Investigation of Product Design Students' Attitudes and Behavioral Intention of Online Learning at Sichuan University of Media and Communications in Sichuan Province, China

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Abstracts

The main objective of this study is to determine 1) the influencing factors of the attitude and behavioral intention of students majoring in product design to online learning, 2) determine what actions should be taken by students, teachers, teaching managers and university in the process of online learning, and 3) put forward suggestions that affect the attitude and behavioral intention of students in online learning.

Based on the theories of TAM, TAM3 and UTAUT, this study constructed a research model of students' attitudes and behavioral intentions towards online learning. This research takes the students majoring in product design as the research sample, and the participants are all learning experience online learning. The research instrument is the questionnaire, with a total of 33 survey questions. A total of 450 valid questionnaire survey data were collected. Statistics used in data analysis were frequency, percentage, mean, standard deviation, skewness, kurtosis and hypotheses testing.

The results showed that 1) PEOU has a significant impact on PU, 2) PEOU has a significant impact on ATU, 3) PU has a significant impact on ATU, 4) ATU has a significant impact on BI, 5) SI has a significant impact on BI, 6) PE has a significant impact on BI, 7) SE has a significant impact on PEOU. The main conclusions of this study are 1) to ensure that online learning is easy to operate and use, 2) enhance students' sense of self-efficacy, 3) make students aware of the important role of online learning, 4) enable students to feel the importance and positive role of online learning from the external world.

Keywords: product design; attitude; behavioral intention; online learning

Introduction

Information and communication technology has changed the form of modern education in China, and diversified teaching modes and methods have emerged, including e-learning, multimedia education, online and open education and mixed learning (Wang et al., 2018: 195-210).

Online learning refers to the use of information and communication technology, computer technology and network technology in the electronic environment. This learning method is mainly composed of online learning resources, online learning environment and online learning platform. Types include distance learning, online learning, e-learning, digital learning, etc（Hiltz, 1994).

With the rapid development of China's economy, China has the ability to provide better infrastructure and various necessary conditions for colleges and universities. Online

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learning is considered a promising method because it provides students with a good opportunity to interact with experienced teachers or professors. The Chinese government has launched various types of national projects to improve school infrastructure, and established some online schools and distance education colleges to provide various online learning projects(Wang et al., 2009:77-81).

According to the information released by the Ministry of Education of the People's Republic of China , as of September 30, 2021, there were 3012 Chinese colleges and universities, including 2756 ordinary colleges and universities (1270 undergraduate and 1486 junior colleges) and 256 adult colleges and universities. The list does not include universities in Hong Kong, Macao and Taiwan.According to the information released by the Education Department of Sichuan Province, as of September 30, 2021, there were 134 colleges and universities in Sichuan Province, including 53 ordinary undergraduate colleges and universities (35 public universities and 18 private universities) and 81 colleges for professional training.With the continuous development of China's higher education, online education vehicle has become an indispensable content in the process of education and teaching, and the relationship between online education and China's higher education is becoming closer and closer.

China's private colleges and universities are the product of reform and opening up and the sustainable development of China's higher education. Since the 1990s, after 30 years of continuous development, there are 757 private colleges and universities in China (including 257 independent colleges and 1 adult college). By June 2021, a total of 2196900 students had been enrolled, an increase of 357500 over the previous year, an increase of 19.43%; There were 7.0883 million students in school, an increase of 592300 over the previous year, an increase of 9.12%. There are 876 postgraduates enrolled and 1865 in school.

Sichuan University of Media and Communications is a representative private undergraduate college in Sichuan Province. There are nearly 30000 students in the school. The hardware facilities of the school are very complete. Students are good at using various types of hardware to improve their professional ability in the learning process. In the field of academic research, the research on online learning is mostly concentrated in public colleges and universities, and the research on the attitude and intention of students in private colleges and universities is relatively lack. Therefore, the purpose of this study is to take the product design students of Sichuan University of Media and Communications as the research sample, analyze their attitude and behavior intention towards online learning, and apply the conclusions obtained through the research to the online education of other private colleges and universities.

