

# UEQ KPI Result Report of the Evaluation of Amazon and Skype

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# 1 Introduction

In many companies, decisions are mostly made based on the key figures, such as turnover, profit, employee satisfaction, or the Net Promoter Score (NPS). Managers are accustomed to information being summarized and available via key figures. This leads to the demand for the user experience to also be mapped in a single KPI (UX KPI).

Our main goal is to show the calculation of a UX KPI in practice by conducting two studies evaluating Amazon and Skype. In addition, we want to determine whether there are difference between the values of the UEQ scales and the perceived importance per UEQ scale. For this purpose, we have added six additional questions to the User Experience Questionnaire (UEQ) to determine the perceived importance of each scale of the UEQ.

In this paper, we describe the detailed results of our studies.

## 2 The Study

The study has been conducted in England, Spain, and Germany through online and paper versions of the questionnaire. For the English and German dataset, we have chosen a social panel (Prolific Academic<sup>1</sup>) to collect the data. We have collected the Spanish dataset from the University of Seville.

First of all, the participants were asked to choose between Amazon and Skype. In the next step, they had to complete the UEQ [Laugwitz et al. 2008]. The UEQ is a semantic differential of 26 items that measures user experience in terms of attractivity, perspicuity, efficiency, dependability, stimulation, and novelty [Laugwitz et al. 2008]. Based on the six UEQ scales, the participants were asked in the following step to assess how important the scale and/or product quality is to them for the chosen product. In Table 2.1 the detailed statements are listed.

Finally, the participants had to state their age and gender. Each participant only evaluated one product.

### 2.1 Participants

A total of 882 participants took part in the study. Not all participants answered all items seriously. To detect the somewhat random or non serious answers and clean up the datasets, we used a simple heuristic [Schrepp 2016]. In the end, we identified 87 answers as problematic and deleted them from the datasets. The remaining answers are categorized as follows:

	<b>Amazon</b>		<b>Skype</b>	
England	238	(158 females, 96 males)	215	(172 females, 82 males)
Spain	51	(no data available)	62	(no data available)
Germany	144	(52 females, 102 males)	85	(40 females, 52 males)
<b>Total</b>	<b>433</b>		<b>362</b>	

Table 2.2: Number of Participants Choosing Amazon or Skype

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<sup>1</sup> <https://www.prolific.ac>

Scale	Statements
Attractiveness	[ENG] Amazon should look attractive, enjoyable, friendly and pleasant. [SPA] El sistema tiene que ser atractivo, agradable y simpático. [GER] Das Produkt soll attraktiv, angenehm und sympathisch wirken.
Efficiency	[ENG] I should perform my tasks with Amazon fast, efficient and in a pragmatic way. [SPA] El sistema debe ayudar a que yo haga mis tareas de forma rápida, eficiente y pragmática. [GER] Das Produkt soll mir helfen, meine Aufgaben schnell, effizient und pragmatisch zu erledigen.
Perspicuity	[ENG] Amazon should be easy to understand, clear, simple, and easy to learn. [SPA] El sistema debe ser entendible, claro y fácil de aprender. [GER] Das Produkt soll übersichtlich, verständlich und leicht zu lernen sein.
Dependability	[ENG] The interaction with Amazon should be predictable, secure and meets my expectations. [SPA] El uso del sistema debe ser predecible de usar y fácil de controlar. [GER] Die Bedienung des Produkts soll in der Bedienung vorhersehbar und gut kontrollierbar sein.
Stimulation	[ENG] Using Amazon should be interesting, exiting and motivating. [SPA] Trabajar con el sistema debe ser interesante, emocionante y de activación. [GER] Das Arbeiten mit dem Produkt soll interessant, spannend und aktivierend sein.
Novelty	[ENG] Amazon should be innovative, inventive and creatively designed. [SPA] El sistema debe ser original, innovadora y creativa. [GER] Das Produkt soll originell, innovativ und kreativ gestaltet sein.

Table 2.1: Additional questions to assess the importance of the parameters to the participant.

The average age is 34 years (35 for females, 33 for males) for the English dataset and 29 years (31 for females, 28 for males) for the German dataset. We have no socio-demographic information available for the Spanish dataset.

