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Critical Factors Shaping University Students' Satisfaction and Continued Engagement with E-Learning in Sichuan, China

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Abstract

Purpose: This study explored the key factors impacting university students' satisfaction and intention to use e-learning at Xihua University in Sichuan, China. The conceptual framework proposed relationships among Interactivity, Course Content Quality, Perceived Usefulness, Confirmation, Perceived Ease of Use, Satisfaction, and Continuance Intention. **Research design, data, and methodology:** A quantitative approach was employed, with a sample size of 500 students from Xihua University. The sampling strategy included judgmental sampling for school selection, quota sampling to determine the sample size, and convenience sampling for data collection and questionnaire distribution online. Data analysis was conducted using structural equation modeling (SEM) and confirmatory factor analysis (CFA) to assess model fit, reliability, and construct validity. **Results:** The study revealed that interactivity, course content quality, perceived usefulness, confirmation, and ease of use significantly influenced students' satisfaction. Satisfaction was found to mediate the effect of these factors on students' continuance intention to use e-learning. **Conclusions:** The statistical analysis confirmed all six research hypotheses, indicating that the study successfully met its objectives. To enhance the effectiveness of e-learning, it is recommended that policymakers and program developers at Xihua University increase their investment in factors that impact student satisfaction and continuance intention and optimize the allocation of these resources.

Keywords: Perceived Usefulness, Confirmation, Perceived Ease of Use, Satisfaction, Continuance Intention

JEL Classification Code: E44, F31, F37, G15

1. Introduction

E-learning has increasingly been recognized as a vital component of modern education, driven by significant technological advancements. Clark and Mayer (2011) defined e-learning as instructional content delivered via digital devices, emphasizing the crucial role of technology in enhancing accessibility to education. This definition lays the foundation for understanding the role of digital tools in education. Garrison and Anderson (2003) further elaborate on e-learning by discussing how Web 2.0 technologies have introduced interactive features such as video lectures and collaborative learning environments. These technologies enhance the learning experience by fostering greater engagement between students and educators. Moore and

Kearsley (2005) point out that the widespread adoption of e-learning in higher education largely depends on content design and delivery. They stress the importance of creating platforms that are both user-friendly and rich in content, which are essential for achieving successful educational outcomes. Eze et al. (2018) discuss how local educational policies and cultural factors influence the adoption and effectiveness of e-learning. This perspective highlights the importance of tailoring e-learning platforms to meet the specific needs of different student populations. Ferrer et al. (2022) emphasize that student engagement and satisfaction are critical predictors of the continued use of e-learning platforms. Their research highlights the necessity of high-quality content, ease of use, and effective communication tools in designing these systems, particularly in regions

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facing unique educational challenges.

Bernard et al. (2004) found that while online learning provides flexibility in time, location, and resources, it also presents challenges, such as low student engagement and a lack of face-to-face interaction. Robinson and Hullinger (2010) observed that students in online learning environments tend to feel more isolated and demotivated compared to traditional classrooms, partially due to the absence of social interaction and immediate feedback. UNESCO (2020) reported that the digital divide was particularly pronounced in remote learning. In rural and low-income areas, students often needed high-quality internet connections and essential learning resources. This gap significantly affected these students' ability to participate in online learning, further exacerbating educational inequality. Anderson (2008) discussed the evolution and impact of online learning. He highlighted how the government has promoted the development and integration of e-learning into educational systems by implementing supportive policies. In Sichuan Province, with 147 higher education institutions and 2.89 million enrolled students, the increasing acceptance and usage of online learning among university students are gaining attention. Investigating the factors influencing satisfaction and continuous usage intention of online learning among these students is crucial for enhancing e-learning methods and optimizing online classroom learning modes.

This study explored the factors impacting students' satisfaction and continuance intention to use e-learning at Xihua University in Sichuan Province, China. The research focused on seven key factors: Interactivity (IN), Course Content Quality (CCQ), Perceived Usefulness (PU), Confirmation (CO), Perceived Ease of Use (PEOU), Satisfaction (SA), and Continuance Intention (CI). By thoroughly analyzing the relationships among these independent variables, mediating variables, and dependent variables, the study aims to uncover the critical factors that influence e-learning adoption within the context of higher education, particularly in Sichuan Province. Xihua University, as a comprehensive institution, was chosen for its broad representation of student demographics and academic disciplines, as well as its active promotion and adoption of e-learning, making it an ideal setting for this research.

