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RECEIVED 28 October 2025

REVISED 19 November 2025

ACCEPTED 28 November 2025

PUBLISHED 23 January 2026

CITATION

Carbo Vélez C, González Vázquez KY, Cedillo Pucha MN, Pacheco Olea F and Valenzuela Cobos J (2026) Factors influencing continuity in online education: a replication study in the Ecuadorian university context. *Front. Educ.* 10:1734517. doi: 10.3389/feduc.2025.1734517

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Factors influencing continuity in online education: a replication study in the Ecuadorian university context

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The rapid development of digital technologies has established e-learning as an essential component of modern higher education. In Ecuador, the expansion of online education has created new challenges in terms of student retention and the sustainability of virtual programs. The objective of this study was to identify the factors that influence Ecuadorian university students' intention to continue in virtual environments and to replicate and validate a model previously applied in China. For the empirical analysis, a structured survey was administered to 477 students enrolled in virtual programs at the State University of Milagro during May and June 2025. Data processing was performed using structural equation modeling (SEM), based on the information systems success model and service quality theory. The measurement instrument showed adequate reliability and convergent validity (Cronbach's $\alpha = 0.872$; CR > 0.87; $\sqrt{\text{AVE}} > 0.75$). The results indicate that interactions particularly teacher-student and peer relationships have a significant effect on perceived value and, consequently, on intention to continue, while service quality and course quality play a lesser role in the Ecuadorian context. Overall, the results replicate several patterns described in the Chinese study, although contextual differences suggest that the online education experience in Ecuador is more strongly determined by sociocultural and relational factors. Practical implications include strengthening pedagogical interaction strategies and promoting student-centered methodologies. Future studies should incorporate longitudinal and mixed-method approaches to deepen the understanding of perceived value and continuity of online learning in Latin America.

KEYWORDS

online education, intention to continue, Ecuador, perceived value, service quality

1 Introduction

Online education has established itself as an educational modality with broad benefits for students and teachers, highlighting the flexibility to access materials and lectures from anywhere and at any time (Fatoni et al., 2020). Virtual environments allow for continuous interaction without physical contact, transforming the dynamics of the education sector (Dittler and Kreidl, 2021). This model relies on technological infrastructure, specialized software, and digital connectivity (Clark and Mayer, 2003), creating an innovative environment that promotes the acquisition of knowledge and professional skills (Vlachopoulos et al., 2012). However, gaps remain in terms of teacher self-efficacy and educational quality in virtual contexts.

During the COVID-19 pandemic, around 91% of universities worldwide migrated to online teaching (UNESCO, 2020), accompanied by policies and subsidies to reduce digital divides

(Hongsuchon et al., 2022). Since then, the literature has examined the challenges and opportunities of online education (Vlachopoulos, 2011; La Velle et al., 2020; Quezada et al., 2020), the pedagogical strategies applied (Moorhouse, 2020; Osman, 2020), and the factors that condition its adoption and permanence (Almaiah et al., 2020). Among the most consistent findings, user satisfaction and perceived usefulness stand out as determinants of the intention to continue in virtual environments (Mo et al., 2021; Huang and Zhi, 2023).

However, most of these studies have been conducted in Asian contexts, highlighting the need to validate these models in other cultural and socioeconomic environments. In Ecuador, online education faces challenges related to connectivity and territorial inequality. According to SENESCYT (2023), in 2021, 7.83% of the 756,066 higher education students opted for this modality, with 34.75% concentrated at the State University of Milagro (UNEMI). In 2022, the percentage rose to 11.82%, and in 2023, UNEMI reached 38.2% of the national total, consolidating its position as a leader in online education.

These data reflect the sustained growth of online education in Ecuador and the need to analyze the factors that explain its continuity. Within this framework, this study seeks to replicate and validate the online education continuity model originally tested in China in the Ecuadorian context, evaluating the extent to which its theoretical relationships hold true in different sociocultural and infrastructure conditions.

Based on the above, the following research questions are posed:

- 1 To what extent are the structural relationships proposed in the original Chinese model replicated in the Ecuadorian context?
- 2 Are the hypotheses formulated in the original study valid when applied to Ecuadorian university students?
- 3 What contextual, pedagogical, or sociocultural factors help explain the similarities or deviations from the original model?

To answer these questions, an online survey was administered to 600 students from different provinces of Ecuador, obtaining 477 valid responses during May and June 2025. The analysis was carried out using the Structural Equation Modeling (SEM) approach.

The study is structured into five main sections. Section 2 presents a review of the literature, setting out the theoretical and conceptual foundations related to online education, the success model for information systems, course quality, online service quality, interaction in online learning, perceived value, and intention to continue. Section 3 presents the nine hypotheses formulated and the research model designed to identify the factors that influence students' motivation to continue in online education environments. It also details the design of the questionnaire, its content, and the data analysis procedures, along with the results obtained in the hypothesis testing. Section 4 is devoted to the discussion of the findings, while Section 5 addresses the implications of the study, also pointing out its limitations and possible lines of future research.

2 Literature review

2.1 Online education

Online education has established itself as an essential modality in higher education, enabling both synchronous and asynchronous

teaching and learning experiences (Fatoni et al., 2020; Zhao et al., 2020). Unlike e-learning, which includes various media such as television or radio, online education refers specifically to educational processes mediated by the Internet (Panigrahi et al., 2018; Singh and Thurman, 2019).

In this context, interaction has been identified as a determining factor for student acceptance, engagement, and retention (Dittler and Kreidl, 2021). Recent studies show that interactivity increases the perception of telepresence and enriches the virtual experience, constituting a key antecedent in the adoption of online learning.

2.2 Information systems success model

The information systems (IS) success model proposed by DeLone and McLean (2003) is one of the most widely used frameworks for evaluating online education platforms. This model considers six dimensions: system quality, information quality, service quality, usage, user satisfaction, and net benefits (Yang et al., 2017).

System quality assesses technical effectiveness in terms of ease of use, functionality, and reliability; information quality assesses accuracy, relevance, and consistency; while service quality refers to the support received, including empathy and responsiveness (Chung et al., 2015).

Several studies have expanded this model, integrating it with theories such as TAM, ECM, or technological continuity to explain student behavior in virtual environments (Aldholay et al., 2018). In this way, the IS success model becomes a solid basis for analyzing both the technical and environmental dimensions that influence the continuity of online learning.

