AGRICULTURAL UNIVERSITY STUDENTS' SATISFACTION WITH ONLINE LEARNING PLATFORMS

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Abstract: In recent years, online learning platforms have become an integral part of higher education, offering flexible and accessible learning opportunities to students worldwide. This study aims to explore Agricultural University students' satisfaction with online learning platforms. This study developed the satisfaction model by integrating the Expectation Confirmation Theory and the Technology Acceptance Model. Data were collected from undergraduates at agricultural universities in China who have used online learning platforms. The findings indicate that the most significant factor influencing undergraduates' satisfaction is confirmation between pre-use expectations and post-use perceived performance. Additionally, perceived usefulness and ease of use also play crucial roles. The study also offers practical implications for educators and platform developers, suggesting that improving user satisfaction involves managing expectations effectively, enhancing perceived utility, and ensuring the platform's user-friendliness. The research offers a comprehensive framework for understanding user satisfaction with online education. The structural model assessment demonstrated that our proposed model explains 80.6% of the variance in undergraduates' satisfaction. This research offers a novel approach to assessing satisfaction with online education by focusing specifically on Agricultural University students. It highlights the significance of expectation confirmation, perceived usefulness, and ease of use in determining student satisfaction, contributing to the broader understanding of factors that influence the success of online learning platforms.

Keywords: Agricultural universities; Online learning platforms; Satisfaction; Expectation confirmation theory; Undergraduate; Promotion suggestion

1 INTRODUCTION

As information technology rapidly advances and internet usage becomes more prevalent, online learning platforms have swiftly risen within the global education system, significantly supplementing traditional education models. Particularly during the COVID-19 pandemic, universities across the globe adopted online education to ensure students' academic progress and the continuity of teaching activities [1]. This unforeseen event significantly propelled the use of online learning platforms, which have continued to demonstrate their irreplaceable advantages and potential even after the pandemic was brought under control. These platforms offer students flexible learning options, breaking time and space constraints and enriching the diversity and accessibility of learning resources [2]. Online learning platforms enhance the availability and quality of education and training, helping to reduce costs and improve the economic efficiency of education [3].

However, despite the potential advantages of online learning platforms, attracting and retaining students remains a major challenge. Existing studies indicate that users of online learning platforms exhibit high dropout rates [3]. One of the key factors contributing to this dropout rate is student satisfaction, which significantly impacts their intention to continue using the platform. In the field of educational technology, student satisfaction is considered a critical parameter for assessing the quality of online education [4]. Educational researchers and platform developers can formulate targeted improvement measures by collecting and analyzing student feedback. Therefore, understanding student satisfaction with online learning platforms and their influencing factors is crucial for optimizing the online educational environment and enhancing the quality of education.

Current studies have primarily concentrated on users' acceptance of online learning platforms and their intentions for continued use [3]. Factors influencing acceptance include task-technology fit, perceived usefulness, social influence, attitude, user innovativeness, and perceived ease of use [5-8]. These determinants are often examined through frameworks such as the theory of planned behavior and the technology acceptance model (TAM). On the other hand, researchers have applied TAM, the task technology fit model, and the expectation confirmation model to examine factors affecting users' willingness to continue using online platforms, including curiosity, perceived benefits, system quality, platform reliability, confirmation, user satisfaction, task-technology fit, and ongoing technical support [1, 9-11]. Despite these insights, limited research has specifically examined the satisfaction of undergraduates with online learning platforms. Addressing this gap could provide deeper insights into improving educational practices and platform features to meet university students' needs better.

