Research article

Students' long-term orientation role in e-learning success: A Brazilian study

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ABSTRACT

E-learning can play an important role in the solution to educate a large quota of the population in significant countries. Studies point out that cultural characteristics can influence e-learners' performance. Our main goal is to understand the e-learning success drivers in Brazil. Our research proposes a model that analyzes students' long-term orientation role in the Brazilian e-learning context. We collected 297 answers from a survey of higher education students in nine regions. Data were analyzed through a quantitative method. Results indicate that information and collaboration quality, and e-learner satisfaction explain e-learning systems usage. Our model indicates that students' long-term orientation influences the positive relationship between e-learning systems' use and the perceived net benefits. We also found that system and information quality, and e-learning systems' use are determinants of e-learning user satisfaction. Collaboration quality and information quality are determinants of e-learning systems usage. E-learning usage and user satisfaction explain overall e-learning net benefits, and long-term orientation has a moderating effect between e-learning use and net benefits.

1. Introduction

Brazil is a vast country composed of several cultures, and universities face many challenges when providing access to instruction for their students. Leading Brazilian universities tend to be in the main cities and near the eastern part of the country. Brazilian telecommunications are scant in several locations in the interior of the country; these districts are also deeply isolated from the best universities (Duran & Costa, 2016, 2016; Stewart and Lopes, 2015; World University Rankings, 2019). All these factors combined might explain a non-usage of online learning systems. Students tend to use several media to communicate and tend to ask questions to their peers (Stewart and Lopes, 2015). In this setting, it is important to understand what the origins of e-learning systems usage, satisfaction, and overall success are. Tarhini et al. (2017) concluded in their study that the adoption of e-learning should focus on the cultural aspects of students. Despite being a wide, vast country, we could not find in-depth studies regarding E-learning systems usage and conclude that this aspect is not widely studied in Brazil. In recent months, due to COVID-19, these types of information systems are more critical than ever before, because they play a decisive role in the learning process (Chen et al., 2020). Some authors studied Brazilian e-learning adoption and usage previously, including Okazaki & dos Santos (2012), by validating

the technology acceptance theory. Machado da Silva et al. (2014) studied the determinants of use and satisfaction of e-learning in Brazil. Saccol, Schelmmer, Barbosa, Reinhard & Sarmento (2009) led a qualitative study on the ease of use and interface of a mobile-learning application. Stewart and Lopes (2015) made a qualitative study on the different types of interaction in online learning. However, these studies do not entirely capture the e-learning success drivers in Brazil.

Brazil is a tremendously diverse country characterized by literacy gaps, economic disparities, and the coexistence of several cultural communities. Today Brazil still has the strong influence of its colonial heritage, especially Portugal in the XVI century, and later engagement by France and Netherlands in the XVII century. Brazil also has several communities formed by immigrants from other parts of the globe: Africa (Angola, Mozambique), Europe (Germany), and Asia (Japan). In Brazil, cultural aspects have always been a challenging variable for research. In this study, we address the influence of long-term (LTO) and short-term orientation (STO) on e-learning systems' success. LTO and STO are characteristics that clearly define part of the oriental and western cultures (Hofstede and Bond, 1988). Our research proposes a model grounded on the information systems success (ISS) theory (DeLone, 1988; DeLone and McLean, 2003) and the cultural characteristics of LTO & STO (Confucianism) (Hofstede and Bond, 1988). We conducted a

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survey in eleven regions of Brazil to test our proposed model empirically; however, we obtained valid answers for analysis from nine regions.

Our study contributes to understanding the setting of Brazilian e-learning systems success, a country where e-learning plays a vital role in societal literacy. Our study outlines the main e-learning systems success determinants: system (SysQ), information (IQ), and collaboration (CQ) quality were found as the main contributors to e-learning systems adoption and students' satisfaction. Our study also contributes to understanding the role of culture, namely students' long-term orientation that affects overall e-learning success.

This paper is organized into six sections. In the first section, we introduce the context and the research objective. The second section presents the theoretical study background, followed by the Brazilian e-learning systems success model proposal (section three). We describe the methodological approach and results in the fourth and fifth sections. In the sixth section, we discuss our results and present our research conclusions.

2. From IS success to a cultural oriented e-learning success

The information systems (IS) success theory has been influenced by seminal studies that marked five eras of IS success studies: data processing era (in the'50s to '60s); management reporting and decision support era ('60s to '80s); strategic and personal computing (in the '80s to the '90s); enterprise system and networking ('90s to 2000); and customer-focused era (in the 2000s) (Petter et al., 2012). These five eras of IS success studies are named after the verified technological evolution and innovations. DeLone and McLean (1992) proposed the first ISS model, identifying IQ, SysQ as the determinants of ISS. These two dimensions positively influenced IS usage and IS satisfaction and the subsequent explanation of individual and organizational performance. DeLone and McLean (1992) ISS model and the later model (DeLone and McLean, 2003) have been studied and verified in several contexts since then; e.g., in the usage of employees portal (Urbach et al., 2010); e-banking (Koo et al., 2013; Tam and Oliveira, 2016); e-commerce systems (Chong et al., 2010); e-government systems (Khayun et al., 2012); e-learning systems (Machado da Silva et al., 2014). IS success defines systems usage as a success measure, as well as the satisfaction of users towards the system. IS success defines the perceived positive impact of technology usage at individual and organizational levels as dependent variables of success. The authors DeLone and McLean (2003) later merged individual impacts (II) and organizational impacts (OI) into net benefits (NB). Net benefits stand for the positive impacts on various levels of systems' usage, although the authors denominated these two impacts.

IS success theory defines that independent variables are dimensions that comprehend various types of quality (IQ, SysQ, and SerQ), as a set of desirable characteristics related with the reliability of the SysQ, the required features of the system output (information quality) and the requirable support to services (Delone and McLean, 2003). The inner-model variables correspond to the first stage of success, measuring IS intention behavior to use, and actual IS use, as well as users' satisfaction with the system. The dependent variables, II & OI, were grouped into a new construct, net benefits.

