ACCEPTANCE AND USE OF A VIRTUAL LEARNING ENVIRONMENT (VLE): STRUCTURAL EQUATIONS MODELING OF THE UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY

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ABSTRACT

UTAUT 2 is a model designed to be a starting point for investigating IT adoption and can be used to identify the factors that influence the intention to use it, as well as to be adopted by an organization. The main objective of this research is to validate the Unified Theory of Acceptance and Use of Technology (UTAUT2) model by applying the questionnaire to students of a university that has gone through the process of implementing a virtual learning environment. The method is the quantitative one, through the survey strategy. As for the time horizon of the survey, a transversal cut was chosen. The techniques and

procedures adopted were the modeling of structural equations with partial least squares in the Smart-PLS 3 software. The instrument used in this article is an adaptation of the questionnaire of Venkatesh et al (2012). The results point to evidence of converging and descriminating validity. This research contributes to the Unified Theory of Technology Acceptance and Use (UTAUT) as it is applied in different environments, evidencing characteristics that may allow its generalization. Finally, in the practical scope, it is possible to use this tool to evaluate and plan the acceptance of a new technology in the organizational scope.
Keywords: Intention to use information systems; Virtual Learning Environment; UTAUT 2.

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INTRODUCTION

UTAUT is a model designed to be a starting point for investigating IT adoption and can be used to identify the factors that influence the intention to use it, as well as to be adopted by an organization. The Unified Theory of Acceptance and Use of Technology (UTAUT) is considered the most complete model, since it encompasses eight other studies on technology acceptance and unifies them into a single model and centralizes the determining factors in critics and contingencies related to the prediction of the behavior intention to use a technology and use of technology, mainly in organizational contexts (VENKATESH et al., 2003). In the Brazilian context there are still few studies published on UTAUT2. The general objective of this research is to validate the Unified Theory of Acceptance and Use of Technology (UTAUT2) model by applying the questionnaire to students who use a Virtual Learning Environment. This research is justified by the lack of in-depth research on this topic. The importance of generating knowledge in the area of measurement and development of scales for the Brazilian scope is highlighted (COSTA, 2011).

THEORETICAL FRAMEWORK

UTAUT 2 was designed to verify the acceptance and use of technology in the context of consumption. It used a structural model, in which the variables, Performance Expectation, Effort Expectation, Social Influence, Facilitating Conditions, Hedonic Motivations, Price and Habit sought to explain the behavior of the Intention of Behavior variable, as well as the Facilitating Conditions and Intention of Behavior variables sought to explain the Use variable. In addition, the moderating variables were: gender, age and experience. The model explained 74% of the variance of Intention of Behavior and 52% for behavior of use, being considered effective to predict the acceptance and use of technology in the context of consumption. UTAUT emphasizes the importance of utilitarian value (extrinsic motivation). The construction linked to utility, knowledge, performance expectation, has been consistently shown as the strongest predictor of behavior intention (VENKATESH et al., 2003). Complementary to this perspective of motivation theory is intrinsic or hedonic motivation (VALLERAND, 1997). Hedonic motivation has been included as a

predictor in many consumer behavior surveys (HOLBROOK and HIRSCHMAN, 1982) and previous Information Systems surveys in the context of consumer technology use (BROWN and VENKATESH, 2005).

In the construction of the effort expectation, in the organizational configurations, the employees evaluate the time and effort in the formation of points of view about the general effort associated with the acceptance and use of technologies. In a context of using consumer technology, price is also an important factor, since, unlike workplace technologies, consumers must bear the costs associated with purchasing devices and services. Consistent with this argument, many consumer behavior researches have included cost related constructions to explain consumer actions (DODDS et al., 1991). Finally, UTAUT and related models depend on intentionality as a fundamental underlying theoretical mechanism that drives behavior. Many, including detractors of this class of models, have argued that the inclusion of additional theoretical mechanisms is important. In one use, rather than initial acceptance, the context habit has proved to be a critical factor in predicting the use of the technology (KIM and MALHOTRA, 2005; KIM et al., 2005; LIMAYEM et al., 2007). Based on the gaps mentioned above in UTAUT and the associated theoretical explanation provided, the hedonic motivation, price and habit in UTAUT were added to adapt it to the context of consumer technology use.

