pISSN: 1906 - 6406 The Scholar: Human Sciences
eISSN: 2586 - 9388 The Scholar: Human Sciences
http://www.assumptionjournal.au.edu/index.php/Scholar

Determinants of Student Satisfaction with Online Courses Delivered via Cloud-Based Platforms in Educational and Training Institutions, Chongqing, China

Qu Zhi*

Received: October 19, 2023. Revised: February 19, 2024. Accepted: February 18, 2025.

Abstract

Purpose: This study aims to investigate the influencing factors that affect the students' satisfaction cloud-based online courses of educational and training organizations among college students in Chongqing, China. **Research design, data, and methodology:** A quantitative approach was used, with a questionnaire as the instrument to collect the data. The target population is undergraduate students from Chongqing, China, who had some online learning experience. The content validity and reliability of the questionnaire were tested using the index of item-objective congruence (IOC) and pilot test (n=50). Confirmatory factor analysis (CFA) and structural equation model (SEM) were used to analyze the data, verify the model's goodness of fit, confirm the causal relationship between the variables, and conduct hypothesis testing. **Results:** Course content quality, perceived usefulness, system quality, and information quality significantly influence on satisfaction. In addition, perceived ease of use significantly influences perceived usefulness. Nevertheless, service quality has no significant influence on satisfaction. **Conclusions:** Perceived ease of use is the strongest predictor of direct response to college students' satisfaction. Course quality, perceived usefulness, system quality, information quality, and system quality are significantly driven by online courses. Therefore, this study suggests that online platform operators and university policymakers should focus on improving service quality, thereby increasing student satisfaction with online.

Keywords : Cloud-Based Online Courses, Course Content Quality, Perceived Usefulness, System Quality, Satisfaction

JEL Classification Code: E44, F31, F37, G15

1. Introduction

In the 1960s, computers began to emerge as teaching aids in education. According to Khan and Qudrat-Ullah (2021), the rapid development of information and communication technology (ICT) and the continued evolution of the Internet have profoundly impacted the socio-economic and communication sectors. Traditional educational methods usually require face-to-face learning and communication between teachers and students within the classroom, where the teacher plays the central role of knowledge (Khan & Qudrat-Ullah, 2021). However, today, more distance learning and video teaching have replaced the traditional face-to-face mode of teaching. We can learn various categories of knowledge through various platforms such as Ding Talk, Xue Lang, Dou Yin, and You Dao. The true value of online education was realized during the New Crown Pneumonia epidemic. Due to the restrictive measures of the epidemic, everyday ways of living, learning, working, interacting, and socializing migrated to the online environment.

However, online programs can face a few challenges. Compared to traditional face-to-face teaching, online teaching is more virtual and involves less engagement and

1* Qu Zhi, Chengdu Vocational University of Art. Email: dadazhi888@126.com

interaction between teachers and students. Therefore, it becomes crucial to explore how to simulate face-to-face interactions, discussions, and question-and-answer sessions through online education modes and develop corresponding teaching strategies (Wang et al., 2020) According to the Technical Specification for Educational Resources Construction (CELTS-411), a technical standard for educational informatization developed by the Educational Technology Sub-committee of the China Information Technology Standardization Technical Committee (CITSTC), an "online course" is a comprehensive compilation of instructional materials and pedagogical practices related to a specific subject matter that is made available and accessible through a computer network.

An online course consists of two key components: firstly, the organization of the content based on clear pedagogical objectives and methods, and secondly, the provision of a supportive online teaching environment. A supportive online teaching and learning environment involves integrating various software tools, learning resources, and teaching and learning activities into an online education platform to facilitate online education. However, there are some drawbacks to cloud-based online courses compared to traditional learning methods. One of the most obvious is the need for real-time connection and collaboration between educators and students, which results in a less immersive learning experience. Therefore, Wang et al. (2020) argued that a key challenge for the "cloud classroom" is to develop learning environments for students that support diverse needs.

2. Literature Review

2.1 Course Content Quality

The concept of CCQ consists of two main dimensions: material richness and frequency of updates (Arbaugh, 2000; Burns et al., 1990). Content quality refers to an e-learning strategy that prioritizes learners' needs and preferences by providing them with accurate and consistent content, thus facilitating their use of online learning systems (Lee et al., 2009). Previous studies have shown that IQ is the main criterion for assessing the quality of course materials in e-learning environments (Lee et al., 2009; Liu et al., 2010).

According to Burns et al. (1990), Arbaugh (2000), and Chen et al. (2003), there is a strong correlation between regular updating of online course content by the online course system and significant improvement in learners' SAT. Test quality is an integral part of the overall quality of course material and has been found to favor user SAT (Lee et al., 2005). Hence, a hypothesis is suggested:

H1: Course content quality has a significant influence on satisfaction.

2.2 Perceived Usefulness

Davis (1989) definition of Perceived Usefulness (PU) refers to the extent to which individuals believe that using a particular system will improve their learning outcomes. PU can be described as an individual's belief that utilizing a particular educational system will positively impact their overall learning outcomes (Hsu & Lin, 2008). According to Seddon (1997), PU refers to stakeholders' belief that using a particular online course system will improve their learning outcomes or the performance of their team or company.

Individuals' conceptualization of perceived utility is related to their motivations, which are related to improving learning performance and using technology (Robey & Farrow, 1982). Seddon (1997) further argues that learner satisfaction is highly dependent on the perceived utility of a particular educational intervention. Hence, a hypothesis is suggested:

H2: Perceived usefulness has a significant influence on satisfaction.

