Understanding the Attitude of Antecedents and Consequences towards E-learning: An Integration Model of Technology Acceptance Model and Theory of Planned Behavior

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Published: 29 March 2020

Cite this article: Gao, H.L. (2020). Understanding the Attitude of Antecedents and Consequences towards E-learning: An Integration Model of Technology Acceptance Model and Theory of Planned Behavior. *International Journal of Liberal Arts and Social Science*, 8(3), 55-71.

Abstract

This research aims to explore the current situation of knowledge sharing behaviors of college students using digital learning platforms, study the key factors and problems that affect knowledge sharing attitudes, intentions and satisfaction of knowledge sharing behaviors, and propose solutions to the problems, with a view to providing college students with digital A reference for learning platforms to enhance the effectiveness of their digital learning. This study is based on the Theory of Planned Behavior and Technology Acceptance Model, and has become the framework for the theoretical model of this study. The object of this study is a student who has used e-learning in a university. A total of 198 valid samples were obtained, and the reliability and validity tests were performed through Partial Least Square to analyze the explanatory ability and causality of the model structure. After verifying the research hypothesis, the research results found that perceived ease-of-use and usefulness have the positive influence on continuance intention via attitude. Beside, attitude towards e-learning and perceived behavioral control in Theory of Planned Behavior also provide the significant influence on continuance intention. From the results of the research, we provide suggestions on the use of digital learning platforms for knowledge sharing among college students, with a view to effectively improving the practicality and effectiveness of using digital learning platforms.

Keywords: Electronic Learning (E-Learning); Technology Acceptance Model (TAM); Theory of Planned Behavior (TPB); Partial Least Square Structural Equation Model (PLS-SEM)

1. Introduction

The rise of the Internet has changed the richness and convenience of people's lives, shopping, work and study. Among them, online learning courses have sprung up. More and more people are choosing online learning for formal or informal learning. With the diversification of multimedia and the convenience of 3C products, online learning has expanded rapidly. In view of the powerful function of the Learning Management System (LMS) or Course Management System (CMS) currently adopted in schools, the announcement of important news, teaching materials, lecture outlines, and student assignment management required for teaching , Grade management, course questionnaires, online quizzes, etc., can be achieved through the platform's existing functions, so many educators choose to use this tool as a platform for supplementary teaching and communication after class (Wu, 2008). Although current common learning or curriculum management systems have been able to guide students to learn, allow teachers to provide teaching materials and online tutoring on the platform, and record students' learning status, some scholars have pointed out the limitations of the use of learning or curriculum management systems, including: many complicated functions And beyond the general teaching needs,

the operation is not easy, so that it not only tests the teacher's computer operation ability, but also distracts the learner's limited attention; the interface design and audio-visual interaction methods fail to meet the expectations of the teachers and students, and are likely to generate cognitive load.

Rosenberg (2001) defines digital learning as the delivery of a large number of collating solutions through Internet technology to improve knowledge and performance. Employees can instantly update, access and share teaching content or information, and enjoy the convenience of digital learning. Digital learning includes a wide range of applications and programs, such as web-based learning, computer-based learning, virtual classrooms, digital collaboration, and more. Internet, local / wide area network, audio and video, satellite broadcasting, interactive TV and CD-ROM to deliver course content.

Since the establishment of a teaching platform is not a solution for the average educator's technical ability and financial resources, how to find a low-tech threshold alternative teaching platform that can meet the needs and expectations of both educators and learners to attract more educators Adopting digital teaching tools, practicing the omnipresent learning concept, and excluding the current learning difficulties faced by students returning to education, are the topics discussed and resolved during this research period.

Therefore, this research integrates the above-mentioned related theoretical models and further discusses them. The main purposes of this research are: (1) to understand the current situation of university students using e-learning for learning; (2) Explore the impact of Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) on the use of e-learning. According to the empirical results of Taylor & Todd (1995), it is found that the C-TAM-TPB model obtained by combining the TAM and the planning behavior theory has a high degree of appropriateness to explain the behavior of users using new technology. In addition, after group analysis of users based on different experience, it was found that C-TAM-TPB showed a fairly good fit for both experienced and inexperienced users. Therefore, this study uses C-TAM-TPB proposed by Taylor & Todd (1995) as the basic architecture, and explores the use of intended anchors and determinants in e-learning.