The subjects of this study are students from Xihua University in Sichuan Province, chosen due to the diversity of their student body and the broad range of disciplines offered, which make them representative of the university student population in the region. These students come from various administrative areas within the province and have experience using e-learning platforms. This study tests seven hypotheses within the research framework through data analysis, revealing the relationships among various variables. The study aims to identify the key factors influencing the

satisfaction and continuance intention of e-learning among university students in Sichuan Province. The findings will provide valuable insights for educational policymakers and e-learning platform developers, helping to optimize platform design and teaching strategies to enhance students' learning experiences and outcomes.

2. Literature Review

2.1 Interactivity

Arbaugh et al. (2008) highlighted the crucial role of a user-friendly and highly interactive Learning Management System (LMS) in enhancing the online learning experience, which is closely linked to student satisfaction. Kuo et al.'s (2014) research established a positive correlation between students' perceived interactivity and satisfaction, indicating that increased levels of interactivity are associated with greater satisfaction. Dixson (2015) emphasized the strong correlation between student engagement and satisfaction, where interactivity increases course appeal and effectiveness, enhancing the overall learning experience. Across all these studies, the relationship between interactivity and satisfaction is consistently mentioned, highlighting its significance in educational settings.

H1: Interactivity has a significant impact on satisfaction.

2.2 Course Content Quality

Nikou and Economides (2017) explored the influence of course content quality on student satisfaction in mobile learning environments, emphasizing the importance of enhancing the quality of mobile learning resources. Cheng (2020) discovered that course quality significantly affects student satisfaction in cloud-based e-learning systems. High-quality course content and design increase student satisfaction with the cloud-based e-learning system. Arbaugh (2000) investigated the relationship between virtual classroom characteristics and student satisfaction with internet-based MBA courses, with results indicating that high-quality course content and online course features positively influence student satisfaction.

H2: Course content quality has a significant impact on satisfaction.

2.3 Perceived Usefulness

Davis (1989) found a positive correlation between users' perceived usefulness of information technology systems and their satisfaction, meaning that when users perceive a system as more useful, their satisfaction levels tend to be higher. Wu

and Wang (2005) explored mobile commerce and found a positive relationship between users' perceived usefulness of mobile commerce and their satisfaction. When users perceive mobile commerce as useful, they are more satisfied and willing to use it. Cheng (2020) discovered in the context of cloud-based e-learning systems that the perceived usefulness of courses significantly impacts student satisfaction. Higher perceived usefulness contributes to increased student satisfaction with cloud-based e-learning systems.

H3: Perceived usefulness has a significant impact on satisfaction.

2.4 Confirmation

Oliver (1980) cognitive model revealed the crucial role of confirmation in forming satisfaction. This finding underscores the positive impact of confirmation on satisfaction. The relationship between confirmation and satisfaction is pivotal in understanding consumer behavior. Lee and Choi (2013) demonstrated the positive correlation between confirmation and satisfaction in online learning; when these expectations are met or exceeded, they lead to satisfaction. Lin et al. (2005) pointed out that confirmation is crucial in enhancing satisfaction levels, emphasizing the need to align online learning experiences with learners' expectations to achieve optimal results.

H4: Confirmation has a significant impact on satisfaction.

2.5 Perceived Ease of Use

Liaw (2008) directly investigated students' perceived satisfaction when using the Blackboard learning management system, explicitly stating that perceived ease of use is a critical factor affecting satisfaction. Park (2009) utilized TAM to analyze university students' behavioral intention towards e-learning and found a positive effect of perceived ease of use on attitudes and satisfaction. Finally, Roca et al. (2006) extended TAM in their article to understand the intention to continue using e-learning, reiterating the importance of perceived ease of use in fostering user satisfaction and intentions for continued use. Alraimi et al. (2015) found that perceived ease of use is one of the important factors affecting students' satisfaction and continued intention to use.

H5: Perceived ease of use has a significant impact on satisfaction.

2.6 Satisfaction

Sun et al. (2008) revealed that enhancing learner satisfaction significantly boosts their continuance intention, emphasizing the pivotal role of satisfaction in fostering sustained online learning. Hong and Tam (2014) discovered that the positive influence of satisfaction on continuance intention extends to other information services, such as online learning. Liaw (2008), through a case study, explored students' e-learning experience within the Blackboard system environment and found that satisfaction has a significant positive impact on continuance intention in specific e-learning settings, highlighting the critical importance of enhancing student satisfaction to promote their continued learning.

H6: Satisfaction has a significant impact on continuance intention.

