Journal of Education and Educational Research
ISSN: 2957-9465 | Vol. 7, No. 1, 2024

The Research on Optimization of Online Education Platform Based on Customer Satisfaction

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Abstract: With the application of Internet technology in traditional education, online education has emerged as a teaching and learning form based on the Internet. Since 2010, there has been a surge in investment in online education, with market size and user numbers steadily increasing, and online education platforms flourishing. Chaoxing Learning Platform is a comprehensive mobile application developed by Beijing Chaoxing Company in 2016, covering mobile teaching, learning, reading, and social functions. It is one of the earliest companies in China to engage in the digitization of paper resources and electronic publishing. However, users still encounter the following problems when using Chaoxing Learning Platform or other online learning platforms: low completion rate, poor learning effectiveness, difficult time management, lack of motivation, lack of feedback and guidance, and so on. Therefore, it is necessary to find ways to improve the low completion rate and high exit rate of Chaoxing Learning Platform for its future healthy development. This study takes Chaoxing Learning Platform as the research object, based on customer satisfaction model and technology acceptance model, explores the factors that affect user satisfaction of online education platforms, and is expected to provide useful suggestions and countermeasures for platform optimization, promotion, and improvement of user experience.

Keywords: Satisfaction with Online Education Platforms; Internet Technology; College Student Education; Educational Development Trends.

1. Introduction

At the beginning of 2020, the outbreak of COVID-19 forced the suspension of offline education in China. The Ministry of Education promoted the "suspension of classes and schools", canceled offline courses and activities, and promoted the rapid development of domestic online education [1]. With the support of national policies, the prosperous development of the Internet, the increasing willingness of the people to receive education, and the surge in demand for online education in 2020 driven by the epidemic, the development of online education platforms has also shown an astonishing trend. In 2011, China added 100000 education related enterprises, and by 2019, the number of new related enterprises had reached an astonishing 560000. In November 2020, China added nearly 520000 education related enterprises. Among them, from January to May 2020, more than 20000 online education related enterprises were registered and established, with an average of 140 new companies added every day. As of October 2023, there were 82000 new online education enterprises, accounting for 17.3% of the entire education industry [2]

Chaoxing Learning Platform is a free application developed and launched by Beijing Chaoxing Company in 2016, which integrates mobile teaching, mobile learning, mobile reading, and mobile socializing. Chaoxing Company is one of the earliest companies in China to engage in digital and electronic publishing of paper resources. Since its establishment, Chaoxing Company has accumulated a massive amount of resources such as books, journals, newspapers, videos, and original works over the past 20 years, with an annual increase of over 100000 types [3]. At the same time, Chaoxing Company attaches great importance to the promotion of the Learning Platform on campus, which has a high popularity rate in general universities. However, when users use Chaoxing Learning Platform or other online learning platforms, learners may encounter various problems, including low completion rate, poor learning effect, lack of interaction and discussion, time management difficulties, lack of motivation, homework and exam pressure, lack of feedback and guidance [4]. Therefore, it is necessary to find ways to improve the low completion rate and high exit rate of Chaoxing Learning Platform for its future healthy development.

This article is supported by the Information System Success Theory (D&M Theory) and analyzed based on the Chinese Customer Satisfaction Model. A research model is constructed, with Chaoxing Learning Platform as the research object to explore the factors that affect the satisfaction of Chaoxing Learning Platform users. Based on the Chinese Customer Satisfaction Model, the study examines the quality of Chaoxing Learning Platform courses, systems, and services Will social interaction, perceived value, and expected quality have an impact on satisfaction.

The research on the group satisfaction of superstar learning platform in the existing literature is very rare. Based on the Chinese customer satisfaction theory, this study analyzes the factors that affect learners' satisfaction with Superstar learning platform, and explores the relationship between various factors by constructing a hypothesis research model, in order to make a supplement and reference for improving the satisfaction of superstar learning platform learners.

