Application of digital transformation in blended learning to enhance competitiveness during international integration at universities in Vietnam

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Abstract

This study evaluates the potential application of digital transformation (DT) in blended learning (BL) to enhance competitiveness (COM) at universities in Vietnam. The author conducted a survey and obtained 317 observations, identifying nine factors that influence competitiveness. The research aims to determine which factors positively impact digital transformation and blended learning, thereby integrating these two elements under the support of facilitating conditions and government resolutions that affect competitiveness. The factors influencing digital transformation and blended learning include: university leadership; social benefits; the need for international integration; social interest; digital transformation capacity; blended learning curriculum; teaching innovation capacity; facilitating conditions; and government resolutions. Both intermediate factors—digital transformation and blended learning—have a positive impact on competitiveness, with an impact level of 61.2%. Consequently, the author successfully developed a research model that integrates digital transformation with blended learning to enhance competitiveness at Vietnamese universities in the context of international integration.

Keywords: Blended learning, Competitiveness, Digital transformation, International Integration, University, Vietnam.

1. Introduction

Digital transformation (DT) is becoming an undeniable trend in higher education. Applying DT in teaching and learning processes is assessed as crucial in strategies to enhance competitiveness and promote the development of the education system [1]. Numerous DT projects in education are attracting attention from countries, such as the Riconnessioni

project promoted by Compagnia di San Paolo with the agreement of the Ministry of Education in Italy [1] and the DT process in education conducted in several countries such as Australia emphasizing "Change management [2]. The international society for technology in education (OECD) considers the digitization process in the context of higher education, with the federal government proposing research initiatives to promote studies on digitization in higher education through funding from the German Federal Ministry of Education and Research for the application of digital transformation in teaching.

Digital transformation also contributes to enhancing the competitiveness of universities during international integration [2]. Applying digital transformation in the training process not only provides an advanced learning environment for students but also promotes the development and international integration of the education system. Students have access to the modern knowledge and technology, therefore becoming high-quality human resources and ready to participate in unlimited competition in the international labor market. Currently, the software applications for DT in BL at universities in Vietnam are increasing, such as MISA, LMS, and E-learning software. These applications are being upgraded with numerous new features, intuitive, the bringing high efficiency in teaching and learning. Researching application of DT in B-learning will support students develop digital capabilities, self-study abilities, independent problem-solving skills, contributing to enhancing competitiveness to meet the needs of international integration.

Decision No. 749/QD-TTg approving the "National Digital Transformation Program to 2025, with orientation to 2030" was issued by the Prime Minister on June 3, 2020. Subsequently, on January 25, 2022, the Prime Minister issued Decision No. 131/QD-TTg approving the project "Enhancing the application of information technology and digital transformation in education and training for the period 2022-2025, with orientation to 2030" with the purpose of 'promoting teaching and learning in the digital environment...'. This confirms that digital transformation holds significant importance, not only in education but also in social development.

Blended learning (BL): According to Aycock and colleagues have shown that BL helps students to be flexible in their learning space and time. Information technology helps learners actively choose their study time. Another study suggests that the BL environment can support students become more engaged rather than passively receiving information from traditional lectures. The research results of Chang Zhu and colleagues show that BL can help instructors optimize the usage of multimedia. To maximize the effectiveness of BL, instructors must carry out a range of tasks professionally, such as structuring teaching content, designing digital teaching aids, creating multimedia lectures, and developing online learning websites

1.1. Research Questions

1. How can universities develop policies to apply digital transformation in teaching using blended learning methods? What conditions do universities in Vietnam need to maintain competitiveness to respond the needs of international integration?

2. How is the strategy evaluated based on "Michael Porter's Five Forces Model" to consider the application of digital transformation integrated with blended learning?

From these causes and realities, we have developed the subject: "Application of Digital Transformation in Blended Learning to Enhance Competitiveness during International Integration at Universities in Vietnam"

2. Research Hypotheses and Proposed Model

2.1. Theoretical Foundation

Blended Learning with Digital Transformation: Blended learning has emerged as an indispensable instrument for pioneering scientific educational activities in the 21st century [3]. Utilizing BL combined with DT in higher education reflects teachers' confidence levels within the context of the DT process. The integration of BL with DT will also enhance personalized learning [4]. Digital Transformation in blended learning provides adaptive learning platforms and intelligent tutoring systems that customize learning experiences based on individual needs [5] preferences, and learning styles. The study by Stockwell has demonstrated that digital transformation in blended Learning stimulates interest and provides foundational information to students, yielding superior results in science education [6]. Applying digital transformation in blended learning bring opportunity to learning experiences for digitally literate students. The integration of BL with DT is considered a promising prospect for creating innovative educational models, enhancing specific features in university-level education processes [7]. The digital transformation in blended learning process at universities inevitably leads to a new model in providing learning and research methods for a variety of learners.

Competitiveness (COM): The competition among universities in Vietnam is not only evident within the domestic but also extends globally in the context of globalization, the socialization of education, and the autonomy of higher education [8, 9]. To enhance competitiveness (COM), universities need to develop innovative strategies, and develop effective teaching methods [10] with the support of information technology during the digital transformation period.

Table 1.
COM approach of higher education institutions under the impact of BL on DT.

