



Digital Transformation, Student Satisfaction, Word of Mouth and Online Learning Intention in Vietnam

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Abstract

Objectives: To deal with the Covid-19 pandemic and its unpredictable variations, universities must develop many different response scenarios in which online teaching is considered a suitable, strategic, and long-term solution. Our study aims to investigate and determine the relationships between digital transformation, satisfaction, word-of-mouth communication, and students' intention to continue learning online in universities. **Methods/Analysis:** Our study uses Structural Equation Modeling (SEM) to measure the interaction with data processing tools such as partial least squares SEM (PLS-SEM), Cronbach's Alpha coefficient, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and PLS Bootstrapping with descriptive and inferential statistics. **Findings:** The results show a positive interaction between students, faculty, and schools with digital transformation; between digital transformation and student satisfaction and word of mouth communication; between satisfaction with an expression of mouth communication and the intention to continue learning online; and between oral communication and a student's intention to continue learning online. **Novelty/Improvement:** This is the first study to simultaneously identify, examine, and measure the impact of factors influencing digital transformation, student satisfaction, word-of-mouth communication, and the intention to continue online learning and their interrelationships.

JEL Classification: A22, I20, I23

Keywords:

Students; School;
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Digital Transformation;
Word-of-Mouth Communication;
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1- Introduction

The outbreak of the Covid-19 pandemic has had an enormous impact on people and property around the world. Most activities were reduced or disrupted, and many businesses and organizations were forced to close or cease operations. To get out of bankruptcy and crisis and minimise damage caused by the Covid-19 pandemic, organisations have chosen to change operational solutions, considering digital transformation as an urgent and vital task, helping organisations adapt to new contexts. If met with the expectations of students and instructors, digital transformation at universities will improve and increase their satisfaction [1]. When students and instructors are satisfied, it promotes word-of-mouth activities and increases the intention of re-registering for online learning and teaching [2]. Research on the digital transformation of universities has received much attention from researchers. Tungpantong et al. (2021) [3] highlight three key factors affecting digital transformation success. It is the application of new technology, information and communication technology in operations, and the digital capacity of the leader. Kuzu (2020) [4] identifies digital transformation in universities' strategic plans, including education, research, community service, and management. Reis

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et al. (2018) [5] classify digital transformation into three categories: technological, organizational, and social. New technology represents new technology, such as social media and devices [6]. The organisation means adopting new business models or changes to existing processes [7]. Society reflects the impact of digital transformation on people's lives [8]. Navaridas-Nalda et al. (2020) [9] state that factors influencing digital transformation include university context, technology support and services related to digital documents, personal and professional profiles of brands, university leaders, education policy, university size, and digital culture. Alhubaishy and Aljuhani (2021) [10] conclude that learning outcomes, scarcity of easily accessible resources, and aversion to change are the factors that hinder the success of digital transformation in universities. They also see behavioral, physical, and emotional challenges as significant barriers to digital transformation success. Kuzu (2020) [4], and Navaridas-Nalda et al. (2020) [9] argue that the university's digital infrastructure is also an essential determinant of the success of the digital transformation.

Although the internet has appeared in the world for a long time, digital transformation appeared and became popular only when the 4th Industrial Revolution broke out. Digital transformation includes not only the simple application of new technologies but also the provision of services, goods, and direct experiences while searching, processing, and accessing the truly available resources (human, physical, intellectual, economic, etc.), creating many new connections between people, places, and things [11]. Digital transformation helps organizations transform their entire operations, processes, and value creation on the base on digital technology in response to a changing market landscape [12].

Digital transformation is applied in educational institutions to facilitate the learning process involving the ability to overcome various challenges, such as time and competence in traditional learning [10]. Digital transformation in higher education applies the university's digital platform to convert formal training to online training. Digital infrastructure is invested by the school for teaching and learning, such as online learning software, internet connection system, access to digital documents, the interaction between lecturers and students through the platform, and assessment assess student learning outcomes. Bond et al. (2018) [13] assert that innovation in digital teaching is not only technical innovation but also academic, curricula, organisational and structural innovation that contribute to the improvement of digital literacy, improving teaching higher education, transforming existing physical learning environments and creating new virtual learning environments. They find the integration of digital media in teaching and learning a complex negotiation process between different university stakeholders. Gaivoronskii et al. (2017) [14] acknowledge that the development trend of digital transformation in education has brought about outstanding achievements, while the traditional way of learning previously had some limitations. Digital transformation helps to digitise lecture knowledge, create online libraries, and create keyword search engines, change the traditional learning structure, toward user and market education, avoiding redundant training or not necessary for the future. Xiao (2019) [15] admits that digital transformation in education improves teaching quality, digitises data for application and establishes an electronic library that allows users to access lifelong learning and research goals.

In addition, several studies evaluate the outcomes and trends of digital transformation [13, 16, 17] or mention the challenges and opportunities of online learning during the Covid-19 outbreak [18] or emphasize human behaviour regarding devices and technology [19]. Most of the studies mainly look at the current state of digital transformation at universities [4, 16, 20] or mention the challenges lecturers and students face in digital transformation [1]. Some other studies mention human factors [19], the role of leaders [9], and information systems [3] in promoting the digital transformation of universities. However, the above studies have only been carried out in a theoretical framework and have not yet proposed the factors affecting the digital transformation process at universities. Moreover, there has not been any research that has deeply addressed the elements belonging to students, lecturers and schools related to digital transformation; or referred to the intrinsic factors of digital transformation, student satisfaction, word of mouth communication and intention to continue enrolling in online courses; nor has there been any research addressing the interactive relationship between digital transformation, student satisfaction, word of mouth communication and students' intention to continue enrolling in online learning. Therefore, our study was conducted to fill the above research gap. On the other hand, our research also examines the relationship between digital transformation and student satisfaction, increased word of mouth, and the increase in intention to continue enrolling online. Shehzadi et al. (2020) [21] identify that e-word of mouth and students' satisfaction generate a positive brand image for universities.

Although there have been some studies on digital transformation and factors affecting digital transformation, there is still very little research on identifying and measuring factors affecting digital transformation in universities in emerging economies like Vietnam. Therefore, identifying and measuring the skills, behaviours, attitudes and emotions of students and instructors and the university's investment in digital infrastructure for the digital transformation of universities are essential in the current context. Further, the assessment of satisfaction, word of mouth and intention to continue teaching/learning online should also be considered. This study will provide empirical evidence to support universities in their admissions, training and teaching decisions in living with the current Covid-19 pandemic.