2. Literature Review

2.1. The Theory of Information System Success

Scholars Delone and McLean put forward the theory of

information system success (D&M theory) [5]. They study information systems by explaining the relationship and interaction path between factors such as system quality, information quality, service quality and user satisfaction, which is widely used in the measurement and evaluation of information systems. With the development of information system and the gradual application experience of enterprises, the initial mode of D&M has been gradually improved.

2.2. Customer Satisfaction Model

In 1989, American scholars proposed to combine the psychological state of customers, such as customer expectation and perception after purchase, with the actual state of purchase price and use, and other factors to form an econometric model [6]. Then, American scholars constructed the American customer satisfaction index model (ASCI) ASCI model based on the local situation of the United States. On the basis of the original model, two variables, perceived quality and perceived price, are introduced, as shown in Figure 1.

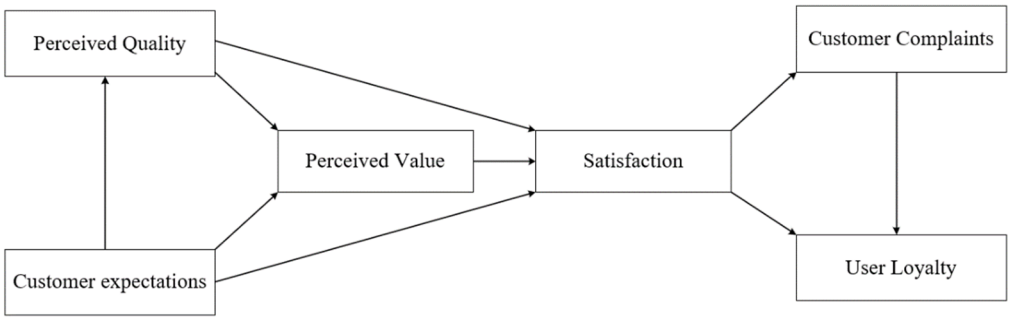

Figure 1. Customer Satisfaction Model

With the continuous research on the user satisfaction model, Tsinghua University in China has created a Chinese user satisfaction model applied to China according to local conditions [7]. As shown in Figure 2. Based on the user satisfaction model of the United States, it can better help companies and enterprises understand the consumers of their users in a more specific and detailed way, and through this model, it can help enterprises understand consumers and further plan the direction of continuous development of enterprises in production and services. At the same time, it can further improve the consumption quality of consumers and create a win-win situation between enterprises and consumers.

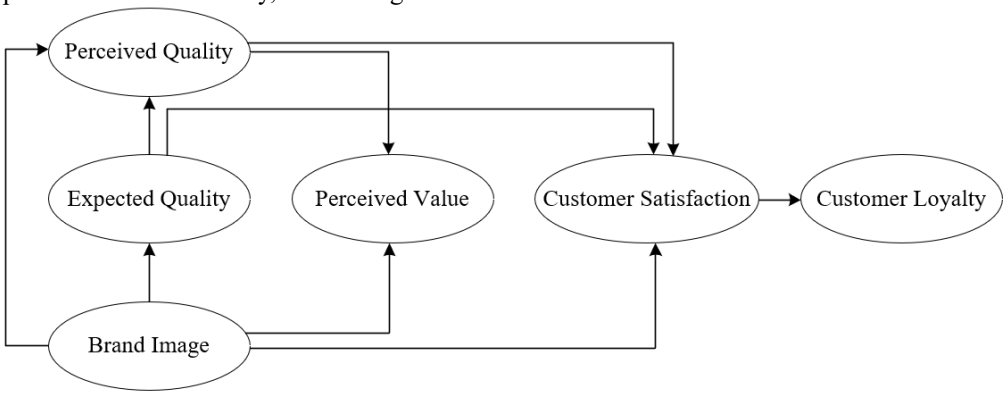

Figure 2. Chinese Customer Satisfaction Model

3. Theoretical Models and Assumptions

As an important research variable, customer satisfaction has existed since the establishment of the concept of customer satisfaction. With the continuous development of theory and model, it has not been deleted as an important basic variable. From this, we can see that whether user expectations can be met will have a great impact on customer satisfaction, so we added the expected quality as a variable to the superstar learning general user satisfaction model.

