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A Study of the Factors Influencing Teachers' Behavioral Intention to Use the Intelligent Center of Vocational Education (ICVE) in Chinese Higher Vocational Colleges

Xiaoxia Liu[1] and Lu Zhu[2]
[1]Ph.D. Candidate, Graduate School of Business and Advanced Technology Management, Assumption University, Thailand
[2]Ph.D. Program Director, Art, Music, Sports and Entertainment Management, Graduate School of Business and Advanced Technology Management, Assumption University, Thailand
E-mail: 61826610@qq.com, ORCID ID: https://orcid.org/0009-0001-5170-074X
E-mail: zhulu@au.edu, ORCID ID: https://orcid.org/0000-0001-6736-4309

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Abstract

Background and Aim: This study aims to explore the factors that affect the behavioral intention of teachers using the Intelligent Center of Vocational Education (ICVE) system in Chongqing higher vocational colleges. To investigate whether the quality of the system (QS), information quality (IQ), service quality (SQ), E-learning experience (XP), perceived usefulness (PU), and perceived ease of use (PEOU) have effects on ICVE behavioral intention to use (BIU).

Materials and Methods: The research builds a conceptual framework based on two core theories: the Technology acceptance model (TAM) and the DeLone and McLean information systems success model. The quantitative method and questionnaire survey were used to collect sample data from four higher vocational schools in Chongqing China. An online questionnaire was used to issue the questionnaires. After collecting data, 439 valid questionnaires were obtained. Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) are used for specific data analysis. The model's goodness of fit is verified, the causal relationship between variables is confirmed, and hypothesis testing is carried out.

Results: It is found that perceived usefulness has the greatest impact on the intention to continue using, and usefulness is mainly affected by information quality and service quality. The second most important factor affecting the intention to continue use is perceived ease of use, which is significantly influenced by the E-learning experience and quality of the system.

Conclusion: Improving the quality of the system, information quality, and service quality of ICVE, and improving teachers' E-learning experience can effectively enhance teachers' behavioral intention to use ICVE.

Keywords: Intelligent Center of Vocational Education (ICVE); Behavioral intention to use; TAM

Introduction

In today's world, the digital economy is triggering the third wave of globalization, and the educational environment is facing major changes. The EU adopted its first Digital Education Action Plan in 2018, and released its second Digital Education Action Plan (2021-2027) in 2020, calling on people to respond to education in the post-pandemic era and build a new form of education. In 2021, UNESCO released the report "Reimagining Our Future Together: Forging a New Social Contract for Education", calling on countries to reform curricula and teaching methods to respond to the challenges of the digital revolution. At the beginning of 2022, China's Ministry of Education proposed to launch the implementation of the National Education Digitization Strategy action. Promising educational strategies can be accomplished through the synergy of open educational resources(OER) and open educational practices(Ossiannilsson et al., 2020). Educational practice is based on open educational resources, which can be realized through the national repository of educational resources for schools(Megalou et al., 2016). "Open Educational Resources" is an educational resource that primarily refers to educational materials or content that are made freely available and accessible(Di Renzo et al., 2016; Ferguson, 2017; King, 2017). The building of open educational resources has brought about a major change in the field of education. It provides access to a wealth of learning materials from around the world and offers a great deal of scope for digital learning. More and more ministries of education are paying attention to the construction of OERs and investing heavily in building their national OERs(Megalou et al., 2016).

Based on the rapid growth of online education users and the education digitization requirements put forward by the Ministry of Education of China, the Ministry of Education of China launched the National Education Digitization strategic initiative, focusing on the construction of the SMART EDUCATION OF

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CHINA platform, which was opened and launched on March 28, 2022. It is built as an open educational resource that integrates the national primary and secondary school smart education platform, the national vocational education smart education platform, and the national higher education smart education platform. And achieving comprehensive coverage of basic education, vocational education, and higher education. ICVE is one of the columns of the Platform of Smart Education of China. It is a vocational education digital teaching resource sharing platform and online teaching service platform Intelligent Vocational Education for short.

