

Benchmarks for Intuitive Interaction with Mobile Devices

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ABSTRACT

The QUESI (Questionnaire for the subjective consequences of intuitive use), a specific measure of the satisfaction of users interacting with a product, is presented. In addition, first benchmark values for mobile devices and applications are provided.

Categories and Subject Descriptors

H.5.2 User Interfaces: User-centered design, theory and methods, evaluation/methodology.

General Terms

Design, Human Factors, Theory, Measurement.

Keywords

Design for Intuitive Use, usability, evaluation, questionnaire.

1. INTRODUCTION: INTUITIVE USE

Although ‘intuitive use’ is widely used as a description of the interaction with a product, it is rarely made explicit what intuitive use actually is. An elaborate framework for intuitive use was developed by the German IUUI group (Intuitive Use of User Interfaces) [1]. Based on an extensive review of the literature on intuition and empirical studies about the understanding of ‘intuitive use’ by experts and users [2,3] the group defines intuitive use as *the subconscious application of prior knowledge that leads to effective interaction*. According to Hurtienne [4], when measuring intuitive use one needs to measure the effectiveness, the mental efficiency, and the satisfaction of users interacting with a product. As yet, a specific measure of satisfaction was missing that allowed to assess the subjective consequences of intuitive use. Here, we propose QUESI – a questionnaire for the subjective consequences of intuitive use – and provide benchmark values in order to make a comparison of an evaluated product to some standard products possible.

2. THE QUESI QUESTIONNAIRE

From the definition of intuitive use the following criteria for subjective consequences can be derived [3]:

1. Low subjective mental workload: this follows from the precondition of intuitive use being the subconscious (and therefore effortless) application of knowledge.
2. High perceived achievement of goals: this follows from the requirement of effective interaction in the definition.
3. Low perceived effort of learning: if user interface designs are based on the prior knowledge of their users, the effort of learning should be low when encountering the product for the first time.
4. High familiarity: basing designs on the prior knowledge of users should lead to a higher familiarity in using the product.
5. Low perceived error rate: this follows from the requirement of effective interaction.

Based on these criteria, the QUESI (Questionnaire for the subjective consequences of intuitive use) was developed. The main part of the questionnaire consists of 14 items with the best item characteristics (i.e. item-total-correlations, item difficulty, reliability and validity coefficients, see [5]). Each item is phrased as a statement about a consequence of use (and not, e.g. about a product feature as can often be found in other questionnaires). The answer scale is a Likert agreement scale with five levels. The labels of each level were chosen so as to be equidistant: 1 = “Fully disagree”, 2 = “Mainly disagree”, 3 = “Neutral”, 4 = “Mainly agree”, 5 = “Fully agree”. All items are phrased in a way that higher scores represent a higher probability of intuitive use:

1. I could use the system without thinking about it.
2. I achieved what I wanted to achieve with the system.
3. The way the system worked was immediately clear to me.
4. I could interact with the system in a way that seemed familiar to me.
5. No problems occurred when I used the system.
6. The system was not complicated to use.
7. I was able to achieve my goals in the way I had imagined to.
8. The system was easy to use from the start.
9. It was always clear to me what I had to do to use the system.
10. The process of using the system went smoothly.
11. I barely had to concentrate on using the system.
12. The system helped me to completely achieve my goals.
13. How the system is used was clear to me straight away.
14. I automatically did the right thing to achieve my goals.

The score of each subscale is computed as the mean across the responses to the items of that subscale. The total score of the questionnaire is equal to the mean across all five subscales. Items are allocated to subscales as following: Subjective mental

workload (W): Items 1, 6, 11; Perceived achievement of goals (G): Items 2, 7, 12; Perceived effort of learning (L): Items 3, 8, 13; Familiarity (F): Items 4, 9, 14; Perceived error rate (E): Items 5, 10. The questionnaire is accompanied by questions about the users' prior experience with the product to be evaluated (e.g. a model of an mp3 player of a specific brand) and with the product type in general (e.g. mp3 players). It is assumed that prior experience with the same product and the same product class will lead to higher scores in intuitive use (because more prior knowledge is available and will be used in product interaction). The questionnaire also contains the usual demographic variables (e.g. age, gender). From the early data, the questionnaire and its subscales show good statistical characteristics (even distribution of item difficulties, satisfactory reliability measures: Cronbach's alphas above .90 for the overall questionnaire and between .78 and .92 for the subscales; see [5] for details). Also, the mean values are slightly lower for unfamiliar products than for familiar products (average familiarity 43 weeks). This would be expected, because intuitive use is a function of prior experience with a product. This result is an early result for the validity of the questionnaire.

