USE OF VIRTUAL LEARNING ENVIRONMENTS: A THEORETICAL MODEL USING DECOMPOSED EXPECTANCY DISCONFIRMATION THEORY

Fernando Antonio de Melo Pereira
Universidade de São Paulo - FEA/USP, São Paulo, Brasil
Anatália Saraiva Martins Ramos
Universidade Federal do Rio Grande do Norte – UFRN, Rio Grande do Norte, RN, Brasil
Adrianne Paula Vieira de Andrade
Universidade Federal do Rio Grande do Norte – UFRN, Rio Grande do Norte, RN, Brasil
Bruna Miyuki Kasuya de Oliveira
Fundação Getúlio Vargas – FGV, São Paulo, SP, Brasil

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ABSTRACT

The present study aims to investigate the determinants of satisfaction and the resulting continuance intention in the e-learning context. The constructs of decomposed expectancy disconfirmation theory (DEDT) are evaluated from the perspective of users of a virtual learning environment (VLE) in relation to expectations and perceived performance. An online survey collected responses from 197 students of a public management distance learning course. Structural equation modeling was operationalized by the method of partial least squares in Smart PLS software. The results showed that there is a relationship between quality, usability, value and value disconfirmation with satisfaction. Likewise, satisfaction proved to be decisive for continuance intention. However, there were no significant relationships between quality disconfirmation and usability disconfirmation with satisfaction. Based on the results, it is discussed the theoretical and practical implications of the structural model found by the research.

Keywords E-learning, Virtual Learning Environment, Decomposed EDT, Partial Least Squares.

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1.   INTRODUCTION

New organizational forms spawned by developments in information technology continue to attract researchers and practitioners (Chou; Min; Chang & Lin, 2010). Following this trend, e-learning or distance learning using a virtual learning environment (VLE) has become popular (Carvalho, 2009). Understanding the factors that influence satisfaction and desire to continue doing distance courses using virtual platforms is critical to achieve a high success rate in e-learning services (Chiu; Hsu; Sun; Lin & Sun, 2005). Empirical studies indicate that increased performance levels results in: increased motivation, positive attitudes toward technologies, higher levels of satisfaction, and higher meaningful learning achievement (Hung & Cho, 2008; Pachter; Majer & Macher, 2010; Lee, 2010).

The use of expectation disconfirmation theory (EDT) allows to assess satisfaction and continuance intention through the measurement of expectations and perceived performance levels of users (Oliver, 1980; Oliver & Swan, 1989; Chiu *et al.* 2005; Paechter *et al.,* 2010). Expectations are beliefs about what will occur or what will be revealed in the future and play a role in learning, motivation, decision making, affective responding and forecasting, and social interaction (Hoorens, 2012). Performance is efficiency and effectiveness associated with a task's completion. Efficiency is the level of resources consumed and effectiveness is the ability to users to complete tasks using technology. These factors affect levels of satisfaction (Coursaris; Hassanein; Head & Bontis, 2012).

The focus of the study is to measure the impact of attributes and user's perceptions related to satisfaction and the decision to continue using web-based educational services in the context of e-learning. The following antecedents of user satisfaction are investigated: quality, usability and value, evaluated in two stages of the e-learning process, the expectation of service (disconfirmation) and perceived performance (confirmation), as it is defined by Chiu *et al.* (2005) with decomposed expectancy disconfirmation theory (DEDT). The study is used in the educational context; however, the theoretical model can be applied in professional environments.

"Carvalho (2009) argues that it is relevant to conduct research of this nature, as there are few studies that address aspects to evaluate performance of e-learning services with a focus on the VLE, with emphasis on the international level work of Chiu *et al*. (2005) and Lankton and McKnight (2006). So DEDT contributes to the literature, because besides the investigation of perceived performance of the course, the model also considers the expectations that the student has about a distance course, a fact that minimizes the absence of a longitudinal study. Most of the studies ignore the factors that are not confirmed because of the difficulty to operationalize them. Thus, this study contributes to the literature by confirming the significance of the factors studied in the context of the continuance intention use of e-learning services (Hung & Cho, 2008; Liao; Chuang; Yu; Lai & Hong 2011). It also explores attributes addressed in models of individual acceptance of technology and extends the DEDT model by Chiu *et al.* (2005).

From a practical point of view, the result of the model of interactions contributes to help the distance course manager to strategize and direct more targeted investments to select and retain students (Lee, Hsieh & Hsu, 2011; Roca; Chiu & Martinez, 2006), since it   starts to what have information of what influences the satisfaction of these

students and, therefore, their intention to continue to do a distance learning course. This is important considering that dropout students are reported to be the biggest obstacle faced by distance learning courses, resulting in ineffective spending. on them

The article is divided into five topics, including this introductory topic. The second topic is related to theoretical research. The third topic contains the methodological procedures, including the research model. In the topic analysis, it is displayed the measure model and structure model of research, as well as discussions of the results. The final topic contains conclusions, including limitations of the research and suggestions for future studies.