The impact of technology acceptance in teaching and learning on the digitization of education deserves attention and continued research (Y. Liu & Krutkrongphan, n.d.). Although ICVE brings together many online learning resources, these resources will lose their usefulness if the technology is not accepted. Therefore, it is important to understand the behavioral intention factors that may influence users' acceptance of learning systems.

The purpose of this study was to explore the factors influencing teachers' behavioral intention to use ICVE in Chinese higher education institutions, including perceived usefulness, perceived ease of use, as well as the relationship between the quality of the system, information quality, service quality, and E-learning experience and perceived usefulness and perceived ease of use, through a quantitative survey method.

Literature review

Many scholars have defined the main factors that influence the behavioral intentions of e-learning platforms. These factors include perceived ease of use, perceived usefulness, system quality, content quality, and service quality(Almaiah et al., 2016; Alshurideh et al., 2019; Mahande et al., 2019). In studies of learners' behavioral intentions, some researchers have identified e-learning experience as another factor that influences users' use of e-learning platforms(Liu et al., 2010a; Mailizar, Almanthari, et al., 2021; Mailizar, Burg, et al., 2021; Sylvia & Abdurachman, 2018).

Relationship between the quality of the system (QS) and perceived ease of use (PEOU), perceived usefulness(PU)

PEOU is defined as the degree to which users believe that using e-learning will be effortless(Davis, 1989; Lin et al., 2011). According to Mailizar, et al., (2021), System quality is about the quality related to the functionality, speed, content, and features of the learning management system. In the adoption of information technology, especially in the initial stage, An important factor in the acceptance of information technology is its perceived ease of use(Venkatesh & Bala, 2008). In the acceptance and use of electronic systems, the effectiveness of the system is very important("The DeLone and McLean Model of Information Systems Success," 2003). Therefore, managers must focus on the success of each system(Wang et al., 2007). The perceived ease of use and perceived usefulness are the primary function of the quality of any system when using a system over the Internet(Chuan-Chuan Lin & Lu, 2000). Previous studies have shown that the Quality of the System has a significant effect on the perceived ease of use of learning systems(Alshurideh et al., 2019, 2021; Mahande et al., 2019). The quality of the System has a significant effect on the perceived usefulness(Alshurideh et al., 2019, 2021; Fathema et al., 2015; Mahande et al., 2019; Mailizar, Burg, et al., 2021).

Therefore, we propose the following two hypotheses:

H1: Quality of the System (QS) has a significant influence on the perceived ease of use (PEOU) of ICVE.

H2: Quality of the System (QS) has a significant influence on the perceived usefulness (PU) of ICVE.

Relationship between information quality (IQ), service quality (SQ), and perceived usefulness (PU)

Davis (1989) pointed out that perceived usefulness refers to the tendency of people to believe that using a particular system will help improve their work performance, directly affecting people's use of a

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system. Some scholars define perceived usefulness as the degree to which an individual believes that the use of a certain technology can improve his or her work performance(Thompson et al., 1991). The information quality and perceived usefulness were important predictors of users' behavioral intentions (Blennerhassett et al., 2019). Alhashmi et al. (2020)found in research that information quality was a significant factor that helped to predict customer behavior and make decisions. Previous studies have shown that the information quality has a significant effect on the perceived usefulness(Alshurideh et al., 2019, 2021; Mahande et al., 2019). At the same time, many studies have included the impact of service quality on users' perceived usefulness and confirmed that service quality affects the perception of learning tools, the service quality (SQ) has a significant effect on the perceived usefulness(Alshurideh et al., 2019, 2021; Mahande et al., 2019).

Based on this, we give the following two hypotheses:

H3: Information quality (IQ) has a significant influence on the perceived usefulness (PU) of ICVE.

H4: Service quality (SQ) has a significant influence on the perceived usefulness (PU) of ICVE.

Relationship between E-learning experience and perceived ease of use (PEOU)

In this study, E-learning experience refers to the degree to which teachers in relevant universities have used e-learning to participate in or engage in specific tasks before using ICVE. Learners' previous learning experiences using the web have a huge impact on online learning engagement(Reed et al., 2000). Acceptance of e-learning depends both on the technology itself and on the skills of the users: the more experienced the users, the more likely they are to use e-learning(Sylvia & Abdurachman, 2018). Prior research has shown that the E-learning experience has a positive impact on users' perceived ease of use(Abdullah & Ward, 2016; Chang et al., 2017; Mailizar, Almanthari, et al., 2021). Therefore, we give the following hypotheses:

H5: E-learning experience (XP) has a significant influence on the perceived ease of use (PEOU) of ICVE.