2. Literature Review

2.1 Technology acceptance model

The Technology Acceptance Model (TAM), also known as the TAM, was first extended from the Theory of Rational Action (Fishbein &Ajzen, 1975) and the TPB (Ajzen, 1985). In 1989 by Fred D. Davis Modified the theory of rational behavior to become the current TAM, the purpose of which is to study the behavioral intentions of users of technology information systems. Davis et al. (1989) believe that the TAM can be used to verify, explain, and predict the relationship between attitude and behavior of information technology systems and users. After the TAM (TAM) was proposed, Davis et al. (1989)

added the behavioral intention variable in order to explain and predict more effectively, and advocated that the actual use of science and technology information system owners was affected by behavioral intention. Perceived usefulness and use of attitude will directly affect behavioral intention. Perceived usefulness and perceived ease-of-use will affect the use of attitude, and perceived usefulness will also be affected by perceived ease-of-use. Finally, perceived usefulness and perceived ease-of-use will be affected by external variables. The following introduces four important factors of TAM.

- Perceived usefulness: Davis et al. (1989) defined it as "the possibility that using an information technology system will improve its work efficiency or learning performance". TAM assumes that when a user perceives or recognizes that an information technology system is easy to use, it will prompt the user to make the same effort to complete more tasks and improve or improve job performance. In other words, when a user perceives or realizes that an IT system is useful or helpful, the more he or she will hold a positive attitude towards the IT system.
- Perceived ease-of-use: Davis et al. (1989) defined it as "the degree to which users think subjectively to learn the operation of an information technology system and how easy it is to use". In other words, when a user perceives or perceives the functional operation of an information technology system, if the user does not have to spend time learning how to operate, the attitude of using the information technology system will be more positive and positive. If it is used, it is more difficult to operate, too complicated, or requires more time and energy, which will cause a burden on the user and bad emotions, and then reject the use.
- Attitude: Davis et al. (1989) defined it as "the positive or negative evaluation that users feel when using an information technology system". That is, when users use an information technology system, the feelings are good or bad for themselves (Taylor & Todd, 1995).The use of an information technology system by the user will be directly affected by the useful usefulness and the ease-of-use. In other words, when the user perceives or recognizes that an information technology system is useful or helpful, the higher the or improve work performance, and in terms of functional operations, you don't have to spend too much time studying, the more positive the attitude of using the information technology system.
- Behavioral intention: Davis et al. (1989) defined it as "the degree of willingness of users to implement an information technology system". The TAM believes that behavioral intention will be directly affected by the user's use of an information technology system's altitude, and by the user's use of an information technology system's perceived usefulness and perceived ease-of-use.

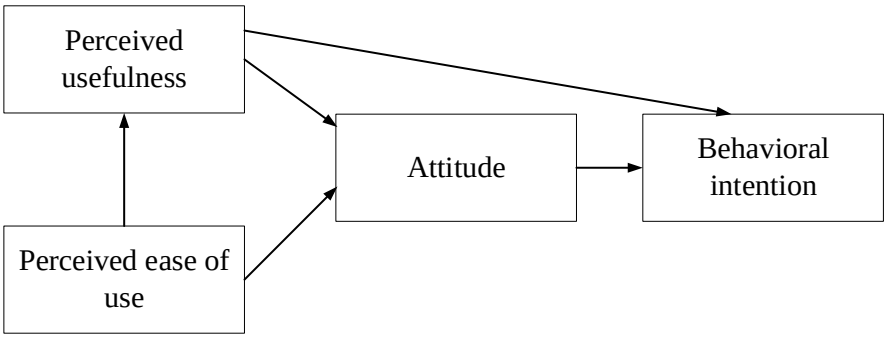

Figure 1: Technology Acceptance Model

Through Table 1, we can find the relevant application results of the TAM in the past 10 years