This study aims to develop a satisfaction model for undergraduates' use of online learning platforms, revealing the factors that influence their satisfaction. To achieve this, we first integrated the TAM with the expectation confirmation

theory (ECT) to construct a comprehensive model that explains undergraduates' satisfaction with online learning platforms. Next, we conducted an empirical survey targeting agricultural universities in China, collecting 804 valid responses. After verifying the reliability and validity of the research data, we performed a structural model analysis to test our hypotheses. The results demonstrated that confirmation was the most significant factor affecting undergraduates' satisfaction with online learning platforms. In addition to confirmation, we also investigated the roles of perceived usefulness, ease of use, perceived performance, and expectation in shaping undergraduates' satisfaction. Finally, based on our findings, we provided recommendations for online education platforms, suggesting specific improvements to enhance student satisfaction and overall user experience.

Our research makes significant contributions to both theoretical understanding and practical application in the online education field. Theoretically, this research provides a model framework for analyzing agricultural university students' satisfaction with online learning platforms by integrating the TAM and ECT. The model demonstrates strong explanatory power, explaining 80.6% of the variance in agricultural university students' satisfaction, which highlights its effectiveness in capturing the key factors influencing satisfaction. Empirically, the study identifies expectation confirmation as the most influential determinant of satisfaction. Practically, the study offers valuable guidance for platform developers and educators to improve the design and user experience of online learning platforms.

The paper is organized as follows. Section 2 delves into the development of the satisfaction model, the methodology, and the data collection process. Sections 3 and 4 present the research findings and corresponding discussions. In conclusion, Section 5 brings the paper to a close by summarizing the main findings and research limitations.

2 MATERIALS AND METHODS

2.1 Model Development

2.1.1 Expectation confirmation theory

ECT is a foundational framework for understanding user satisfaction and post-usage behavior, originally developed by Bhattacherjee [12]. ECT posits that satisfaction is a function of the comparison between users' initial expectations and their perceived performance after engaging with a product or service. The theory suggests that users enter an experience with certain expectations based on prior experiences, marketing communications, or social influences [13]. After using the product or service, they evaluate its performance, leading to confirmation or disconfirmation. If the perceived performance meets or exceeds their expectations, confirmation occurs, resulting in higher satisfaction. Conversely, disconfirmation occurs if the performance falls short of expectations, often leading to dissatisfaction. This satisfaction or dissatisfaction plays a crucial role in determining future behaviors, such as the intention to repurchase, recommend, or continue using the product or service.

Satisfaction, in the context of this research, represents undergraduates' overall emotional response to their experiences with the online learning platform. It arises after students directly interact with the platform, reflecting the extent of contentment or pleasure with its performance.

Confirmation refers to the degree to which the actual experiences meet initial expectations about a product, service, or system. When the platform's performance aligns with or exceeds these expectations, undergraduates may likely experience positive confirmation, leading to higher satisfaction. Conversely, disconfirmation occurs when the platform falls short of their expectations, resulting in lower satisfaction. According to ECT, satisfaction is primarily shaped by the degree of confirmation or disconfirmation of the users' initial expectations [12]. The connection between confirmation and satisfaction is a core principle of ECT, which posits that when users' initial expectations are met or exceeded by the actual performance of a product or service, their satisfaction levels increase. Therefore, we hypothesize that:

H1: Confirmation positively influences undergraduates' satisfaction with online learning platforms.

Expectation refers to the beliefs or assumptions that consumers hold about the performance of a product or service before they experience it. In this study, expectations refer to the undergraduates' anticipations about the online learning platform before using it. These expectations establish the initial benchmark against which they evaluate the platform, serving as the foundation for the subsequent formation of their satisfaction. As a result, we anticipate that:

H2: Expectation positively influences undergraduates' confirmation of online learning platforms.

Perceived performance is the user's evaluation of a product or service's performance after using it [14]. In this research, perceived performance describes the undergraduates' evaluation of the functionality and effectiveness of the online learning platform after using it. If the platform is easy to navigate and provides high-quality educational content, undergraduates will likely perceive its performance as high, thereby increasing the likelihood of confirmation. Consequently, we hypothesize that:

H3: Perceived performance significantly affects undergraduates' confirmation of online learning platforms.