In summary, our study is the first to simultaneously examine and measure the impact of factors influencing digital transformation, student satisfaction, word of mouth communication, students' intention to continue online learning, and especially the reciprocal relationship between them. We firmly believe that this study will contribute to the existing literature by providing new empirical evidence on the influencing factors and interactions among students, lecturers,

schools, digital transformation, student satisfaction, word of mouth communication and intention to continue learning online. Our research was conducted during the period from November 15 to December 10, 2021, which is the period when Vietnam had just begun to change its perception of the Covid-19 pandemic; instead of trying to "wipe out" Covid-19, Vietnam began to adjust to a model of "live together safely", while controlling the disease outbreak, reopening the economy and restoring everyday life, towards a "new normal" life. In that context, Vietnam's education sector - including universities - has applied a series of different solutions to join hands with the whole country to overcome difficulties and maintain and improve training quality.

Our article is divided into five sections. After the introduction of the paper is a theoretical underpinning and hypothesis development. Section 3 deals with the research model and methods. Section 4 presents the results and discussion, and section 5 presents the conclusions and policy implications.

2- Theoretical Basis and Hypothesis Development

2-1-Relationship Between Instructors and Digital Transformation

The role of teachers in education cannot be denied. The instructor/lecturer is the subject of the teaching activity, the one who organises and controls the teaching activity by choosing methods, measures, means, classroom organisation and orientation for students' learning activities. Bilyalova et al. (2019) [16] argue that technology can only be an effective tool, but it cannot replace teachers. The lecturers are the person who performs the teaching behaviour as an interaction between teacher and learner-student [22], and they are influenced by their skills, experience, motivation, confidence, and level of interaction with students. Alhubaishy & Aljuhani (2021) [1] recognise the challenges faced by lecturers such as lack of skills, lack of experience, lack of access to resources, many obstacles to change, low teaching effectiveness, poor social skills, fear of change, lack of confidence, lack of motivation, privacy concerns, and unrealistic expectations. Rudhumbu et al. (2021) [23] indicate that organisation, technology, pedagogy, student, and gender have significantly influenced lecturers' intention to teach online and, therefore, significantly impact digital transformation. Nguyen et al. (2022) [24] find that when teachers are confident and proactive, and able to decide and perform tasks themselves, they will be more creative to achieve leadership effectiveness. Sharma and Srivastava (2019) [25] confirm that value beliefs significantly positively influence the behavioural intention to use teachers' technology, social influence and perceived ease of use. Therefore, the first hypothesis for this study is stated as follows:

H₁: The instructors have a positive impact on digital transformation.

2-2-Relationship Between Students and Digital Transformation

Thanks to technology, learners are now at the centre of the learning process, and education is gradually shifting from imparting knowledge to developing learners' capacity. Applying digital transformation in education creates conditions for students to access open-source materials, and promotes students' initiative and creativity. Students are equipped with independent working and teamwork skills to ensure effective learning.

Students are influenced by cognition, behaviour, and emotions. Thi et al. (2022) [26] reveal that attitude (which is dominated by perceived usefulness and perceived ease of use), IT competence, and self-study influence students' intention to accept online learning at an early stage and future digital transformation of students. Compatibility, resource availability, subjective norms, subject preferences, and institutional brand significantly influence students' acceptance of further technologically advanced learning [27]. Dubey and Sahu (2021) [27] (2021) also found that information quality and effectiveness did not significantly contribute to students' intention to adopt technology-enhanced learning. Bag et al. (2020) [28] concluded that attitude, ease of use and usefulness have a significant relationship with students' behavioural intentions when using an online education system, while the nature of residency, device usage and network usage have negligible impact.

The university's digital transformation process will quickly succeed when increasing interaction between lecturers and students on technology platforms invested by the university or social networks and when students receive support from their lecturers and university in accessing digital resources. Singh et al. (2020) [29] assert that interactivity, cost-effectiveness and perceived usefulness form students' positive attitudes toward digital transformation and their intention to apply it shortly. Alhubaishy and Aljuhani (2021) [1] found that overcoming cognitive, behavioural, and emotional barriers between students and instructors facilitated successful early digital transformation. Furthermore, students' perceived levels of knowledge, skills acquired, and satisfaction also increased the school's digital transformation [9]. Performance longevity, effort lifespan, and social influence have significant positive effects on students' online readiness in online learning [30].

In contrast to the above studies, Zizka and Probst (2022) [31] found that although students appreciate the usefulness of the learning experience, the consequences of "forced" online learning make motivation their learning power declines, leading to many adverse effects on student learning outcomes. The above studies put forward the following hypothesis:

H₂: Students' cognition, behaviours, and emotions positively impact digital transformation.

2-3- The Relationship Between the School and Digital Transformation

Digital transformation in universities brings significant and practical effects. Navaridas-Nalda et al. (2020) [9] found that digital transformation is influenced by university factors such as investment in digital infrastructure, applying technology in training programs, communication with current students, or working with partners to accelerate digital transformation. For digital transformation at universities to succeed, university leaders must have profound skills, attitudes, knowledge and experience [3]. Accordingly, leaders with these characteristics will encourage higher education institutions to use technology and achieve their digital transformation goals more effectively. Since digital transformation involves changing the way it works, and technology only helps an organisation do that, schools are crucial to the success of the digital transformation [32]. Navaridas-Nalda et al. (2020) [9] also found that the leader profile factor (age, teaching experience, management experience, motivation to become a principal, perceived usefulness in engineering transformation) affected increasing the intended use of digital education resources. In addition, when the university invests in new technology, it also contributes to accelerating the digital transformation process [3]. Brunetti et al. (2020) [33] affirm that digital transformation is a pervasive challenge to the regional innovation system that requires a series of strategic actions under three main pillars: “culture and skills”, “infrastructures and technologies”, and “ecosystems”. They also point out that independent interventions are insufficient to address digital transformation from a systems perspective. Carvalho et al. (2022) [34] reveal that in universities, the most common leadership style is transformational; the most mentioned performance aspect is representative of teaching and learning activities, and the most discussed part of digital transformation are those related to online learning systems and types of different technology. This discussion leads to the following hypothesis:

H₃: Schools have a positive impact on digital transformation.