2.3 Course quality

Course quality is one of the most influential elements in the learning experience. In MOOCs, content personalization and specific student support have been identified as factors that positively impact motivation and satisfaction (Gardner and Brooks, 2018; Schmid and Petko, 2019).

Quality Matters (QM) standards highlight dimensions such as learning objectives, teaching materials, interactive activities, appropriate technology, and balanced workload, all of which contribute directly to the perception of course quality (Sadaf et al., 2019; Wang et al., 2021). Likewise, teacher empathy has been identified as a critical variable in virtual teaching, given that it is more difficult to convey affection and passion for the subject compared to face-to-face teaching (Cartee, 2021).

2.4 Online service quality

Service quality has been extensively studied under the SERVQUAL model (Pham et al., 2019), which includes dimensions such as reliability, assurance, empathy, tangibility, and responsiveness. In online education, these dimensions have been adapted to the provision of teaching and technological services through virtual platforms.

Research has shown that service quality has a direct impact on satisfaction and intention to continue (Pham et al., 2019). Factors such

as ease of use, security, timeliness of information delivery, accessibility, personalization, and credibility are decisive in students' perceptions (Jung, 2011).

Complementarily, recent studies emphasize that both the quality of the system and the quality of information and service must be integrated into a common framework to explain the student experience in hybrid or virtual environments (DeLone and McLean, 2003).

2.5 Interaction in online education

Interaction is a multifaceted and essential construct in online education, directly influencing the quality and effectiveness of the learning process. Garrison and Shale (1990) state that education, in essence, is an interaction between instructor, student, and content, while Moore et al. (2011) distinguish three main types: student-student (SS), student-instructor (SI), and student-content (SC) (Abrami et al., 2012).

Although there is no single definition, interaction is characterized by the exchange of information and opinions between individuals (Alqurashi, 2019; Baber, 2022). Its importance is heightened in virtual environments, where it guarantees the quality and effectiveness of learning (Anderson, 2003; Dittler and Kreidl, 2021).

SI interaction is highly valued for offering academic, organizational, and emotional support (Martin and Rimm, 2015). SC depends on the student's internal motivation; and SS fosters collaboration and a sense of community (Li et al., 2021).

Recent studies show that interaction has a positive impact on satisfaction and intention to continue, acting as a mediating variable between perceived quality and student engagement (Hone and El Said, 2016; Liu and Pu, 2023).

2.6 Perceived value

Perceived value is a key factor in service evaluation (Adedoyin and Soykan, 2023) and is considered a better predictor of consumer behavior than satisfaction, especially in terms of repurchase or continuity intention (She et al., 2021). In online learning, it is linked to interaction, the usefulness of feedback, course design, and the resources offered (Feitosa et al., 2021; Qi et al., 2023). Several studies argue that satisfaction, analyzed in isolation, is limited, as only when combined with perceived value does it allow us to understand users' subsequent decisions. This is defined as the subjective assessment of the benefits obtained in relation to the costs or efforts invested (Adedoyin and Soykan, 2023) and explains the intention to continue with online education more accurately than satisfaction (She et al., 2021).

Perceived value is shaped by multiple dimensions (interaction, feedback, design, and resources) (Qi et al., 2023). and studies in Pakistan (Younas et al., 2022), Korea (Rivers, 2023), and the United Kingdom show that higher levels of satisfaction and perceived value are associated with greater commitment and academic performance. Consequently, the assessment of online education is a complex process influenced by the student's environment and conditions, reinforcing the need to analyze perceived value as a central component of the educational experience (Rivers, 2023).

2.7 Intention to continue

According to Bhattacharjee (2001), intention to continue (IC) in online education has been extensively researched for its role as a key predictor of sustained use of digital educational systems (Bhattacharjee, 2001; Clark and Mayer, 2003). This author distinguished between initial acceptance and continued use of a technology, noting that the motivations that explain adoption differ from those that underpin permanence. Since then, CI has been analyzed in various technological contexts, such as electronic banking, digital commerce, mobile applications, social networks, and online education (Roca and Gagné, 2008; Cheung et al., 2015; Dağhan and Akkoyunlu, 2016).

In this field, the most widely used theories to explain continuity are the Technology Acceptance Model (TAM), the Expectancy Confirmation Model (ECM), and the Information Systems Success Model (IS). Various studies have combined or extended them to overcome their limitations. For example, Lee (2010) integrated the ECM, the TAM, the Theory of Planned Behavior (TPB), and flow experience to analyze the factors of continued use. The ECM proposes that satisfaction, expectation confirmation, and post-adoption evaluation determine permanence on digital platforms (Clark and Mayer, 2003; Li et al., 2021).

Overall, research on CI in online education converges on three critical dimensions: technological quality (system, service, and information), interaction between educational actors, and perceived student value (Dağhan and Akkoyunlu, 2016), factors that explain retention, satisfaction, and sustained commitment to online education (Kang and Park, 2022; Huang and Zhi, 2023).