2. THEORETICAL BACKGROUND

2.1 Decomposed EDT model (DEDT)

Expectation disconfirmation theory (EDT) is a model of the consumer behavior that is widely accepted in research to explain and predict consumer's satisfaction and repurchase intention (Chiu *et al.*, 2005). The original theory of EDT, developed by Oliver (1980) proposes that repurchase intentions are primarily determined by the satisfaction (Hair; Sarstedt; Ringle & Mena, 2011). It is a model derived from studies on consumer behavior where customer satisfaction is co-determined by disconfirmation of expectation (Liao *et al.,* 2011).

The model by Oliver (1980) assumes that the degree of consumer satisfaction stems from a five-step process, which consists firstly in the initial expectation before the purchase, later in the acceptance of using the product or service; after the second step, which determines a period of initial consumption, they form perceptions about the performance by the most important attributes (Chiu *et al.*, 2005). In the third step, those perceptions are compared with initial expectations, and then consumers develop a feeling of satisfaction or dissatisfaction based on the level of disconfirmation. A satisfaction moderate level is maintained by confirmation and reinforced by positive disconfirmation, decreasing the disappointment of the negative disconfirmation (Oliver, 1980; Oliver, 2009). Finally, satisfied consumers have intentions to reuse the product or service in the future, whereas the dissatisfied consumers stop using them.

EDT is a theory that aims to explain and predict consumer behavior in relation to satisfaction with products and services (Oliver & Swan, 1989). Satisfaction is an individual feeling of pleasure or discontentment, resulting in the comparison between perceived performance and expectations in relation to services provided (Chiu *et al.*, 2005). EDT has been demonstrating great applicability in the context of individual acceptance of technology (Premkumar & Bhattacherjee, 2008). In the environent of e-learning services, the EDT model has been demonstrating efficiency to evaluate systems on the Internet and therefore in VLEs (Hung & Cho, 2008; Lin, 2011; Paechter *et al.,* 2010).

Thus, in view of the predictive ability of EDT, Chiu *et al.* (2005) used the perceived performance from EDT, divided it into three components - usability, quality, value - and examined the impact of these three components on the satisfaction of individuals with e-learning (Chiu, Wang, Shih & Fan, 2011). These components were chosen because previous studies have provided empirical support for the relationships among these constructs (Chiu *et al,* 2005; Chiu *et al,* 2011; Terzis, Morides &

Economides, 2013).

In the model proposed by Chiu *et al.* (2005), disconfirmation has the greatest influence on immediate satisfaction. The model was entitled Model Decomposition EDT (DEDT). Disconfirmation is the degree in which superior performance is the same or falls short of expectations of individuals, resulting in positive, null and negative, disconfirmation respectively (Oliver & Swan, 1989). It is in that way that models based on EDT are validated empirically, focusing the constructs that are not confirmatory on the expectation and confirmatory constructs on the moment of the use or experimentation (Liao, Chen & Yen, 2007; Liao *et al.,* 2011). The predictive capacity has been confirmed in a series of studies that address the determinants of the satisfaction and intention to continue to usee-learning (See Table 1).

Terzis, Morides and Economides (2013) argue that several variables explain efficiently the intention of continuity of use in the context of e-learning. Besides quality, usability and value, measured with confirmatory and not confirmatory constructs (Chiu *et al.*, 2005), are also essential services in e-learning information quality, usefulness, subjective norms, self-efficacy, and others (Chou *et al.,* 2010; Hung & Cho, 2008; Lee *et al.,* 2011; Liao *et al.,* 2007). These constructs are applied in the context of the e-learning from adaptations of theoretical models of customer satisfaction and individual acceptance of technology, such as EDT.

Authors	Type	Constructs
(Chiu *et al.,* 2011)	Adaptation	Social Interaction, Quality, Value, and Self-Efficacy.
(Lin, 2011)	Adaptation	Usability, Usability Disconfirmation, and Attitude.
(Hung & Cho, 2008)	Adaptation	Usability, Quality, Self-Efficacy, Compatibility, and Expected Performance.
(Liao *et al.,* 2007)	Adaptation	Usability, Usability Disconfirmation, Attitude, and Subjective Norms.
(Chou *et al.,* 2010)	Replication	Quality, Usability and Value.
(Cheung & Lee, 2011)	Replication	Quality, and VLE Technical Attributes
(Lee *et al.,* 2011)	Adaptation	Quality, Usability, Utility, and Subjective Norms
(Paechter *et al.,* 2010)	Adaptation	Behavioral Intentions, and Quality
(Roca *et al.,* 2006)	Adaptation	Quality, Usability, Utility, and Attitude
(Chiu *et al.*, 2005)	New Model	Quality, Usability, Value, Quality Disconfirmation, Usability Disconfirmation, and Value Disconfirmation

Table 1: EDT applications in context of e-learning services
Source: Pereira *et al.* (2015).