E-learning systems are enablers of learning (Neroni et al., 2015), as they support communication of several types of contents to be used anywhere, anytime, and on multiple devices, these characteristics are favorable to a country like Brazil. Brazil has many people seeking to learn; however, not all people are near universities or schools as it is a vast geographically dispersed country so e-learning plays an integral part in knowledge diffusion. Most of those researches focus on the problematic of the adoption of e-learning (Machado da Silva et al., 2014; Maldonado et al., 2009; Teo, 2011), very few in the Brazilian context (Machado da Silva et al. (2014) as this country has particular challenges to face regarding infrastructure and various cultures (occidental and oriental) and different literacy levels across Brazilian society. In this

research, we focus on the Brazilian context and on determining the main factors that explain e-learning systems' usage and overall success. This context draws a line we explore in this study, which is to understand the impact of LTO and STO in the success of e-learning. E-learning culture studies pointed out that culture affects how a student learns and perceives learning (Aparicio, Bacao & Oliveira, 2016). We found some studies that include one or various cultural dimensions in online learning contexts (Simmons et al., 2012; Tapanes et al., 2009; Tarhini et al., 2017; Yang et al., 2014). These studies found that cultural factors influence the way people learn and the way people interact with learning materials and peers. Tapanes et al. (2009), Simmons et al. (2012), Yang et al. (2014) and Tarhini et al. (2017) focus on the effects of the cultural characteristics on online learning adoption and usage, like individualism/collectivism, ambiguity tolerance level, power distance, masculinity, uncertainty avoidance, and cultural orientation. Considering these earlier studies, we found that it is relevant to study the role of LTO & STO in e-learning success. LTO & STO are cultural characteristics (Hofstede, 1984) that may imply in the way people acquire knowledge and in the way they face their life, from another study we learned that when students pursue long term objectives and impress persistency on their achievement, it impacts on success (Duckworth and Gross, 2014).

Hofstead and Bond (1988) focused studies on the oriental way of life, grounding in the Confucian philosophy, which they named as "Confucian dynamism." This secular philosophy proposes: (1) societal stability is based on several relationship types between people; (2) family is typically regarded as a prototype of social organizations; (3) moral behavior towards others, is considered as a way of treating others, as each person would like to be treated by others; and (4) moral with regards to anyone's tasks, is regarded as the way people try to obtain instruction and skills, working consistently and in a persevering way, regarding the sufficient resources to do that. Considering the oriental perspective, Hofstede (1991) added a fifth cultural dimension, LTO/STO, to original four as a way to incorporate the oriental view in the model. STO is coined as unfavorable or anti-ethical perspectives, the LTO, regarding Confucian dynamism Theory, tend to the opposite, to the positive and ethical perspectives. According to this theory (Hofstede, 1991, 2001a, b), the original interpretation of LTO is persistence, ordering relationships, combined with the sense of shame. The LTO/STO dichotomy is based on how the culture impacts on the way people see time passing by. In this research evolution, they tried to create a measuring scale and started the LTO concept. LTO is the cultural characteristic of incorporating time in many contexts of people's lives, respecting both past & future, instead of estimating peoples' actions only for their consequences on here/now or in their future (Bearden et al., 2006). According to Confucian dynamism theory (Hofstede and Bond, 1988; Bearden et al. (2006), and the studies of Hofstede (1991) and Geert et al. (2010) LTO versus STO is related with the peoples' willing to focus their behavior in the future or the present & past. These authors considered a strong relationship between LTO and ethics (Nevins et al., 2007). They concluded that the more LTO the individual has, probably the more ethics component he has, and that influences the nation's culture. Considering that the DeLone & McLean Model comes from a behavioral basis, it is possible to consider that the Confucian dynamic theory, dimensions of a nation's culture can also be used to evaluate some aspects of an information system because individual aspects of behavior define the nation's culture (Figure 1). Leidner and Kayworth (2006) pointed out two main aspects of culture and information technology use and outcomes in their research: (a) different cultures lead to similar or different benefits and (b) cultural value is more significant to information technology success. Geert et al. (2010), correlated LTO with better school results. In the studies of Smith et al. (2004), they concluded that there is a need to take cultural characteristics on the world wide web into consideration. The Confucian dynamic theory (Bearden et al., 2006) refers that countries with STO or LTO ratings interact with learning and work, considering: (1) While people with LTO estimate thrift, effort, and responsibility as central values, people with STO are more related to convictions and emphasize rights and values; (2)
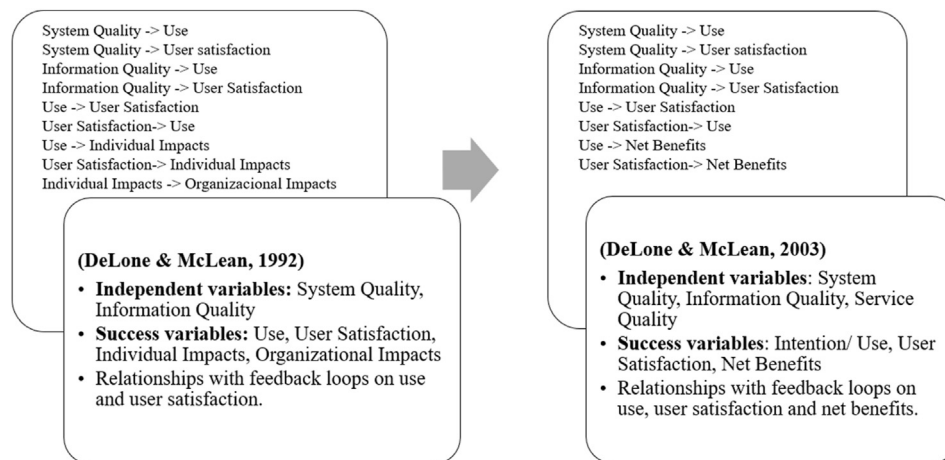
Figure 1. IS success variables evolution (DeLone & McLean, 1992, 2003) (Source: Authors of this paper).

The higher LTO the person has, the more they are committed. On the other hand, individuals with STO are less committed; and (3) As a behavior, LTO people are mainly modest, whereas people with STO are mainly talkative. Some conflict can be caused by the difference between expectations and reality in people with STO. People in LTO cultures prefer to ask "what" and "how" than to ask "why." In a recent study, Figlio et al. (2017) found that LTO students attitudes' have improved results than other students, with less prominence on a delayed reward. Some studies relate LTO and STO in the learning context, indicating that several previous studies have found the impact of cultural dimensions in instructional contexts (Figlio et al., 2017; Lai et al., 2016; Mahomed et al., 2017; Nistor et al., 2013). Therefore, STO and LTO would impact overall e-learning success (DeLone and McLean, 2003), justifying the integration of IS Success Theory with Confucian dynamism theory (Bearden et al., 2006; Smith et al., 2004).