Relationship between perceived ease of use (PEOU), perceived usefulness (PU), and behavioral intention to use (BIU)

BIU is a behavioral tendency of users to continue to use technology in the future, As such, it determines the acceptance of technology(Alharbi & Drew, 2014). in TAM, perceived ease of use and perceived usefulness are two important variables that affect users' behavioral intentions toward technology(Liu et al., 2010b). Perceived ease of use and perceived usefulness were found to be the two strongest predictors of usage intent(Salloum et al., 2019). Many previous studies have shown that the behavior to use e-learning is directly influenced by PEOU and PU(Al-Gahtani, 2016; Hsia et al., 2014; Lee et al., 2014; Tarhini et al., 2014, 2016). People are more likely to find technology useful if they think it is easy to use(Al-Hamad et al., 2021). Therefore, the better the perceived ease of use, the greater the perceived usefulness(Mahande et al., 2019). Many previous studies have verified that perceived ease of use has a significant effect on perceived usefulness(Al-Hamad et al., 2021; Almaiah et al., 2016; Alshurideh et al., 2019; Mahande et al., 2019; Mailizar, Almanthari, et al., 2021; Mailizar, Burg, et al., 2021).

Based on this, we give the following three hypotheses:

H6: Perceived ease of use (PEOU) has a significant influence on the perceived usefulness (PU) of ICVE.

H7: Perceived ease of use (PEOU) has a significant influence on behavioral intention to use (BIU) of ICVE.

H8: perceived usefulness (PU) has a significant influence on behavioral intention to use (BIU) of ICVE.

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Conceptual Framework

Conceptual frameworks were models used to represent all the variables in the study and the relations between them (Hair et al., 2013). Three researchers (Alshurideh et al., 2019; Almaiah et al., 2016; Mailizar et al., 2021) respectively developed an extended TAM model with different external variables, analyzed users' behavior intentions to use technology through investigation and research in different countries, and the research results all well proved the applicability of extended TAM. Based on this, this study develops a new extended TAM model using the above three theoretical frameworks. This study explores the factors that affect the intention of university teachers to use ICVE. The model consists of seven variables: quality of the system, information quality, service quality, E-learning experience, perceived ease of use, perceived usefulness, and behavior intention to use. Also, eight assumptions are included in the model.

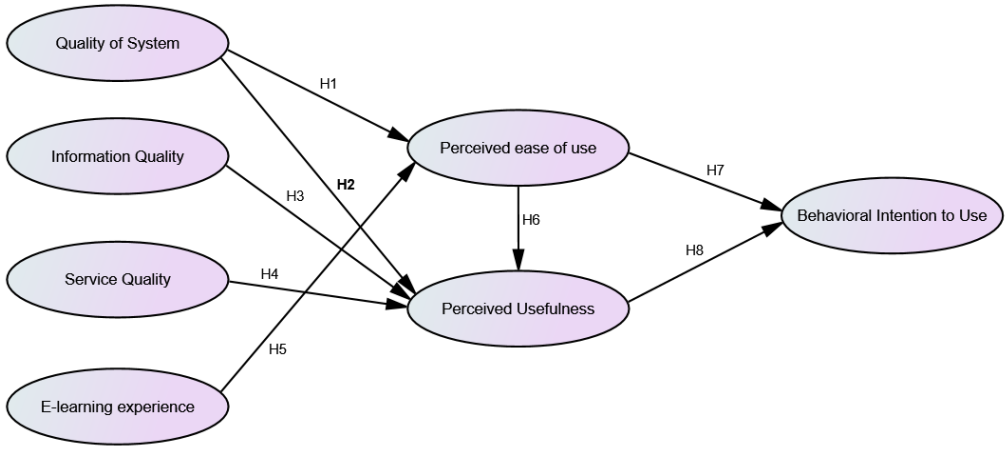

Figure 1 Conceptual Framework

Methodology

This study used a quantitative method to collect data from the target population using a questionnaire. To explore the factors affecting teachers' behavior and intention to use ICVE in Chinese higher vocational colleges and universities, teachers from four higher vocational colleges and universities in Chongqing were selected as the study population. The questionnaire consists of three main parts. The first part is the screening problem, ensuring that the target population has used the technology in the study and can complete the survey. The second part is the Characteristic information about the respondent, the last part is the measurement of all variables, there are 31 questions. There are 36 questions in the questionnaire, all questions were closed-ended and scored using a 5.0 Likert scale.