2-4- Relationship Between Digital Transformation and Satisfaction and Word-of-Mouth Activity

Student satisfaction in universities depends on various factors, such as whether their expectations and needs are met, whether the university they are attending is the best choice or not and are they pleased to study there. Learner performance is significantly affected by satisfaction, while it is indirectly affected by using the online learning system through satisfaction [30]. Student satisfaction is the outcome of evaluating the experience with the educational service received [35]. This often depends on the student's previous experience and expectations. Online-learning readiness has a positive impact on both learner satisfaction and the use of the online learning system.

Furthermore, student satisfaction depends on how well they meet their expectations from various factors such as academic factors, non-academic factors, training program factors and facilities [36]. Maini et al. (2021) [37] show six independent variables that affect students' participation and satisfaction in online classes, such as teachers' structured approach, teachers' technical readiness, teachers' self-efficacy, students' technical readiness, students' autonomy, and students' self-efficacy. Hamdan et al. (2021) [38] note significant differences in student satisfaction depending on education level, type of university and marital status. They also find the critical predictors of student satisfaction with online education were self-regulated learning, Internet effectiveness, learner-content interaction, learners and learners interaction and the number of theoretical courses on e-learning. Natour and Woo (2020) [39] find that students' satisfaction with digital transformation will increase when students are aware of the social benefits and pragmatism of applying digital transformation in learning. Pérez-López et al. (2020) [40] argue that educational technologies will increase student motivation and interest, improving student satisfaction. At the same time, the university's successful digital transformation will increase student interest, get them more engaged in the course, and increase positive word-of-mouth. Tools that enable instructors to communicate with students and vice versa are more critical to students and their satisfaction than tools that allow students to interact with each other [41].

Students' perceptions of interactivity, course content quality, and course design quality contributed significantly to their perceived usefulness, validation, and satisfaction with the learning system, which directly or indirectly led to their intention to continue using it [42]. Shehzadi et al. (2020) [21] demonstrate that ICT, e-service quality, and e-information quality contribute positively to students' e-learning, ultimately leading to positive word-of-mouth and student satisfaction. Similarly, Istijanto (2021) [43] finds that perceived differences in quality aspects between the traditional classroom and online learning positively and significant impact positively student satisfaction. Darawong and Widayati (2021) [44] are aware that the most vital aspect of service quality affecting Thai students' satisfaction is reliability, responsiveness and capacity; for Indonesian students, empathy, responsiveness, and competence and reliability.

In contrast to the above studies, Basuony et al. (2020) [45] find that the Internet, background information, class hours, loss of interest, motivation and self-motivation, as well as the use of online tests for assessment can be considered as factors that significantly influence student satisfaction with online learning.

From the above results and discussions, hypotheses H₄, H₅ and H₆ are proposed as follows:

H₄: Digital transformation has a positive impact on satisfaction;

H₅: Digital transformation has a positive effect on word of mouth;

H₆: Satisfaction has a positive effect on the expression of mouth activity.

2-5-Relationship Between Satisfaction, Word-of-Mouth Communication and Intent to Continue Learning Online

Student satisfaction impacts word-of-mouth activities and intention to continue enrolling online. Students continue to register in online learning to gain knowledge as part of their personal development [46]. Student satisfaction is highly dependent on university facilities, the availability of seasoned professors, close professor-student relationships, the lecture's content, the feedback and assessment results of the lecturers [47] and the conducive learning environment [48]. It is essential to have a comprehensive understanding of the factors contributing to student satisfaction. This will help create satisfying experiences that can generate word of mouth and students' intention to continue enrolling in online learning. Alarabiat et al. (2021) [49] recognise that sensory, reach, and relationship requirements for the formation of student satisfaction have a significant influence on the intention to continue using online learning. They also realise that the homogeneity requirements and the identical had no significant effect on students' satisfaction or intention to continue using e-learning. It is essential to have a comprehensive understanding of the factors that contribute to student satisfaction. This will help create satisfying experiences that can generate word of mouth and students' intention to continue enrolling in online learning [48]. Alarabiat et al. (2021) [49] recognise that sensory, reach, and relationship requirements for the formation of student satisfaction significantly influence the intention to continue using online learning. They also realise that the homogeneity requirements and the identical had no significant effect on students' satisfaction or their intention to continue using e-learning.

Contrary to the above results, James et al. (2021) [50] believe that technology overload can reduce the positive relationship between online learning intensity and satisfaction of basic psychological needs, affecting students' positive experiences. They also realise that technology overload and lack of expertise can directly lead to frustration with basic psychological needs, reducing positive outcomes and increasing anxiety about learning, strongly influencing the intention to continue enrolling on online education.

From the above analysis, hypotheses H₇ and H₈ are proposed as follows:

H₇: Satisfaction has a positive influence on intent to continue learning online;

H₈: Word-of-mouth communication positively affects the intention to continue learning online.

3- Research Model and Methods

Based on the research hypothesis, we build the following formal research model (Figure 1):