2.3 Information Quality

As described by Ahn et al. (2007) and Roca et al. (2006), in terms of IQ, the system provides accurate and comprehensive information applicable to educational purposes. According to Roca et al. (2006), SEQ can be defined as the gap between the user's expectations of the services an online course system provides and the final experience. IQ is related to the overall quality of an online course system and includes several aspects, such as reliability, suitability, and comprehensiveness (Cidral et al., 2018).

The concept of IQ includes several aspects, such as accuracy, comprehensiveness, security, comprehensibility, reliability, precision, and timeliness of the information output produced by the system (Cheng, 2012). According to Cheng (2012), the perception that an online classroom learning system is simple and user-friendly involves two key elements. Firstly, it requires the information system to provide learners with accessible learning materials. Secondly, it involves the provision of well-designed lessons for learners within the information system. Hence, a hypothesis is suggested:

H3: Information quality has a significant influence on satisfaction.

2.4 System Quality

The term "SYQ" in the context of online courses refers to the operational effectiveness, usability, ease of use, and inclusiveness that learners experience when using an online course platform in each program (Cidral et al., 2018). The concept of SYQ includes two key aspects: simplicity of use and task performance (Elkaseh et al., 2016; Schaupp & Bélanger, 2005). The concept of SYQ refers to evaluating the information processing system itself (Chen & Chen, 2010). The concept of SYQ refers to evaluating the information processing system itself (Chen & Chen, 2010). The concept of SYQ refers to evaluating the information processing system itself (Chen, & Chen, 2010). It is established based on user requirements identified throughout the system analysis and development process—the quantification of system performance, formally known as SYQ, was described by Zeithaml and Bitner (2000).

A study by Roca et al. (2006) provided empirical evidence to support the assertion that IQ affects SAT more than SEQ and SYQ. A study by Machado et al. (2014) revealed a significant relationship between SYQ and user SAT in the context of an online course system. As stated by DeLone and McLean (2003), the quality of information is determined by its correctness, validity, and ubiquity. The concept of SYQ relates to the inherent technical attributes of the system, operational efficiency, and accessibility (DeLone & McLean, 2003). Hence, a hypothesis is suggested:

H4: System quality has a significant influence on satisfaction.

2.5 Service Quality

Service quality is a term used to describe the degree to which customer needs or expectations are met (Asubonteng et al., 1996; Lewis & Smith, 1993). According to Parasuraman et al. (1985), SEQ can be defined as the gap between consumers' expectations and their perceptions of the service. The concept of SEQ relates to the overall assessment or perception of service excellence from a broad perspective (Parasuraman et al., 1985). SEQ measures of effective service support in online learning systems include assessments of empathy, responsiveness, trust, and security (DeLone & McLean, 2003; Urbach & Ahlemann, 2010).

Investigations of effective online courses in information systems have emphasized the importance of SEQ as a key determinant of user SAT (Kettinger & Lee, 1994; Landrum & Prybutok, 2004). According to Parasuraman et al. (1985), a fundamental aspect of ensuring high SEQ is meeting or exceeding learners' service expectations. According to Kettinger and Lee (1994), the main determinants of learners' SAT in the context of learning information systems are SEQ reliability and empathy. Hence, a hypothesis is suggested:

H5: Service quality has a significant influence on satisfaction.

2.6 Perceived Ease of Use

PEOU is the extent to which users perceive the learning impact of an online course system (Davis, 1989; Venkatesh & Davis, 2000). According to Davis' concept, PEOU is the degree to which an individual perceives that using a technology requires little physical and cognitive exertion (Davis, 1989). Venkatesh and Agarwal's (2006) study showed that the ease of use experienced by the user is largely influenced by system response time, document transfer speed, query functionality, software and hardware access speed, and other factors.

According to Cheng (2012), the perceived simplicity and user-friendliness of an online classroom learning system involve two key factors. Firstly, it requires the information system to provide learners easy access to learning materials. Second, it involves providing well-designed courses for learners within the information system. Hence, a hypothesis is suggested:

H6: Perceived ease of use has a significant influence on perceived usefulness.

2.7 Satisfaction

Spreng et al. (1996) described SAT as an emotional state, specifically an emotional response to the service experience of an online course program or online course system. According to DeLone and McLean (2003), user SAT is defined as the level of SAT experienced by an individual relative to the system. According to Sun et al. (2008), user SAT is a valuable indicator for assessing the degree to which users' expectations are met and indicates the success of a given endeavor. Research has shown that learner SAT relates to the emotional disposition of individuals who use computer applications in each environment (Baroudi & Orlikowski, 1988).

Seddon and Kiew (1994) found a positive correlation between IQ, SYQ, and user well-being. The study conducted by Rai et al. (2002) provided evidence to support the idea that learners' SAT levels are affected by the quality of the information they receive. The study conducted by Roca et al. (2006) provided empirical evidence to support the idea that PU and PEOU have a significant beneficial effect on users' SAT has a significant beneficial effect.

3. Research Methods and Materials

3.1 Research Framework

The research model of this paper builds on the previous research by investigating the factors influencing the usefulness and satisfaction of online courses (cloud-based online courses) of education and training organizations among university students in Chongqing. The first theoretical model was first proposed by Cheng (2020) as a framework for previous research, which included research on course content quality, perceived usefulness, and satisfaction. The second theoretical framework was conducted by Cheng (2012), who conducted a second study investigating perceived usefulness and ease of use. The third theoretical framework came from Chang (2013), who conducted a third study investigating system, information, and service quality. The conceptual framework of the study presented in this paper is shown in Figure 1.