In addition, as an influential online learning platform, superstar learning link not only has massive learning resources, with functions such as digital library and online check-in, but also plays the role of the online learning platform with the highest penetration rate in China. It uses the massive data on the network to provide users on its platform with services such as online check-in, online examination and online interaction. So we integrate the D&M theoretical model with the perceived quality in customer satisfaction. As for platform quality, we interpret it with the three most classic variables in the D&M theoretical model: system quality, content quality and service quality. In addition, because of the social attributes of the superstar learning platform, the variable of interaction quality is set. To sum up, we built the research model of superstar learning general user satisfaction as shown in Figure 3.

In the figure, H1a indicates that the course quality of superstar learning has a positive impact on its perceived quality, and H1b indicates that the course quality of superstar learning has a positive impact on its expected quality. H2a indicates that the system quality of superstar learning has a positive impact on its perceived value, H2b indicates that the system quality of superstar learning has a positive impact on its expected quality, H3a indicates that the service quality of superstar learning has a positive impact on its perceived value, H3b indicates that the service quality of superstar learning has a positive impact on its expected quality, H4a indicates that learners' social interaction has a positive impact on their perceived value, H4b indicates that learners' social interaction

has a positive impact on their expected quality, H5a indicates that learners' perceived value has a positive impact on their satisfaction, H6a indicates that expected quality has a positive impact on their perceived value, H6b indicates that expected quality has a positive impact.

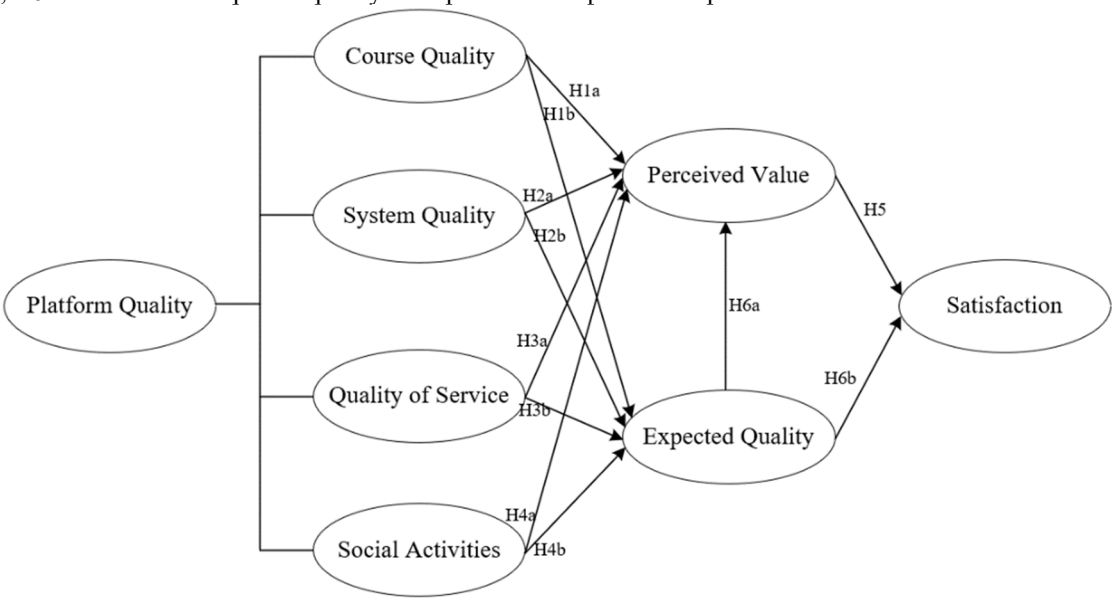

Figure 3. Hypothetical research model on factors affecting learner satisfaction with using the Chaoxing Learning Platform course

4. Data Source and Sample Analysis

4.1. Data Source

The questionnaire of this paper based on the factors affecting Chinese college students' continuous use of superstar learning platform, 38 projects were designed, which were divided into two parts. The first part consists of demographic issues, including the gender of respondents, whether they have studied the completed courses, grade, the number of completed courses, the number of completed courses and the decision to use the completed courses. In addition, a question is designed as a screening option to screen out those questions that have been selected "0 times" during the final analysis process. The second part is the core part of the questionnaire, referring to the Richter five scale. It measures the curriculum quality, system quality, service quality, social interaction quality and perceived value, expectation quality and satisfaction, as well as 32 items.