Before distributing the questionnaire, the researcher invited three experts in the field of study to assess the validity of the questionnaire utilizing Item-Objective Congruence (IOC). Then the researcher used a pilot test to test the reliability of the research instrument. After the questionnaire was qualified for both reliability and validity, an online questionnaire was used for data collection. In this study, a total of 502 questionnaires were distributed to four vocational colleges. After sorting and cleaning the questionnaire data, 439 questionnaires were retained.

In the data analysis section, demographic description of valid data, and descriptive statistics of variables were conducted. Then the data's convergent and differential validity were verified by validated factor analysis (CFA). Finally, results were obtained using structural equation modeling (SEM) to verify the fit of the structural model and to validate the hypotheses.

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Results

In the data analysis of the study, based on the 439 samples, a demographic description of the valid data was performed followed by descriptive statistics of the variables. This section considers sample mean, standard deviation, normal distribution, and reliability analysis to ensure that the data is suitable for the next step of validity analysis.

Table 1 Statistical table for reliability analysis for 439 Respondents

Variable	Number of Items	Cronbach's Alpha
Quality of the System	5	0.862
Information Quality	5	0.908
Service Quality	5	0.913
E-learning experience	4	0.854
Perceived ease of use	5	0.941
Perceived Usefulness	4	0.926
Behavior Intention to Use	4	0.940

Confirmatory Factor Analysis (CFA)

To examine data quality, this study used confirmatory factor analysis (CFA) to assess the correlations between latent variable items, measure the model's applicability, and the data's convergent and divergent validity. Through the CFA model assessment, the analysis revealed the need to adjust the model. This adjustment was accomplished by removing some items.

Table 2 CFA goodness of fit information for variable models

Fit Index	Criteria	Before Adjustment	After Adjustment
CMIN/DF	CMIN/DF < 3.00	2.348	1.982
GFI	GFI ≥ 0.90	0.862	0.908
AGFI	AGFI ≥ 0.80	0.835	0.885
CFI	CFI ≥ 0.90	0.953	0.971
NFI	NFI ≥ 0.90	0.921	0.943
RMSEA	RMSEA < 0.05	0.055	0.047

The research theoretical model was evaluated using three evaluation criteria: convergent validity, internal consistency reliability, and discriminant validity, provided that the CFA model was well-fitted after removing some of the question items. The convergence validity is achieved by checking the external load of the index and the Average Variance Extracted (AVE) (Mailizar, Burg, et al., 2021). The composite reliability (CR) is then measured to determine the internal consistency reliability (Hair et al., 2017). According to Hair et al. (2017), If factor loading is greater than 0.6, it is trusted, that CR values of 0.7 or higher mean adequate consistency reliability, and AVE values of 0.5 or higher mean convergent validity are evident.

Table 3 The Results for Factor loading, Composite Reliability (CR), and Average Variance Extracted (AVE)

Variable	Item	Unstd.	S.E.	T-value	P	Std.	SMC	CR	AVE
QS	QS1	1				.739	.546	.834	.558
	QS3	.964	.074	13.080	***	.647	.419		
	QS4	1.124	.070	16.127	***	.791	.626		