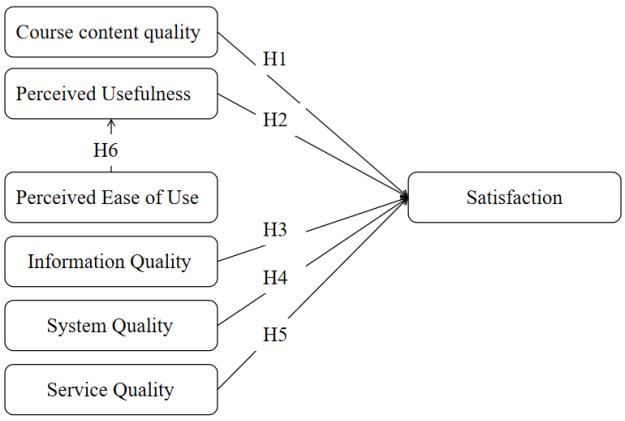

Figure 1: Conceptual Framework

H1: Course content quality has a significant influence on satisfaction.
H2: Perceived usefulness has a significant influence on satisfaction.
H3: Information quality has a significant influence on satisfaction.
H4: System quality has a significant influence on satisfaction.
H5: Service quality has a significant influence on satisfaction.
H6: Perceived ease of use has a significant influence on perceived usefulness.

3.2 Research Methodology

This study adopted a combination of empirical analyses and quantitative surveys to collect relevant data samples through questionnaires from the target respondent population. Before collecting large-scale data, we verified the content validity and reliability of the questionnaire through the item-objective congruence (IOC) test and Cronbach's alpha pilot test. After passing the reliability tests, we distributed the questionnaire online to college students majoring in art theory, management, and law in Chongqing. Respondents had to have at least one year of online learning experience.

Before collecting data, the research team conducted a thorough assessment of the measurement tool's quality, which included an Item-Objective Congruence (IOC) evaluation and a pilot test. The IOC assessment was performed by a panel of three experts, and all items surpassed the acceptable threshold of 0.6, demonstrating their alignment with the research objectives. Subsequently, a pilot test involving 50 participants was carried out to gauge the measurement tool's reliability. The results indicated that the measurement tool met the required standards, with a Cronbach's alpha coefficient equaling or exceeding 0.60, signifying a satisfactory level of structural quality (Nunnally & Bernstein, 1994).

In this study, we adopted a method to analyze the sample data. Based on Anderson and Gerbing (1988), we used a two-step Structural Equation Model (SEM) approach. The first step was a Confirmatory Factor Analysis (CFA) using SPSS and AMOS to test the convergent validity of the constructs. The second step was to explore the causal relationships between the constructs of the conceptual model using SEM to validate the influencing factors and propose the hypotheses' significance. SEM can explore a range of dependencies simultaneously, especially when the model includes direct and indirect influences between constructs (Hair et al., 2010).

3.3 Population and Sample Size

In this study, the target population was selected as undergraduate students from Chongqing, China, who came from three majors (law, management, and art theory) and had some online learning experience. This was to ensure the accuracy of the measurement data. Kotler and Armstrong (2016) stated that sample size is the total number of sample elements taken from the total population. In addition, this study used a calculator developed by Soper (2015) to calculate the appropriate sample size, with the parameters of 7 latent and 28 observed variables, recommending a minimum sample size of 425. therefore, the questionnaire was distributed and screened for 2603 participants, which 498 are valid responses.

3.4 Sampling Technique

The researchers used multi-stage sampling techniques, including judgment sampling, stratified random sampling, and convenience sampling, to determine the scope and selection of the sample. Through judgment sampling, undergraduate students from the Chongqing region of China were selected, covering three majors: law, management, and art theory, and these students had to have some online learning experience. Stratified random sampling was used to determine the sample size for each major or sample stratum, as detailed in Table 1.

Table 1: Sample Units and Sample Size

Target Group	Population Size	Proportional Sample Size
Art theory	478	92
Management	856	163
Law	1269	243
Total	**2603**	**498**

Source: Constructed by author

4. Results and Discussion

4.1 Demographic Information

As shown in Table 2, of the 498 respondents, 124 (24.9 percent) were male, and 374 (75.1 percent) were female. Most of them are 18-22 years old, with 310 people, accounting for 64.3 percent; followed by 23-24 years old, with 120 people, accounting for 24.2 percent; and the lowest proportion is 25-28 years old, with 68 people, accounting for 11.5 percent.

Table 2: Demographic Profile

Demographic and General Data (N=498)		Frequency	Percentage
Gender	Male	124	24.9%
	Female	374	75.1%
Age	18-22	310	64.3%
	23-24	120	24.2%
	25-28	68	11.5%

4.2 Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) is often considered an important starting point for Structural Equation Modelling (SEM) (Hair et al., 2010). Table 3 shows Cronbach's alpha used to assess the reliability of the questionnaire. In this study, all measurement constructs demonstrated reliability with Alpha coefficient values greater than 0.7 for each group. CFA was first developed by Jöreskog (1971) to assess a measurement model's convergent and discriminant validity. Byrne (2001) also stated that convergent validity and discriminant validity are two methods of construct validity that CFA can validate. In this study, we usually use factor loadings, average variance extracted (AVE), and composite reliability (CR) to assess the convergent validity of the conceptual model (Hair et al., 2013). In this study, the factor loading values of all variables were greater than 0.5, with a p-value of less than 0.05, indicating that they were acceptable.

