Research on the influencing factors of college students' online learning behavior -- Taking some universities in Dalian as an example

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Abstract. Online learning has many advantages such as portability, flexibility and repeatability, so it is widely accepted by teachers and students. In order to improve the use efficiency of online learning platform for college students and provide new reference for the development of online learning, the students of 9 colleges and universities in Dalian were investigated with questionnaires, and 214 valid questionnaires were obtained. This study uses PLS algorithm to explore the influencing factors of college students' online learning behavior preferences from both internal and external aspects. The results show that performance expectation, social impact, interface perception, and cooperation have significant positive effects on adoption intention.

Keywords: Digital era; Online learning; Behavioral preference.

1   Introduction

With the continuous application of digital technology, 5G, artificial intelligence and other modern technologies, college students' online learning has gradually emerged a new driving force for development[1]. Online learning firmly em-beds digital technology into college students' classroom[2]. Online learning emphasizes the freedom of learning. F. Gou (2020) analyzed and studied college teachers' cognitive evaluation of online teaching environment support satis-faction and online teaching platform function satisfaction[3]. S. Tang (2020) analyzed and studied the factors affecting the learning effect of COOC online teaching plat-form[4]. In practice, many basic models of online learning characteristics in China have taken shape[5], but few of them consider both online learner sample characteristics and online learning platform[6]. This study helps to solve the pain points and difficulties of the traditional online learning mode, and put for-ward constructive suggestions on the online learning platform, so as to better pro-mote the efficiency and interest of online learning of college students, and promote the healthy development of online education in colleges and universities.

2   Research model and research hypothesis

2.1   Research model

This paper uses VOSviewer visual analysis software to analyze the research literature on the online learning behavior included in CNKI database from 2006 to 2023, and obtains the keyword co-occurrence map as shown in Fig. 1. The top 5 keywords of frequency are adoption intention, influencing factors, technology acceptance model, adoption behavior and information adoption. The analysis results of these documents can provide reference for this study.
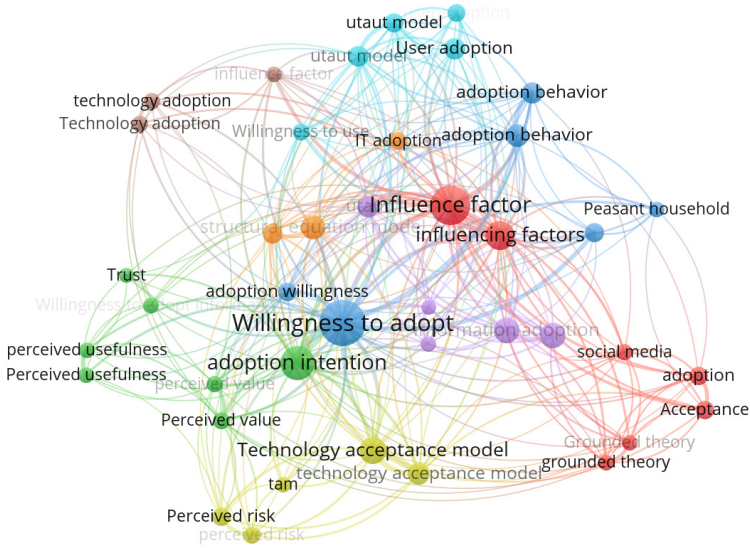

Fig. 1. Keyword co-occurrence atlas of online learning behavior

This paper selects the research UTAUT model of Venkatesh and Davis (2003) as the basic model. First, this paper selects three original external variables, namely performance expectation, social impact, and interface perception. Considering the research object of this paper - learning communication platform, according to existing research, this paper proposes the impact of cooperation on the willingness to adopt, Cooperation refers to the support of functional resources provided by the learning platform during online learning. Therefore, this paper adds "cooperation" latent variable to make the structural model more perfect and more suitable for the research subject.

2.2   Research theories and assumptions

This study mainly uses PLS algorithm for analysis[7]. The software used in this study is SmartPLS. Based on the adjusted integrated technology acceptance model, it is

proposed to empirically analyze the influencing factors of college stu-dents' online learning behavior.

This paper takes performance expectation (JX) as the external dependent variable of the model. In this paper, performance expectation refers to that the performance pursued by college students can be improved after using the learning communication platform. In this paper, Interface appearance (JM), Social Impact (SH), Cooperation (PH), Willingness to adopt (CN) and Use behavior (SY) are adopted as the external variable of the modified model.

Research hypothesis 1: performance expectations have a significant positive impact on the willingness to adopt the learning communication platform.

Research hypothesis 2: interface appearance has a significant positive impact on the willingness to adopt the learning platform.

Research hypothesis 3: social impact has a significant positive impact on the willingness to adopt the learning communication platform.

Research hypothesis 4: cooperation has a significant positive impact on the willingness to learn and adopt.

Research hypothesis 5: willingness to adopt has a significant positive impact on the use behavior of the learning communication platform.

3   Research design

3.1   Questionnaire design

The design of this questionnaire is mainly based on the potential variables in the model. Since the potential variables in the adjusted model cannot be directly measured, the questionnaire adopts the option system for the demographic information statistics of college students, and the rest uses the internationally accepted Likert five-level scoring method. observation variables are shown in Table 1.

