

# Identifying Satisfaction Factors in Long-Term Use of Digital Products for Japanese Young Consumers

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## ABSTRACT

The present study examined the factors leading to good UX that affect overall satisfaction in long-term product use. This finding would contribute to establishing design guidelines to enhance user experience (UX). A questionnaire was conducted to investigate overall satisfaction and impression of digital products. The four types of pleasures (physio-pleasure, socio-pleasure, psycho-pleasure, and ideo-pleasure) were considered aspects that constitute UX, and their impacts on overall product satisfaction were investigated. Moreover, what kind of product impressions lead to pleasure was also investigated. The effects of digital products' four pleasures and impressions on overall satisfaction were analyzed using multiple regression analysis. Physio-pleasure and psycho-pleasure were found to contribute to the overall satisfaction of digital products.

**Keywords:** User experience, Product satisfaction, Long-term use

## INTRODUCTION

The recent proliferation of the Internet and digital products makes it necessary to think about user interface (UI) design with many users worldwide in mind. It is important to understand the characteristics of various users with various preferences, values, and cultural backgrounds, and to localize UI design appropriately or find standard solutions among several users. Especially in recent years, there has been an emphasis on an approach that focuses on users' subjective experience (Design for user experience (UX)), rather than just eliminating usability drawbacks for efficient and effective UI operation (Norman, 1998; Hancock et al., 2000). As people's lives become more affluent, product design approaches that consider the entire subjective experience of users, not just usability, are required (Pine and Gilmore, 1998; Schmitt, 1999). Hassenzahl et al. (2000) and Hassenzahl and Ullrich (2007) divided product quality into pragmatic quality, which relates to traditional usability, and hedonic quality, which relates to attractiveness that appeals to human sensitivity. They mentioned the importance of hedonic quality to enhance user experience (UX). The design approach of "Design for UX," which considers users' subjective experience, has attracted great

attention in the industrial world, and design methodologies for improved UX are being actively investigated (Unger and Chandler, 2009; Levy, 2015). However, unlike the design approach for improving usability, the factors that promote good UX are unclear in the design approach for enhancing UX, and a common sense for design principles, guidelines, and processes has not yet been established. Once these factors are identified, they can be used as design guidelines for product design.

The main feature of “Design for UX,” which is different from usability, covers all the subjective experiences of users interacting with a product. While usability studies often focus on highly brief interactions during the operation of a product, UX studies need to consider medium- to long-term experiences, from before the purchase to after long-term use of a product, as shown in the period in the UX White Paper (Roto et al. 2011). Additionally, since all experiences are included, it is necessary to consider practical aspects such as usability and emotional and hedonic aspects. Jordan (1998) stated that the emotions related to pleasure products are security, confidence, pride, excitement, and satisfaction. Through interviews with users, Jordan (1998) showed that product characteristics that affect pleasure during use are function, ease of use, aesthetics, performance, and reliability. Moreover, Jordan (2002) stated that the four pleasures (physio-pleasure, socio-pleasure, psycho-pleasure, and ideo-pleasure) described by Tiger (1992) could be used as a framework for considering pleasure in product use.

Various studies have mentioned there are many aspects to enhance good UX. However, it is unclear how each aspect of UX contributes to overall satisfaction, what product characteristics and impressions contribute to each UX aspect, and how products should be designed to lead to pleasure. Once these points are clarified, the findings can be used as design guidelines for “Design for UX.” Besides, cultural aspects should influence the factors that lead to satisfaction because previous studies (Doi and Murata, 2021; Doi and Murata, 2020) reported that cultural differences are associated with UI design and its preferences. It is necessary to consider the satisfaction factors that lead to good UX with a good understanding of the cultural background underlying the user’s values. These factors would contribute as a design principle for UX design.

The present study aimed to examine the factors leading to good UX that affect overall satisfaction in long-term product use of young Japanese consumers. This finding would contribute to establishing design guidelines to enhance UX. In particular, the impact of Tiger’s (1992) four pleasures as aspects of UX on the overall satisfaction of products was investigated alongside what kind of product impressions lead to what kind of pleasure.