Table 1: Relevant Research of TAM in recent 10 years

Author	Research Topics	Source
Chen, S. C., Shing-Han, L., &Chien-Yi, L.	Recent related research in technology acceptance model: A literature review.	Australian Journal of Business and Management Research
Chen, S. C., Liu, S. C., Li, S. H., & Yen, D. C.	Understanding the mediating effects of relationship quality on technology acceptance: an empirical study of e-appointment system.	Journal of Medical systems
Alharbi, S., & Drew, S.	Using the technology acceptance model in understanding academics' behavioural intention to use learning management systems.	International Journal of Advanced Computer Science and Applications
Evans, C., Hackney, R., Rauniar, R., Rawski, G., Yang, J., & Johnson, B.	Technology acceptance model (TAM) and social media usage: an empirical study on Facebook.	Journal of Enterprise Information Management
Park, E., Baek, S., Ohm, J., & Chang, H. J.	Determinants of player acceptance of mobile social network games: An application of extended technology acceptance model.	Telematics and Informatics

Author	Research Topics	Source
Persico, D., Manca, S., &Pozzi, F.	Adapting the Technology Acceptance Model to evaluate the innovative potential of e-learning systems.	Computers in Human Behavior
Wallace, L. G., & Sheetz, S. D.	The adoption of software measures: A technology acceptance model (TAM) perspective.	Information & Management
Cheng, S. I., Chen, S. C., & Yen, D. C.	Continuance intention of E-portfolio system: A confirmatory and multigroup invariance analysis of technology acceptance model.	Computer Standards & Interfaces
Ooi, K. B., & Tan, G. W. H.	Mobile technology acceptance model: An investigation using mobile users to explore smartphone credit card.	Expert Systems with Applications
Chen, C. F., Xu, X., & Arpan, L.	Between the technology acceptance model and sustainable energy technology acceptance model: Investigating smart meter acceptance in the United States.	Energy research & social science
Tarhini, A., Hone, K., Liu, X., &Tarhini, T.	Examining the moderating effect of individual-level cultural values on users' acceptance of E-learning in developing countries: a structural equation modeling of an extended technology acceptance model.	Interactive Learning Environments
Wu, B., & Chen, X.	Continuance intention to use MOOCs: Integrating the technology acceptance model (TAM) and task technology fit (TTF) model.	Computers in Human Behavior
Scherer, R., Siddiq, F., &Tondeur, J.	The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education.	Computers & Education

2.2 Theory of planned behavior

Theory of Planned Behavior (TPB) was proposed by Ajzen (1985). It mainly uses human to predict and understand human behavior. TPB is mainly used to predict behavior and help understand people's psychological factors. But because the theory of rational behavior ignores whether the individual can decide to behave as he wants or not to show a particular behavior. The biggest difference between the two theories is that rational behavior theory believes that all the behaviors of individuals are rational and can be controlled by willpower, while planned behavior theory believes that because of actual conditions, external factors or environmental constraints king. In other words, because actual behavior does not just determine a person's motivation, it also contains some irrational factors, such as time, environment, and personal knowledge. TPB related factors are described below.

- Attitude: Attitude is the individual's preference for a certain matter and the position he or she displays. With attitude, you can measure the outcome of a specific behavioral development. When individuals think that innovative green technology products are convenient for our daily lives, their willingness to accept will be higher, and vice versa.
- Subjective norm: Subjective norm refers to the pressure of another person or group to influence an individual's desire for a goal when performing a certain behavior.
- Perceived behavioral control: Perceived behavioral control refers to the relevant resources and assistance that you can master when you expect to do something. If you want to carry out research on innovative green technology products, it involves mechanical, electrical, chemical, and physical assistance. When there are sufficient resources to assist, it will affect the behavior intention of the individual, and even the final behavior.