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
Course content quality (CCQ)	Cheng (2020)	3	0.826	0.548 – 0.954	0.749	0.515
Perceived Usefulness (PU)	Cheng (2020)	4	0.898	0.703– 0.948	0.906	0.709
Information Quality (IQ)	Chang (2012)	6	0.888	0.607– 0.862	0.892	0.582
System Quality (SYQ)	Cheng (2012)	4	0.860	0.718– 0.849	0.863	0.613
Service Quality (SEQ)	Cheng (2012)	3	0.880	0.836– 0.866	0.880	0.709
Perceived Ease of Use (PEOU)	Cheng (2012)	4	0.862	0.636– 0.920	0.871	0.632
Satisfaction (SAT)	Cheng (2020)	4	0.876	0.672– 0.916	0.880	0.517

According to Brown (2015), the consistency of the measurement model between the observed variables and the latent variables in the model can be tested by confirmatory factor analysis (CFA). Ainur et al. (2017) mentioned that model fit can be measured by Goodness of Fit (GOF). From Table 4, the values of GOF are CMIN/DF = 851.065/329 or 2.587, GFI = 0.901, AGFI = 0.878, NFI = 0.907, CFI = 0.940, TLI = 0.932, and RMSEA = 0. 057. The discriminant validity of Table 4 is satisfactory.

Table 4: Goodness of Fit for Measurement Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/DF	< 5.00 (Al-Mamary & Shamsuddin, 2015; Awang, 2012)	851.065/329 or 2.587
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.901
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.878
NFI	≥ 0.80 (Wu & Wang, 2006)	0.907
CFI	≥ 0.80 (Bentler, 1990)	0.940
TLI	≥ 0.80 (Sharma et al., 2005)	0.932
RMSEA	< 0.08 (Pedroso et al., 2016)	0.057
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 = Normed fit index, CFI = Comparative fit index, TLI = Tucker-Lewis index, and RMSEA = Root mean square error of approximation

According to Fornell and Larcker (1981), it is recommended that for discriminant validity to be confirmed, the square root of the AVE must be greater than the correlation coefficient between any two potential variables. In this study, the square root of all AVE values was greater than the correlation coefficient between the potential variables in question. Therefore, the measurement model had discriminant validity, as detailed in Table 5.

Table 5: Discriminant Validity

	CCQ	PU	PEOU	IQ	SYQ	SEQ	SAT
CCQ	**0.718**						
PU	0.45	**0.842**					
PEOU	0.431	0.331	**0.795**				
IQ	0.434	0.252	0.259	**0.763**			
SYQ	0.36	0.286	0.303	0.222	**0.783**		
SEQ	0.384	0.316	0.3	0.252	0.211	**0.842**	
SAT	0.539	0.418	0.399	0.338	0.341	0.294	**0.806**

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 analyzed the collected data using Structural Equation Modelling (SEM). SEM has several advantages. Firstly, SEM can explore dependencies between variables (Hair et al., 2010). Second, SEM examines causal relationships between latent and observed variables through SEM. Third, it utilizes random errors in the observed variables to provide more accurate measurements. Fourth, SEM uses multiple indicators to measure latent variables. Finally, it can test hypotheses not only at the item level but also at the construct level (Hoyle, 2011).

SEM is a statistical method that analyses the relationship between variables based on their covariance matrix. The fit indices are shown in Table 6 with statistical values of 1187.850/336 or 3.535, GFI = 0.851, AGFI = 0.820, NFI = 0.870, CFI = 0.903, TLI = 0.891, and RMSEA = 0. 071. Considering the above values together, we can determine the structural model's fit level.

Table 6: Goodness of Fit for Structural Model

Index	Acceptable	Statistical Values
CMIN/DF	< 5.00 (Al-Mamary & Shamsuddin, 2015; Awang, 2012)	1187.850/336 or 3.535
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.851
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.820
NFI	≥ 0.80 (Wu & Wang, 2006)	0.870
CFI	≥ 0.80 (Bentler, 1990)	0.903
TLI	≥ 0.80 (Sharma et al., 2005)	0.891
RMSEA	< 0.08 (Pedroso et al., 2016)	0.071
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 = Normed fit index, CFI = Comparative fit index, TLI = Tucker-Lewis index, and RMSEA = Root mean square error of approximation

4.4 Research Hypothesis Testing Result

Structural equation modeling (SEM) combines the observed variables of a concept with the relationships between the constructs by combining the measurement constructs (from factor analysis) with a path analysis framework by setting up latent and unobserved constructs while incorporating mediating paths into the structural model. The degree of correlation between the independent and dependent variables presented in the hypotheses is usually measured by regression coefficients or standardized path coefficients. The path coefficients reflect the correlation between the structural equation model's external and internal latent variables. As seen in Table 7, the results of the hypothesis testing support H1, H2, H3, H4, and H6, but not support H5.

Table 7: Hypothesis Results of the Structural Equation Modeling

Hypothesis	(β)	t-value	Result
H1: CCQ→SAT	0.362	7.057*	Supported
H2: PU→SAT	0.275	6.294*	Supported
H3: IQ→SAT	0.166	3.869*	Supported
H4: SYQ→SAT	0.201	4.429*	Supported
H5: SEQ→SAT	-0.034	-0.880	Not Supported
H6: PEOU→PU	0.340	7.254*	Supported

Note: * p<0.05
Source: Created by the author

As shown in Table 7, five proposed hypotheses were supported. Student satisfaction with online courses was strongly influenced by perceived ease of use, course content, and perceived usefulness, which significantly impacted student satisfaction.