No.	Definition	Approach	References
1	Digitization of higher education institutions or universities undergoing digital transformation as a factor ensuring competitiveness during the period of international educational integration	Competitiveness is closely linked with the development of digital transformation.	Nye [11]
2	Classification of educational programs, duration of service provision, teaching methods, forms of service provision	COM under the impact of changing teaching methods	Stockwell, et al. [12]
3	Applying from the requirement to innovate teaching methods, teaching content and improve the quality of graduates		Kartashova, et al. [13]
4	Develop curriculum, faculty capacity, operational strategies and impact on 5market share in the field of education. Improving university competitiveness through quality education by developing human resources in the digital era	Competitiveness under the impact of human resources and domestic and foreign market segments	Parakhina, et al. [14]
5	The competitiveness of higher education institutions is based on international university rankings through research activities, the process of collecting and storing documents, assessing the percentage of employed students, and salaries after graduation	Competitiveness and academic excellence with the application of DT integrated with BL	Priyanto and Suhandi [15]
6	Competitiveness assesses the ability to attract international students. Regularly updated curricula through lecture content and blended learning methods promote lifelong learning opportunities for students.	Competitiveness and acceleration of global integration, lifelong learning opportunities for students	Kartashova, et al. [13]

Competitiveness in higher education is implemented in many different approaches such as evaluating education. However, in this study, the author focuses on evaluating the approach to COM under the impact of DT integrated with BL to establish a standardized teaching process and model. This model helps educational institutions market and attract students in both domestic and international markets. Global higher education policies promote competition and innovation by providing university choices based on the reputation of teaching methods and branding for students [16]. From an educational perspective, competitiveness is the ability to effectively operate a university in quantitative terms, such as assessing the competencies of incoming students, the competencies of graduating students, and the number of students with stable employment. Additionally, considering the value gained from studying at a university, the COM of a university is also assessed through the social effectiveness of its curriculum and teaching methods. Furthermore, the humanity in teaching and the adaptability of students in the information technology era are also emphasized. Therefore, proposing practical solutions to enhance COM is crucial for the expeditious and sustainable development of universities in Vietnam during the process of global integration.

2.2. Research Hypothesis and Model

The rapid explosion of information technology following the Covid-19 pandemic has impacted many sectors of the economy, including education [17]. Currently, researchers use a variety of technology models, such as the Theory of Reasoned Action (TRA) [18] The Technology Acceptance Model (TAM) [19].

In this study, the author inherits and develops the Unified Theory of Acceptance and Use of Technology (UTAUT) [5] by emphasizing facilitating conditions and the impact of technology on social benefits during international integration.

School leadership (SP): The role of school leadership is a crucial factor in deciding to integrate digital transformation into blended learning to enhance competitiveness at universities in Vietnam. School leadership is also a driving force for the successful application of digital transformation into blended learning at universities [20]. The decisiveness of leaders, strategic planning, and decision-making for integrating blended learning and digital transformation are prerequisites for the success of this teaching model [11]. The role of school leadership is reflected through the following factors: (SP1) Developing a strategy for applying digital learning integrated with blended learning; (SP2) Commitment to implementation, building infrastructure for using digital transformation in blended learning in the future; (SP3) Implementing various policies to support the innovation of teaching methods applying digital transformation in blended learning for lecturers; (SP4) Reasonably changing detailed curricula to apply digital transformation in, (SP5) Allocating funds for training and professional development for lecturers to enhance awareness of digital transformation and blended learning in teaching.

Hypothesis 1 (H1): SP positively affects the digital transformation (DT) process.
Hypothesis 2 (H2): SP positively affects blended learning (BL).
Social benefits and need for international integration (SBI): Digital transformation in education creates a learning environment where everything is connected 24/7 between instructors and students [21]. The innovative combination of

digital transformation with blended learning aims to bridge geographical gaps to create diverse learning experiences while enhancing interaction among people. The goal of integrating blended learning with digital transformation in education is to improve educational quality, create a modern, flexible, and equitable learning environment, and comprehensively develop the competitiveness of universities, meeting the demands of the digital age and international integration, and serving the learning interests of society [22]. The objectives of social benefits and the requirements for international integration are demonstrated through the following factors: (SBI1) Developing e-learning lectures for the community, (SBI2) Creating lectures in multiple languages, (SBI3) Applying digital transformation integrated with blended learning when creating lectures for international students, (SBI4) Combining DT and BL to attract lifelong learning for students.

Hypothesis 3 (H1): SBI positively affects the digital transformation (DT) process.

Hypothesis 4 (H2): SBI positively affects blended learning (BL).

Resources and digital transformation capacity (DC): Applying digital transformation integrated with blended learning in teaching to enhance the competitiveness of universities is a process of transforming the mindset of technology users. Digital transformation in the field of education requires lecturers to have vision and foresight but should not be equated with merely applying technology to activities and fields. It must be remembered that regardless of how advanced technology becomes, human intellect still plays a decisive role in the process of digital transformation [23]. Human resources in the context of applying digital transformation into blended learning significantly contribute to the success of the competitiveness strategy of universities in Vietnam through the following factors: (DC1) Awareness of the importance of DT combined with BL in education, (DC2) Blended learning environment (virtual learning environment, management information systems, communication technology, and information and resource sharing technology) [22] (DC3) Trust value achieved when applying DT combined with BL [24] (DC4) Ability to apply Artificial Intelligence (AI) and robots in teaching, (DC5) Professional qualifications of lecturers when applying digital transformation in teaching.

Hypothesis 5 (H5): DC positively affects the digital transformation (DT) process.

Blended learning curriculum (BLC): Blended learning is increasingly becoming popular and effective in higher education classrooms [25]. Developing a curriculum using blended learning methods and techniques is a powerful innovation that helps students achieve academic success and promotes social welfare [26]. To develop a curriculum that is suitable for the era of digital transformation and international integration [27] the following factors must be ensured: (BLC1) Diverse course content, (BLC2) Reasonable course objectives, (BLC3) Appropriateness of online and offline distribution, (BLC4) Scientific nature in the evaluation of the course program.

Hypothesis 6 (H6): BLC positively affects blended learning (BL).

Teaching innovation capacity (TIC): One of the key factors in determining whether the application of blended learning methods impacts the competitiveness of a higher education institution is the capacity for teaching innovation. Evaluating the improvement and modification of teaching methods to befit Vietnamese students and the needs of international integration requires examining the following factors: (TIC1) Enhancing teaching quality [14] (TIC2) Selecting specific teaching methods for each discipline, (TIC3) The level of informatization and ICT used in teaching methods [12], (TIC4) Implementation of new courses and teaching methods, (TIC5) Upgrading infrastructure to support blended learning methods between theoretical classrooms and practical labs [28].

