

# HUX – Measuring Holistic User Experience



HUX measures which influence the nature of product characteristics has on the users' holistic product experience and calculates its significance for the overall experience.

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## Abstract

Which influence do individual product characteristics have on the user experience? Which product characteristics are worthwhile investing in? What are the minimum requirements of individual characteristics in a product category that must be fulfilled in order for the users to still accept the product? Which qualities enthrall delight the users?

designaffairs has developed the HUX Tool (Holistic User Experience) in order to find reliable answers to these crucial product strategy questions. HUX takes 21 characteristics into consideration to compile a complete description of the User Experience. In addition to pure product characteristics such as design or material quality, other context-related attributes such as brand perception or product presentation are also surveyed. The measurement involves assessing the characteristics independently of one another in an extensive panel and then analysing them by means of a statistical process. The benefit of HUX over established UX measurement methods is that the tool delivers specific guidelines for individual product attributes from the measurement results. It shows which characteristics are worth investing in, in order to make the product successful. This even involves determining non-linear correlations such as, for example, hygiene or delight factors including critical limits. The end result provides clear decision-making information for strategic product planning.

## Keywords:

- /// User Experience
- /// UX-Design
- /// Measuring
- /// Method
- /// Design-to-value
- /// Design-to-cost
- /// Product strategy
- /// Hygiene factor
- /// Delight factor
- /// Non-linear regression analysis

## 1. User Experience

designaffairs has been developing strategies and design for products in the sectors hardware, software and services now for 20 years. With more than 70 experts worldwide, the company provides research, strategy, design and engineering services.

Creativity is combined here successfully with scientific methods. User Experience is the catchphrase of our times. Apple's success, just as BlackBerry's failure, is based on this. Quite rightly too, because the term User Experience subsumes the holistic product experience perceived by the customer. The actual product functions as they stand are comparable among the competitors and as such, can hardly be differentiated by the customer. The objective quality of the products is not identifiable and measurable for the customers, because for example, a poor system and software architecture only

becomes apparent once the product has been in use for a longer period of time. This means that the subjectively perceived product quality is becoming an increasingly important factor for the purchase decision and for later customer satisfaction – this does not just apply to consumer products, but also increasingly more so in all sectors up to capital goods and medical technology.

User Experience is standardised! (DIN EN ISO 9241-210: Ergonomie der Mensch- System-Interaktion Teil 210: (Ergonomics of Human-System-Interaction Part 210:) Prozess zur Gestaltung gebrauchstauglicher interaktiver Systeme; Ausgabe:2010-03). (Process for designing usable interactive systems; issue: 2010-03) It should be emphasised at this point that the term „user experience“ means a holistic interdisciplinary approach that observes not only the subjective holistic perception, but also the brand values. User

experience has also become popular as a key factor in business economics too:

Clayton Christensen, Harvard Business Professor writes for Forbes: “a relentless focus on the user experience, not profit, is what is driving today's best companies like Amazon, Apple, and Salesforce. ...these companies are constantly searching for better ways to delight their customers” (Porter 11). Roland Berger and Mc Kinsey proclaim strategies in terms of design-to-value and design-to-cost, whereby all values are usually subsumed under „value“ which are included in the User Experience definition (Berger 10).

## 2. Costs and Benefits of User Experience

Development budgets are limited and customers from all sectors ask us regularly about the most efficient way for them to

obtain a good user experience (UX). This results in specific questions such as, for example: Would the investment in a larger display be more worthwhile than the investment in a faster processor? Or: What improves the user experience more in the long-term, a new design? Or would using better quality materials be enough? Improvements of this nature do not increase the actual functionality of the product itself. In the sales force's opinion, some of these invests are not easy to convey or do not have a direct added value as a sales argument compared with the competition. As such, they are difficult to argue or present.

Product quality improvements are usually associated with considerable costs, which, because they are hard to argue for, fall victim to budget cuts. So the product development here depends upon different disciplinary areas within a company. This means that the department in a company that calls the shots usually also determines which product attribute will be invested in. In many companies the focus lies on the product's functionality (sales-driven), in others it lies on the technical quality (development) or on the brand and design (marketing). Decisions about product improvements are usually made by those responsible without a solid knowledge base and the added value that is achieved by the investments in the end is hard to measure.