The attributes used in this study are commonly evaluated in the moments preceding the use and after the use, allowing the comparison between expectation and performance. The first of them is usability, defined as the degree a user considers that the use of a VLE will be hassle free (Lin, 2011; Premkumar & Bhattacherjee, 2008). Usability involves factors such as ease of use, familiarity with technology and attitude toward the use of computer systems (Pereira *et al.,* 2015). In the TAM model, this construct is named as ease of use. However, depending on the context in which it is

used, it may involve familiarity with technology and attitudes towards the use of computer systems (Roca *et al.,* 2006).

The quality construct in the e-learning context refers to response time, relevance, accuracy and completeness of the information generated by VLE. This means that is important to have a VLE that meets the quality requirements that the user expects to get (Cheung & Lee, 2011; Paechter *et al.*, 2010). The construct denotes the importance of VLE quality, being this one the main system to measure user satisfaction (Cheung & Lee, 2011; Kim; Trimi; Park & Rhee 2012). The quality concept applied to e-learning derives from models of customer satisfaction, as Service Quality (SERVQUAL) (Parasuraman, Zeithaml & Berry, 1988) as models of individual acceptance of technology, as the successful model in IS of the Delone and McLean (2003).

The value is an abstract concept that refers to the mode of conduct, personal preference or position toward the technology offered (Pereira *et al.,* 2015). In the e-learning context, the value refers to the expected benefits by users in the scope of the expectations and in the value creation in the scope of the perceived performance (Chiu *et al.,* 2005; Chiu *et al.,* 2011).In the TAM model, the value is operationalized as usefulness, characterized by an individual feeling of the user into believing that the use of an IS will improve their performance (Davis, 1989; Ifinedo, 2006). Researchers suggest that high levels of value lead to high user satisfaction (Bojanic, 1996; Chou *et al.,* 2010).

3 RESEARCH MODEL AND HYPOTHESES

Based on previous literature review, including studies that address theoretical constructs in e-learning environments based on web systems, this paper addresses the following variables of EDT: usability, quality and value, evaluated under two perceptions (expectation and perceived performance), as defined by Oliver (1980).

The basic presupposition of the research model (See Figure 1) is that the intention to continue the service of e-learning is determined by user satisfaction, which in turn, is determined by a group of variables, characterizing the following groups: perceived usability, perceived quality, perceived value, disconfirmation of usability, disconfirmation of quality and disconfirmation of value.
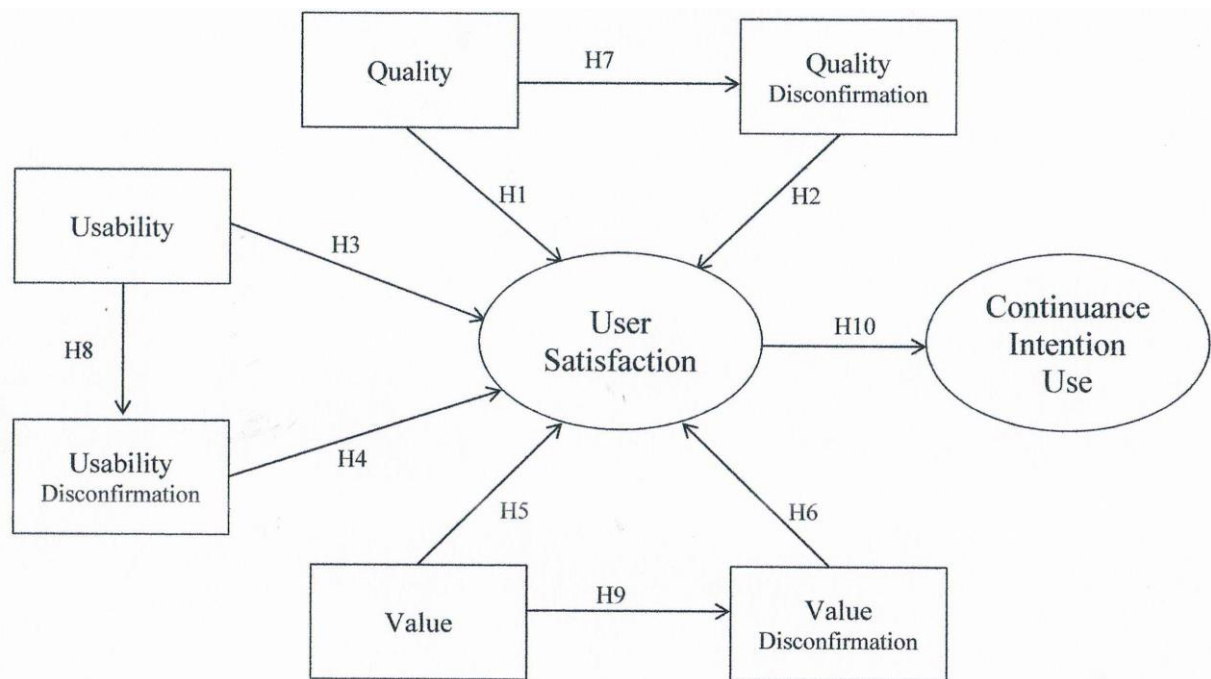
Figure 1 – Research model