In **H1,** course content quality significantly affects satisfaction with cloud-based online courses with a standardized path coefficient of 0.362 and a t-value of 7.057*. The correlation between the quality of course content and the accuracy of the content provided by the lecturer and the quality of information is positive (Ohliati & Abbas, 2019). Suppose the instructor needs access to up-to-date information. In that case, user satisfaction decreases, resulting in the course being unable to update the information promptly, and the quality of the course content decreases (Sharma et al., 2017).

Next is **H2,** where perceived usefulness significantly affects satisfaction with cloud-based online courses with a standardized path coefficient of 0.275 and a t-value of 6.294*. Cheng et al. (2019) found that their perceived usefulness positively affects satisfaction with cloud-based online course

systems. Arbaugh's (2000) study also confirms the statement that "the perceived usefulness of the course software has a significant effect on the user's satisfaction with online courses." satisfaction" as a conclusion. Similarly, studies by Seddon (1997), Alsabawy et al. (2011), and Limayem and Cheung (2008) found that user satisfaction was significantly influenced by perceived usefulness.

Similarly, in **H3,** information quality significantly affects satisfaction with cloud-based online courses with a standardized path coefficient of 0.166 and a t-value of 3.869*. Information quality significantly impacts satisfaction (Ranganathan & Ganapathy, 2002). Roca et al. (2006) found that the higher the quality of information, the higher the satisfaction of e-learning system consumers. Saeed and Abdinnour-Helm (2008) argued that improving the quality of information can help users make accurate judgments and increase their productivity. Therefore, an increase in information quality will lead to an increase in satisfaction with cloud-based online courses.

In **H4,** system quality significantly affects the satisfaction of cloud-based online courses. The standardized path coefficient was 0.201, and the t-value was 4.429*. Seddon and Kiew (1994) evaluated several D&M information system success models developed by Delone and McLean. The results of the study indicated that system quality had a significant impact on learner satisfaction. This aligns with the findings of Roca et al. (2006), who also stated that system quality affects learner satisfaction.

Service quality has a significant effect on cloud online course satisfaction in **H5.** The standardized path coefficient is -0.034, and the t-value is -0.88*. Whether it is an e-learning system or an information system, the quality-of-service technicians provide positively affects learner satisfaction with the system. The relationship between service quality and user satisfaction is a valid measure of user satisfaction (Pitt et al., 1995). Also, Athiyaman (1997) and Deshields et al. (2005) have confirmed that the quality of service directly affects learners' satisfaction with online programs. The study in this paper empirically demonstrates that the service quality of online learning platforms in the region still needs to be strengthened and improved.

Finally, in **H6,** perceived ease of use significantly affects the perceived usefulness of cloud-based online courses. The standardized path coefficient is 0.340, and the t-value is 7.254*. Previous studies have shown (Davis, 1989; Venkatesh & Davis, 2000) that perceived usefulness is affected by PU. Wu and Chen (2005) argued that if learners perceive an online learning system as easy to use, they will perceive the service as beneficial. When all other factors are held constant, the effectiveness of an information system is directly proportional to its simplicity of use.

5. Conclusion and Recommendation

5.1 Conclusion and Discussion

This study aimed to comprehensively analyze the factors influencing university students' usefulness and satisfaction with cloud-based online courses from educational and training institutions in Chongqing, China. The researchers proposed six conceptual frameworks based on previous studies to examine the factors influencing students' satisfaction. The questionnaires were distributed to undergraduate students in the Chongqing area via online or offline methods, with the prerequisite that they had more than one month of online learning experience. The researchers used CFA to measure and test the validity and reliability of the research conceptual models, and scanning electron microscopy was used to analyze and explore the findings. Five of the six hypotheses proposed by the researchers were supported and confirmed.

The main findings of this study can be summarized as follows. First, for online learning courses, student satisfaction was most affected by course content, which was the second predictor in this study. As pointed out by Lee et al. (2005), quality checking of course content is a key component of the overall quality of the course material. It has a significant impact on user satisfaction. Therefore, improving the content quality of cloud-based online courses is critical.

Second, perceived ease of use, perceived usefulness, and information quality significantly impact satisfaction. When using cloud-based online learning platforms, users perceive the reliability of information quality, which is key in influencing user satisfaction with the system. Users' satisfaction with the system, in turn, influences their effective use. This is in line with the model of information systems for online courses proposed by DeLone and McLean (1992) and Seddon (1997), in which system quality and information quality significantly impact learner use and satisfaction.

Finally, this study found that the results of the impact of service quality on satisfaction were less favorable. Parasuraman et al. (1985) define *service quality* as the difference between consumers' expectations and actual perceptions of a service. Users are only satisfied if they perceive that the quality of the service meets their expectations (Parasuraman et al., 1985). Liu et al. (2010) concluded that service quality is an important influence on customer satisfaction. Moreover, the findings of Tamim et al. (2011) showed that service quality substantially impacts user satisfaction. Roca et al. (2006) found that improvement in service quality is positively related to the satisfaction of e-learning system consumers.

5.2 Recommendation

In this paper, course content was the strongest predictor of student satisfaction in using cloud-based online courses in this study. Therefore, the quality of course content is critical to student satisfaction. High-quality materials and content can improve learning outcomes and enhance student satisfaction. Perceived usefulness as a mediating variable is influenced by perceived ease of use, which is the strongest predictor in this paper. Therefore, whether students feel the online course is useful for learning is important. If students perceive an online course as useful, they are more likely to use it consistently and increase their satisfaction. Therefore, educational institutions need to ensure that the design and content of online courses meet students' learning needs.