Literature Review

1.Technology Acceptance Model (TAM)

With the development of information technology, the technology acceptance model (TAM) is one of the most widely used models in the study of personal intention and technology use (Alenezi & Karim, 2010 : 22-34) .TAM is based on Theory of Planned Behaviour (TBP) and Theory of Reasoned Action (TRA)(Setiyani et al., 2021 : 80-89). TAM was developed and validated by Davis (Davis , 1989 : 318-341). TAM Model proposes Perceived Usefulness(PU) and perceived ease of use(PEOU) as the main measurement of technology acceptance behavior

(Davis et al., 1989 : 982-1004). The structure of TAM model shows that the use behavior of information technology is determined by intention, intention is determined by the user's attitude and perceived usefulness, and attitude is jointly determined by perceived usefulness and perceived ease of use. Perceived usefulness is affected by perceived ease of use and external variables, and perceived ease of use is also affected by external variables(Legris et al., 2003 : 191-204). The model shows that the higher the perceived ease of use, the more positive the use attitude, and the greater the perceived usefulness. To put it simply, the simpler and easier a technology is applied, the easier it will be accepted by users and the greater the perceived use. Of course, perceived ease of use is a process expectation. In the early stage of user learning and use, the impact of perceived ease of use on behavior intention is huge, but with the continuous use of users, the experience also increases. Therefore, the impact of perceived ease of use on behavior intention will also be weakened (Davis et al., 1989 : 982-1004).In different research fields, the research of many researchers provides data support for TAM. Mathieson, (1991 : 173-191) based on the data research of students using computers, it is concluded that the interpretation of intention by TAM is 70%; Taylor and Todd (1995 : 144-176) based on the background of students' use of computer resource center, it is concluded that the interpretation of intention by TAM is 52%; Plouffe et al.（2001 : 208-222）taking the smart card of electronic support system used by businessmen as the background, the data research shows that the interpretation of intention by TAM is 33%.In short, Tam theory has been proved to be a relatively mature theory in the field of education, and the theoretical framework of this study also adopts the theoretical results.

2.Unified Theory of Acceptance and Use of Technology (UTAUT)

Researchers have designed various theoretical models to predict the adoption and use of technology. Unified Theory of Acceptance and Use of Technology (UTAUT) is one of the most important theoretical models. Venkatesh et al.（2003 : 425-478）proposed this model on the basis of reviewing and synthesizing eight theoretical models such as TAM, TRA and TBP.The eight basic theoretical models include:Theory of Reasoned Action (TRA)(Ajzen & Fishbein, 1975 : 261), Technology Acceptance Model (TAM)(Davis,1989 : 318-341), Motivational Model(MM) (Davis et al., 1992: 1111-1132), Theory of Planned Behavior(TPB) (Ajzen, 1991 : 179-211), Combined TAM and TPB(C-TAM-TPB) (Taylor & Todd, 1995 : 144-176), Model of PC Utilization (MPCU) (Thompson et al., 1991 : 125-143), Innovation Diffusion Theory (IDT)(Moore & Benbasat, 1991:192-222),Social Cognitive Theory (SCT)(Compeau et al., 1999 : 145-158). Venkatesh et al. (2003 : 425-478) believed that UTAUT proposed four main factors affecting users' intention of using information technology:Performance Expectancy,Effort Expectancy,Social Influence,Facilitating Conditions. There are four moderating variables in the model: gender, age, experience, and voluntariness of use (Im et al., 2011 : 1-8). Performance Expectancy refers to the extent to which the user believes that using the system will help him or her get benefits in his or her work (Davis et al., 1992 : 1111-1132). In UTAUT, effort expectancy is defined as the ease of using a system.This factor is highly correlated with perceived ease of use in ATM model (Venkatesh et al., 2003 : 425-478）. Social impact refers to the degree to which users think important people judge the importance of technology use (Diaz & Loraas, 2010 : 61-77).Facilitating Conditions is defined as the user's trust in the organization or technology to support the use of the system(Thompson et al., 1991 : 125-143). In this study, Performance

Expectancy and Social Influence are added to the research framework, which lays the foundation for the formation of the research framework.