METHODOLOGY

This research is part of a post-positivist philosophy, with a deductive approach, where a theory is used and a strategy is sought to test the hypotheses (SAUNDERS, 2012). The method is the quantitative one, through the survey strategy. As for the time horizon of the research, a transversal cut was chosen. The techniques and procedures adopted were the modeling of structural equations with the partial least squares (MEE) in the Smart-PLS 3 software. The MEE made it possible to test the validity of the measurement scale by confirmatory factor analysis, Pearson's coefficient of determination (R2), calculation of Cronbach's Alpha coefficient (α), compound reliability (CR), analysis of mean extracted variances (AVE), values of cross loads, path coefficients, predictive validity (Q2) and effect size (f2). In this research the steps described by Ringle (2011) and Hair (2014) are used in order to check the adequacy and validity of the proposed UTAUT2 model. The tool used in this article is an adaptation of the questionnaire of Venkatesh et al (2012) and it is applied to university students who use a Virtual Learning Environment.

RESULTS AND DISCUSSION

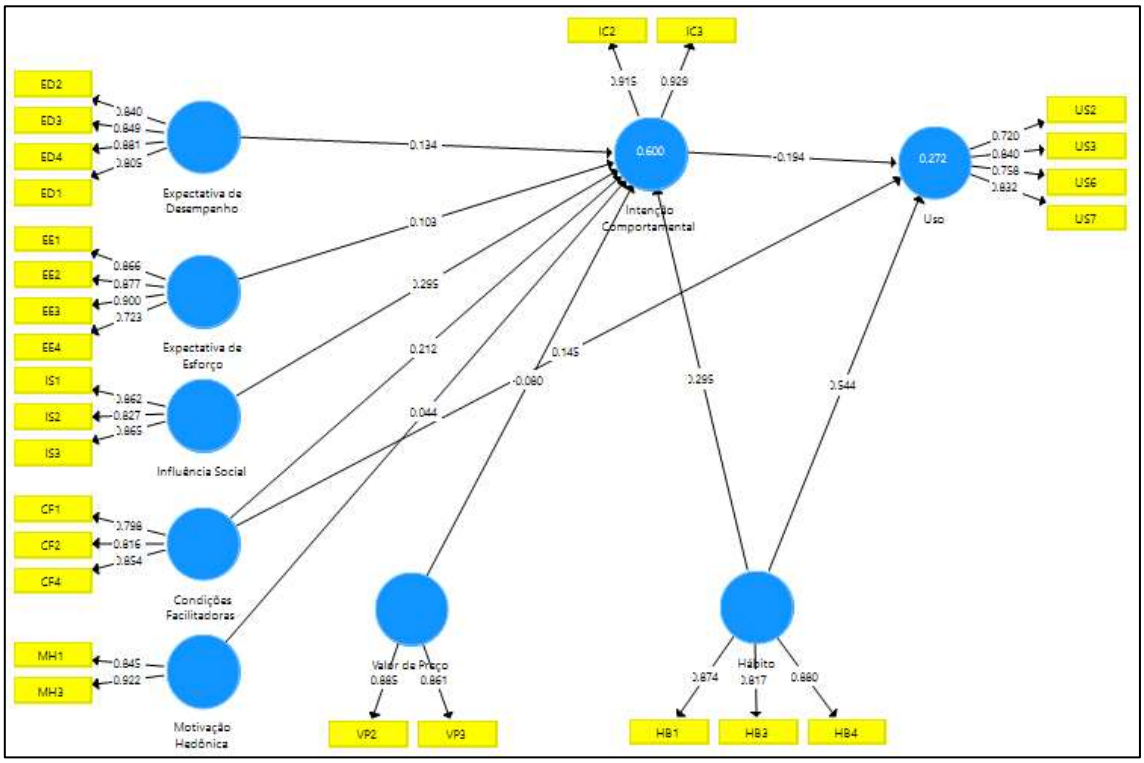
The sample was estimated as described by Ringle et al (2014) using G*Power 3.1 software (FAUL; ERDFELDER; BUCHNER; LANG, 2009). The frequencies of responses on age, gender, experience of the mid-sized company were calculated in order to describe the characteristics of the sample. The sample consisted of 62% female and 38% male respondents; 100% were aged 19 to 29 years.

Model

From the data collection, a measurement model was estimated (Figure 1), in which the latent variables of UTAUT2 are predictors of Behavioral Intent and Use, according to the hypotheses indicated in this article.