Hypothesis 7 (H7): TIC positively affects blended learning (BL).

Facilitating conditions (FC): Advancing the digital transformation process requires necessary investments in IT infrastructure. For instance, only 24.4% of people in Africa have access to Internet services. Insignificant IT infrastructure is a factor that hinders the digital transformation process in African countries. Developing infrastructure is a crucial factor in promoting the application of blended learning integrated with digital transformation to enhance the competitiveness of universities [13]. The prerequisite for effectively integrating blended learning with digital transformation to enhance competitiveness in education requires meeting the following criteria: (FC1) infrastructure fully equipped with necessary teaching equipment (computers, peripherals, and software) [29], (FC2) a skilled technical support team, (FC3) a learning environment that meets the requirements of BL combined with DT [13], (FC4) infrastructure supporting communication processes with external entities [30].

Hypothesis 8 (H8): FC positively affects the digital transformation (DT) process.

Hypothesis 9 (H9): FC positively affects blended learning (BL).

Hypothesis 10 (H10): FC positively affects competitiveness (COM).

Government revolution (GR): In June 2016, the Vietnamese Ministry of Education and Training issued Resolution No. 19-2016/NQ-CP of the Government on key tasks and solutions to improve the business environment, enhance national competitiveness among universities nationwide and internationally. To assess government support through policies in the application of DT into BL, the following factors need to be studied: (GR1) Government recognition, (GR2) Government financial support for the application of blended learning integrated with digital transformation in universities, (GR3) Official regulations on the application of digital transformation with blended learning to enhance competitiveness, (GR4) Government documents on the application of blended learning with DT in education [15].

Hypothesis 11 (H11): GR positively affects the digital transformation (DT) process. Hypothesis 12 (H12): GR positively affects blended learning (BL).

Hypothesis 13 (H13): GR positively affects competitiveness (COM).

Application of digital transformation tools in education (DT): Applying digital transformation needs to comply with standards set by the Ministry of Education and build advantages to compete in the global education context towards an "education center" [31]. Implementing technology in teaching requires schools to improve (DT1) Information security in

DT [32], (DT2) Education management capabilities in the digital era to enhance competitiveness, (DT3) Developing human resources to support digital technology in enhancing competitiveness [33].

Hypothesis 14 (H14): DT positively affects competitiveness (COM).

Blended learning impact on competitiveness (BL): Blended learning provides significant value to higher education institutions and has been proven to enhance the efficiency and effectiveness of learning experiences [5]. Relevant factors to study include: (BL1) Applying BL in teaching will assess the competitiveness of students at universities, (BL2) students' pride in learning BL to enhance competitiveness in grades, (BL3) lecturers using a combination of direct and online teaching methods in BL to increase student engagement, (BL4) applying BL to attract international students, thereby enhancing the competitiveness of higher education institutions in the global education market [10].

Hypothesis 15 (H15): BL positively affects competitiveness (COM).

Competitiveness of universities (COM): Currently, many models assess competitiveness in business and education, such as the SWOT model [18] PEST, and Thompson and Strickland's model. In this paper, the author uses Porter's Five Forces to evaluate the competitiveness of universities. Based on initiatives applying DT with BL to enhance the competitiveness of higher education institutions, the author has developed several hypotheses leading to the success of the model: (COM1) explicit policies and guidelines on competitiveness, (COM2) Creating facilitating conditions when applying DT with BL, such as infrastructure, human resource development, and financial management of the university [19]. (COM3) Maintaining communication with faculty, students, and other stakeholders [34] (COM4) Developing core competencies in the digital field. Through the digital education system, the younger generation is provided with essential knowledge, skills, and values to face the challenges of international integration. The issue of the competitive advantage of higher education is also of interest to universities through innovation and the sustainable development of the institution.
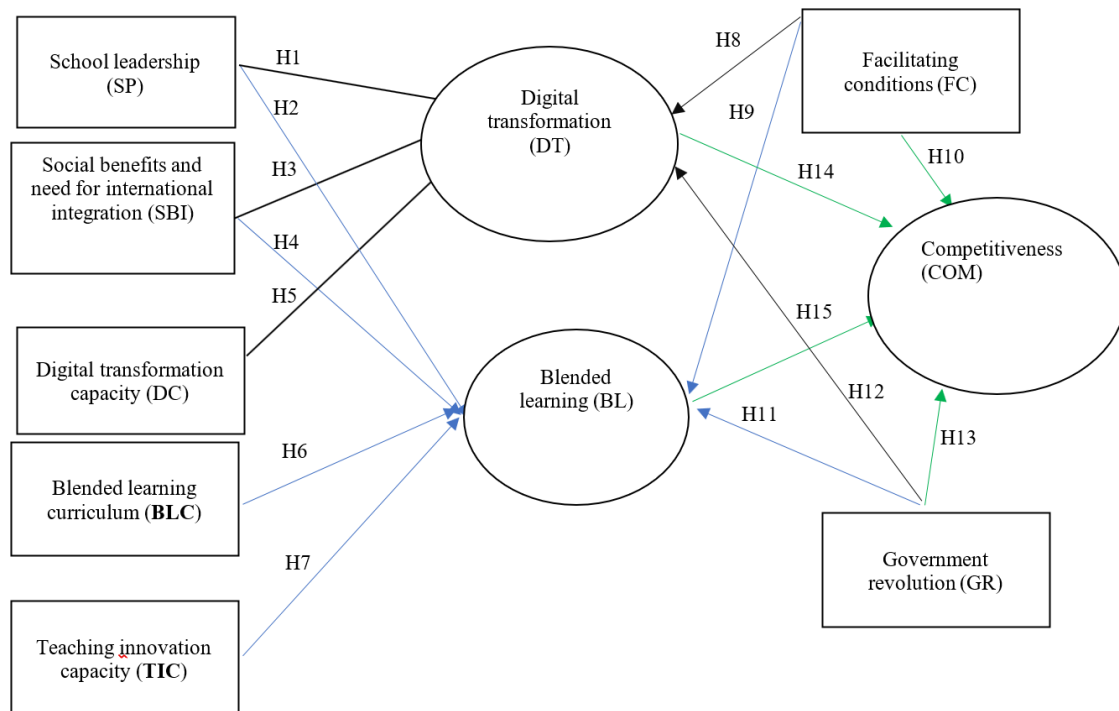
Figure 1.
Proposed Research Model.

