statistically analyzed in SPSS 16.

2.3 Procedure

The respondents participated in the survey by filling in a web-based questionnaire where they could easily access in their own country, either South Korea or the Netherlands. Through discussion forums for product review and the human network of the researchers they were recruited. The answers given by them were automatically stored into a database on the Internet.

3 RESULTS

The questionnaire survey led to 176 complaints about that had nothing to do with technical failure. Together with demographical data gained through the survey, the relationships between soft usability problem and product attributes were analyzed. First, demographical variables are summarized and secondly, reported soft usability problems and product types are presented. Then, the correlations between product attributes and soft usability problems, between demographical variables and soft usability problem, and between demographical factors and product attributes are presented in order.

3.1 Demographical factors

Demographical factors of the sample are presented in Table 1. The values in the table are based on the total number of 102 complainers and non-complainers were excluded in the study. The sample will not be representative for the total population between 20 and 60 years old. Since most of them are not recruited or selected other than through a web-platform, they will be probably representative for the

population of internet visitors. However, this 'biased' sample can offer interesting insights into the relationships between demographic variables, type of product, and soft usability problem in the sense that this study aims at exploring the interactions. The Table shows that the sample is not representative for both populations.

Table 1. Demographic Characteristics of Complainers (n=102)

Demographic factors	Frequency		Total	Percentage
	Dutch	South Korean		
Age at time of survey (years)				
20-29	20	42	62	60.8
30-39	9	15	24	23.5
40-49	7	2	9	8.8
50-59	7		7	6.9
Gender				
Male	27	37	64	62.7
Female	16	22	38	37.3
Highest education level completed				
High school grad	8	-	8	7.8
College grad	4	-	4	3.9
University grad	12	5	17	16.7
Postgraduate (Master degree)	11	35	46	45.1
Postgraduate (Doctoral degree)	8	19	27	26.5
Annual income (Euro)				
<€20,000	17	32	49	48
€20,000-29,999	16	21	37	36.3
€30,000-39,999	7	6	13	12.7
€40,000+	3	-	3	2.9
Percentage	42.2	57.8		

3.2 Soft usability problems

Since consumer complaints were so divergent, from misunderstanding to maintenance, the complaints were divided in six categories according to the type of complaint (Kim et al. 2007):

- Awareness-related complaint: difficulties in understanding, finding functions, lack of need with regard to some functions and insufficient information such as no feedback or feedforward.
- Performance-related complaint: low efficiency, slow reaction time and errors.
- Sensation-related complaint: poor sound and touch quality, heavy weight, heat generated by products, physical fatigue of the product or concern on safety issues, and hard-to-press buttons.
- Structure-related complaint: complaints about wiring and cable system, connection, mechanical structure, shape, and the size of buttons.
- Maintenance-related complaint: dissatisfaction with service, cleaning, special care and durability.
- Constraint-related complaint: lack of a necessary function, unimproved features compared with its previous version, low compatibility with other products, and low battery life, poor quality of manual.

Electronic products complained about are presented in Table 2. The numbers in the table show the frequency of complaints on each soft usability problem without distinction between both countries. The ranked electronic products reach a total of 33 types of household electronic products, varying from mobile phone and desktop computer to shaver and toaster. Complex electronic products are ranked mostly on top while simple ones have a relatively low rank. Complaints in relation to

Awareness were most frequently reported followed by complaints on Structure. Dissatisfactions resulting from Maintenance were least reported.

Table 2. The Ranking of Complained Electronic Products and their Soft Usability Problem Distributions