H4: Perceived performance significantly influences undergraduates' expectations of online learning platforms.

2.1.2 Technology acceptance model

TAM is widely recognized as a foundational framework for understanding user acceptance and usage of technologies [15]. TAM is built upon the theory of reasoned action, which posits that an individual's behavior is driven by their intention to perform the behavior, with this intention being influenced by their attitude and subjective norms. TAM simplifies this by focusing on two key determinants of technology acceptance: perceived usefulness (PU) and perceived ease of use (PEOU). In online education, TAM has been instrumental in understanding how perceptions about the ease

of use and usefulness of learning platforms influence students' acceptance and sustained interaction with the technology [4, 8, 9, 16, 17]. Drawing from existing findings in TAM research, we developed the following hypotheses:

H5: Perceived usefulness significantly affects undergraduates' satisfaction with online learning platforms.

H6: Perceived usefulness significantly affects the perceived performance of online learning platforms.

H7: Perceived ease of use significantly affects undergraduates' satisfaction with online learning platforms.

H8: Perceived ease of use positively influences the perceived performance of online learning platforms.

H9: Perceived ease of use positively influences undergraduates' perceived usefulness.

The proposed theoretical model extends ETC with TAM to explore undergraduates' satisfaction with online learning platforms. Figure 1 demonstrates our proposed satisfaction model of online learning platforms.



Figure 1 Our Proposed Satisfaction Model

2.2 Measurements

The questionnaire consisted of two parts. The first part collected basic demographic information from the participants, such as gender and academic year. The second part used a measurement scale to investigate undergraduates' experiences and opinions on online learning platforms. We carried out a thorough literature review to identify existing scales and items effectively used in previous research to measure similar constructs. The survey items were adapted and contextualized from previous influential research, mainly drawing on the works of Lee [10], Li, et al. [7], and Venkatesh, et al. [18], which have extensively explored various facets of technology acceptance and user satisfaction. Additionally, we incorporated reverse items (SAT3 and EXP3) in the survey to enhance the reliability of the data by identifying non-serious responses in the answers provided by the respondents. This careful construction and validation of the questionnaire ensured the collected data could be reliably used for further analysis. The satisfaction measurement scale used for the survey is presented in Table 1. Responses to the questionnaire were gathered using a seven-point Likert scale.

Constructs	Items	Factor loadings	Cronbach's Alpha	CR	AVE
	SAT1: I am satisfied with my experience using the online learning platform.	0.989	0.979	0.986	0.959
Satisfaction (SAT)	SAT2: Using the online learning platform is a wise decision.	0.974			
	SAT3*: Overall, I am dissatisfied with the online learning platform.	0.975			
Confirmation (CON) Perceived Performance (PP)	CON1: My experience with the online learning platform matched my expectations.	0.983	0.969	0.979	0.941
	CON2: The functions and services of the online learning platform are consistent with my initial expectations.	0.955			
	CON3: The online learning platform fulfills needs that surpass my service expectations.	0.971			
	PP1: The online learning platform completely meets my learning needs.	0.931	0.925	0.952	0.869
	PP2: The online learning platform responds quickly to my learning requests.	0.944			
	PP3: The online learning platform provides reliable, customized, and professional services.	0.922			
Perceived Usefulness (PU)	PU1: The online learning platform has improved my academic performance.	0.938	0.939	0.961	0.891

 Table 1 The Satisfaction Measurement Scale and Its Reliability Test Results

	PU2: The online learning platform saves time in achieving my learning objectives.	0.947			
	PU3: The online learning platform has increased my learning efficiency.	0.947			
	EXP1: My experience with the online learning platform is better than I expected.	0.936	0.893	0.933	0.824
Expectation (EXP)	EXP2: The service level of the online learning platform is better than I expected.	0.931			
	EXP3*: In general, most of my expectations for the online learning platform have not been met.	0.854			
	PEOU1: Using the online learning platform is easy for me.	0.933	0.910	0.943	0.847
Perceived Ease of Use (PEOU)	PEOU2: Using the online learning platform is clear and understandable.	0.916			
. ,	PEOU3: I can easily become proficient in using the online learning platform.	0.912			

*SAT3 and EXP3 were reversed items whose responses have been reversed during data analysis.

