The Impact of Technology Adoption on Student Satisfaction with Higher Education: An Empirical Study from Vietnam

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Abstract

This study aims to analyze the impact of technology adoption on students' satisfaction with the higher education system in Vietnam. With the continuous development of information and technology, the education sector in particular and many economic sectors in Vietnam have witnessed an explosion of applications and interventions in teaching-learning. However, these innovations have also received a lot of criticism regarding their effectiveness and feasibility. Although the numerous benefits that technology adoption has brought to education are apparent, many practitioners have not adjusted to this transition, resulting in lower learner satisfaction. Through a survey of more than 2472 university students in Vietnam, the results find a positive relationship between technology adoption and student satisfaction in higher education. We also test how nine contingent factors including gender, income, major, self-study time, learning methods, technology administration, self-ability in adopting technology, technology accessibility, and purpose of using technology can moderate that relationship. Indeed, technology adoption acts as a facilitator to make learning more convenient, effective, and accessible, rather than completely affecting learning outcomes and satisfaction. This result suggests that self-motivation is an important and decisive factor in improving satisfaction through choosing and applying technology effectively and appropriately.

Keywords: Student Satisfaction, Technology Adoption, Higher Education, Vietnam

JEL Classification Code: I20, I23, I24, M31, M39

1. Introduction

In the information era, smart technology plays an important role in changing people's lives (Abrahams, 2010). Vietnam is one of the countries with the fastest-growing Internet usage rate in the Asia-Pacific region. It is worth noting that more than a third of the 50 million Internet users in our country are youths aged 15 to 24, or those in higher education (Chen et al., 2017). This shows that information technology is rooted in everyone's everyday work, without exception in education. Therefore, technology adoption and its influence on student satisfaction in higher education have received much attention from academics and practitioners (Chen et al., 2017). They have found that the biggest change in education starts with E-learning, which helps students from different places learn easier and cheaper (Aldunate & Nussbaum, 2013). Therefore, the Vietnamese government decided to renovate the educational training system from the one-way transmission into creative thinking.

However, there is a lot of evidence of deep concern in the quality of education when both learners and teachers cannot keep up with the transformation in technology, reducing the quality of education and the satisfaction of learners. According to Chen et al. (2017), students' satisfaction is an important aspect that translates their response and desires into a qualifiable concept of thoughts and behaviors. This definition implies that satisfaction contains a feedback-loop process in which students can express how satisfied they are in higher education (Aldemir & Gülcan, 2004). The level of satisfaction is a function of the difference between received and expected results. Students may have one of the following three levels of satisfaction (Alves & Raposo, 2007; Bergman, 2016; de Nooijer et al., 2021).

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If the performance is worse than expected, the student will not be satisfied. If the performance results match the expectations, the student will be satisfied (Annamdevula & Bellamkonda, 2016; Chen et al., 2017). If the actual results exceed the expectations, the student is delighted.

Particularly, in the context of the COVID-19 pandemic, many Vietnamese universities started applying technology to teaching via e-learning databases or software (Chen & Cuong, 2020). However, both students and teachers expressed their concerns with the quality of online training as these management tools cannot replace the laboratory, experiments, or satisfy the experiences that learners have had in traditional classrooms (Pham et al., 2019; Mulyono, 2020). Many teachers cannot change how they deliver the lecture, and they cannot take the advantages that information and technology have brought when switching to an online format (Beecham, 2009). Technology applications have changed teachers' and students' learning, and materials are now uploaded to learning sites. Applying technology to learning methods also changes students' learning methods from traditional learning methods to applying technology to learning. However, as many students have expressed their disappointment and dissatisfaction with many teachers' technology adoption and teaching techniques, these changes can occasionally have unfavorable results (Alves & Raposo, 2007; Fatani, 2020; Doan, 2021).

On the part of students, the biggest existence is the passive habit, the habit of listening, copying, memorizing, and repeating mechanically, modeling what the lecturer has taught, knowing only the knowledge that the teacher has taught (Annamdevula & Bellamkonda, 2016). Most students do not have the habit of actively looking up information on the Internet. In addition, the lack of facilities and equipment, especially multimedia classrooms, audio-visual equipment to illustrate the lecturer's lectures, has made the application of technology difficult (Annamdevula & Bellamkonda, 2016; Chen, 2013). The connection and use of the Internet have not been thoroughly implemented and are used infrequently due to lack of funds and slow transmission speed (Aldunate & Nussbaum, 2013).