Source: Adapted from Chiu *et al.* (2005)

The items that measure quality, were adapted from Parasuraman *et al.* (1988) and DeLone and McLean (2003). Usability and value were adapted from Davis (1989). The relationships between expectations and perceived performance were adapted from Oliver (1980). The items related to the satisfaction and continuance intention were adapted from Oliver (1980) and Chiu *et al.* (2005). In this paper, the relations established in the research model (See figure 1) can be confirmed in studies such as Chiu (2005), Chou *et al.* (2010), Chin (2005), Lin (2011), Roca (2006) and Cho (2008).

This research model includes disconfirmation and confirmation of the quality, usability and value as direct predictors of satisfaction. In this study, as well as in Chiu *et al.* (2011) the hypotheses are formulated focused on positive disconfirmation (performance is better than expectation). The model includes satisfaction and intention to continue use as dependent variables. The following hypotheses are proposed:

H1: Quality is positively associated with satisfaction
H2: Quality Disconfirmation is positively associated with satisfaction
H3: Usability is positively associated with satisfaction
H4: Usability Disconfirmation is positively associated with satisfaction
H5: Value is positively associated with satisfaction
H6: Value Disconfirmation is positively associated with satisfaction
H7: Quality is positively associated with Quality Disconfirmation
H8: Usability is positively associated with Usability Disconfirmation
H9: Value is positively associated with Value Disconfirmation
H10: Satisfaction is positively associated with continuance intention

3.1 Data collection

This study was conducted with 405 students in a distance learning undergraduate course of public administration, of UFRN-Brazil. The course uses Moodle as its VLE, configured as a blended learning and as asynchronous teaching form. Blended learning involves the use of several learning methods that help to accelerate the learning process (Enap, 2008). Asynchronous e-learning is a self-study that may be supplemented by non-real time interaction (Chiu *et al.*, 2005). The questionnaire went through a pre-test with five researchers in information systems that have already experienced services of e-learning. In addition, a pilot study was conducted involving 30 students who accomplished a similar course using Moodle as a VLE.

The data have been collected from a specific sample of students of an undergraduate distance course. However, this study can be replicated in a professional or academic context, where there is a full distance course, either undergraduate or post - graduate, who uses Moodle or similar VLE. This happens because the object of research focuses on aspects concerning the use of VLE for any student to do a distance learning course.

The online survey-type questionnaire consists in 42 closed questions arranged in a metric scale of 10 points, being 1 – little agreement and 10 – high agreement. There are three profile questions totaling 45 subjects. The questionnaire was hosted at Google Drive, an online tool. The questionnaires were sent to the respondents via e-mail. It was established a period of four weeks to maximize feedback, besides guaranteeing anonymity in the evaluations accomplished by the respondents. The data collection was held in 2013 when these students were in the last year of undergradute course

Among the 405 students who participated in the survey, 197 answered the questionnaire entirely, the alternatives unbiasedly and right in time, avoiding the incidence of missing values, obtaining return rate close to 50% of total questionnaires distributed. In the aim of calculating the required minimum sample size, we used the software G * Power 3.1.5, obtaining 146 observations as required sample. The value of 197 exceeds the minimum sample to a statistical power of 0.95 and effect size of the independent variables of 0.15, which is the configuration recommended by Faul , Erdfelder, Lang and Buchner (2007) and Prajapati, Dunne and Armstrong (2010).

Considering the demographic profile of the respondents, 61.4% were male (n=121) and 38.6% are female (n=76). In terms of age, 27.4% are aged between 18 and 25 years old. However, the majority of the respondents are aged between 26 and 35 years (33%, n=65). In relation to marital status, there was a balance between married and single respondents, with a slight predominance of married respondents (51,8%, n=102 and 40,6%, n=80 respectively).

Also regarding to the profile, we sought to identify differences between means of profile variables with dependent variables. In a multivariate analysis of variance (MANOVA), operationalized as recommended by Hair, Anderson, Taha and Black (2009), no significant differences were found for evaluation by stratum.

Structural equation modeling (SEM) with partial least squares (PLS) is used in this study. Brei and Liberali (2006) point out that the use of SEM is suitable for complex empirical investigations which address theoretical and measurement aspects. Maroco (2010) recommends the use of SEM in two stages, the first being the

confirmatory factor analysis (CFA), creating the measure model. In the second step, the causal relationships are added and the structural model is generated. This study used Smart PLS 2.0.3 to verify the measure and structure model. This analysis strategy is used in studies that address the context of e-learning (Chou *et al.,* 2010; Chiu *et al.,* 2011; Liao *et al.,* 2011).

