

UEQ KPI Value Range based on the UEQ Benchmark

Andreas Hinderks
University of Seville

Martin Schrepp
SAP SE

Francisco José Domínguez Mayo
University of Seville

María José Escalona Cuaresma
University of Seville

Jörg Thomaschewski
University of Applied Science Emden/Leer

December 2018



Contents

1 Introduction	2
1.1 UEQ KPI	2
1.2 Research Methodology	3
2 UEQ KPI Value Range	5
2.1 UEQ KPI Value Range - Benchmark Category Bad	6
2.2 UEQ KPI Value Range - Benchmark Category Below Average	6
2.3 UEQ KPI Value Range - Benchmark Category Above Average	7
2.4 UEQ KPI Value Range - Benchmark Category Good	7
2.5 UEQ KPI Value Range - Benchmark Category Excellent	8
List of Figures	9
List of Tables	10
Bibliography	11

1 Introduction

The formula described here is to combine for every participant the value and assessed importance of each UEQ scale. Therefore, we calculated for each participant the relative importance of each scale and multiplied this with the value of the UEQ scale. This allows to generate a meaningful UX KPI based on the UEQ, that we have named UEQ KPI. The steps are described in detail below.

The method presented in this paper is based on the User Experience Questionnaire (UEQ) [Laugwitz et al. 2008] and its benchmark [Schrepp 2017a]. The objective of the UEQ is to allow a quick assessment done by end users covering a preferably comprehensive impression of user experience. It should allow the users to express feelings, impressions, and attitudes that arise when experiencing the product under investigation in a very simple and immediate way. It consists of 26 items that are grouped into 6 scales (Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation and Novelty). Each scale represents a distinct UX quality aspect.

In this paper, we describe an approach to calculate the possible value range of the UEQ KPI [Schrepp 2017b].

1.1 UEQ KPI

The central idea of our approach is to combine for every participant the value and perceived importance of each UEQ scale [Schrepp 2017a]. Therefore, we calculated for each participant the relative importance of each scale and multiplied this with the value of the UEQ scale. Finally, we have generated a UX KPI based on the UEQ. We have named the resulting value UEQ KPI. The steps are described in detail below.

- The result of the UEQ represents a value per participant Pa_i and for every scale: attractiveness A_i , perspicuity P_i , efficiency E_i , dependability D_i , stimulation S_i , and novelty N_i .
- The result of the six additional questions is a value of the perceived importance of each scale: attractiveness a_i , perspicuity p_i , efficiency e_i , dependability d_i , stimulation s_i , and novelty n_i .
- We have calculated the relative importance per participant using the given perceived importance of each scale. For example for attractiveness $Aw_i = a_i / (a_i + p_i + e_i + d_i + s_i + n_i)$.
- The UEQ KPI per participant can be calculated by multiplying the mean value of the UEQ scale with its relative importance: $UEQ\ KPI_i = Aw_i * A_i + Pw_i * P_i + Ew_i * E_i + Dw_i * D_i +$

$$Sw_i * S_i + Nw_i * N_i.$$

The UEQ KPI has been calculated using the following formula:

$$UEQ\ KPI = \frac{1}{n} \sum_{i=1}^n (Aw_i * A_i + Pw_i * P_i + Ew_i * E_i + Dw_i * D_i + Sw_i * S_i + Nw_i * N_i) \quad (1.1)$$

We have used this formula to calculate the possible value range of the UEQ KPI with a combination of the UEQ Benchmark and theoretical values.

1.2 Research Methodology

The formula for calculating the UEQ KPI consists of two parts for each factor of the UEQ: The first is the value of the UEQ factor and the second is the perceived importance per UEQ factor. The UEQ KPI is calculated from both values. In order to determine the value range of the UEQ KPI, both values should be considered. Theoretically, the two values can have the following ranges:

- **UEQ factor:** Between -3 and +3
- **Perceived importance:** Between 1 and 7

If the values are calculated with the UEQ KPI formula, this results in a value range for the UEQ KPI between -3 and +3. This is the theoretically assumed value range of the UEQ KPI. However, this value range is not very helpful.

Another way to calculate the possible value range is to include the UEQ benchmark. A benchmark already exists for the UEQ, which specifies a practical value range for the factors of the UEQ [Schrepp 2017a]. The results of an evaluation of a product can thus be better interpreted. The figure 1.1 shows the benchmark categories for each factor.