2.3 Data Collection

The investigation was conducted in agricultural universities in China. Undergraduates who had participated in at least one online course were allowed to participate in this survey. The Questionnaire Star platform, a widely recognized tool for creating and distributing electronic surveys, was used to collect data. The electronic questionnaires were distributed to undergraduates via university email and social media platforms commonly utilized by the students. This study was approved by the Northeast Agricultural University Committee on Experimental and Animal Ethics.

We implemented several measures throughout the survey process to ensure the quality and reliability of the data collected. First, the questionnaire was pre-tested with a small group of students to identify and correct any ambiguities or misunderstandings in the questions. This pre-test also allowed us to estimate the time required to complete the survey, ensuring it was manageable for respondents. Next, we conducted stratified sampling to ensure the study's findings could reflect the entire undergraduate population. Respondents were divided into different academic years (freshman, sophomore, junior, and senior), with each category proportionately represented in the sample. This stratification aimed to minimize sampling bias and enhance the generalizability of the study's results. Additionally, we incorporated logical checks (i.e., reversed items) into the questionnaire to eliminate responses with contradictory answers. All questions were mandatory, and the system issued reminders if participants attempted to skip any required questions.

In total, we collected 1,073 survey responses from university undergraduates. We cleaned the collected data to enhance the quality of the dataset. First, we excluded responses with abnormally short completion times, which indicated that the respondent did not thoroughly consider the questions. Additionally, we removed any responses that contained illogical answers based on the reversed items, further refining the research dataset. After the data cleaning, we retained 804 valid samples. The final sample exhibited a balanced demographic distribution. Of the 804 respondents, 375 were male, and 429 were female, ensuring that both genders were adequately represented. By academic year, the respondents were distributed as follows: 393 freshmen, 239 sophomores, 70 juniors, and 102 seniors. All valid respondents had participated in at least one online course learning.

2.4 Data Analysis

This study analyzes the relationships among latent variables by applying PLS-SEM, providing reliable theoretical validation and practical application guidance. First, measurement model evaluation is aimed at verifying the reliability and validity of the latent variables, ensuring that the observed indicators accurately reflect the corresponding latent constructs. Second, structural model evaluation examines the relationships between the latent variables and assesses the model's predictive capabilities. The explanatory power of the satisfaction model is evaluated using the R^2 value. This value is a key measure for assessing the model's overall explanatory strength. Moreover, evaluating the model's predictive relevance (Q^2) is essential to determine how well the model explains and predicts the data.

3 RESULTS

3.1 Evaluation of Measurement Model

The initial phase of our analysis concentrated on evaluating the reliability of the constructs. We assessed internal consistency using Cronbach's alpha and Composite Reliability (CR). The values presented in Table 1 indicated good internal consistency across all constructs, reflecting that the satisfaction measurement scale was reliable. Furthermore, indicator reliability was verified by analyzing the loadings of each item on its respective construct, which exceeded the recommended threshold of 0.7, thereby substantiating that the items were well-suited to their respective constructs. Convergent validity was assessed by examining each construct's average variance extracted (AVE). The AVE measures the level of variance captured by the construct in relation to the variance due to measurement error. The AVE values were all above the 0.50 threshold, supporting the convergent validity of the measurement model.

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To ensure discriminant validity, we applied the Fornell-Larcker criterion, comparing the square root of the AVE values for each construct with the correlations between constructs. The results (see Table 2) indicated that the square root of the AVE for each construct was greater than the highest correlation with any other construct, satisfying the Fornell-Larcker criterion and confirming discriminant validity. This finding implies that the constructs in the model are distinct and that the items designed to measure a specific construct do not overlap significantly with items measuring other constructs. Additionally, cross-loading examination further validated that each item's highest loading was on its intended construct, affirming strong discriminant validity (see Table 3).