In the analysis of the validity and reliability of the structural model, the factor loads of the items, the Alpha de Cronbach coefficients, the Mean Variances Extracted, the Composite Reliability and the R2 were generated, as shown in Table 1.

Figure 1- Structural Equation Model .



Source: Authors (2020).

In the model, we chose to use only those items with loads greater than 0.700 (HAIR et al ,2014) indicated in Table 1. In the evaluation of the structural model the Pearson coefficient of determination (R2) calculated for the latent variable Entrepreneurial Intent was 0.28, considered a large effect (COHEN, 1988). The values of the Mean Extracted Variances (AVE) were higher than 0.500, confirming the convergent validity (FORNELL & LARCKER, 1981; HENSELER; RINGLE & SINKOVICS, 2009). For the reliability analysis, the Alfas de Cronbach coefficients were calculated, where we obtained values greater than 0.700 and the Composite Reliability (CR) with values greater than 0.500, both evidencing the optimum reliability of the model (HAIR et al ,2014). All calculated values can be seen in Table 1.

Table 1 - Values of the quality of fit of the MEE model.

Variable	**Itens**	**VIF**	**Cargas[a]**	**α Cronbach[b]**	**AVE[c]**	**CR[d]**	**R Square[e]**
Use	US2	1.529	0.720	0.805	0.622	0.868	0.272
	US3	1.586	0.840				
	US6	2.055	0.758				
	US7	2.185	0.832				
Behavioural	IC2	1.965	0.915	0.824	0.850	0.919	0.600
Intention	IC3	1.965	0.929				

Expectation	ED1	1.901	0.805	0.866	0.713	0.908	-
Performance	ED2	2.250	0.840				
	ED3	2.701	0.849				
	ED4	2.689	0.881				
Expectation	EE1	2.277	0.866	0.863	0.712	0.908	-
Effort	EE2	2.742	0.877				
	EE3	2.834	0.900				
	EE4	1.491	0.723				
Habit	HB1	1.863	0.874	0.821	0.736	0.893	-
	HB3	1.711	0.817				
	HB4	2.025	0.880				
Social	IS1	2.083	0.862	0.814	0.726	0.888	-
Influence	IS2	1.871	0.827				
	IS3	1.622	0.865				
Hedonic	MH1	1.488	0.845	0.728	0.782	0.878	-
Motivation	MH3	1.488	0.922				
Facilitating	CF1	1.728	0.798	0.770	0.678	0.863	-
Conditions	CF2	1.713	0.816				
	CF4	1.418	0.854				
Price Value	VP2	1.379	0.885	0.688	0.762	0.865	-
	VP3	1.379	0.861				

Source: Authors (2020).

a. All items with loads greater than 0.700 (HAIR et al ,2014).

b. Alpha Cronbach coefficients greater than 0.700 optimal reliability indicators (HAIR et al, 2014).

c. All mean extracted variances (AVE) greater than 0.5 converging validity indicators (FORNELL & LARCKER, 1981; HENSELER; RINGLE & SINKOVICS, 2009).

d. All Composite Reliability (CR) indicators greater than 0.5 (HAIR et al ,2014).

e. R2 greater than 26%, indicating a large effect (COHEN, 1988).

* Only the variable "Price Value" obtained the coefficient a little below the parameter 0.688. We chose not to exclude the variable because it is considered regular acceptable (COSTA, 2011).

To check the discriminant validity of the model, the Cross Load Values were analyzed. For the Cross Load Values analysis, the loads should be higher in the original latent variables than in others (RINGLE et al, 2014). In this study, all calculated loads were higher in their respective latent variables when compared to the others (Table 2), indicating discriminant validity for the model (CHIN, 1998).