3.Technology Acceptance Model 3 (TAM 3)

Venkatesh and Bala (2008 : 273-315) designed Technology Acceptance Model 3 (TAM 3) model based on TAM and TAM2. The main advantage of this model is its comprehensiveness and potential practical value. It has certain operability in guiding users to accept the management practice of technology. Whetten (1989 : 490-495) believes that comprehensiveness and simplicity have their own advantages in the process of theoretical development. Comprehensiveness ensures that all relevant factors are included in the theory. Simplicity indicates that some factors should be cancelled because it is of little value to understand some phenomena. TAM 3 emphasizes the unique role and process of perceived usefulness and perceived ease of use, and believes that the determinants of perceived usefulness do not affect perceived ease of use, and vice versa. This is a very valuable theoretical contribution, because there are many uncertain conclusions about the relationship between perceived usefulness and perceived ease of use. Agarwal and Karahanna (2000 : 665-694) found that computer self-efficacy is an important determinant of perceived usefulness. However, Venkatesh believes that perceived ease of use fully regulates the impact of computer self-efficacy on behavioral intention (Venkatesh, 2000 : 342-365).In the TAM 3 model, the determinants of perceived ease of use include six parts: Computer Self-efficacy(CSE), Computer Anxiety(CA), Perception of Efficacy(POE), Computer Playfulness(CP), Perceived Enjoyment(PE) and Objective Usability(OU). Computer self - efficacy (CSE)refers to an individual's judgment of his ability to use computer (Compeau & Higgins, 1995 : 189-211).Computer anxiety(CA) refers to the fear and anxiety of users in the process of using the computer (Venkatesh, 2000 : 342-365).Computer Playfulness(CP) refers to the pleasant psychological state produced by users in the process of using computers (Webster & Martocchio, 1992: 201-226). Perception of Efficacy(POE) refers to the user's judgment of the external conditions that support the use of the computer.Perceived Enjoyment(PE) refers to an individual's judgment of the pleasure brought by the use of specific information technology; Objective Usability (OU) refers to the possibility of actually making efforts to complete a specific task.The effects of these factors on perceived ease of use are as follows: in the process of users' acceptance and use of information technology,Computer Self-efficacy(CSE), Computer Anxiety(CA), Perception of Efficacy(POE), Computer Playfulness(CP), Perceived are important predictors of perceived ease of use; In the middle and later stages of using technology, the importance of Enjoyment(PE) and Objective Usability(OU) is reflected; With the increase of user experience, the impact of computer anxiety on users' perceived ease of use is gradually weakened. The impact of perceived ease of use on behavior intention is as follows: perceived ease of use only has an impact on behavior intention in the early stage of information technology use, and this impact is weakening with the increase of use experience (Venkatesh & Bala , 2008 : 273-315). In this study, the relationship between Computer Self-efficacy and perceived ease of use is the key research content. Therefore, the variable of computer efficiency is added to the research framework.

Research objectives

The purpose of this research is to study the factors of attitude and behavior intention of product design majors in online learning. The main objectives of the study include the following three aspects:

1. Determine the influencing factors of online learning attitude and behavior intention of product design students.

2. Determine what actions students, teachers, teaching managers, and universities should take in the online learning process,

3. Provide suggestions that affect students' attitudes and behavioral intentions towards online learning.

Research Methodology

1.Research instruments

This study uses the questionnaire method to investigate the online learning attitude and behavior intention at students majoring in product design of Sichuan University of Media and Communications. The questionnaire consists of three main parts: screening questions, demographic profile of the participants and factors related to the seven latent variables of the conceptual framework.

It is worth noting that before the researcher distributed the questionnaire to students majoring in product design, the researcher asked three experts in the field of product design to test the index of Item-Objective Congruence (IOC) to ensure the validity of the questionnaire. Then 30 questionnaires were distributed to students as a preliminary test to ensure the reliability of the questionnaire. After collecting all the data, the researchers analyzed all the data using confirmatory factor analysis (CFA) and structural equation model (SEM), and described the data results in detail.