3. Long term-oriented e-learning success model proposal

This research proposes and empirically tests a conceptual long term/ short term-oriented e-learning success model in the Brazilian context based on IS theory and Confucian dynamism theory (Bearden et al., 2006; DeLone and McLean, 1992; Hofstede and Bond, 1988). The proposed conceptual research model is illustrated in Figure 2, and the following sections present the theoretical justification for each of the predicted models constructs relationships' bearing in mind prior literature discoveries and begin to be validated by some empirical studies, thus gaining solid foundations.

3.1. Constructs and hypotheses

Our research model (Figure 2) comprises nine theoretical constructs: system quality (SysQ), information quality (IQ), collaboration quality (CQ), service quality (SQ), use (U), use satisfaction (US), long-term orientation (LTO), short-term orientation (STO), and net benefits (NB). Appendix A presents the definitions of the constructs for the e-learning context. To theoretically support the relationships between the proposed model constructs, we have defined the next hypotheses (H1a; H1b; H2a; H2b; H3a; H3b; H4a; H4b; H5a; H5b; H6; H7; H8a; H8b; H8c; H9a; H9b and H9c):

A good e-learning user experience is due to the e-learning system quality (Ahn et al., 2004). SysQ consists of the systems' ease of use, navigability, accessibility, structure, interface, among others, to support users' tasks (Elkaseh et al., 2016; McKinney et al., 2002; Schaupp et al., 2006). Some studies on e-learning also validated that user experience in the learning context is well perceived by learners (Butzke and Alberton, 2017; Tarhini et al., 2017). Machado da Silva et al., 2014 empirically

demonstrated that system quality influences e-learning usage and satisfaction. Thus, we hypothesize that system quality has a direct and positive impact on use and user satisfaction.

H1a. *System quality has a positive impact on the use of e-learning systems.*

H1b. *System quality has a positive impact on e-learners' satisfaction.*

IS content is of utmost importance for usage and satisfaction, especially when content is developed considering its usefulness, understandability, and reliability (DeLone and McLean, 2003). Previous research found that IQ has a positive impact on IS usage and users' satisfaction, as a result of using those systems (Lin and Lee, 2006; McKinney et al., 2002; Urbach et al., 2010; Z. Yang et al., 2005). Machado da Silva et al., 2014 studied the effect of information quality on e-learning use and learners' satisfaction. Thus, we hypothesize that:

H2a. *Information quality has a positive impact on the use of e-learning systems.*

H2b. *Information quality has a positive impact on e-learners' satisfaction.*

ISS theory supports that staff responsiveness level, sympathy, confidence are characteristics of a system with quality, thus determining usage and users' satisfaction (Chang and King, 2005; Pitt et al., 1995; Uppal et al., 2017), this was also verified in an e-learning context (Machado da Silva et al., 2014). Thus, we hypothesize that:

H3a. *Service quality has a positive impact on the use of e-learning systems.*

H3b. *Service quality has a positive impact on e-learners' satisfaction.*

Collaboration quality appeared as a positive determinant of IS usage and users' satisfaction in the employee portal success model of Urbach et al. (2010), opening the potential for developing communities that enable the sharing of practices in a work context by employees (Benbya et al., 2004; Detlor, 2000; Wang, 2003). The existence of a digital space that enables collaborative work might as well constitute a favorable environment to learn. Facilitating interaction, communication, and knowledge sharing were studied by Stewart and Lopes (2015) when they researched on different interaction types in online learning. Thus, we hypothesize that:

H4a. *Collaboration quality has a positive impact on the use of e-learning systems.*

H4b. *Collaboration quality has a positive impact on e-learners' satisfaction.*

According to ISS theory, information systems usage influences users' level of satisfaction when they perceive the ease of use an adequacy of a system in supporting their tasks (DeLone and McLean, 2003; Seddon, 1997). Wang and Chiu (2011), in their e-learning success study, confirm
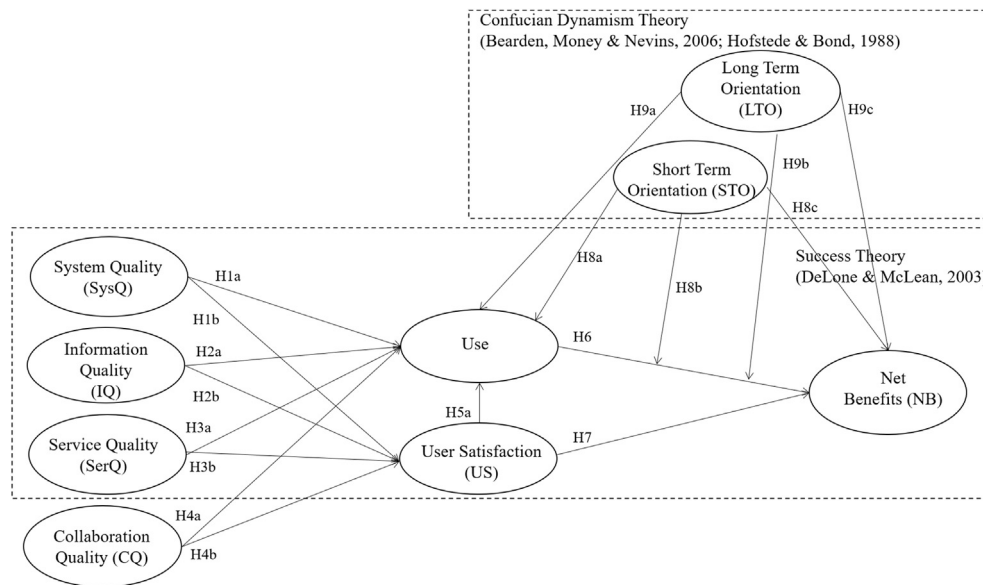
Figure 2. Model proposal of LTO/STO influence on e-learning success.

that students' satisfaction level is directly related to e-learning usage. As students' satisfaction levels increase, it supports and leads to continuous e-learning usage (Al-Samarraie et al., 2018). Thus, we hypothesize that:

