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Awareness of Digital Transformation, Satisfaction, and Intention to Learn Online Through the E-Learning System Among Vietnamese Students: A Case Study at Tra Vinh University

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ABSTRACT

Inspired by the Vietnamese government's national digital transformation program and the persistent COVID-19 pandemic implications, including the potential for disease resurgence, Tra Vinh University has adopted a strategic blended learning approach. This approach seamlessly combines traditional classroom instruction with advanced online pedagogy through the E-learning system. The study aims to investigate the relationship between students' awareness of digital transformation, satisfaction, and their intention to continue studying online through E-learning at Tra Vinh University. A valid sample size of 383 participants was utilized, and various statistical techniques were employed, including descriptive statistics, Cronbach's alpha scale reliability testing, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and linear structural equation modeling (SEM). The results indicate that factors such as teachers, educational institutions, and families have a positive influence on students' perception of digital transformation capacity. Additionally, awareness of digital transformation positively impacts students' satisfaction and their intention to continue learning online. Furthermore, satisfaction significantly influences learners' intention to sustain their engagement in online learning. Several implications can be drawn. Educational leaders should develop strategies to enhance instructors' digital teaching skills and promote student participation in online learning. Instructors should receive training to improve their digital teaching competencies. Families should provide modern devices for learners to become acquainted with the digital environment and perform online tasks in the E-learning system. Educational institutions should offer additional training in digital technology and guide students in effectively using online learning systems to enhance their confidence and learning experiences.

Keywords: Teacher, Family support, Educational institution, Trend of the times, Online learning intention

1. INTRODUCTION

The term "digital transformation" pertains to the utilization of digital technology across different sectors of society. According to the Ministry of Information and Communications of Vietnam, digital transformation is the process of overall and comprehensive change of individuals and organizations in the way of living, working and production methods based on digital technologies. Furthermore, FPT Digital, a digital transformation consulting company, posits that digital transformation, in its broader sense, includes human transformation, cognitive transformation, and business transformation activities. In particular, digitizing information and digitizing processes will be part of successful digital transformation for businesses. Within the realm of education, digital transformation signifies a shift in pedagogical approaches, incorporating information technology and contemporary devices into the teaching and learning processes. This integration of information technology and modern devices serves to fulfill the requirements of both students and educators, empowering them to optimize their cognitive abilities, foster

creativity, and encourage initiative in the educational process (Hakan, 2020).

One of the popular ways to implement digital transformation is online learning, which is an educational method that utilizes computers, smartphones, and internet connections. This approach has gained significant popularity worldwide, including in countries such as the US, Korea, China, Japan, and India (Kentnor, 2015). In Vietnam, the implementation of E-learning applications has experienced substantial growth and has drawn government attention since 2006 (Le, 2012). This learning format allows learners to save time and costs by overcoming the barriers of time and geographical distance. Moreover, it enables instructors to update training content more frequently, monitor the knowledge acquisition of learners through self-assessment systems, and provide learning materials in various file formats, deviating from traditional teaching methods. In the context of the challenging COVID-19 pandemic, online learning has garnered even more attention and has become the preferred alternative to traditional learning methods. This shift ensures

the safety and health of students and helps prevent the spread of the COVID-19 epidemic (Directive No. 16/CT-TTg).

Tra Vinh University in Vietnam has implemented an online learning model for its regular university students in response to the challenging circumstances posed by the COVID-19 pandemic in March 2020. However, this transition has presented certain challenges for students, including a lack of psychological preparedness, difficulties adapting to new learning formats, and limited access to necessary learning resources. As a result, student satisfaction with online learning has become a prominent topic of investigation for researchers both domestically and internationally, given its crucial role in the educational process (Baber, 2020). Previous studies conducted by Baber (2020), Basuony et al. (2021), Sharma et al. (2020), and Thach et al. (2021), have explored the factors that influence student satisfaction in online learning environments. Tungpantong et al. (2021) posit that the success of digital education hinges on the effective utilization of new technologies and the digital competence of educational leaders. Additionally, factors such as technological support, digital document management, personal records, educational policies, and digital culture all contribute to the digital transformation of universities (Navaridas-Nalda et al., 2020). Of particular note is that the digital infrastructure of universities also plays a critical role in determining the overall success of the digital transformation process (Hakan, 2020; Navaridas-Nalda et al., 2020).

The post-COVID-19 period has necessitated the adoption of innovative educational strategies at Tra Vinh University (TVU), including a blended learning model that combines traditional face-to-face instruction with online learning through the E-learning system. This integration aims to facilitate the provision of study materials and assignments to students, in line with the teaching and learning conditions at TVU, as well as the digital transformation objectives set by the Vietnamese government (Decision No. 749/QĐ-TTg). TVU is known as a training institution with the core educational goal of delivering high-quality learning opportunities to the community, thus prompting an inquiry into students' perceptions, feedback, and evaluations regarding the online learning system. To date, there is a dearth of research on the interplay between digital transformation, satisfaction, and intention to learn online among students at Tra Vinh University. Therefore, a study titled "Awareness of digital transformation, satisfaction, and intention to learn online through the e-learning system among Vietnamese students: A case study at Tra Vinh university" was conducted with the aim of determining the factors affecting students' perception, measuring their influence on digital transformation awareness, online learning satisfaction, and intention. From there, this research aims to propose implications for the institution in terms of preparing supportive resources and enhancing students' satisfaction and intention to continue online learning.

2. LITERATURE REVIEW

2.1 Digital Transformation in Higher Education – An Inevitable Trend

Digital transformation in higher education is the application of digital technology and internet information systems in the field of education to improve the quality of teaching, learning, and educational management (Xiao, 2019). In other words, it can be

understood as a process of comprehensive change in the methods of teaching, learning, and educational management, involving not only the implementation of technological measures, but also a combination of digital technologies, human and organizational factors (Oliveira & Souza, 2022; Tungpantong et al., 2022).