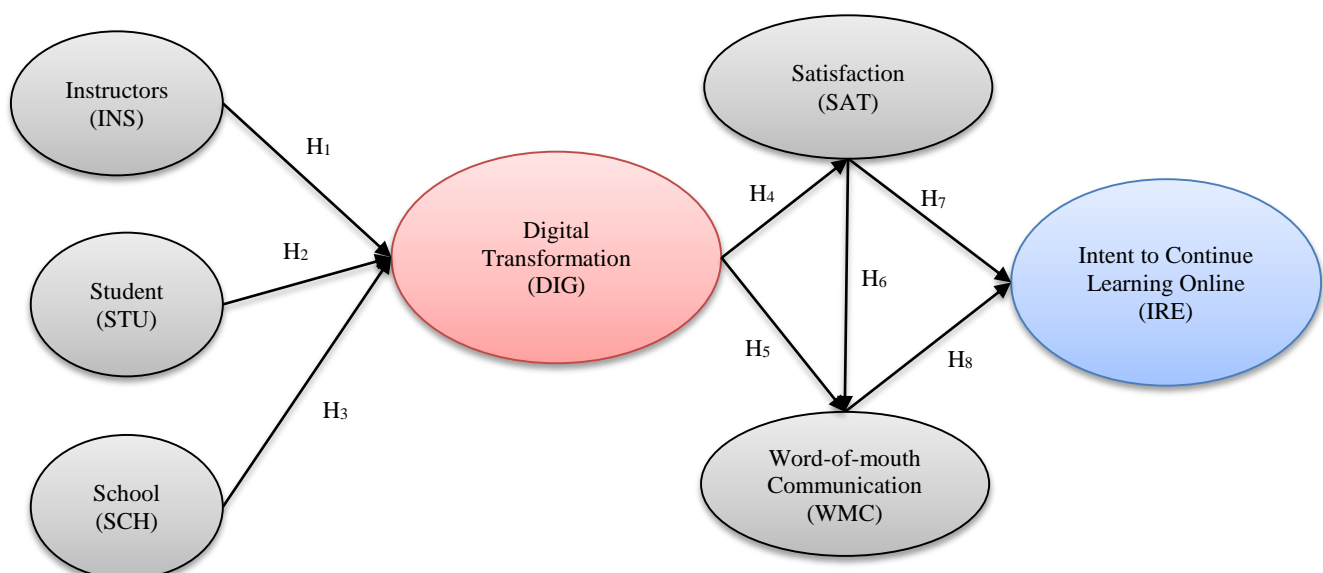


Figure 1. Research model

Our study uses SEM to measure the interactive relationship between digital transformation, satisfaction, word of mouth communication and students' intention to continue enrolling in online learning at universities in Vietnam. The research was carried out in two phases: (1) qualitative research and (2) quantitative research. In the qualitative research phase, after sketching the ideas and developing the research outline, building a draft scale for the variables in the model, the authors' group organised a group discussion of 15 students from different universities. Based on the results of the

comments, the study completed the scale to perform preliminary quantification to check the reliability of the scales. The purpose of phase 1 is to synthesise published research, combined with student discussion, to answer the question, "What factors affect digital transformation, satisfaction, word-of-mouth communication and intention to continue to enrol in online learning of students in Vietnam?".

The quantitative research phase is divided into two steps: preliminary research and formal research. Primary quantitative analysis is necessary due to the need to adjust and develop the scales in the study. The sample size in the preliminary quantitative research step consisted of 110 observations. The formal quantitative analysis was performed with 410 observations. The survey questionnaire was sent online through a link to 500 students of the universities surveyed. The research group received a total of 443 responses. After data cleaning, the number of valid responses was 410 and used in the formal study (accounting for 92.6%). Out of 410 survey samples, male students are 158 (accounting for 38.5%), female students are 252 (accounting for 61.5%); first-year students are 20 (accounting for 4.9%), the second year is 193 (47.1%), the third year is 121 (accounting for 29.5%), and fourth-year is 76 (18.5 %); the number of students under Thuy Loi University is 122 (accounting for 29.6%), University of Economics Ho Chi Minh City is 121 (accounting for 29.5%), Van Hien University is 109 (accounting for 26.6%), Industrial University of Ho Chi Minh City is 31 (accounting for 7.6%), University of Finance - Marketing is 4 (accounting for 1.0%), Ba Ria - Vung Tau University is 8 (accounting for 2.0%) and some students other schools under the National University of Ho Chi Minh City and Hanoi National University are 15 (accounting for 3.7%) (Figure 2).

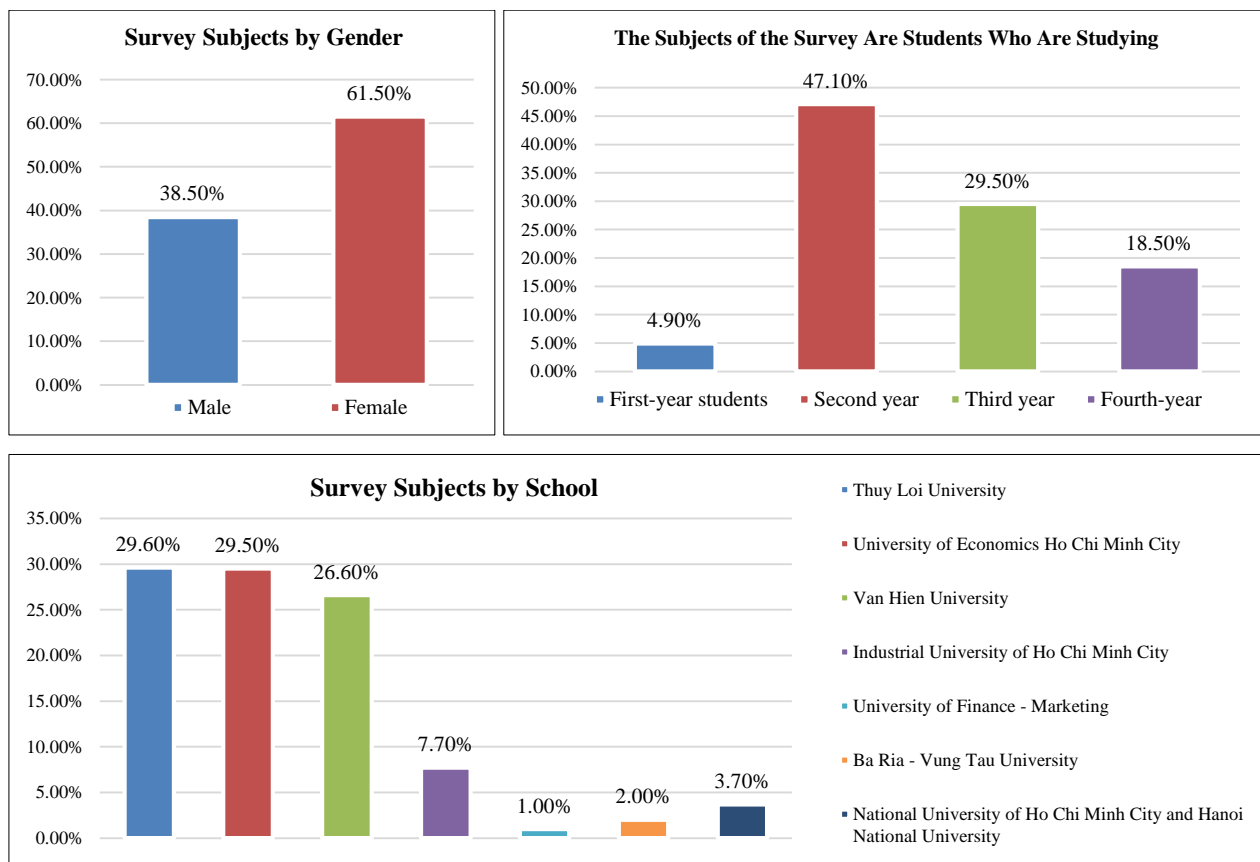


Figure 2. Characteristics of the survey sample

The official research sample was collected by a convenient sampling method, an online survey via Google form 365. The research group actively contacted friends and colleagues from different universities in Vietnam. After receiving survey consent and support, the survey link is sent to the survey subjects. The survey period is from November 15, 2021, to December 10, 2021.