H5a. *Use has a positive impact on e-learners' satisfaction.*

H5b. *E-learners' satisfaction has a positive impact on the use of e-learning systems.*

The positive user experience from the learners tends to have a favorable impact on e-learners' overall performance, thus on net benefits (Al-Fraihat et al., 2019; Piccoli et al., 2001). Satisfaction can only be achieved by the use of IS, DeLone (1988), satisfaction, and use have positive effects on net benefits. From preceding researches, we can infer that e-learners' usage and satisfaction levels will have a positive impact on e-learners' net benefits (Hassanzadeh et al., 2012; Montrieux et al., 2015). Thus, we hypothesize that:

H6. *The use of e-learning systems has a positive impact on the net benefits.*

H7. *E-learners' satisfaction has a positive impact on the net benefits of e-learning systems.*

Culture acts as an influential factor influenced by information processing, and cognition (Earley and Ang, 2003; Tarhini et al., 2017) included social, organizational and individual characteristics and investigated if those characteristics led to predicting e-learners students' behavioral intention (Tarhini et al., 2017) and e-learning usage. Some studies (Brodowsky et al., 2008; Leonard, 2008) show that in culture, temporal orientation (e.g., STO) is an important aspect because it explains the behavior of individuals. The users' time orientation' impact on website usage also has repercussions on their attitude, as confirmed in some studies on STO/LTO and website quality perceptions (Hassan et al., 2011; Singh et al., 2006; Tsikriktsis, 2002). Therefore, it is valid to study if STO, a time-oriented dimension, has various impacts on e-learning usage, on e-learning overall performance perception, and whether STO decreases the positive relationship of usage on net benefits. Thus, we hypothesize that:

H8a. *Learners' short-term orientation has a positive impact on e-learning systems usage.*

H8b. *Learners' short-term orientation moderates the use on net benefits.*

H8c. *Learners' short-term orientation has a positive impact on e-learning systems' net benefits.*

Long Term Orientation was studied as a single dimension in several studies (e. g., marketing research, determinant in a new product, global brand, and other applications). As LTO is a cultural value, Rai et al. (2009), in their study, demonstrated that cultural characteristics impact on ISS. Joy and Kolb (2009), found that culture impacts on learning outcomes. In Hofstede's (2001b) work, he found that LTO and students' mathematics' performance are significantly correlated. Therefore, LTO impacts on the learning results. Galor and Özak (2016) showed that in different geographic areas, preferences for delayed gratification are extremely stable over time, and are correlated with technology adoption, savings, and educational achievement. Tarhini et al. (2017) concluded in their study that the adoption of e-learning should focus on the cultural aspects of students. Previous studies indicate that the pursuit of long-term objectives, such as gritty students may use more e-learning systems to undertake the learning process, these studies demonstrated a direct relationship between grit and school success, despite adversities encountered in the learning process (Aparicio et al., 2017; Duckworth and Gross, 2014). LTO can be seen as a non-cognitive trait of e-learners, and non-cognitive students' attributes showed good determinants of learning success (Duckworth et al., 2019; Porter et al., 2020). We believe that students with high LTO influences their performance in more than one way, LTO directly influences e-learning usage, and also, moderates the relationship effect of e-learning use on net benefits. Thus, we hypothesize that:

H9a. *Learners' long-term orientation has a positive impact on the use of e-learning systems.*

H9b. *Learners' long-term orientation moderates the use on net benefits.*

H9c. *Learners' long-term orientation has a positive impact on the net benefits of e-learning systems.*

The hypothesized relationships.between our model dimensions are represented in Figure 2.

4. Research methodology

This model was empirically validated using structural equation modeling (SEM)/partial least squares (PLS) in the context of Brazil's e-learning systems usage. In this country, the usage of these kinds of online learning systems is essential because of the geographically vast population distribution and the various historically cultural backgrounds. The model was operationalized using only previously validated scales to

measure the constructs (please see Appendix B) all used items in the questionnaire were on a 7-point range scale (1-*strongly disagree* up to 7-*strongly agree*). The questionnaire contained 42 questions, five questions for sampling purposes, and 37 to operationalize the research model. The questionnaire was distributed through a commercial online survey platform.

4.1. Conducted survey context and data collection strategy

The data collection strategy was conducted by targeting the local adult population that studied or used e-learning in universities (public and private) all over Brazil. The survey was distributed online after contacting leading Brazilian universities, asking them to distribute it and have students answer voluntarily. The data was collected from higher education students (e.g., colleges, universities), both public and private organizations. They were invited to participate in this study through e-mail invitations. In order to minimize the partiality of the obtained responses, e-learners' participation was entirely voluntary. Students were briefed on the study's purpose at the beginning of the questionnaire, and given the option to participate or not. In this research, no reward or incentive of any kind was offered.

4.2. Sample characterization

The empirical data was collected from Brazilian higher education students in the context of e-learning systems usage. Figure 3 shows the regions of our respondents, all of them answered the questionnaire voluntarily, and no personal data was asked for or obtained. We obtained 297 valid and complete responses for analysis of the survey. Table 1 presents the demographic characteristics of the respondents. Figure 3 illustrates the e-learners' provenience, and the 297 respondents are from nine regions: Alagoas; Goiás; Maranhão; Mato Grosso; Paraná; Rio Grande do Sul; Rio de Janeiro; Santa Catarina and São Paulo. The majority of respondents are from the regions where the most ranked Brazilian universities are located (World University Rankings, 2019). We double-checked the common method bias, firstly, to determine if any factor could emerge as a variance dominating only one single factor

(Podsakoff et al., 2003), and the obtained results settle that none of the factors explained the majority of the variance individually. Then secondly, we calculated a marker variable test (Lindell and Whitney, 2001), consisting of including a theoretically unrelated marker variable in the research model, the result was 0.021 (2.1%) as the maximum shared variance with the rest of the variables; this result is considered a low value (Johnson et al., 2011). Consequently, we found no significant common method bias.

Table 1 shows the main sample characterization, 43% of the respondents are female, and 57% are male. The large majority (98%) are university graduates, 51% say they use e-learning systems in a university program context, 30% use e-learning in a training context, and 19% use e-learning for other purposes, these numbers indicate that there are respondents that use e-learning systems for more than one objective. The great majority, 83% of the respondents, use proprietary software platforms, 16% use free software platforms, and the remainder uses other platforms or does not know the system type. Only 15% of e-learners say they use massive open online courses (MOOCs), the vast majority 85% do not use any MOOC platforms.