In the context of the COVID-19 pandemic, social distancing measures have been widely implemented by governments around the world to mitigate the spread of the COVID-19 pandemic. Regarding the field of education, instructors are encouraged to adapt their teaching methods, transitioning from traditional face-to-face instruction to remote distance learning models utilizing technology to facilitate continued instruction. In a study on university students' cognitive perceptions of digital transformation amidst the COVID-19 context, Hervás-Gómez et al. (2021) affirmed a positive correlation between technology-integrated teaching approaches, student motivation, and the digital learning environment. Sosa Díaz (2021) asserted the significant utility of remote distance education during school closures and demonstrated the potential for the digitization and transformation of educational systems. However, substantial support from students' families is crucial. In a study examining the relationship between family, attitudes, and digital technology proficiency among university students, Kim et al. (2018) confirmed that families exert influence on students' digital proficiency and attitudes toward digitalization in higher education.

In his study, "Usage of Digital Technology in Higher Education: Teacher and Student Digital Competency," Tekleselase (2021) contends that digital technology plays a significant role in students' academic performance, especially for those with high academic aptitude. University students have access to various digital technologies, including the internet, desktop computers, laptops, and smartphones. However, the proficiency in using digital technology among both instructors and students remains relatively low. Bond et al. (2018), in their study on the awareness and utilization of digital media among university students and instructors in German universities, investigated the issue of digital transformation in higher education. The study involved a sample size of 381 instructors and 200 students, who were assessed for their awareness and utilization of digital tools in the teaching and learning process. The findings revealed that both instructors and students exhibited limited utilization of digital technology. Therefore, a more widespread integration of technology in education is considered a primary strategy for higher education institutions.

2.1.1 The Context of Digital Transformation in Education in Vietnam.

In the outbreak of the complex COVID-19 pandemic, Vietnam's Ministry of Education and Training directed educational institutions to teach and learn via the internet or television to ensure that learning activities continued and were in line with the motto "pause going to school, don't stop studying" (Dung et al., 2021). This pandemic has highlighted the need to implement social distancing measures as per Government Directive No. 16/CT-TTg, ensuring physical distance between individuals and communities. In particular, schools have responded by integrating various technological platforms (Zoom, Microsoft Teams, Google Meet, etc.) with internet applications, enabling the delivery of educational content to learners and ensuring the quality and

timely progression of learning activities. Along with that, scientific and technological advancements have greatly supported the development of the education sector. Indeed, technology is regarded as a valuable ally in effectively and practically fulfilling educational objectives in a timely manner.

According to the National Digital Transformation Program by the government, the aim is to achieve digital transformation in teaching, learning, and assessment by 2025 and beyond, as outlined in Decision No. 749/QĐ-TTg. This entails a comprehensive transformation of teaching methodologies, classroom management techniques, and learner interactions into the digital space. It leverages information technology to facilitate successful instructional practices. Thereby, these transformations result in several advantages, including the optimization of teachers' instructional activities (e.g., attendance, assessments, interactive lectures), the provision of a wide range of resources and diverse learning modalities for learners, and the ability to promptly and conveniently update task requirements. Moreover, it facilitates the efficient and convenient management of educational processes. For these reasons, universities are actively embracing digital transformation to enhance the quality of education and bolster their brand presence.

2.1.2 Forms of Online Learning. *Synchronous online learning* is a format in which instructors and students engage in exchanges and communication similar to offline classroom instruction, allowing students to ask questions that instructors promptly answer (Bansal et al., 2021). Moreover, students receive guidance from teachers and interact with both instructors and peers through text, audio chat, and video conferencing in a virtual classroom (Dung, 2020).

Asynchronous online learning, on the other hand, involves a learning approach where immediate interaction between instructors and students does not occur. This format provides students with accessible materials on the system and self-directed learning guidance (Yulia, 2020). In this context, instructors provide materials, study programs, and assignments that students complete using various supportive tools such as email, discussion forums, personal or public blogs, webcasting, CD-ROMs, or television broadcasting. Students can access and download these materials at their own convenience within a suitable timeframe.

Lastly, *blended learning* combines online and face-to-face instruction, with some courses requiring direct in-person meetings during a semester while incorporating computer-mediated communication in between. This blended approach can encompass both asynchronous and synchronous interactions (Dung, 2020).

2.2 Research Overview on Students' Awareness, Satisfaction, and Intention to Continue Learning by E-Learning

E-learning is understood as the learning process supported and enabled by information and communication technology (ICT), which refers to technology-mediated learning (Deng & Sun, 2022) and involves the delivery of course instructions, communication among students and instructors, and the execution of learning tasks (Alavi & Leidner, 2001). Regarding digital transformation in higher education institutions, the primary objective of universities is to prepare future experts with digital literacy to address digitalization issues while

equipping learners with technology skills. In accordance with Laddunuri's (2022) study on the digitalization of universities from students' perceptions, the aim is to ascertain students' attitudes toward the utilized technologies, their learning capabilities, and the actions that universities should undertake and by whom. The survey results reveal that students recognize changes in teaching and learning practices not only within themselves but also within the university's leadership. These findings are highly beneficial for instructors and departmental administrators who wish to facilitate the digitalization of services and learning.

From the perspective of learner satisfaction, Van Vu et al. (2022) examined the relationship between digital transformation, satisfaction, word-of-mouth, and intention to continue online learning among university students. They employed a quantitative technique known as structural equation modeling (SEM) to analyze the relationships and the extent of the impact of factors on satisfaction and intention to continue online learning. The findings indicate positive interactions between students, instructors, and institutions with digital transformation; between digital transformation and student satisfaction and word-of-mouth; between satisfaction and word-of-mouth and intention to continue online learning; and ultimately, between word-of-mouth and students' intention to continue online learning.

In another scope, Hien and Uyen (2022) conducted research on the factors influencing students' intention to continue online learning in universities in Ho Chi Minh City, Vietnam. Using expert interviews to design the measurement scale and quantitative methods such as Cronbach's alpha reliability test, exploratory factor analysis (EFA), and structural equation modeling (SEM), data were collected from 752 university students in Ho Chi Minh City. The results revealed that (1) perceived effectiveness, (2) perceived effort, (3) social influence, and (4) satisfaction are significant predictors of students' intention to continue online learning in universities. Favorable conditions and task-technology fit indirectly influence the intention to continue through satisfaction.