Table 1 Results of Internal Consistency Reliability Evaluation of the Pilot Test

Variable	**Number of Items**	**Cronbach's Alpha**
Self-efficacy	8	0.894
Perceived ease of Use	5	0.879
Perceived Usefulness	4	0.892
Attitude Towards Use	4	0.880
Behavioral Intention	4	0.877
Social Influence	4	0.861
Performance Expectancy	4	0.907

2.Sampling Strategy

This study selects 496 students with online learning experience from four grades of product design major of Sichuan University of Media and Comunications as the research object by using judgment sampling technology. These students represent the number of samples sampled in the first stage.

This study uses quota sampling technology to select participants from four grades of product design specialty, and is divided into 19 sampling units according to their classes. The researchers selected 450 students as the second stage sample according to the proportion of the total sample size of these 19 levels. The specific sampling information is shown in table 2.

Table 2 Sample Units and Sample Size

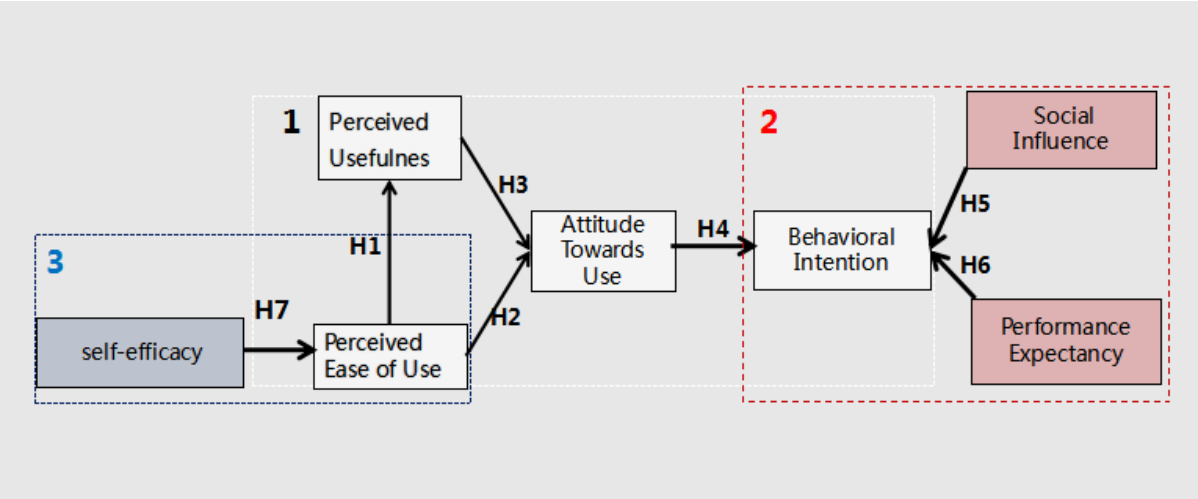
Target Grade	Class	Population Size Total = 496	Proportional Sample Unit Size Total = 450
Freshman	Class1	30	27(30*450/496)
	Class2	30	27 (30*450/496)
	Class3	29	26 (29*450/496)
	Class4	31	28 (31*450/496)
	Class5 （International class）	10	9 (10*450/496)
Sophomore	Class1	29	26 (29*450/496)
	Class2	29	26(29*450/496)
	Class3	31	28 (31*450/496)
	Class4 （International class）	15	14 (15*450/496)
Junior	Class1	36	33 (36*450/496)
	Class2	36	33 (36*450/496)
	Class3	36	33 (36*450/496)
	Class4	24	22 (24*450/496)
	Class5	20	18(20*450/496)
	Class6 (International class）	15	14 (15*450/496)

Senior	Class1	30	27 (30*450/496)
	Class2	29	26 (29*450/496)
	Class3	28	26 (28*450/496)
	Class4 （Internationalclass）	8	7 (8*450/496)

