



Research on the Digital Transformation Path of Education in Chinese Private Universities Based on TAM and SEM Models

Yan Wu ^{1,*} , Rui Lei ^{2,a} 

¹Beijing Institute of Technology, Zhuhai, China

²China Mobile Communications Group Guangdong Co., LTD. Zhuhai Branch
Zhuhai, China

*Corresponding author's e-mail: wu_yan@bitzh.edu.cn
^aleirui@gd.chinamobile.com

Abstract. This article is based on TAM and SEM models, taking Beijing Institute of Technology, Zhuhai as an example, to analyze the impact and paths of perceived usefulness, perceived ease of use, and perceived risk on the attitude and behavioral intention of the digital transformation of education in Chinese Private Universities. The empirical research results indicate that perceived ease of use has a positive and significant impact on perceived usefulness and attitudes towards digital transformation of education in Chinese Private Universities; The attitude towards digital transformation of education in Chinese Private Universities has a significant positive impact on the behavioral intention; The impact of perceived usefulness on attitudes and behavioral intention towards the digital transformation of education in Chinese Private Universities is negative and not significant; The impact of perceived risk on attitude and behavioral intention is not significant; The impact of perceived ease of use on usage intention is not significant. Finally, the countermeasures and suggestions were proposed.

Keywords: Private Universities, The Digital Transformation of Education, TAM, SEM.

1 Introduction

On February 27, 2023, the State Council of China released the "Overall Layout Plan for the Construction of Digital China", which pointed out the need to vigorously implement the national education digitalization strategy. On January 12, 2022, the State Council of China released the "14th Five Year Plan for the Development of Digital Economy", which mentioned the need to promote digital industrialization and industrial digitization in a coordinated manner. On March 14, 2022, the National "Fourteenth Five Year" Education Development Plan was released, which proposed to implement the Education Informatization 2.0 Action Plan. On October 16, 2022, the 20th National Congress of the CPC was held ceremoniously. The report of the Con-

gress clearly proposed to promote the digitization of education and build a learning society and a learning country with lifelong learning for all.

From a policy perspective, China has proposed the construction of a digital China at the macro level, the promotion of digital industrialization and industrial digitization at the meso level to achieve positive results, and the digital transformation of enterprises at the micro level. Therefore, this paper focuses on the digitization of education, and as a part of industrial digitization, it has significant practical significance.

Domestic and foreign scholars have conducted extensive research on the digital transformation of education, mainly focusing on the following aspects:

Firstly, the meaning and development stages of digital transformation in education. Wu et al. (2023)^[5] systematically reviewed the latest digital policies or reports issued by four global or regional international organizations, namely UNESCO, OECD, European Union, and World Bank. They found that the current focus of international organizations on the digital transformation of education is mainly on nine aspects: digital talent cultivation, new technological tools, teacher digital capabilities, digital infrastructure, teaching mode innovation, digital resource platforms, teaching evaluation, data-driven management decision-making, privacy and ethical security. Hu et al. (2023)^[2] mentioned that UNESCO divides the application of digital technology in the education process into four stages: initiation, application, integration, and transformation. Yu (2023)^[6] believes that China's higher education has gone through three stages in the digitalization of teaching: (1) from 2013 to 2015, which was the stage of MOOC construction, with a focus on learning; (2) From 2016 to 2019, it was the stage of blended learning, with the core of promoting interaction; (3) From 2020 to 2022, it is the stage of online and integrated teaching, with the core being data acquisition.

Secondly, conducting research on various aspects of digital transformation in education, from the perspectives of teachers, student, and government policies, such as Orji, I. J. et al. (2022)^[4].

Thirdly, the application of digital transformation in various sub sectors of education, such as the digital transformation of medical education, construction education, manufacturing education, railway transportation engineering education.

Fourthly, research methods for the digital transformation of education. In a review article by Mukul et al. (2023)^[3], it was pointed out that compared to other aspects of digitization, the research methodology section is relatively weak, mainly using statistical methods such as rule mining, simulation, three-layer architecture, neural networks, and cluster analysis. Antonietti et al. (2022)^[1] used the Technology Acceptance Model (TAM) and Structural Equation Model (SEM) methods. In addition, there are methods such as text mining, knowledge graph visualization analysis, and maturity models for digital transformation in education.

To make the research more focused, this article from the perspective of students through the TAM model outlines the digital transformation path of private university education through the SEM model.