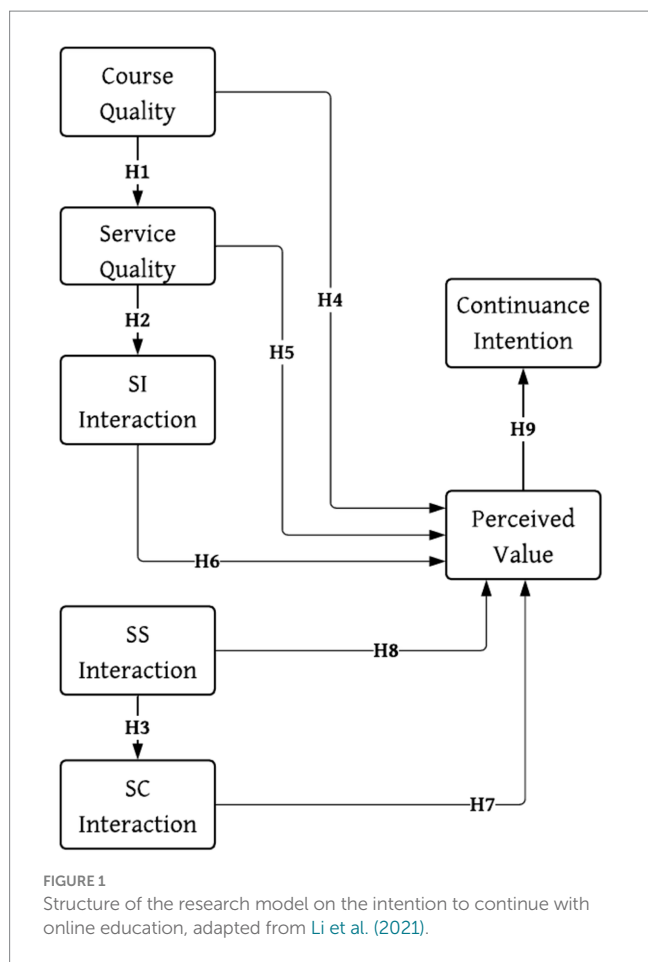
3 Research methodology

3.1 Research model

Based on the theoretical approaches reviewed in the Literature Review, particularly the information systems (IS) success model and interaction theory, a research model comprising nine hypotheses was developed. These hypotheses replicate those proposed in the original study conducted in China and establish relationships between key variables: service quality (SQ), course quality (CQ), interactions [student-instructor (SII), student-content (SCI), and student-student (SSI)], perceived value (PV), and intention to continue (CI) in online education (Figure 1). The objective of this model is to evaluate whether the theoretical structure validated in the Chinese context is also valid in the field of Ecuadorian higher education.

3.2 Research hypothesis

Following international evidence, especially the original study conducted by Li et al. (2021), this paper replicates their theoretical model to assess whether the effects identified in China hold true in the Ecuadorian context. In the original model, both course quality and service quality play a decisive role in satisfaction and intention to continue in online education environments. Therefore, this study fully adopts the Information Systems (IS) Success Model, maintaining the



conceptual structure and relationships proposed in the reference research.

Within this model, course quality is conceived as an indicator of the level of excellence of e-learning, while information quality refers to the accuracy, relevance, and usefulness of the content (Molla and Licker, 2001; DeLone and McLean, 2003; Saeed et al., 2003). Following the same adaptation made by Li et al. (2021), this replication replaces the dimension “information quality” with “course quality” in order to emphasize the pedagogical components of instructional design.

Parasuraman et al. (1985) argued that service quality continues to be a relevant predictor of behavioral intentions. Consistent with this replicated theoretical structure, the hypothesis that course quality has a positive effect on service quality (H1) is maintained, along with the rest of the hypotheses from the original model.

Hypothesis 1 (H1): Course quality has a positive effect on service quality.

In online education environments, interaction between educational actors is central to building meaningful and sustainable experiences. Various authors have pointed out that the link (SI) is one of the most decisive forms of interaction, as it is the main source of guidance, support, and feedback that guides the training process (Wong and Chapman, 2023). However, the effectiveness of this interaction depends largely on the quality of the service provided by learning platforms, which encompasses technical, communicative,

and administrative dimensions that support the dynamics of virtual teaching (Limbu and Pham, 2023). An efficient service, characterized by its responsiveness, technological stability, and timely pedagogical support, promotes more fluid and effective interactions between students and instructors. In this sense, it can be argued that service quality acts as a key facilitator of communicative exchange in the digital environment, which supports the hypothesis that a higher level of service quality has a positive impact on student-instructor interaction.

Hypothesis 2 (H2): Service quality has a positive effect on student-instructor interaction (SI).

Technological innovations allow us to rethink and expand the modes of interaction in online education environments. In particular, the study by Pandita and Kiran (2023) suggests that a robust technological interface that includes digital infrastructure, quality electronic content, and technology-assisted facilities acts as a key stimulus to foster student engagement through the mediation of interaction.

This technological commitment translates into activities that are more focused on content and active learning, which can strengthen interaction (SC). Based on this logic, interaction (SS), facilitated by collaborative tools or interactive technological platforms, catalyzes a cognitive process of joint construction that then fosters a deeper relationship with educational materials. In line with this reasoning, we reiterate the hypothesis that greater interaction between students leads to improved interaction (SC).

Hypothesis 3 (H3): Student-student interaction (SS) positively influences student-content interaction (SC).

In the specific context of online education, when students choose a virtual course, its quality plays a decisive role: it not only influences their initial decision, but also whether they continue or drop out of the course over time. As the perception of quality improves, it is expected that the value perceived by students will also increase, which favors their motivation and retention in the course. Therefore, the following hypothesis is proposed

Hypothesis 4 (H4): Course quality has a positive effect on the value perceived by students.

In online education environments, the quality of educational services is considered an essential element that directly influences the value perceived by students. When the services offered by institutions, such as teaching support, technical support, availability of materials, and academic guidance, exceed expectations, students tend to rate their educational experience more positively (Hapsari et al., 2017). Various studies have confirmed a positive and significant relationship between the quality of educational services and perceived value in digital contexts (Wang and Chiu, 2011; Kilburn et al., 2014; Yokiman et al., 2021).

These studies show that proper management of online education services not only improves the perception of value but also increases satisfaction, trust, and the intention to continue using online education platforms. In this sense, it is proposed that higher quality educational services in virtual environments favor the perception of

usefulness and the overall student experience, strengthening their commitment and retention in the educational process.

Hypothesis 5 (H5): Service quality has a positive impact on perceived value.

Various studies agree that interaction in virtual environments positively influences the value perceived by students. (SI) interaction strengthens satisfaction and perceived learning by providing support and effective feedback (Kang and Im, 2013; Robertson et al., 2021). (SC) interaction improves self-efficacy and performance, increasing course evaluation (Zhang and Vongurai, 2025). For its part, (SS) interaction fosters a sense of community and satisfaction with learning (Sher, 2009; El Moussaddar et al., 2025). Taken together, these findings demonstrate that all three forms of interaction contribute significantly to increasing the perceived value of online education, which is why the following hypotheses are proposed:

Hypothesis 6 (H6): Student-instructor (SI) interaction has a positive effect on perceived value.

Hypothesis 7 (H7): Student-content (SC) interaction has a positive effect on perceived value.

Hypothesis 8 (H8): SS interaction has a positive effect on the value perceived by students.