With the support of *SmartPLS Software*, the scales are evaluated by measurement model analysis and linear structural model. Research data are processed using PLS-SEM because this method allows the processing of small sample sizes. The evaluation of the measurement model is done through Cronbach's Alpha reliability analysis, aggregate reliability, and extracted mean-variance to test the reliability and convergence value of the scale. The PLS Bootstrapping technique evaluated the structural model with a repeated sample size of 5000 observations through the coefficient of determination (R^2) and predictive compatibility (Q^2) to test the research hypothesis. The flowchart of the research methodology that was used to achieve the study's aims is shown in Figure 3.

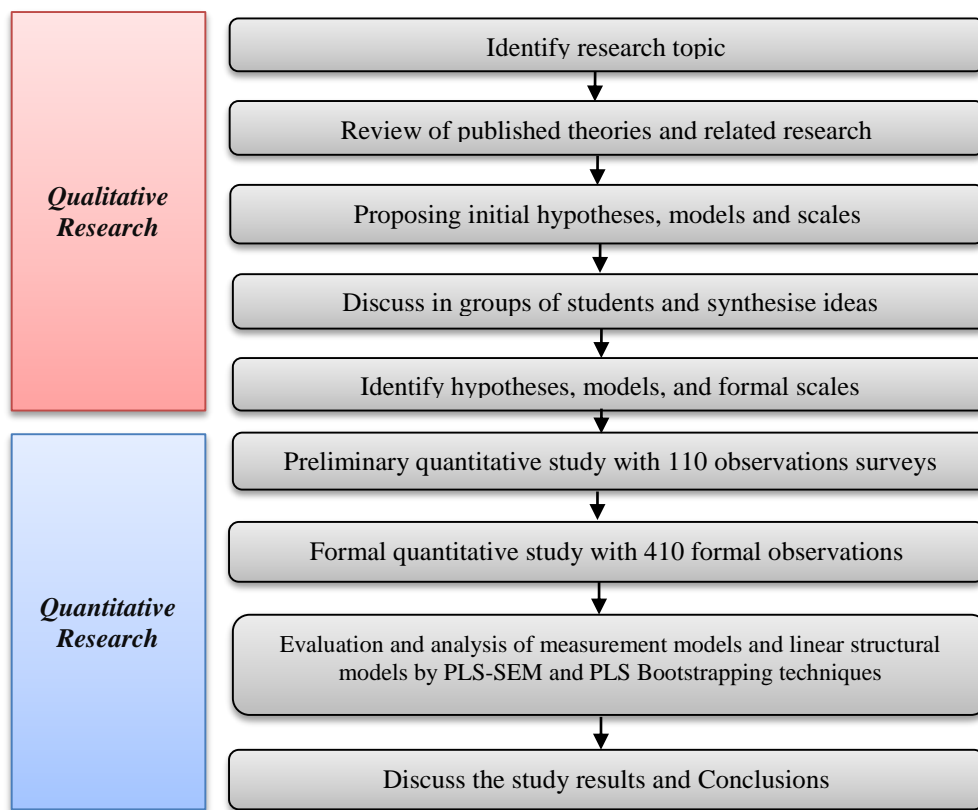


Figure 3. Overview of the research process and method

4- Results and Discussion

4-1- Qualitative Research Results

Based on in-depth discussions with 15 students selected from universities in Vietnam about the models, factors and scales relevant to this study; at the same time, removing, adjusting and supplementing the proposed scale to suit the online learning reality of students in Vietnam, the results after discussion, 08 research hypotheses were kept unchanged.

4-2- Preliminary Quantitative Research Results

Preliminary results show that the scales in the research model all have Cronbach's Alpha coefficient (α) greater than 0.6. Specifically, the coefficient α of the students' perception, behaviour, and emotion is 0.743, 0.797, and 0.812, respectively. Coefficient α of lecturers, schools, digital transformation, satisfaction, intention to continue to register are 0.950, 0.919, 0.949, 0.909, 0.872, and 0.765, respectively. According to the standards of Hair et al. (2014) [51], all scales are reliable.

The results of EFA analysis for each scale show that: Observed variables with the same properties converge on each factor. Therefore, when represented in a rotated component matrix, each group of observed variables by each element will be located in a separate column. All scales ensure discriminant validity. As for the student variable, different scales for three components: students' cognition, behaviour, and emotions converge into one scale. The Cronbach's Alpha analysis results of this scale show that $\alpha = 0.893$ is still satisfactory. Therefore, in the formal study, the scale for the student component is grouped into a hierarchy with ten observed variables consistent with the initially proposed theory.

4-3- Official Quantitative Research Results

4-3-1- Test the Reliability of the Scale and Discriminant Validity

Table 1 presents the results of testing the reliability of Cronbach's alpha, Composite Reliability, and Average Variance Extracted from the scales in the model. All scales have Cronbach's Alpha coefficient (α), and the composite reliability is greater than the minimum allowable threshold of 0.6 [51]. Therefore, the scales in the research model are reliable according to the standards of [51].

Table 1. The results of testing the reliability of the scales

Scales	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Digital transformation	0.931	0.946	0.743
Instructor	0.927	0.943	0.734
School	0.899	0.937	0.832
Student	0.882	0.904	0.485
Satisfaction	0.907	0.935	0.782
Word-of-mouth communication	0.876	0.942	0.890
Intent to continue learning online	0.723	0.873	0.776

Table 2 shows that the loading coefficients of most of the retained variables are significant at 0.7. Some observed variables have a loading coefficient of less than 0.7, but they should be kept because they have essential content in the scale. This is entirely appropriate because these reflection figures are only empirical and recommended; they do not have a mandatory meaning if the type will violate the content value of the scale. Therefore, the observed variables used in the research model have convergent values according to [51]. The results of descriptive statistics (Table 2) show that the average value of the observed variables of the factor has a relative level of agreement ranging from 3.10 to 3.89.