## 2.2 Data Analysis in General

We have analyzed the results of the studies on Amazon and Skype in terms of the following aspects:

- **UEQ KPI:** See detailed information and development of the UEQ KPI in Chapter 2.3.
- **UEQ Overview:** Values for each UEQ scale [Schrepp 2015].
- **UEQ Scale Statistic:** Mean, standard deviation, and confidence value for each UEQ scale [Schrepp 2015].
- **UEQ Scales Consistency:** Cronbach's Alpha Coefficient for each UEQ scale [Cronbach 1951].
- **UEQ Benchmark:** Comparison of the results with the UEQ Benchmark [Schrepp 2017b].
- **Perceived Importance:** Values of the perceived importance of each UEQ scale. The results are calculated on the basis of the additional statements (see Table 2.1).
- **Perceived Importance Statistic:** Mean, standard deviation and confidence of the perceived importance of each UEQ scale. In addition we calculate the correlation between Scale Mean and Perceived Importance.

In addition to the analysis for Amazon and Skype, we have compared the results from the three countries.

## 2.3 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 Study

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- 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:

$$UEQ KPI = \frac{1}{n} \sum_{i=1}^n (Aw_i * A_i + Pw_i * P_i + Ew_i * E_i + Dw_i * D_i + Sw_i * S_i + Nw_i * N_i) \quad (2.1)$$

We have used this formula to calculate the UEQ KPI for the two studies conducted for Amazon and Skype. In the following chapters, we present the results of the studies in detail.



### 3 Amazon Results

#### 3.1 UEQ KPI

$$\text{UEQ KPI}_{\text{Amazon Overall}} = 1.336$$

$N_{\text{Amazon Overall}} = 433$

#### 3.2 UEQ Overview

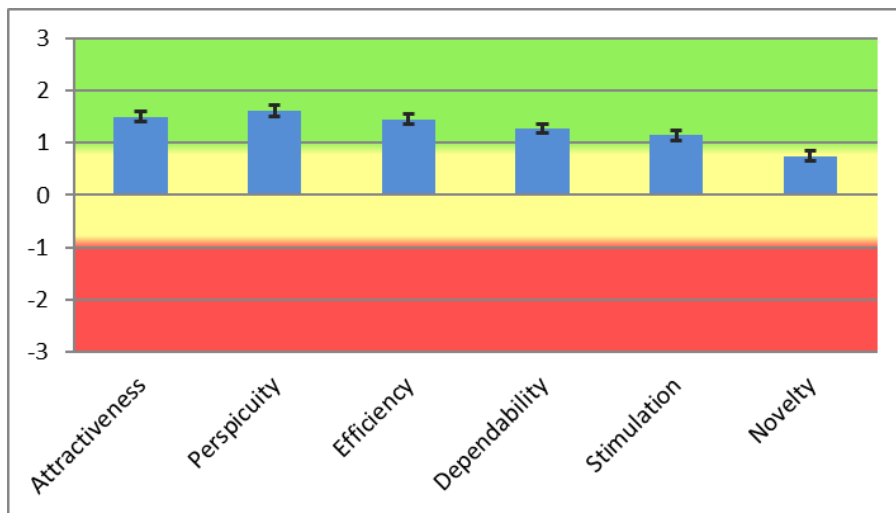


Figure 3.1: Amazon Overall - UEQ Overview

$N_{\text{Amazon Overall}} = 433$

Confidence as error bar.

### 3.3 UEQ Scales - Mean, Standard Deviation, and Confidence

Scale	Mean	Std. Dev.	N	Confidence	Confidence interval	
Attractiveness	1.500	1.032	433	0.097	1.403	1.598
Perspicuity	1.614	1.067	433	0.101	1.514	1.715
Efficiency	1.453	1.008	433	0.095	1.358	1.548
Dependability	1.275	0.877	433	0.083	1.193	1.358
Stimulation	1.144	0.979	433	0.092	1.052	1.237
Novelty	0.745	1.040	433	0.098	0.647	0.843