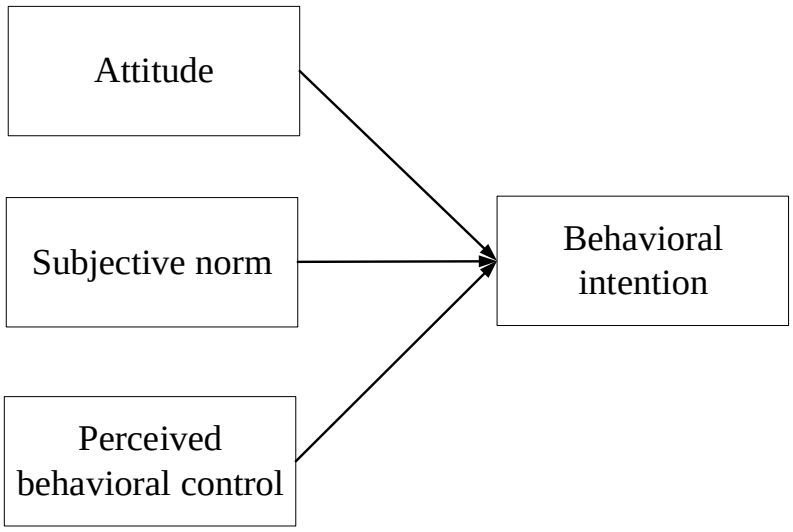

Figure 2: Theory of Planned Behavior

Through Table 2, we can find the related application results of TPB in the past 10 years.

Table 2: Relevant Research of TPB in recent 10 years

Author	Research Topics	Source
Chen, S. C., & Li, S. H.2010	Consumer adoption of e-service: Integrating technology readiness with the theory of planned behavior.	African Journal of Business Management
Kim, E., Lee, J. A., Sung, Y., & Choi, S. M.2016	Predicting selfie-posting behavior on social networking sites: An extension of theory of planned behavior.	Computers in Human Behavior
Paul, J., Modi, A., & Patel, J. 2016	Predicting green product consumption using theory of planned behavior and reasoned action.	Journal of retailing and consumer services
Wang, S., Fan, J., Zhao, D., Yang, S., & Fu, Y.2016	Predicting consumers' intention to adopt hybrid electric vehicles: using an extended version of the theory of planned behavior model.	Transportation
Cheung, M. F., & To, W. M.2017	The influence of the propensity to trust on mobile users' attitudes toward in-app advertisements: An extension of the theory of planned behavior.	Computers in Human Behavior
Han, H., Meng, B., & Kim, W. 2017	Emerging bicycle tourism and the theory of planned behavior.	Journal of Sustainable Tourism
Hsu, C. L., Chang, C. Y., &Yansritakul, C.2017	Exploring purchase intention of green skincare products using the theory of planned behavior: Testing the moderating effects of country of origin and price sensitivity.	Journal of Retailing and Consumer Services
Yadav, R., & Pathak, G. S.2017	Determinants of consumers' green purchase behavior in a developing nation: Applying and extending the theory of planned behavior.	Ecological economics
Yang, H., Lee, H., & Zo, H.2017	User acceptance of smart home services: an extension of the theory of planned behavior.	Industrial Management & Data Systems.
Verma, V. K., & Chandra, B.2018	An application of theory of planned behavior to predict young Indian consumers' green hotel visit intention.	Journal of Cleaner Production

3. Research Method

This study uses TAM and TPB as the theoretical foundation to establish a research framework, and then based on this research framework to establish research hypotheses and definition variables, and then design a questionnaire to explore the factors that influence students' intention to use e-learning. In order to obtain students' perspectives on the use of data, a questionnaire survey was used to collect data, and quantitative analysis was conducted to verify the hypothesis. This chapter will design the measurement items for all variables in this research questionnaire in accordance with the research framework and assumptions, variable operational definitions and measurement items, questionnaire design and reliability and validity, research analysis methods and statistical methods. The research object is Chinese domestic university students who have used or are using e-learning. The questionnaire uses a Likert seven-point scale, which is measured from 7 levels of "strongly disagree" to "strongly agree", and scores 1 ~ 7 in order. Based on the foregoing hypothesis derivation, this study proposes the research model of Figure 3 and the research setup of Table 3.