Table 2. Descriptive statistics of variables included in the research model

Variable name	Mean	Std. Deviation	Loading Coefficients
Instructor			
1. Instructors have good skills when using information technology in teaching activities	3.82	0.838	0.861
2. Instructors adapt quickly when the school converts the traditional form of training to online	3.88	0.842	0.863
3. Instructors have good experience in imparting knowledge and motivating students when participating in online learning	3.8	0.868	0.886
4. Instructors have good social skills when communicating with students	3.9	0.846	0.872
5. Instructors are highly motivated when teaching online	3.54	0.908	0.798
6. Instructors are very confident when teaching online	3.79	0.897	0.86
Student			
<i>Emotion</i>			
1. Students accept the change when the school converts the traditional form of training to online	3.65	0.939	0.716
2. Students are confident in their skills and knowledge when learning online	3.23	0.976	0.737
3. Students are highly motivated to learn online	3.1	1.039	0.701
<i>Behaviour</i>			
1. Students rarely encounter inadequacies/problems when the school converts the traditional form of training to online	3.22	0.996	0.662
2. Students achieve good academic results when learning online	3.22	0.933	0.716
3. Students have good social skills in interacting and communicating with instructors and other departments of the school	3.34	0.935	0.707
4. Students have improved self-control when learning online	3.69	0.93	0.743
<i>Cognition</i>			
1. Students have many digital resources that need access to serve the learning process	3.89	0.934	0.595
2. Students receive support from their families, lecturers, and universities when using new technology	3.82	0.903	0.697
3. Students actively participate in exchanges and group discussions through technology platforms	3.8	0.95	0.68
School			
1. The school has used a lot of digital infrastructures when training online	3.66	0.9	0.9
2. The school has a fully equipped digital infrastructure	3.69	0.844	0.946
3. Using the school's digital infrastructure is considered very easy	3.6	0.867	0.89
Digital transformation			
1. The school uses technology diversely and flexibly in teaching activities	3.75	0.803	0.871
2. Schools develop technology in the classroom and outside of the classroom	3.69	0.839	0.885
3. Technology application in training programs	3.82	0.793	0.832
4. Applying technology in communicating with current students, graduates and potential students	3.71	0.795	0.876
5. Developing own software to serve training activities	3.68	0.849	0.824
6. Collaborate with partners to accelerate digital transformation	3.67	0.819	0.882

Satisfaction			
1. The school met my expectations	3.5	0.868	0.888
2. The school has met my current needs	3.61	0.878	0.879
3. The university that I am attending is the most suitable choice	3.69	0.843	0.886
4. I am happy while studying at my University	3.73	0.869	0.886
Word-of-mouth communication			
1. I positively recommend my family and friends to consider this university for admission	3.64	0.876	0.946
2. I share with prospective students some information about the school and its training programs	3.79	0.833	0.941
Intent to continue learning online			
1. I want to continue to register for online learning in the future.	3.11	1.018	0.828
2. This university offers experiential learning better than other universities	3.39	0.894	0.931

Table 3 presents the results of testing discriminant validity of latent variables in the model, using Fornell-Larcker criteria [52]. The results show that all square root values of the AVE of each research variable are more significant than the correlation coefficient between that variable and the rest of the variables in the model. Therefore, the scales of the research variables all have discriminant values.

Table 3. Discriminant validity test (Fornell-Lacker)

Variable	DIG	INS	SCH	STU	SAT	WMC	IRE
Digital transformation	0.862						
Instructor	0.692	0.857					
School	0.782	0.664	0.912				
Student	0.685	0.71	0.643	0.697			
Satisfaction	0.705	0.63	0.716	0.661	0.885		
Word-of-mouth communication	0.663	0.625	0.649	0.579	0.732	0.943	
Intent to continue learning online	0.539	0.467	0.579	0.488	0.67	0.626	0.881

Notes: Diagonal elements are the square root of AVE for each construct; Off-diagonal elements are the correlations between constructs

4-3-2- Test the Research Hypothesis and Theoretical Model

The results of testing the research hypotheses are shown in Table 4. The quality of the proposed model is assessed through the R² value and the Stone-Geisser Index value (Q²). The R² values of the variables are all greater than 0.26 (digital transformation: 0.685, satisfaction: 0.496, word-of-mouth communication: 0.579, intention to continue enrolling online: 0.685) greater than 0.26, showing the degree of the explanation is that the models are substantial [53] (Cohen, 1988). The Stone-Geisser values of the variables are all greater than 0.35 (digital transformation: 0.501, satisfaction: 0.386, word-of-mouth communication: 0.501, intention to continue enrolling online: 0.358), showing a high degree of fit of the model [54].

Table 4. Hypothesis test results

Hypothesis	Relationship	B	Std. Dev.	T	P-Values	Conclude
H ₁	Instructors → Digital transformation	0.199***	0.056	3.570	0.000	Accept
H ₂	Students → Digital transformation	0.215***	0.046	4.655	0.000	Accept
H ₃	Schools → Digital transformation	0.511***	0.048	10.759	0.000	Accept
H ₄	Digital transformation → Satisfaction	0.704***	0.039	18.030	0.000	Accept
H ₅	Digital transformation → Word-of-mouth communication	0.290***	0.073	4.020	0.000	Accept
H ₆	Satisfaction → Word-of-mouth communication	0.528***	0.067	7.841	0.000	Accept
H ₇	Satisfaction → Intent to continue learning online	0.456***	0.059	7.706	0.000	Accept
H ₈	Word-of-mouth communication → Intent to continue learning online	0.293***	0.060	4.870	0.000	Accept
Coefficient of determination (R ²)				R ² _{DIG} = 0.685, R ² _{SAT} = 0.496, R ² _{WMC} = 0.579, R ² _{IRE} = 0.685		
Stone-Geisser's Q ²				Q ² _{DIG} = 0.501, Q ² _{SAT} = 0.386 Q ² _{WMC} = 0.501, Q ² _{IRE} = 0.358		

Note: *** p < 0.001; B: Sample Mean, T: T Statistics

The test results show that hypothesis H₁, the instructor factor has a positive and statistically significant effect on digital transformation (H₁: $B = 0.199$, $p = 0.000 < 0.001$), so hypothesis H₁ is accepted. This result is consistent with the study [23] on the positive relationship between teachers and digital transformation. Similarly, in hypothesis H₂, the student factors (cognition, behaviour and emotions) have a positive impact on digital transformation (H₂: $B = 0.215$, $p = 0.000 < 0.001$), so hypothesis H₂ is also accepted. This result, although contrasted with [31], is in agreement with the results of [1, 26, 27, and 29] on the positive relationship between students' cognition, behaviour and emotions with digital transformation.