Ta	Table 2 Assessment Results by the Fornell-Larcker Criterion						
		CON	EXP	PEOU	PP	PU	SAT
	CON	0.970					
	EXP	0.793	0.908				
	PEOU	0.586	0.594	0.920			
	PP	0.826	0.807	0.590	0.932		
	PU	0.709	0.775	0.626	0.719	0.944	
	SAT	0.883	0.79	0.605	0.825	0.733	0.979
	Table	3 The R	esults o	f Cross-	Loading	Examin	nation
		CON	PU	EXP	PEOU	PP	SAT
	CON1	0.983	0.722	0.801	0.593	0.835	0.901
	CON2	0.955	0.656	0.736	0.548	0.766	0.816
	CON3	0.971	0.683	0.768	0.562	0.800	0.851
	PU1	0.691	0.938	0.760	0.593	0.696	0.707
	PU2	0.662	0.947	0.716	0.615	0.669	0.691
	PU3	0.654	0.947	0.718	0.565	0.672	0.678
	EXP1	0.772	0.790	0.936	0.583	0.776	0.769
	EXP2	0.757	0.709	0.931	0.577	0.774	0.745
	EXP3	0.617	0.596	0.854	0.444	0.634	0.626
	PEOU1	0.526	0.544	0.519	0.934	0.513	0.536
	PEOU2	0.587	0.655	0.610	0.916	0.602	0.617
	PEOU3	0.493	0.514	0.498	0.912	0.503	0.504
	PP1	0.774	0.699	0.775	0.535	0.931	0.781
	PP2	0.768	0.662	0.746	0.566	0.944	0.777
	PP3	0.767	0.650	0.735	0.551	0.922	0.749
	SAT1	0.858	0.710	0.761	0.587	0.808	0.989
	SAT2	0.907	0.746	0.807	0.618	0.839	0.974
_	SAT3	0.825	0.696	0.750	0.569	0.772	0.975

3.2 Evaluation of Structural Model

We assessed the structural model aimed at evaluating the relationships between the latent variables in the model. The first step in the structural model evaluation is examining the path coefficients. A path coefficient is considered significant if its corresponding p-value is less than the conventional threshold of 0.05, indicating that the data support the hypothesized relationship. Table 4 presents the supporting results for hypothesized relationships.

 Table 4 Supporting Results for Hypothesized Relationships

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Hypothesis	Standardized Path coefficients (β)	Hypothesis supported or not
H1: CON→SAT	0.710***	Yes
H2: EXP→CON	0.362***	Yes
H3: PP→CON	0.534***	Yes
H4: $PP \rightarrow EXP$	0.807***	Yes
H5: PU→SAT	0.183***	Yes
H6: PU→PP	0.575***	Yes
H7: PEOU→SAT	0.074***	Yes
H8: PEOU→PP	0.230***	Yes
H9: PEOU→PU	0.626***	Yes
	w .0.05 www0.01 www	0.04

* p<0.05, ** p<0.01, *** p<0.001

Next, the coefficient of determination (R^2) is examined for each endogenous construct in the model. The R^2 value indicates the amount of variance in the satisfaction explained by the independent variables. In PLS-SEM, a higher R^2 value suggests the model has good explanatory power for the endogenous constructs. The R^2 value of our proposed

satisfaction model is 0.806, as shown in Figure 2, suggesting a good explanatory power. In addition to R^2 , the model's predictive relevance (Q^2) is assessed using the blindfolding procedure. The Q^2 value of our proposed satisfaction model is 0.765, demonstrating its ability to predict satisfaction and further supporting the model's quality.



