GERMAN TRANSLATION OF THE UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY 2 (UTAUT2) QUESTIONNAIRE

David Harborth* and Sebastian Pape
Goethe University, Chair of Mobile Business & Multilateral Security,
Theodor-W.-Adorno Platz 4, 60323 Frankfurt, Germany,
*david.harborth@m-chair.de

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Abstract

We present and validate a German translation of the questionnaire of the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). For this case, we surveyed participants on the location-based mobile augmented reality game Pokémon Go. We conducted the translation with the help of two independent and certified translators and tested the validity and reliability of the constructs by analysing a partial least squares structural equation model. The analysis is based on a sample of 681 active players of the game. The participants were acquired with the help of a certified German panel provider. The results indicate the validity and reliability of the German translation of the constructs for the case of Pokémon Go.

Professional translations of existing constructs are necessary to apply established models and associated questionnaires in other countries. In particular, because language may influence survey responses, especially with regard to attitudes. However, these translations are associated with high monetary costs and efforts and seldom published. Therefore, with this work we provide opportunities for future work by making our valid and reliable German translation of the UTAUT2 questionnaire accessible to interested researchers.

Keywords: UTAUT2, German translation, structural equation modelling, technology acceptance model questionnaire, certified translation.

1 Introduction

The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) from Venkatesh et al. (2012) has been well established for investigating technology acceptance in many areas. As Venkatesh et al. (2016) point out, the location influences various factors such as national culture, regional economic status and industry competition. Therefore, the need arises to challenge existing results in various locations. However, directly connected to the location is the language spoken at a specific location. The problem of translating surveys is not new. Ervin and Bower (1952) state that while in theory methodological considerations should be the only ones, in practice other matters like costs of translation cannot be ignored. However, Pérez (2015) describes how language effects survey responses and Ogunnaike et al. (2010) show that language may implicitly influence attitudes with a large effect size (d=.72).

None of the work we found applying UTAUT or UTAUT2 in Germany (Bühler and Bick 2013; Dünnebeil et al. 2012; Lisson et al. 2017; Nistor et al. 2010, 2014; Vollmer et al. 2016) includes the potentially used German questionnaire. Some of them do not even mention the translation or describe the translation process, although Ervin and Bower (1952) point out the importance of a rigorous translation process. We argue that it is not necessary to do the translation each time again. In particular, for an often used and well-established construct, researchers should build on the results of previous studies and either spare the efforts and costs of the translation or invest it in improving existing translations and its validations. In general, the research subject - in our case Pokémon Go - can easily be substituted in the translated items with the respective technology. Thus, by publishing the translation and validating it, we contribute a generally applicable German questionnaire of UTAUT2 and allow other researchers to build on our work.

The remainder of the paper is as follows. Section 2 describes the methodology and in particular the translation process. The translated questionnaire is presented here. Reliability and validity tests are in Section 3. We end with a brief discussion and conclusion of the results in Section 4.

2 Methodology

The context of the UTAUT2 model fits well to the mobile AR application Pokémon Go. Originally, the model was tested for the case mobile internet services (Venkatesh et al. 2012). To test the validity and reliability of our translation, we need to analyse the constructs within the structural equation model (SEM). There are two main approaches for SEM, namely covariance-based SEM (CB-SEM) and partial least squares SEM (PLS-SEM) (Hair et al. 2011). Since the original research is also based on PLS-SEM, we use PLS-SEM for our analysis as well. In the following subsections, we discuss the questionnaire composition and the data collection process.

2.1 Questionnaire Translation

To ensure content validity of the translation, we followed a rigorous translation process that is also used in the original paper by Venkatesh et al. (2012) for the translation in Chinese. First, we translated the English questionnaire into German with the help of a translator certified by the DIN EN 15308 norm. EN 15038 was defined in 2006 by CEN, the European Committee for Standardization (European Committee for Standardization n.d.) and is a quality standard developed especially for translation services providers (Wikipedia 2017). Although, DIN EN 15038 was superseded by ISO 17100 in November 2015, DIN EN 15038 is still in place and it will take a while until certifications are fully replaced by ISO17100 (International Organization for Standardization 2015).