3. Research Methods and Data

3.1. Data

Primary data was collected through a pre-designed questionnaire sent to the survey participants. The survey participants included the leadership and faculty members of universities in Vietnam. A total of 375 survey forms were distributed, 350 were returned, and 317 were valid, achieving a response rate of 84.53%.

3.2. Research Methods

The study employs a combination of qualitative and quantitative methods. The collected data was processed using SMART PLS 4.1.0.0 and SPSS 22 software. The questionnaire was assessed using a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) with 42 observed variables, 7 independent factors, and 2 intermediate factors (DT and BL) affecting the dependent variable (COM).

3.3. Research Results:
3.3.1. Descriptive Statistics

Table 2.
Characteristics of the Research Sample.

Content	Number of valid samples	Proportion
I. Universities	35	100%
1. The university has become financially autonomous	30	85.71%
2. The university is not financially autonomous	5	14.29%
II. Questionnaire survey form	317	100%
1. Survey Subjects	317	100%
School leaders	35	11.04%
Lecturer	206	64.95%
IT Technical Manager at the school	76	24.01%
2. Work Experience	317	100%
Less than 10 years	78	24.61%
From 10 to less than 15 years	104	32.81%
From 15 to less than 20 years	69	21.76%
Over 20 years	66	20.82%
3. Education	317	100%
University	26	8.2%
Master's Degree	194	61.19%
Ph.D.	97	30.61%
4. Using DT in BL teaching	317	100%
Yes	305	96.21%
No	12	3.79%

Statistics show that the majority of faculty members use digital transformation with blended learning in teaching, accounting for 96.21%, but the extent is not high, primarily utilizing the available software provided by the university, such as LMS. Most departments at the university promote the E-Learning model for distributing learning materials, grading, while student score management is handled by separate software. The current proportion of PhDs in universities averages 25 to 30%, which is not high and does not meet the requirements of the Vietnamese Ministry of Education for universities with postgraduate admissions needs.

3.3.2. Scale Testing in the Research Model
+ Scale reliability assessment:

Table 3.
Reliability and convergence analysis of factors.

Factors	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
School leadership (SP)	0.842	0.845	0.905	0.760
Social benefits and need for international integration (SBI)	0.876	0.884	0.924	0.801
Digital Transformation Capacity (DC)	0.868	0.879	0.910	0.717
Blended Learning Curriculum (BLC)	0.905	0.910	0.934	0.779
Teaching Innovation Capacity (TIC)	0.880	0.889	0.926	0.807
Facilitating Conditions (FC)	0.840	0.854	0.903	0.756
Government Revolution (GR)	0.824	0.852	0.894	0.739
Digital Transformation (DT)	0.797	0.805	0.868	0.622
Blended Learning (BL)	0.786	0.799	0.875	0.701
Competitiveness (COM)	0.833	0.836	0.901	0.752

Evaluating the reliability of the research scale with Cronbach's Alpha indicators ranging from 0.786 to 0.905 meets the requirements. During the verification process, the observed variables "SP1," "SP2," "SBI1," "DC1," "TIC 2," "TIC3," "GR3," "BL3," and "COM4" were excluded due to the total correlation coefficient being less than 0.700. Table 3 shows that the average variance extracted (AVE) values range from 0.622 to 0.807, indicating that the scales for each variable in the research model achieve convergent validity.

3.3.2.1. Calculation of the Variable Linearity of the Scale Observation Scale

The authors use PLS analysis - SEM Algorithm to determine the collinearity of the observed variable. According to Hair, if the VIF coefficient > 5, multicollinearity will occur and the variable will be removed from the model. The results show that the VIF coefficients in the research model are all < 5, so the observed variables are accepted and no multicollinearity occurs.

Table 4.
Summary of VIF magnification factors.

Observation variable	VIF	Observation variable	VIF	Observation variable	VIF
BL2	1.929	DC4	2.451	GR4	2.124
BL4	1.525	DC5	2.232	SBI2	2.272
BLC1	2.560	DT1	1.796	SBI3	2.403
BLC2	2.159	DT2	1.513	SBI4	2.503
BLC3	3.312	DT3	1.739	SP3	1.800
BLC4	3.231	DT4	1.473	SP4	2.111
COM1	2.258	FC1	1.939	SP5	2.232
COM2	1.765	FC2	2.285	TIC1	3.206
COM3	3.100	FC3	1.871	TIC4	3.687
DC2	1.924	GR1	1.581	TIC5	1.908

+ Differential Value Verification

Table 5.
Correlations between variables.

	BL	BLC	COM	DC	DT	FC	GR	SBI	SP	TIC
BL	0.837									
BLC	0.588	0.882								
COM	0.708	0.422	0.867							
DC	0.495	0.592	0.353	0.847						
DT	0.338	0.312	0.189	0.285	0.789					
FC	0.552	0.535	0.633	0.432	0.202	0.869				
GR	0.421	0.331	0.478	0.318	0.314	0.370	0.860			
SBI	0.528	0.425	0.604	0.340	0.137	0.819	0.320	0.895		
SP	0.626	0.719	0.417	0.566	0.280	0.578	0.290	0.466	0.872	
TIC	0.489	0.494	0.573	0.670	0.208	0.539	0.315	0.405	0.505	0.899

The square root values of the AVE range from 0.789 to 0.899 and are all higher than the correlation coefficient between that factor and other factors, obtained from the bootstrapping technique with 95% confidence.