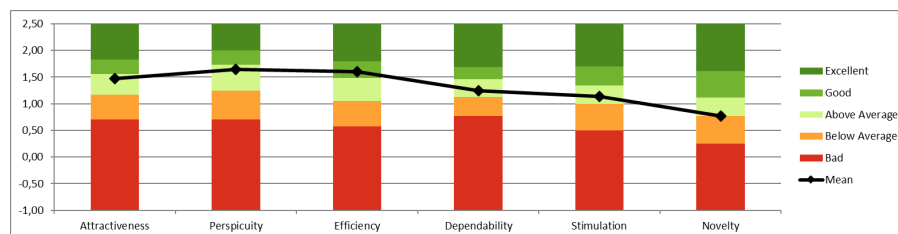


Figure 1.1: UEQ Benchmark

Introduction

From the UEQ benchmark, the mean values per factor can be extracted, as are given in table 1.1.

	ATT	PER	EFF	DEP	STI	NOV
Bad	-0.155	-0.185	-0.235	-0.115	-0.255	-0.355
Below Avarage	0.930	0.855	0.755	0.955	0.740	0.500
Above Avarage	1.340	1.315	1.220	1.305	1.145	0.875
Good	1.630	1.725	1.620	1.560	1.425	1.220
Excellent	2.125	2.200	2.140	2.075	2.025	1.950

Table 1.1: UEQ Benchmark - Mean Value for each Factor (ATT-Attractiveness , PER-Perspiciuity, EFF-Efficiency, DEP-Dependability, STI-Stimunlation, NOV-Novelty)

We use these mean values of the benchmark to calculate the possible range of values of the UEQ KPI with practical data. In this way, the value range of the UEQ KPI can be calculated on the basis of the following data:

- **UEQ factor:** Mean values per UEQ factor from the benchmark categories (Bad, Below Avarage, Above Avarage, Good, Excellent)
- **Perceived importance:** Between 1 and 7

The UEQ KPI was calculated for all benchmark categories. All possible combinations of all benchmark categories and for each perceived importance factor (1 to 7 per UEQ factor) were calculated. Chapter 2 presents the results of the calculation.

2 UEQ KPI Value Range

From the UEQ KPI formula (see Section 1.1) and the ranges of values (see Section 1.2), the following mean values and the minimum and maximum values for each benchmark categorie result:

UEQ Benchmark	UEQ KPI Mean Value	UEQ KPI Min Value	UEQ KPI Max Value
Bad	-0.224	-0.286	-0.162
Below Avarage	0.768	0.645	0.891
Above Avarage	1.164	1.038	1.290
Good	1.502	1.375	1.628
Excellent	2.080	2.018	2.143

Table 2.1: UEQ KPI Value Range - Overview

The figure below shows the table (see table 2.1) graphically.

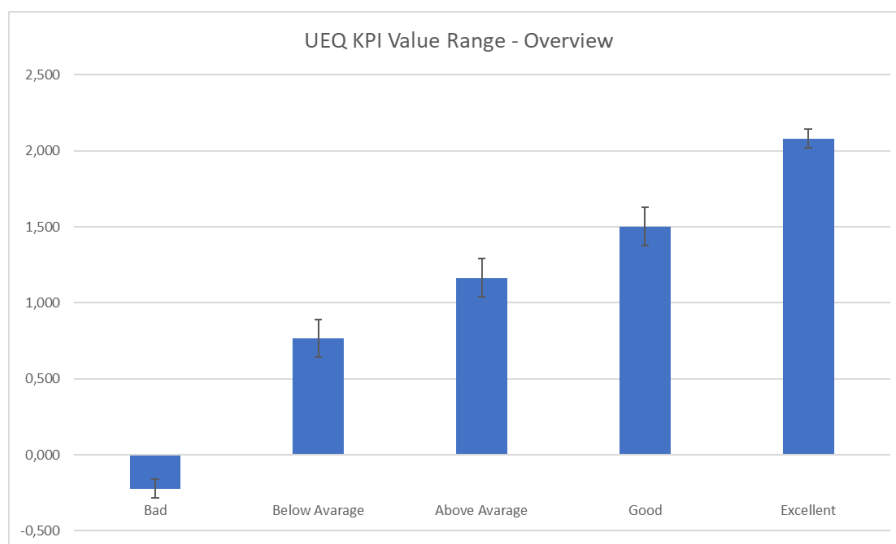


Figure 2.1: UEQ KPI Value Range for each Benchmark Range

This gives the possible range of values for the UEQ KPI based on the UEQ benchmark of:

UEQ KPI Value Range between **-0.286** and **2.143**

The value range for the perceived importance per UEQ factor should be recorded in an additional benchmark, so that the value range of the UEQ KPI can be interpreted in an even better manner.

UEQ KPI Value Range

Although a theoretical value range from -3 to +3 is possible, it will not occur in a practical application. Rather, it shows that the real value range is smaller and more positive.