With the HUX Tool designaffairs provides an opportunity for the first time of making valid quantitative statements about the relevance of individual product attributes for the holistic user experience. In addition it is possible to observe the relevance depending on the quality of the characteristics attributes as dynamic factors. This results in a reliable statement about how important individual product characteristics are to the user and whether or not the acceptance for a higher purchase price is given if the product quality is improved.

### 3. Why do it all again? – Established measurement methods and their limitations

There are methods on the market that measure user experience on the user side, such as, for example Attraktidiff (Hassenzahl et al. 08) or User Experience Questionnaire (UEQ) (Langwitz, et al. 09). And there are also established measurement methods, to ascertain the relevance of individual product characteristics such as the Conjoint Analysis and the Kano Analysis.

The two methods Attraktidiff (Hassenzahl) and User Experience Questionnaire (SAP) were both explicitly developed to measure the user experience of software systems. These observe the hedonistic and pragmatic qualities or more precisely, the effect on the user side by the software. Attraktidiff for example, questions how practical, predictable, clear, creative, inventive, challenging, professional, connective, good, attractive and pleasant the software is for the user. So, based on established psychological models, these thus show a very reliable picture of how the software is perceived subjectively. This means that dedicated statements can be made as to how the perceived qualities differ, especially in a product comparison or a long-term survey. However, neither of these two methods researches which of the many different product attributes actually cause this subjective perception.

The product experience is individual and can only be influenced indirectly. The manufacturer can „only“ design different product parameters and wants to know how these change the holistic product experience. In practice, the problem is that the measurements using the established test methods do not enable the manufacturer to draw any conclusions as to why the user is currently experiencing the product in the way that he does. And no account is taken of the real importance of individual attributes to the user. This means that the most important question remains unanswered: Which product characteristics must be invested in, in order to make more successful products?

So it would be better to measure on the product side and not on the user side. Other analysis methods provide basic approaches for this.

The Conjoint Analysis (CONsidered JOINTly) is an established measurement method to determine the share held by individual product attributes in the overall benefits (Backhaus et al. 00). For example, test people are asked here if they prefer a Porsche with 250 hp, or a BMW with 300 hp. The desired product characteristics are often queried in direct comparison against each other in many cases.

The value of the attributes (in this case brand and engine power) for the test people is then calculated from the responses. This procedure is extremely work-intensive for more complex questions and only provides linear correlations. It therefore does not achieve the desired results.

Based on Herzbergs „Two-Factor“ theory (Herzberg 59) we know that the weighting of individual characteristics depends upon their quality. Herzberg differentiates here between hygiene and motivational factors. So poor material quality is perhaps not of relevance for some products. However, if the material quality falls under the lowest acceptable level, then the user weighs this disproportionately highly in his overall product assessment.

The established Kano method differentiates between three factors delight attributes = delight factor, basic attributes = hygiene factor and performance attributes = motivation factor (Kano 84). However, as with the Conjoint method, only theoretical product variations are measured here and not actual product experiences (user experience). The model also assumes linear weighting ratios within the three factors. In addition it cannot make any statement about the point at which the quality level of a product characteristic drops below the customers' acceptance threshold.



#### 4. HUX, Measuring Holistic User Experience

None of the established measurement methods provides the desired statements that the manufacturers require. designaffairs has therefore developed its own HUX Tool.

The following statements were made as a basis for the tool:

1. UX describes the holistic product experience which is comprised from the individual experiences with individual product factors by the active user.
2. The UX results from the interplay between several very heterogeneous experience factors, which are shaped by the individual product attributes.
3. The assessment of the individual product characteristics occurs subconsciously, and, depending on the product category, with different weightings, and flows into the overall product assessment.
4. The UX quality is a holistic measure for product quality.
5. The quality of the holistic user experience can be derived and predicted from the quality of the individual product attributes with their weightings.

In contradiction to the afore-mentioned procedures, no theoretical future product variations or initial impressions of products or product groups are measured, but instead the longer term experience with a specific existing product: The test person evaluates

his own product that he uses actively. This is the only way to guarantee that all aspects that are of long term relevance for the purchaser, such as for example, the quality in usage, are included in the assessment and not just the initial superficial impressions.