Like student and lecturer composition, school composition has a positive and statistically significant impact on digital transformation, so hypothesis H₃ is also accepted (H₃: $B = 0.511$, $p = 0.000 < 0.001$). This conclusion is similar to the results of studies [3, 9, 34]. Next, hypothesis H₄, digital transformation has a positive and statistically significant impact on student satisfaction (H₄: $B = 0.704$, $p = 0.000 < 0.001$) and hypothesis H₅, digital transformation tends to have a similar effect on word of mouth (H₅: $B = 0.291$, $p = 0.000 < 0.001$). The estimated results show that hypotheses H₄ and H₅ are accepted in this study. Compared with previously published studies, the conclusion about the positive relationship between digital transformation on student satisfaction is consistent with studies [30, 38, 39] but in contrast to research [45]. For hypothesis H₅, this result is consistent with the results of the study [40].

In addition, the hypotheses about the relationship between student satisfaction, word of mouth communication and intention to continue enrolling online are also accepted, so hypothesis H₆ (H₆: $B = 0.527$, $p = 0.000 < 0.001$); H₇ (H₇: $B = 0.455$, $p = 0.000 < 0.001$) and H₈ (H₈: $B = 0.294$, $p = 0.000 < 0.001$) were also included in this study. The results of the positive relationship between student satisfaction and word of mouth activities are consistent with the results of the studies [21, 40]; the positive relationship between student satisfaction and intention to continue online learning is contrary to the research results [48] but consistent with the research results of [42, 49]. Finally, the results of our study are consistent with the results of studies [42, 48] on the positive relationship between word of mouth and online learning intention.

The results of model estimation by Bootstrapping method with a sample size of 5000 are shown in Figure 4.

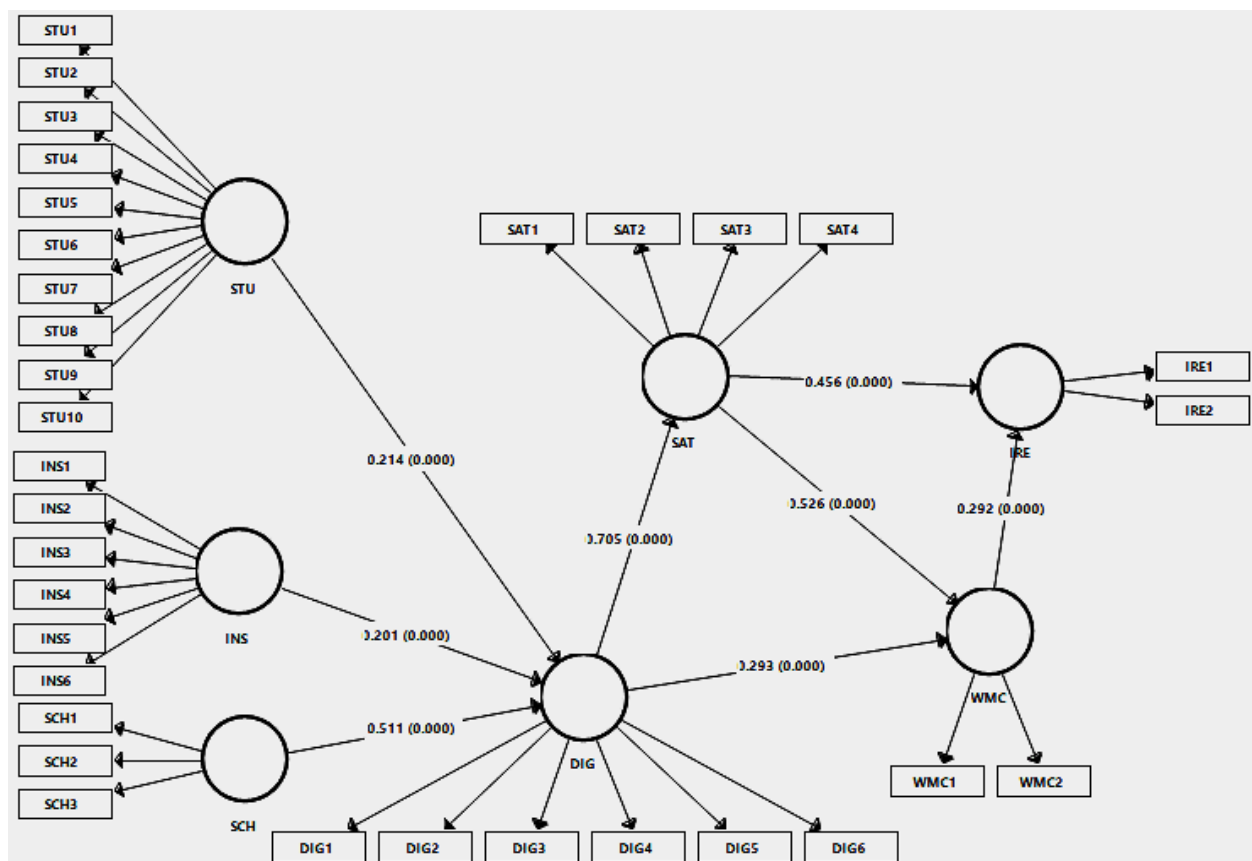


Figure 4. Estimation results PLS-SEM

4-3-3- Testing the Intermediary Role of Digital Transformation

The results of theoretical model testing (Table 5) clearly show that the digital transformation process of universities is influenced by three main components: students, instructors and schools. In this study, hypotheses H₁, H₂, H₃, H₄ and H₅ have been less tested in previous studies, while hypotheses H₆, H₇ and H₈ have been tested quite extensively.