In 1985, Fred Davis proposed the TAM model in his doctoral thesis, mainly used to analyze users' acceptance of new things and technologies. This article constructs an indicator system based on the TAM model, including perceived usefulness, perceived

ease of use, perceived risk, students' attitudes towards digital transformation in education, and willingness to use, as shown in Fig. 1.

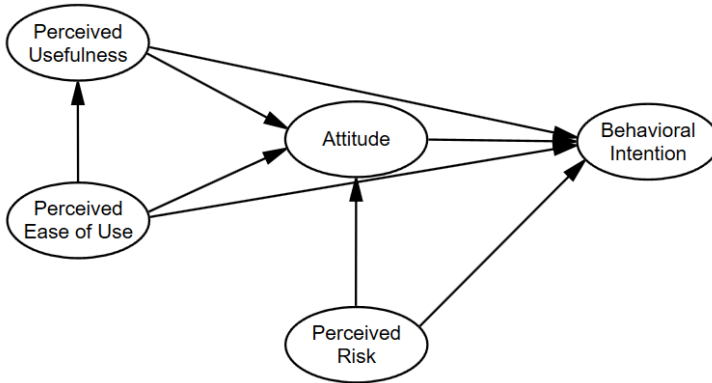


Fig. 1. The TAM of the Digital Transformation of Private Higher Education

2 Empirical Analysis

2.1 Design of Questionnaire

This article takes Beijing Institute of Technology, Zhuhai as an example to conduct a questionnaire survey on the digital transformation path of education in Chinese private universities. 196 questionnaires were collected, and multidimensional scales were used to estimate variables. Using the Likert 7-point rating system, with 1 point indicating 'strongly disagree' and 7 points indicating 'strongly agree'. Table 1 shows the model variable indicator system.

Table 1. the Model Variable Indicator System

Variable	Indicator	Scale items
Perceived Usefulness	PU1	I think the university has fast internet speed and convenient internet access on campus, which can improve my learning efficiency.
	PU2	I believe that the university has abundant digital resources that can meet my learning needs.
	PU3	I believe that university teachers actively introduce new teaching methods, which have improved my learning outcomes.
	PU4	I believe that paperless office and service automation in university enrollment, registration, finance, and administration have improved my efficiency in handling affairs.
	PU5	I believe that the university can better serve me by utilizing big data analysis, such as allocating dormitories based on students' personality test data, providing precise subsidies to impoverished students based on their consumption situation, and providing learning assistance based on big data.

	PU6	I believe that providing digital training through university will enhance my digital literacy.
Perceived Ease of Use	PEU1	I think using the campus network to access the internet is easy to operate.
	PEU2	I think it's easy to find digital resources in online libraries.
	PEU3	I will quickly accept and adapt to new teaching methods such as blended learning and flipped classroom.
	PEU4	I will use the school system for online registration and payment.
Perceived Risk	PR1	I think there are security risks associated with using campus networks to access the internet.
	PR2	I think there are personal privacy and security risks in the digital transformation of schools.
	PR3	I think there are account security risks in the digital transformation of university.
Attitude	AT1	I believe that the digital transformation of education in private universities is a wise move.
	AT2	I think the high-speed, stable, and convenient campus network of private universities is more attractive.
	AT3	I believe that the digitization of educational resources in private universities will benefit students.
	AT4	I believe that the introduction of new teaching methods by teachers in private universities, such as blended learning and flipped classrooms, will provide students with a better experience.
	AT5	I believe that digitizing the management processes of private universities, such as enrollment, registration, finance, administrative paperless office, and service automation, will make student affairs more convenient.
	AT6	I believe that conducting big data analysis and application in private universities will make them more attractive.
	AT7	I think it is necessary for private universities to cultivate digital talents, improve the quality of teachers and students through professional training.
Behavioral Intention	BI1	In the future, I will continue to use digital resources and technology to improve efficiency.
	BI2	I am willing to recommend universities with digital transformation to my family and friends.