Table 1. Model variables and indicator contents

Variable name	Question item	Observable variable
Performance expecta-tions (JX)	A1	It is easy to obtain better learning re-sources by using Learning Tools
	A2	Use the Learning Communication Plat-form to improve learning efficiency
Interface appearance (JM)	B1	Clear learning interface
	B2	The learning interface is reasonably ar-ranged and comfortable
Social Impact (SH)	C1	Students recommend using the Learning Communication platform for learning
	C2	Teachers and schools are required to use Learning Pass for learning
Cooperation (PH)	D1	The learning resources of Learning Con-nect client meet the learning requirements
	D2	Learning platform learning resources are convenient for learning

Willingness to adopt (CN)	F1	We plan to use the Learning Connect platform in the future
	F2	Students will be recommended to use the Learning Connect platform
Use behavior (SY)	G1	You have used Learning Pass for relevant learning
	G2	Has helped students use the Learning Connect platform

3.2   Data collection

This study takes the "Learning Connect" platform as the research object of data acqui-sition. This paper collects questionnaires through the network. The research mainly takes the students of 9 universities in Dalian as the object of investigation. The ques-tionnaire survey began in October 2022 and ended in January 2023 for a total of three months. A total of 245 questionnaires were collected. After eliminating the invalid questionnaires, 214 valid questionnaires were finally obtained, with an effective rate of 87.35%.

4   Data Analysis and Hypothesis Test

4.1   Analysis of factors influencing the characteristics of online learning behavior platform

This study uses the partial least square structural equation algorithm, and the software is SmartPLS. The factor load and reliability test are shown in Table 2. The factor load is greater than the restrictive standard of 0.6, Cronbach α Both CR and CR were greater than 0.7, which met the reliability criteria according to statistical principles.

Table 2. Reliability and validity test table

Potential varia-bles	Question item	Factor load	Reliability coefficient	CR	AVE	Cronbac hα
Performance expectations	A1	0.926	0.917	0.821	0.846	0.818
	A2	0.914				
Interface appear-ance	B1	0.921	0.913	0.811	0.840	0.810
	B2	0.912				
social influence	C1	0.908	0.896	0.771	0.812	0.768
	C2	0.894				
Cooperation	D1	0.924	0.921	0.829	0.854	0.829
	D2	0.924				
Willingness to adopt	E1	0.942	0.940	0.873	0.888	0.873
	E2	0.942				
Use behavior	F1	0.940	0.941	0.874	0.888	0.874
	F2	0.944				

According to Table 2, the minimum value of factor load of each question is 0.894, which is far greater than the standard value of 0.5. The minimum value of AVE is 0.812, which is greater than 0.5, and the reliability coefficient is higher than 0.65. Therefore, all variables meet the requirements of convergence validity.

The scale in Table 3 meets the requirements, the measurement model can be considered to have good differential validity. Good validity indicates that the measurement results of each variable are consistent with the test content, ensuring the accuracy and authenticity of this study.

Table 3. Differential validity test table

	JX	JM	SH	PH	CN	SY
JX	**0.920**					
JM	0.787	**0.917**				
SH	0.862	0.787	**0.901**			
PH	0.848	0.837	0.829	**0.924**		
CN	0.875	0.832	0.865	0.856	**0.942**	
SY	0.860	0.813	0.878	0.848	0.870	**0.942**

4.2   Fit test

According to Table 4, the SRMR test result 0.044 is less than the standard value 0.08, the d-ULS and d-G values are 0.154 and 0.401, respectively, are less than 0.95, and the NFI value is 0.97, which is greater than the standard value 0.7. Therefore, the evaluation of each index in the study is satisfied, and the fitting is good.

Table 4. Inspection table of fit

Indicator category	evaluating indicator	Adaptation standard	Inspection results	Model fitness
Absolute goodness of fit	SRMR	<0.08	0.044	Fine
Perfect fit index	d-ULS	<0.95	0.154	Fine
	d-G	<0.95	0.401	Fine
Specification adaptation index	NFI	>0.7	0.797	Fine

4.3   Path coefficient

Use SmartPLS to study the path coefficient and significance of the model, as shown in Fig. 2 and Table 5. The path coefficient is as follows. The number of subsamples in this paper is 5000, which follows the normal distribution and conforms to the large and medium samples in statistics. The test results of this paper are as follows: the path coefficients of performance expectation, social impact, interface perception, and cooperation are 0.379, 0.288, 0.311, and 0.386 respectively, which are significant at 0.01 confidence level, so hypothesis 1, hypothesis 2, hypothesis 3, and hypothesis 4

are valid. Similarly, the path coefficient of adoption intention to use behavior is 0.540, which is significant at the confidence level of 0.01, so hypothesis 5 is valid.

Table 5. Path coefficient table

Research hy-pothesis	Model path	Path coefficient	T	P	Inspection results
Assumption 1	JX-CN	0.379	5.272	0.000	Support
Assumption 2	JM-CN	0.288	4.901	0.000	Support
Assumption 3	SH-CN	0.311	4.767	0.000	Support
Assumption 4	PH-CN	0.386	6.193	0.000	Support
Assumption 5	CN-SY	0.540	8.306	0.000	Support
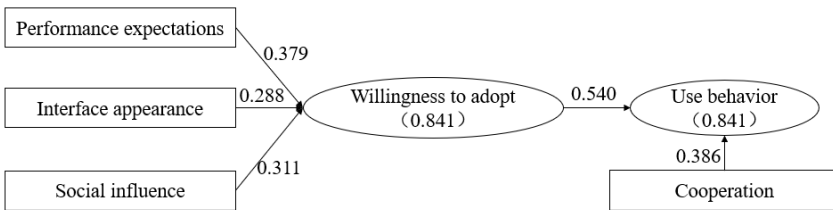
Fig. 2. Path coefficient diagram

5   Conclusions

Based on the above research conclusions, the following suggestions are proposed. First, improve the usefulness and applicability of the online learning platform. Second, in terms of social impact, we should strengthen the publicity of the use of online learning platform. Third, provide a convenient and fast online learning platform use environment.

Acknowledgment

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