Figure 2 Structural Model Evaluation Results

The goodness-of-fit of our proposed satisfaction model is evaluated using the standardized root mean square residual (SRMR). The SRMR is a measure of the discrepancy between the observed and predicted correlations. The SRMR value of our proposed satisfaction model is 0.075, lower than 0.08, which indicates a good fit, suggesting that the model's predictions are consistent with the observed data.

The effects of predictors on undergraduates' satisfaction are demonstrated in Table 5. The results imply that CON is the strongest predictor of satisfaction, with a coefficient of 0.710 (p < 0.001). EXP shows a significant indirect effect on satisfaction, with a coefficient of 0.257 (p < 0.001). PEOU has both significant indirect and direct effects on satisfaction, with coefficients of 0.461 (p < 0.001) and 0.074 (p < 0.001), respectively. It indicates that while PEOU primarily influences satisfaction indirectly, its direct effect is also meaningful, contributing to an overall total effect of 0.535 (p < 0.001). PP also shows a strong indirect effect on satisfaction, with a coefficient of 0.587 (p < 0.001). PU exhibits both indirect and direct effects on satisfaction, with coefficients of 0.338 (p < 0.001) and 0.183 (p < 0.001), respectively. This finding suggests that while undergraduates' usefulness perception of the platform contributes significantly to their satisfaction, a substantial portion of this effect is mediated through other variables, resulting in a total effect of 0.521 (p < 0.001). Overall, the analysis indicates that CON, EXP, PEOU, PP, and PU are all significant predictors of satisfaction, each playing distinct roles in influencing undergraduates' overall satisfaction with online learning platforms.

Table 5	Effects of	Predictors on	Undergrad	luates' S	Satisfactio	or
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	Indirect effect	Direct effect	Total effect
CON→SAT	-	0.710***	0.710***
EXP→SAT	0.257***	-	0.257***
PEOU→SAT	0.461***	0.074***	0.535***
PP→SAT	0.587***	-	0.587***
PU→SAT	0.338***	0.183***	0.521***
*	n<0.05 ** n<0.0	1 *** ~~0 001	

p*<0.05, ** *p*<0.01, * *p*<0.001

4 DISCUSSION

4.1 Main Findings

The analysis indicates confirmation is the strongest factor influencing undergraduates' satisfaction with online learning platforms. Similar observation has been noted in educational contexts, such as MOOCs [11]. This finding suggests that satisfaction significantly increases when students' actual experiences with the platform meet or exceed their initial expectations. In other words, the degree to which students' expectations are confirmed by their actual experiences has a decisive impact on their overall satisfaction. The outcome aligns with the fundamental assumption of expectations and perceived performance [10]. The reasons for this phenomenon may relate to the unique environment of online learning platforms. On online learning platforms, students rely on the resources, tools, and functionalities provided by the platform to achieve their learning objectives. Therefore, their expectations are usually based on their previous learning experiences, platform promotional activities, and peer recommendations. Undergraduates are more satisfied when these expectations are met or surpassed during use.

Perceived performance is a critical predictor of undergraduates' satisfaction. It implies that undergraduates' subjective evaluations of the platform's functionality, content quality, and user experience directly impact their overall satisfaction. Specifically, when students perceive that the online learning platform excels in supporting their learning needs, offering high-quality content, and providing a user-friendly interface, their satisfaction with the platform tends to be higher. This finding aligns with previous research outcomes [19]. One possible explanation is that the core value of an online learning platform is its ability to meet students' learning demands through its actual performance. Unlike traditional classroom teaching, undergraduates rely more on the platform to access resources, participate in interactions, and complete assignments while using online learning platforms. Therefore, the platform's stability and content quality influence undergraduates' learning experience and satisfaction. Undergraduates' satisfaction naturally increases when they perceive that the platform operates smoothly and provides rich and practical learning resources and functionalities. We discovered that PEOU and PU are critical determinants of satisfaction for university students adopting online learning platforms. This finding is corroborated by recent studies in online education, such as those by Ullah, et al. [20] and Joo, et al. [21]. It suggests that when undergraduates find the online learning platform easy to adopt and useful, their satisfaction with it significantly increases. The critical role of PEOU in influencing satisfaction might be attributed to its direct impact on learning efficiency. Undergraduates can focus more effectively on the content when they find the online platform easy to navigate rather than struggling to access it. Furthermore, online learning platforms require students to complete their learning tasks independently without face-to-face support, making the platform's ease of use a critical factor influencing the learning experience. Undergraduates are more likely to perceive the online learning platform as useful for their studies when they find that it offers valuable educational resources, such as accessible information, interactive content, and tools that align with their learning styles, thereby enhancing their satisfaction with the platform.