2.7 Continuance intention

Sun et al. (2008) revealed that enhancing learner satisfaction significantly boosts their continuance intention, emphasizing the pivotal role of satisfaction in fostering sustained online learning. Hong and Tam (2014) discovered that the positive influence of satisfaction on continuance intention extends to other information services, such as online learning. Liaw (2008), through a case study, explored students' e-learning experience within the Blackboard system environment and found that satisfaction has a significant positive impact on continuance intention in specific e-learning settings, highlighting the critical importance of enhancing student satisfaction to promote their continued learning.

3. Research Methods and Materials

3.1 Research Framework

This study references several theories, including Anderson (2003) Interactivity Theory, Kember et al. (2010) theory on the impact of high-quality course content on the learning experience, Davis (1989) Technology Acceptance Model (TAM), Bhattacharjee (2001) Expectation Confirmation Theory (ECT), and DeLone and McLean (2003) Information Systems Success Model. These theories have been used to construct a conceptual framework for this study, which is visually represented in Figure 1.

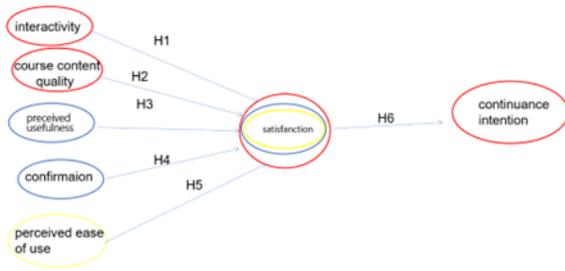


Figure 1: Research Conceptual Framework

- H1:** Interactivity has a significant impact on satisfaction.
- H2:** Course content quality has a significant impact on satisfaction.
- H3:** Perceived usefulness has a significant impact on satisfaction.
- H4:** Confirmation has a significant impact on satisfaction.
- H5:** Perceived ease of use has a significant impact on satisfaction.
- H6:** Satisfaction has a significant impact on continuance intention.

3.2 Research Methodology

The researchers utilized a quantitative approach with non-probability sampling by distributing questionnaires through an online survey platform to students at Xihua University in Sichuan Province. The objective was to examine the factors influencing student satisfaction and the continuance intention of e-learning at the university.

The questionnaire comprised three sections: screening questions, 5-point Likert scale items evaluating variables related to the study's hypotheses, and demographic questions. A pilot test with 50 respondents ensured the questionnaire's reliability and validity, assessed through Cronbach's Alpha and expert item-objective congruence (IOC) index scores (Hartog & Verburg, 2004).

3.3 Population and Sample Size

After distributing the final questionnaire, 500 valid responses were collected. Data analysis was conducted using SPSS AMOS, with confirmatory factor analysis (CFA) employed to validate the model's reliability and fit. Structural equation modeling (SEM) was then used to explore the causal relationships among the studied variables.

3.4 Sampling Technique

The researchers employed a non-probability sampling approach, incorporating judgment and quota sampling techniques to select participants from XiHua University.

Questionnaires were distributed via an online survey platform. The detailed sampling information is presented in Table 1.

Table 1: Sample Units and Sample Size

XiHua University	Population Size	Proportional sample size
Transportation Operation Management	260	156
Logistics Management	285	172
Tourism Management	286	172
Total	831	500

Source: Constructed by author

4. Results and Discussion

4.1 Demographic Information

A survey was conducted with 500 students from XiHua University, collecting demographic data such as gender, age, e-learning usage frequency, and preferred platforms. The sample included 253 females (50.6%) and 247 males (49.4%). Age-wise, 305 students (61.0%) were between 18 and 20 years old, 140 students (28.0%) were 21 to 22 years old, and 55 students (11.0%) were 23 to 24 years old. Regarding e-learning frequency, 55 students (11.0%) accessed it 1-2 times per week, 145 students (29.0%) used it 3-4 times, 202 students (40.4%) used it 5-6 times, 73 students (14.6%) used it 7-8 times, and 25 students (5.0%) used it over eight times weekly. The demographic information is summarized in Table 2.

Table 2: Demographic Profile

Demographic and General Data (N=500)		Frequency	Percentage
Gender	Male	253	50.6%
	Female	247	49.4%
Age	18 to 20 years old	305	61.0%
	21 to 22 years old	140	28.0%
	23 to 24 years old	55	11.0%
	over 24 years old	0	0.0%
The frequency of using the e-learning	1-2 times	55	11.0%
	3-4 times	145	29.0%
	5-6 times	202	40.4%
	7-8 times	73	14.6%
	Over 8 times	25	5.0%

4.2 Confirmatory Factor Analysis (CFA)

This study employed confirmatory factor analysis (CFA) to evaluate each variable within the conceptual framework. The results indicated that all measurement items for each variable were statistically significant, with acceptable factor loadings, demonstrating a strong fit with the conceptual framework. The factor loadings for all items exceeded the

threshold of 0.30, p-values were below 0.05, composite reliability (CR) values were greater than 0.70, and average variance extracted (AVE) values were above 0.50, confirming

the robustness of the model. These metrics are detailed in Table 3.