Bui and Tran (2021) conducted a study to explore the factors influencing learner satisfaction with E-learning at Nguyen Tat Thanh University in Vietnam. The research consisted of two phases: a qualitative study involving expert interviews to develop a measurement scale, and a quantitative study utilizing descriptive statistics, Cronbach's alpha reliability analysis, exploratory factor analysis, and linear regression analysis. The results revealed that the following factors, (1) course content, (2) individual learners, (3) instructors, and (4) technology, significantly contribute to learner satisfaction.

Moreover, Jiménez-Bucarey et al. (2021) conducted a study to identify the factors influencing student satisfaction with the quality of online learning in higher education. The qualitative phase of the research involved convenience sampling and expert interviews to develop a robust measurement scale. In the quantitative phase, the researchers employed partial least squares structural equation modeling (PLS-SEM) and importance-performance map analysis (IPMA). Analysis of the data collected from 1,430 students at the School of Medicine revealed that the quality of technical services, particularly in terms of training and the implementation of teacher strategies that foster student engagement, requires improvement.

In another study examining the interaction model in E-learning, Bashir (2019) investigated learner satisfaction and the intention to continue learning in Ugandan higher education institutions. Using a stratified sampling method, the study obtained a valid sample size of 232. Data analysis involved reliability tests using Cronbach's alpha, confirmatory factor analysis, and structural equation modeling. The findings confirmed that, apart from learner content, factors such as the learner interface and interactive feedback exhibited significant relationships with learner satisfaction and their intention to continue learning. Notably, learner satisfaction was found to have a positive impact on the intention to continue learning.

2.3 Proposed Research Model

In spite of studies on digital transformation, digital strategy in information systems, digital transformation meeting national development requirements, and digital transformation in higher education from an online learning perspective, there is still limited research on defining factors affecting digital transformation in universities, especially in Vietnam. Therefore, identifying and measuring the factors that influence students' awareness of a university's digital transformation capabilities are crucial for the future application of online learning methods at universities. Furthermore, assessing learners' satisfaction and their intention to continue learning online should also be taken into consideration.

The following factors have been identified as common areas of concern in previous research on cognition, satisfaction, and intention to continue online learning among students. These factors aim to develop and enhance strategies for digital education, including the digital competencies of instructors and administrators (Bond et al., 2018; Bui & Tran, 2021; Jiménez-Bucarey et al., 2021; Laddunuri, 2022; Van Vu et al., 2022), students' awareness of their technological abilities (Bashir, 2019; Bond et al., 2018; Bui & Tran, 2021; Tekleselase, 2021; Van Vu et al., 2022), support from students' families (Hervás-Gómez et al., 2021; Kim et al., 2018), institutional factors (Van Vu et al., 2022), societal influences (Hien & Uyen, 2022), and technology-integrated teaching methods (Bui & Tran, 2021; Hervás-Gómez et al., 2021). Based on these factors, the proposed research model is as shown in Figure 1.

With this study, the author anticipates making significant theoretical contributions by empirically validating the components of students' awareness regarding the digital transformation capacity of universities. These components include teachers, schools, family, temporal trends, and their

impact on students' satisfaction and their intention to continue online learning. The research was conducted in March 2023, aiming to assist the university in thorough preparedness, proactive enhancement of teaching quality, and effective adaptation to the challenges posed by the post-COVID-19 pandemic context.

2.3.1 Research Hypothesis: Factors Influencing Students' Awareness of the University's Digital Transformation Capacity. Tungpantong et al. (2022) identified the digital transformation components for higher education institutions, including strategy, process, service, people, data, and technology. On the human side, it mentions the roles and responsibilities of stakeholders like teachers, administrators, and program professionals who contribute to the digital transformation of educational institutions by supporting technologically appropriate content and infrastructure. This requires previous training in preparation for the digital transformation (Balyer & Öz, 2018).

In terms of technology, the fundamental foundation of digital transformation in every organization is digital technology, which creates business models, operational processes, customer experiences, and essential devices for learning in education. The result of this provides students with state-of-the-art equipment and vibrant classrooms. According to Van Vu et al. (2022), university digital transformation success involves extensive interaction between faculties and students through university-invested technology platforms or social networks, along with continuous support from lecturers and the university to access digital resources.

First of all, the teacher plays a vital role in teaching, communication, course management, and student engagement in their classroom. They are responsible for developing lectures and exercises (Thu, 2019). Therefore, instructional lecturers need to possess both theoretical and practical knowledge and facilitate continuous interaction among students (Pham et al., 2019). In the digital era, the professional competence requirements for lecturers include awareness, reading and writing skills, integrating digital technology into teaching, and relevant research (Benavides et al., 2020; Schenk & Dolata, 2020). If lecturers know how to organize and prepare for classes, create a conducive learning environment, demonstrate attentiveness to the classroom, maintain discipline, and effectively communicate with students, it will significantly impact student satisfaction.

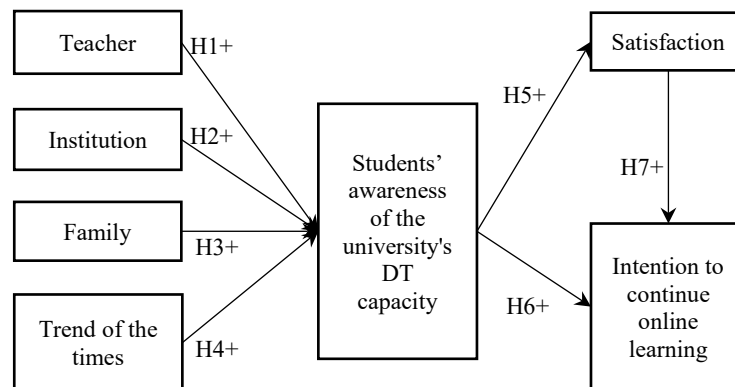


Figure 1. Proposed Research Model

Hypothesis H1: A teacher has a positive influence on students' awareness of the university's digital transformation capabilities.