Research Conceptual Framework

The conceptual framework of this study is shown in Figure 1. The main purpose of this study is to investigate the online learning attitude and behavior intention of students majoring in product design at Sichuan University of Media and Communications in Sichuan Province, China. The conceptual framework clearly shows all the variables used in this study.The conceptual framework is chain multiple mediation model. The researcher applied three major theories (TAM, TAM3 and UTAUT) and three major previous research frameworks to support and develop conceptual framework of this study. The three major theories provided a study of Perceived ease of use(PEOU), Perceived usefulness(PU), Attitude towards use(ATU), Behavioral intention(BI), Social influence(SI), Performance expectancy(PE), Self-efficacy(SE).For the previous research framework, the first previous research framework was conducted by Lin (2006: 540-547). This research framework provides a basis for research on the relationship between PEOU, PU, ATU and BI.The second previous research framework was conducted by Mtebe and Raisamo(2014: 4-20). It provided the study of Social influence(SI), Performance expectancy(PE), and Behavioral intention(BI). The third previous research framework was conducted by Ramayah and Aafaqi (2004: 39-57). It provided the study of Self-efficacy(SE),Perceived ease of use(PEOU),and Perceived usefulness(PU).There are seven variables in the framework of this study.There are three types of variables in the framework of this study: independent variables, mediating variables and dependent variables. The independent variables for this study are Social influence(SI), Performance expectancy(PE), Self-efficacy(SE). The mediator variable for this study are Perceived ease of use(PEOU), Perceived usefulness(PU) and Attitude towards use(ATU). The only one dependent variable for this study is Behavioral intention(BI), which is the heart of this research as this study aims to investigate investigate the online learning attitude and behavior intention of students majoring in product design of Sichuan University of Media and Communications in Sichuan Province, China.The researchers analyzed the relationship between the seven variables,The PEOU, PU, ATU and BI are endogenous variable; SI, PE and SE are exogenous variable.

Figure 1 Conceptual Framework



Based on the conceptual framework structure, the researchers proposed the following 7 hypotheses:

H1: Perceived ease of use has significant influence on perceived usefulness.

H2: Perceived ease of use has significant influence on attitude toward Online learning.

H3: Perceived usefulness has significant influence on attitude toward Online learning.

H4: Attitude towards use has significant influence on Behavioral intention of Online learning.

H5: Social influence has significant influence on Behavioral intention of Online learning.

H6: Performance expectancy has significant influence on Behavioral intention of Online learning.

H7: Self-efficacy has significant influence on Perceived ease of use of Online learning.

Research Results

1.Demographic Information

In this study, the demographic information collected from the respondents included gender and grade. The interviewees are all students majoring in product design at Sichuan University of Media and Communications. Among them, 147 were male, or 32.7 percent, and 303 were female, or 67.3 percent. According to statistics, the ratio of male to female students in Sichuan University of Media and Communications is about 1:2, and the ratio of male to female students majoring in product design is about 1:2. The gender ratio of respondents conforms to the actual gender ratio of the university and the product design major.In this study, 450 respondents were distributed across four different grades. Among them, there are 117 first-year students, accounting for 26%; There are 94 students in the second grade, accounting for 20.9%, 153 students in the third grade, accounting for 34%, and 86 students in the fourth grade, accounting for 19.1%. The number of respondents in each grade accounts for a high proportion of the total number of students in that grade, reflecting the true wishes and ideas of the vast majority of students.The detail information is showed in Table 3.

Table 3 Demographic Profile

Variable	Category	Frequency	Percentage
Gender	Male	147	32.7%
	Female	303	67.3%
	Total	450	100%
Year of Study	Freshman	117	26.0%
	Sophomore	94	20.9%
	Junior	153	34.0%
	Senior	86	19.1%
	Total	**450**	**100%**

2.Confirmatory Factor Analysis (CFA)

Researchers use AMOS software to repeatedly adjust the measurement model and ultimately obtain indicators that match the acceptable range. The adjusted indicators are as follows: CMIN/DF=1.461<3.00, GFI=0.916 (≥ 0.90), CFI=0.976 (≥ 0.90), NFI=0.928 (≥ 0.90), TLI=0.973 (≥0.90), and RMSEA=0.032 (<0.08), AGFI=0.900 (≥0.90). All indicators meet the requirements, indicating that the measurement model has good fitting indicators and can lay a good foundation for the subsequent structural equation model.

