Exploring the Key Drivers of Student Satisfaction and Adoption of E-Learning Systems in Higher Vocational Colleges in Chengdu, China

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Abstract

Purpose: This paper aims to study the important factors that affect students' satisfaction and willingness to use e-learning in higher vocational colleges in Chengdu, China. The paper argues that perceived usefulness, perceived ease of use, students' satisfaction, habit, subjective norm, attitude, and intention to use e-learning system are interrelated in the conceptual framework. **Research design, data, and methodology:** The paper adopts a quantitative survey and the questionnaires are distributed to 461 students from three majors of the School of Information Engineering of Chengdu Industrial Vocational and Technical College. In this survey, a multi-stage sampling strategy is adopted to collect survey data, including judgment and quota sampling. Confirmatory factor analysis and structural equation model are implemented to analyze the data. **Results:** Each exogenous variable significantly affects the relevant endogenous variables, among which SS has the most important impact on ITU. Meanwhile, PEOU has the most important impact on SS. All hypotheses have been confirmed to achieve the purpose of the study. **Conclusions:** The result indicates that to improve the efficiency of higher vocational college students in using E-Learning System, designers and developers of ELS, managers, and teaching staff of higher vocational colleges should emphasize the potential variables that have a significant impact on satisfaction with ELS and intention to use E-Learning.

Keywords: E-Learning, Students' Satisfaction, Habit, Subjective Norm, Intention to Use

JEL Classification Code: E44, F31, F37, G15

1. Introduction

ELS is a powerful transformative tool that can expand traditional learning models and build educational and training capabilities (Tarhini et al., 2017). Indeed, E-Learning represents a major number of humans who have conducted training since the invention of the blackboard (Horton, 2000). According to the literature, the definition of ELS includes a technology-oriented definition, a definition from the perspective of flexibility and remoteness, and a definition from the perspective of interactivity and multimedia. For example, (Ramadiani et al., 2017) believe that ELS is conducted on the Internet using various electronic tools such as computers, tablets, laptops, and smartphones. E-Learning courses can be provided through CD-ROMs, DVDs, TV channels, and videotapes (Venkatesh et al., 2012). ELS is a way of learning not restricted by space and time. It can efficiently transmit digital teaching materials, reduce learning costs, and shorten students' time looking for self-learning content (Chen & Tseng, 2012) (Roszak et al., 2021). In addition, (Peraya, 2004) (Paulsen et al., 2003) believed that E-Learning was an interactive multimedia comprehensive learning form that included text, images, audio, video, and other media to enhance the learning experience.

ELS has been widely adopted worldwide. Many types of

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ELS are in the market, and their quality varies greatly. Therefore, it is particularly important to pay attention to students and their satisfaction when choosing an ELS (Fleming et al., 2017). ELS designers often ignore learners' acceptance of it (such as satisfaction), and it is necessary to consider which factors influence learners' acceptance of electronic learning (Teo & Wong, 2013). China began flourishing after the Ministry of Education issued the "Suspending Classes without Stopping Learning" policy. However, research on resource design and application modes still needs to be improved, and researchers primarily focus on digital learning research. However, systematic analysis of learners' behavior intentions and the provision of comprehensive strategies is still relatively rare (Zhang et al., 2020). As technology continues to evolve, learners' thinking patterns are also changing, and the factors affecting vocational students' acceptance of digital learning are also changing.

Chengdu's unique cultural and background characteristics may also affect SS and ITU. This study contributes to how cultural and background differences affect technology adoption and usage patterns in educational environments. Vocational college students have their characteristics. The subjects of this study are students from vocational colleges. Therefore, it can also be used to develop and implement more effective ELS teaching models and strategies for vocational colleges and determine the impact on vocational colleges. After considering factors such as student satisfaction and willingness to use college ELS, educators and instructional designers can determine more effective teaching methods to meet student's needs and preferences better and improve learning efficiency.

On the one hand, this study helps vocational college students to understand ELS further and effectively apply it to their own learning needs. At the same time, vocational colleges can adjust their related factors to improve ELS effectively. The results of this study are conducive to achieving an effective connection between in-class and extracurricular learning, promoting vocational college students to actively and deeply participate in E-learning, and forming a good campus E-learning environment. Learner-centered ELS provides evaluation criteria for learning resource construction and platform development. It provides learners with ELS resources, actionable strategies, and effective methods to enhance their learning interests. It also provides direct guidance for hardware device developers and educational software designers on attracting learners to adopt ELS better.