In order to bring about changes in the functioning and operation of education through digital infrastructure, technology is a prerequisite that aids educational organizations in achieving this objective, highlighting the crucial role of universities in successful digital transformation (Thi et al., 2023). The digital transformation within an educational institution is influenced by investments in digital infrastructure, the application of technology in training programs, communication with current students, and collaboration with partners to accelerate the digital transition (Navaridas-Nalda et al., 2020). To ensure the successful implementation of digital transformation at universities, leaders should actively promote the use of technology in order to effectively achieve the goals of digital transformation (Thi et al., 2023; Tungpantong et al., 2021).

Hypothesis H2: The educational institution has a positive influence on students' awareness of the university's digital transformation capabilities.

Family encouragement in utilizing digital technology can be a significant factor influencing students' attitudes toward technology. Furthermore, support from parents who possess high knowledge and skills in computer usage can be beneficial in fostering learners' competence (Shashaani & Khalili, 2001). However, family circumstances can also impact low access to digital education when students come from disadvantaged backgrounds, such as challenging economic situations, labor demands, limited accessibility, utilization of digital devices, and educational approaches (Montenegro et al., 2020).

Hypothesis H3: Family has a positive influence on students' awareness of the university's digital transformation capabilities.

The development of innovation and technology in higher education must meet the demands of rapid global changes, thus the application of digital transformation in higher education is essential (Bogdandy et al., 2020; Santos et al., 2019; Zhao et al., 2020). The benefits of digital transformation in higher education, as perceived by learners, include the development of in-depth learning materials, accurate grading of papers, and swift publication of student evaluation results (Meyer, 2019). Moreover, this process brings advantages to universities, such as easy supplementation of resources in virtual classrooms, the cultivation of integration and mobile accessibility capabilities, as well as expanding international training and educational integration.

Hypothesis H4: Trend of the times has a positive influence on students' awareness of the university's digital transformation capabilities.

2.3.2 Research Hypothesis: Students' Awareness of the University's Digital Transformation Capabilities, Satisfaction, and Intention to Learn Online. Bui and Tran (2021) argue that personal competence awareness has a positive influence on student satisfaction. This can be explained by the fact that online learning requires students to work individually to meet the course requirements. Additionally, in the digital educational environment, students have access to open educational resources, opportunities to be proactive and creative, and are equipped with teamwork skills to ensure effective learning. Therefore, training activities now not only

emphasize the role of instructors but also focus on students' awareness of behavior control in learning. According to McCombs (1989), when learners have better behavior control skills, they tend to achieve higher scores in exams and perform better academically. Furthermore, when individuals believe in their ability to easily use computers and the internet, it positively impacts their satisfaction with online learning (Roca et al., 2006). Thi et al. (2023) suggest that attitudes, perceptions of technology usability, ICT competence, and self-learning ability influence learners' intention to accept online learning during the digital transformation process in educational institutions.

Hypothesis H5: Students' awareness of the university's digital transformation capabilities has a positive influence on their satisfaction.

Hypothesis H6: Students' awareness of the university's digital transformation capabilities has a positive influence on their intention to continue online learning.

According to Chen et al. (2020), customer satisfaction is the state of delight or disappointment that is formed by comparing the perceived effectiveness of a product or service with the expected value. Consequently, learners form expectations before starting an online course, and after experiencing the course, they compare and contrast the results achieved with their initial expectations. Hoyer et al. (2001) argue that when customers feel satisfied with using a product or service from a supplier, they tend to continue to choose and use the products and services they find satisfactory. Therefore, when learners feel satisfied and comfortable, they demonstrate higher motivation to continue their learning journey, creating a positive cycle and emphasizing their will to continue learning in the future.

Hypothesis H7: Students' satisfaction on online learning has a positive influence on their intention to continue online learning.

3. METHODOLOGY

The research objective is to determine the component factors of awareness of digital transformation capacity at Tra Vinh University, and then measure the influence of these factors on satisfaction and intention to continue online studying: the case of E-learning. Based on the results, several implications are given to related stakeholders to promote the process of university digital transformation implementation and enhance students' satisfaction and intention to continue online learning. To address these questions, the author uses both qualitative and quantitative research methods, thereby overcoming the limitations of being unable to obtain sufficient views of the survey subjects if only using qualitative research, and failing to thoroughly understand the context that the subject is facing if using only a quantitative approach (Creswell & Clark, 2017).

3.1 The Qualitative Research Method

Initially, the author conducted a comprehensive review of literature pertaining to students' awareness of digital transformation, satisfaction with online learning, and their intentions to continue participating in E-learning programs. The focus was on leading empirical and research papers in the *Journal of Applied Research in Higher Education*, *International Journal of Educational Technology in Higher Education*, *Journal of Electrical Engineering and Electronic*

Technology, Science Education, Sustainability Journal, and the Journal of Science and Technology. The next step to achieve the research objectives and be grounded in relevant theoretical frameworks and models, was for an expert panel comprising of two leaders from the Department of Education in Tra Vinh province, one university leader, and two university lecturers, all affiliated with Tra Vinh University, to engage in in-depth discussions. These discussions were guided by a structured outline that included open-ended questions, both with and without suggestions, aimed at shaping and refining the factors within the research model.

Furthermore, the research methodology involved group discussions with ten students from the Class of 2022 who were pursuing degrees in Business Administration at Tra Vinh University. The interactive sessions, involving both the expert panel and the student group, resulted in a consensus regarding the comprehensibility, clarity, and appropriateness of the scale's content. Subsequently, the scale was transformed into a structured survey questionnaire with a 5-point Likert scale (1-Strongly disagree; 5 - Strongly agree).

3.2 Building a Conceptual Measurement Scale

Based on previous academic research, measurement scales for the study's concepts were developed. Initially, the components used to measure the concept of "digital transformation awareness of students" were as follows: (1) Teacher support (5 observed variables) was drawn from adjusted scales by Pham et al. (2019), Sharma et al. (2020), Gam (2022), and Van Vu et al. (2022). (2) The concept of "educational institution" (6 observed variables) was inherited from adjusted scales by Van Vu et al. (2022) and Thi et al. (2023). (3) The concept of "family support" (4 observed variables) was derived from adjusted scales by Kim et al. (2018) and María (2021). (4) The concept of "Trend of the times" (5 observed variables) was inherited from adjusted scales by Santos et al. (2019), Bui and Tran (2021), Hervás-Gómez et al. (2021), and Hien and Uyen (2022).