Construct	Original English Items adapted to Pokémon Go	German Translation
Habit (HT) Angewohnheit (HT-G)	HT1. Playing Pokémon Go has become a habit for me. HT2. I am addicted to playing Pokémon Go. HT3. I must play Pokémon Go. HT4. Playing Pokémon Go has become natural to me.	HT1-G. Pokémon Go zu spielen ist bei mir zur Angewohnheit geworden. HT2-G. Ich bin süchtig danach Pokémon Go zu spielen. HT3-G. Ich muss Pokémon Go spielen. HT4-G. Pokémon Go zu spielen ist bei mir zu etwas Natürlichem geworden.
Performance Expectancy (PE) Leistungserwartung (PE-G)	PE1. I find Pokémon Go useful in my daily life. PE2. Using Pokémon Go increases my chances of achieving things that are important to me. PE3. Using Pokémon Go helps me accomplish things more quickly. PE4. Using Pokémon Go increases my productivity.	PE1-G. Ich empfinde Pokémon Go in meinem Alltag als nützlich. PE2-G. Die Nutzung von Pokémon Go erhöht meine Chancen, Dinge zu erreichen, die mir wichtig sind. PE3-G. Die Nutzung von Pokémon Go hilft mir dabei, Dinge schneller zu erreichen. PE4-G. Die Nutzung von Pokémon Go erhöht meine Produktivität.
Effort Expectancy (EE) Aufwandserwartung (EE-G)	EE1. Learning how to play Pokémon Go is easy for me. EE2. My interaction with Pokémon Go is clear and understandable. EE3. I find Pokémon Go easy to play. EE4. It is easy for me to become skillful at playing Pokémon Go.	EE1-G. Pokémon Go spielen zu lernen ist einfach für mich. EE2-G. Meine Interaktion mit Pokémon Go ist klar und verständlich. EE3-G. Ich finde, Pokémon Go ist einfach zu spielen. EE4-G. Es ist einfach für mich, geübt im Spielen von Pokémon Go zu werden.
Social Influence (SI) Sozialer Einfluss (SI-G)	SI1. People who are important to me think that I should play Pokémon Go. SI2. People who influence my behavior think that I should play Pokémon Go. SI3. People whose opinions that I value prefer that I play Pokémon Go.	SI1-G. Personen, die mir wichtig sind, denken, ich sollte Pokémon Go spielen. SI2-G. Personen, die mein Verhalten beeinflussen, denken, ich sollte Pokémon Go spielen. SI3-G. Personen, deren Meinung ich schätze, ziehen vor, dass ich Pokémon Go spiele.
Hedonic Motivation	HM1. Playing Pokémon Go is fun. HM2. Playing Pokémon Go is enjoy-	HM1-G. Pokémon Go zu spielen macht Spaß. HM2-G. Pokémon Go zu spielen ist