Table 3: Confirmatory Factor Analysis Result, Composite Reliability (CR) and Average Variance Extracted (AVE)

Variables	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factors Loading	CR	AVE
Interactivity (IN)	Cheng (2020)	3	0.804	0.687-0.807	0.807	0.583
Course Content Quality (CCQ)	Cheng (2020)	3	0.786	0.712-0.754	0.777	0.538
Perceived Usefulness (PU)	Cheng (2012)	4	0.829	0.694-0.765	0.829	0.549
Confirmation (CO)	Alami and El Idrissi (2022)	3	0.760	0.724-0.764	0.787	0.552
Perceived Ease of Use (PEOU)	Cheng (2012)	4	0.818	0.669-0.764	0.819	0.532
Satisfaction (SA)	Alami and El Idrissi (2022)	3	0.804	0.701-0.795	0.795	0.564
Continuance Intention (CI)	Chang (2013)	3	0.786	0.651-0.813	0.794	0.565

The model's fit was assessed using several indices: CMIN/DF, GFI, AGFI, NFI, CFI, TLI, and RMSEA, as shown in Table 4.

Table 4: Goodness of Fit for Measurement Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/DF	< 5.00 (Awang, 2012; Marsh et al., 2004)	1.119
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.961
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.948
NFI	≥ 0.80 (Wu & Wang, 2006)	0.949
CFI	≥ 0.80 (Bentler, 1990)	0.994
TLI	≥ 0.80 (Sharma et al., 2005)	0.993
RMSEA	< 0.08 (Pedroso et al., 2016)	0.015
Model Summary		Acceptable Model Fit

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI = normalized fit index, CFI = comparative fit index, TLI = Tucker Lewis index, and RMSEA = root mean square error of approximation

Table 5 provides the square root of the AVE values, which confirms the appropriateness of the correlations among the study variables. The results demonstrate acceptable levels of convergent and discriminant validity, affirming the validity of the structural model.

Table 5: Discriminant Validity

	IN	CCQ	PU	CO	PEOU	SA	CI
IN	0.764						
CCQ	0.298	0.733					
PU	0.352	0.440	0.741				
CO	0.398	0.356	0.384	0.743			
PEOU	0.385	0.303	0.340	0.390	0.729		
SA	0.342	0.367	0.364	0.377	0.359	0.751	
CI	0.378	0.345	0.352	0.301	0.356	0.387	0.752

Note: The diagonally listed value is the AVE square roots of the variables
Source: Created by the author.

4.3 Structural Equation Model (SEM)

This study used SPSS AMOS version 26 to perform Structural Equation Modeling (SEM) to refine the proposed model. Marsh et al. (2004) suggests that a chi-square to degrees of freedom ratio (CMIN/DF) below 5.00 is considered an acceptable threshold for model fit, a guideline further supported by Awang (2012). Similarly, Sica and Ghisi (2007) recommend that both the Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI) should exceed 0.80 to indicate a suitable model. Wu and Wang (2006) have posited that the Normed Fit Index (NFI) should also surpass 0.80. Additionally, Bentler (1990) notes that the Comparative Fit Index (CFI) should be greater than 0.80, while Sharma et al. (2005) emphasize that the Tucker-Lewis Index (TLI) should follow the same criterion. Finally, Pedroso et al. (2016) suggest that the Root Mean Square Error of Approximation (RMSEA) should remain below 0.08 to confirm a good model fit. The fit indices in this study showed that the model fits the data well: CMIN/DF = 3.397, GFI = 0.853, AGFI = 0.819, NFI = 0.834, CFI = 0.876, TLI = 0.860, and RMSEA = 0.069, as summarized in Table 6.

Table 6: Goodness of Fit for Structural Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/DF	< 5.00 (Awang, 2012; Marsh et al., 2004)	3.397
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.853
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.819
NFI	≥ 0.80 (Wu & Wang, 2006)	0.834
CFI	≥ 0.80 (Bentler, 1990)	0.876
TLI	≥ 0.80 (Sharma et al., 2005)	0.860
RMSEA	< 0.08 (Pedroso et al., 2016)	0.069
Model Summary		Acceptable Model Fit

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, NFI = normalized fit index, CFI = comparative fit index, TLI = Tucker Lewis index, and RMSEA = root mean square error of approximation