Type of Appliance	Awareness	Performance	Sensation	Structure	Maintenance	Constraint	Total
Mobile phone	11	7	7	10	4	10	49
Vacuum		2	3	9	1	1	16
MP3 player	4	1	1	2	1	6	15
All-in-one printer	2	4		2	1	1	10
VCR/DVD player	5	1			2	1	9
Digital camera	2	1	3		1	2	9
Laptop computer		2	3	1		2	8
Desktop computer	1	3		1	1	1	7
Remote controller	5					-	5
Microwave	2	1				1	4
Coffee machine	1	2			1		4
Toaster		1		2	1	-	4
Television set	1	1	1		1	-	4
Dish washer	1			2			3
Earphones				2	1	-	3
Stereo set						2	2
Air conditioner					1	1	2
Washing machine			1			1	2
Refrigerator			1			1	2
Humidifier	1				1	-	2
Rice cooker	1				1	-	2
Video camera	1	1				-	2
Alarm radio clock	2					-	2
Sewing machine						1	1
Electric grill pan					1	-	1
Speakers				1		-	1
Food mixer				1		-	1
Water cooker			1			-	1
Mouse			1			-	1
Tablet			1			-	1
Shaver			1			-	1
Charger		1				-	1
Game console	1					-	1
Total	41	28	24	33	19	31	176

3.3 Product profile in terms of soft usability problems

Another way to categorize products that ask for problems are the level of complexity and intimacy because electronic products are more and more armed with many functions and compact for personal and portable use. Complexity refers to the extent to which cognitive load in using an electronic product is required or an electronic product is easy to use. The number of functions is related to the extent to which a product is complex (e.g. products requiring high cognitive load are mobile phone and computer while ones requiring low cognitive load are vacuum cleaner and microwave). Intimacy refers to the extent to which an electronic product is intimate with its user, for personal use, or portable (e.g. products with high intimacy are mp3 player and mobile phone while ones with low intimacy are vacuum and washing machine). Every product reported in the study belonged to either high or low level of each product characteristics: that is, whether a product requires complex vs. simple, and high vs. low intimacy. (Figure 1). Looking at

products that are mostly complained about, three major soft usability problems were identified in each product attribute domain defined by complexity and intimacy. The results indicate that in each product attribute domain some soft usability problems are dominant. For instance, in the domain of complex and high intimate products such as mobile phone, Awareness, Constraint and Sensation in order are probable Soft usability problems while in the domain of simple and low intimate products such as vacuum cleaner Maintenance, Structure and Performance are the problems (Table 3).