Several studies have shown that the value perceived by students significantly influences their intentions to continue with online learning. For example, research in the field of higher education has shown that student satisfaction, influenced by perceived value, is a key predictor of the intention to continue using online education platforms (Nugroho et al., 2019). These findings suggest that when students perceive high value in their online education experience, whether due to the quality of the content, interaction with instructors, or the usefulness of the platform, they are more likely to decide to continue participating in such educational environments.

Hypothesis 9 (H9): Perceived value positively influences students' intentions to continue in the online course.

3.3 Data collection

The questionnaire developed by Li et al. (2021), consisting of seven constructs and 27 items, adapted to the Ecuadorian context, was used to collect information. The sample frame corresponded to students enrolled in UNEMI's online education programs during the 2024–2025 period.

Recruitment was carried out by sending invitations through the institutional Learning Management System (LMS), which ensured that only active students in virtual programs had access to the instrument. Consequently, the study was based on an intentional non-probabilistic sampling, targeting exclusively this population and without public access, thus avoiding the nature of an open survey.

The inclusion criteria were:

- a being enrolled in a fully virtual program and

- b having previous experience in online education.

The questionnaire was administered online using the Google Forms platform between May and June 2025, ensuring accessibility and confidentiality. A total of 477 complete and valid responses were collected. All items were answered using a five-point Likert scale, ranging from “Strongly disagree” (1) to “Strongly agree” (5).

Since the database used in the original study was not available, this data collection process was designed independently for the Ecuadorian context. Therefore, although the instrument remained the same as in the Chinese study, the sampling was not parallel or coordinated between the two countries. This methodological decision is in line with the purpose of conducting a conceptual replication of the study, allowing us to evaluate whether the findings reported in the Chinese context are also observed in an Ecuadorian university population.

3.4 Translation and cultural adaptation of the instrument

Given that the original questionnaire was developed in English and validated in a different cultural context, a systematic process of translation and cultural adaptation was carried out following the recommendations of Fuentes Cabrera et al. (2020). This process was developed by the Language Department of the State University of Milagro.

- a Direct translation: Two teachers specializing in English language teaching independently translated the instrument into Spanish. Both versions were compared and unified into a consensus version, ensuring semantic equivalence with the original questionnaire.
- b Back-translation: A third teacher, an expert in applied linguistics who was not involved in the initial process, performed a back-translation from Spanish to English. This version was compared with the original instrument to identify conceptual or terminological discrepancies.
- c Review by an expert committee: A committee made up of three academics from the fields of education, methodology, and educational technology reviewed the translation process, resolving discrepancies and adjusting expressions to ensure conceptual consistency and cultural appropriateness. Minor adjustments were made without modifying the factorial structure of the instrument.
- d Preliminary validation: After applying the questionnaire to the total study sample, the psychometric quality of the adapted version was evaluated using Confirmatory Factor Analysis (CFA), which allowed for verification of its validity and reliability in the Ecuadorian context.

3.5 Data analysis

The data analysis was carried out in two complementary stages. First, descriptive statistics were applied to characterize the sample profile and obtain an overview of response trends using measures of frequency, percentage, and central tendency. These procedures were

carried out using SPSS (Statistical Package for the Social Sciences) software.

In the second stage, inferential techniques were applied to evaluate the reliability and validity of the instrument. Given the sample size ($n \geq 9$ per item), an Exploratory Factor Analysis (EFA) was performed following the recommendations of (Hair et al., 2014). Subsequently, a Confirmatory Factor Analysis (CFA) was performed in IBM SPSS AMOS v23 to examine the convergent validity, discriminant validity, and significance of the structural coefficients.

Structural Equation Modeling (SEM) was used to validate the measurement model, a technique that allows for the simultaneous evaluation of the internal consistency and validity of the proposed model (Srinivasan et al., 2020). RStudio v2025.05.0 was used to calculate composite reliability (CR) and Cronbach's alpha (CA) as indicators of internal consistency, while Average Variance Extracted (AVE) was used to assess convergent validity according to the criteria of Fornell and Larcker (Humbani and Wiese, 2019).

Since the database used in the original study was not available, this data collection process was designed independently for the Ecuadorian context. Therefore, although the instrument remained the same as in the Chinese study, the sampling was not parallel or coordinated between the two countries. This methodological decision is in line with the purpose of conducting a conceptual replication of the study, allowing us to evaluate whether the findings reported in the Chinese context are also observed in an Ecuadorian university population.

4 Results and discussion

4.1 Sample characteristics

A total of 600 questionnaires were distributed, of which 477 were valid, achieving a response rate of 79.5%, considered acceptable according to Fincham (2008) methodological criteria. Table 1 presents the demographic profile of the participants. Of the total number of respondents, 49.48% were men and 50.52% were women, proportions that are consistent with official statistics from SENESCYT (2023), which report a higher female participation in the online modality of the State University of Milagro (70.93% women and 29.07% men).

In terms of age, participants between 18 and 25 years old constituted the largest group, followed by those between 26 and 35 years old, showing that the university population in virtual environments is mainly made up of young adults. There was also a significant representation of students between the ages of 36 and 45, suggesting a significant presence of working professionals who combine study and work, a common feature of online education. In terms of occupation, 49.48% were students, followed by teachers (19.29%), and other groups in smaller proportions. This composition reveals a heterogeneous sample, unlike traditional studies on student perception, which generally focus on conventional undergraduate students.

The presence of adults with professional experience, as well as teacher-students, may influence how interaction, the value of learning, and the use of virtual tools are perceived. Participants with greater academic maturity or work experience tend to have higher levels of autonomy, clearer educational expectations, and a tendency to value interaction based on its practical applicability.

Additionally, information was collected on the weekly time spent on online activities, with the purpose of contextualizing the

TABLE 1 Profile of respondents.

	Frequency	Percentage %
Gender		
Male	236	49.48
Female	241	50.52
Age (years)		
18–25	143	29.98
26–35	137	28.72
36–45	102	21.38
46–55	72	15.09
> 56	23	4.82
Occupation		
Teacher	92	19.29
Employee	47	9.85
Student	236	49.48
Other	29	6.08
Professional	73	15.30
Weekly learning time		
1–5 h	105	22.01
6–10 h	119	24.95
11–15 h	125	26.21
16–20 h	128	26.83

participants' level of experience and digital exposure within the online education environment.