## **METHODS**

### **Participants and Procedure**

A questionnaire-styled survey was conducted on 70 Japanese students in the Department of Mechanical Systems at Okayama University. The survey was conducted during class hours with participants’ consent. Those who provided

**Table 1.** Questionnaires for the four pleasures.

Physio-pleasure	I instinctively felt sensory and physical comfort.
Socio-pleasure	I felt meaningful value for myself about other people (e.g., stories) and society (e.g., status and image).
Psycho-pleasure	I felt the convenience, ease of use, and enjoyment of the functions of products during the process of seeing and using the product.
Ideo-pleasure	I felt values that fit with my philosophy and ideas.

answers that did not match prior instructions were excluded, resulting in 65 valid participants (mean age: 20.82, SD: 0.89).

The questionnaire consisted of overall satisfaction, types of pleasure in product usage, and product impressions. Questionnaires were completed using an online Google form. The response time was about 30 minutes. First, the questionnaire was explained to participants, and they were asked to give informed consent. After, participants were required to select one digital product they had used in the past that had a relatively high overall satisfaction level throughout the entire usage period. This study defines a digital product as a device equipped with a computer that some user interface can operate. Participants were required to select a digital product freely that they use voluntarily, not ones they must use due to work or other reasons. Besides, participants were also required to select a product they had used for at least six months.

### Questionnaire

Typically, in evaluating long-term UX, either user are monitored for a long time while using a product or a retrospective evaluation after a long period of use is conducted. This study conducts a retrospective evaluation based on Hassenzahl et al. (2010) questionnaire because responses from many users are relatively easy to obtain.

#### *Overall satisfaction*

Participants were required to indicate their overall satisfaction with their selected product over the entire usage period. A seven-point Likert scale ranging from “1: Not at all satisfied” to “7: Very satisfied” was used.

#### *Four types of pleasure for product use*

Jordan (2002) stated that pleasure in product use could be captured in the four types: physio-pleasure, socio-pleasure, psycho-pleasure, and ideo-pleasure. This study considered that the four pleasures contributed to improving overall satisfaction. The degree of each type of pleasure was assessed using a seven-point Likert scale ranging from “1: I felt no pleasure at all” to “7: I felt very much pleasure” (Table 1).

#### *Product impression*

The 25 words were selected based on product reaction cards (Benedek and Miner, 2011) (Table 2). A seven-point Likert scale ranging from “1: Not at all true” to “7: Very true” was used for each word.

### Data Analysis

A multiple regression analysis was conducted to confirm how the four pleasures contribute to overall satisfaction. The objective variable is overall

**Table 2.** Wordlist to evaluate product impression.

Personal	Powerful	Exciting	Professional	Clean
Familiar	Reliable	Rigid	Simplistic	Consistent
Annoying	Time-consuming	Trustworthy	Comfortable	Unpredictable
Useful	Effective	Fresh	Impressive	Unapproachable
Old	Optimistic	Ordinary	Sensuous	Accomplishment

**Table 3.** Results of the multiple regression test to examine the relationship between the overall satisfaction and degree of the four pleasures (\*\*:  $p < 0.01$ ).

Predictors	SE	$\beta$	$F$	$t$	VIF
Physio-pleasure	0.07	0.27	7.82	2.80**	1.46
Socio-pleasure	0.06	0.05	0.27	0.52	1.33
Psycho-pleasure	0.09	0.63	37.32	6.11**	1.63
Ideo-pleasure	0.10	-0.03	0.10	-0.32	1.75
Constant term	0.50		9.08	3.01**	

satisfaction, and the explanatory variables are the degree of the four types of pleasures. Next, a multiple regression analysis was conducted to examine the products' impressions that affect each type of pleasure. The objective variable is the degree of pleasure for each type, and the explanatory variable is the word that represents the impression of the product.

## RESULTS AND DISCUSSION

### Effects of Four Types of Pleasures on Overall Satisfaction

A multiple regression analysis was performed with overall satisfaction as the objective variable and the degree of the four pleasures as explanatory variables (Table 3). The coefficient of determination  $R^2$  of the multiple regression model was 0.613 ( $F(4,64) = 23.804$ ,  $p < 0.01$ ). The variance inflation factors (VIF) were low, less than 2 for all variables, and there was no multicollinearity among the explanatory variables. Therefore, the obtained multiple regression model was valid. The standard partial regression coefficients were significant only for physio-pleasure and psycho-pleasure, whereas the values were much smaller for socio-pleasure and ideo-pleasure.