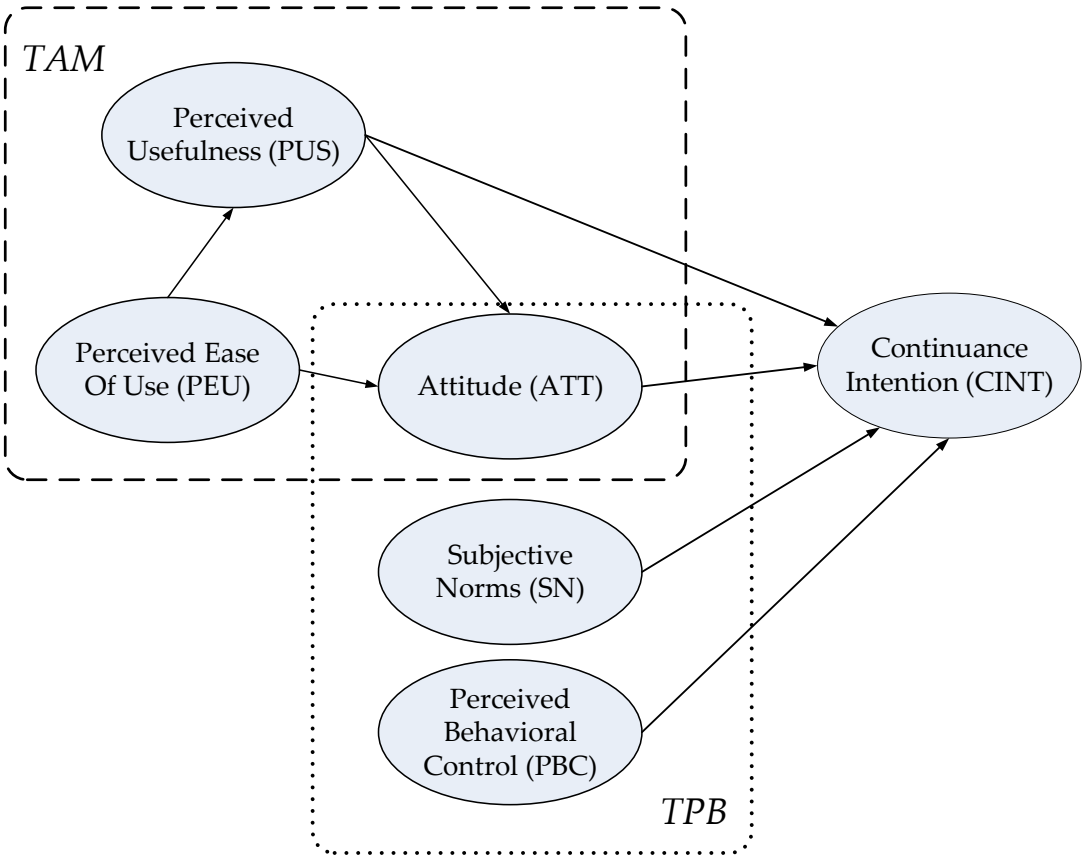

Figure 3: Research Model

Table 3: Research hypotheses

Hypothesis	Path
H1: Perceived ease-of-use positively influence perceived usefulness	PEU-> PUS
H2: Perceived ease-of-use positively influence attitude	PEU-> ATT
H3: Perceived usefulness positively influence attitude	PUS-> ATT
H4: Perceived usefulness positively influence continuance intention	PUS-> CINT
H5: Attitude positively influence continuance intention	ATT-> CINT
H6: Subjective norm positively influence continuance intention	SN-> CINT
H7: Perceived behavioral control positively influence continuance intention	PBC-> CINT

Note: Perceived Ease-of-use= PEU; Perceived Usefulness= PUS; Attitude= ATT; Subjective Norm= SN; Perceived behavioral control= PBC; Continuance Intention= CINT

4. Data Analysis

This study adopted a two-stage analysis procedure for analysis applying SmartPLS (Ringle et al., 2015). First, the measurement mode is evaluated with reliability and validity; then the structural relationship is verified, and the research hypothesis is tested. This study uses Composite Reliability (CR) to measure the reliability of various facets. According to Fornell and Larcker (1981), the CR value of each facet should be greater than 0.7 (as shown in Table 4). According to Fornell and Larcker (1981) and Hair et al. (2010), the average Variance Extracted of each facet should be above 0.5 to ensure acceptable convergent validity (as shown in Table 5).