3. QUESI BENCHMARK VALUES FOR MOBILE DEVICES AND APPLICATIONS

In the following we will provide first benchmark values in order to facilitate a comparison of a product to be evaluated regarding intuitive interaction to some standard products. The values are derived from a series of studies with two different samples, each evaluating different devices and applications in the field of information and communication technology with the help of QUESI (see [5] for details). The first sample is a sample of $n=96$ users rating unfamiliar systems immediately after interacting with these systems. The second sample consists of $n=442$ users rating systems they were already familiar with (average familiarity with the system $M=43.34$ weeks, $SD=72.88$). Table 1 shows the QUESI total scores for a number of products from the series of studies of which there are ratings of at least five users being either already familiar with the system or not. Later on it will be possible to provide more sophisticated norming information to answer questions like 'In the domain of mobile phones, what is the percentile rank of my product, i.e. the percentage of products that is more (or less) intuitive to use than my product?'. To support expanding this norming database, researchers are free and encouraged to use QUESI, as long as they provide us with their data (accordingly anonymised).

Table 1. QUESI total scores for mobile devices and applications, ordered by rating

System	Category	N (familiar?)	M (SD)
Nintendo Wii	Game Console	9 (yes)	4.23 (.47)
Apple iPod Touch	Music Player	5 (yes)	3.92 (.48)
AirBerlin.com	Website	12 (no)	3.79 (.62)
Apple iPhone 3G	Mobile phone	6 (yes)	3.72 (.96)
facebook.de	Website	8 (yes)	3.55 (.90)
Nokia N95	Mobile phone	5 (yes)	3.46 (.76)
Apple iPod Touch 1G	Music Player	12 (no)	3.38 (.97)
Apple iPod Nano	Music Player	7 (yes)	3.14 (1.04)
Samsung SGH C260	Mobile phone	12 (no)	3.04 (1.04)
Apple iPod Classic 4G Photo	Music Player	12 (no)	2.92 (.78)
Windows Vista	Operating System	6 (yes)	2.80 (.59)
TuiFly.com	Website	12 (no)	2.42 (1.01)
Alcatel One Touch 311	Mobile phone	12 (no)	2.39 (.79)

4. REFERENCES

- [1] Naumann, A., Hurtienne, J., Israel, J. H., Mohs, C., Kindsmüller, M. C., Meyer, H. A., and Hußlein, S. Intuitive Use of User Interfaces: Defining a vague concept. In Harris, D. (Ed.), *Engineering Psychology and Cognitive Ergonomics*. Springer, Heidelberg, 2007, 128-136.
- [2] Mohs, C., Hurtienne, J., Israel, J. H., Naumann, A., Kindsmüller, M. C., Meyer, H. A., et al. IUUI-Intuitive Use of User Interfaces. In Bosenick, T., Hassenzahl, M., Müller-Prove, M., and Peissner, M. (Eds.), *Usability Professionals 2006*. German Chapter der Usability Professionals' Association, Stuttgart, 2006, 130-133.
- [3] Mohs, C., Hurtienne, J., Scholz, D., and Rötting, M. Intuitivität: definierbar, beeinflussbar, überprüfbar. In VDI/VDE (Ed.), *Ueware 2006*. VDI-Verlag, Düsseldorf, 2006, 215-224.
- [4] Hurtienne, J. *Image schemas and Design for intuitive use*. PhD Thesis, Technische Universität Berlin, 2009.
- [5] Hurtienne, J., Dinsel, C., Sturm, C. *Project Documentation QUESI*. FG Mensch-Maschine Systeme, TU Berlin, 2009.