5. Data quantitative analysis and study results

We used the SEM/PLS method and applied a variance-based technique (VBSEM) to test the hypotheses empirically. This technique produces more robust results disregarding the sample, the normality data distribution, and sample size (Hair et al., 2010; Hair et al., 2012). The collected data were computed with SmartPLS (version 3 software) (Ringle, Wende & Becker, 2015)). The next subsections present the two-stage method results according to the SEM/PLS method.

5.1. Measurement model results

Generally accepted conditions to analyze latent variable relationships are loadings and cross-loadings, composite reliability (CR), Cronbachs' Alpha (CA), average variance extracted (AVE), and discriminant validity valuation (Hair et al., 2012). The criterion to verify variables' internal consistency is though CA Cronbach (1951), and an alternative measure

Figure 3. Regional map of the Brazilian respondents (Map build with Google Maps on August, 8, 2019).

Table 1. Brazilian e-learners' characterization.

Characteristics	Absolut number	Percentage (%)
e-learners' gender		
Female	129	43%
Male	168	57%
Total	**297**	**100%**
e-learners' instruction level		
Undergraduate	1	1%
2 Year College Degree	100	34%
4 Year College Degree	99	33%
Master Degree	19	27%
Doctoral Degree	13	4%
Professional Degree	2	1%
Total	**297**	**100%**
Used e-learning platforms		
Moodle	49	16%
Blackboard	211	70%
University Proprietary System (in-house system)	41	13%
Other or do not know	3	1%
Total	**297**	**100%**
Context student's e-learning course		
University Course	233	51%
Training	138	30%
Other (ie: Specialization course)	85	19%
Learning contexts total	**456**	**100%**
Simultaneously used MOOC platforms by e-learners		
Coursera	**23**	8%
edX	4	1%
Khan Academy	19	6%
Other platform	0	0
Do not use MOOCs	251	85%
Total	**297**	**100%**

for CA is composite reliability (CR) (Werts, Linn, & Jö; reskog, 1974) as recommended by Chin (1998), because it overcomes some CA deficiences. The model measures CR above 0.800 (please see Table 2), indicating the criteria is met (Fornell and Larcker, 1981). AVE results also meet the rule of being above 0.500 (Barclay et al., 1995).

Table 3 suggests that discriminant conditions are confirmed. The cross-loading (Table 3) shows that loadings are higher than all their cross-loadings, therefore. a second criterion is also achieved, Hensler, Ringle & Sartedt (2015) propose another.approach, the heterotrait-monotrait (HTMT) ratio of correlations. If the HTMT value is below 0.90, discriminant validity has been established between two reflective constructs, indicating discriminant validity. All constructs in Table 3 have values below 0.90 for the HTMT test, so a third criterion is also achieved; thus, we can conclude that the measurement model presents discriminant validity.

5.2. Results of Brazilian e-learning structural model

Between the two-phases SEM/PLS, all the constructs for multicollinearity were tested according to Farrar and Glauber (1967). We also tested the variables' variance inflation factor (VIF); results showed no multicollinearity issues. The second phase of SEM/PLS consists in testing the hypotheses, by applying a resampling technique (preferably with 5000 subsamples extracted from the original collected sample), the bootstrapping (Henseler et al., 2009). This practice assures a more accurate result of the effects of LTO/STO on the global success of e-learning systems. For hypotheses, H5a and H5b computed the PLS two-stages tests, as we could not calculate both H5a & H5b due to recursivity. Therefore, we tested model A, which tests use impact on user satisfaction

(H5a), and model 2, which calculates the user satisfaction' impact on e-learnings systems usage (H5b). Figure 4 illustrates both models (A/B) results.

The presented model explains 33.5%/32.6% (model A/model B) of variation in use, Information quality ($\widehat{\beta} = 0.176***/0.241***$) and collaboration quality (CQ) ($\widehat{\beta} = 0.366***/0.369***$) are statistically significant to explain use (Use). Long-term orientation (STO) and short-term orientation.(STO) are not statistically significant on use (USE). The model explains 49.6%/50.4% of variation in user satisfaction (US). System quality (SysQ) ($\widehat{\beta} = 0.242***/0.237***$) and information (IQ) ($\widehat{\beta} = 0.469***/0.437***$) are statistically significant to explain user satisfaction (US). The model explains 59.7%/59.8% of the variation in net benefits (NB). Use ($\widehat{\beta} = 0.259***/0.259***$) and user satisfaction (US) ($\widehat{\beta} = 0.595***/0.595***$) are statistically significant to explain net benefits NB. The long-term orientation (LTO) ($\widehat{\beta} = -0.107*/-0.107*$) negatively moderates use on net benefits (NB). As the short-term orientation of Brazilian e-learners' does not moderate the. relationship between use and NB or have a significant impact on NB.In summary, H1b, H2a, H2b, H4a, H5a, H5b, H6, H7, and H9bare supported. The H1a, H3a, H3b, H4b, H8a, H8b, H8c, H9a, and H9care not supported (Table 4).

6. Discussion

The empirical results of the of Brazilian e-learning systems success imply that net benefits are explained by 60% directly by the impact of e-learning use and e-learners' satisfaction, and by the negative moderation effect of students' long term-orientation from use to net benefits (please see, Figure 5). This finding means that if students are higher oriented in the long-term towards learning, this cultural aspect weakens the positive

Table 2. E-learning systems' measurement model results.