Checking whether the square of the correlation coefficient between each facet and other facets is smaller than the AVE value of the facet can confirm whether each facet used in the research has acceptable discriminant validity (Fornell&Larcker, 1981). In addition, it can be seen from the results in Table 6 that the factor loadings of all facets of this study are higher than the cross loadings, which indicates that the data of this study have discriminant validity (Hair et al., 2016).

Table 4: Reliability and Convergent Validity

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
PEU	0.883	0.884	0.719
PUS	0.871	0.871	0.691
ATT	0.907	0.907	0.765
SN	0.912	0.912	0.838
PBC	0.884	0.882	0.715
CINT	0.953	0.953	0.872

Note: Perceived Ease-of-use= PEU; Perceived Usefulness= PUS; Attitude= ATT; Subjective Norm= SN; Perceived behavioral control= PBC; Continuance Intention= CINT

Table 5: Discriminant Validity

	PEU	PUS	ATT	SN	PBC	CINT
PEU	***0.85***					
PUS	0.55	***0.83***				
ATT	0.83	0.68	***0.87***			
SN	0.62	0.56	0.65	***0.92***		
PBC	0.50	0.64	0.55	0.45	***0.85***	
CINT	0.61	0.64	0.64	0.38	0.65	***0.93***

Note 1: Perceived Ease-of-use= PEU; Perceived Usefulness= PUS; Attitude= ATT; Subjective Norm= SN; Perceived behavioral control= PBC; Continuance Intention= CINT

Note 2:

Table 6: Factor Loadings and Cross Loadings

Construct and Items	PEU	PUS	ATT	SN	PBC	CINT
PEU1	***0.72***	0.60	0.87	0.59	0.49	0.54
PEU2	***0.92***	0.54	0.74	0.59	0.49	0.57
PEU3	***0.83***	0.45	0.69	0.54	0.40	0.49
PUS1	0.47	***0.81***	0.53	0.54	0.56	0.51
PUS2	0.42	***0.83***	0.58	0.44	0.55	0.55
PUS3	0.48	***0.85***	0.57	0.41	0.48	0.53
ATT1	0.79	0.40	***0.68***	0.43	0.37	0.50
ATT2	0.77	0.56	***0.88***	0.54	0.43	0.56
ATT3	0.70	0.62	***0.88***	0.57	0.50	0.58
SN1	0.58	0.52	0.59	***0.91***	0.40	0.35
SN2	0.55	0.50	0.59	***0.92***	0.41	0.34
PBC1	0.42	0.59	0.48	0.38	***0.87***	0.57
PBC2	0.39	0.52	0.44	0.35	***0.80***	0.52
PBC3	0.46	0.50	0.47	0.40	***0.86***	0.55
CINT1	0.57	0.59	0.60	0.35	0.63	***0.93***
CINT2	0.55	0.61	0.61	0.33	0.61	***0.95***
CINT3	0.60	0.59	0.59	0.38	0.57	***0.92***

Note: Perceived Ease-of-use= PEU; Perceived Usefulness= PUS; Attitude= ATT; Subjective Norm= SN; Perceived behavioral control= PBC; Continuance Intention= CINT

After confirming that all facets in the measurement model have reached a certain degree of reliability and validity, this study uses PLS to test the paths and hypotheses in the model. Because PLS cannot directly test the significance of path coefficients, this study uses bootstrapping technology to perform 5000 iterations on samples to evaluate the significance of each path in the model. The analysis results are shown in Figure 4 and Table 7.

Table 7: Inner Model Results

Path	Path Coefficient	T-value
PEU-> PUS	0.482***	6.625
PEU-> ATT	0.596***	8.545
PUS-> ATT	0.314***	4.148
PUS-> CINT	0.237*	2.280
ATT-> CINT	0.353***	4.765
SN-> CINT	-0.109	1.621
PBC-> CINT	0.334***	3.807

Note 1: BINT= Behavioral Intention; SATI= Satisfaction; PEREXP= Performance Expectancy; EFFEXP= Effort Expectancy; SOCI= Social Influence; FACCON= Facilitating Conditions