4.2. Data Collection

This survey uses the network questionnaire survey method to conduct a sampling survey. Through the questionnaire star platform, the questionnaire is distributed online with the help of QQ, wechat and other tools to carry out the survey. Then through the snowball sampling method, the questionnaire links are distributed on the popular social media platforms in China, such as microblog, wechat, QQ and so on, and the target population is invited to participate, so as to expand the scope of the questionnaire and increase the number of samples.

The questionnaire survey object of this study is: college students with super star learning experience. The questionnaire of this study was made into an online questionnaire through the questionnaire star platform, which was distributed on social software in the form of links and wechat QR code, and the questionnaire data was collected from the questionnaire star platform. The questionnaire is distributed through the questionnaire star platform, and the requirements for filling in and answering are clearly described at the time of distribution. After manual screening, the questionnaires with a filling time of less than 60 seconds were eliminated (the judgment standard was that the respondents with a filling time of less than 60 seconds were judged to be random and the answers had large errors), and the samples of non college students and samples that had not used the superstar learning platform in the questionnaire were deleted.

The sample size is determined by the simple random sampling formula $n = \mathrm{N}/(1+\mathrm{N}\times e^2)$ [8], Results the sample size was about 400. In view of the possible sampling errors in the actual operation, we finally determined the sample size of 450.Organize and filter the data collected from the questionnaire survey, identify effective data, and then use computer software for subsequent data analysis.

Based on D&M theory and customer satisfaction index model, this study takes college students who have used superstar learning link as the research object, and conducts a questionnaire survey through the network questionnaire platform. On this basis, it uses computer analysis software to carry out sample analysis, reliability and validity evaluation, factor analysis, SEM model analysis on the sample data, and uses computer software to carry out path analysis. In order to test whether the factors summarized in the previous paper will have an impact on the subject satisfaction of this study, and whether there will be a corresponding impact between the factors, and finally draw a conclusion.

4.3. Sample Analysis

A total of 442 responses were collected during the 20-day survey conducted on the questionnaire star, a famous survey platform in China. After using the filter option to filter invalid responses, 37 surveys were excluded, and 405 valid surveys were used for data analysis. The proportion of males in the survey sample was 48.6%, a total of 197 people; Women accounted for 51.4%, a total of 208 people. The number of freshmen is the most, accounting for 63.2%, and the number of seniors is the least, accounting for 3.2%, because most of the seniors in the university are facing the situation of looking for jobs after completing their studies. On the contrary,

freshmen in the university are the ones who study the most. So, this sample grade distribution is in line with the actual situation, which proves the reliability of this data.

Table 1. Sample characteristics describe the frequency number analysis results

project	option	frequency	percentage (%)	Cumulative percentage of (%)
sex	male	197	48.6	48.6
	emale	208	51.4	100
grade	first year in college	256	63.2	63.2
	Second grade in college	70	17.3	80.5
	junior	66	16.3	96.8
	senior	13	3.2	100
Number of enrollment courses	One	90	22.2	22.2
	Two	56	13.8	36
	Three	29	7.2	43.2
	Four	31	7.7	50.9
	Five or more	199	49.1	100
Number of courses completed	One	145	35.8	35.8
	Two	80	19.8	55.6
	Three	116	28.6	84.2
	Four	53	13.1	97.3
	Five or more	11	2.7	100
Use the reason	Learning ChaoXing Xuetang through to make up for their own lack of offline learning	236	20.60%	20.60%
	I am recommended to use Superstar for learning and learning	168	14.70%	35.30%
	ChaoXing Xuetang pass credits can be exchanged for class credits	68	5.90%	41.20%
	Complete the school electives	271	23.60%	64.80%
	Have been used to the learning process of ChaoXing Xuetang pass	34	3.00%	67.80%
	Increase your own reserves of knowledge and skills	133	11.60%	79.40%
	The learning process can be arranged freely	135	11.80%	91.20%
	Complete the ChaoXing Xuetang pass can get a certificate, which will be helpful for future employment	101	8.80%	100.00%