Construct	Original English Items adapted to Pokémon Go	German Translation
(HM) Hedonische Motivati-on (HM-G)	able. HM3. Playing Pokémon Go is very entertaining.	vergnüglich. HM3-G. Pokémon Go zu spielen ist sehr un-terhaltsam.
Price Value (PV) Preis und Wert (PV-G)	PV1. Pokémon Go is reasonably priced. PV2. Pokémon Go is a good value for the money. PV3. At the current price, Pokémon Go provides a good value.	PV1-G. Pokémon Go ist preisgünstig. PV2-G. Pokémon Go bietet einen guten Nut-zen für das Geld. PV3-G. Zum derzeitigen Preis bietet Pokémon Go einen guten Nutzen.
Facilitating Conditions (FC) Erleichternde Bedingungen (FC-G)	FC1. I have the resources necessary to play Pokémon Go. FC2. I have the knowledge necessary to play Pokémon Go. FC3. Pokémon Go is compatible with other technologies and applications I use. FC4. I can get help from others when I have difficulties playing Pokémon Go.	FC1-G. Ich habe die notwendigen Ressourcen zum Spielen von Pokémon Go. FC2-G. Ich habe das notwendige Wissen zum Spielen von Pokémon Go. FC3-G. Pokémon Go ist kompatibel mit ande-ren von mir benutzten Technologien und An-wendungen. FC4-G. Ich kann Hilfe von anderen bekom-men, wenn ich Schwierigkeiten beim Spielen von Pokémon Go habe.
Behavioral Intention (BI) Verhaltensabsicht (BI-G)	BI1. I intend to continue playing Pokémon Go in the future. BI2. I will always try to play Poké-mon Go in my daily life. BI3. I plan to continue to play Poké-mon Go frequently.	BI1-G. Ich beabsichtige, in der Zukunft auch weiterhin Pokémon Go zu spielen. BI2-G. Ich werde im Alltag immer versuchen, Pokémon Go zu spielen. BI3-G. Ich habe vor, weiterhin regelmäßig Pokémon Go zu spielen.
Use Behavior (USE) Verwendung (USE-G)	Please choose your usage frequency for Pokémon Go: Never Once a month Several times a month Once a week Several times a week Once a day Several times a day Once an hour Several times an hour All the time	Bitte wählen Sie Ihre Nutzungshäufigkeit von Pokémon Go aus: Niemals Einmal monatlich Mehrmals im Monat Einmal wöchentlich Mehrmals die Woche Einmal täglich Mehrmals täglich Einmal die Stunde Mehrmals pro Stunde Ständig
Scales	All items are measured with a seven-point Likert scale, ranging from "strongly disag-ree" to "strongly agree" ("stimme überhaupt nicht zu", "stimme nicht zu", "stimme nicht ganz zu", "weder noch", "stimme ein wenig zu", "stimme zu", "stimme absolut zu"). Since the original UTAUT2 paper did not a specified scale for the use behavior, we adapted the frequency scale from Rosen et al. (2013).	

Table 1. German Questionnaire Translation

The German version was then given to a second certified translator who independently retranslated the questionnaire to English. This step was done to ensure the equivalence of the translation. Third, a group of five academic colleagues checked the two English versions with regard to this equivalence. All items were found to be equivalent, except for one. For this case, we contacted the translator of the German version and discussed and solved the issue personally. In a last step, the German version of the questionnaire was administered to students of a Master's course to check preliminary reliability and validity. The original items by Venkatesh et al. (2012) adapted to the case of Pokémon Go and the German translation can be found in Table 1.

2.2 Data Collection and Demographics

We decided to conduct the study with the help of a German sample provider to have representative sample. Thereby, we could ensure two things. To ensure quality of our data, we chose a certified provider (certified following the ISO 26362 norm). We installed the survey on a university server and managed it with the survey software LimeSurvey (version 2.63.1) (Schmitz 2015). This link was distributed by the panel provider to 9338 participants. Of those 9338 approached participants, only 681 remained after asking whether they play Pokémon Go, whether they are older than 18 years old and, whether they answered a test question in the middle of the survey correctly. Besides this test question, we asked the Pokémon Go players about their current level. We designed this question intentionally as a free field question with numeric entries only. As Pokémon Go ends at level 40. we could test the knowledge of the participants and establish an additional screen-out mechanism. We sorted out all participants who stated to have a level higher than 40. Since they were actually not playing, they did not answer the questions carefully or they did not take the questionnaire seriously enough. In addition, two participants stated that they "never" play Pokémon Go.

3 Reliability and Validity Tests

To assess the German translation of the questionnaire, we conduct the following statistical analyses. First, we analyse the internal consistency reliability (ICR). After that, we assess convergent and discriminant validity. Since we collected all data at one point in time, we also checked for common method bias (CMB). All these tests belong to the necessary steps of evaluating the measurement model with reflective constructs (Hair et al. 2017). The last analysis belongs to the structural model assessment, whereas it is also very important for the translation itself. We assess whether there are substantial correlations among the constructs themselves (collinearity). If this was the case for our translated version, the model would not be measuring the results correctly. Therefore, we also test for collinearity. We tested the model using SmartPLS version 3.2.6 (Ringle et al. 2015). For the PLS algorithm, we choose the path weighting scheme with a maximum of 300 iterations and a stop criterion of 10^{-7}. For the bootstrapping procedure, we use 5000 bootstrap subsamples and no sign changes as the method for handling sign changes during the iterations of the bootstrapping procedure.