4.2 Reliability and validity of the instrument

The questionnaire consisted of 27 items grouped into seven constructs: (CQ), (SQ), (SSI), (SII), (SCI), (PV), and (CI) (Table 2). La Figure 2 shows the measurement model used to perform the analysis in AMOS (version 23). This model allows us to test the hypotheses regarding the factors that influence students' intention to continue with online education in Ecuador.

Internal reliability was assessed using (CA), (CR), and (AVE). The results (Table 3) show α and CR values above 0.88 and AVE values above 0.69, confirming adequate internal consistency and convergent validity (Kline, 2016; Hair et al., 2021).

Although both coefficients reflect internal consistency, in analyses based on Structural Equation Models (SEM) at the construct level, it is considered more appropriate to use composite reliability than Cronbach's alpha (Hair and Gómez, 2010).

On the other hand, the R^2 values obtained for the endogenous variables show low levels, ranging between 0.00 and 0.065. This indicates that, within the Ecuadorian context, the predictors included in the original model explain a limited proportion of the variance of the dependent constructs. The low explanatory power suggests the presence of contextual differences with respect to the model applied in Asian settings, particularly in the determinants of interaction, perceived value, and intention to continue.

TABLE 2 Measurement instrument.

Constructs	Items	Questions
Course Quality (CQ)	CQ1	The online education service provides the courses I need.
	CQ2	The online education service offers courses that could help me improve my skills.
	CQ3	The online education service offers courses that are easy to understand.
	CQ4	The online education service offers courses that demonstrate high reliability.
	CQ5	The online education service offers comprehensive and accurate courses.
Service Quality (SQ)	SQ1	The online education system helps me acquire knowledge more efficiently.
	SQ2	The online education system provides excellent service to users.
	SQ3	The online education system can provide a quick response to my questions.
Interaction SS (SSI)	SSI1	I can communicate with my classmates quickly and easily.
	SSI2	Most of the time, I can communicate with my classmates about professional knowledge.
	SSI3	I communicate frequently with fellow students in online learning.
	SSI4	I maintain a close relationship with my classmates in online learning.
Interaction SI (SII)	SII1	I interact frequently with instructors during online classes.
	SII2	I can get quick feedback from instructors.
	SII3	Puedo obtener retroalimentación rápida de los instructores.
	SII4	I can easily communicate with instructors through online learning.
	SII5	Instructors provide professional instruction to advise students.
Interaction SC (SCI)	SCI1	The online educational system helps me understand the learning content more deeply.
	SCI2	The online education system prompts me to preview and review the learning content on time.
	SCI3	The online education system inspires my enthusiasm for acquiring knowledge.
Perceived Value (PV)	PV1	I find the online education system useful for improving my skills and knowledge.
	PV2	The online education system plays an important role in the learning process.
	PV3	Through the online education system, I achieved what I set out to do with this course.
	PV4	I use the online education system to acquire knowledge more efficiently compared to traditional forms of learning.
Intention to Continue (CI)	CI1	I will continue to take online courses in the future.
	CI2	I will recommend others to take online education courses in the future.
	CI3	will take online courses frequently in the future.

4.3 Evaluation of the structural model

In the structural model analysis, both the goodness of fit and the overall explanatory power of the proposed model were examined (Table 4).

The value of CMIN/DF (1.374) and RMSEA (0.028) indicate an adequate correspondence between the theoretical model and the observed data. The CFI (0.987), NFI (0.955), TLI (0.986), and IFI (0.987) values are within the recommended thresholds, demonstrating a high quality of incremental fit. In addition, the PCFI (0.886) and GFI (0.937) indices confirm a parsimonious and globally well-fitted model. Taken together, these results validate the robustness and statistical adequacy of the proposed model.

4.4 Discriminant validity of the model

Discriminant validity was verified using the method proposed by Fornell and Larcker (1981), which establishes that the square root of the (AVE) of each construct must be greater than the correlations between that construct and the others. This result can be seen in

Table 5, where the values on the diagonal exceed those in the corresponding rows and columns, showing that each construct shares greater variance with its own indicators than with those of other constructs.

In addition, (EFA) Table 6, using the principal component method and Varimax rotation with Kaiser normalization, aimed to verify that each item loaded significantly on its theoretical construct and that cross-loadings on other factors were minimal, reinforcing the conceptual independence between the dimensions analyzed.

These results support satisfactory discriminant validity, as the items clearly and distinctly measure the theoretical dimensions proposed. Additionally, high loadings (>0.80) show adequate convergent validity, indicating that the items within each construct share a high common variance (Hair et al., 2021).

4.5 Structural model results

The results of the hypothetical relationships Table 7 show that course quality ($\beta = 0.142$, CR = 2.703, $p = 0.007$) has a positive