Table 3.1: Amazon Overall - UEQ Scales - Mean, Standard Deviation and Confidence

Std. Dev.  $\equiv$  Standard Deviation

### 3.4 UEQ Scales - Cronbach's Alpha Coefficient

Scale	Alpha
Attractiveness	0.904
Perspicuity	0.812
Efficiency	0.752
Dependability	0.653
Stimulation	0.778
Novelty	0.742

Table 3.2: Amazon Overall - UEQ Scales - Cronbachs Alpha-Coefficient

$N_{\text{Amazon Overall}} = 433$

### 3.5 UEQ Benchmark

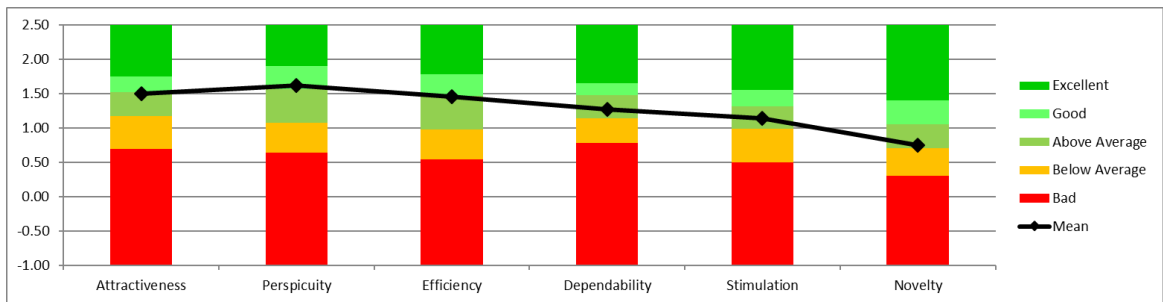


Figure 3.2: Amazon Overall - UEQ Benchmark

$N_{\text{Amazon Overall}} = 433$

### 3.6 Perceived Importance of UEQ Scales - Overview

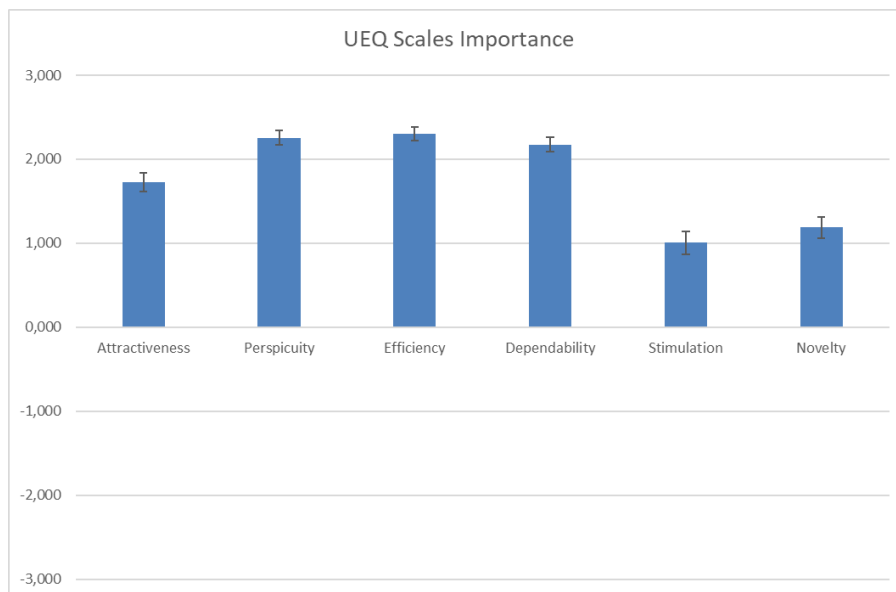


Figure 3.3: Amazon Overall - Perceived Importance of UEQ Scales - Overview

$N_{\text{Amazon Overall}} = 433$

Confidence as error bar.