Table 6.
Heterotrait-Monotrait Ratio (HTMT).

	BL	BLC	COM	DC	DT	FC	GR	SBI	SP
BL									
BLC	0.699								
COM	0.867	0.483							
DC	0.608	0.669	0.418						
DT	0.427	0.363	0.232	0.334					
FC	0.674	0.610	0.745	0.512	0.240				
GR	0.500	0.377	0.571	0.375	0.381	0.441			
SBI	0.636	0.470	0.702	0.385	0.164	0.854	0.379		
SP	0.771	0.812	0.494	0.666	0.337	0.689	0.344	0.536	
TIC	0.583	0.552	0.669	0.781	0.248	0.619	0.366	0.456	0.588

According to Mujisusatyo [35] the discriminant validity between two latent variables is ensured when the HTMT index is < 1. As shown in Table 8, the research results are all < 1, indicating that the discriminant validity between the latent variables in the research model is satisfactory.

3.3.3. Official model

First-round validation results: P Values of the effects shows that P values < 0.05 indicate the model is statistically significant. Among them, the hypotheses SBI -> DT = 0.253, FC -> BL = 0.588, FC -> DT = 0.639, and SP -> DT = 0.056 all have significance levels (P values) > 0.05, so the hypotheses H1, H3, H8, and H9 are not statistically significant and are subsequently removed from the model.

Second-round validation results after eliminating four hypotheses (H1, H3, H8, and H9):

Table 7.
R² and R² calibration tests.

	R-square	**R-square adjusted**
BL	0.528	0.520
COM	0.617	0.612
DT	0.137	0.131

$R^2_{(COM)} = 0.612 > 0.5$ indicates that the official research model is significant. According to the results in Table 6, the factors in the model explain over 61.2%, meaning the independent variables account for over 50% of the variance in the dependent variable. This assesses that the combination of digital transformation with blended learning on competitiveness achieves statistical significance in the application of the research model at universities in Vietnam.

Table 8.
Results of coefficient testing.

|	**Hypothesis**	**Original sample (O)**	**Sample mean (M)**	**Standard deviation (STDEV)**	**T statistics (|O/STDEV|)**	**P values**
SP -> BL	H2	0.297	0.289	0.083	3.567	0.000
SBI -> BL	H4	0.216	0.217	0.049	4.425	0.000
DC -> DT	H5	0.206	0.214	0.053	3.924	0.000
BLC -> BL	H6	0.168	0.171	0.080	2.091	0.037
TIC -> BL	H7	0.115	0.116	0.050	2.279	0.023
FC -> COM	H10	0.316	0.315	0.057	5.494	0.000
GR -> DT	H11	0.248	0.250	0.054	4.577	0.000
GR -> BL	H12	0.174	0.177	0.052	3.321	0.001
GR -> COM	H13	0.187	0.186	0.048	3.872	0.000
DT -> COM	H14	-0.098	-0.098	0.036	2.740	0.006
BL -> COM	H15	0.488	0.490	0.066	7.362	0.000
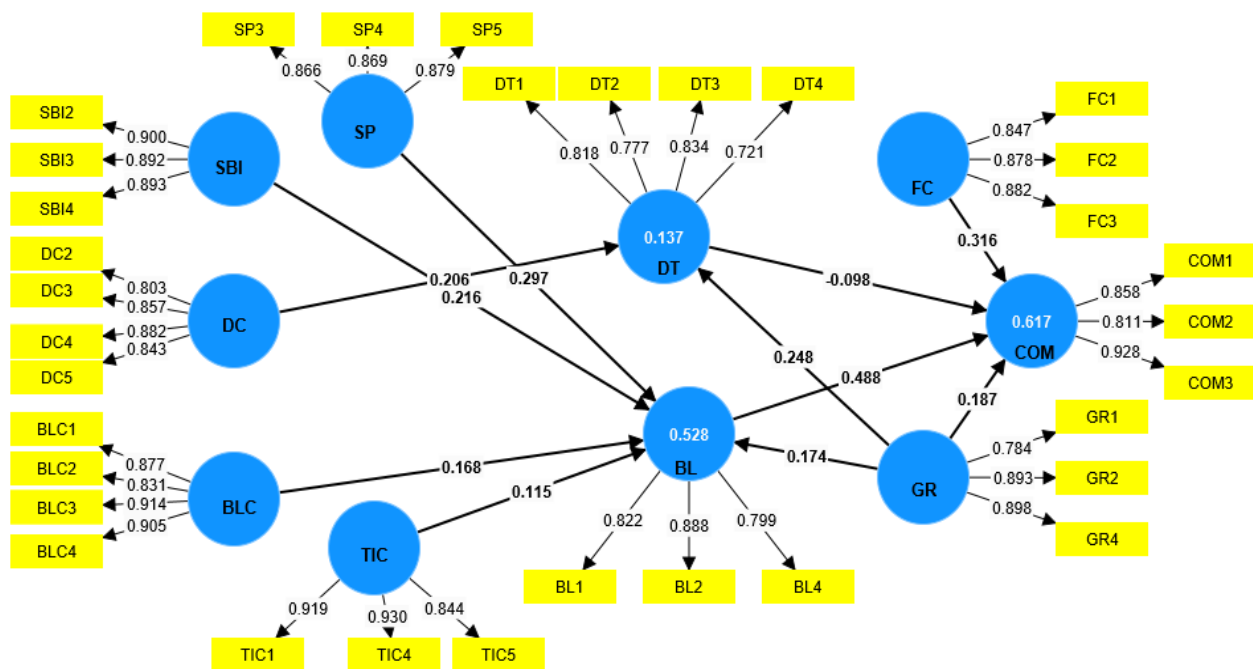
Figure 2.
Final study model.