Hair *et al.* (2011) argue that the quality of studies employing PLS-SEM must follow the recommendations expressed, for the value of the method in research and practice to be maintained and disseminated to other researchers. Among the recommendations, guidance on data distribution is included, as well as the basic features that should contain the model, the method of settings for the software, parameters for evaluating the results, adjusting and testing of hypotheses.

The PLS is a successful method for analyzing customer satisfaction (Henseler; Ringle & Sinkovics, 2009). The choice of PLS as an SEM method is preferred in this study because it is a complex reflective model with 42 manifest variables. It is also justified by focusing on the development of predictive causal relationships and work with a model of latent construction (Ringle; Sarstedt & Straub, 2012; Nobre, 2006).

4. FINDINGS

4.1 Measure model

The tested model was submitted to CFA to compose the measurement model, initiating the first step of SEM. The model fit was obtained through tests of factorial validity (convergent and discriminant) as suggested by Mulaik *et al.* (1989), Kline (2005), Hair *et al.* (2009) and Maroco (2010).

In a first moment it was verified the existence of outliers by Malahanobis square distance (D^2), with no significant observations to be excluded, adopting a conservative strategy of excluding outliers (Maroco, 2010). This procedure meets one of the assumptions required by SEM: the inexistence of outliers.

Once the adjustments are made, the other assumptions which determine the correct use of SEM were evaluated. The assumption of multivariate normality was not confirmed. However, the adoption of a least squares estimation method does not require the normality assumption for parameter estimation (Hwang, Malhotra, Kim, Tomiuk & Hong, 2010). The assumptions of multiple indicators and linearity were confirmed previously. The first guarantees the measure of the constructs formation by at least three manifest variables, while the second confirms the linearity of the model, which was proved by analysis using Smart PLS software.

The software also confirmed the assumption of a nonzero sample covariance, with 0 being the endogenous variables in the examination of the measurement model. The assumption of strong measure was also met, as it requires the use of measurement scale of at least five points for evaluation of variables, generating discrete or continuous variables (Hair *et al.* 2009). Thus, the compliance of the requirements to use SEM makes the evaluation model robust against the violation of assumptions.

Factorial validity was checked with the evaluation of the factor loadings of the manifest variables on their respective constructs. Variables DU1, DU2 and U3 were eliminated because of their factorial load below 0.5, as recommended by Hair *et al.*

(2009) to ensure the adequate adhesion between variable and formed construct. The averages, deviations and factorial loads of the variables are presented in Table 2.

Code	Variable	Mean	Std. Deviation	Factor loading
Usability (U) α=0.804				
Usability Disconfirmation (DU) α=0.776				
U1	Learning to work with Moodle is easy for me	8.63	1.84	0.871
DU1	In this respect, was it what you expected?	6.34	2.92	0.363
U2	It is easy for me to become skillful in the use of Moodle	8.52	1.85	0.823
DU2	In this respect, it was what you expected?	6.06	2.99	0.370
U3	Using Moodle I can improve my learning in the disciplines	8.00	2.65	0.469
DU3	In this respect, it was what you expected?	7.29	2.91	0.745
U4	Using Moodle I can simplify my process of learning in the disciplines	7.89	2.36	0.656
DU4	In this respect, it was what you expected?	7.20	2.71	0.820
U5	Study by Moodle fits well in the way I learn	7,.59	2.32	0.773
DU5	In this respect, it was what you expected?	6.99	2.69	0.833
U6	The resources and activities (forums, quizzes, etc.) of Moodle are compatible with the way I learn	7.59	2.31	0.793
DU6	In this respect, it was what you expected?	7.30	2.39	0.865
Quality (Q) α=0.883				
Quality Disconfirmation (DQ) α=0.888				
Q1	The layout and user interface of Moodle are friendly	7.78	2.11	0.769
DQ1	In this respect, it was what you expected?	7.16	2.49	0.823
Q2	It is easy to navigate through Moodle	8.28	2.18	0.781
DQ2	In this respect, it was what you expected?	7.34	2.57	0.774
Q3	The Moodle offers the services I need	7.58	2.24	0.831
DQ3	In this respect, it was what you expected?	6.98	2.56	0.769
Q4	I feel comfortable using the services offered by the virtual platform	7.59	2.50	0.809
DQ4	In this respect, it was what you expected?	7.22	2.41	0.778
Q5	The Moodle offers complete information	7.11	2.48	0.821
DQ5	In this respect, it was what you expected?	6.90	2.46	0.846
Q6	Moodle provides information that is easy to comprehend	7.75	2.17	0.837
DQ6	In this respect, it was what you expected?	7.29	2.35	0.813
Value (V) α=0.847				
Value Disconfirmation (DV) α=0.864				
V1	Doing a distance course brings me a sense of accomplishment	8.37	2.11	0.901
DV1	In this respect, it was what you expected?	7.50	2.81	0.896
V2	Doing a distance course brings me a	8.29	2.16	0.903