3.1 Internal Consistency Reliability

The internal consistency reliability (ICR) indicates how well certain indicators of a construct measure the same latent phenomenon. Two standard approaches for assessing ICR are Cronbach's α and the composite reliability. The values of both measures should be between 0.7 and 0.95 for research that builds upon accepted models. Values of Cronbach's α are seen as a lower bound and values of the composite reliability as an upper bound of the assessment (Hair et al. 2017).

Table 2 includes the ICR of the used variables in the last two rows. It can be seen that all values for both measures are above the lower threshold of 0.7. The construct performance expectancy is the only construct that is slightly above 0.95. As the composite reliability is a less conservative measure, the values for the hedonic motivation, performance expectancy and social influence construct are above 0.95. Values above that upper threshold indicate that the indicators measure the same dimension of the latent variable, which is not optimal with regard to the validity (Hair et al. 2017). But since Cronbach's α is within the suggested range for hedonic motivation and social influence, we only consider the ICR of performance expectancy as problematic.

3.2 Convergent Validity

Convergent validity determines the degree to which indicators of a certain reflective construct are explained by that construct. This is assessed by calculating the outer loadings of the indicators of the constructs (indicator reliability) and by looking at the average variance extracted (AVE) (Hair et al. 2011). Loadings above 0.7 imply that the indicators have much in common, which is desirable for reflective measurement models (Hair et al. 2017). Table 2 shows the outer loadings in bold on the diagonal. All loadings are higher than 0.7 except for the indicators 3 and 4 of the FC constructs. However, the AVE of the construct is above 0.5. Therefore, the third and fourth item do not have to be deleted necessarily. The AVE indicates convergent validity for a construct. AVE is equal to the sum of the squared loadings divided by the number of indicators. A threshold of 0.5 is acceptable, indicating that the construct explains at least half of the variance of the indicators (Hair et al. 2017). The first column of Table 3 presents the AVE of the constructs in parentheses. All values are above 0.5, demonstrating convergent validity.