Table 4 Goodness of Fit for Confirmatory Factor Analysis

Index	Acceptable Values	Source	Before Adjustment	After Adjustment
CMIN/DF	< 3.00	Hair et al. (2010)	1.635	1.461
GFI	≥ 0.90	Baumgartner and hombur (1996:139-161)	0.905	0.916
AGFI	≥ 0.90	Baumgartner and hombur (1996:139-161)	0.887	0.900
CFI	≥ 0.90	Hair et al. (2006:431-454)	0.967	0.976

NFI	≥ 0.90	Bentler & Bonnett (1980:588−606)	0.919	0.928
TLI	≥ 0.90	Hair et al. (2006:431-454)	0.963	0.973
RMSEA	<0.08	Pedroso et al. (2016:43, 37-40)	0.038	0.032

The Factor Loading in this study are all greater than 0.5, AVE is greater than 0.6, and CR is greater than 0.7, indicating that the model has good convergent validity. Specific data is shown in Table 5.

Table 5 Confirmatory Factor Analysis Result, Composite Reliability (CR), and Average Variance Extracted (AVE)

	Factor Loading	**S.E.**	**T-value**	**P**	**CR**	**AVE**
SE1	0.714	-	-		0.893	0.511
SE2	0.761	0.063	16.862	***		
SE3	0.760	0.069	15.121	***		
SE4	0.763	0.07	15.380	***		
SE5	0.615	0.065	12.095	***		
SE6	0.648	0.069	12.767	***		
SE7	0.751	0.071	14.714	***		
SE8	0.690	0.067	13.575	***		
PEOU1	0.671	-	-		0.880	0.597
PEOU2	0.769	0.081	14.385	***		
PEOU3	0.849	0.081	15.318	***		
PEOU4	0.786	0.078	14.417	***		
PEOU5	0.777	0.082	14.305	***		
PU1	0.813	-	-		0.893	0.676
PU2	0.795	0.054	18.981	***		
PU3	0.864	0.051	20.791	***		
PU4	0.814	0.051	19.120	***		
ATU1	0.798	-	-		0.883	0.655
ATU2	0.837	0.054	19.778	***		
ATU3	0.885	0.057	20.407	***		
ATU4	0.706	0.059	15.813	***		
BI1	0.803	-	-		0.877	0.640

	Factor Loading	S.E.	T-value	P	CR	AVE
BI2	0.800	0.055	18.426	***		
BI3	0.792	0.054	18.184	***		
BI4	0.805	0.053	18.406	***		
SI1	0.813	-	-			
SI2	0.829	0.053	19.247	***	0.852	0.592
SI3	0.688	0.052	14.605	***		
SI4	0.738	0.050	15.916	***		
PE1	0.832	-	-			
PE2	0.838	0.048	21.240	***	0.907	0.708
PE3	0.884	0.049	22.902	***		
PE4	0.811	0.049	20.088	***		

In this study, researchers conducted discriminant validity analysis on the model using AMOS software. The final result was that the square roots of AVE were 0.715, 0.773, 0.822, 0.809, 0.800, 0.769, and 0.841 on the diagonal, respectively, and the coefficients of any two potential variables did not exceed 0.800. The data shows that the arithmetic square root of AVE in dimensions such as SE, PEOU, PU, ATU, BIT, SI, PE is greater than the correlation coefficient between this dimension and other dimensions. This indicates that the discriminant validity of items in dimensions such as SE, PEOU, PU, ATU, BIT, SI, PE is good, indicating good discriminant validity.The specific results are shown in Table 6.

Table 6 Discriminant Validity

	AVE	PE	SI	BIT	ATU	PU	PEOU	SE
PE	0.511	**0.715**						
SI	0.597	0.656	**0.773**					
BIT	0.676	0.613	0.693	**0.822**				
ATU	0.655	0.586	0.624	0.606	**0.809**			
PU	0.64	0.616	0.649	0.695	0.530	**0.8**		
PEOU	0.592	0.454	0.556	0.548	0.415	0.500	**0.769**	
SE	0.708	0.426	0.468	0.368	0.351	0.366	0.397	**0.841**

3.Structural Equation Model (SEM)

The researchers conducted data analysis on the structural model and obtained the fitting index .the researchers corrected the model using the MI correction index and obtained a more ideal indicator. The comparison between the pre modified and post modified indicators is shown in Table 7.