2.2 Descriptive Statistical Analysis

From the descriptive analysis results, firstly, students have a high Behavioral Intention (average value=5.75) and a supportive attitude (average value=5.74). The ranking of the average values of the observed variables of Behavioral Intention is: continue to use (5.78), recommend to friends and family (5.72). The average ranking of supportive attitudes is as follows: digitalization of management processes (5.81), digital educational resources (5.79), digital talent cultivation (5.78), big data analysis and application (5.76), high-speed and stable campus network (5.75), digital transformation

(5.65), and new teaching methods (5.64). Secondly, the low score of perceived risk (average value=4.59) indicates that students believe that the risk of digital transformation in private higher education is relatively low. Thirdly, the average values of observed variables related to perceived usability are ranked as follows: online management system (5.97), new teaching methods (5.49), campus network (5.45), and online resources (5.41). Fourthly, the average values of observed variables for perceived usefulness are ranked as follows: digitalization of management processes (5.61), digital training (5.59), big data services (5.57), new teaching methods (5.56), digital resources (5.44), and campus networks (5.32).

2.3 Reliability and Validity Test

Structural Equation Model (SEM) is a statistical method that can handle and test causal relationships between multiple variables.

SPSS 27 was used to analyze the scale data. Table 2 shows the Cronbach's coefficient test for variables, and the test values are all above 0.9, indicating that the scale has good internal consistency and is highly reliable.

Use AMOS 28 for fitness testing and apply maximum likelihood estimation method to fit the model. From the fitness test of the Confirmatory Factor Analysis (CFA) model, CMIN/DF (chi square degree of freedom ratio) =3.047, RMSEA (root mean square error) =0.102, GFI=0.78 and AGFI=0.72 >0.7, IFI=0.93, TLI=0.918 and CFI=0.93 > 0.9. Therefore, the model fitting effect is good.

The further tests were conducted on the convergence validity and combination reliability of each dimension of the scale, as shown in Table 2. The AVE values of each dimension reached 0.7 or above, and the CR value reached 0.9 or above, indicating that all dimensions have good convergent validity and combination reliability.

Table 2. Convergence Validity and Composite Reliability Test

Variable	Indicator	Standardized Factor Loadings	Cronbach's Coefficient	Composite Reliability (CR)	Average Variance Extraction (AVE)
Perceived Usefulness	PU1	0.754	0.941	0.946	0.744
	PU2	0.872			
	PU3	0.896			
	PU4	0.867			
	PU5	0.868			
	PU6	0.91			
Perceived Ease of Use	PEU1	0.832	0.902	0.904	0.703
	PEU2	0.859			
	PEU3	0.85			
	PEU4	0.811			
Perceived	PR1	0.923	0.962	0.963	0.895

Risk	PR2	0.978			
	PR3	0.937			
	<hr/>				
Attitude	AT1	0.858			
	AT2	0.878			
	AT3	0.968			
	AT4	0.86	0.974	0.975	0.846
	AT5	0.946			
	AT6	0.955			
	AT7	0.965			
<hr/>					
Behavioral Intention	BI1	0.967	0.938	0.936	0.884
	BI2	0.913			

2.4 Fitness Test of Structural Equation Model

The fitness test of the structural equation model shows that $CMIN/DF=3.076$, $RMSEA=0.103$, $GFI=0.776$ and $AGFI=0.718 > 0.7$, $IFI=0.928$, $TLI=0.917$, and $CFI=0.928 > 0.9$, indicating a good fitness of the model.

2.5 Path Analysis Results of Structural Equation Model

Using Amos 28 for path analysis of the model, Table 3 shows the standardized path coefficients and hypothesis testing of the SEM model. The path results indicate that: (1) the perceived ease of use has a positive and significant impact on perceived usefulness and attitudes towards digital transformation of education in Chinese Private Universities; The attitude towards digital transformation of education in Chinese Private Universities has a significant positive impact on the behavioral intention; (2) The impact of perceived usefulness on attitudes and behavioral intention towards the digital transformation of education in Chinese Private Universities is negative and not significant. The negative correlation may be due to students' excessive expectations for the digital transformation of education in Chinese Private Universities, but the current actual experience has not met these expectations; (3) The impact of perceived risk on attitude and behavioral intention is not significant, indicating that students believe that the risk of digital transformation of education in Chinese Private Universities is low and will not have a significant impact on attitude and behavioral intention; The impact of perceived ease of use on usage intention is not significant.