Construct	BI-G	EE-G	FC-G	HT-G	HM-G	PE-G	PV-G	SI-G	USE-G
BI1-G	**0.930**	0.512	0.498	0.320	0.644	0.228	0.365	0.139	0.357
BI2-G	**0.858**	0.356	0.394	0.458	0.501	0.415	0.312	0.312	0.357
BI3-G	**0.946**	0.499	0.506	0.359	0.657	0.282	0.364	0.181	0.392
EE1-G	0.443	**0.899**	0.533	0.095	0.457	-0.037	0.346	-0.024	0.285
EE2-G	0.450	**0.892**	0.579	0.155	0.492	0.035	0.384	0.023	0.250
EE3-G	0.458	**0.914**	0.527	0.134	0.467	-0.003	0.357	-0.002	0.257
EE4-G	0.459	**0.894**	0.580	0.163	0.414	0.027	0.382	0.020	0.277
FC1-G	0.420	0.536	**0.858**	0.142	0.400	0.072	0.273	0.061	0.235
FC2-G	0.468	0.633	**0.854**	0.121	0.449	0.039	0.342	0.040	0.270
FC3-G	0.329	0.326	**0.665**	0.204	0.306	0.295	0.285	0.187	0.082
FC4-G	0.285	0.232	**0.571**	0.169	0.316	0.238	0.222	0.268	0.043
HT1-G	0.439	0.257	0.246	**0.866**	0.324	0.387	0.294	0.301	0.442
HT2-G	0.221	0.003	0.095	**0.811**	0.110	0.569	0.184	0.436	0.258
HT3-G	0.257	-0.021	0.065	**0.841**	0.120	0.619	0.172	0.468	0.253
HT4-G	0.402	0.166	0.199	**0.886**	0.316	0.570	0.274	0.353	0.350
HM1-G	0.645	0.501	0.489	0.269	**0.946**	0.231	0.391	0.127	0.274
HM2-G	0.623	0.478	0.480	0.262	**0.948**	0.229	0.408	0.144	0.217
HM3-G	0.601	0.456	0.438	0.270	**0.933**	0.241	0.400	0.154	0.234
PE1-G	0.347	0.038	0.181	0.570	0.269	**0.912**	0.290	0.517	0.148
PE2-G	0.278	-0.016	0.166	0.570	0.200	**0.947**	0.248	0.544	0.135
PE3-G	0.291	-0.027	0.151	0.562	0.191	**0.945**	0.229	0.542	0.155
PE4-G	0.318	0.020	0.153	0.551	0.253	**0.928**	0.254	0.499	0.141
PV1-G	0.297	0.382	0.298	0.202	0.351	0.149	**0.844**	0.125	0.202
PV2-G	0.339	0.313	0.334	0.288	0.383	0.324	**0.891**	0.253	0.121
PV3-G	0.375	0.396	0.368	0.264	0.395	0.251	**0.929**	0.213	0.183
SI1-G	0.229	0.026	0.161	0.417	0.157	0.547	0.223	**0.963**	0.105
SI2-G	0.201	-0.002	0.131	0.390	0.124	0.513	0.197	**0.942**	0.101
SI3-G	0.216	-0.011	0.134	0.434	0.146	0.545	0.222	**0.952**	0.100
USE-G	0.405	0.297	0.238	0.403	0.257	0.156	0.188	0.107	1,000
Cronbach's ∝	0.898	0.922	0.733	0.879	0.937	0.951	0.867	0.948	1,000
Comp. Reliability	0.937	0.944	0.831	0.913	0.960	0.964	0.919	0.967	1,000

Table 2. Loadings and cross-loadings of the reflective items and ICR measures

Constructs (AVE)	BI-G	EE-G	FC-G	HM-G	HT-G	PE-G	PV-G	SI-G	USE-G
BI-G (0.832)	0.912								
EE-G (0.810)	0.503	0.900							
FC-G (0.558)	0.513	0.616	0.747						
HM-G (0.888)	0.662	0.508	0.498	0.942					
HT-G (0.725)	0.412	0.152	0.198	0.284	0.852				
PE-G (0.871)	0.334	0.006	0.176	0.248	0.604	0.933			
PV-G (0.790)	0.381	0.409	0.377	0.424	0.285	0.276	0.889		
SI-G (0.906)	0.227	0.005	0.150	0.150	0.435	0.563	0.225	0.952	
USE-G (1.000)	0.405	0.297	0.238	0.257	0.403	0.156	0.188	0.107	1,000

Table 3. Convergent (AVEs) and discriminant validity (Fornell-Larcker approach)

3.3 Discriminant Validity

Discriminant validity measures the degree of uniqueness of a construct compared to other constructs. Comparable to the convergent validity assessment, two approaches are used for investigated discriminant validity. The first approach, assessing cross-loadings, is dealing with single indicators. All outer loadings of a certain construct should be larger than its cross-loadings with other constructs (Hair et al. 2011). Table 2 illustrates the cross-loadings as off-diagonal elements. All cross-loadings are smaller than the outer loadings, fulfilling the first assessment approach of discriminant validity. The second approach is on the construct level and compares the square root of the constructs' AVE with the correlations with other constructs. The square root of the AVE of a single construct should be larger than the correlation with other constructs (Fornell-Larcker criterion) (Hair et al. 2017). Table 3 contains the square root of the AVE on the diagonal in parentheses. All values are larger than the correlations with other constructs, indicating discriminant validity. Since there are problems in determining the discriminant validity with both approaches, researchers propose the heterotrait-monotrait ratio (HTMT) for assessing discriminant validity as a superior approach to the others (Henseler et al. 2015). HTMT divides between-trait correlations by within-trait correlations, therefore providing a measure of what the true correlation of two constructs would be if the measurement is flawless. Values close to 1 for HTMT indicate a lack of discriminant validity. A conservative threshold is 0.85. Table 4 contains the values for HTMT and no value is above the suggested threshold of 0.85. To evaluate whether the HTMT statistics are significantly different from 1, a bootstrapping procedure with 5,000 subsamples is conducted to get the confidence interval in which the true HTMT value lies with a 95% chance. The HTMT measure requires that no confidence interval contains the value 1, which is fulfilled (Table 5). Thus, discriminant validity is established for our model.