In addition, the concept of "digital transformation awareness of students" (5 observed variables) was synthesized from the calibrated scales of Gam (2022) and Van Vu et al. (2022). Subsequently, the concept of "students' satisfaction" (4 observed variables) with online learning was inherited from adjusted scales by Jiménez-Bucarey et al. (2021), Gam (2022), and Van Vu et al. (2022). Lastly, four observed variables, which were synthesized from the adjusted scales of Hien and Uyen (2022) and Van Vu et al. (2022) measured the concept of "students' intention to continue online learning."

3.3 The Quantitative Research Method

A quantitative survey was conducted through direct questionnaires targeted at Tra Vinh University's regular students from the class of 2018 to the class of 2022. Eligible respondents were individuals with experience learning via the E-learning system. The survey sample was selected using a stratified random sampling method, taking into account variables such as gender, ethnicity, major, and year of study. This combination of survey subjects and sampling approach supports the utilization of independent samples t-test and one-way ANOVA methods to analyze differences among demographic groups and students' perceptions of the university's digital transformation capacity.

The survey sample comprised 383 students, and most questionnaire items were measured using a five-point Likert

scale, supplemented by requests for demographic information. Analytical methods, including descriptive statistics, scale reliability testing, exploratory factor analysis, confirmatory factor analysis, and linear structural equation modeling, were employed to assess the relevance of concepts and hypotheses within the research model.

Among the total of 383 surveyed students, 58% of the respondents were female. Regarding ethnicity, 83.3% of the participants were of the Kinh ethnic group, 14.4% were Khmer, and 2.3% were of Chinese descent. The majority of the surveyed individuals belonged to the Economics discipline, accounting for over 50% of the sample. The Office Administration discipline comprised 11.5%, Pharmacy accounted for 17.2%, Information Technology constituted 12.8%, and Veterinary Medicine made up 6%. In terms of academic year, the student population was evenly distributed across the years, with the first, third, and fifth-year students comprising over 20% each, while the second and fourth-year students accounted for 19.6% and 18.5%, respectively.

The findings show that there are differences in students' awareness of Tra Vinh University's digital transformation capacity among freshmen, sophomores, juniors, seniors, and fifth-year students, based on support from their families and educational institutions. This result is supported by the significance levels (.sig) in the ANOVA test, which are 0.040 (for family) and 0.028 (for school), both less than 0.05, respectively. Additionally, students belonging to various fields of study do not have the same awareness of their university's digital transformation capabilities, as evidenced by the significance levels (.sig) in the ANOVA test of 0.047 and the Welch result test of 0.012, both of which are less than 0.05.

This leaves the possibility that some students, like the third-year, fourth-year, and fifth-year students, may have been more exposed to digital tools in the university environment, while others may be new to these technologies or, due to specialized factors (13.8% for IT major), IT students will be more proficient in using technology and online learning applications, making it easier for them to adapt compared to students in other majors. Moreover, students whose families are more tech-savvy and supportive of online learning tend to have higher awareness.

4. RESULTS AND DISCUSSION

4.1 Reliability Testing of the Measurement Scale

The author conducted a Cronbach's alpha coefficient test on 33 observed variables. The results of the test indicated that the alpha coefficients of all the measured variables met the condition of ≥ 0.6 . Specifically, Teacher support (TEA) had an alpha coefficient of 0.944, Educational Institution support (INS) had an alpha coefficient of 0.929, Family support (FAM) had an alpha coefficient of 0.902, Trend of the times (TREN) had an alpha coefficient of 0.918, Students' awareness of digital transformation capabilities (AWA) had an alpha coefficient of 0.930, Students' satisfaction on online learning (SAT) had an alpha coefficient of 0.934, and Student's intention to continue online learning (INT) had an alpha coefficient of 0.940. Moreover, the correlation coefficients among all the variables were > 0.3 . These findings indicate that the constituent concepts of the scale satisfy the requirements (Nunnally & Bernstein, 1994).

4.2 Exploratory Factor Analysis

The results of the factor analysis for the independent variables, using 20 observed variables, yielded a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of 0.948, which is greater than the recommended threshold of 0.5 (Hair et al., 2006), indicating that the data are suitable for factor analysis. The significance level of the Bartlett's test was 0.000, meeting the requirement of ≤ 0.05 (Hair et al., 2006), thereby rejecting the null hypothesis (H0) that the variables are uncorrelated and satisfying the conditions for factor analysis.

Applying the Principal Axis Factoring method with Promax rotation, the results revealed that the 20 observed variables could be grouped into four factors. The total extracted variance accounted for was 72.955%, exceeding the minimum requirement of 50%, indicating that these four factors explain 72.955% of the data variation.

The Eigenvalues of all the factors were high (> 1), with the lowest Eigenvalue of the fourth factor being 1.087, which is greater than 1. The factor loadings were all above 0.5, and there were no variables that loaded onto multiple factors simultaneously. Therefore, the factors ensured convergence and distinctiveness during the exploratory factor analysis. Furthermore, there was no cross-loading of factors, indicating that these independent factors remained unchanged after the factor analysis (refer to Table 1).

Component	Factor			
	1	2	3	4
TRE3	0.901			
TRE1	0.838			
TRE4	0.781			
TRE5	0.717			
TRE2	0.714			
TEA1		0.850		
TEA4		0.816		
TEA3		0.791		
TEA2		0.737		
TEA5		0.728		
INS6			0.947	
INS4			0.800	
INS5			0.795	
INS2			0.521	
INS1			0.508	
INS3			0.482	
FAM2				0.926
FAM3				0.864
FAM1				0.834
FAM4				0.558

Table 1. Exploratory Factor Analysis of Independent Variables

The results of the EFA analysis for the dependent variables meet the criteria. Therefore, 13 observed variables were retained for further CFA analysis (refer to Table 2).