In addition, PEOU and PU significantly impact undergraduates' satisfaction through the mediating effects of perceived performance and confirmation. Our research finds these two factors enhance satisfaction by improving users' perception of the performance. It suggests that the benefits and accessibility of the platform play important roles in affecting undergraduates' overall satisfaction by influencing their perceptions of performance and confirmation. Undergraduates may likely perceive the performance of the online learning platform when they find its usefulness and ease of use since it facilitates a smoother and more effective learning experience. This enhanced performance perception confirms their initial expectations, leading to higher satisfaction.

The findings reveal that the expectation significantly influences undergraduates' satisfaction through the mediating role of confirmation. This finding confirms the assumptions in the expectation confirmation theory [11]. Undergraduates form certain expectations before using online learning platforms, and when their actual experiences meet or exceed these expectations, their sense of confirmation is strengthened, thereby enhancing their satisfaction. This result can be explained from the perspectives of psychology and behavioral economics. Psychological research suggests that individuals tend to seek cognitive consistency. They generate positive emotional responses when actual experiences align with expectations, thereby increasing satisfaction. Additionally, Prospect Theory in behavioral economics posits that individuals are generally more sensitive to losses than gains. This means that undergraduates may exhibit stronger dissatisfaction if their expectations are unmet. Conversely, once expectations are confirmed, the increase in satisfaction is more pronounced.

4.2 Practical Implications

The research results carry significant practical implications for developing, evaluating, and enhancing online educational platforms. Firstly, one of the most critical findings is confirmation's central role in shaping undergraduates' satisfaction. It underscores the need for educational technology designers and administrators to align platform capabilities closely with student expectations. Therefore, continuous feedback mechanisms should be established to gauge undergraduates' expectations accurately and to assess whether these expectations are being met. Online educational institutions can implement regular surveys that focus not only on general satisfaction but also on specific features of the platform, such as content accessibility, usability, and effectiveness. These surveys should be distributed at various points throughout the academic term to monitor how student expectations and satisfaction change over time. In addition to surveys, focus groups could be conducted to provide deeper, qualitative insights into how undergraduates interact with the platform. These discussions can reveal specific pain points or unmet needs that may not be captured in standard surveys. For example, undergraduates might highlight issues with navigation, the clarity of course materials, or difficulty using certain tools. Incorporating the feedback from focus groups can guide more targeted improvements that are grounded in real user experiences. By consistently collecting insights into undergraduates' needs and satisfaction, platform administrators can better understand their student users' evolving needs and expectations. Such feedback can guide iterative improvements to the platform, ensuring that updates and changes directly address user needs and enhance satisfaction.

Secondly, the significance of perceived ease of use suggests that educational platforms must be user-friendly to foster a positive learning experience. By ensuring that the platform is easy to use, educational institutions and platform developers can significantly enhance the quality of undergraduates' interaction with online learning technologies, leading to higher satisfaction and better educational outcomes. The platform should be designed to be intuitively understandable so students can quickly become familiar with its features without the need for extensive training or support. Developers of online learning platforms should prioritize designing user-friendly interfaces that cater to the

needs and preferences of diverse student groups. Developers should prioritize streamlining navigation to ensure that students can easily locate and access learning materials, assignments, and communication tools. In addition, given the increasing reliance on mobile devices for education, the platform should be fully responsive and optimized for mobile use. This ensures that students can access learning materials and engage with the platform regardless of their device. Optimizing the mobile experience can significantly enhance accessibility and ease of use, especially for students who rely on their smartphones for learning. Regular updates and feedback loops are also beneficial, as they help ensure that the platform evolves according to user needs, further enhancing ease of use and thereby increasing user satisfaction.