The researchers found that the ease of use of an online course had the greatest indirect effect on student satisfaction. If students find it easy to use an online learning platform, they are more likely to be actively engaged in their learning and increase their satisfaction. Therefore, interface design and user experience should consider students' needs and feedback. The same goes for the accuracy and reliability of the information students access in their online courses. High-quality information is critical to student learning and satisfaction. Ensuring that online courses provide accurate and credible information is important to promote student satisfaction. The quality of the online learning system can also affect student satisfaction. Students may be dissatisfied if the system is malfunctioning or running slowly. Therefore, it is crucial to ensure the stability and performance of the online learning platform.

It has been observed that the quality of service has a poor measure of student satisfaction. This is due to multiple reasons. Customer support, timely feedback, and problem resolution can increase student satisfaction. Cloud online education platforms and university decision-makers should ensure that teachers and support staff are professionally trained and regularly communicate with students about their needs and feedback. Provide clear course instructions and resources, including course syllabi, textbooks, and assignment instructions. Understand the individual needs of students and provide support accordingly.

Ultimately, satisfaction is a comprehensive metric reflecting how students feel about their online course experience. Student satisfaction can be enhanced by improving the quality of each of these dimensions. Monitoring satisfaction and taking action to improve it is key to continuously improving the quality of online courses.

5.3 Limitation and Further Study

This study has some limitations that are worth noting, and the following are suggestions for future research. Firstly, this study was conducted only on undergraduate students in Chongqing, and only three related majors were selected, so the scope and sample size of the study have some limitations. Second, only learning platforms such as Ding Talk, Xue Lang, Dou yin, and You Dao were included in the study, and other cloud-based online learning platforms, such as Massive Open Online Courses (MOOCs) and Superstar, were not considered. Future research can expand the scope of the study to explore the different effects of different platforms on the way students interact with cloud courses.

Third, the study in this paper was limited to undergraduate students in Chongqing, and it is recommended that the study be expanded to a wider audience. Finally, the study has been conducted in a specific context, possibly a specific educational institution or region. Therefore, the applicability of the findings may be limited by the context and difficult to generalize to other educational institutions or regions. These limitations need to be more fully considered and addressed in future research to improve understanding of student satisfaction with cloud-based online courses.

References

Ahn, Y. Y., Han, S., Kwak, H., Moon, S., & Jeong, H. (2007). Analysis of topological characteristics of huge online social networking services. *In Proceedings of the 16th international conference on World Wide Web*, 835-844. https://doi.org/10.1145/1242572.1242685

Ainur, A. K., Deni, S. M., Jannoo, Z., & Yap, B. W. (2017). Sample Size and Non-Normality Effects on Goodness of Fit Measures in Structural Equation Models. *Pertanika Journal of Science and Technology, 25*(2), 575-586.

Al-Mamary, Y. H., & Shamsuddin, A. (2015). Testing of The Technology Acceptance Model in Context of Yemen. *Mediterranean Journal of Social Sciences, 6*(4), 1-10. https://doi.org/10.5901/mjss.2015.v6n4s1p268

Alsabawy, A., Cater-Steel, A., & Soar, J. (2011). Measuring E-Learning System Success (Research in Progress). *PACIS 2011 - 15th Pacific Asia Conference on Information Systems: Quality Research in Pacific, 15,* 1-10.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411-423. https://doi.org/10.1037/0033-2909.103.3.411

Arbaugh, J. B. (2000). Virtual classroom characteristics and student satisfaction with internet-based MBA courses. *Journal of management education, 24*(1), 32-54. https://doi.org/10.1177/105256290002400104

Asubonteng, P., McCleary, K. J., & Swan, J. E. (1996). SERVQUAL revisited: a critical review of service quality. *Journal of Services Marketing, 10*(6), 62-81. https://doi.org/10.1108/08876049610148602

Athiyaman, A. (1997). Linking student satisfaction and service quality perceptions: the case of university education. *European journal of marketing, 31*(7), 528-540. https://doi.org/10.1108/03090569710176655

Awang, Z. (2012). *Structural equation modeling using AMOS graphic* (1st ed.). Penerbit Universiti Teknologi MARA

Baroudi, J. J., & Orlikowski, W. J. (1988). A short form measure of user information satisfaction: a psychometric evaluation and notes on use. *Journal of Management Information Systems, 4*(4), 44-59. https://doi.org/10.1080/07421222.1988.11517807

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238-246. https://doi.org/10.1037/0033-2909.107.2.238

Brown, T. A. (2015). *Confirmatory Factor Analysis for Applied Research* (2nd ed.). Guilford Publications.

Burns, A., Jacoby, R., & Levy, R. (1990). Psychiatric phenomena in Alzheimer's disease. *British Journal of Psychiatry, 157,* 72-76. https://doi.org/10.1192/bjp.157.1.72

Byrne, B. M. (2001). *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming* (1st ed.). Lawrence Erlbaum Associates.

Chang, C. (2012). Narrative Ads and Narrative Processing. In E. Thorson and S. Rodgers (Eds.), *Advertising Theory* (pp.241-254). Routledge.