Table 5. Hypothesis test results

Relationship	B	CIs	P-Values
Schools → Digital transformation → Satisfaction → Word-of-mouth communication → Intent to continue learning online	0.057	[0.027; 0.094]	0.002
Schools → Digital transformation → Satisfaction	0.36	[0.282; 0.437]	0.000
Students → Digital transformation → Word-of-mouth communication → Intent to continue learning online	0.018	[0.008; 0.032]	0.004
Instructors → Digital transformation → Satisfaction → Intent to continue learning online	0.065	[0.025; 0.112]	0.003
Students → Digital transformation → Satisfaction → Intent to continue learning online	0.069	[0.036; 0.108]	0.000
Digital transformation → Satisfaction → Word-of-mouth communication	0.371	[0.266; 0.479]	0.000
Instructors → Digital transformation → Word-of-mouth communication → Intent to continue learning online	0.017	[0.005; 0.035]	0.022
Students → Digital transformation → Satisfaction → Word-of-mouth communication	0.08	[0.041; 0.129]	0.000
Students → Digital transformation → Satisfaction → Word-of-mouth communication → Intent to continue learning online	0.024	[0.01; 0.044]	0.008
Digital transformation → Satisfaction → Word-of-mouth communication → Intent to continue learning online	0.11	[0.056; 0.175]	0.000
Satisfaction → Word-of-mouth communication → Intent to continue learning online	0.156	[0.084; 0.241]	0.000
Instructors → Digital transformation → Word-of-mouth communication	0.06	[0.017; 0.118]	0.024
Instructors → Digital transformation → Satisfaction	0.141	[0.061; 0.222]	0.001
Student → Digital transformation → Satisfaction	0.151	[0.084; 0.223]	0.000
School → Digital transformation → Word-of-mouth communication	0.148	[0.077; 0.222]	0.000
Digital transformation → Word-of-mouth communication → Intent to continue learning online	0.085	[0.041; 0.137]	0.000
Digital transformation → Satisfaction → Intent to continue learning online	0.32	[0.234; 0.405]	0.000
Students → Digital transformation → Word-of-mouth communication	0.062	[0.028; 0.103]	0.001
School → Digital transformation → Satisfaction → Word-of-mouth communication	0.19	[0.123; 0.262]	0.000
School → Digital transformation → Word-of-mouth communication → Intent to continue learning online	0.043	[0.02; 0.072]	0.001
School → Digital transformation → Satisfaction → Intent to continue learning online	0.163	[0.117; 0.212]	0.000
Instructors → Digital transformation → Satisfaction → Word-of-mouth communication → Intent to continue learning online	0.022	[0.009; 0.039]	0.005
Instructors → Digital transformation → Satisfaction → Word-of-mouth communication	0.074	[0.034; 0.118]	0.001

Note: CIs - Confidence intervals, B: Sample Mean

Specifically, hypotheses H_1 , H_2 and H_3 show that the digital transformation process of universities is affected by students' cognition, behaviour and emotions, by the skill, experience and motivation of the teaching staff and by the investment in technology of the university. These three components play an essential role in driving successful digital transformation at universities. The results of this study are consistent with the views of Alhubaishy & Aljuhani (2021) [10]. The authors believe that the cognitive, behavioural and emotional challenges students and instructors face are significant barriers to digital transformation success in universities. In addition, investment in the university's digital infrastructure also contributes to increasing universities' digital transformation intentions [9].

Hypothesis H_4 and H_5 suggest that successful digital transformation contributes to student satisfaction and positive word of mouth. This result is consistent with the views of Pérez-López et al. (2020) [40], but it is also rarely tested in previous studies. The group of authors believe that educational technologies will increase student motivation and interest and increase student satisfaction. Hypotheses H_6 , H_7 and H_8 emphasize that when students are satisfied, they will promote positive word-of-mouth activities and increase intent to continue learning online in the future. This result is exactly the same as what Rehman et al. (2020) [2] found in their research.

5- Conclusions

The paper aims to identify and measure the interactive relationship between digital transformation, satisfaction, word-of-mouth communication, and students' intention to continue enrolling in online learning in universities in Vietnam. During the early stages of the Covid-19 pandemic, universities in Vietnam temporarily suspended operations and found solutions to adapt to the new context. Among the proposed solutions, digital transformation is optimal to help universities return to normal operations to ensure training progress. However, the digital transformation process at universities has many barriers and has not received adequate attention. Our study uses the partial minimum structure model estimation method (PLS-SEM) with a sample size of 410 students from universities. Research results confirm the interactive relationship between digital transformation, satisfaction, positive word-of-mouth communication, and the intention to

continue enrolling in an online study of university students in Vietnam. In addition, the study also discovered that digital transformation acts as a mediator between students, lecturers, and schools with satisfaction, positive word-of-mouth communication, and students' intention to continue enrolling in online learning.

Based on research findings, to accelerate the digital transformation of universities, increase student satisfaction and positive communication, as well as drive the intention to continue enrolling in courses online, we make recommendations to raise students' awareness, improve the quality of teaching staff, and increase investment in facilities for digital transformation in schools. Each school's leadership should develop specific recommendations to address students' and instructors' cognitive, behavioral, emotional, technological, and skills-related issues. Recommendations should enhance all stakeholders' perceived outcomes and satisfaction with a good education. This will accelerate the digital transformation process, increase active word-of-mouth communication, and ultimately promote students' intention to continue enrolling in online learning. Our study still has some limitations on the sample. Applying the convenience sampling method will limit the representativeness of the sample population. Therefore, in the following survey, it is necessary to use other sampling methods such as stratified sampling to overcome the convenience sampling method. Furthermore, the survey subjects in this study are students. Therefore, the perception level when assessing the composition of the lecturer and the school will be inaccurate, leading to possible errors. Consequently, it is necessary to survey more lecturers or school leaders to provide more accurate information.

6- Declarations

6-1-Author Contributions

Conceptualization, D.V.V., G.N.T., and C.V.N.; methodology, C.V.N.; software, G.N.T.; validation, D.V.V., G.N.T., and C.V.N.; formal analysis, D.V.V.; investigation, D.V.V., and G.N.T.; resources, D.V.V., and G.N.T.; data curation, C.V.N.; writing—original draft preparation, D.V.V., and G.N.T.; writing—review and editing, C.V.N.; visualization, G.N.T.; supervision, C.V.N.; project administration, D.V.V.; funding acquisition, D.V.V. All authors have read and agreed to the published version of the manuscript.

6-2-Data Availability Statement

The data presented in this study are available in the article.

6-3-Funding

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6-4-Acknowledgements

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6-5-Institutional Review Board Statement

Not applicable.

6-6-Informed Consent Statement

All the study participants signed an informed consent agreeing to provide data and availability for the survey.

6-7-Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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