Student satisfaction is the most concerning issue for students themselves and their families. There is no one approach to learning that can suit everyone (Beecham, 2009; Fatani, 2020; Pham et al., 2019). Each of us has different abilities, so learning methods should be tailored to everyone to be most effective. Students will be able to choose a good learning approach for themselves as a result of this research. At the same time, teachers and schools are considering and developing the use of smart technology in schools to replace traditional teaching-learning techniques to meet the needs of the 4.0 industrial era (Abrahams, 2010; Aldunate & Nussbaum, 2013; Barber et al., 1990).

Learning is the process of training, accumulating knowledge, and perfecting skills (Aldemir & Gülcan, 2004;

Pham et al., 2019). Therefore, student satisfaction with learning is always influenced by many factors, which are internal factors (hard-working, motivation, personal ability, self-awareness) and external factors (family supports, teaching quality, class schedule, supporting documents, etc). In this era, technology adoption and interpretation skills are crucial determinants of student satisfaction (Aldunate & Nussbaum, 2013). They determine how effectively lectures can be delivered to students and how efficiently they can absorb them via smart technology (Abrahams, 2010; Aldunate & Nussbaum, 2013; Barber et al., 1990).

This study demonstrates that technology adoption positively influences student satisfaction. However, satisfaction is moderated by gender, income, major, teaching quality, and personal ability to adapt to advancements in learning. These results give several recommendations for universities in Vietnam to improve their teaching quality and the effectiveness of technology adoption to upgrade student satisfaction with their services. On the other hand, students should pay more attention to technology in learning because of many benefits that help students save time, search, and synthesize knowledge more easily than traditional learning methods. However, whether the application of technology in learning has a large or small impact on student learning outcomes depends greatly on the students themselves. In addition, the school's technological facilities and equipment also help students easily access technology, along with the use of technology in teaching also affects the student's satisfaction.

2. Literature Review

Capitalist countries' superior education systems have benefited from rapid technical advancement over the decades. The usage of technology in education is piquing researchers' curiosity (Barber et al., 1990; Benjamin, 2014). In Western countries, the advantages of technology in learning have been studied and implemented early in school. Bergman (2016), for example, claims that technology aids and facilitates the learning process everywhere, resulting in improved performance in the higher education system. Additionally, the development of teaching tools is an inevitable condition that teachers and students must access and use, similar to learning a new subject. Thus, the application of technology in learning is necessary for students (Aldunate & Nussbaum, 2013; Bergman, 2016).

Additionally, Benjamin (2014) suggested the significant influence of technology on student learning. They emphasize the importance of using technology combined with new teaching approaches in upgrading the curriculum and teaching administration process (Benjamin, 2014; Buchanan et al., 2013). Empirical evidence also shows that combining online and offline learning via technological equipment

increases student engagement, reduces learning stress, and consequently enhances teaching and learning quality (Buchanan et al., 2013; Fatani, 2020). Teachers can schedule their teaching hours more freely and creatively thanks to steps to incorporate information technology into the classroom, providing students with relaxing and engaging learning opportunities (Chen et al., 2002; Fatani, 2020). As a result, technological advancements might be viewed as a significant means of increasing student learning satisfaction.

However, some scholars have demonstrated that the relationship between technology adoption and student satisfaction is contingent on moderating factors such as time and ability to adapt to the technology effectively. For example, Buchanan et al. (2013) study the impact of laptop use on student learning outcomes. The results show that students using laptops express significantly higher satisfaction and improvement in nearly all subjects (Buchanan et al., 2013). Fatani (2020) analyzes how learning methods can change how students adopt technology, resulting in different learning experiences. This study finds that internet-based instruction promotes higher learning effectiveness than non-computer-based methods (Fatani, 2020). Finally, Aldunate & Nussbaum (2013) explore the role of technology in language learning and suggest that students' experiences in learning can be improved by incorporating technology into the classroom. Learners express their interest and satisfaction when technological applications make the learning convenient and effective and help them stay focused.