4.3 Confirmatory Factor Analysis

The appropriateness of the model was evaluated using four fit indices, which include χ^2/df , TLI and CFI, and RMSEA (Bentler & Bonett, 1980; Garver & Mentzer, 1999; Hu & Bentler, 1995). The results of the CFA analysis indicate

significant findings, with a p-value of $0.000 < 0.05$. The Chi-square statistic is 1554.687 with 470 degrees of freedom, $CMIN/df = 3.308 \leq 5$ (Bentler & Bonett, 1980), $CFI = 0.919 > 0.9$ and $TLI = 0.909 > 0.9$, and $RMSEA = 0.078 < 0.08$ (Garver & Mentzer, 1999; Hu & Bentler, 1995). These indices satisfy the requirements, indicating that the model is a suitable fit for the official data.

Furthermore, the test outcomes demonstrated that the composite reliability coefficient (CR) ranges from 0.652 to 0.807, which meets the necessary criteria (≥ 0.60). Additionally, the total variance extracted ranged from 90.5% to 94.4%, satisfying the requirements (≥ 0.50). Consequently, the standardized coefficients of the scales exhibited notable strength and statistical significance at the 5% level, with values greater than 0.50. This indicates that the unidimensionality and convergence of variables were ensured.

4.4 Structural Linear Equation Model

Through the estimated results from the model, it is evident that all variables are statistically significant at the 5% level. Table 3 shows the results of the SEM test. The results of the hypothetical research model are presented in Figure 2. Based on Table 3, the author statistically summarizes the necessary information regarding the results of testing the research hypothesis as follows (refer to Table 4).

The factors of teacher, educational institution, and family exhibit a statistically significant influence on students' perception of digital transformation, with a confidence level of 95%. Moreover, it is observed that students' perception of digital transformation has a positive impact on their satisfaction and intention to engage in online learning, while satisfaction, in turn, positively influences students' intention to continue in online learning.

Hypothesis H1 (*Teach* → *Aware*: $\beta_1 = 0.194$; $P_1 = 0.007$): Teachers positively influence students' perception of digital transformation, which is consistent with prior research conducted by Bond et al. (2018), Pham et al. (2019), Bui & Tran (2021), Jiménez-Bucarey et al. (2021), Laddunuri (2022), and Van Vu et al. (2022). Educators with strong subject knowledge and expertise are able to communicate effectively, develop instructional materials, and deliver high-quality teaching, particularly in effectively integrating digital competencies into online course design and management. Consequently, students perceive a comfortable learning environment, facilitated by clear message delivery and close communication skills, which fosters a sense of enthusiasm toward online classes.

Hypothesis H2 (*Insti* → *Aware*: $\beta_2 = 0.561$; $P_2 = 0.000$): The positive influence of educational institutions on students' perception of digital transformation is supported, consistent with the findings of Tungpantong et al. (2021) and Thi et al. (2023). It can be affirmed that the role of educational institutions is crucial in investing in technical infrastructure and adopting digital platforms, thereby facilitating the swift and effective realization of digital transformation goals.

Likewise, hypothesis H3 (*Famil* → *Aware*: $\beta_3 = 0.233$; $P_3 = 0.000$) suggests that the family also influences students' perception of digital transformation. This finding aligns with the perspective presented by Kim et al. (2018), indicating that family encouragement, emotional support, tangible assistance in terms of learning tools, knowledge sharing, and computer literacy significantly contribute to the digital competence of university students.

	Factor		Factor		Factor
	1		1		1
AWA4	0.894	SAT3	0.934	INT2	0.935
AWA3	0.873	SAT4	0.908	INT3	0.917
AWA5	0.866	SAT1	0.859	INT1	0.910
AWA2	0.865	SAT2	0.835	INT4	0.827
AWA1	0.771				
KMO	0.874 > 0.5	KMO	0.845 > 0.5	KMO	0.844 > 0.5
Bartlett's Test	0.000 ≤ 0.05	Bartlett's Test	0.000 ≤ 0.05	Bartlett's Test	0.000 ≤ 0.05
Cumulative %	73.055 > 50%	Cumulative %	78.323 > 50%	Cumulative %	80.659 > 50%
Eigenvalues	3.917 > 1.0	Eigenvalues	3.345 > 1.0	Eigenvalues	3.415 > 1.0

Table 2. Exploratory Factor Analysis of Dependent Variables

The indices	Reference value	Model value	Conclusion
Adjusted Chi-square statistic (Cmin/df)	$\chi^2/df \leq 5.0$	3.334	The measurement model is consistent with the actual data.
Tucker-Lewis Index (TLI)	TLI > 0.90	0.908	
Comparative Fit Index (CFI)	CFI > 0.90; 0 < CFI < 1: the closer to 1, the better fit	0.917	
Root Mean Square Error Approximation (RMSEA)	RMSEA < 0.08: Acceptable, the smaller, the better	0.078	

Table 3. Evaluation of Model Fit

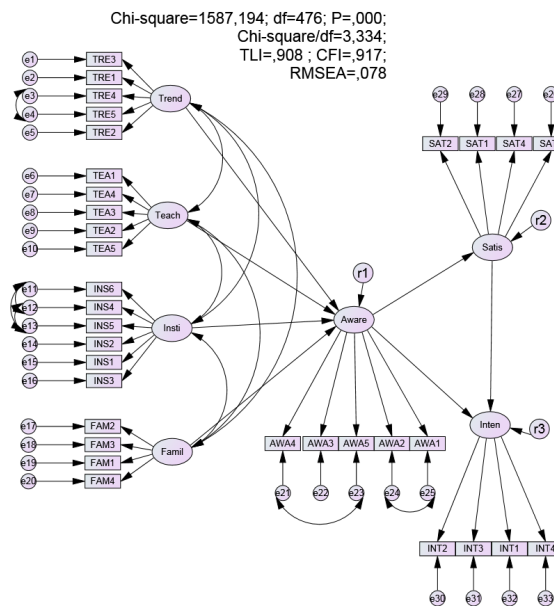


Figure 2. Structural Linear Equation Model Results

Hypothesis				Estimate	S.E	C.R	P	Conclusion
H1	Aware	←	Teach	0.194	0.082	2.704	0.007	Accept
H2	Aware	←	Insti	0.561	0.094	7.071	***	Accept
H3	Aware	←	Famil	0.233	0.049	4.600	***	Accept
H4	Aware	←	Trend	-0.042	0.065	-0.724	0.469	Reject
H5	Satis	←	Aware	0.869	0.044	19.860	***	Accept
H6	Inten	←	Aware	0.403	0.082	5.271	***	Accept
H7	Inten	←	Satis	0.485	0.081	6.410	***	Accept