From the perspective of the number of registered courses and completed courses of superstar learning, the number of registered courses with five or more courses is the most, but the number of completed courses with five or more courses is the least. This data just confirms the fact that superstar learning has a low completion rate and a high exit rate.

4.4. Reliability Analysis

Generally speaking, the reliability analysis coefficient α The closer to 1, the better the reliability of the questionnaire α If the coefficient is greater than 0.7, the reliability of the questionnaire is very good. If it is between 0.6 and 0.7, it is within an acceptable range. However, if it is less than 0.6, it is necessary to add or remove items or revise the questionnaire (Hair, Black, Babin,&Anderson, 2019). This article uses the reliability analysis function in computer software to conduct reliability analysis on seven variables, including course quality, system quality, service quality, social interaction, perceived value, expected quality, and satisfaction, as well as the overall valid data of the sample. The results are shown in Table 2.

From Table 2, it can be seen that in the reliability test of the survey sample in this article, the Cronbach's Alpha value of course quality is 0.908; The Cronbach's Alpha value for system quality is 0.908; The Cronbach's Alpha value of service quality is 0.893; The Cronbach's Alpha value for social interaction is 0.898; The Cronbach's Alpha value for perceived value is 0.872; The expected Cronbach's Alpha value for quality is 0.891; The Cronbach's Alpha value for satisfaction is 0.884, indicating that the Cronbach's Alpha values for the reliability tests of the seven variables in this study are all greater than 0.8, and two dimensions are even greater than 0.9. Therefore, the survey data in this study is in a very good range and is suitable for factor analysis.

Table 2. Cronbach reliability analysis

variable	designation	Correction for Item Total correlations	Item deleted α coefficient	Cronbach α Coefficient	The overall Cronbach α coefficient
Course quality	CQ1	0.73	0.894	.908	.938
	CQ2	0.738	0.893		
	CQ3	0.745	0.892		
	CQ4	0.737	0.893		
	CQ5	0.75	0.891		
	CQ6	0.781	0.887		
mass of system	PQ1	0.732	0.893	.908	
	PQ2	0.749	0.89		
	PQ3	0.758	0.889		
	PQ4	0.706	0.896		
	PQ5	0.731	0.893		
	PQ6	0.791	0.884		
quality of service	CE1	0.732	0.874	.893	
	CE2	0.768	0.861		
	CE3	0.742	0.87		
	CE4	0.816	0.844		
Social interaction	SI1	0.748	0.878	.898	
	SI2	0.766	0.87		
	SI3	0.753	0.875		
	SI4	0.825	0.849		
Perceived value	PU1	0.678	0.856	.872	
	PU2	0.739	0.832		
	PU3	0.71	0.843		
	PU4	0.784	0.815		
Expected quality	EC1	0.736	0.868	.891	
	EC2	0.783	0.852		
	EC3	0.751	0.863		
	EC4	0.779	0.854		
degree of satisfaction	SAT1	0.734	0.856	.884	
	SAT2	0.732	0.857		
	SAT3	0.708	0.867		
	SAT4	0.821	0.824		

The overall reliability value of the sample is 0.938, which is greater than 0.9 and belongs to a very good range. This indicates that the various factors in this study are relatively stable and reliable, and the reliability of the sample data is very high, which can be used for factor analysis.

4.5. Validity Analysis

When testing validity, this study adopted factor analysis method to test the validity of the survey sample data. The factor analysis function in computer analysis software was used to analyze the validity of seven variables: course quality, system quality, service quality, social interaction, perceived value, expected quality, and satisfaction. The results are shown in Table 3.