Technology adoption enables teachers to incorporate integrated multimedia resources such as images, music, video, and other media into lecture content, enhancing the richness and appeal of the learning experience (Beecham, 2009; Pham et al., 2019). This also aids students in stimulating their thinking and creativity, as well as increasing teacher-student engagement. These benefits improve their friendships and interactions with their professors (Chen et al., 2002). This is a crucial assumption for piquing students' interest in studying, hence using technology boosts students' motivation, social engagement, and ease of learning. Guolla (1999) and Chen et al. (2002) provide examples of how smart technology can be increase learner accountability. These studies find that learners gain the opportunity to increase exposure to language in a meaningful and understanding context; learners also can communicate with society to practice practical life skills (Aldunate & Nussbaum, 2013). This is highly effective through the learner's cooperation with more modern technology. The more time spent using smartphones (smart technology devices), the lower the learning outcomes. The fact that technology devices such as phones make students easily divert students' attention away from their studies, as well as entertainment apps and social media sites, contributes to a drop in student performance (Beecham, 2009; Guolla, 1999). Moreover, the study also shows that using many smart mobile devices also makes students less communicative in the environment, afraid to talk to teachers and friends (Annamdevula & Bellamkonda, 2016).

Teaching and learning in Vietnam has changed significantly as a result of the unavoidable development of technology in the 4.0 industry era (Chen & Cuong, 2020; Pham et al., 2019). When the COVID-19 outbreak erupted in 2020 in Vietnam and other countries around the world, the Vietnamese government quickly switched from traditional teaching and learning to online learning at all levels (Chen & Cuong, 2020; de Nooijer et al., 2021). Changing the form of learning has changed the way of teaching and learning habits, resulting in many dissatisfactions among learners who cannot come up with these innovations. Pham et al. (2019) showed that 70% of Vietnamese students expressed their dissatisfaction with online learning. Particularly, they found that most lecturers' satisfaction levels were only at 3; students chose levels 4 and 5 more. Through this assessment, it can be concluded that the E-Learning system has partly met the learning needs and satisfaction among faculty/staff and students of the whole university, but the level is not high and needs many innovative solutions to improve the effectiveness of the E-Learning system in teaching and learning (Bui et al., 2021; Ha & Tam, 2015).

Chen and Cuong (2020) then examined the issue of leveraging Microsoft teams to teach English to first-year non-English majors (2020). According to the study, 64 percent of the students surveyed were interested in learning online (Chen & Cuong, 2020; Guolla, 1999). Many students can assess their benefits and disadvantages to select the best learning approach to save time and achieve good results (Fatani, 2020). Furthermore, the study highlights the drawbacks of employing technology in education, such as excessive reliance on the Internet, uncontrollable cheating in learning and tests, and other issues (Annamdevula & Bellamkonda, 2016). The findings of the study suggest that the use of technology in the teaching and learning process is beneficial, but the study did not look into the results of student satisfaction after online learning, instead of focusing on the level of student satisfaction (Chen & Cuong, 2020; Chen et al., 2002).

According to research findings from both overseas and within the country, there are still significant research gaps regarding the impact of smart technology on student learning satisfaction. To begin with, the majority of international research publications on the use of technology in learning and teaching focus on higher education in developed nations, where access to smart technology is considerably easier than in developing countries like Vietnam (Lai & Van Nguyen, 2017). As a result, the studies overlook the economic situation and the students' access to resources. However, because students' financial circumstances vary in Vietnam, not all students have equal access to smart technology (Chen & Cuong, 2020;

Pham et al., 2019). At the same time, students' access to and use of smart technology devices is still limited, which causes Vietnamese students to struggle. They do, however, have good access to technology but are unable to properly utilize it for educational benefits (Chen et al., 2002).

Another research gap in the existing literature may be found in the fact that while most studies have focused on the benefits of employing technology in education, some studies have also highlighted the limitation that leads the use of technology in education to reduce student learning outcomes (Beecham, 2009; Fatani, 2020). At the same time, technology can allow exam cheating, resulting in educational inequity (Aldemir & Gülcan, 2004). As a result, it's critical to refocus on the link between technology use and student satisfaction. In conclusion, the impact of information technology use on students' learning satisfaction will be investigated in this study (Pham et al., 2019). We also create a more complex and integrated model that assesses the impact of other contingent factors on the relationship, such as gender, income, major, hard-working level, and ability to use students' technology.

3. Research Methods and Materials

3.1. Data Collection

To analyze the impact of information technology use on students' academic satisfaction. The research topic was quantitative research based on a survey that we posted publicly on social networking applications. We studied data collected through questionnaires from students. To ensure representativeness, completeness, and reliability of the samples collected, data was collected based on the following criteria:

Research period: The research period is from April to June 2021. This is the period when Vietnamese university students prepare to finish their courses. Therefore, the spirit, attitude, and sense of learning are very stable, and there is no state of not studying, not concentrating, not doing homework, and being lazy to study.