The current study is based on the TAM and UTAUT models, supplemented with SP, SBI, DC, BLC, TIC, FC, and GR, to integrate DT tools with BL to enhance competitiveness (COM) at universities in Vietnam. The analysis results show that the research model fits the data and the factors are statistically significant. The article constructed 15 hypotheses, eliminated 4 unsuitable hypotheses (H1, H3, H8, H9), and accepted 11 hypotheses (H2, H4, H5, H6, H7, H10, H11, H12, H13, H14, H15). The study evaluates that the model achieves the expected results for applying DT with BL to enhance the competitiveness of universities in Vietnam. The factors of the independent variables positively influence the intermediate variables: School leadership; Social benefits and need for international integration; Resources and digital transformation capacity; BL curriculum; Teaching innovation capacity; Facilitation conditions; And government revolution. The digital transformation tools and blended learning impact the dependent variable of the research model, Competitiveness.

The research results for the hypothesis "BL -> COM = 0.488" show the strongest impact within the research model. The findings emphasize that "blended learning" affects "competitiveness" when applying digital transformation in the

teaching and learning of university students, positively influencing the research outcomes and confirming hypothesis H15. This result, supported by various other studies, suggests that adopting changes in teaching methods can enhance competitiveness and attract student enrollment in courses taught by lecturers. This aligns with the research findings of Pramesworo, et al. [10].

In the research model, the second most influential factor is "FC -> COM = 0.316," accepting hypothesis H10. Facilitation conditions significantly impact the competitiveness of universities. The paper highlights the crucial role of technical infrastructure and advanced information technology infrastructure. Strong financial support facilitates the successful application of DT integrated with BL. The study assesses the reliability of utilizing university resources to enhance the competitive strength of universities, aligning with the research on improving COM by several authors [13, 29, 30].

With the factor "Government Revolution" the author constructs three hypotheses (H11, H12, H13), all accepted and positively influencing the outcomes. Results show "GR -> DT = 0.248," "GR -> BL = 0.174," and "GR -> COM = 0.187," aligning with studies by Priyanto and Suhandi [15]. The evaluation of GR's impact on DT considers the government's contribution level in approving national DT programs. Government documents, decrees, and regulations on changing BL methods encourage creative thinking and the innovation of teaching methods by lecturers. GR's impact on COM assesses the government's role in shaping the competitive strategies of domestic and international universities.

Furthermore, "DT -> COM = -0.098" shows a negative correlation, indicating that digital transformation does not significantly impact the competitiveness of universities, contrary to previous research by several authors [31, 32]. Some studies have even highlighted the drawbacks of applying digital transformation in teaching [33]. Additionally, concerns about the security of digital transformation lead teachers to have a negative perception of using digital transformation. Therefore, it is necessary to integrate DT into BL to meet the competitiveness of universities. Particularly in Vietnam, most teachers face heavy workloads and are concerned about working overtime and the costs associated with learning new technologies.

Regarding the factor SP, the author constructs two hypotheses, accepting hypothesis H2 with "SP -> BL = 0.297," which shows a positive correlation and aligns with the research of several authors. Hypothesis H1 is rejected "SP -> DT" with P values = 0.056 due to the fact that at some institutions, the infrastructure does not meet the digital transformation requirements, and digital transformation is still a relatively new issue at some private universities.

The SBI factor with hypothesis H4 "SBI -> BL = 0.246" is accepted and positively influences the research results, aligning with the findings of Casquilho-Martins, et al. [22]. Hypothesis H3 is removed from the research model due to the cautious evaluation of the benefits of Digital transformation application for society and the need for international integration. Therefore, introducing some carefully designed support activities in training programs can help teachers become familiar with Digital transformation, serving social benefits and international integration.

Digital transformation technology under the influence of digital transformation capacity (DC) can analyze the intentions and evaluate the capabilities of the university and faculty in applying DT and blended learning to enhance competitiveness (COM). Hypothesis H5 "DC -> DT = 0.206" positively influences the research results and aligns with the studies of several authors.

4. Recommendations and Future Research Directions

The research team successfully developed a model with 7 independent variables, 2 intermediate variables, and 1 dependent variable to test and measure their impact in applying digital transformation with blended learning to enhance competitiveness at Vietnamese universities. After the data analysis process, the results showed that the completed model achieved positive outcomes in applying DT with BL in universities to enhance competitiveness. Based on the research results, the authors propose the following solutions with theoretical and managerial implications:

* Regarding school leadership: Universities need projects to modernize their facilities to meet DT requirements, which is a prerequisite for universities wanting to apply DT in teaching to enhance COM. Universities need to issue documents, hold training sessions, and organize workshops to innovate curricula and teaching methods. They should focus on developing and enhancing the capacities of faculty and management staff, and strengthening quality assurance processes. Universities should also concentrate on raising teachers' awareness of effectively incorporating digital transformation into teaching, as surveys indicate that blended learning using DT has the highest impact on competitiveness, attracting more student participation. Universities should implement various staff development projects and offer short-term training classes. Building international educational collaboration programs will aid in the integration of Vietnamese faculty and students into the global education market.

- Regarding faculty: As DT progresses rapidly, faculty members need to enhance their technological skills through information technology courses. Faculty members should develop electronic and digital lectures to meet the needs of international integration. They need to improve their foreign language skills to create lectures in various languages, ensuring that their blended learning (BL) teaching methods are accessible to both domestic and international students. This will help enhance the competitiveness of universities, attracting more enrollments from both local and international students.

- Government revolution: Although the Vietnamese government has already issued many policies to promote the application of digital transformation in education, many schools in Vietnam have not responded positively. Therefore, the government needs to issue the latest regulations with specific guidelines to help universities apply DT more effectively. Additionally, while the current development of information technology in Vietnam is good compared to other countries in

the region, further investment in technological infrastructure is needed. Implementing cybersecurity laws in education is essential to secure information for universities.