When developing the tool, the decisive characteristics that constitute the overall product quality were identified first of all in several iterative interdisciplinary expert groups. A total of 21 attributes were named for a complete description of the user experience: In addition to pure product characteristics such as design or material quality, these also cover context characteristics such as for example brand perception or product presentation. It soon became apparent that the relevance and the expectations of the users concerning individual qualities depend on the respective product category.

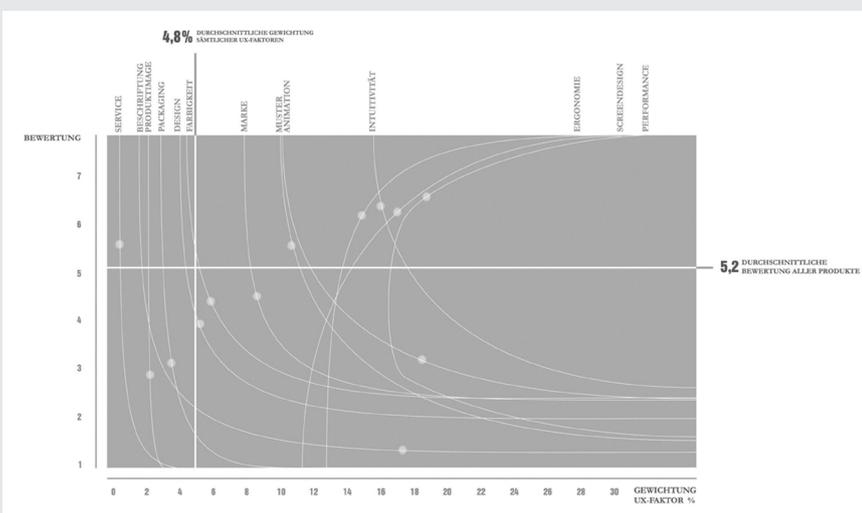
During the data collection phase the user is not asked directly about how relevant he finds the individual product characteristics. The reason being that if attention is directed towards a characteristic during the survey, then the danger arises that this is then weighted more strongly by the user as a result, although it might otherwise be rated lower on a subconscious level for the overall assessment.

So the idea and innovation behind the HUX measurement method is to indirectly calculate the subconscious weighting by asking about both the overall assessment as well as the qualitative assessment of individual characteristics. The weighting assigned subconsciously by people to individual characteristics is calculated using a regression analysis.

The new measurement method not only provides statements about a simple linear weighting of the individual product attributes in the same way as the linear regressions do, it also enables the evaluation of the weighting for individual attributes depending on the characteristic's quality. **[Figure 1]**

A non-linear statistical procedure was developed jointly with the Mathematics and Computing Science faculties at the FU Berlin in order to take account of and evaluate complex models such as hygiene, motivations and delight factors. This procedure depicts the psychological model, as well as additional dependencies between the factors with the help of cost functions and provides the respective results. **[Figure 2]**

The Institute for Statistics at the LMU Munich was also consulted as a further expert.



**Figure 1.** HUX Diagram: Depicts the weighting (horizontal axis) and assessment (vertical axis) of the individual product characteristics. The horizontal line shows the average overall assessment of the products. The vertical line defines the average weighting across all product attributes. The points mark the average evaluation and weighting of individual product characteristics. The lines show the progression, in which the weighting changes with increasing and decreasing characteristic quality.

## 5. Theoretical Background

There are product attributes that have a „must have“ character and others with a „nice to have“ character. The „Two-Factor“ theory by Frederick Herzberg differentiates accordingly between hygiene factors and motivation factors.

For example: Usability tends to be a hygiene factor (must have). This means, a poor assessment below a certain threshold of this feature, has alone a very high influence on the overall assessment of the product. And by contrast, a very good assessment cannot raise the overall evaluation of the product very strongly.

Design is more of a motivation factor. A poor to good assessment has an even linear influence on the overall assessment. The weighting will differ depending on the product category.

As such, a good design alone can, for example, have a significant influence on the overall assessment.

As with the Kano Analysis, we have assumed a third possible factor, the delight factor. A brand with an average assessment influences the overall product evaluation to a medium-high extent.

However, if the brand image is evaluated as particularly outstanding, then this brand assessment influences the overall product assessment disproportionately strongly. In reality all features are more or less mixed forms of the three extremes described above.