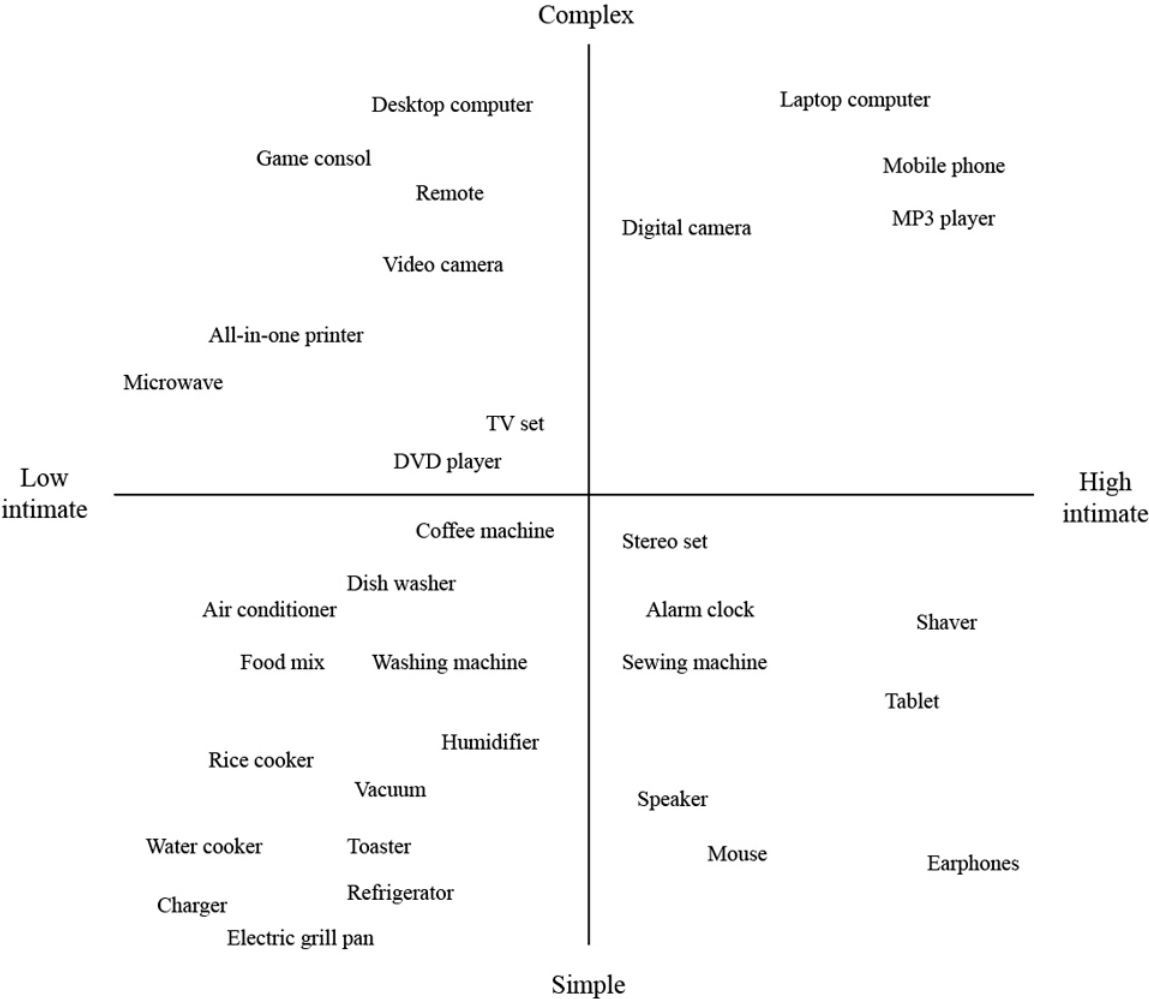


Figure 1. Electrnonic Product Distribution on Complexity and Intimacy Graph

Table 3. Dominant Soft Usability Problems in the Four Product Attribute Domains

Product attribute	Low intimate	High intimate
Complex	<ul style="list-style-type: none"> • Awareness • Performance • Maintenance 	<ul style="list-style-type: none"> • Awareness • Constraint • Sensation
Simple	<ul style="list-style-type: none"> • Maintenance • Structure 	<ul style="list-style-type: none"> • Sensation • Structure

	• Performance	• Constraint
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3.4 Demographical variables and Soft usability problems

Age, gender, educational background, annual household income and cultural background were analysed as major demographic factors in order to see if they are related to Soft usability problems. The chi-square analysis was used to test for differences between dichotomous variables such as gender and cultural background and each Soft usability problem. For the variables having continuous values such as age, educational background and annual income, the independent t-test analysis was conducted. None of the demographical variables were statistically significantly linked to any of soft usability problems. Although cultural background does not have any statistically significant relationships with any Soft usability problems either, it may provide a useful overview on the differences between the two cultures with regard to Soft usability problems as shown in Figure 2.