Latent Variables	Item	Loadings.	Composite Reliability	Cronbach's Alpha	Average Variance Extracted (AVE)	DiscriminantValidity
SystemQuality (SysQ)	Sys Q1	0.922	0.956	0.939	0.845	Yes
	Sys Q2	0.932				
	Sys Q3	0.924				
	Sys Q4	0.900				
InformationQuality (IQ)	IQ 1	0.929	0.935	0.907	0.783	Yes
	IQ 2	0.883				
	IQ 3	0.902				
	IQ 4	0.823				
ServiceQuality (SerQ)	SerQ 1	0.929	0.946	0.924	0.815	Yes
	SerQ 2	0.870				
	SerQ 3	0.941				
	SerQ 4	0.867				
Collaboration Quality (CQ)	CQ1	0.916	0.952	0.932	0.831	Yes
	CQ2	0.943				
	CQ3	0.861				
	CQ4	0.925				
Use. (U)	Use1	0.629	0.851	0.778	0.536	Yes
	Use2	0.805				
	Use3	0.805				
	Use4	0.788				
	Use5	0.609				
User Satisfaction. (US)	US 1	0.894	0.931	0.9	0.773	Yes
	US 2	0.760				
	US 3	0.935				
	US 4	0.916				
Long-Term Orientation(LTO)	LTO 1	0.908	0.897	0.772	0.814	Yes
	LTO 2	0.896				
Short-Term Orientation(STO)	STO 1	0.966	0.971	0.941	0.971	Yes
	STO 2	0.977				
Net Benefits (NB)	NB 1	0.803	0.948	0.937	0.694	Yes
	NB 2	0.865				
	NB 3	0.834				
	NB 4	0.773				
	NB 5	0.836				
	NB 6	0.873				
	NB 7	0.845				
	NB 8	0.832				

Table 3. Fornell-Larcker criterion and interconstruct correlations & Heterotrait-Monotrait ratio (HTMT).

Fornel Larker									Heterotrait-Monotrait ratio (HTMT)								
	SysQ	IQ	SerQ	CQ	Use	US	LTO	STO	NB	SysQ	IQ	SerQ	CQ	Use	US	LTO	STO	NB
SysQ	0.891																	
IQ	0.623	**0.844**								0.622								
SerQ	0.451	0.423	**0.867**							0.449	0.423							
CQ	0.509	0.495	0.506	**0.882**						0.508	0.496	0.507						
Use	0.410	0.527	0.338	0.585	**0.647**					0.41	0.535	0.336	0.581					
US	0.610	0.722	0.426	0.439	0.484	**0.841**				0.609	0.722	0.428	0.439	0.487				
LTO	0.240	0.287	0.164	0.157	0.294	0.250	**0.793**			0.241	0.287	0.165	0.156	0.302	0.242			
STO	0.211	0.234	0.234	0.207	0.214	0.209	0.363	**0.952**		0.211	0.238	0.235	0.202	0.216	0.214	0.368		
NB	0.634	0.683	0.535	0.530	0.608	0.773	0.310	0.201	**0.806**	0.635	0.684	0.536	0.528	0.613	0.78	0.31	0.201	

Note: Diagonal values (in.bold) are the square.root of the AVE; System Quality(SysQ); Information Quality(IQ); Service Quality(SerQ); Collaboration Quality(CQ); User Satisfaction(US); Net Benefits(NB); Long-Term Orientation(LTO), and Short-Term Orientation(STO).

relationship between e-learning systems usage on the perceived net benefits (H9b). These findings were not reported before. However, Gert Hoftsetde (2001) indicated in his study that LTO might predict the adoption of technology. In previous studies, perseverance effort and consistency of interest, long-term orientation traits', do not directly influence the use of e-learning systems (Aparicio et al., 2017). This inference might mean that for higher long-term oriented e-learners, they do not perceive that their overall performance is due to the e-learning
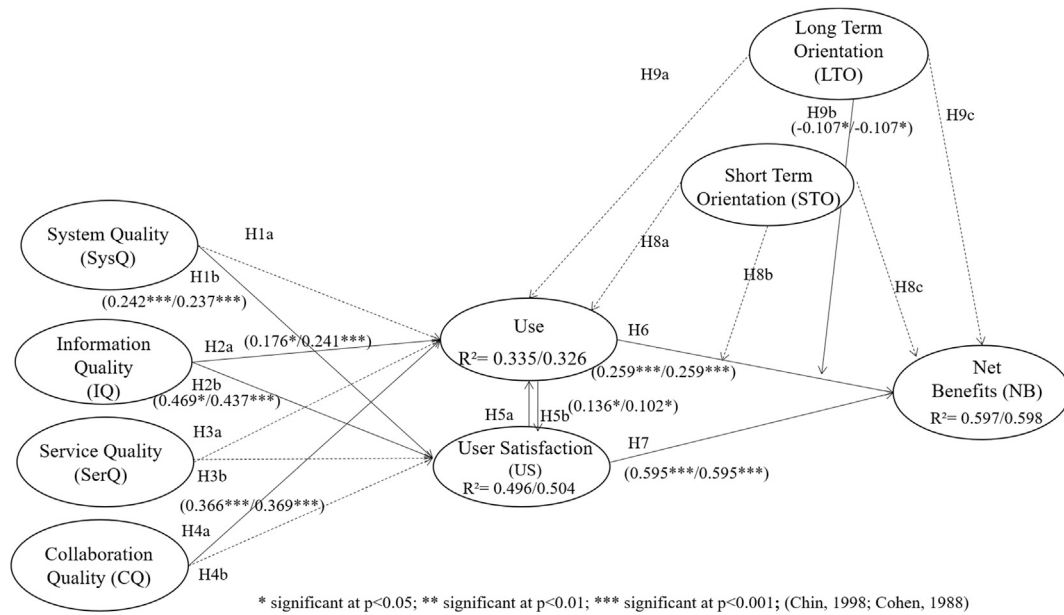
Figure 4. Brazilian e-learning systems success research model results.

Table 4. Results' summary of Brazilian e-learning systems success hypotheses tests.