## 6. Approach for the HUX Process

The test period is defined precisely at the start of a survey. The exact product category is specified, as well as the brands from which product data are required. The 21 product attributes are pre-filtered or adapted depending on the product category.

Forexample, the parameter „taste“ is not relevant for smart phones.

The target groups and target markets are defined. Their later evaluation provides particularly enlightening results. For example, that women weight certain characteristics differently to men. Or that the acceptance thresholds of the sexes differ significantly from one another.

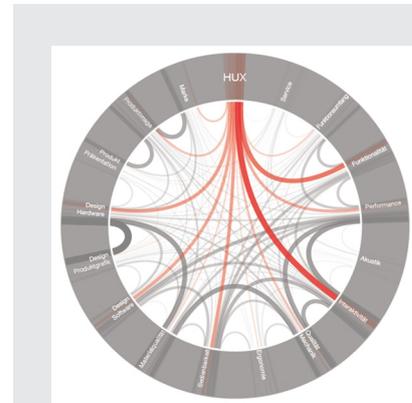
Up to 4 parameters are determined per product characteristic. The number of test people must be correspondingly high for the survey, from about n=400. The most efficient form of survey is the online survey.

The test people must already own and have been using a product in the defined category for a longer period of time. Initially they are asked about their overall rating of their product. The basis here is to ascertain the attitude to the product by means of a 4-item scale. (Moreau et al. 01). In addition to emotional and cognitive aspects, we also ask about the usage itself, as well as the readiness to recommend the product to others. The overall assessment of the product serves as a reference point for the later regression analysis.

Once the personal data aspects have been collected in the questionnaire, the test people must then rate the individual product attributes (up to 21 items) in a randomised process. We use a 7-point Likert scale here (7 = „I agree fully“).

The questionnaire itself is evaluated by designaffairs as objective (expert interviews), valid (face & content validity) and reliable. The internal consistency of the scale for measuring the holistic user experience is given (Cronbachs-  $\alpha$  Test =0,9).

The statistical evaluation of the data is the final step to be completed. In order to evaluate the quality of the results we conduct both the square error as well as a cross-validation and the variance in each case. In this way we can assess how precise the results are and



**Figure 2.**  
Correlation Diagram: Depicts the correlation of individual product attributes in relation to one another as well as to the overall assessment (HUX).

whether or not further test people need to be surveyed in order to obtain stable results.

## 7. Example: Smart Phones

In order to test the concept and measuring method designaffairs has conducted two of its own surveys (n=300 and n= 500 respectively) to examine the holistic user experience of smart phones and washing machines. The test people rated their respective known products that they use in everyday life here.

The analysis of the first random samples confirmed our theories: For the holistic user experience the individual product attributes are of differing strong relevance, and also dependent on the product category. So the relevant characteristics for smart phones differ from those for washing machines. Among other things the HUX results show that the 3 factors functionality, interactivity and hardware design alone account for 60% of the overall user experience for smart phones. For washing machines the 4 characteristics operation, hardware design, mechanical quality and range of features are together responsible for 80% of the overall assessment of the product.



In this survey the test people were also asked directly about their personal opinion concerning the relevance of individual attributes and the results were compared with the weighting that was determined on a statistical basis. As expected, the personal evaluations by the test people could not be used for strategic product decisions, because all characteristics were more or less weighted equally in the random samples. So the square error for the weighting calculated using the HUX tool is 26% lower than specified by the test people.

The data were also evaluated according to the different manufacturers. So, specific statements could be made as a result for each manufacturer as to the expense associated with obtaining the best Return of Invest. For example, Motorola should invest in a better hardware design, whereas BlackBerry should initially improve its products' interactivity.

The market price was determined for all measured products, in order to generate a pricing model for the product category smart phones that puts the measured user experience in relation to the market price. This model will help to make predictions about which market price can be realised with which user experience. In combination with the model from HUX reliable predictions can therefore be made about which investments in which product characteristic can obtain the best Return of Invest. This makes HUX an optimum option for providing valid quantitative data to a design-to-value strategy.

The existing results strengthen us in the assumption that the HUX Tool delivers valid and differentiated recommendations for product managers and UX designers. We are now working on expanding our data base and continuing to refine and validate our methods and the mathematical models.

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