Table 7 The Goodness of Fit Results Before and After Adjustment of SEM

Index	Acceptable Values	Before Adjustment	After Adjustment	Goodness of Fit
The Ratio of the ChiSquare Value to Degree of Freedom **(CMIN/DF)**	< 3.00	2.342	1.967	Good
Goodness-of-Fit Index **(GFI)**	≥ 0.90	0.878	0.900	Good
Adjusted Goodness-of-Fit Index **(AGFI)**	≥ 0.90	0.859	0.882	Acceptable
Comparative Fit Index **(CFI)**	≥ 0.90	0.928	0.949	Good
Normed Fit Index **(NFI)**	≥ 0.90	0.882	0.903	Good
Tucker-Lewis Index **(TLI)**	≥ 0.90	0.922	0.944	Good
Root-Mean-Square Error of Approximation **(RMSEA)**	<0.08	0.055	0.046	Good

4.Hypothesis Testing Results

In this study, the maximum likelihood method is used to estimate each regression coefficient. As shown in the table below, the standard error S.E. of the path coefficient is positive and there is no abnormally large phenomenon. The absolute values of the corresponding critical value C.R. are all greater than 1.96, indicating that there is a significant difference in the value of the regression coefficient at the level of 0.05. The criteria for testing the significance of path coefficients are: when the critical ratio is greater than 1.96, it is significant at a level of P less than 0.05; When the critical ratio is greater than 2.58, it is significant at a level of P less than 0.01.

Table 8 Research Hypotheses Test Results

Hypothesis	**Paths**			**Estimate**	**S.E.**	**C.R.**	**P**	**Result**
H1	PU	←	PEOU	0.501	0.074	8.910	***	Supported
H2	ATU	←	PEOU	0.208	0.073	3.680	***	Supported
H3	ATU	←	PU	0.422	0.058	7.228	***	Supported
H4	BI	←	ATU	0.213	0.050	3.770	***	Supported
H5	BI	←	SI	0.331	0.061	4.773	***	Supported
H6	BI	←	PE	0.172	0.053	2.730	0.006	Supported
H7	PEOU	←	SE	0.450	0.056	7.640	***	Supported

Note: Constructed by the Author; S.E.=Standard Error; ***=p<0.001; **=p<0.01; *=p<0.05.

From the fitting index test results in the table above, it can be seen that the model fitting index meets the standard, so path analysis and hypothesis testing between variables can be performed.The standardized path coefficient of SE on PEOU is 0.450 (p<0.05), indicating that SE has a significant positive impact on PEOU, so the hypothesis is valid.The standardized path coefficient of PEOU on PU is 0.501 (p<0.05), indicating that PEOU has a significant positive impact on PU, so the hypothesis is valid.The standardized path coefficient of PEOU on ATU is 0.208 (p<0.05), indicating that PEOU has a significant positive impact on ATU, so the hypothesis is valid.The standardized path coefficient of PU on ATU is 0.422 (p<0.05), indicating that PU has a significant positive impact on ATU, so the hypothesis is valid.The standardized path coefficient of ATU on BI is 0.213 (p<0.05), indicating that ATU has a significant positive impact on BI, so the hypothesis is valid.The standardized path coefficient of SI on BI is 0.331 (p<0.05), indicating that SI has a significant positive impact on BI, so the hypothesis is valid.The standardized path coefficient of PE on BI is 0.172 (p<0.05), indicating that PE has a significant positive impact on BI, so the hypothesis is valid.