Hypothesis	Independent Variable		Dependent Variable	Moderation	Findings	Conclusion Hypothesis validation
H1a	SystemQuality(SysQ)	→	Use	n. a.	$\widehat{\beta} = -0.020/0.012$; NS	Non-significant
H1b	SystemQuality(SysQ)	→	User Satisfaction(US)	n. a.	$\widehat{\beta} = 0.242^{***}/0.237^{***}$	Significant
H2a	InformationQuality(IQ)	→	Use	n. a.	$\widehat{\beta} = 0.176^{*}/0.241^{***}$	Significant
H2b	InformationQuality(IQ)	→	User Satisfaction(US)	n. a.	$\widehat{\beta} = 0.46^{*}9/0.437^{***}$	Significant
H3a	Service Quality(SerQ)	→	Use	n. a.	$\widehat{\beta} = -0.018/-0.007$; NS	Non-significant
H3b	Service Quality(SerQ)	→	User Satisfaction(US)	n. a.	$\widehat{\beta} = 0.092/0.091$; NS	Non-significant
H4a	Collaboration Quality(CQ)	→	Use	n. a.	$\widehat{\beta} = 0.366^{***}/0.369^{***}$	Significant
H4b	Collaboration Quality(CQ)	→	User Satisfaction(US)	n. a.	$\widehat{\beta} = 0.033/-0.005$; NS	Non-significant
H5a	User Satisfaction	→	Use	n. a.	$\widehat{\beta} = 0.136^{*}/n.a$	Significant
H5b	Use	→	User Satisfaction(US)	n. a.	$\widehat{\beta} = n.a./0.102^{*}$	Significant
H6	Use	→	NetBenefits	n. a.	$\widehat{\beta} = 0.259^{***}/0.259^{***}$	Significant
H7	User Satisfaction	→	NetBenefits	n. a.	$\widehat{\beta} = 0.595^{***}/0.595^{***}$	Significant
H8a	Short Term Orientation(STO)	→	Use	n. a.	$\widehat{\beta} = 0.023/0.024$; NS	Non-significant
H8b	Use*Short Term Orientation(STO)	→	NetBenefits	STO	$\widehat{\beta} = -0.020/-0.020$; NS	Non-significant
H8c	Short Term Orientation(LTO)	→	NetBenefits	n. a.	$\widehat{\beta} = -0.005/-0.006$; NS	Non-significant
H9a	Long Term Orientation(LTO	→	Use	n. a.	$\widehat{\beta} = 0.108/0.115$; NS	Non-significant
H9b	Use*Long Term Orientation(LTO)	→	NetBenefits	LTO	$\widehat{\beta} = -0.107^{*}/-0.107^{*}$	Significant
H9c	Long Term Orientation(LTO)	→	NetBenefits	n. a.	$\widehat{\beta} = 0.083/0.083$; NS	Non-significant

Notes: n.a. = non-applicable; NS = non-significant; * significant for p < 0.05; ** significant for p < 0.01; *** significant for p < 0.001 (Chin, 1998; Cohen, 1988).

systems use, but rather their persistence towards their learning goals in the future (Hofstede and Minkov, 2010). Long term orientation does not have a direct impact on e-learning use (H9a) and net benefits (H9c).

Short term orientation impact on e-learning systems' use (H8a), on net benefits (H8c) and indirect effect on the relationship between use and net benefits (H8b), are not supported in this study, probably indicating that when students are short term oriented they attribute their success or failure to luck (Hofstede, 2011), instead of the e-learning systems

platforms usage. A possible reason that might explain these results can reside in previous findings that indicate that non-cognitive attributes of the students are determinants to their success (Aparicio et al., 2017; Duckworth et al., 2019; Porter et al., 2020). The long-term orientation of the students can be considered as a non-cognitive attribute of students (Duckworth and Gross, 2014, 2019), and previous studies show that students' success is derived from those traits. In our study, we found that students with high LTO might perceive success, net benefits, as a result of
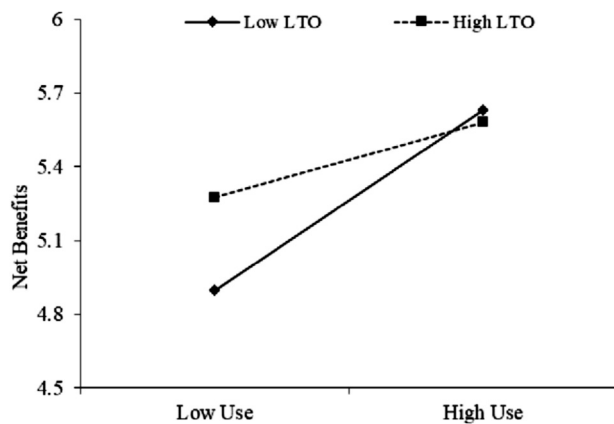
Figure 5. Moderation effect of the LTO.

their study and learning capabilities rather than using an e-learning platform. Our study also indicates that net benefits of e-learners are positively influenced by the usage of e-learning (H6) and by e-learners' satisfaction on using those systems as a means to achieve and support the learning process (H7), as discussed by Petter et al. (2012), and similar results were achieved in a study on e-government systems (Stefanovic et al., 2016). E-learning systems' use has a positive impact on the level of e-learners' satisfaction (H5b), and student's satisfaction level impacts positively on e-learning systems usage level (H5a), similar to the study by Stefanovic et al. (2016). E-learning systems usage is also positively influenced by information quality (H2a) and by collaboration quality (H4a), meaning that e-learners adopt these systems derived from the importance and adequacy of the contents, also derived from the collaboration with their colleagues and the overall satisfaction, similar results were found in other studies (Machado da Silva et al., 2014). Results do not show that system quality (H1a) and service quality (H3a) have any influence on the use of e-learning systems. This finding might indicate that students adopted the e-learning systems because their universities made the platforms' adoption decisions. Students' satisfaction is directly and positively influenced by e-learning systems usage (H5b), by the system quality (H1b) and by information quality (H2b), meaning that if students perceive the platforms have good quality in terms ease of use and if the contents are understandable, useful students become more satisfied, these results are similar to previous studies (Machado da Silva et al., 2014). However, the positive impact of service quality on e-learners' satisfaction (H3b) was not found similar to the Urbach et al. (2010) study. Neither was a direct relationship between collaboration quality on student satisfaction (H4b) found similar to previous results in the employee portal success' context (Urbach et al., 2010). These results can be explained by a possible high quality of the systems in a way that students did not face problems with the e-learning platforms staff or because they perceive that e-learning platforms' are not the primary communication channel for interact with their peers.

7. Conclusions and implications

Our study presents a Brazilian e-learning systems success model supported by information systems success theory combined with the cultural characteristics of e-learners. We tested the model in real usage in the Brazilian higher education context. In this research, we can conclude that e-learning systems' quality, information quality, and use are determinant to students' satisfaction. We also found that information, collaboration quality, and learners' satisfaction are determinants of e-learning systems usage. From our study, we can further conclude that use and user

satisfaction impact positively on the net benefits of students and that for a higher level of long-term-oriented students, the cultural aspect can play a weakening role in the positive impact of e-learning systems usage on their overall performance.