2. Literature Review

2.1 Perceived Usefulness

Perceived usefulness is a perceptual construct of doing something regularly and commonly, and it is an important motivation for utilization behavior and purpose (Davis, 1989). For organizations, PU is related to the financial benefits they can gain by adopting new technologies; for individuals, PU is a motivation where users feel that using ELS can improve their work performance and learning efficiency (Robey & Farrow, 1982). Multiple surveys have shown that perceived usefulness is one of the strongest predictors of students' satisfaction (Liaw, 2008).

H1: Perceived usefulness has a significant impact on student's satisfaction.

2.2 Perceived Ease of Use

Perceived ease of use is the degree to which people find that using ELS does not require much effort (Davis, 1989). PEOU refers to a person who thinks ELS is easy to use with little or no mental effort (Venkatesh, 2000) (Arteaga Sánchez et al., 2013). Students realize that using ELS always feels effortless and easy to use in the context of ELS (Lee, 2006). PEOU is an E-learning system in which users find it effortless to use ELS (Elisa et al., 2022).

H2: Perceived ease of use has a significant impact on student's satisfaction.

2.3 Students' Satisfaction

Students' satisfaction is people's general evaluation and emotional reaction to an event or other person (Oliver, 1980). SS is the extent to which people believe an experience gave them positive feelings and reactions (Rust & Oliver, 1994). SS measures students' positive or negative attitudes or feelings when using E-learning systems (Pham et al., 2019). SS indicates that students meet their expectations in a virtual or actual learning environment (Martínez-Mesa et al., 2016). SS is defined as the assessment of technical quality based on experience (Ben Romdhane, 2013) (Al-Busaidi, 2013) (Islam & Azad, 2015) (Gashi et al., 2024).

H3: Students' satisfaction has a significant impact on intention to use e-learning.

2.4 Habit

Habit describes a state where people do something frequently, hesitantly, or unconsciously (Venkatesh et al., 2012). It often has the same meaning as automation (Tan & Kim, 2015). HB is a learned behavior pattern that is repeated

repeatedly through context-related situations. Subsequent encounters with the same or similar situations will automatically trigger inertial responses (Nilsen et al., 2012). HB plays a particularly important role in ITU (Tarhini et al., 2017) (Gunasinghe et al., 2019) (Tandon et al., 2022).

H4: Habit has a significant impact on intention to use e-learning.

2.5 Subjective Norm

Subjective norm refers to the situation in which an individual's behavior will be affected when "important" people around him believe that doing something is necessary (Fishbein & Ajzen, 1975). SN is people's opinion about behavior, and the performance of this behavior can change due to social pressure (Fishbein & Ajzen, 1975). SN refers to an individual's behavior that changes based on what others think they should or should not do (Finlay et al., 1999). Similarly, SN refers to the cognitive social pressure that an individual should or should not perform a certain behavior shaped by the opinions of others, influenced by Schepers and Wetzels (2007). When teachers require using ELS, SN will directly affect the ITU (Lee, 2006).

H5: Subjective norm has a significant impact on intention to use e-learning.

2.6 Attitude

Attitude refers to people's views on a system and determines whether the system is useful or not (Fishbein & Ajzen, 1975). ATT is the people's feelings or thoughts about things, people, and concepts (Davis, 1989). ATT is the degree of recognition and trust in people's evaluation or assessment of relevant behaviors. (Ajzen, 1991). ATT is a state of mental and neurological readiness that has a guiding or dynamic influence on an individual's response and all of its associated objects and situations through experience (Fazio, 2007). For E-Learning systems, attitude refers to students' positive and negative feelings about E-Learning (Rajeh et al., 2021). ATT towards the digital transformation of education affects their willingness to use E-Learning systems and ultimately determines whether students accept E-Learning systems (Xu et al., 2024).

H6: Attitude has a significant impact on intention to use e-learning.