- Impact from family and social benefits: Digital transformation in universities is not just about investing in digital infrastructure but also requires a profound shift in thinking and management within families, as the family is the cradle of learning and development for students. University DT is not solely the responsibility of schools, faculty, or the government, but of society as a whole. Families need to equip themselves with computers, smartphones, and necessary DT management software to help students integrate with global education.

+ Implications for research model limitations: The author has contributed to the theoretical framework and demonstrated the factors positively or negatively impacting the model, thereby building appropriate hypotheses. However, research on the application of digital transformation with blended learning to enhance competitiveness at Vietnamese universities is still new. This study focuses on a few universities in Vietnam, with a limited number of 317 survey responses. Additionally, the study was conducted using only an online questionnaire sent to university leaders and faculty, without direct interviews or questionnaires sent to leading IT experts. These limitations will be addressed in future research.

+ Research proposal directions: Develop additional observed variables and research hypotheses. Expand the research scope beyond universities to include 12th-grade students preparing to enter university. Beyond the factors mentioned in the article, the author hopes that future research can include some key factors impacting the research model, such as factors affecting usage intention, and the performance of DT with BL…

5. Conclusion

In the current context, digital transformation is considered an inevitable activity to meet changes and enhance management efficiency. "The study concludes that blended learning has the strongest positive impact on competitiveness; Facilitating Conditions also have a very strong impact on competitiveness; Government revolution significantly influence the digital transformation process, BL, and COM; School leadership characteristics have a moderate impact on BL; Social benefits and the need for international integration have a significant impact on BL; Resources and digital transformation capacity have a considerable influence on the digital transformation process; the extent to which BL curriculum (BLC) affects BL is moderate; teaching innovation capacity also moderately impacts BL. The paper also indicates that DT does not significantly impact the COM of universities, and SP also has a limited impact on DT. This implies that in many universities, issues such as security concerns and hesitation in adopting new technologies negatively affect teachers' perceptions of the digital transformation process. Some private universities in Vietnam do not meet the requirements for advanced infrastructure, and DT is still a relatively new issue. Universities also emphasize the significant impact of BL on competitiveness when applying DT in teaching to attract students. The importance of advanced technological infrastructure in universities greatly influences competitiveness, particularly with strong financial support facilitating the application of DT in BL. For successfully integrating DT into BL to enhance COM at universities in Vietnam, the roles of school leadership and the government are crucial, given the guidance and support from the government and the strategic planning of school leadership.

References

[1]   K. Özdemir Hakan, "Digital transformation in higher education: A case study on strategic plans," *Higher Education in Russia,* vol. 29, no. 3, pp. 9–23, 2020.

[2]   C. G. Demartini, L. Benussi, V. Gatteschi, and F. Renga, "Education and digital transformation: The "Riconnessioni" project," *IEEE Access,* vol. 8, pp. 186233–186256, 2020. https://doi.org/10.1109/ACCESS.2020.3018189

[3]   A. M. McCarthy, D. Maor, A. McConney, and C. Cavanaugh, "Digital transformation in education: Critical components for leaders of system change," *Social Sciences & Humanities Open,* vol. 8, no. 1, p. 100479, 2023. https://doi.org/10.1016/j.ssaho.2023.100479

[4]   M. Bond, V. I. Marín, C. Dolch, S. Bedenlier, and O. Zawacki-Richter, "Digital transformation in German higher education: Student and teacher perceptions and usage of digital media," *International Journal of Educational Technology in Higher Education,* vol. 15, p. 48, 2018. https://doi.org/10.1186/s41239-018-0130-1

[5]   J. Prudente and A. Yunaningsih, "Improving university competitiveness and quality education through Human Resource Development in the digital era," *Bedan Research Journal,* vol. 8, no. 1, pp. 173-201, 2023. https://doi.org/10.58870/berj.v8i1.51

[6]   N. Ivanenko, A. Boiko, L. Fedorchuk, I. Panchenko, and D. Marieiev, "Development of educational policy in Ukraine in the context of European integration and digital transformation," *Revista Eduweb,* vol. 17, no. 2, pp. 296-305, 2023. https://doi.org/10.46502/issn.1856-7576/2023.17.02.25

[7]   D. R. Garrison and H. Kanuka, "Blended learning: Uncovering its transformative potential in higher education," *The Internet and Higher Education,* vol. 7, no. 2, pp. 95-105, 2004. https://doi.org/10.1016/j.iheduc.2004.02.001

[8]   Á. H. Galvis and D. Carvajal, "Learning from success stories when using eLearning and bLearning modalities in higher education: A meta-analysis and lessons towards digital educational transformation," *International Journal of Educational Technology in Higher Education,* vol. 19, p. 23, 2022. https://doi.org/10.1186/s41239-022-00325-x

[9]   D. R. Serrano, M. A. Dea-Ayuela, E. Gonzalez-Burgos, A. Serrano-Gil, and A. Lalatsa, "Technology-enhanced learning in higher education: How to enhance student engagement through blended learning," *European Journal of Education,* vol. 54, no. 2, pp. 273-286, 2019. https://doi.org/10.1111/ejed.12330

[10]   I. S. Pramesworo, I. Fathurrochman, D. Sembing, B. A. Bangkara, and D. Sudrajat, "Relevance between blended learning and students' independent learning curriculum: An overview of digital age education, student and teacher engagement,

technological resources," *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran,* vol. 9, no. 3, pp. 858-869, 2023. https://doi.org/10.33394/jk.v9i3.8320

[11] B. D. Nye, "Intelligent tutoring systems by and for the developing world: A review of trends and approaches for educational technology in a global context," *International Journal of Artificial Intelligence in Education,* vol. 25, pp. 177-203, 2015. https://doi.org/10.1007/s40593-014-0028-6

[12] B. R. Stockwell, M. S. Stockwell, M. Cennamo, and E. Jiang, "Blended learning improves science education," *Cell,* vol. 162, no. 2, pp. 933-936, 2015. http://dx.doi.org/10.1016/j.cell.2015.08.009

[13] L. A. Kartashova, A. M. Gurzhii, V. O. Zaichuk, and T. M. Sorochan, "Digital twin technology for blended learning in educational institutions during COVID-19 pandemic," in *In CTE Workshop Proceedings*, 2024.