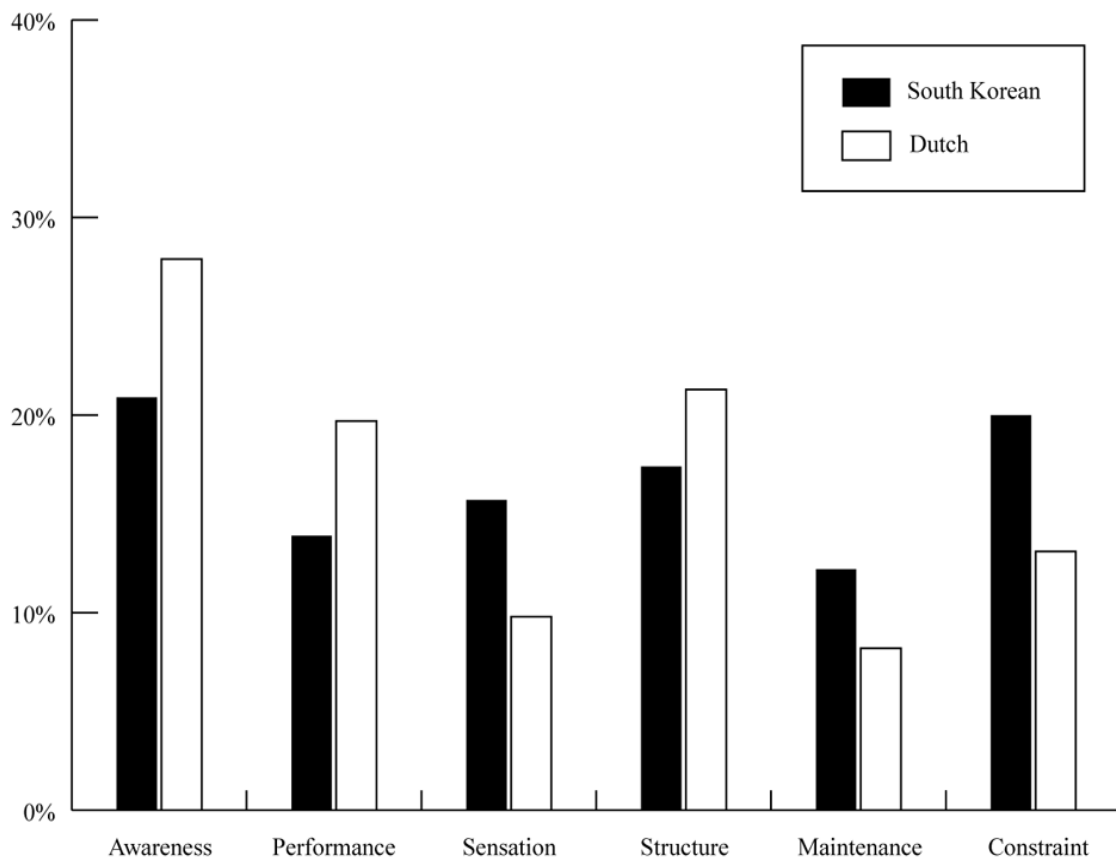


Figure 2. The Comparison of Soft Usability Problems between South Korean and Dutch Participants

3.5 Demographical variables and Product attributes

The demographical variables such as gender, age, educational background, annual income and cultural background were used to test for correlations with specific product attributes. The chi-square test was conducted for both gender and cultural background having dichotomous values. The t-test analysis was used again to compare the values of the means from the other variables having continuous values. The results illustrate that there are very statistically significant correlations between gender and cultural background and product attributes (Table 5). However, the outcomes with regard to age and educational background showed no statistical significance: they appeared to show some minor correlations with types of product. Annual household income did not show any significant relationship with the four types of product, though. The correlations are presented as follows:

- Gender: male participants more complained about electronic products requiring high cognitive load or low intimacy than female ones.

- Cultural background: South Korean respondents more complained about electronic products requiring high cognitive load or low intimacy than Dutch ones.

Figure 4 illustrates the top 10 complained products and the percentage between South Korean and Dutch respondents. It was found that electronic products complained by the participants vary between the two countries. South Korean participants mostly complained about personal and portable electronic products while Dutch ones were mainly dissatisfied with electronic products that are usually used indoor.

Table 4. The Correlations between Gender, Cultural Background, and Product Attributes

Product attribute		Gender		Cultural background	
		Number of complainer	$\chi^2(1)$	Number of complainer	$\chi^2(1)$
Complexity	Low ($n=69$)	31	12.93***	34	12.94***
	High ($n=107$)	77		81	
Intimacy	Low ($n=95$)	67	7.310**	79	28.93***
	High ($n=81$)	41		36	