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Variable	Item	Unstd.	S.E.	T-value	P	Std.	SMC	CR	AVE
	QS5	1.169	.072	16.335	***	.801	.642		
IQ	IQ2	1				.799	.638	.906	.707
	IQ3	1.166	.054	21.429	***	.879	.773		
	IQ4	1.243	.060	20.601	***	.855	.731		
	IQ5	1.186	.060	19.736	***	.829	.687		
SQ	SQ2	1				.839	.704	.901	.694
	SQ3	1.002	.046	21.663	***	.840	.706		
	SQ4	.981	.047	21.090	***	.826	.682		
	SQ5	.947	.045	21.121	***	.827	.684		
XP	XP1	1				.814	.663	.861	.611
	XP2	.951	.054	17.468	***	.764	.584		
	XP3	1.022	.049	20.656	***	.874	.764		
	XP4	.927	.064	14.435	***	.657	.432		
PEOU	PEOU1	1				.857	.734	.926	.759
	PEOU3	1.065	.041	26.249	***	.907	.823		
	PEOU4	1.056	.040	26.567	***	.913	.834		
	PEOU5	.985	.047	21.136	***	.804	.646	.929	.766
PU	PU1	1				.889	.790		
	PU2	1.050	.034	30.624	***	.930	.865		
	PU3	1.029	.037	27.487	***	.887	.787		
	PU4	.922	.043	21.679	***	.789	.623		
BIU	BIU1	1				.917	.841	.927	.809
	BIU2	1.036	.035	29.967	***	.905	.819		
	BIU3	.989	.036	27.714	***	.875	.766		

Note: SE=Standard Error, ***=P<0.001, **Std.=** Factor Loading

Evaluation of Structural Equation Model

In the study, the structural equation model was tested for goodness-of-fit, and the structural model after the CFA deletion of the five items is shown in Figure 1, which meets the fit index.

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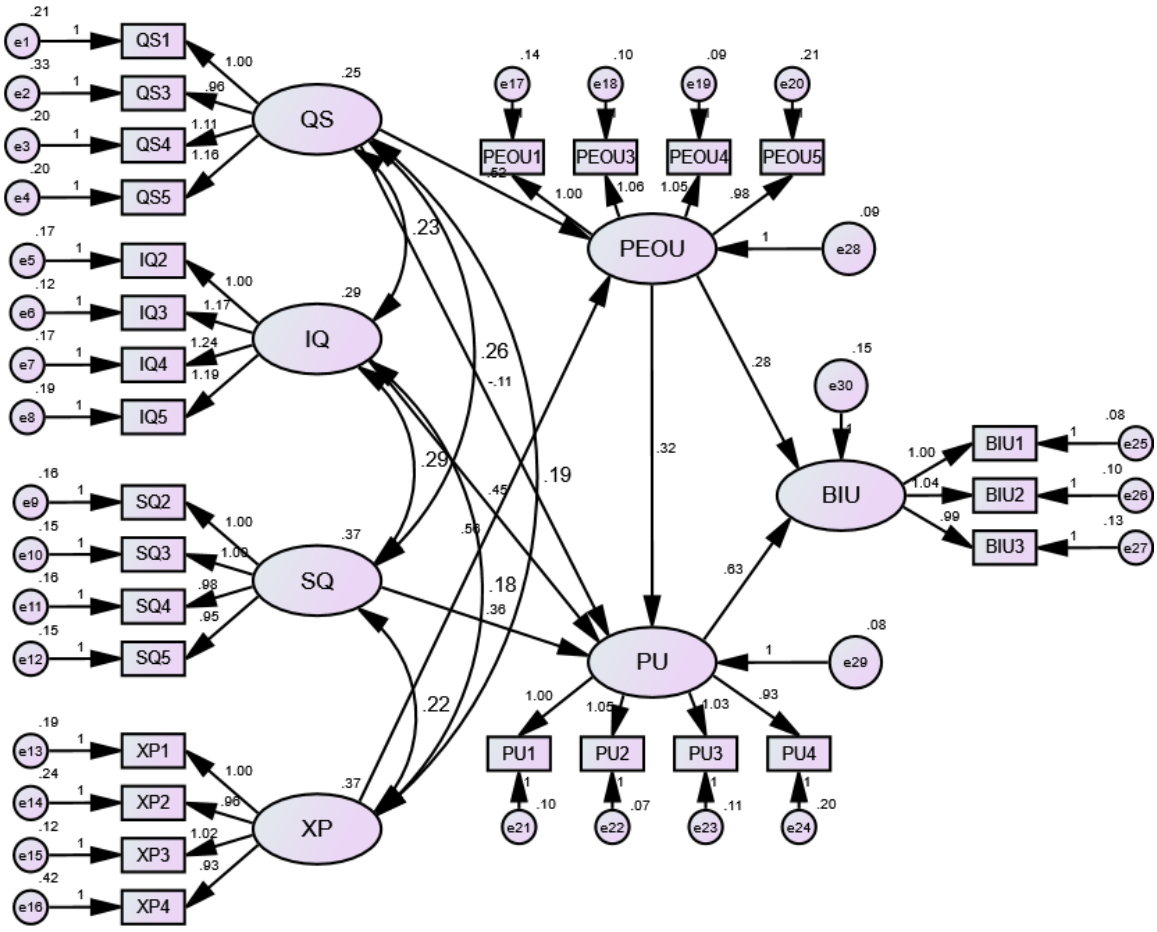