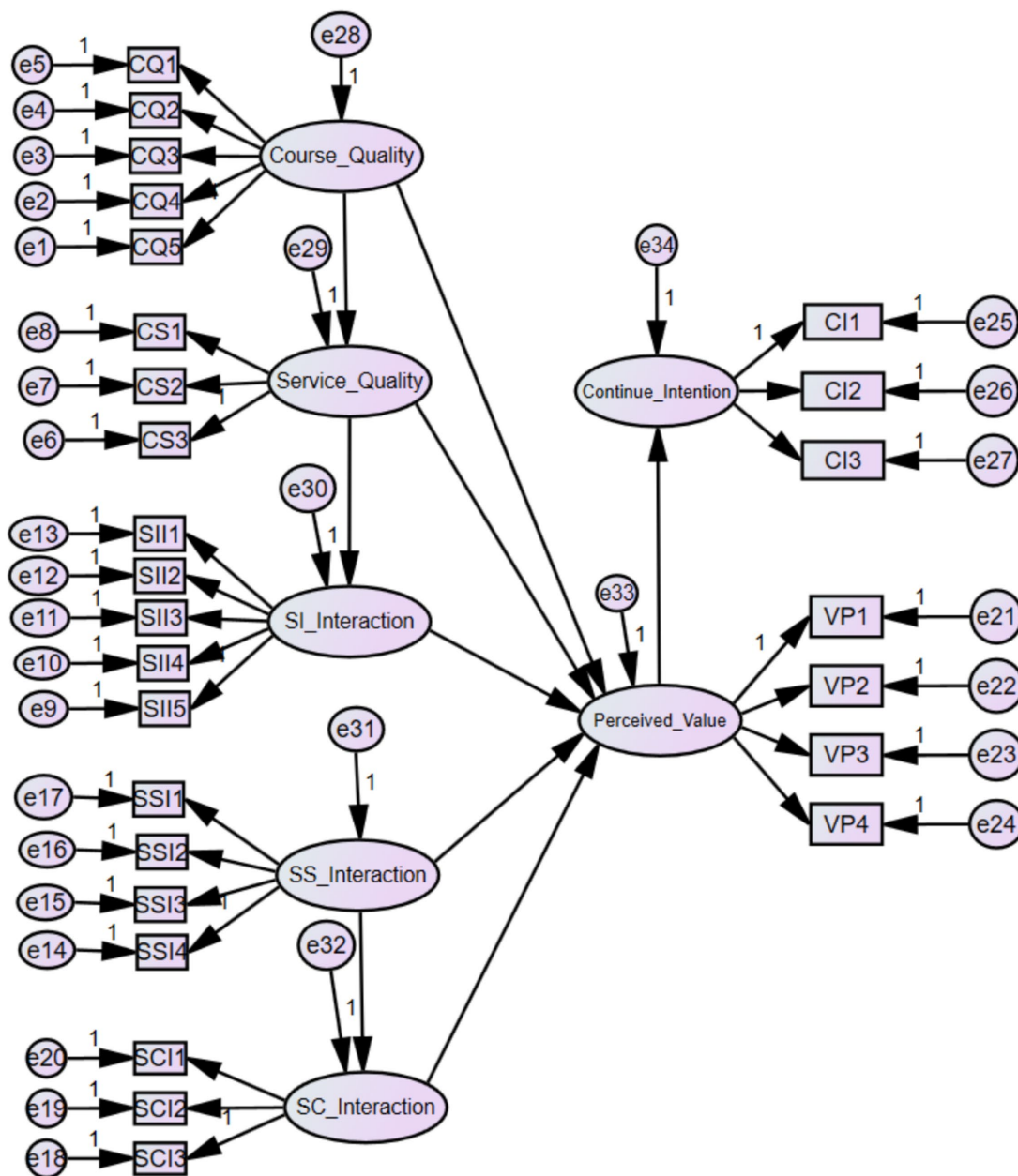


FIGURE 2 Measurement model.

and significant impact on service quality, supporting (H1). This finding coincides with previous studies where the quality of academic content affects the perception of overall educational service (Chen et al., 2019).

For its part, (SQ) ($\beta = 0.184$, $CR = 3.600$, $p < 0.001$) has a positive and highly significant impact on (SII), confirming (H2). Likewise, (SSI) ($\beta = 0.227$, $CR = 4.303$, $p < 0.001$) has a positive and significant effect on interaction with the course system, supporting (H3), which confirms that the perceived quality of the virtual environment promotes collaboration and engagement. This pattern is in line with research that highlights the importance of social interaction and teacher support in online education (Sun et al., 2008; Al-Fraihat et al., 2020).

In terms of perceived value, the results indicate that course quality ($\beta = 0.065$, $CR = 1.256$, $p = 0.209$) and service quality ($\beta = 0.043$, $CR = 0.829$, $p = 0.407$) have positive effects, but not significant in the Ecuadorian context, unlike what was reported in China (Li et al., 2021), which is a theoretically relevant finding: it suggests that, in this population, the construction of perceived value does not depend primarily on technical or course design attributes, but rather on relational and contextual factors.

However, student-instructor interaction ($\beta = 0.135$, $CR = 2.717$, $p = 0.007$), interaction with the course system ($\beta = 0.102$, $CR = 2.227$, $p = 0.026$), and interaction between students ($\beta = 0.142$, $CR = 2.850$, $p = 0.004$) have positive and significant impacts on perceived value, confirming Hypotheses 6,

TABLE 3 Internal reliability of the measurement instrument.

Construct	Items	Factor Loading	AVE	CR	CA	R ²
CI	CI1 ← CI	1.000	0.765	0.907	0.907	0.25
	CI2 ← CI	0.973				
	CI3 ← CI	0.922				
CQ	CQ1 ← CQ	1.021	0.696	0.920	0.920	0.000
	CQ2 ← CQ	1.037				
	CQ3 ← CQ	0.975				
	CQ4 ← CQ	1.030				
	CQ5 ← CQ	1.000				
PV	PV1 ← PV	1.000	0.741	0.920	0.919	0.65
	PV2 ← PV	0.962				
	PV3 ← PV	0.992				
	PV4 ← PV	0.956				
SCI	SCI1 ← SCI	0.976	0.811	0.928	0.926	0.044
	SCI2 ← SCI	0.893				
	SCI3 ← SCI	1.000				
SII	SII1 ← SII	0.992	0.693	0.919	0.918	0.033
	SII2 ← SII	0.929				
	SII3 ← SII	0.957				
	SII4 ← SII	0.923				
	SII5 ← SII	1.000				
SQ	SQ1 ← SQ	0.980	0.725	0.888	0.888	0.019
	SQ2 ← SQ	1.000				
	SQ3 ← SQ	1.000				
SSI	SSI1 ← SSI	1.010	0.762	0.927	0.927	0.000
	SSI2 ← SSI	1.016				
	SSI3 ← SSI	1.005				
	SSI4 ← SSI	1.000				
Cronbach's Alpha α			0.872			

AVE, average variance extracted; CR, composite reliability; CA, Cronbach's alpha, R² (endogenous).

7, and 8, respectively, indicating that in the Ecuadorian context, perceived value is mainly nourished by relational and communicative quality, rather than by the technical attributes of the course. Finally, the results confirm that perceived value ($\beta = 0.166$, $CR = 3.208$, $p = 0.001$) has a positive and significant effect on the intention to continue, which supports Hypothesis 9, confirming that the perception of value motivates permanence in digital learning environments (Nugroho et al., 2019). These patterns can be explained by socio-cultural and structural factors, conditions that favor an assessment of learning focused on support, flexibility, and human relationships rather than technical efficiency (Pérez et al., 2020; UNESCO, 2023). Consequently, we propose that future research consider the incorporation and validation of alternative constructs (e.g., “socio-formative value,” “perceived teacher support,” or “contextual relevance”) and the development of culturally situated theoretical models, rather than assuming the universality of operationalizations of “value” derived from technologically consolidated contexts.