### 3.7 Perceived Importance of UEQ Scales - Mean, Standard Deviation and Confidence

Scale	Importance	-3/3	Std. Dev.	N	Confidence	Confidence interval	
Attractiveness	5.726	1.726	1.125	419	0.108	1.618	1.833
Perspicuity	6.255	2.255	0.922	432	0.087	2.168	2.342
Efficiency	6.305	2,305	0.847	433	0.080	2.225	2.385
Dependability	6.176	2.176	0.951	433	0.090	2.086	2.265
Stimulation	5.005	1.005	1.480	433	0.139	0.865	1.144
Novelty	5.189	1.189	1.342	433	0.126	1.063	1.316

Table 3.3: Amazon Overall - Perceived Importance of UEQ Scales - Mean, Standard Deviation and Confidence

$N_{\text{Amazon Overall}} = 433$

-3/3  $\equiv$  Importance value from 1 to 7 adjusted to -3 to +3

Std. Dev.  $\equiv$  Standard Deviation

### 3.8 Correlation between Scale Mean and Perceived Importance

Scale	Correlation
Attractiveness	0,323
Perspicuity	0,206
Efficiency	0,247
Dependability	0,217
Stimulation	0,327
Novelty	0,320

Table 3.4: Amazon - Correlation between Scale Means and Perceived Importance

## 4 Amazon Compare Countries

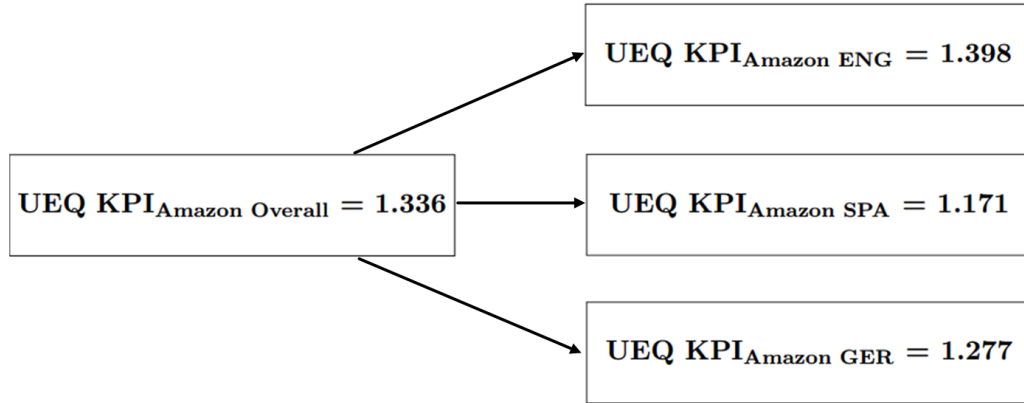


Figure 4.1: Amazon - Compare Countries - UEQ KPI

$N_{\text{Amazon ENG}} = 238$ ;  $N_{\text{Amazon SPA}} = 51$ ;  $N_{\text{Amazon GER}} = 144$

### 4.1 UEQ Scales - Mean, Standard Deviation, and Confidence

Scale	England			Spain			Germany		
	Mean	Std. Dev.	Conf.	Mean	Std. Dev.	Conf.	Mean	Std. Dev.	Conf.
Attractiveness	1.535	1.089	0.138	1.294	1.034	0.284	1.516	0.929	0.152
Perspicuity	1.710	1.097	0.139	1.069	1.163	0.319	1.649	0.922	0.151
Efficiency	1.641	1.044	0.133	1.074	1.040	0.285	1.276	0.861	0.141
Dependability	1.277	0.887	0.113	1.054	0.926	0.254	1.351	0.834	0.136
Stimulation	1.201	1.019	0.129	1.181	1.001	0.275	1.038	0.898	0.147
Novelty	0.825	1.053	0.134	0.951	1.042	0.286	0.542	0.991	0.162

Table 4.1: Amazon - Compare Countries - UEQ Scales - Mean, Standard Deviation and Confidence

$N_{\text{Amazon ENG}} = 238$ ;  $N_{\text{Amazon SPA}} = 51$ ;  $N_{\text{Amazon GER}} = 144$

Std. Dev.  $\equiv$  Standard Deviation

## 4.2 UEQ Scales - Cronbach's Alpha Coefficient

Scale	ENG Alpha	SPA Alpha	GER Alpha
Attractiveness	0.911	0.897	0.903
Perspicuity	0.830	0.868	0.732
Efficiency	0.825	0.711	0.663
Dependability	0.610	0.745	0.712
Stimulation	0.796	0.793	0.742
Novelty	0.710	0.774	0.790