## 2.7 Intention to Use E-Learning system

In the background of ELS, ITU determines the degree to which users want to accept the ELS (Salloum et al., 2019). ITU refers to people's ITU in the future, not only to themselves but also to recommend using the ELS to others (Chang, 2013). ITU refers to an individual's ITU in the future

based on the current learning method (Samsudeen & Mohamed, 2019). (Chemseddine & Kamel, 2021) focus on students' ITU. They believe that students are at the center of the learning process. In E-Learning, with the active participation of students, all efforts to improve the quality of ELS will be worthwhile.

3. Research Methods and Materials

3.1 Research Framework

A conceptual framework is a synthesis of interrelated variables that are used to solve real-world problems (Imenda, 2014). Using TAM, UTAUT2, and ECM as the basic models and constructed from three theoretical frameworks, the researchers structured the Conceptual framework. The first theoretical framework is derived from (Alrousan et al., 2022). This theoretical framework supports four variables: PU, PEOU, SS, and ITU. The second theoretical framework is derived from (Twum et al., 2022). This theoretical framework provides two variables, HB and ITU. The third theoretical framework is derived from (Danilova et al., 2021) (Gill et al., 2022). This theoretical framework provides three variables: SN, ATT, and ITU.
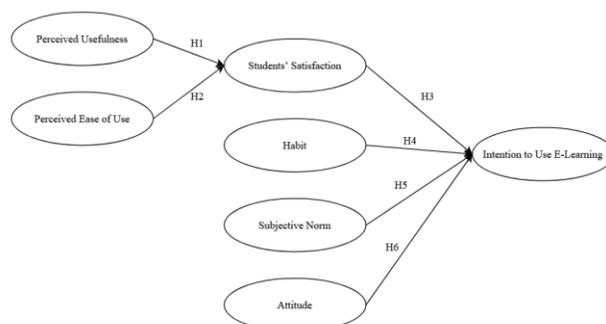
Figure 1: Conceptual Framework

H1: Perceived usefulness has a significant impact on student's satisfaction.
H2: Perceived ease of use has a significant impact on student's satisfaction.
H3: Students' satisfaction has a significant impact on intention to use e-learning.
H4: Habit has a significant impact on intention to use e-learning.
H5: Subjective norm has a significant impact on i intention to use e-learning.
H6: Attitude has a significant impact on intention to use e-learning.

3.2 Research Methodology

This study used a quantitative questionnaire. The questionnaire consisted of three main parts: screening questions, demographic information, and scale items for the entire observed variable. The questions in all three parts were closed-ended. Screening questions are a questionnaire method used to screen out a specific type of respondent from the entire sample (Danilova et al., 2021). The target respondents obtained through the screening questions in the first part were students of Chengdu Vocational & Technical College of Industry majoring in Internet of Things Application Technology, Information Security Technology Application, and Mobile Application Development with more than six months of E-Learning experience. Next, background information such as gender, age, E-Learning system preferences, and frequency of use was collected through a demographic questionnaire. The third part is the scale items for the entire observed variable. This part consists of 24 items. Among them, items 1 to 3 represent PU, items 4 to 6 represent PEOU, items 7 to 10 represent SS, items 11 to 14 represent ITU, items 15 to 18 represent HB, items 19 to 21 represent SN, and items 22 to 24 represent ATT. This section uses a five-point Likert scale. Respondents will select the option that best matches their feelings about the statement or question. A score of 1 shows strongly disagrees, and a score of 5 shows strongly agrees.

3.3 Population and Sample Size

Students majoring in Internet of Things application technology, information security technology application, and mobile application development in CDIVTC, Sichuan Province, are the target population. The researchers entered the relevant information into the sample size calculator of the SEM and found that the minimum sample size for the test was 425. 500 students from a population of 2,877 were selected as samples after screening and selection of places.

3.4 Sampling Technique

This study adopts both probability sampling and non-probability sampling. The sampling is divided into three stages. The first stage is judgment sampling. Three majors of the School of Information Engineering of CDIVTC are selected at this stage. The selection criteria ensure that the sample is representative (Palinkas et al., 2015). The second stage is stratified random sampling, a type of probability sampling that divides the target population into different strata and then selects samples within each layer by simple or systematic sampling (Martínez-Mesa et al., 2016). The third stage is convenience sampling. This stage selects a convenient sample and finds target respondents willing to answer the questionnaire (Dörnyei, 2007). The participants are screened through screening questions to determine that the target respondents are students majoring in Internet of Things Application Technology, Information Security Technology Application, and Mobile Application Development in CDIVTC who have experience in using E-Learning. After collecting the questionnaires, 461 valid data were confirmed, and 39 were invalid. The information on sample units and sample Size is demonstrated in Table 1.