4.6 Comparison of results between China and Ecuador

Table 8 presents a comparison of the structural coefficients between the original study conducted in China and its replication in Ecuador. Although both models confirm the overall validity of the theoretical framework, there are significant differences in the intensity and direction of some effects. These variations reflect not only technological divergences, but also profound differences in educational practices, cultural values, and socioeconomic conditions that characterize both contexts.

4.6.1 Contextual and cultural interpretation of differences

Although course quality significantly influences service quality in both countries (H1), the effect is much weaker in Ecuador. This difference can be understood based on the characteristics of the Latin American education system, where historical gaps in digital

TABLE 4 Indicadores de bondad de ajuste del modelo.

Measures of Fit	Indices	Value	Recommended Values
Discrepancy measurement	CMIN/DF	1.374	(<2)
	Root Mean Square Error of the Approximation (RMSEA)	0.028	(0–0.1)
Incremental adjustment measures	Comparative Fit Index (CFI)	0.987	[0.9–1]
	Normed Fit Index (NFI)	0.955	[0.9–1]
	Tucker-Lewis Index (TLI)	0.986	(0.9–1)
	Incremental Fit Index (IFI)	0.987	(0.9–1)
Parsimony-adjusted and related measures	Parsimony-Adjusted Measures (PCFI)	0.886	(0.5–1)
	Foodness-of-Fit Index (GFI)	0.937	(0.9–1)

TABLE 5 Discriminant validity according to the Fornell–Larcker criterion.

Constructo	CQ	SQ	SSI	SII	SCI	PV	CI
CQ	0.875						
SQ	0.146	0.834					
SSI	0.203	0.218	0.861				
SII	0.207	0.196	0.209	0.900			
SCI	0.216	0.261	0.223	0.168	0.832		
PV	0.146	0.134	0.219	0.206	0.189	0.873	
CI	0.145	0.227	0.185	0.220	0.160	0.169	0.851

The values in bold correspond to the square root of the AVE for each construct.

infrastructure and less standardization of online education environments persist (CEPAL, 2020). In these contexts, the perception of service does not depend solely on the formal design of the course, but also on the institutional capacity to solve technical problems, provide continuous support, and offer personalized pedagogical support.

Similarly, the effects of SQ → SII (H2) and SSI → SCI (H3) were consistent but weaker in Ecuador. This can be explained by the fact that, in many Latin American universities, online education is still in a process of consolidation, with varying levels of teacher training and students who alternate their education with work and family responsibilities. This is reflected in the sample of the present study, where almost 70% of the participants are practicing professionals, which generates different expectations regarding interaction, flexibility, and institutional support.

4.6.2 Contrasting cultural patterns: technical factors vs. relational factors

One of the most notable differences is that, while in China Perceived Value is strongly determined by technical factors (Course

TABLE 6 Principal component method and Varimax rotation with Kaiser normalization.

	CQ	SQ	SSI	SII	SCI	PV	CI
CQ1	0.875						
CQ2	0.869						
CQ3	0.831						
CQ4	0.875						
CQ5	0.850						
SQ1							0.878
SQ2							0.888
SQ3							0.895
SSI1			0.892				
SSI2			0.890				
SSI3			0.893				
SSI4			0.884				
SII1		0.870					
SII2		0.843					
SII3		0.846					
SII4		0.835					
SII5		0.884					
SCI1					0.924		
SCI2					0.891		
SCI3					0.926		
PV1				0.899			
PV2				0.883			
PV3				0.887			
PV4				0.875			
CI1						0.911	
CI2						0.901	
CI3						0.898	

Quality and Service Quality), in Ecuador relational dimensions linked to social interactions (SII, SSI, SCI) are more relevant.

This result is consistent with previous findings in Latin American literature and with decolonial approaches that point out that pedagogies in Latin America are based on a culture of interaction, collective construction, and human support (Walsh, 2017; Pérez et al., 2020). In these frameworks, learning is not reduced to technological efficiency, but integrates affective, collaborative, and community dimensions that directly influence the perception of educational value.

In contrast, studies conducted in East Asia show that the continent’s education systems prioritize discipline, performance, and technical efficiency, which makes students value attributes related to the quality of the system and content more highly (Hofstede, 2013; Kim and Kim, 2021). This explains why Chinese coefficients associated with CQ and SQ are higher.

4.6.3 Socioeconomic factors and digital access gaps

The lower magnitude of structural relationships in Ecuador may also be associated with the connectivity gaps that characterize the

TABLE 7 Structural coefficient estimates.

#Hypothesis	Relationship	Estimate (β)	S. E.	C. R.	P
H1	Service_Quality \leftarrow Course_Quality	0.142	0.053	2.703	0.007
H2	SI_Interaction \leftarrow Service_Quality	0.184	0.051	3.600	***
H3	SC_Interaction \leftarrow SS_Interaction	0.227	0.053	4.303	***
H4	Perceived_Value \leftarrow Course_Quality	0.065	0.052	1.256	0.209
H5	Perceived_Value \leftarrow Service_Quality	0.043	0.052	0.829	0.407
H6	Perceived_Value \leftarrow SI_Interaction	0.135	0.050	2.717	0.007
H7	Perceived_Value \leftarrow SC_Interaction	0.102	0.046	2.227	0.026
H8	Perceived_Value \leftarrow SS_Interaction	0.142	0.050	2.850	0.004
H9	Continue_Intention \leftarrow Perceived_Value	0.166	0.052	3.208	0.001

*** Statistical significance.

TABLE 8 Comparison of structural coefficients from the study conducted in China and Ecuador.