Constructs	BI-G	EE-G	FC-G	HM-G	HT-G	PE-G	PV-G	SI-G	USE-G
BI-G									
EE-G	0.549								
FC-G	0.619	0.705							
HM-G	0.718	0.547	0.595						
HT-G	0.438	0.156	0.253	0.280					
PE-G	0.363	0.036	0.258	0.260	0.684				
PV-G	0.429	0.458	0.469	0.470	0.306	0.297			
SI-G	0.250	0.023	0.223	0.159	0.498	0.592	0.244		
USE-G	0.427	0.309	0.247	0.265	0.406	0.159	0.204	0.110	

Table 4. Discriminant validity (HTMT approach)

3.4 Common Method Bias

The common method bias (CMB) can occur if data is gathered with a self-reported survey at one point in time in one questionnaire (Malhotra et al. 2006). Since this is the case in our research design, the need to test for CMB.

	Original Sample (O)	Sample Mean (M)	Bias	2.5%	97.5%
EE-G -> BI-G	0.549	0.549	0.000	0.468	0.621
FC-G -> BI-G	0.619	0.618	0.000	0.528	0.695
FC-G -> EE-G	0.705	0.704	-0.001	0.639	0.766
HM-G -> BI-G	0.718	0.718	0.001	0.659	0.772
HM-G -> EE-G	0.547	0.547	0.000	0.453	0.629
HM-G -> FC-G	0.595	0.596	0.001	0.490	0.678
HT-G -> BI-G	0.438	0.438	0.000	0.358	0.510
HT-G -> EE-G	0.156	0.166	0.010	0.110	0.190
HT-G -> FC-G	0.253	0.259	0.007	0.178	0.324
HT-G -> HM-G	0.280	0.281	0.000	0.202	0.352
PE-G -> BI-G	0.363	0.362	-0.001	0.288	0.429
PE-G -> EE-G	0.036	0.053	0.017	0.016	0.040
PE-G -> FC-G	0.258	0.263	0.005	0.190	0.332
PE-G -> HM-G	0.260	0.260	0.000	0.189	0.327
PE-G -> HT-G	0.684	0.684	-0.001	0.629	0.737
PV-G -> BI-G	0.429	0.429	0.000	0.338	0.508
PV-G -> EE-G	0.458	0.459	0.001	0.376	0.539
PV-G -> FC-G	0.469	0.470	0.001	0.384	0.542
PV-G -> HM-G	0.470	0.471	0.001	0.393	0.538
PV-G -> HT-G	0.306	0.306	0.000	0.222	0.387
PV-G -> PE-G	0.297	0.296	-0.001	0.221	0.371
SI-G -> BI-G	0.250	0.249	-0.001	0.170	0.322
SI-G -> EE-G	0.023	0.044	0.022	0.009	0.025
SI-G -> FC-G	0.223	0.227	0.004	0.155	0.301
SI-G -> HM-G	0.159	0.159	0.000	0.081	0.231
SI-G -> HT-G	0.498	0.497	0.000	0.423	0.570
SI-G -> PE-G	0.592	0.592	0.000	0.527	0.652
SI-G -> PV-G	0.244	0.243	-0.001	0.161	0.326
USE-G -> BI-G	0.427	0.427	0.000	0.352	0.496
USE-G -> EE-G	0.309	0.309	0.000	0.225	0.386
USE-G -> FC-G	0.247	0.249	0.003	0.161	0.336
USE-G -> HM-G	0.265	0.264	-0.001	0.176	0.350
USE-G -> HT-G	0.406	0.405	0.000	0.330	0.478
USE-G -> PE-G	0.159	0.158	-0.001	0.078	0.237
USE-G -> PV-G	0.204	0.203	-0.001	0.122	0.282
USE-G -> SI-G	0.110	0.110	0.000	0.029	0.186