	feeling of supplying my needs			
DV2	In this respect, it was what you expected?	7.43	2.73	0.837
V3	Doing distance course brings me a feeling of following a trend	8,01	2.43	0.739
DV3	In this respect, it was what you expected?	7.29	2.87	0.680
V4	Doing a distance course brings me a feeling of pleasure	7.87	2.58	0.760
DV4	In this respect, it was what you expected?	7.43	2.72	0.806
V5	Doing a distance course brings me a sense of feeling smart	7.40	2.92	0.667
DV5	In this respect, it was what you expected?	6.94	2.99	0.671
V6	Doing a distance course brings me a sense of independence	7.67	2.92	0.681
DV6	In this respect, it was what you expected?	7.67	2.50	0.824
Satisfaction (S) α=0.895				
S1	I am satisfied with the performance of the distance course at University	8.26	2.06	0.916
S2	I am satisfied with the experience to participate in a distance learning course	8.56	2.05	0.942
S3	My decision to do an undergraduate course distance was a wise decision	8.46	2.37	0.879
continuance intention (US) α=0.921				
US1	I plan to continue doing distance learning courses the future	8.56	2.31	0.907
US2	I will continue doing distance learning courses in the future	8;35	2.47	0.946
US3	I will regularly do learning distance courses the future	8.12	2.60	0.936

Table 2: Research variables

In the analysis of the 42 manifest variables, all showed high averages. This affirms that the gravity center of distribution of the responses on the scale focuses on values which positively evaluate the measured indicators. The students' expectations in relation to usability which involves the ease of use, skillful in the use of Moodle, process of learning, resources and activities of Moodle were overcome. This means that before starting the course, the student assessment as for these questions ranged 6-7 points in a metric scale. After they started the course, their expectations were overcome and these items were evaluated with a score of 7-8 points. The averages of the items of construct quality of the course also show that students' expectations regarding the layout, user interface of Moodle, Moodle's services, Moodle's information and ease of navigation were overcome.

In relation to the value, it is also noticed that the students had an opinion on the benefits that the course could offer to them, which changed after the course. The only assertiveness that did not show the exceeded expectations was the sense of independence, which the distance course can generate. The evaluation that the students made about this question, before the course, was the same as they did after the course. These results show that managers of a distance course should develop strategies to improve the image of the front course students as usability, satisfaction and value. In

turn, the standard deviation does not show high dispersion (values above 3.0), which corroborates the results of the averages and other measures of central tendency, as defined by Corrar, Paulo and Dias (2007).

These constructs define the user performance and provides strategic potential in distance learning and improved levels of satisfaction (Biasutti, 2011). Chen affirms that the system of e-learning should focus on performance, providing better learning conditions. Following the analysis scheme of EDT, the high indexes of averages and factor loads show the importance of these characteristics for the success of e-learning services (Roca *et al.,* 2006).

To ensure the factorial validity, were maintained in the measurement model only variables with loads above 0.5. There is also the calculation of the Cronbach's Alpha (α) which measures the reliability of the construct. According to Table 2, all constructs shows α over 0.7, which is the minimum defined by Hair *et al.* (2009) to ensure satisfactory reliability.

These findings demonstrate that respondents believe they have a good performance, and the items related to the construct value are the ones that were best evaluated. In the study by Chiu *et al.* (2005) the results were similar. It is perceived that the expectations placed on quality aspects, usability and value were attended. Thus, the disconfirmation is positive (Oliver, 2009), the performance exceeded the expectations according to the user evaluation.

According to Chen (2011), a good performance indicates good educational compatibility and a consequent increase of satisfaction in using the VLE. This behavior related to the analyzed constructs has been well evaluated in other studies, such as the ones by Cheung and Lee (2011) and Kim *et al.* (2012).

After the evaluation of the causal relationships, the usability disconfirmation and the quality disconfirmation - despite showing factorial validity and reliability - has showed causal pathways lower than expected , which demonstrate that the respondents, when evaluate the VLE, place their expectations in usability and quality, but are not decisive to determine satisfaction and subsequent continuance intention.

After verified the factorial validity, the second component evaluated was convergent validity, answered when the constructs present positive correlations among themselves and also by calculating the average variance extracted (AVE), proposed by Fornell and Larcker (1981). For the discriminant validity, the calculating of composite reliability (CR) is added. The results of the validation indices are shown in Table 3.

	AVE	(U)	(Q)	(V)	(DV)	(S)	(US)	*CR*
		Square correlations – Fornell and Larcker Criterion						
(U)	*0.61*	*1*						0.91
(Q)	*0.65*	0.59	*1*					0.88
(V)	*0.60*	0.34	0.31	*1*				0.89
(DV)	*0.60*	0.29	0.30	0.60	*1*			0.90
(S)	*0.83*	0.38	0.38	0.65	0.54	*1*		0.93
(US)	*0.86*	0.23	0.25	0.51	0.32	0.43	*1*	0.95

Table 3 – Factorial validation indices

Note that both AVE and CR presented satisfactory results (AVE> 0.5, CR> 0.7), confirming the convergent validity. Based on these results, it was possible to compare the square of the latent correlations with the AVE. The AVE of the six evaluated constructs showed higher indexes than the square of the correlations, and this result is indicated by Maroco (2010) as appropriate, thus confirming the discriminant validity. It is therefore possible to tell that the instrument is reliable, consistent and reproducible, corroborating the reliability results generated by Cronbach's Alpha.