Table 3. KMO and Bartlett's test

Number of KMO sampling suitability quantities		.925
Bartlett sphericity test	Approximate chi square	8457.219
	free degree	496
	conspicuousness	.000

As shown in the above table, the KMO coefficient value of the overall survey sample data in this study is 0.925, which is at a very good level if it is greater than 0.9. The Bartlett sphericity test result is 0.000, which is less than the significance level of 0.05. Therefore, the survey data in this study is suitable for factor analysis.

4.6. Factor Analysis

Figure 4 provides the confirmatory factor analysis model diagram of this study. The following analysis data are all from this diagram. It can be seen from table 4 that the chi square degree of freedom ratio (CMIN/DF) is 1.864, less than 3, The standard fit index (NFI), the Tucker Lewis index (TLI), the incremental fit index (IFI), and the comparative fit index (CFI) are all above 0.9, while the goodness of fit index (GFI) and the adjusted goodness of fit index (AGFI) are also above 0.85, The root mean square error of approximation (RMSEA) is 0.046, less than 0.08, which also meets the standard. Therefore, it can be considered that this model has a good matching degree.

Convergent validity is used to measure the degree of association between latent variables and their corresponding observed variables. In the measurement model, each latent variable is associated with multiple observed variables, and convergent validity is used to verify whether these observed variables can collectively reflect or measure the latent variable. If there is a high degree of correlation between observed variables and latent variables, it indicates good

convergent validity. Convergent validity is typically assessed using Average Variance Extracted (AVE) and Construct Reliability (CR). AVE measures the strength of the latent variable's explanation for its observed variables, and its value should typically be greater than 0.5 or within the range of 0.36 to 0.5, which is considered reasonable. CR represents the internal consistency or reliability of the latent variable, and a value greater than 0.7 is generally considered reasonable.