Note 2: * p-value< 0.1; ** p-value< 0.05; *** p-value< 0.01

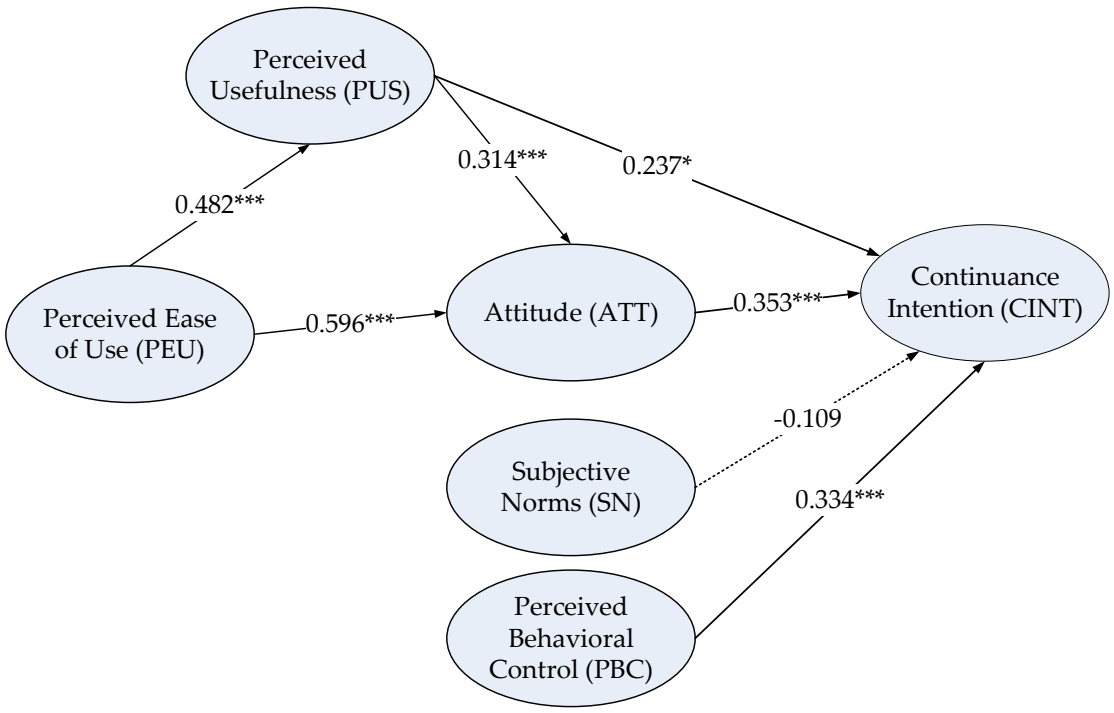

Figure 4: Analysis Results of Path Model

5. Discussion and Conclusion

The purpose of this study is to understand how students 'needs for e-learning affect their attitudes and behaviors in digital learning systems, and how such behaviors may affect students' self-learning. First, perceived usefulness and perceived ease of use have a positive and significant impact on attitudes.

This result indicates that the students are very helpful in learning the information provided by the teacher in digital e-learning. In addition, the school's digital learning platform interface design is easy to use and feel simple and easy to use, so it has a high impact on perceived usefulness and ease of use. Second, perceptual usefulness, attitude and perceptual behavior control have a positive and significant impact on e-learning's intention to use. Perceived behavior control has a significant positive effect on e-learning. This result indicates that the more skilled the students are in using the computer, the faster they can click, absorb, and share the content of the digital learning platform, and therefore the higher the intention of use.

Studies have shown that the influence of teachers is highly relevant for students to use digital learning platforms. In a digital learning environment, it is important to enrich and enrich the curriculum. For teachers, they must face the use of technology, adjustment of teaching materials, and ways of interacting with learners. Most school teachers need to adjust their teaching models and methods, hoping that they can respond to the changes in the learning environment. The teaching function presented by the Internet is not to convert the paper to the textbook content on the Internet, but needs to be transformed into a comprehensive and in-depth teaching process to provide complete and close-to-fact teaching. In the 21st century, information technology is booming. Countries around the world are actively planning and promoting information education to cultivate national information literacy, strengthen their knowledge capital, and build a sound information society to meet the advent of the knowledge economy era and make it changeable. In the environment, we can keep abreast of the development of knowledge to enhance the competitiveness of the country.

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