Table 5. Confidence intervals for HTMT

An unrotated principal component factor analysis is performed with the software package STATA 14.0 to conduct the Harman's single-factor test to address the issue of CMB (Podsakoff et al. 2003). The assumptions of the test are that CMB is not an issue if there is no single factor that results from the factor analysis or that the first factor does not account for the majority of the total variance. The test shows that six factors have eigenvalues larger than 1 which account for 73.26% of the total variance. The first factor explains 33.01% of the total variance. Based on results of previous literature (Blome and Paulraj 2013; Ruiz-Palomino et al. 2013), we argue that CMB is not likely to be an issue in the data set.

3.5 Collinearity

Collinearity is present if two predictor variables are highly correlated with each other. To address this issue, we assess the inner variance inflation factor (inner VIF). All VIF values above 5 indicate that collinearity between constructs is present. For our model, the highest VIF is 2.013. Thus, collinearity is apparently not an issue.

4 Discussion and Conclusion

By analyzing the constructs and items within a partial least squares structural equation model, we replicated the original work by Venkatesh et al. (2012) and showed that internal consistency reliability, convergent validity and discriminant validity is given. Only the German translation of the construct performance expectancy (PE-G) showed problematic values with regard to ICR, indicating that the single items of the construct measure same dimensions of the latent phenomenon. In addition to these tests, we performed a Harman's single-factor test to address the issue of common method bias (CMB). The results indicate that there is no bias for our case. Furthermore, collinearity among the constructs seems to be not existent.

In summary, our analyses indicate that our translated version of the UTAUT2 questionnaire is a valid and reliable instrument for future work on technology adoption with German speaking participants. By providing the instrument to the research community, we hope to foster research in other languages and to encourage more researchers to publish their research materials, like translations of questionnaires or raw data.

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References

Blome, C., and Paulraj, A. 2013. "Ethical Climate and Purchasing Social Responsibility: A Benevolence Focus," *Journal of Business Ethics* (116:3), pp. 567–585 (doi: 10.1007/s10551-012-1481-5).

Bühler, J., and Bick, M. 2013. "The Impact of Social Media Appearances During Election Campaigns," in *AMCIS 2013 Proceedings*, pp. 1–11.

Dünnebeil, S., Sunyaev, A., Blohm, I., Leimeister, J. M., and Krcmar, H. 2012. "Determinants of physicians' technology acceptance for e-health in ambulatory care," *International Journal of Medical Informatics* (81:11), pp. 746–760 (doi: 10.1016/j.ijmedinf.2012.02.002).

Ervin, S., and Bower, R. T. 1952. "Translation Problems in International Surveys," *In Public Opinion Quaterly* (16:4), pp. 595–604 (doi: 10.1086/266421).

European Committee for Standardization. (n.d.). "CEN 2017," (available at https://www.cen.eu/; retrieved November 9, 2017).

Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. 2017. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, SAGE Publications.

Hair, J. F., Ringle, C. M., and Sarstedt, M. 2011. "PLS-SEM: Indeed a Silver Bullet," *The Journal of Marketing Theory and Practice* (19:2), pp. 139–152 (doi: 10.2753/MTP1069-6679190202).

Henseler, J., Ringle, C. M., and Sarstedt, M. 2015. "A new criterion for assessing discriminant validity in variance-based structural equation modeling," *Journal of the Academy of Marketing Science* (43:1), pp. 115–135 (doi: 10.1007/s11747-014-0403-8).

International Organization for Standardization. 2015. "Translation Services - Requirements for translation services ISO 17100:2015."