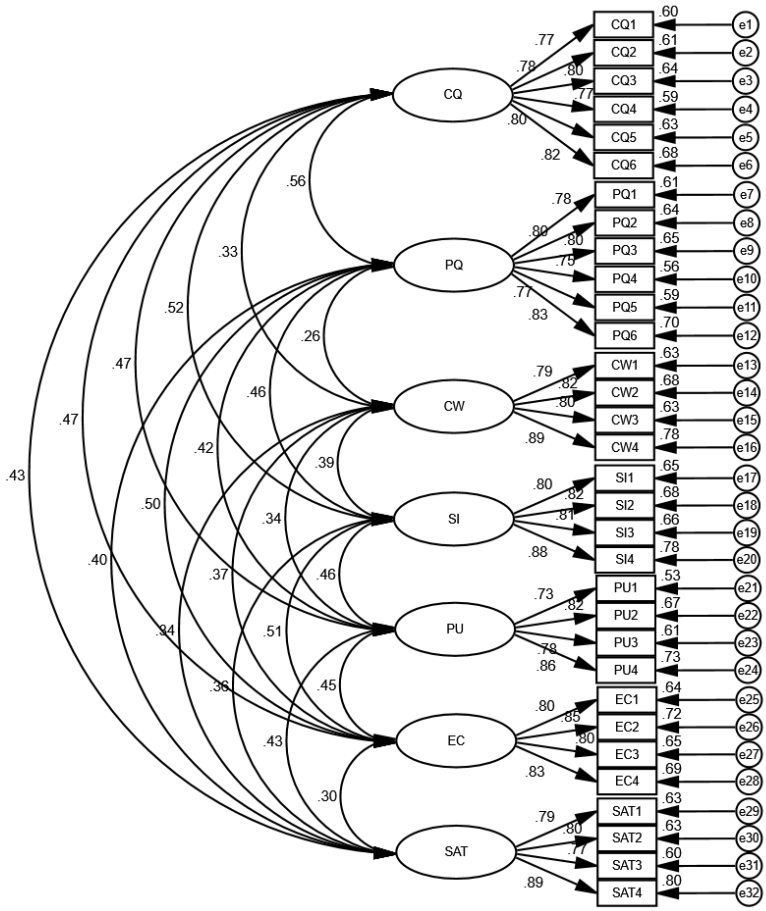

Figure 4. Confirmatory factor analysis model diagram

Table 4. Confirmatory Factor Analysis Model Fit

Fit indicators	CMIN	DF	$\chi 2$/df	RMSEA	GFI	AGFI	IFI	NFI	TLI	CFI
Acceptable range			<3	<0.08	>0.85	>0.85	>0.9	>0.9	>0.9	>0.9
Measurement value	825.678	443	1.864	.046	.891	.870	.955	.907	.949	.954

As shown in Table 5, the aggregated validity indicates that the standard factor loadings for course quality (KC), system quality (XT), service quality (FW), social interaction (SJ), perceived value (GZ), expected quality (YQ), and satisfaction (MY) are all above 0.7; The composite reliability (CR) values are all above 0.7; The Average Variance Extracted (AVE) value, rounded to three decimal places, is above 0.5; Based on the previous text, if AVE is greater than 0.5 and CR value is greater than 0.7, it indicates high convergent validity. Therefore, this confirmatory factor analysis model has good convergent validity.

4.7. Discussion on the Impact of Various Variables on Expected Value

To further investigate the impact of subjective norms on consumer intention, this study used computer software to conduct regression analysis on the survey sample data. The regression analysis results are shown in Table 6.

Through correlation and regression analysis, the hypotheses H1b, H2b, H3b, and H4b proposed earlier have been validated, including variables such as "course quality", "system quality", "service quality", and "social interaction", all of which have a significant positive correlation with expectations. And "course quality", "system quality", "service quality", and "social interaction" all belong to platform quality.

That is to say, on Chaoxing Learning Platform, the higher the course quality of the software, the higher the expected value of customers. Similarly, the higher the system and service quality of the software, the higher the expected value of customers; The higher the interaction effect of the software during class, the higher the expected value of customers.

This is consistent with many internet platforms, such as [9-10], which have proven to varying degrees that the system quality and service quality of the platform can have an impact on consumer expectations and satisfaction. However, these

confirmations were all on internet sales platforms, and this study confirmed them on internet education platforms. And it also proposes a pre influencing factor for the customer expectations of the consumer satisfaction index model, namely platform quality.

Table 5. Confirmatory Factor Analysis Aggregation Validity

			Estimate	S.E.	C.R.	P	factor loading	CR	AVE
CQ1	<---	CQ	1				0.76	0.906	0.616
CQ2	<---	CQ	1.091	0.065	16.708	***	0.795		
CQ3	<---	CQ	1.051	0.066	15.98	***	0.78		
CQ4	<---	CQ	0.909	0.057	15.886	***	0.776		
CQ5	<---	CQ	0.943	0.06	15.674	***	0.771		
CQ6	<---	CQ	1.054	0.062	17.026	***	0.824		
PQ1	<---	PQ	1				0.78	0.911	0.632
PQ2	<---	PQ	1.027	0.059	17.39	***	0.803		
PQ3	<---	PQ	0.999	0.057	17.552	***	0.814		
PQ4	<---	PQ	0.892	0.056	16.062	***	0.758		
PQ5	<---	PQ	0.893	0.054	16.568	***	0.774		
PQ6	<---	PQ	1.01	0.055	18.203	***	0.838		
CE1	<---	CE	1				0.796	0.901	0.696
CE2	<---	CE	1.078	0.059	18.216	***	0.832		
CE3	<---	CE	1.007	0.057	17.639	***	0.816		
CE4	<---	CE	1.033	0.051	20.264	***	0.889		
SI1	<---	SI	1				0.779	0.890	0.670
SI2	<---	SI	0.949	0.056	16.949	***	0.802		
SI3	<---	SI	0.989	0.057	17.271	***	0.823		
SI4	<---	SI	1.037	0.057	18.222	***	0.867		
PU1	<---	PU	1				0.736	0.878	0.644
PU2	<---	PU	1.203	0.076	15.922	***	0.82		
PU3	<---	PU	1.142	0.074	15.508	***	0.804		
PU4	<---	PU	1.141	0.07	16.405	***	0.845		
EC1	<---	EC	1				0.786	0.886	0.661
EC2	<---	EC	1.196	0.067	17.937	***	0.843		
EC3	<---	EC	1.058	0.062	16.953	***	0.806		
EC4	<---	EC	0.968	0.057	16.968	***	0.816		
SAT1	<---	SAT	1				0.773	0.883	0.655
SAT2	<---	SAT	1.045	0.062	16.849	***	0.804		
SAT3	<---	SAT	1.017	0.065	15.752	***	0.763		
SAT4	<---	SAT	1.096	0.059	18.46	***	0.892		