Table 4.2: Amazon - Compare Countries - UEQ Scales Cronbachs Alpha-Coefficient

$N_{\text{Amazon ENG}} = 238$ ;  $N_{\text{Amazon SPA}} = 51$ ;  $N_{\text{Amazon GER}} = 144$

## 4.3 Perceived Importance of UEQ Scales - Mean, Standard Deviation and Confidence

Scale	England			Spain			Germany		
	Mean	Std. Dev.	Conf.	Mean	Std. Dev.	Conf.	Mean	Std. Dev.	Conf.
Attractiveness	1.647	1.184	0.150	2.027	0.986	0.318	1.778	1.047	0.171
Perspicuity	2.160	0.994	0.126	2.280	0.991	0.275	2.403	0.742	0.121
Efficiency	2.429	0.807	0.103	2.196	0.939	0.258	2.139	0.850	0.139
Dependability	2.244	0.927	0.118	2.098	0.900	0.247	2.090	1.003	0.164
Stimulation	1.076	1.430	0.182	1.412	1.283	0.352	0.743	1.586	0.259
Novelty	1.294	1.248	0.159	1.608	1.218	0.334	0.868	1.469	0.240

Table 4.3: Amazon - Compare Countries - Perceived Importance of UEQ Scales - Mean, Standard Deviation and Confidence

$N_{\text{Amazon ENG}} = 238$ ;  $N_{\text{Amazon SPA}} = 51$ ;  $N_{\text{Amazon GER}} = 144$

Std. Dev.  $\equiv$  Standard Deviation

#### 4.4 UEQ Scales - T-Test

	ENG-SPA		ENG-GER		SPA-GER	
Attractiveness	0.139	No Sig. Diff.	0.858	No Sig. Diff.	0.180	No Sig. Diff.
Perspicuity	0.001	Sig. Diff.	0.562	No Sig. Diff.	0.002	Sig. Diff.
Efficiency	0.001	Sig. Diff.	0.000	Sig. Diff.	0.216	No Sig. Diff.
Dependability	0.120	No Sig. Diff.	0.416	No Sig. Diff.	0.047	Sig. Diff.
Stimulation	0.901	No Sig. Diff.	0.105	No Sig. Diff.	0.370	No Sig. Diff.
Novelty	0.435	No Sig. Diff.	0.009	Sig. Diff.	0.017	Sig. Diff.

Table 4.4: Amazon - Compare Countries - UEQ Scales - T-Test

Alpha level = 0.05

$N_{\text{Amazon ENG}} = 238$ ;  $N_{\text{Amazon SPA}} = 51$ ;  $N_{\text{Amazon GER}} = 144$