2.1 UEQ KPI Value Range - Benchmark Category Bad

Possible range of values for the UEQ KPI based on the UEQ benchmark category *bad*. The UEQ KPI value range for the UEQ benchmark category *bad* is between -0.286 and -0.126 with -0.224 as the mean value.

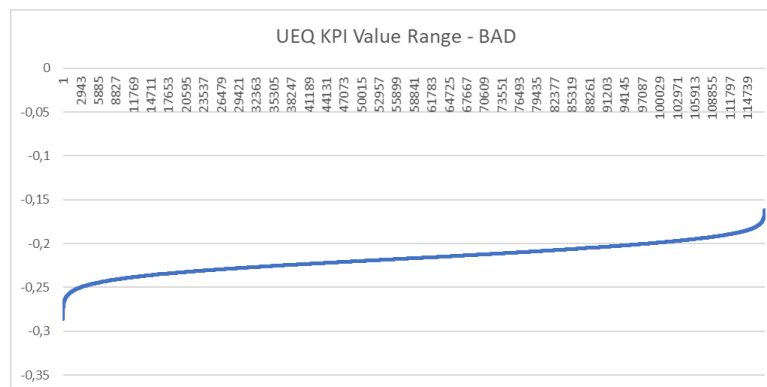


Figure 2.2: UEQ KPI Value Range - Benchmark Category Bad

2.2 UEQ KPI Value Range - Benchmark Category Below Average

Possible range of values for the UEQ KPI based on the UEQ benchmark category *Below Average*. The UEQ KPI value range for the UEQ benchmark category *Below Average* is between 0.645 and 0.891 with 0.768 as the mean value.

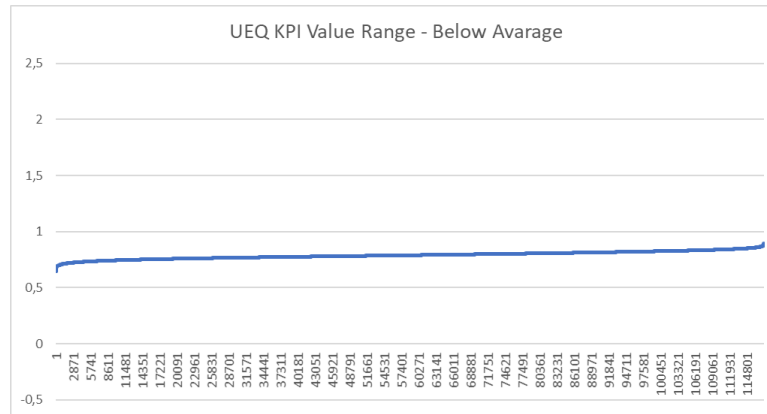


Figure 2.3: UEQ KPI Value Range - Benchmark Category Below Average

2.3 UEQ KPI Value Range - Benchmark Category Above Average

Possible range of values for the UEQ KPI based on the UEQ benchmark category *Above Average*. The UEQ KPI value range for the UEQ benchmark category *Above Average* is between 1.038 and 1.290 with 1.164 as the mean value.

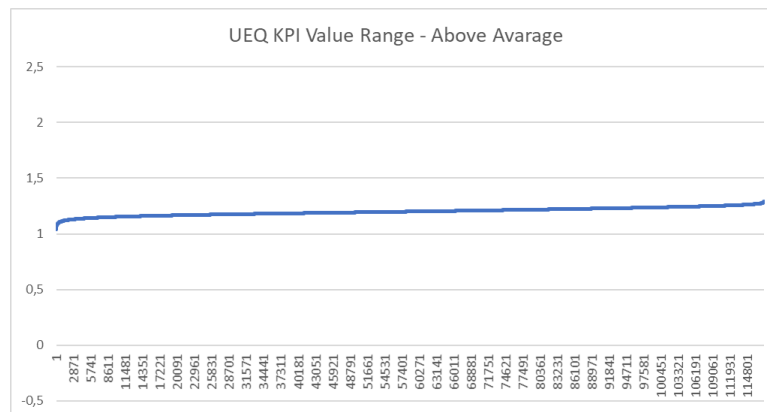


Figure 2.4: UEQ KPI Value Range - Benchmark Category Above Average

2.4 UEQ KPI Value Range - Benchmark Category Good

Possible range of values for the UEQ KPI based on the UEQ benchmark category *Good*. The UEQ KPI value range for the UEQ benchmark category *Good* is between 1.375 and 1.628 with 1.502 as the mean value.