Table 3. Path Analysis Results of Structural Equation Model

hypothesis	Path	Standardized Coefficient	SE	CR	P
H1	PEU → PU	0.941	0.08	11.593	***
H2	PU → AT	-0.36	0.202	-1.469	0.142

H3	PEU	→	AT	1.154	0.209	4.472	***
H4	PR	→	AT	0.063	0.029	1.363	0.173
H5	PR	→	UI	0.006	0.019	0.228	0.819
H6	PEU	→	UI	0.105	0.14	0.688	0.492
H7	AT	→	UI	0.924	0.078	13.374	***
H8	PU	→	UI	-0.055	0.115	-0.444	0.657

3 Conclusions and Suggestions

This article is based on TAM and SEM models, taking Beijing Institute of Technology, Zhuhai as an example, to analyze the paths of perceived usefulness, perceived ease of use, and perceived risk on the attitude and behavioral intention of the digital transformation of education in Chinese Private Universities. The empirical research results indicate that perceived ease of use has a positive and significant impact on perceived usefulness and attitudes towards digital transformation of education in Chinese Private Universities; The attitude towards digital transformation of education in Chinese Private Universities has a significant positive impact on the behavioral intention; The impact of perceived usefulness on attitudes and behavioral intention towards the digital transformation of education in Chinese Private Universities is negative and not significant; The impact of perceived risk on attitude and behavioral intention is not significant; The impact of perceived ease of use on usage intention is not significant. For the improvement of perceived usefulness, private universities need to make improvements in campus network construction, digital resources, new teaching methods, and big data services.

Based on the above research, this article proposes the following suggestions for the digital transformation of Chinese private universities:

(1) Developing a digital strategy for education in private universities: Chinese private universities need a clear digital strategy, which should be integrated with the overall development goals of the school and set specific goals and implementation paths.

(2) Strengthening the construction of digital infrastructure in private universities: The construction of digital infrastructure in private universities refers to the comprehensive construction and continuous maintenance of digital infrastructure, including building high-speed and stable campus networks, strengthening server performance, optimizing data center operations, and deploying advanced cloud computing platforms. The goal is to ensure seamless processing and operation of large-scale data and applications on campus.

(3) Digitalization of educational resources: The digitalization of teaching content and resources, such as electronic textbooks, online courses, virtual laboratories, etc. and introducing high-quality digital resources.

(4) Strengthening the reform of teaching methods: Introduce new teaching methods and technologies, such as blended learning, flipped classrooms, online assessments, etc., to improve teaching quality and adapt to the learning needs of different students.

(5) Digitalization of management processes: Utilize information technology to simplify and optimize management processes, such as enrollment, registration, finance, administration, etc., to achieve paperless office and self-service.

(6) Big data analysis and application: Establish data collection, analysis, and application mechanisms to support decision-making, improve management efficiency, and enhance service quality through big data analysis.

(7) Network security guarantee: Establish a sound information security management system to protect the security of personal information and academic achievements, prevent data leakage and other security risks.

(8) Digital talent cultivation: Enhance the digital literacy of teachers and students, regularly provide professional training related to information technology for teachers and students, including the use of the latest teaching software, online teaching platforms, data analysis tools, etc.

Acknowledgments

This work was financially supported by the 2023 Project of the Teaching Quality Management Professional Committee of Private Universities of Guangdong Higher Education Teaching Management Association “Research on the Digital Transformation Path of Education in Private Universities Based on TAM and SEM Models” (GDZLGL2327)

References

1. Antonietti, C., Cattaneo, A., & Amenduni, F. (2022). Can teachers' digital competence influence technology acceptance in vocational education? *Computers in Human Behavior*, 132, 107266.
2. Hu, Q.T., Wei, M., & Chen Y.S. (2023). Digitization of Higher Education: Evolution, Challenges and Transformation. *Journal of National Academy of Education Administration*, (04),20-26.
3. Mukul, E., & Büyüközkan, G. (2023). Digital transformation in education: A systematic review of education 4.0. *Technological forecasting and social change*, 194, 122664.
4. Orji, I. J., Ojadi, F., & Okwara, U. K. (2022). Assessing the pre-conditions for the pedagogical use of digital tools in the Nigerian higher education sector. *The International Journal of Management Education*, 20(2), 100626.
5. Wu, D., Li L., Wu L., & Yu, X.R. (2023). International Comparative Study on Digital Transformation of Higher Education. *Journal of National Academy of Education Administration*, (04), 27-36.
6. Yu, X.J. (2023). The Development Process and Future Prospects of Digital Teaching in Higher Education. *China Higher Education*(Z1),4-7+11.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