These findings suggest that physio-pleasure and psycho-pleasure contribute to overall satisfaction and are important for users to obtain a good UX in long-term use. In contrast, socio-pleasure and ideo-pleasure do not contribute to the improvement of total satisfaction. They may be less important in using digital products, although they may be important factors in achieving a good UX. Additionally, feeling these pleasures depends mainly on individual past experiences and values. Although these pleasures may have increased overall satisfaction for some users, the majority did not find these pleasures to be dominant in their overall satisfaction.

## Effects of Impressions of Products on each Type of Pleasures

### Physio-Pleasure

The coefficient of determination  $R^2$  of this multiple regression model was 0.660 ( $F(25,64) = 3.029, p < 0.01$ ). The VIF was low, less than 5 for all variables, and there was no multicollinearity among the explanatory variables. Therefore, the obtained multiple regression model was valid. The standard partial regression coefficients were significant for “clean,” “unpredictable,” “useful,” and “sensuous.” Of these, “exciting” negatively affected overall satisfaction while “clean,” “unpredictable,” “useful,” and “sensuous” had a positive effect.

These results suggest that it is important for users to obtain clean, unpredictable, useful, and sensuous impressions to obtain sensory and physical comfort. In addition, most digital products in this study are used daily, and the impression of excitement is not required for the long-term use of such products.

### Socio-Pleasure

The coefficient of determination  $R^2$  was 0.592 ( $F(25,64) = 2.264, p < 0.05$ ). The VIF was low, less than 5 for all variables, with no multicollinearity among the explanatory variables. Therefore, the obtained multiple regression model was valid. The standard partial regression coefficients for “comfortable” and “impressive” were significant, with “comfortable” negatively impacting overall satisfaction while “impressive” having a positive impact. These results suggest that even if a product is not comfortable to use, satisfaction may be enhanced by its story and social status. Presumably, this result was obtained because the products whose satisfaction was increased by the story and social status emphasized the importance of being “impressive” and did not balance the comfort of use. Therefore, comfort is not necessary for improving overall satisfaction, and the standardized regression coefficient of “comfortable” might be negative because the products with high socio-pleasure were not comfortable.

### Psycho-Pleasure

The coefficient of determination  $R^2$  was 0.782 ( $F(25,64) = 5.605, p < 0.01$ ). The VIF was low, less than 5 for all variables, with no multicollinearity among the explanatory variables. Therefore, the obtained multiple regression model was valid. The standard partial regression coefficients were significant for “time-consuming,” “comfortable,” “unpredictable,” “useful,” “effective,” “impressive,” “old,” and “ordinary.” The standard partial regression coefficients for “time-consuming,” “comfortable,” “unpredictable,” “useful,” “effective,” “impressive,” “old,” and “ordinary” were significant, with “comfortable,” “old,” and “ordinary” negatively affecting overall satisfaction while the other words had a positive effect.

“Comfortable” and “time-consuming” had opposing impacts due to the features of the digital products used in this survey, while such impressions are not necessarily required to improve overall satisfaction. For example, most participants answered that information and communication devices

such as PCs are time-consuming to set up and prepare. It is possible that the impression of “time-consuming” positively impacted the overall satisfaction. The impressions of “usable” and “effective” may be related to usability. Similarly, “unpredictable” and “impressive” lead to enjoyment during use.

### Ideo-Pleasure

The coefficient of determination  $R^2$  was 0.422 ( $F(25,64) = 1.140, p = 0.350$ ). The VIF was low, less than 5 for all variables, with no multicollinearity among the explanatory variables. However, the coefficients of determination were lower than those of the multiple regression model with other pleasures as the objective variables. The model was not significant (neither were the standard partial regression coefficients), so it is unlikely that this model is a valid model to explain identity-pleasure. It is thought that the digital products targeted in this study are products that do not easily reflect the thoughts and values of individuals. Therefore, identity-pleasure was not emphasized when considering the UX of digital products. It is also possible that it was difficult to generalize the concept of “identity-pleasure” because it is dependent on individual values and past experiences.