#H	Structural relationship	β (China)	Sig.	β (Ecuador)	Sig.	Coincidence
H1	SQ \leftarrow CQ	0.805	***	0.142	0.007	Same direction, lower intensity in Ecuador
H2	SII \leftarrow SQ	0.599	***	0.184	***	Same direction, weaker effect
H3	SCI \leftarrow SSI	0.829	***	0.227	***	Same direction, weaker effect
H4	PV \leftarrow CQ	0.289	0.004	0.065	0.209	Significant only in China
H5	PV \leftarrow SQ	0.300	0.009	0.043	0.407	Significant only in China
H6	PV \leftarrow SII	0.306	***	0.135	0.007	Same direction, weaker effect
H7	PV \leftarrow SCI	0.062	0.590	0.102	0.026	Significant only in Ecuador
H8	PV \leftarrow SSI	-0.006	0.955	0.142	0.004	Significant only in Ecuador
H9	CI \leftarrow PV	0.827	***	0.166	0.001	Same direction, weaker effect

*** Statistical significance.

region. According to UNESCO (2023), unstable Internet access, dependence on mobile phones as the primary device, and variability in digital literacy limit the online education experience and condition the way students evaluate virtual systems.

5 Conclusion

The results indicate that the theoretical model originally developed in the Chinese context remains partially valid in the Ecuadorian case, although with differences in the intensity of the relationships between the constructs. In both countries, CQ positively influences SQ, and SQ positively influences Student Interactions, confirming the soundness of the educational service quality framework and the foundations of the information systems success model.

However, (PV) behaves differently: in Ecuador, it is configured as a social and relational dimension, mediated mainly by teacher-student interaction, rather than by the technical quality of the course or service. This reflects a contextual adaptation of the model, where affective and communicative factors are decisive in explaining (CI) in virtual environments.

In summary, although the conceptual structure of the model remains the same, its explanatory power varies according to the

sociocultural, institutional, and technological conditions of the Ecuadorian education system. Perceived value acts as a link between the quality of the virtual environment and academic continuity, highlighting the role of teacher support and social cohesion as pillars of sustainable online learning.

5.1 Theoretical implications

From a theoretical perspective, this study provides empirical evidence that expands the original model of retention in online education proposed in the Asian context, demonstrating that its structure can be adapted to Latin American contexts by incorporating social interaction variables.

The results confirm the validity of the quality-value-intention approach, but suggest that perceived value is not a universally technical construct, but is affected by the culture of collaborative learning and expectations of pedagogical closeness.

Consequently, this work contributes to the theoretical body of intercultural online learning, proposing a more integrative view of educational value, which combines functional (quality) and relational (interaction, teacher support) dimensions. This finding complements previous models of information system success, adding a social nuance relevant to universities in developing countries.

5.2 Practical implications

From an applied perspective, the findings of this study offer strategic guidance for Ecuadorian higher education institutions seeking to strengthen student retention in online education programs. First, there is a clear need to enhance teacher-student and peer interaction by designing pedagogical strategies that promote two-way communication, active collaboration, and a sense of academic community. These elements contribute to reinforcing the perception of support, belonging, and commitment, which are determining factors in student retention. It also proposes a reconceptualization of the quality of educational service, transcending the purely technological aspects of the platform to incorporate dimensions associated with institutional efficiency, timely feedback, and continuous pedagogical guidance. Such components strengthen student satisfaction and consolidate their confidence in the online education experience.

Similarly, it is recommended that courses be designed based on active, student-centered methodologies that promote guided autonomy, social presence, and intrinsic motivation in digital environments. Finally, the importance of teacher training in digital skills, empathic communication, and emotional management of online education is emphasized, given that human connection emerges as an essential axis for building meaningful and sustainable pedagogical relationships.

5.3 Limitations of the study

Despite the theoretical and empirical contributions of this study, it is necessary to acknowledge certain limitations that condition the scope of the results. First, the research was based on a non-probabilistic sample of Ecuadorian university students, which restricts the external validity and generalizability of the findings. Second, data collection through self-reporting may have introduced biases of social desirability or subjective interpretation, partially affecting the accuracy of the responses. Likewise, the proposed structural model did not consider relevant contextual variables, such as student digital competence, level of institutional support, or quality of technological infrastructure, which could significantly influence the perception of value and intention to continue. Consequently, the results should be interpreted with caution, recognizing that they represent a contextual and exploratory approach to the phenomenon analyzed.

5.4 Future lines of research

Based on the limitations identified, various directions for future research are proposed to broaden and deepen understanding of the model. First, it is relevant to develop longitudinal studies that enable analysis of the evolution of perceived value and intention to continue over time, providing evidence on the stability or variability of constructs in virtual environments. Second, it would be valuable to incorporate expanded cross-cultural comparisons, including samples from other Latin American countries, in order to validate the cross-cultural robustness of the model and examine the influence of sociocultural factors on the digital educational experience.

Additionally, it is recommended to construct integrative explanatory models that consider complementary variables, such

as academic satisfaction, intrinsic motivation, digital self-efficacy, and institutional support, in order to enrich the understanding of student behavior in online education contexts. Finally, the use of mixed research designs (combining quantitative and qualitative methodologies) would allow for a more in-depth exploration of the emotional, symbolic, and relational dimensions of online education, providing a more comprehensive and contextualized perspective on the phenomenon.

Data availability statement

The original contributions presented in the study are included in the article; further inquiries can be directed to the corresponding author.

Ethics statement

The University does not have an Ethics Committee applicable to low-risk research. In accordance with institutional regulations, studies that use anonymous surveys and do not collect identifiable information are exempt from ethical review. For this reason, this study did not require formal approval and was classified under ethical exemption. The studies were conducted in accordance with the local legislation and institutional requirements. The ethics committee/institutional review board also waived the requirement of written informed consent for participation from the participants or the participants' legal guardians/next of kin.

Author contributions

CCV: Conceptualization, Methodology, Software, Validation, Data curation, Writing – original draft, Writing – review & editing, Project administration. KYCV: Methodology, Formal Analysis, Software, Visualization, Project administration, Writing – review & editing. MNCP: Conceptualization, Investigation, Methodology, Project administration, Visualization, Formal analysis, Writing – original draft. FPO: Writing – original draft, Project administration, Resources, Investigation, Writing – review & editing, Validation, Supervision. JVC: Software, Supervision, Resources, Formal analysis, Project administration, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research and/or publication of this article.

Acknowledgments

The authors are grateful to the Universidad Estatal de Milagro (UNEMI).

Conflict of interest

The author(s) declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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