Table 1: Sample Units and Sample Size

Target Major	Population Size	Proportional Sample Size
Internet of Things Application Technology	917	159
Information Security Technology Applications	999	174
Mobile Application Development	961	167
Total	**2877**	**500**

Source: Constructed by author

4. Results and Discussion

4.1 Demographic Information

Table 2 shows the comprehensive and detailed demographic information of the 461 respondents. In terms of the age of the respondents, 2.82% were 18 years, 13.45% were 19 years, 62.47% were 20 years, and 21.26% were over 20 years. Among the respondents, 62.04% were male, and 37.96% were female. 31.89% were majoring in Internet of Things Application Technology, 34.27% were majoring in Information Security Technology Application, and 33.84% were majoring in Mobile Application Development. 33.62% of these respondents used mobile phones for e-learning, 65.94% used computers for E-Learning, and 0.44% used other methods for E-Learning. Most respondents used Chaoxing, and a few used other systems, such as Zhijiaoyun and Yuketang.

Table 2: Demographic Profile

Demographic and General Data (N=461)		Frequency	Percentage
Gender	Male	286	62.04%
	Female	175	37.96%
Age	18 years	13	2.82%
	19 years	62	13.45%
Major	20 years	288	62.47%
	More than 20 years	98	21.26%
Major	Internet of Things Application Technology	147	31.89%
	Information Security Technology Application	158	34.27%
	Mobile Application Development	156	33.84%

Demographic and General Data (N=461)		Frequency	Percentage
Tools	Phone	155	33.62%
	Computer	304	65.94%
	Others	2	0.44%
Use Frequency	1-2 times a week	101	21.91%
	3-4 times a week	169	36.66%
	5-6 times a week	65	14.10%
	More than 6 times	126	27.33%
System	Zhijiaoyun	9	1.95%
	Chaoxing	398	86.33%
	Yuketang	1	0.22%
	Others	53	11.50%

4.2 Confirmatory Factor Analysis (CFA)

CFA is a quantitative data analysis technique that is used to analyze the validity of the measurement model (Hair, 1998), assessing the fit of the observed data to the theoretical foundation model of the a priori conceptualization (Wright, 2015). As shown in Table 3, the experimental measurement values of AVE are equal to or greater than 0.70, the experimental measurement values of composite reliability (CR) are greater than 0.80, and the experimental measurement values of factor loading are equal to or greater than 0.70. According to the research of Bagozzi and Yi (1988), these values meet the requirements.

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
Perceived Usefulness (PU)	Alrousan et al. (2022)	3	0.880	0.816-0.892	0.884	0.718
Perceived Ease of Use (PEOU)	Alrousan et al. (2022)	3	0.902	0.855-0.890	0.901	0.752
Students' Satisfaction (SS)	Alrousan et al. (2022)	4	0.913	0.824-0.855	0.908	0.711
Habit (HB)	Twum et al. (2022)	4	0.872	0.831-0.855	0.909	0.716
Subjective Norm (SN)	Fishbein and Ajzen (1975)	3	0.924	0.779-0.883	0.883	0.715
Attitude (ATT)	Fishbein and Ajzen (1975)	3	0.906	0.810-0.854	0.875	0.700
Intention to Use (ITU)	Alrousan et al. (2022)	4	0.928	0.846-0.872	0.920	0.743

Table 4 contains seven indicators (shown in Table 4) and their thresholds. The actual values of the measurements of these seven indicators all meet the threshold requirements. Therefore, these measurements are acceptable.

Table 4: Goodness of Fit for Measurement Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/DF	≤ 5.0 (Wheaton et al., 1977)	304.504/231=1.318
GFI	≥ 0.85 (Kline, 2011)	0.950
AGFI	≥ 0.85 (Sica & Ghisi, 2007)	0.935
RMSEA	< 0.08 (Schumacker & Lomax, 2010)	0.026
CFI	≥ 0.90 (Bentler, 1995)	0.990
NFI	≥ 0.90 (Bentler, 1995)	0.960
TLI	≥ 0.90 (Bentler, 1995)	0.988
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, RMSEA = root mean square error of approximation, CFI = comparative fit index, NFI = normalized fit index and TLI = Tucker Lewis index

Table 5 shows the investigation and presentation results of discriminant validity. The results are acceptable because the values corresponding to the diagonal in the table are the square roots of AVE, and the actual experimental values between the two variables are not greater than 0.80.