Sig. Diff.  $\equiv$  Significant Difference

## 5 Skype Results

### 5.1 UEQ KPI

$$\text{UEQ KPI}_{\text{Skype Overall}} = 0.896$$

$$N_{\text{Amazon Overall}} = 362$$

### 5.2 UEQ - Overview

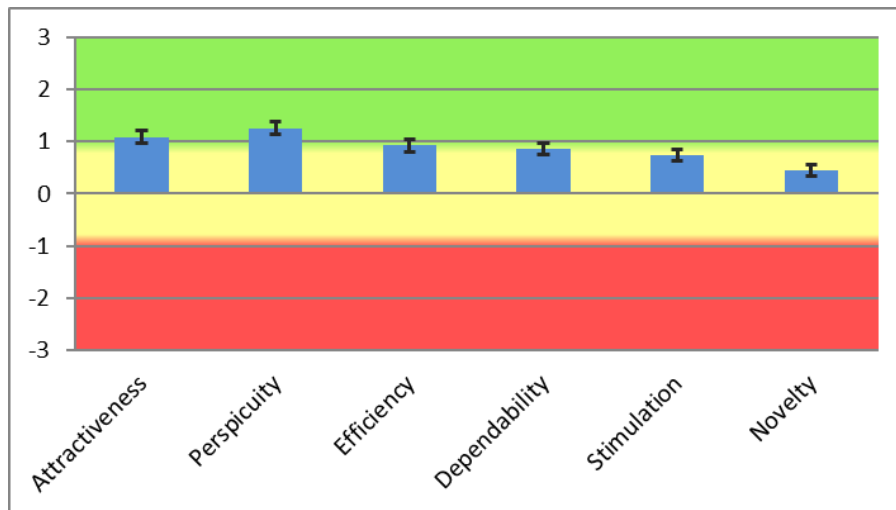


Figure 5.1: Skype Overall - UEQ Overview

$$N_{\text{Skype Overall}} = 362$$

Confidence as error bar.



### 5.3 UEQ Scales - Mean, Standard Deviation, and Confidence

Scale	Mean	Std. Dev.	N	Confidence	Confidence interval	
Attractiveness	1.086	1.123	362	0.116	0.971	1.202
Perspicuity	1.255	1.145	362	0.118	1.137	1.373
Efficiency	0.924	1.106	362	0.114	0.810	1.038
Dependability	0.860	0.998	362	0.103	0.758	0.963
Stimulation	0.727	1.052	362	0.108	0.619	0.836
Novelty	0.444	1.015	362	0.105	0.340	0.549

Table 5.1: Skype Overall - UEQ Scales - Mean, Standard Deviation and Confidence

Std. Dev.  $\equiv$  Standard Deviation

### 5.4 UEQ Scales - Cronbach's Alpha Coefficient

Scale	Alpha
Attractiveness	0.920
Perspicuity	0.832
Efficiency	0.798
Dependability	0.710
Stimulation	0.790
Novelty	0.739