The relevance of perceived usefulness in determining satisfaction highlights the importance of aligning educational technology with learners' needs and educational goals. Incorporating interactive elements and multimedia resources that align with the learning objectives can make the platforms more engaging and perceived as more useful by undergraduates, thereby enhancing their satisfaction. It is suggested that interactive elements such as quizzes, discussion forums, and collaborative projects be added to make learning more engaging. These elements encourage active participation and allow undergraduates to apply what they have learned in a practical context, thereby enhancing their understanding and retention of knowledge. Such interactive features also mirror traditional classroom interactions, helping to bridge the gap between online and in-person education. Another important aspect of enhancing perceived usefulness is integrating multimedia resources such as videos, animations, and interactive simulations. These resources can cater to various learning styles, making the educational content more accessible and easier to understand for a diverse student body. For instance, complex scientific concepts can be more easily grasped when demonstrated through video tutorials or interactive models, thereby increasing users' perception of the platform's utility.

Finally, perceived performance and expectations are also significant factors influencing undergraduates' satisfaction, further indicating that the relationship between the actual performance of the platform and undergraduates' initial expectations is crucial in determining their satisfaction. Therefore, online learning platforms should ensure stable performance, quick responsiveness, and consistent service quality to meet or exceed undergraduates' expectations. Platform developers should reduce system downtime, improve load times, and ensure seamless integration across different devices, including desktops, tablets, and mobile phones. Ensuring high perceived performance means regularly updating the platform's features and content to keep up with technological advancements and educational trends. This could involve integrating the latest multimedia tools or updating course content to reflect current information and methodologies. It helps to enhance undergraduates' perception of the platform's performance, thereby increasing their satisfaction. Additionally, educational institutions can enhance undergraduates establish reasonable expectations. These guides should outline what students can expect from the course in terms of content, workload, assessment criteria, and available resources. Clear communication around what students can expect from the platform and the course itself helps avoid disappointment and ensures that students have realistic and achievable expectations from the outset.

5 CONCLUSION

This study targeted students from agricultural universities in China with online learning experiences to explore their satisfaction with online learning platforms. We constructed a satisfaction model for undergraduates using online learning platforms based on the ECT and TAM. The structural model assessment showed that our proposed model fitted well, explaining 80.6% of the variance in agricultural university students' satisfaction. The results demonstrated that confirmation between pre-use expectations and post-use perceived performance was the most crucial factor affecting undergraduates' satisfaction. Additionally, online learning platforms' usefulness and ease of use play important roles in shaping agricultural university students' satisfaction. It suggests that managing students' expectations effectively, enhancing the perceived usefulness and ease of use of the platform, and ensuring stable performance are crucial strategies for improving users' satisfaction. Future studies could expand the sample to include a more diverse demographic to ascertain if the findings hold across different populations.

There are limitations and areas for further research that could deepen and broaden these findings. First, this study primarily focused on undergraduates with online learning experience, which might limit the generalizability of the findings to other groups such as postgraduates, professionals in continuous education, or those without prior online learning experience. Future studies could expand the sample to include a more diverse demographic to ascertain if the findings hold across different populations. Additionally, the cross-sectional nature of the research captures only a snapshot of user satisfaction, not accounting for how perceptions might evolve with prolonged use or through different stages of a student's educational journey. Future research could carry out longitudinal studies, providing deeper insights into how satisfaction changes over time and with continued use.

COMPETING INTERESTS

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