Table 5: Discriminant Validity

	PU	PEOU	SS	ITU	HB	SN	ATT
PU	**0.847**						
PEOU	0.172	**0.867**					
SS	0.211	0.314	**0.842**				
ITU	0.235	0.302	0.435	**0.862**			
HB	0.142	0.225	0.274	0.249	**0.846**		
SN	0.185	0.221	0.166	0.314	0.135	**0.846**	
ATT	0.170	0.186	0.329	0.339	0.194	0.230	**0.840**

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

4.3 Structural Equation Model (SEM)

After using CFA for evaluation, this study continued to use SEM for validation. Because SEM examined observed variables and latent variables' relationships that had been proved, multiple regression equations in a single framework were estimated simultaneously (Pervan et al., 2017). After experiments using AMOS 28, as shown in Table 6, the actual values of these seven indicators' measurements (Table 6) all meet the threshold requirements. Therefore, the results were verified.

Table 6: Goodness of Fit for Structural Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/DF	≤ 5.0 (Wheaton et al., 1977)	491.150/246=1.997
GFI	≥ 0.85 (Kline, 2011)	0.914
AGFI	≥ 0.85 (Schumacker & Lomax, 2010)	0.895
RMSEA	< 0.08 (MacCallum et al., 1996)	0.047
CFI	≥ 0.90 (Bentler, 1995)	0.966
NFI	≥ 0.90 (Bentler, 1995)	0.935
TLI	≥ 0.90 (Bentler, 1995)	0.962
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, RMSEA = root mean square error of approximation, CFI = comparative fit index, NFI = normalized fit index and TLI = Tucker Lewis index

4.4 Research Hypothesis Testing Result

As shown in Table 7, PEOU and PU exhibited a very important effect on SS. The value of β was 0.323 (t-value was 3.884***). The latter's coefficient (β) was 0.191 (t-value was 6.483***)

Additionally, the value of β was 0.374 besides t-value was 7.749***; that shows that the variable SS has the strongest effect on ITU. SN exhibited the second powerful, considerable interaction effect on ITU. The value of β was 0.243, and the t- t-value was 5.157***. ATT exhibited the third-powerful considerable interaction effect on ITU. The value of β was 0.192, and the value was 4.052***. HB had the least import influence on ITU, β was 0.113, and the value was 2.464*.

Table 7: Hypothesis Results of the Structural Equation Modeling

Hypothesis	(β)	t-value	Result
H1: PU→SS	0.191	6.483***	Supported
H2: PEOU→SS	0.323	3.884***	Supported
H3: SS→ITU	0.374	7.749***	Supported
H4: HB→ITU	0.113	2.464*	Supported
H5: SN→ITU	0.243	5.157***	Supported
H6: ATT→ITU	0.192	4.052***	Supported

Note: *** p<0.001, * p<0.05
Source: Created by the author

Table 7, the standardized path parameter threshold for structured methods was 0.191. That shows that H1 is supported and PU is closely related to SS. Multiple investigations have demonstrated that perceived usefulness is the strongest predictor of students' satisfaction (Liaw, 2008) (Limayem & Cheung, 2008) (Al-Fraihat et al., 2020).

The standardized path parameter threshold for structured methods was 0.323. That shows that H2 is supported and PEOU is closely related to the SS of ELS. When students perceive an ELS as easy to use based on the system configuration, their satisfaction level increases (Salimon et al., 2021). (Al-Azawei et al., 2016) (Mahadin et al., 2020) have all confirmed a close relationship between PEOU and SS. The easier the E-learning technology, the higher the student satisfaction.

The standardized path parameter threshold for structured methods was 0.374. This shows that H3 is supported, and SS was closely related to ITU. Cole et al. (2014) also argued that SS plays an important role in assessing the success of ELS implementation and is a measure of the consistency of the ELS experience.