Table 2 - Cross Load Values

	FC	**PE**	**EE**	**HB**	**BI**	**SI**	**HM**	**US**	**PV**
CF1	**0.798**	0.312	0.399	0.379	0.387	0.335	0.369	0.155	0.234
CF2	**0.816**	0.192	0.422	0.485	0.386	0.359	0.425	0.301	0.298
CF4	**0.854**	0.278	0.423	0.450	0.599	0.276	0.343	0.312	0.120
ED1	0.181	**0.805**	0.497	0.334	0.436	0.396	0.411	0.265	0.375
ED2	0.200	**0.840**	0.284	0.308	0.382	0.350	0.383	0.145	0.397
ED3	0.314	**0.849**	0.284	0.343	0.394	0.441	0.457	0.184	0.389
ED4	0.356	**0.881**	0.365	0.459	0.482	0.493	0.459	0.265	0.421
EE1	0.459	0.318	**0.866**	0.282	0.412	0.184	0.304	0.365	0.107
EE2	0.399	0.454	**0.877**	0.352	0.391	0.303	0.152	0.386	0.128
EE3	0.389	0.484	**0.900**	0.324	0.455	0.314	0.320	0.384	0.235
EE4	0.471	0.147	**0.723**	0.464	0.330	0.162	0.381	0.429	0.162
HB1	0.460	0.414	0.429	**0.874**	0.590	0.412	0.463	0.475	0.371
HB3	0.497	0.417	0.222	**0.817**	0.496	0.408	0.458	0.326	0.360
HB4	0.426	0.290	0.383	**0.880**	0.536	0.359	0.399	0.464	0.320
IC2	0.520	0.446	0.431	0.516	**0.915**	0.611	0.409	0.144	0.269
IC3	0.543	0.485	0.443	0.647	**0.929**	0.500	0.478	0.281	0.283
IS1	0.350	0.403	0.219	0.426	0.454	**0.862**	0.474	0.252	0.345
IS2	0.193	0.307	0.131	0.304	0.439	**0.827**	0.206	0.192	0.108
IS3	0.406	0.533	0.353	0.425	0.608	**0.865**	0.425	0.210	0.390
MH1	0.347	0.472	0.325	0.423	0.351	0.370	**0.845**	0.304	0.468
MH3	0.444	0.437	0.284	0.477	0.486	0.408	**0.922**	0.249	0.459
US2	0.242	0.073	0.338	0.301	0.217	0.168	0.189	**0.720**	0.125
US3	0.237	0.164	0.193	0.527	0.155	0.217	0.246	**0.840**	0.175
US6	0.252	0.309	0.425	0.261	0.161	0.137	0.300	**0.758**	0.235
US7	0.304	0.297	0.585	0.389	0.225	0.259	0.244	**0.832**	0.140
VP2	0.208	0.433	0.214	0.353	0.273	0.296	0.446	0.120	**0.885**
VP3	0.225	0.384	0.111	0.358	0.249	0.306	0.462	0.251	**0.861**

Source: Authors (2020).

To test the hypotheses it was necessary to evaluate the causal relationships of the latent predictor variables in the Behavioral Intent and the Use variable (Table 3). Hypotheses 6 and 7 were rejected because they did not obtain a significant causal relationship (P>0.05) (HAIR et al, 2014). The values of path coefficients, T-values and significance are shown in Table 3, below.

Table 3 - Path coefficient values of the adjusted model.

Hypotheses	Relationship	Path Coefficients	T-Value	P-Value	Decision
H1	Performance Expectation -> BI*	0.134	2.391	0.017	Accepted
H2	Expected Effort -> BI *	0.103	2.036	0.042	Accepted
H3	Social Influence -> Intenção IC*	0.295	5.108	0.000	Accepted
H4	Facilitating Conditions -> IC*	0.212	4.467	0.000	Accepted
H5	Facilitating Conditions -> Use	0.145	2.110	0.035	Accepted
H6	Hedonic Motivation -> BI *	0.044	0.550	**0.582**	Rejected
H7	Price Value -> BI *	-0.080	1.256	**0.209**	Rejected
H8	Habit -> BI *	0.295	5.936	0.000	Accepted
H9	Habit -> Use	0.544	9.985	0.000	Accepted
H10	Behavioral intention-> Use	-0.194	2.984	0.003	Accepted

* Behavioral intention

Source: Authors (2020).

CONCLUSION AND LIMITATIONS

The main objective of this article was to validate the Unified Theory of Acceptance and Use of Technology (UTAUT2) model from the application of the questionnaire in students of a university that went through the process of implementing a virtual learning environment. The items of each factor, in general, showed results considered satisfactory. However, it is recommended the elaboration of new items for the factors "Facilitating Conditions" and "Intent of Use" and new validations of the UTAUT2 theory scale, since the constructs may vary according to the researched environment and the variation of time. The meanings that constructs have at certain times may change with the passing of the years, due to the breakdown of paradigms and behavioral changes of societies.

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