Table 4. Results of Testing the Research Hypotheses

The research findings also revealed that students' awareness of digital transformation capabilities positively influences their satisfaction and intention to continue online learning. This is confirmed in hypothesis H5 (*Aware* → *Satis*: $\beta_5 = 0.869$; $P_5 = 0.000$) and hypothesis H6 (*Aware* → *Inten*: $\beta_6 = 0.403$; $P_6 = 0.000$), suggesting that the perception of technology's ease of use contributes to satisfaction in online learning (Roca et al., 2006). Furthermore, family encouragement and timely financial support, dedicated guidance from instructors, and investment in physical infrastructure by educational institutions are core resources that foster students' self-directed learning ability and acceptance of online learning during the process of digital transformation in educational settings (Thi et al., 2023).

Similarly, hypothesis H7 (*Satis* → *Inten*: $\beta_7 = 0.485$; $P_7 = 0.000$) suggests that satisfaction has a positive impact on students' intention to continue online learning; this research result is consistent with studies by Cheng (2020), Alarabiat et al. (2023), Hien and Uyen (2022), and Van Vu et al. (2022). After experiencing online learning, students feel satisfied with the course compared to their initial expectations before starting online learning. In particular, students are satisfied with the invested infrastructure provided by the educational institution, digital competence of instructors, and other factors. The consequence of this satisfaction creates a positive effect and motivates students to continue their online learning process.

In contrast, Hypothesis H4 is rejected (*Trend* → *Aware*: $P_4 = 0.469 > 0.05$): The contemporary trend does not influence students' awareness of digital transformation capabilities. This result contradicts the findings of Bond et al (2018), Bui and Tran (2021), Jiménez-Bucarey et al (2021), Laddunuri (2022), and Van Vu et al. (2022). This can be explained by the educational and governmental legal factors implemented by the Vietnamese government to comprehensively integrate digital transformation programs in education and to synchronize their implementation across educational institutions (Decision No. 749/QĐ-TTg). Sooner or later, online learning methods are expected to gradually replace traditional learning approaches. Additionally, with the development of the internet, students also proactively seek information on social media platforms to support their learning purposes. Therefore, students' ability to utilize technology in the learning process will inevitably become a prevailing trend. Moreover, advancements in science and technology continually provide increasingly online educational platforms that are becoming more popular and widely accessible. Thus, students' awareness of and capabilities for digital transformation are considered an essential aspect that depends solely on time.

5. CONCLUSION AND RECOMMENDATION

Based on the national digital transformation program initiated by the Vietnamese government and the post-COVID-19 pandemic context with the risk of disease resurgence, Tra Vinh University has implemented a blended learning approach (combining face-to-face and online learning through the E-learning system). The research results reveal that factors influencing students' awareness of digital transformation include teacher, educational institution, and their families. Additionally, students' awareness of digital transformation has a positive and direct impact on their satisfaction and intention to engage in online learning, while satisfaction directly affects

students' intention to participate in online learning. Based on the research findings, several managerial implications are proposed to promote the digital transformation process in the university, enhance students' awareness, increase satisfaction, and foster the intention to continue online learning.

In terms of theory, this study contributes to refining the theoretical foundation and constructing a theoretical model concerning awareness of digital transformation, satisfaction, and the intention to learn online through the E-learning system among Vietnamese students. Similarly, the article is also considered a reliable reference source for students, lecturers, and educational managers conducting related research. Moreover, it provides the potential for organizing seminars and academic conferences to share and exchange experiences with experts and discuss future research directions.

From a practical perspective, the article emphasizes the crucial role of educational institutions in investing in technical infrastructure and adopting digital platforms. These investments facilitate the effective realization of digital transformation goals. In addition, leaders in each educational institution should formulate and communicate specific recommendations regarding issues related to awareness, responsibility, roles, and skills of instructors, while also actively promoting online learning among students.

Likewise, teachers, who serve as dedicated educators and guides throughout the learning process, play a critical role in teaching, inspiring, and motivating students. Moreover, the process of digitally transforming education demands substantial efforts that extend beyond instructors' time and skills. The research once again confirms that teachers play a vital role in shaping students' perception of their university's digital transformation capabilities. Educators who possess strong subject knowledge, communication skills, and expertise in integrating digital competencies into their teaching contribute to a comfortable learning environment. Nevertheless, a lack of knowledge and ambiguity about how to effectively integrate technological tools into courses is unavoidable. Therefore, instructors need to undergo additional training to enhance their digital literacy in teaching practices.

In line with the nationwide digital transformation initiative, the family assumes a pivotal role as an essential educational support system. In order for learners to effectively engage with digital technology for educational purposes, they must be equipped with essential tools such as desktop computers, laptops, and smartphones. These tools are integral for facilitating the adaptation to the digital environment, including tasks such as creating electronic accounts, enrolling in courses, and practicing exercises on the E-learning system. Academic research supports the notion that family encouragement, emotional support, and tangible assistance in terms of learning tools significantly contribute to the digital competence of university students.

In summary, this study also affirms that students' awareness of digital transformation capabilities positively influences their satisfaction and intention to continue online learning. Factors such as family encouragement, timely financial support, guidance from instructors, and investments in physical infrastructure by educational institutions contribute to students' self-directed learning ability and acceptance of online learning during the digital transformation process. Specially, this finding contrasts with previous studies that have shown that the trend of the times does not influence students' awareness of

digital transformation capabilities, satisfaction, or their future intentions for online learning. These differences can be attributed to the comprehensive digital transformation programs implemented by the Vietnamese government, the accessibility of online information, and the increasing popularity of online education platforms.