4.2 Structural model

From the estimates of the measurement model, the causal relationships to trace the structural model are added, which is the second step in a two-step strategy SEM (Maroco, 2010). The structural coefficient significance was evaluated using a t-test by bootstrapping and 200 resampling, and by the estimation of the direct effects between the paths outlined in the model proposed by Smart PLS software. The structural model found by the study is presented in Figure 2.
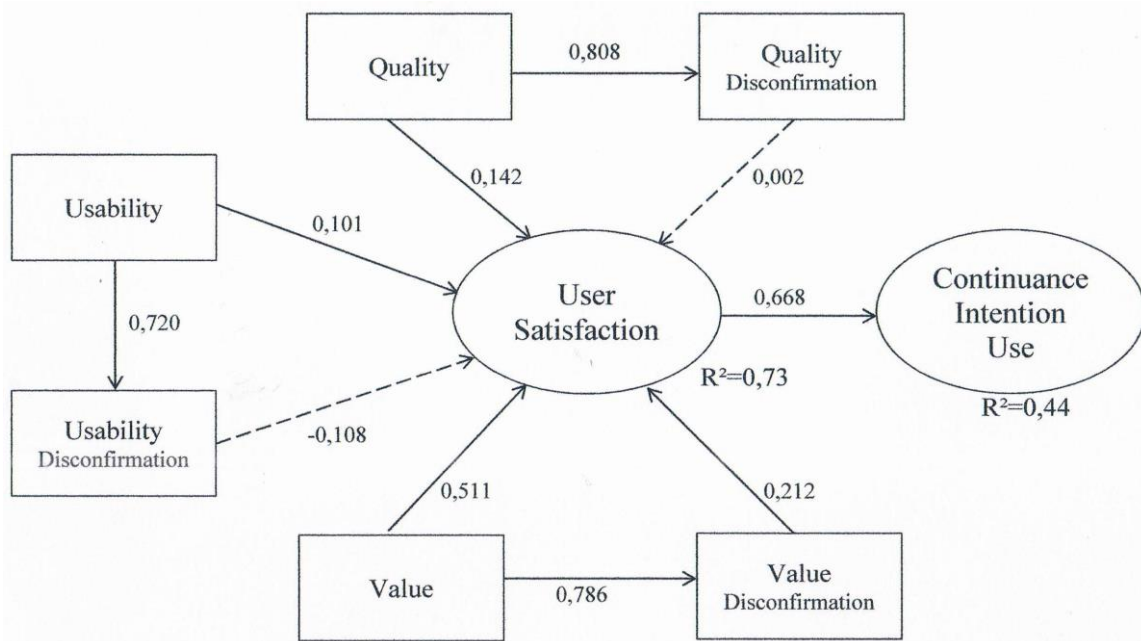
Figure 2 – Continuance intention in e-learning service

Source: Research results (2015)

It is perceived that the level of satisfaction is high, being determined by three constructs of the perceived performance (quality, usability and value) and the non-confirmatory value. These results confirm the hypotheses H1, H3, H5 and H6. However, the low direct effects presented by the non-confirmatory quality and the non-confirmatory usability invalidate hypotheses H2 and H4. Based on the EDT model, it was confirmed the premise that when the perceived performance overcomes expectation, the satisfaction level tends to be high, characterizing the positive disconfirmation (Oliver, 1980; Hung & Cho, 2008).

The rate of variance between satisfaction and continuance intention also proved to be high ($\beta = 0.668$), confirming similar results of the causal relationship found in the

literature (Chiu *et al.,* 2005; Liao *et al.,* 2011; Kim *et al.,* 2012). This result confirms hypothesis H10. Value is the construct that provides more satisfaction among the four constructs with p value> 0.05. Furthermore, value is also the only non-confirmatory construct to be crucial for satisfaction.

It can be verified that the model has a high predictive ability that can be confirmed by the determination coefficient (R^2). The constructs, quality, usability, value and disconfirmation of value explain together approximately 73 % of the students' satisfaction ($R^2 = 0.73$). In turn, the rate of total variance explained of the model is 0.44. Maroco (2010) recommends that the determination coefficient is greater than or equal to 0.25 for the structural model explains a considerable percentage of the variance's endogenous latent variables.

However, respondents did not place expectations on these constructs, only on value; the user needs to feel that they are doing an activity that they previously believe that is important. Therefore, managers of distance courses can develop strategies that show course benefits for students because it is based on the benefits that the value perceived is formed by students. Some strategies can be formulated, such as adaptation to new trends in mobility. The mobile-learning can assist the need of students' time.