Chang, Y. S. (2013). Student Technological Creativity Using Online Problem-Solving Activities. *International Journal of Technology and Design Education, 23*, 803-816. https://doi.org/10.1007/s10798-012-9217-5

Chen, C. F., & Chen, F. S. (2010). Experience Quality, Perceived Value, Satisfaction and Behavioral Intentions for Heritage Tourists. *Tourism Management, 31,* 29-35. https://doi.org/10.1016/j.tourman.2009.02.008

Chen, S.-H., Weng, L.-J., & Su, Y.-J. (2003). Development of a Chinese Internet Addiction Scale and Its Psychometric Study. *Chinese Journal of Psychology, 45,* 279-294. https://doi.org/10.1037/t44491-000

Cheng, K. Y., Colbath, R. A., & Frye, M. A. (2019). Olfactory and Neuromodulatory Signals Reverse Visual Object Avoidance to Approach in Drosophila. *Curr. Biol., 29*(12), 2058-2065. https://doi.org/10.1101/472605

Cheng, Y. M. (2012). Effects of quality antecedents on e-learning acceptance. *Internet Research, 22*(3), 361-390. https://doi.org/10.1108/10662241211235699

Cheng, Y. M. (2020). Students' satisfaction and continuance intention of the cloud-based e-learning system: roles of interactivity and course quality factors. *Education+ Training, 62*(9), 1037-1059. https://doi.org/10.1108/et-10-2019-0245

Cidral, W. A., Oliveira, T., Felice, M. D., & Aparicio, M. (2018). E-learning success determinants: Brazilian empirical study. *Computers and Education, 122,* 273-290. https://doi.org/10.1016/j.compedu.2017.12.001

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319-340. https://doi.org/10.2307/249008

DeLone, W. H., & McLean, E. R. (1992). Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research, 3*(1), 60-95. https://doi.org/10.1287/isre.3.1.60

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information system success: a ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

Deshields, O. W., Kara, A., & Kaynak, E. (2005). Determinants of business student satisfaction and retention in higher education: applying Herzberg's two‐factor theory. *International journal of educational management, 19*(2), 128-139. https://doi.org/10.1108/09513540510582426

Elkaseh, A. M., Wong, K. W., & Fung, C. C. (2016). Perceived ease of use and perceived usefulness of social media for e-learning in Libyan higher education: A structural equation modeling analysis. *International Journal of Information and Education Technology, 6*(3), 192-199. https://doi.org/10.7763/ijiet.2016.v6.683

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research, 18*(1), 39-50. https://doi.org/10.1177/002224378101800104

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (7th ed.). Pearson.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance. *Long Range Planning, 46,* 1-12. https://doi.org/10.1016/j.lrp.2013.01.001

Hoyle, R. H. (2011). *Structural Equation Modeling for Social and Personality Psychology* (1st ed.). The SAGE Library of Methods in Social and Personality Psychology.

Hsu, C.-L., & Lin, J. (2008). Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Information & Management, 45*(1), 65-74. https://doi.org/10.1016/j.im.2007.11.001

Jöreskog, K. G. (1971). Statistical Analysis of Sets of Congeneric Tests. *Psychometrika, 36*(2), 109-133. https://doi.org/10.1007/BF02291393.

Kettinger, W. J., & Lee, C. C. (1994). Perceived service quality and user satisfaction with the information services function. *Decision sciences, 25*(5-6), 737-766. https://doi.org/10.1111/j.1540-5915.1994.tb01868.x

Khan, R. A., & Qudrat-Ullah, H. (2021). *Adoption of LMS in higher educational institutions of the Middle East* (1st ed.). Springer.

Kotler, P., & Armstrong, G. (2016). *Marketing: An introduction* (1st ed.). Prentice-Hall.

Landrum, H., & Prybutok, V. R. (2004). A Service Quality and Success Model for the Information Service Industry. *European Journal of Operational Research, 156,* 628-642. http://dx.doi.org/10.1016/S0377-2217(03)00125-5

Lee, B.-C., Yoon, J.-O., & Lee, I. (2009). Learners' acceptance of e-learning in South Korea: Theories and results. *Computers & Education, 53*(4), 1320-1329. https://doi.org/10.1016/j.compedu.2009.06.014

Lee, M. K. O., Cheung, C. M. K., & Chen, Z. (2005). Acceptance of Internet-based learning medium: the role of extrinsic and intrinsic motivation. *Information & Management, 42*(8), 1095-1104. https://doi.org/10.1016/j.im.2003.10.007

Lewis, A., & Smith, D. (1993). Defining Higher Order Thinking. *Theory into Practice, 32,* 131-137. https://doi.org/10.1080/00405849309543588

Limayem, M., & Cheung, C. M. K. (2008). Understanding information systems continuance: The case of Internet-based learning technologies. *Information & Management, 45*(4), 227-232. https://doi.org/10.1016/j.im.2008.02.005

Liu, B., Larsson, L., Caballero, A., Hao, X., Oling, D., Grantham, J., & Nyström, T. (2010). The polarisome is required for segregation and retrograde transport of protein aggregates. *Cell, 140*(2), 257-267. https://doi.org/10.1016/j.cell.2009.12.031

Machado, F. N., Meirelles, F. D. S., Filenga, D., & Brugnolo Filho, M. (2014). Student satisfaction process in virtual learning system: Considerations based in information and service quality from Brazil's experience. *Turkish Online Journal of Distance Education, 15*(3), 122-142. https://doi.org/10.17718/tojde.52605

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.