[14] V. Parakhina, O. Godina, O. Boris, and L. Ushvitsky, "Strategic management in universities as a factor of their global competitiveness," *International Journal of Educational Management,* vol. 31, no. 1, pp. 62-75, 2017. https://doi.org/10.1108/IJEM-03-2016-0053

[15] P. Priyanto and N. P. M. Suhandi, "Indonesian higher education institutions competitiveness and digital transformation initiatives," *Jurnal Pendidikan Indonesia,* vol. 11, no. 1, pp. 86-95, 2022. https://doi.org/10.23887/jpi-undiksha.v11i1.34263

[16] A. Shah, V. Agarwal, W. G. Griswold, L. Porter, and A. G. Soosai Raj, "In-person vs blended learning: An examination of grades, attendance, peer support, competitiveness, and belonging," in *In Proceedings of the 2024 on Innovation and Technology in Computer Science Education*, 2024.

[17] M. R. Safiullin and E. M. Akhmetshin, "Digital transformation of a university as a factor of ensuring its competitiveness," *International Journal of Engineering and Advanced Technology,* vol. 9, no. 1, pp. 7387-7390, 2019.

[18] V. I. Dubnytskyi, N. Y. Naumenko, and V. R. Pysarkova, "The main aspects of increasing the competitiveness of higher education institutions in the market of educational services in the digital transformation of higher education," *Economic Herald of State Higher Educational Institution "Ukrainian State University of Chemical Technology,* vol. 1, no. 12, pp. 127-136, 2021.

[19] L. Supe, Zeps, A., Jurgelāne, I., & Ribickis, L., "Factors affecting the competitiveness of a higher education Institution: Systematic literature overview.," *Research for Rural Development,* vol. 2, pp. 245-252, 2018.

[20] A. Vasiliev, "Competitiveness and academic excellence with emerging technologies: Methods for assessing the quality of university education," *International Journal of Instruction,* vol. 14, no. 4, pp. 1013-1032, 2021.

[21] S. Rashid and H. Mustafa, "Corporate reputation antecedents and stakeholder loyalty in Malawi higher education institutions: Employees' and students' perspectives," *Tertiary Education and Management,* vol. 28, pp. 101-117, 2022. https://doi.org/10.1007/s11233-021-09088-y

[22] I. Casquilho-Martins, H. Belchior-Rocha, and L. Miguel, "Looking at b-learning and online experience in higher education during COVID-19," in *Proceedings of EDULEARN21*, 2021.

[23] I. Ajzen and M. Fishbein, "Attitude—behavior relations: A theoretical analysis and review of empirical research," *Psychological Bulletin,* vol. 84, no. 5, pp. 888-918, 1977. https://doi.org/10.1037/0033-2909.84.5.888

[24] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly,* vol. 13, no. 3, pp. 319-34, 1989. https://doi.org/10.2307/249008

[25] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User acceptance of information technology: Toward a unified view," *MIS Quarterly,* vol. 27, no. 3, pp. 425-478, 2003. https://doi.org/10.2307/30036540

[26] T. T. Anh and H. X. Trí, "Competitiveness and brand of the industrial university of food technology through the application of total quality management," *Journal of Science and Technology and Food,* vol. 11, pp. 113-122, 2017.

[27] T. T. H. Nguyễn, T. V. Lưu, L. H. Phạm, H. T. V. Trần, and T. K. N. Phùng, "Digital transformation in training at Hung Vuong University," *Journal of Science, Hong Bang International University,* vol. 1, pp. 188–196, 2024. https://doi.org/10.59294/HIUJS.KHQG.2024.019

[28] S. Timotheou *et al.*, "Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review," *Education and Information Technologies,* vol. 28, pp. 6695-6726, 2023. https://doi.org/10.1007/s10639-022-11431-8

[29] P. T. M. T. P. Thi and T. B. S. T. B. San, "Enhancing university faculty competence in the digital transformation era," *Journal of Science, Hong Bang International University,* vol. 25, pp. 139–146, 2023. https://doi.org/10.59294/HIUJS.25.2023.513

[30] C. S. Chai, X. Wang, and C. Xu, "An extended theory of planned behavior for the modelling of Chinese secondary school students' intention to learn artificial intelligence," *Mathematics,* vol. 8, no. 11, p. 2089, 2020. https://doi.org/10.3390/math8112089

[31] X. Cheng, W. Mo, and Y. Duan, "Factors contributing to learning satisfaction with blended learning teaching mode among higher education students in China," *Frontiers in Psychology,* vol. 14, p. 1193675, 2023. https://doi.org/10.3389/fpsyg.2023.1193675

[32] Y. T. Sung, K. E. Chang, and T. C. Liu, "The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis," *Computers & Education,* vol. 94, pp. 252-275, 2016. https://doi.org/10.1016/j.compedu.2015.11.008

[33] P. Gerbic, "Teaching using a blended approach–what does the literature tell us?," *Educational Media International,* vol. 48, no. 3, pp. 221-234, 2011. https://doi.org/10.1080/09523987.2011.615159

[34] D. Bickauske, S. Kromalcas, Z. Simanaviciene, L. Sergiienko, and T. Baranovska, "Digital transformation as a factor of ensuring country competitiveness: Moldova case analysis," *Independent Journal of Management & Production,* vol. 12, no. 3, pp. 560-583, 2021. https://doi.org/10.14807/ijmp.v12i6.1779

[35] Y. Mujisusatyo, "Porter's Five Forces Model competition as a framework for determining the competitive strategy of state university," in *Proceedings of the 3rd International Conference on Community Research and Service Engagements (IC2RSE 2019, 4 December 2019, North Sumatra, Indonesia). EAI*, 2019.