The correlations between the respective confirmatory and non-confirmatory constructs proved high (0.808, 0.720, 0.786), demonstrating that the expectations placed by the respondents were near the lived experience during the course. Thus, hypotheses H7, H8 and H9 were confirmed. Oliver (1980) Chiu *et al.* (2011) and Paechter *et al.* (2010) observe that the approach between expectation and performance is beneficial in e-learning services.

In this study, the non-confirmatory usability and non-confirmatory quality were rejected by the structural model. However, the results confirm the predictive ability of DEDT. Of the nonconfirmatory constructs, only the value was confirmed. Horeens (2012) explains that the construct evaluator of the expectation affects the identification and evaluation of behavior, causal reasoning and interpersonal communication. In the study of Chiu *et al.* (2005), expectations concerning usability were praised, revealing differences between the groups of respondents for each study, justifying the logic of replication the DEDT model under different analysis environments.

Henseler *et al.* (2009) discuss two types of validity to structural models with use of PLS: the nomological validity and external validity. The estimates of hypothesis tests take into account the direct effects of the construct determinants. Such relations present in the model are sufficientand meaningful to confirm the nomological validity. The external validity is confirmed by high variance rates in focal constructs (Henseler *et al.,* 2009; Ringle *et al.,* 2012).

The rates of latent variables responsible for validation tests and confirmation of the hypotheses are consistent in conditions of high commonalities of latent variables. It is also rated the level of redundancy (Q^2) to evaluate the predictive ability of the latent variable in predicting the manifest variables (Ringle *et al.,* 2012; Nobre, 2006). Table 4 shows the results of the model validation.

Construct	Criterion				
	R²	Direct Effects	Indirect Effects	Comunality	Redundancy
Usability	-	0.101	0.067	0.618	-
Quality	-	0.142	0.094	0.653	-
Value	-	0.511	0.451	0.600	-
Value Disc.	-	0.212	0.141	0.604	-
Satisfaction	0.7300	0.668	-	0.832	0.227
Int. Cont. Use	0.4431	-	-	0.863	0.382

Table 4: Validation of the structural model

According to Table 4, commonality rates show values equal or above 0.6 and redundancy Q ² above 0 in the latent variables. Respectively these findings demonstrate good consistency and predictive capacity of the variances and the direct effects found by the study (Hair *et al.* 2009; Henseler *et al.* 2009). Henseler *et al.* (2009) also advise to interpret the indirect effects probably generated by the model. Indirect effects of the constructs were identified, which were determinants on the continuance intention, with predominance of value (0.451). This result suggests that this construct is not only the most relevant to determine satisfaction in the model found, but also to show the potential to estimate causal relation to the continuance intention.

5. CONCLUSIONS

The motivation of this study was to examine the effects of a theoretical model developed in the context of e-learning, indicating the determinants of satisfaction and continuance intention. The survey results showed that respondents positively evaluated the characteristics measured by the variables, showing low resistance in the use of Moodle, this being the VLE use in the distance learning course studied. The commitment to seek the quality of the course demands a high quality VLE, demonstrated by the evaluation of the users about the Moodle. Usability, regarding to the handling of the system, has also been well evaluated. However, respondents did not put expectations on these constructs, only on value; the user needs to feel that they are doing an activity that they previously believe that is important.

Results show that respondents are willing to do more courses, based on a positive relationship between satisfaction and performance. The results also show that performance exceeds expectations, being more decisive for satisfaction. Finally, we demonstrate a high degree compatibility of DEDT applied to users of distance courses.

Usability and quality are key constructs for satisfaction. Thus, managers should consider the student's learning process in the tool, the compatibility of resources and activities with the form of their learning, the interface of Moodle, and tool quality to increase student satisfaction with the course.

The main contribution of this study is to deliver a tool for performance evaluation focused on distance learning courses with the use of VLE. Furthermore, it strengthens the importance of the influence of VLE in user performance. Cheung and Lee (2011) add that such studies provide to researchers new perceptions on what should be speculated about satisfaction in the context of web-based applications.

The survey presents a few limitations. First of all, the results can not be generalized because the results are directed to a specific context, so they have to be re-tested for each distinct organizational environment for ensuring reproducibility logic (Hair *et al.* 2009). However, this study can be replied or adapted with students of a specific course which can be administration or the other, in the undergraduate or postgraduation distance configuration with the VLE tool.

Increasing the complexity of the model is impracticable; hence, constructs used with the EDT model which are equally effective in determining satisfaction are not covered in the survey's model, such as subjective norms, validated by Chen (2011) and Liao, Chen and Yen (2007), and the self-efficacy, validated by Chiu *et al.* (2011) and Hung and Cho (2008).

Future research must continue to explore the impacts of the satisfaction and continuance intention (Cheung & Lee, 2011). Chiu *et al.* (2005) recommend the use of longitudinal studies for obtaining results that allow us to rate acknowledgement over the time. Ultimately, Biasutti (2011) supports the need of more detailed studies, involving fewer groups, outpacing the minimalist view of the theoretical model.

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