Figure2 The Structural Equation Model After Adjustment

Research Hypotheses Testing

Through verification, seven of the eight hypotheses proposed by the study were supported. According to the verification results of the hypothesis, the behavioral intention of using ICVE is influenced by both perceived usefulness and perceived ease of use, among which perceived usefulness has the strongest influence. The perceived usefulness of ICVE is influenced by information quality, service quality, and perceived ease of use respectively, while perceived ease of use is significantly driven by system quality and online learning experience. The effect of system quality on perceived usefulness is not significant.

Table 4 Test results of hypotheses

Hypothesis	Path			Standardized Coefficients (β)	t-value	P	Result
H1	PEOU	<--	QS	0.523	8.817	***	Supported
H2	PU	<--	QS	-0.113	-1.044	0.296	Not Supported
H3	PU	<--	IQ	0.451	4.65	***	Supported
H4	PU	<--	SQ	0.359	3.798	***	Supported

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Hypothesis	Path			Standardized Coefficients (β)	t-value	P	Result
H5	PEOU	<--	XP	0.564	11.189	***	Supported
H6	PU	<--	PEOU	0.316	6.588	***	Supported
H7	BIU	<--	PEOU	0.275	4.803	***	Supported
H8	BIU	<--	PU	0.628	10.49	***	Supported