Table 5.2: Skype Overall - UEQ Scales - Cronbachs Alpha-Coefficient

$N_{\text{Skype Overall}} = 362$

### 5.5 UEQ Benchmark

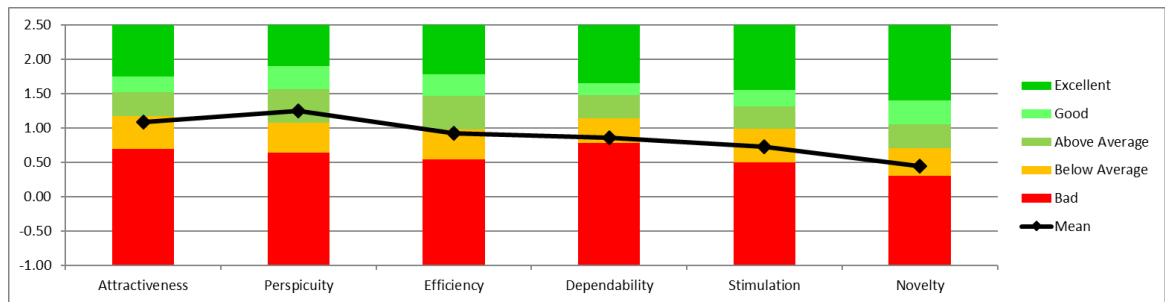


Figure 5.2: Skype Overall - UEQ Benchmark

$N_{\text{Skype Overall}} = 362$

### 5.6 Perceived Importance of UEQ Scales Overview

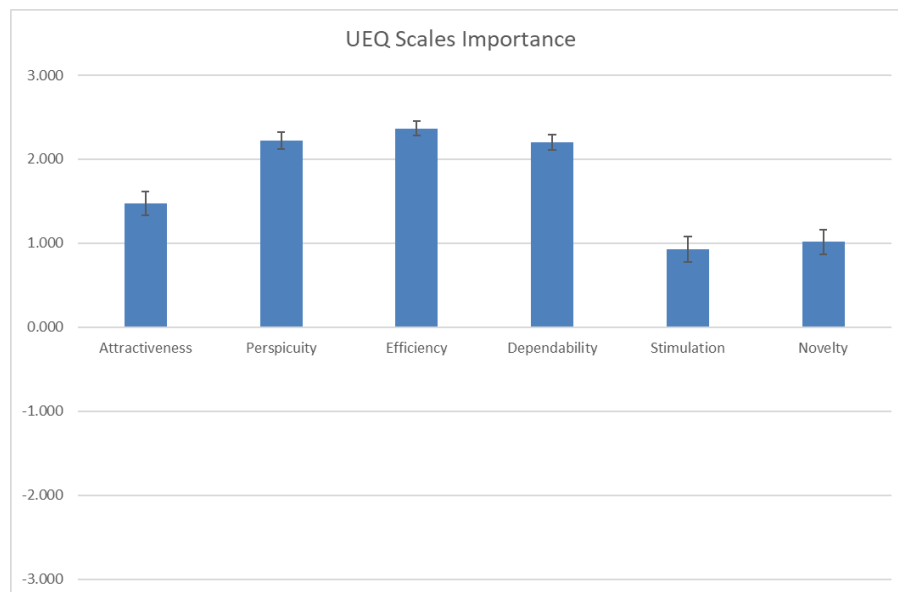


Figure 5.3: Skype Overall - Perceived Importance of UEQ Scales - Overview

$N_{\text{Skype Overall}} = 362$

Confidence as error bar.

## 5.7 Perceived Importance of UEQ Scales - Mean, Standard Deviation, and Confidence

Scale	Importance	-3/3	Std. Dev.	N	Confidence	Confidence interval	
Attractiveness	5.474	1.474	1.3080	346	0.138	1.336	1.612
Perspicuity	6.218	2.218	0.9871	362	0.102	2.117	2.320
Efficiency	6.366	2.366	0.8228	361	0.085	2.281	2.451
Dependability	6.199	2.199	0.8643	362	0.089	2.110	2.288
Stimulation	4.925	0.925	1.4462	362	0.149	0.776	1.074
Novelty	5.014	1.014	1.3894	362	0.143	0.871	1.157

Table 5.3: Skype Overall - Perceived Importance of UEQ Scales - Mean, Standard Deviation and Confidence

$N_{\text{Skype Overall}} = 362$

-3/3  $\equiv$  Importance value from 1 to 7 adjusted to -3 to +3

Std. Dev.  $\equiv$  Standard Deviation

## 5.8 Correlation between Scale Mean and perceived Importance

Scale	Correlation
Attractiveness	0,149
Perspicuity	0,172
Efficiency	0,139
Dependability	0,155
Stimulation	0,237
Novelty	0,159

Table 5.4: Skype - Correlation between Scale Means and Perceived Importance

## 6 Skype Compare Countries

### 6.1 UEQ KPI

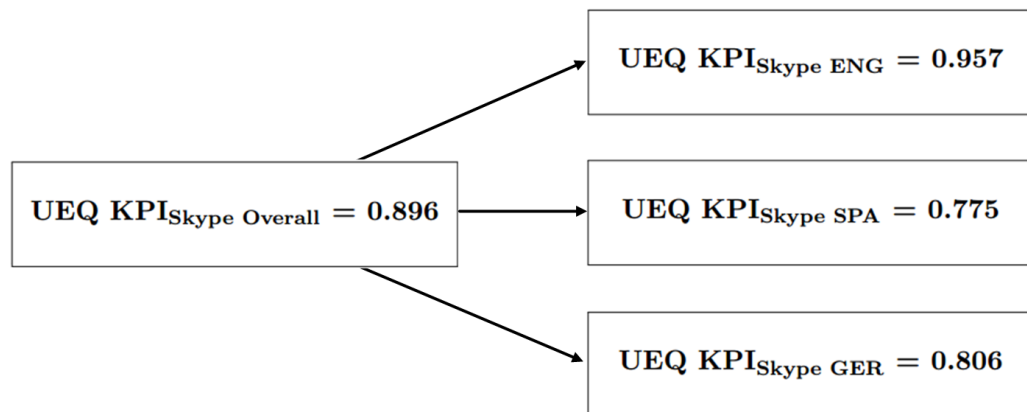


Figure 6.1: Skype - Compare Countries - UEQ KPI

$N_{\text{Skype ENG}} = 215$ ;  $N_{\text{Skype SPA}} = 62$ ;  $N_{\text{Skype GER}} = 85$