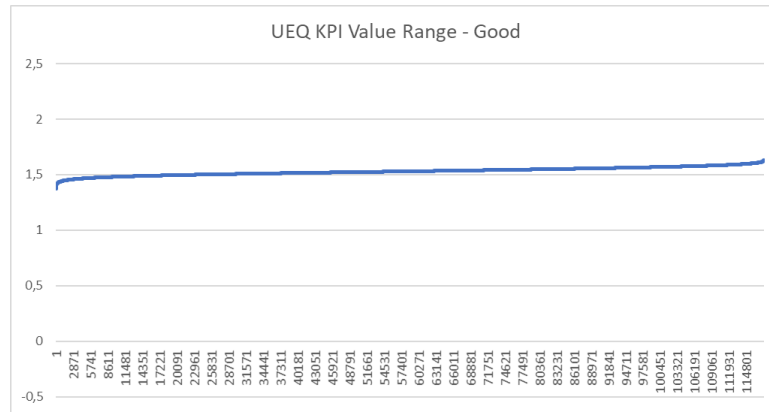


Figure 2.5: UEQ KPI Value Range - Benchmark Category Good

2.5 UEQ KPI Value Range - Benchmark Category Excellent

Possible range of values for the UEQ KPI based on the UEQ benchmark category *Excellent*. The UEQ KPI value range for the UEQ benchmark category *Excellent* is between 2.018 and 2.143 with 2.080 as the mean value.

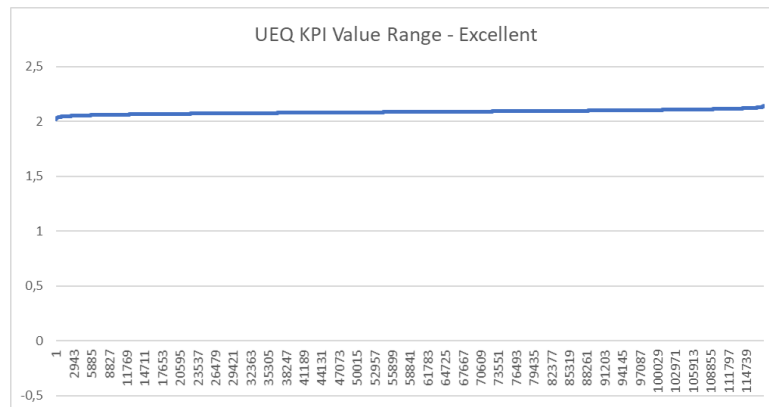


Figure 2.6: UEQ KPI Value Range - Benchmark Category Excellent

List of Figures

1.1	UEQ Benchmark	3
2.1	UEQ KPI Value Range for each Benchmark Range	5
2.2	UEQ KPI Value Range - Benchmark Category Bad	6
2.3	UEQ KPI Value Range - Benchmark Category Below Average	7
2.4	UEQ KPI Value Range - Benchmark Category Above Average	7
2.5	UEQ KPI Value Range - Benchmark Category Good	8
2.6	UEQ KPI Value Range - Benchmark Category Excellent	8

List of Tables

1.1	UEQ Benchmark - Mean Value for each Factor (ATT-Attractiveness , PER-Perspicuity, EFF-Efficiency, DEP-Dependability, STI-Stimunlation, NOV-Novelty)	4
2.1	UEQ KPI Value Range - Overview	5

Bibliography

- [Laugwitz et al. 2008] Laugwitz, B., Held, T., and Schrepp, M. (2008), “Construction and Evaluation of a User Experience Questionnaire”, in A. Holzinger (ed.), *HCI and Usability for Education and Work* (Lecture Notes in Computer Science, Berlin, Heidelberg: Springer Berlin Heidelberg), pp. 63–76.
- [Schrepp 2015] Schrepp, Martin (2015): *User Experience Questionnaire Handbook*. All you need to know to apply the UEQ successfully in your projects. Available online at <http://www.ueq.online.org>, last checked on November 13, 2017.
- [Schrepp 2017a] Schrepp, Martin; Hinderks, Andreas; Thomaschewski, Jörg (2017), “Construction of a Benchmark for the User Experience Questionnaire (UEQ)” In: *International Journal of Interactive Multimedia and Artificial Intelligence* 4 (4), pp. 40–44. DOI: 10.9781/ijimai.2017.445.
- [Schrepp 2017b] Schrepp, Martin; Hinderks, Andreas; Thomaschewski, Jörg (2017), “Die UX KPI - Wunsch und Wirklichkeit”, in: *Gesellschaft für Informatik (Hg.): Mensch und Computer 2017*. In cooperation with Burghardt, M., Wimmer, R., Wolff, C. & Womser-Hacker, C. *Mensch und Computer*. Regensburg.