4.4 Research Hypothesis Testing Result

The significance of the study model was evaluated based on the regression weights and the R² variances calculated for each variable. As summarized in Table 7, the results show that the data support all the hypotheses. Specifically, Interactivity (IN) significantly influenced Satisfaction (SA), with a standardized path coefficient of $\beta = 0.194$. Similarly, Course Content Quality (CCQ) significantly impacted Satisfaction, with a path coefficient of $\beta = 0.250$. Perceived Usefulness (PU) positively contributed to Satisfaction, with a coefficient of $\beta = 0.205$, while Confirmation (CO) influenced with a coefficient of $\beta = 0.216$. Additionally, Perceived Ease of Use (PEOU) significantly affected Satisfaction, showing a coefficient of $\beta = 0.241$. Finally, Satisfaction was a strong predictor of Continuance Intention (CI), with a high coefficient of $\beta = 0.486$.

Table 7: Hypothesis Results of the Structural Equation Modeling

Hypothesis	(β)	t-value	Result
H1: IN→SA	0.194	3.606*	Supported
H2: CCQ→SA	0.250	4.474*	Supported
H3: PU→SA	0.205	3.815*	Supported
H4: CO→SA	0.216	3.831*	Supported
H5: PEOU→SA	0.241	4.405*	Supported
H6: SA→CI	0.486	7.332*	Supported

Note: * p<0.05

Source: Created by the author

Based on the findings summarized in Table 7, the researcher concluded that leadership, as indicated by the confirmation of H1, plays a crucial role in driving commitment, with a criterion coefficient value of 0.194 along its structural path. H2's establishment shows that emotion significantly influences commitment, evidenced by a criterion coefficient value of 0.250. The support for H3 demonstrates that commitment is a key factor contributing to loyalty, with a criterion coefficient value of 0.205. Additionally, H4's establishment suggests that commitment strongly impacts performance, reflected by a criterion coefficient value of 0.216. H5 highlights that knowledge is a significant determinant of performance, with a standardized coefficient value of 0.241, while H6 indicates that climate significantly drives performance, with a standardized coefficient value of 0.486.

5. Conclusion and Recommendation

5.1 Conclusion

This study conducted an in-depth analysis of the factors influencing the satisfaction and continuance intention of undergraduate students at Xihua University within an e-learning environment. By analyzing data from 500 questionnaires, a conceptual framework based on relevant literature was developed, exploring the mediating role of satisfaction in students continued use of the e-learning platform. Data analysis was performed using SPSS and JAMOVI, and the model's factor structure was validated through AMOS. The confirmatory factor analysis (CFA) results indicated a high degree of fit between the data and the model (West, 2002).

The findings revealed that interactivity, course content quality, and confirmation mechanisms enhance student satisfaction. By providing rich course content, high-quality interactive experiences, and timely feedback, students can better understand and master the material, significantly increasing their satisfaction with the e-learning platform. The study also showed that perceived usefulness and ease of use are important factors in enhancing students' learning experiences, further strengthening the overall advantages of e-learning. Additionally, satisfaction, as a mediating variable, significantly impacts students' continuance intention to use the e-learning platform.

5.2 Recommendation

Firstly, we suggest enhancing course content quality and interactivity. Efforts should be made to improve the quality of course content and interactivity, ensuring students have access to high-quality learning resources and engaging interactive experiences. It is recommended that more real-time communication tools and collaborative features be introduced to facilitate interaction between students and between students and instructors, which will help improve learning effectiveness and increase student engagement.

Secondly, enhancing the perceived ease of use of e-learning involves simplifying the platform's interface and making it more intuitive. By improving the user experience in this way, students will be able to navigate the platform more easily, access learning resources more efficiently, and complete tasks more efficiently. This, in turn, will boost their satisfaction with the platform and increase their likelihood of continuing to use it.

Finally, we recommend enhancing the perceived usefulness of learning resources, which is crucial. Platform developers should ensure that course content is practically applicable while simplifying the platform's operational processes. This approach will allow students to get started

and effectively utilize resources quickly. By providing practical and easy-to-use learning content, the platform can further enhance students' positive perceptions and willingness to continue using the e-learning platform.

5.3 Limitation and Further Study

The limitations of this study include a focus on individual-level variables and data collected from a specific period. Data was exclusively gathered from undergraduate students at Xihua University, which may need to fully capture students' learning experiences across different time periods or educational backgrounds. Therefore, the current findings may not represent a broader student population or long-term learning trends. Future research should adopt longitudinal or experimental designs to track data over multiple time points for a deeper understanding of the dynamic changes in online learning. Additionally, expanding the sample to include students from other universities and disciplines would enhance the generalizability of the results.

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