The standardized path parameter threshold for structured methods was 0.113. That shows that H4 is supported, and HB was closely related to ITU. HB is the perception of doing something frequently and regularly and often prevents any changes in actual behavior (Murray & Häubl, 2007). A habit formed by students through repeated use and experience of ELS is a key driver in encouraging them to use ELS (Gunasinghe et al., 2019).

The standardized path parameter threshold for structured methods was 0.243. That shows that H5 is supported. (Dubey & Sahu, 2022) also demonstrated that SN was closely related to ITU.

Eventually, the standardized path parameter threshold for structured methods was 0.192. That shows that H6 is supported, and attitude significantly impacts ITU. Attitude plays a decisive role in determining the ITU; when students' attitude towards ELS is positive, they will have a strong ITU (Lee, 2006) (Rajeh et al., 2021) (Thi et al., 2023).

5. Conclusion and Recommendation

5.1 Conclusion and Discussion

This study aimed to determine which factors significantly impact SS with ELS and ITU in three majors at Chengdu Vocational & Technical College of Industry in China. The conceptual framework contains six hypotheses to confirm the interaction between PU, PEOU, SS, SN, HB, and ATT. To determine any interactions between these variables, 461 vocational college students with experience in using e-learning systems were invited to participate in the questionnaire survey. CFA was used to determine whether the data conformed to the measurement model. SEM was used to verify the hypotheses and evaluate the relationship between the independent and dependent variables affecting the SS and ITU.

PEOU had the greatest impact on SS. SS has the most significant positive effect on ITU. SN and ATT follow closely behind. Habit has the lowest impact on usage intentions.

5.2 Recommendation

The researchers provided suggestions for subsequent studies after analyzing this study. In this experimental results study, many students use SS because they are satisfied with it. Therefore, the developers and schools should continue to improve SS.

To improve SS, PEOU, and PU directly affect SS, especially PEOU, which has a direct and important impact on SS. Therefore, system developers need to develop a simpler and easier-to-operate system based on the characteristics of students in higher vocational colleges, such as a concise and clear user interface design, a simplified and intuitive operation process, and avoid bad experiences caused by system jams or network delays. In terms of content, various learning resources should also be provided, such as video, audio, text, etc., to meet different students' needs. In addition, the interactive functions of the system are also indispensable, such as providing online customer service and other help and support so that students can get help at any time when they encounter problems, reducing the frustration caused by operational problems. At the same time, regularly collecting students' feedback and continuously optimizing and updating the system can also make students feel that their opinions are valued and adopted.

As the second largest factor affecting ITU, SN plays a particularly important role. Therefore, in classroom teaching, teachers can actively guide students to use the ELS, show students the functions of ELS and its effectiveness in improving learning efficiency, use ELS to group students, conduct group discussions and cooperative inquiry learning through ELS, and use ELS to publish learning tasks such as sign-in, brainstorming, classroom discussions, knowledge questions and answers, classroom assignments, and in-class question and answer sessions to enhance students' recognition and dependence on ELS. Invite seniors to share their learning experiences so that juniors can feel the importance and advantages of using the system. Because the generation gap between students is smaller, the behavior of seniors can often influence juniors.

ATT has an important impact on ITU. Strengthening communication and interaction with students through them, such as online tutoring and psychological support, can help students feel emotionally supported when encountering difficulties and improve their attitudes.

HB also affects ITU, such as regularly posting course tasks in ELS before, during, and after class. For example, posting preview videos before class and using them to sign in at every class will gradually increase students' frequency of using ELS, thereby gradually strengthening their habit of using ELS.

Ultimately, improving PEOU and PU can improve SS. ATT, SN, and HB have a positive impact on ITU.

5.3 Limitation and Further Study

The data collected in the study may only cover a part of the student population and fail to fully represent the students of all higher vocational colleges in Chengdu. Students from different schools and majors may have different ELS experiences and needs. This sample limitation may affect the generalizability of the research results. In addition, SS and ITU may increase as students become more familiar with them. This study has not yet captured these dynamic changes. Therefore, in subsequent studies, the scope of the questionnaire will be expanded to cover students of different grades and majors in higher vocational colleges in Chengdu and other parts of China to improve the generalizability of the research results. At the same time, a longitudinal study on students in higher vocational colleges who use ELS will be conducted to track the changes in the SS and ITU students in higher vocational colleges in different semesters (or grades) and then analyze the dynamic changes of the influencing factors.

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