Discussion of research findings

Firstly, the behavioral intention of students majoring in product design at Sichuan University of Media and Communications to engage in online learning is influenced by SE, PEOU, PU, ATU, SI, and PE. In terms of the mutual influence of variables, PEOU has the most significant impact on PU, indicating that students' perception of whether online learning can be easily operated can significantly affect their perception of the usefulness of online learning. Therefore, schools, teachers, and professional managers should attach great importance to whether online learning is easy to operate and use. If the process of online learning is complex or difficult to operate, reforms should be made to make the entire process of online learning simpler.

Secondly, SE has a significant impact on PEOU. It shows that students' self-efficacy has a significant impact on students' perception of whether online learning can be easily operated and used. The students' self-efficacy needs to be strengthened in many ways. Teachers should guide online learning from simplicity to complexity, and students should proficiently learn one knowledge point before proceeding to the next. Teachers' encouragement and support

are also important factors to enhance students' self-efficacy, so teachers should actively encourage students and praise every small achievement they have achieved.

Thirdly, PU has a significant impact on ATU. The choice of online learning by students majoring in product design is influenced by perceived usefulness. Therefore, teaching managers and professional teachers should make students aware of the role of online learning. In terms of specific methods, the introduction course of online learning can be specifically promoted for offline learning, including theoretical learning, practical learning, and interactive communication. At the same time, students can experience the course and perceive the usefulness of online learning.

Fourthly, the impact of SI on BI is also significant, indicating that students' willingness to choose online learning is influenced by external factors. For example, schools and teachers should increase their efforts in promoting and guiding online learning, so that students can perceive the importance and promotion of online learning from the outside world. During the teaching process, teachers should also analyze the importance and precautions of online learning, propose online learning plans, and provide encouragement and support.

Suggestions

This study focuses on exploring the influencing factors of attitudes and behavioral intentions of students majoring in product design who adopt online learning. Through data analysis, research conclusions were drawn. Through summary, it was found that the theoretical results obtained by the researchers can effectively guide students majoring in product design to engage in online learning. Importantly, the above theoretical achievements can provide practical basis for teaching managers, education and teaching development centers, professional managers, professional teachers, and teaching evaluation centers of Sichuan University of Media and Communications.

From the perspective of schools and teaching development centers, adopting incentive measures or reward mechanisms to guide students to engage in online learning is an important teaching management measure. Because social influence (SI) has an extremely important impact on students' behavioral intentions. So, the school management can carry out reforms from the following aspects:

Firstly, actively encourage the development of online learning from a policy perspective, allowing students to engage in professional learning from multiple dimensions, thereby enhancing their learning autonomy.

Secondly, continuously upgrade the software and hardware required for online students. The online learning space for college students during their school years includes classrooms, libraries, dormitories, and study rooms. Therefore, schools can update network speed, improve hardware quality, and ensure that students can learn online anytime and anywhere within the aforementioned space.

Thirdly, In teaching, teachers should make two preparations. Grasp offline teaching with one hand and online teaching with the other. It is necessary to reach a consensus within teachers that proficient online teaching is a necessary quality and basic skill for teachers.

From the perspective of professional managers, in the process of formulating talent development plans, it is important to emphasize students' basic skills in online learning. To help students understand the importance of online learning, whether during their university studies or in their future work. Therefore, professional managers can make efforts from two aspects: firstly, in the curriculum design, more courses can be integrated into online learning,

which can turn a portion of offline teaching time into online learning, fully leveraging students' motivation for self-directed learning. Secondly, through research and learning, enhance the online teaching ability of all professional teachers. After fully understanding the skills of online learning, teachers convey the importance of online learning to students and guide them to understand and become proficient in online learning.

From the perspective of the teaching evaluation center, diversified teaching assessments can be conducted. In the process of students learning professional knowledge, the evaluation center should not only assess offline learning, but also develop more detailed and quantitative online learning assessment methods. At the same time, for different professional courses, the teaching evaluation of teachers should also be different. For example, courses related to product design models can focus on offline assessments; And divergent thinking and software courses can focus on online assessments. Provide detailed evaluation criteria for teachers' teaching preparation for online learning.

In summary, the conclusions of this study have guiding significance for online learning practice for students majoring in product design. At the same time, the research conclusions have guiding significance for the specific work of school teaching managers, professional managers, teacher evaluation centers, and professional teachers.

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