** $p < .01$. *** $p < .001$

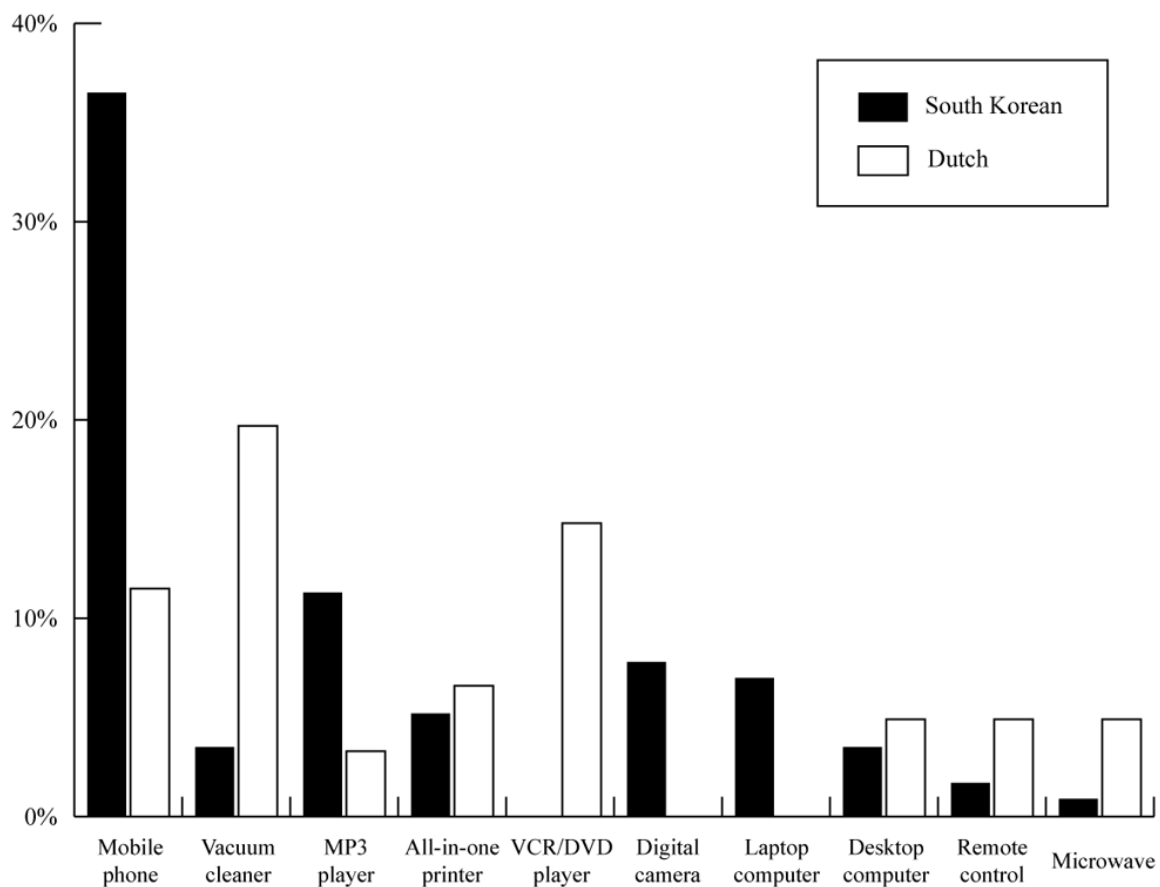


Figure 3. Top 10 Electronic Products Complained and their Comparison between South Korean and Dutch Participants

4 CONCLUSION AND DISCUSSION

New consumer complaints defined as Soft usability problem were dependent on product domains in terms of complexity and intimacy rather than demographics of users. In terms of usability, there was a range of predictor variables at least from product attributes. Therefore, the results of this study support that Soft usability problem is dependent on product attributes.

Product profiles in terms of complexity and intimacy were predictors of the occurrence of specific Soft usability problems in consumer electronic products. Electronic products requiring high cognitive load but intimate are likely to raise Awareness, Constraint and Sensation problems, while ones requiring low cognitive load and not intimate to Maintenance, Structure, and Performance problems. These findings provide information about what factor should be taken into account in developing certain types of electronic products. That is, ease to understand is the most important factor in designing complex but intimate electronics featuring many functions and portable use. When simple and single function electronic products such as vacuum cleaner are designed the focus should be on their Maintenance, which aims at decreasing dissatisfaction resulting from cleaning and durability.