Table 6. Results of perceived value regression

	F	R^2	B	t	conspicuousness
constant			2.728	3.29	0.001
Course quality	99.789	0.198	0.11	2.934	0.004
mass of system	104.093	0.205	0.127	3.733	0.000
quality of service	44.710	0.100	0.087	1.995	0.047
Social interaction	101.078	0.201	0.175	3.588	0.000
Expected quality	111.313	0.216	0.2	4.169	0.000

Dependent variable a: perceived value

4.8. Discussion on the Impact of Various Variables on Perceived Value

Through correlation and regression analysis, the hypotheses H1a, H2a, H3a, H4a, and H6a proposed earlier have been validated, including variables such as "course quality", "system quality", "service quality", "social interaction", and "expected quality", all of which have a significant positive correlation with perceived value. And "course quality", "system quality", "service quality", and "social interaction" all belong to platform quality.

That is to say, the better the quality of the platform, the higher the perceived value of customers. Based on the above discussion, the higher the platform quality, the higher its expected quality will also be, and the higher the expected quality, the higher the perceived value of customers will also be. The root cause of wanting customers to perceive higher value lies in the quality of the platform.

These conclusions are also consistent with many internet platforms [11-12], and are also consistent with the consumer satisfaction index model.

4.9. Discussion on the Impact of Various Variables on Satisfaction

To further investigate the impact of perceived value and expected quality on satisfaction, this study conducted regression analysis on the survey sample data using computer software. The regression analysis results are shown in Table 7.

Table 7. Results of satisfaction regression

	F	R^2	B	t	conspicuousness
constant			7.667	9.379	0.000
Perceived value	54.352	0.119	0.264	4.908	0.000
Expected quality	43.151	0.097	0.193	3.696	0.000

Dependent variable a: perceived value

Through the relevant analysis and regression analysis in the previous text, the hypotheses H5 and H6b proposed based on the customer perception index model have been validated. Among them, "perceived value" and "expected quality" will have a significant positive impact on satisfaction.

That is to say, the higher the customer perceived quality and expected quality of Chaoxing Learning Platform, the higher the consumer satisfaction will be. This conclusion is very consistent with the consumer satisfaction index model.

5. Conclusion

Based on the above research results, this study discusses and analyzes the following conclusions:

(1) In terms of sample data, after completing phased learning, users of Chaoxing Learning Platform are relatively satisfied with the platform. Although this software is mandatory for use by the school, the data shows that its practicality and user experience are still quite good.

(2) The results of this study indicate that perceived value and expected quality have a direct and positive impact on user satisfaction, while course quality, system quality, service quality, and social interaction have an indirect impact on user satisfaction by influencing perceived value and expected quality. The expected quality will also have a direct and positive impact on perceived value.

Although we have reached certain conclusions, more theoretical support and practical applications may be needed to prove the correctness and value of these conclusions. In the future, we can further study the relevant theoretical and practical applications to better explain and prove our conclusions. In conclusion, there is room for further expansion and improvement of the topic and research methods of this research, so as to draw more meaningful and valuable conclusions by deeply exploring the influencing factors of online education platforms.

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