## CONCLUSION

This study aimed to examine the factors leading to a good UX that affect the overall satisfaction in long-term product use. For this purpose, the effects of four pleasures and impressions of digital products on overall satisfaction were analyzed using multiple regression analysis. As a result, physio-pleasure and psycho-pleasure were found to contribute to overall satisfaction. Barring ideo-pleasure, the impressions of the products related to these pleasures were revealed.

This study’s findings can be used as a design guideline for products to obtain a good UX. However, some of the findings seem to be dependent on the characteristics of the surveyed digital products. This point cannot be clearly stated with the results of this study alone and needs to be verified in future works. UX is affected by the characteristics of the user and product and the context of use; this study’s findings were based on the use of digital products by Japanese students, and it is difficult to generalize the findings of this study alone. Future works need to discuss the relationship between overall satisfaction, the four pleasures, and product characteristics, taking into account the differences in user attributes, product categories, and contexts of use.

## REFERENCES

- Benedek, J., Miner, T. (2011) “Product reaction cards,” <http://www.uxforthemasses.com/wp-content/uploads/2011/04/Microsoft-Product-Reaction-Cards.doc>
- Doi, T., Murata, A. (2021) “Examining the Cultural Differences of Users’ Characteristics Between the United States and Japan Related to User Interface Design,” In: Goonetilleke R.S., Xiong S., Kalkis H., Roja Z., Karwowski W., Murata A. (eds) *Advances in Physical, Social & Occupational Ergonomics. AHFE 2021. Lecture Notes in Networks and Systems*, 273, 391–396.

- Doi, T. and Murata, A. (2020) "Comparative analysis of website usability between United States and Japan," In: Karwowski W., Goonetilleke R., Xiong S., Goossens R., Murata A. (eds) *Advances in Physical, Social & Occupational Ergonomics. AHFE 2020. Advances in Intelligent Systems and Computing*, 1215, 501–507.
- Hancock, P.A., Pepe, A.A., Murphy, L.L. (2005) "Hedonomics: The power of positive and pleasurable ergonomics," *Ergonomics in Design*, vol. 13, pp. 8–14.
- Hassenzahl, M., Diefenbach, S., Göritz, A. (2010) "Needs, affect, and interactive products – Facets of user experience," *Interacting with Computers*, vol. 22, pp. 353–362.
- Hassenzahl, M., Platz, A., Burmester, M., Lehner, K. (2000) "Hedonic and ergonomic quality aspects determine a software's appeal," *Proceedings of the CHI2000, Netherlands*, pp. 201–208.
- Hassenzahl, M., Ullrich, D. (2007) "To do or not to do: Differences in user experience and retrospective judgments depending on the presence or absence of instrumental goals," *Interacting with Computers*, vol. 19, pp. 429–437.
- Jordan, P.W. (1998) "Human factors for pleasure in product use," *Applied Ergonomics*, vol. 29, pp. 25–33.
- Jordan, P.W. (2002) "Designing pleasurable products," Routledge.
- Levy, J. (2015) "UX strategy," O'Reilly Media, Inc.
- Norman, D.A. (1998) "Invisible computer: Why good products can fail, the personal computer is so complex, and information appliances are the solution," Cambridge, MA: MIT Press.
- Pine, B.J., Gilmore, J.H. (1998) "Welcome to the experience economy," *Harvard Business Review*, vol. 76, pp. 97–105.
- Schmitt, B. (1999) "Experiential marketing," *Journal of Marketing Management*, vol. 15, pp. 53–67.
- Roto, V., Law, E., Vermeeren, A., Hoonhout, J. (2011) "User experience white paper – bringing clarity to the concept of user experience," <http://www.allaboutux.org/files/UX-WhitePaper.pdf>
- Tiger, L. (1992) "The pursuit of pleasure," Little Brown & Co.
- Unger, R., Chandler, C. (2009) "A project guide to UX design: For user experience designers in the field or in the making," Peachpit Press.