According to the statistical analysis, demographical factors such as gender, age, education, income, and culture showed no relationship with the occurrence of specific Soft usability problems. No statistical association between demographics and Soft usability problem was unexpected since Soft usability problem was supposed to be the outcome of the interaction between product and user characteristics. Nevertheless, the results could give a hint of how some demographical variables somehow correlated with Soft usability problem in a sense that this study has an exploratory character. Cultural background appears to influence the occurrence of Soft usability problem because there seemed some differences between South Korean and Dutch participants: more complaints on Sensation, Maintenance, and Constraint were observed from South Korean than Dutch ones. This finding might imply that South Korean people are more sensitive to feelings evoked by electronic products, seek for more convenience and freedom in using electronics than Dutch people.

Gender and cultural background among demographical variables were predictors of specific product attributes complained by the respondents. Male or South Korean participants complained about electronic products requiring high cognitive load or low intimacy more than female or Dutch ones. A possible implication may be that men or South Korean people are more likely to complain about complex and family-shared electronic products such as DVD player and all-in-one printer. This finding could suggest that project teams designing those types of products should take gender and cultural difference issues into account in their product development process. On the other hand, there appears to have been an association between age and education and type of product although the statistical analysis did not show a significant correlation. Old respondents reported more complaints made from electronics having high intimacy than young people. A possible explanation may be that they mainly used simple and easy products compared with young generation. It might imply that old people are anticipated to complain about simple, single functional, and personal electronics. Meanwhile, highly educated participants had more complaints with their electronic products having low intimacy than low educated ones. This might be because highly educated people would use more diverse range of, high-tech electronic products. However, considering they would carry some personal electronics for their work, there is no clear explanation why they complained about indoor electronic products rather than those that are intimate. Interestingly, there was no correlation between annual household income and product attributes although household income would influence the purchase of electronic products. On the other hand, there were many differences among the top 10 products complained in the survey between the two countries. South Korean participants were most dissatisfied with personal products such as mobile phone, mp3 player, and digital camera while Dutch ones with indoor products such as vacuum cleaner and VCR/DVD player. This result might be inferred that personal products are more popular and common in use in South Korea than the Netherlands. It implicitly implies that people with different cultural background understand and experience electronic products in a different way. Vacuum cleaner was secondly ranked in the list of the top 10 electronic products most complained by the participants. It is interesting that the respondents complained about not only complex products such as mobile phone or mp3 player but also simple products such as

vacuum cleaner or microwave although electronics become increasingly complex. This might indicate that ease to use (or understand) is not the only issue to be dealt with in electronic product usability.

Overall, these findings are in line with results from similar studies that individual differences influence consumer complaining behaviours and product experience. Moreover, the results represent that product attributes do have an impact on individual's usability experience of electronic products while demographical differences have little impact on the use of household electronics. Specific Soft usability problems are dependent on certain product domain, regardless of demographical factors. However, it does not mean that demographics can be negligible considering there were significant correlations between demographics and types of products.

One of the limitations of this study was the fact that it was a small number of people that participated in the survey. In addition, the results would be biased since the participants were recruited through specific ways. Considering some studies show significant correlations between user characteristics and usability, it seems necessary to recruit more participants in a more reliable way to see how demographics affect usability. This idea can be supported through the finding that even some demographical factors showed relationships with usability in the study. At the same time, it is recommended to broaden the range of user characteristics and then test which factors are significantly related to use experience rather than focusing on demographics only.

The major contribution of this paper to this area of research is that it draws attention to the fact that there is a need to understand in what way individual differences and product attributes have an impact on the way people experience electronics. Especially a product profile can be used to identify probable usability-related complaints, which a new electronic product would have in the product development process. This requires designers to look into user characteristics and product attributes interacting with usability of household electronic products. The failure of companies to take these interactions between product and user into account will see them lose out to their competitors as consumers become diverse and products increasingly evolve. The paper's implication to the engineering design society is that there is not a universal single user anymore for any product, service or system. To deliver satisfactory and successful products to our society, the characteristics of end users and developing products should be taken into account in the engineering design processes. This will end up with an increase of users' satisfaction.

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