The main theoretical implication of our study is that students' cultural aspects play a significant role in Brazilian e-learning systems success, in a way that high-level long-term-oriented students might not attribute their success to the usage of e-learning systems, but rather to the overall satisfaction level they feel when using higher education e-learning systems. This study clearly indicates that the quality of e-learning systems and information quality have a positive impact in learners' satisfaction, as well as information quality and collaboration quality have a positive impact on e-learning systems' usage. From these we can draw the following practical implications derived from this study: higher education institutions should consider higher importance to e-learning content in terms of adequacy, because it influences e-learning acceptance and learners' satisfaction, besides providing easiness of navigation in the online learning environment, providing support to their students' collaboration. The collaboration features of these platforms have a substantial impact on its usage, enabling accessible, adequate, and comfortable communication among students, especially in the current times, that students are even more isolated due to COVID-19. Higher education institutions should also pay special attention to higher long-term-oriented students because of the positive influence of the use of these kinds of platforms might be compromised in terms of the perceived students' overall success.

The present model supported information systems success in e-learning theory, and one cultural aspect does not fully capture e-learning systems success in Brazil, therefore in future studies, the question of whether other cultural factors can influence e-learning systems usage success should be understood deeper. In future studies, the perceived e-learning success through the teacher's point of view could also be captured, and the resultant comparisons be drawn.

Declaration

Author contribution statement

W. Cidral: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

M. Aparicio, T. Oliveira: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Appendix A. Model constructs definitions

Constructs	Definition	Authors
System Quality (SysQ)	E-learning systems quality refer to the overall system performance, according to usability aspects, like ease of use, performance, flexibility, integration, interaction, navigation, time-response and reliability of the e-learning system itself.	(Aparicio et al., 2006b; Cidral et al., 2018; Willian H. DeLone and McLean, 2003; Gable, Sedera and Chan, 2003; Pitt et al., 1995; Sun, Tsai, Finger, Chen and Yeh, 2008; Urbach et al., 2010)
Information Quality (IQ)	E-learning information quality has to do with the content accuracy, availability, usefulness, relevance of the information provided within the e-learning platform.	
Service Quality (SerQ)	The service quality in e-learning systems are du to the staff provided support to the various stakeholders, in terms of assurance, empathy, responsiveness and reliability.	
Collaboration Quality (CQ)	Collaboration quality corresponds to the effectiveness of communication between students and teachers, as well as between peers for learning purposes.	
Use	Use is the level of adoption in terms of frequency and purpose of utilization, e.g. the nature of the actual usage the e-learning system.	
User Satisfaction (US)	User satisfaction is the level of fulfilment as a result of the e-learning system usage.	
Net Benefits (NB)	E-learning systems' net benefits correspond to the performance at the student's individual level, in terms of productivity, learnability, learning tasks simplification, usefulness, among other, and the performance at an organizational level, as the e-learning system improves the overall success level of the university, and increased the capacity enhancement of coordination.	
Long Term-Orientation (LTO)	Refers to the learner's effort being focused towards the achievement of results in the future with perseverance.	(William O. Bearden et al., 2006a; G. Hofstede, 1984, 2011; G. Hofstede and Bond, 1988)
Short Term-Orientation (STO)	Corresponds to the immediacy of present results from learning, this construct is also related to the focus on the past orientation of student, rather than the future.	

Appendix B. Measurement items

Constructs	Code	Indicators	Theoretical Support
Using a seven-point scale, 1 strongly disagree, and 7 strongly agree, the variables are to be measured by asking students to rate their perception of e-learning systems			
System Quality	SysQ1	The e-learning system is easy to navigate.	(Willian H. DeLone and McLean, 2003)
	SysQ2	The e-learning system allows me to easily find the information I am looking for.	
	SysQ3	The e-learning system is well structured.	
	SysQ4	The e-learning system is easy to use.	
Information Quality	IQ1	The information provided by the e-learning system is useful.	(Willian H. DeLone and McLean, 2003)
	IQ2	The information provided by the e-learning system understandable.	
	IQ3	The information provided by the e-learning system is interesting.	
	IQ4	The information provided by the e-learning system is reliable.	
Service Quality	SerQ1	The responsible service personnel are always highly willing to help whenever I need support with the e-learning system.	(Willian H. DeLone and McLean, 2003)
	SerQ2	The responsible service personnel provide personal attention when I experience problems with the e-learning system.	
	SerQ3	The responsible service personnel provide services related to the e-learning system at the promised time.	
	SerQ4	The responsible service personnel have sufficient knowledge to answer my questions in respect of the e-learning system.	
Collaboration Quality	CQ1	Our e-learning system enables an easy and comfortable communication with my colleagues.	(Urbach et al., 2010)
	CQ2	Our e-learning system supports an effective and efficient sharing of information with my colleagues.	
	CQ3	Our e-learning system enables a comfortable storing and sharing of documents with my colleagues.	
	CQ4	Our e-learning system allows me to easily and quickly locate my colleagues' contact information.	

(*continued*)

Constructs	Code		Indicators	Theoretical Support
Use	Use1		Retrieve information.	(Willian H. DeLone and McLean, 2003)
	Use2		Publish information.	
	Use3		Communicate with colleagues and teachers.	
	Use4		Store and share documents.	
	Use5		Execute courses work.	
User Satisfaction	US1		How adequately does the e-learning system support your area of study?	
	US2		How efficient is the e-learning system?	
	US3		How effective is the e-learning system?	
	US4		Are you satisfied with the e-learning system on the whole?	
Net Benefits	NB1		The e-learning system enables me to accomplish tasks more quickly.	
	NB2		The e-learning system increases my productivity.	
	NB3		The e-learning system makes it easier to accomplish tasks.	
	NB4		The e-learning system is useful for my job.	
	NB5		The e-learning system has helped my university improve the efficiency of internal operations.	
	NB6		The e-learning system has helped my university improve the quality of working results.	
	NB7		The e-learning system has helped my university enhance and improve coordination within the university.	
	NB8		The e-learning system has helped my university make itself an overall success.	
Confucianism	Short-Term Orientation	STO1	Respect for tradition is important for me.	(Willian O. Bearden et al., 2006; G. Hofstede and Bond, 1988)
		STO2	Traditional values are important for me.	
	Long-Term Orientation	LTO1	I work hard for success in the future.	
		LTO2	I plan for the long-term.	

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