### 6.2 UEQ Scales - Mean, Standard Deviation and Confidence

Scale	England			Spain			Germany		
	Mean	Std. Dev.	Conf.	Mean	Std. Dev.	Conf.	Mean	Std. Dev.	Conf.
Attractiveness	1.119	1.134	0.152	1.182	0.984	0.245	0.933	1.184	0.252
Perspicuity	1.331	1.190	0.159	1.165	0.865	0.215	1.126	1.203	0.256
Efficiency	1.045	1.121	0.150	0.683	1.012	0.252	0.794	1.099	0.234
Dependability	0.914	1.023	0.137	0.891	0.939	0.234	0.703	0.970	0.206
Stimulation	0.691	1.072	0.143	0.956	0.952	0.237	0.653	1.058	0.225
Novelty	0.407	1.004	0.134	0.560	1.029	0.256	0.453	1.037	0.220

Table 6.1: Skype - Compare Countries - UEQ Scales - Mean, Standard Deviation and Confidence

$N_{\text{Skype ENG}} = 215$ ;  $N_{\text{Skype SPA}} = 62$ ;  $N_{\text{Skype GER}} = 85$

### 6.3 UEQ Scales - Cronbachs Alpha-Coefficient

Scale	ENG Alpha	SPA Alpha	GER Alpha
Attractiveness	0.924	0.896	0.928
Perspicuity	0.862	0.655	0.824
Efficiency	0.840	0.727	0.764
Dependability	0.715	0.712	0.679
Stimulation	0.806	0.771	0.766
Novelty	0.720	0.782	0.779

Table 6.2: Amazon - Compare Countries - UEQ Scales Cronbachs Alpha-Coefficient

$N_{\text{Skype ENG}} = 215$ ;  $N_{\text{Skype SPA}} = 62$ ;  $N_{\text{Skype GER}} = 85$

### 6.4 Perceived Importance of UEQ Scales - Mean, Standard Deviation and Confidence

Scale	England			Spain			Germany		
	Mean	Std. Dev.	Conf.	Mean	Std. Dev.	Conf.	Mean	Std. Dev.	Conf.
Attractiveness	1.414	1.434	0.192	1.696	1.072	0.310	1.506	1.065	0.226
Perspicuity	2.251	0.877	0.117	2.145	1.143	0.285	2.188	1.129	0.240
Efficiency	2.526	0.682	0.091	2.246	0.789	0.198	2.047	1.045	0.222
Dependability	2.316	0.804	0.108	2.097	0.882	0.219	1.976	0.951	0.202
Stimulation	0.823	1.540	0.206	1.242	1.237	0.308	0.953	1.318	0.280
Novelty	1.047	1.400	0.187	1.290	1.348	0.335	0.729	1.357	0.289

Table 6.3: Amazon - Compare Countries - Perceived Importance of UEQ Scales - Mean, Standard Deviation and Confidence

$N_{\text{Skype ENG}} = 215$ ;  $N_{\text{Skype SPA}} = 62$ ;  $N_{\text{Skype GER}} = 85$

## 6.5 UEQ Scales - T-Test

	ENG-SPA		ENG-GER		SPA-GER	
Attractiveness	0.672	No Sig. Diff.	0.217	No Sig. Diff.	0.168	No Sig. Diff.
Perspicuity	0.226	No Sig. Diff.	0.184	No Sig. Diff.	0.820	No Sig. Diff.
Efficiency	0.017	Sig. Diff.	0.078	No Sig. Diff.	0.527	No Sig. Diff.
Dependability	0.869	No Sig. Diff.	0.097	No Sig. Diff.	0.239	No Sig. Diff.
Stimulation	0.063	No Sig. Diff.	0.782	No Sig. Diff.	0.072	No Sig. Diff.
Novelty	0.301	No Sig. Diff.	0.728	No Sig. Diff.	0.534	No Sig. Diff.

Table 6.4: Skype - Compare Countries - UEQ Scales - T-Test

Alpha level = 0.05

$N_{\text{Skype ENG}} = 215$ ;  $N_{\text{Skype SPA}} = 62$ ;  $N_{\text{Skype GER}} = 85$

Sig. Diff.  $\equiv$  Significant Difference

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