Lisson, C., Hall, M., Michalk, W., and Weinhardt, C. 2017. "What Drives the Usage of Intelligent Traveler Information Systems?," in *Disrupting Mobility*G. Meyer and S. Shaheen (eds.) (Lecture No.), Cham: Springer, pp. 89–104 (doi: 10.1007/978-3-319-51602-8_6).

Malhotra, N. K., Kim, S. S., and Patil, A. 2006. "Common Method Variance in IS Research: A Comparison of Alternative Approaches and a Reanalysis of Past Research," *Management Science* (52:12), pp. 1865–1883 (doi: 10.1287/mnsc.1060.0597).

Nistor, N., Lerche, T., Weinberger, A., Ceobanu, C., and Heymann, O. 2014. "Towards the integration of culture into the Unified Theory of Acceptance and Use of Technology," *British Journal of Educational Technology* (45:1), pp. 36–55 (doi: 10.1111/j.1467-8535.2012.01383.x).

Nistor, N., Wagner, M., Istvanffy, E., and Dragotă, M. 2010. "E-Learning across Cultural Boundaries: A European Perspective on Technology Acceptance," in *Technology Enhanced Learning.*

*Quality of Teaching and Educational Reform*M. D. Lytras, P. Ordonez De Pablos, D. Avison, J. Sipior, J. Qun, W. Leal, L. Uden, M. Thomas, S. Cervai, and D. Horner (eds.) (Communicat.), Berlin, Heidelberg: Springer, pp. 265–270 (doi: 10.1007/978-3-642-13166-0_38).

Ogunnaike, O., Dunham, Y., and Banaji, M. R. 2010. “The language of implicit preferences,” *Journal of Experimental Social Psychology* (46:6), Academic Press, pp. 999–1003 (doi: 10.1016/J.JESP.2010.07.006).

Pérez, E. O. 2015. “The Language-Opinion Connection,” in *The Oxford Handbook of Polling and Survey Methods*L. R. Atkeson and R. M. Alvarez (eds.) (Oxford Uni.) (doi: 10.1093/oxfordhb/9780190213299.013.18).

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. 2003. “Common method biases in behavioral research: a critical review of the literature and recommended remedies.,” *Journal of Applied Psychology* (88:5), pp. 879–903 (doi: 10.1037/0021-9010.88.5.879).

Ringle, C. M., Wende, S., and Becker, J. M. 2015. “SmartPLS 3,” Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

Rosen, L. D., Whaling, K., Carrier, L. M., Cheever, N. A., and Rokkum, J. 2013. “The Media and Technology Usage and Attitudes Scale: An empirical investigation,” *Comput Human Behav.* (29:6), pp. 2501–2511 (doi: 10.1016/j.pestbp.2011.02.012.Investigations).

Ruiz-Palomino, P., Martínez-Cañas, R., and Fontrodona, J. 2013. “Ethical Culture and Employee Outcomes: The Mediating Role of Person-Organization Fit,” *Journal of Business Ethics* (116:1), pp. 173–188 (doi: 10.1007/s10551-012-1453-9).

Schmitz, C. 2015. “LimeSurvey Project Team,” LimeSurvey Project Hamburg, Germany, p. LimeSurvey: An Open Source survey tool.

Venkatesh, V., Thong, J., and Xu, X. 2012. “Consumer Acceptance and User of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology,” *MIS Quarterly* (36:1), pp. 157–178.

Venkatesh, V., Thong, J. Y. L., and Xu, X. 2016. “Unified Theory of Acceptance and Use of Technology: A Synthesis and the Road Ahead,” *Journal of the Association for Information Systems* (17:5), pp. 328–376.

Vollmer, A.-M., Prokosch, H.-U., Evans, S., and Kuttler, K. 2016. “Evaluation of Acceptance of Nursing Information System in a German and American Hospital.,” *Studies in health technology and informatics* (225), pp. 118–22.

Wikipedia. 2017. “EN 15038, version from October 13th 2017,” (available at https://en.wikipedia.org/w/index.php?title=EN_15038&oldid=805177536; retrieved November 9, 2017).