6. LIMITATIONS

The author acknowledges that, despite diligent efforts to collect and judge references from reputable academic journals, the literature review is not entirely exhaustive or highly representative of the information systems (IS) field. Consequently, some sources were omitted from this research paper. Furthermore, this article is subject to several limitations, including a constrained sample size, the single-site focus on Tra Vinh University (TVU) as the research location, and the restriction of survey participants exclusively to students. It is also important to note that this article does not constitute an exploratory study but, rather, seeks to synthesize and reaffirm the impact of various factors on student satisfaction and learning intention. Consequently, the aspects influencing students' awareness of online learning are delimited to support from educators, educational institutions, families, and contemporary trends. Future research should prioritize expanding the sample size, broadening the research scope to encompass a more extensive geographical area, and considering the inclusion of additional variables that influence students' awareness of digital transformation.

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APPENDIX

Questionnaire Survey

Dear Sir/Madam,

I am conducting a scientific study on “Awareness of digital transformation, satisfaction, and intention to learn online through the E-learning system among Vietnamese students: A case study at Tra Vinh university.”

I kindly request you to take a few minutes to answer the questions below. Your responses are highly valued, and I assure you that I will be kept strictly confidential.

Thank you in advance for your cooperation.

PART 1 – GENERAL INFORMATION

- 1. Gender:** Male Female
- 2. Field of study:**
 Business Administration (BA) Economics Accounting
 Office Administration Pharmacy Information Technology
- 3. Ethnicity:** Kinh Khmer Chinese
- 4. Academic year:**
 First year (2022) Second year (2021) Third year (2020)
 Fourth year (2019) Fifth year (2018)

PART 2 – SURVEY QUESTIONS

Q1. Please give your evaluation of the influence of the factors below on the digital transformation in higher education in Tra Vinh University, especially E-learning system.

- 1. Strongly disagree** **2. Disagree** **3. Neutra** **4. Agree** **5. Strongly agree**

Factors		Likert scale				
		1	2	3	4	5
1. Teacher support						
TEA1	The teacher's skill in using information technology effectively in teaching					
TEA2	The teacher's quick adaptation when the school switches from traditional to online training methods					
TEA3	The teacher's experience in conveying knowledge effectively and motivating students when participating in online learning					
TEA4	The teacher's good social skills when communicating with students					
TEA5	The teacher's high confidence when teaching online					
2. Educational Institution support						
INS1	TVU has utilized diverse and flexible technologies in teaching activities					
INS2	TVU has equipped with complete digital infrastructure					
INS3	TVU has organized training on digital transformation tools for teachers and students					
INS4	The operation of the TVU's digital infrastructure is considered to be very easy					
INS5	TVU has applied advanced echnology in communication with current students, alumni, and prospective students					
INS6	TVU has independently developed software to support educational activities (a website supporting learning and teaching activities)					
3. Family support						
FAM1	The family provides learning equipment and tools (cellphone, PC, laptop, etc.) for the students					
FAM2	The family provides wifi coverage to support the students' learning activities					
FAM3	The family has designated a separate space for the students' study sessions					
FAM4	The family always encourages and motivates the students' learning spirit					
4. Trend of the times						
TRE1	The speed of development of information technology					
TRE2	The diversity of technology platforms in teaching					
TRE3	The legal system regulating digital transformation in education and training					
TRE4	The trend of integration into education globally					

TRE5	Learning anytime, anywhere without spatial and temporal limitations, with abundant learning resources					
5. Student's awareness of TVUs' digital transformation capabilities						
AWR1	Willingness to accept changes when the school transitions from traditional to online training methods					
AWR2	Confidence in their skills and knowledge when learning online					
AWR3	Receiving support from family, teachers, and the university when using new devices					
AWR4	Actively participating in exchanges and group discussions through technology platforms					
AWR5	Having good social skills in interacting and communicating with instructors and other departments of the university					
6. Student's satisfaction on online learning						
SAT1	I am satisfied with the level of technology application in the teaching activities of TVU					
SAT2	I am satisfied with the support from the teacher					
SAT3	TVU that I am currently studying at is the most suitable choice					
SAT4	TVU provides a better learning experience than other universities					
7. Student's intention to continue online learning						
INT1	I will speak highly of the technology platform that TVU has integrated into online teaching (flexible, proactive in study time)					
INT2	I actively recommend my family and friends to consider enrolling in TVU					
INT3	I share with future students some information about TVU and its training programs					
INT4	I want to continue registering for online courses in other fields in the near future					

Q2: Please give me some challenges in the online learning process?

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Q3: Please give me some suggestions to improve current online learning?

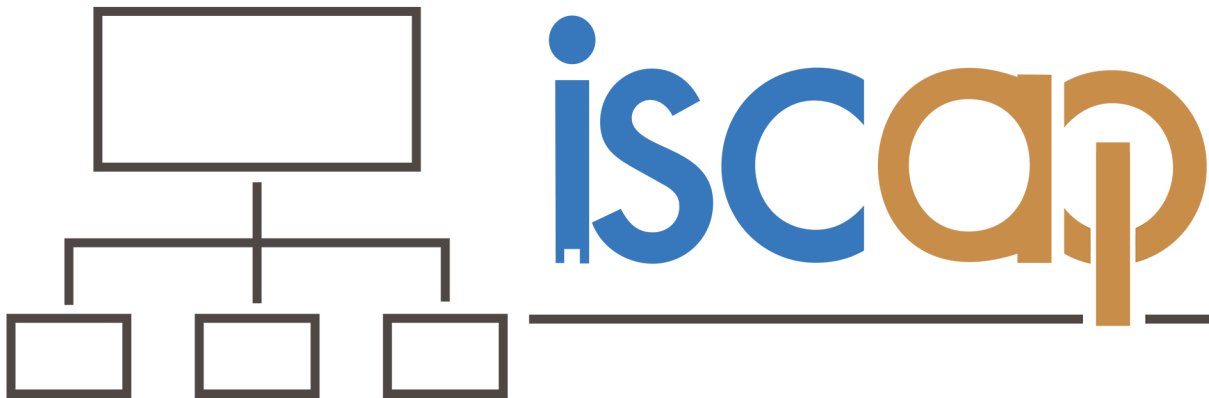
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