Ohliati, J., & Abbas, B. S. (2019). Measuring Students Satisfaction in Using Learning Management System. *Emerging Technology in Learning, 14*(4), 180-189. https://doi.org/10.3991/ijet.v14i04.9427

Parasuraman, A., Zeithaml, V. A., & Berry, L. (1985). A Conceptual Model of Service Quality and Its Implications for Future Research. *Journal of Marketing, 49,* 41-50. http://dx.doi.org/10.2307/1251430

Pedroso, R., Zanetello, L., Guimaraes, L., Pettenon, M., Goncalves, V., Scherer, J., Kessler, F., & Pechansky, F. (2016). Confirmatory factor analysis (CFA) of the crack use relapse scale (CURS). *Archives of Clinical Psychiatry, 43*(3), 37-40. https://doi.org/10.1590/0101-60830000000081

Pitt, L. F., Watson, R. T., & Kavan, C. B. (1995). Service quality: a measure of information systems effectiveness. *MIS Quarterly, 19*(2), 173-188. http://dx.doi.org/10.2307/249687

Rai, A., Lang, S. S., & Welker, R. B. (2002). Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information systems research, 13*(1), 50-69. https://doi.org/10.1287/isre.13.1.50.96

Ranganathan, C., & Ganapathy, S. (2002). Key dimensions of business-to-consumer Web sites. *Information & Management. 39*(6), 457-465. https://doi.org/10.1016/s0378-7206(01)00112-4

Robey, D., & Farrow, D. (1982). User involvement in information system development: A conflict model and empirical test. *Management science, 28*(1), 73-85. https://doi.org/10.1287/mnsc.28.1.73

Roca, J. C., Chiu, C. M., & Martínez, F. J. (2006). Understanding e-learning continuance intention: An extension of the Technology Acceptance Model. *International Journal of human-computer studies, 64*(8), 683-696. https://doi.org/10.1016/j.ijhcs.2006.01.003

Saeed, K. A., & Abdinnour-Helm, S. (2008). Examining the effects of information system characteristics and perceived usefulness on post adoption usage of information systems. *Information & management, 45*(6), 376-386. https://doi.org/10.1016/j.im.2008.06.002

Schaupp, L. C., & Bélanger, F. (2005). A conjoint analysis of online consumer satisfaction1. *Journal of electronic commerce research, 6*(2), 95.

Seddon, P. B. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Journal of Information Systems Research, 8,* 240-253. http://dx.doi.org/10.1287/isre.8.3.240

Seddon, P. B., & Kiew, M. Y. (1994). A Partial Test and Development of the DeLone and McLean model of IS Success. *Australasian Journal of Information Systems, 4,* 90-109. https://doi.org/10.3127/ajis.v4i1.379

Sharma, G. P., Verma, R. C., & Pathare, P. (2005). Mathematical modeling of infrared radiation thin layer drying of onion slices. *Journal of Food Engineering, 71*(3), 282-286. https://doi.org/10.1016/j.jfoodeng.2005.02.010

Sharma, I., Choudhary, P. R., & Vacek, Z. (2017). Inflammatory Diet and Risk for Colorectal Cancer: A Population-Based Case-Control Study in Newfoundland, *Canada. Nutrition, 42,* 69-74. https://doi.org/10.1016/j.nut.2017.05.010

Sica, C., & Ghisi, M. (2007). The Italian versions of the Beck Anxiety Inventory and the Beck Depression Inventory-II: Psychometric properties and discriminant power. In M.A. Lange (Ed.), *Leading - Edge Psychological Tests and Testing Research* (pp. 27-50). Nova

Soper, D. (2015). *The Free Statistics Calculators Website.* http://www.danielsoper.com/statcalc3/

Spreng, R. A., MacKenzie, S. B., & Olshavsky, R. W. (1996). A reexamination of the determinants of consumer satisfaction. *Journal of marketing, 60*(3), 15-32.

Sun, P.-C., Tsai, R. J., Finger, G., Chen, Y.-Y., & Yeh, D. (2008). What drives a successful e-learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education, 50*(4), 1183-1202. https://doi.org/10.1016/j.compedu.2006.11.007

Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. *Review of Educational research, 81*(1), 4-28. https://doi.org/10.3102/0034654310393361

Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. *Journal of Information Technology Theory and Application (JITTA), 11*(2), 2.

Venkatesh, V., & Agarwal, R. (2006). Turning visitors into customers: A usability-centric perspective on purchase behavior in electronic channels. *Management Science, 52*(3), 367-382. https://doi.org/10.1287/mnsc.1050.0442

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204. https://doi.org/10.1287/mnsc.46.2.186.11926

Wang, C., Xie, A., Wang, W., & Wu, H. (2020). Association between medical students' prior experiences and perceptions of formal online education developed in response to COVID-19: A cross-sectional study in China. *BMJ Journals, 10*(10), e041886. https://doi.org/10.1136/bmjopen-2020-041886

Wu, I.-L., & Chen, J.-L. (2005). An extension of Trust and TAM model with TPB in the initial adoption of on-line tax: An empirical study. *International Journal of Human-Computer Studies, 62*(6), 784-808. https://doi.org/10.1016/j.ijhcs.2005.03.003

Wu, J. H., & Wang, Y. M. (2006). Measuring KMS success: A respecification of the DeLone and McLean's model. *Information and Management, 43*(6), 728-739. https://doi.org/10.1016/j.im.2006.05.002

Zeithaml, V. A., & Bitner, M. J. (2000). *Services Marketing: Integrating Customer Focus across the Firm* (2nd ed.). McGraw-Hill.