Note: ***=p<0.001

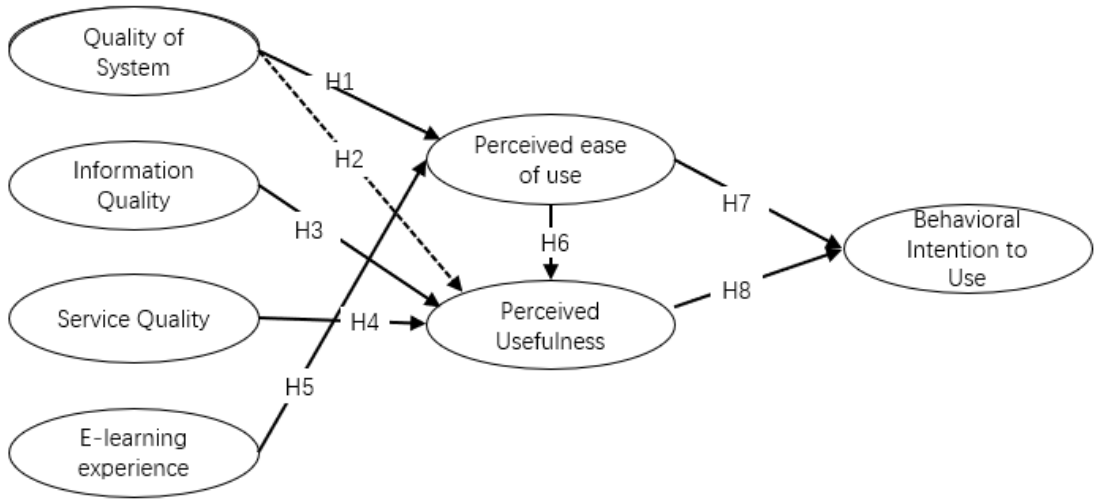

Figure 3 Regression path analysis diagram

Discussion

The purpose of this study was to analyze the factors that influence teachers' behavioral intention to use ICVE. According to the statistical results of the study, from the independent variables, mediating variables, and dependent variables, perceived ease of use and perceived usefulness significantly impact use behavior intention. This result nicely supports the previous findings(Almaiah et al., 2016; Alshurideh et al., 2019; Chang et al., 2017; Salloum et al., 2019). Of these, perceived usefulness had the greatest impact on behavioral intentions. The perceived usefulness of ICVE is influenced by information quality, service quality, and perceived ease of use respectively, while perceived ease of use is significantly driven by system quality and online learning experience. The effect of system quality on perceived usefulness is not significant.

In particular, it should be noted that the results of this study have no significant effect of system quality on the perceived usefulness of the learning system, which is contrary to some previous studies(Al-Hamad et al., 2021; Alshurideh et al., 2019; Fathema et al., 2015; Mahande et al., 2019; Mailizar, Burg, et al., 2021). We can venture a guess that for teachers using ICVE, the current electronic system tends to be well constructed and does not suffer from obvious system flaws. Therefore the behavioral intention to use ICVE in terms of perceived usefulness may be that they care more about the content quality of the information and the quality of the service.

Since the target population of this study was college teachers in Chongqing, China, the findings were not common to some extent. Also, ICVE being a relatively new system, teachers may still have response

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bias. In subsequent studies, more potential variables in the conceptual framework should be explored, or some interviews should be included to do a more comprehensive study of ICVE users in other places to consistently explore the factors influencing the intention to use ICVE to improve its utilization.

Conclusion

In this dissertation, the influencing factors affecting teachers' behavioral intention to use ICVE in Chongqing higher vocational colleges were investigated and the effects of the quality of the system, information quality, service quality, E-learning experience, perceived usefulness, and perceived ease of use on behavioral intention were explored. The study constructed an extended TAM model, verified the hypotheses through quantitative research methods, and the final data analysis using CFA and SEM tested the hypotheses and led to the following main conclusions.

The results of this study show that perceived usefulness has the greatest impact on the intention to continue using. Therefore, establishing a perception of the usefulness of the system is crucial to motivating users' behavioral willingness. The usefulness is mainly affected by the information quality and service quality, therefore, the builders and maintainers of the ICVE system should pay attention to the quality of information and service of the system, and provide users with high-quality information content and services, which will make users feel that the system is useful.

The second most important factor affecting intention to continue use is perceived ease of use. The perceived ease of use is mainly affected by the E-learning experience and Quality of the System, indicating that people with more online learning experience will perceive the ICVE system easier to use, and the stability of system quality is also a criterion for users to feel that the system is easy to use. Therefore, schools should encourage teachers to use more online teaching or learning, and provide relevant training on the use of online systems, so that users can enhance their E-learning experience and perceive the ease of use of the system. At the same time, the builders and maintainers of the ICVE system should update the maintenance system in time to ensure the stability of the system and the user's perception of its ease of use.

Recommendation

First, the research period is from 2023 to 2024. Due to the limitation of the research time, the research results reflect the data analysis of the system used by teachers in this stage, and whether ICVE is a relatively new system or continuously updated and improved, so the intentionality research on the use of ICVE should be in-depth and continuous. In particular, the research should be sustained and deepened to address this finding that the quality of the system does not have a significant effect on perceived usefulness.

Second, the study population is limited to teachers from four higher vocational colleges in Chongqing. Since the ICVE learning system is oriented to the whole world, the regional scope and scope of research objects can be expanded in the subsequent research. Relevant research can be conducted at universities in other parts of China, or you can choose to use ICVE students for relevant research.

Third, an important influencing factor of exogenous variables is XP. With the growth of teachers' age and the change in e-learning experience, factors affecting teachers' willingness to continue to use the platform may subjectively change, which is uncontrollable. Based on this, follow-up and continuous research is particularly important.

In addition, when constructing the conceptual framework of this study, the variables selected by the researchers are limited. Subsequent studies can add exogenous variables or adjust the conceptual framework to conduct in-depth research, the comprehensive method of quantitative plus experimental research can also be adopted to achieve more in-depth and comprehensive research results.

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