Subjects of the samples collected: Due to extensive research on technology users, we do not limit the research subjects. At the same time, we concentrate on students who learn using technology. According to statistics, students are the most common subjects who utilize technology to study. At the same time, we also focus on students who are learning using technology. According to statistics, most of the subjects who use technology to study are students.

Research data: Research data was collected from primary data provided by our questionnaire. This questionnaire was randomly sent to university students, including first-year students, sophomores, middle school, high school, and alumni. Furthermore, students participating in our survey must also come from multiple faculties, institutes, or majors to ensure reliability, transparency, and accuracy.

The number of observations: With the questionnaire given, we surveyed the observations to get the best estimate. On that basis, we have established the test with specialized software, which is SPSS 22.

The survey questionnaire method is used in this research to determine students' opinions and levels of technology application in learning. This method is very convenient for sampling, and the respondents do not need to spend a lot of time or money. Those surveyed are aged 18 years or older. The survey questionnaire has a two-part structure. The first part comprises demographic information of the individual. The second part assesses the level of technology application in learning, and the factors are measured using the Likert scale, in which 1 to 5 is the level from low to high. The survey period is from April 30, 2020, to May 21, 2020. After publicizing on social networking applications, we obtained 2472 valid surveys.

Data after being collected through a questionnaire we entered into Microsoft Excel. Next, we recalculated the student responses based on the Likert scale with a rating score of 1-5, corresponding to the levels of agreement from strongly disagree, disagree, normal, agree, and strongly agree. At the same time, we removed all forms of incomplete and inconsistent responses.

The data was collected, and the following procedures were used to analyze it: To describe the basic quantitative aspects of the data, descriptive statistical analysis is used. The following steps are used in correlation and regression analysis to determine the linear correlation between variables in a regression model.

(1) Test the quality of the measurement using Cronbach's Alpha.
(2) Exploratory factor analysis (EFA) to separate all variables into their categories of factors supports the following steps.
(3) Parsing and analyzing empirical models using SPSS 22.
(4) Test the results from the experimental models.

3.2. Research Models

The study implements two research models corresponding to two dependent variables representing student learning outcomes. These two dependent variables are SATISFACTION (…) and student award, respectively. Other independent variables included in the model are shown in Table 1 below.

Research model:

$$SAT = + \beta_1 * GEN + \beta_2 * INC + \beta_3 * MAJ + \beta_4 * TIM + \beta_5 * MET + \beta_6 * TEC + \beta_7 * ADM + \beta_8 * SEL + \beta_9 * ACC + \beta_{10} * PUR + u$$

Table 1: List of Variables in the Models

Name	Meaning	Measurement	Variable
SAT	Student satisfaction	The level of student satisfaction in higher education	Dependent variable
GEN	Gender	Male	Control variable
		Female	
INC	Income	Personal income	Independent variable
		Family-related income	
		Support from parents	
		Number of personal electronic devices	
MAJ	Major	Natural Science	Independent variable
		Social Science	
TIM	Self-study time	Hard-working	Independent variable
MET	Learning methods	Search for information on the internet	Independent variable
		Find information through books	
		Use software to take notes'	
		Use e-learning software	
TEC	Technology adoption	Presentation and display	Independent variable
		Availability of supporting documents	
		Accessibility of reference	
		The implication of students' discussion	
		The fairness of assessment	
		Critical analysis function	
		Software applications	
		Technology implications	
ADM	Technology administration	Wi-Fi coverage and transmission quality	Independent variable
		Technological equipment	
		E-library	
		E-learning website	
SEL	Self-ability in adopting technology	The personal ability in using technology in learning	Independent variable
ACCESS	Technology accessibility	The personal ability in accessing technology in learning	Independent variable
PUR	Purpose of using technology	Entertainment	Independent variable
		Communication	
		Learning	
		Shopping	

In which:

α: is the intercept
$\beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}$: are coefficients
u: is error

3.3. Hypotheses

Economic conditions are one of the factors that have a significant influence on student satisfaction (Fatani, 2020; Lai & Van Nguyen, 2017). And an economical family

will provide their students with adequate and convenient facilities for learning. On the contrary, students with difficult economic circumstances will not have good conditions for studying and have other concerns (Chen & Cuong, 2020). However, a student born into a family with good economic conditions does not always achieve high academic results. Due to being dominated by different relationships, they do not achieve good results or they think that they would live on what their parents provide without focusing on education (Annamdevula & Bellamkonda, 2016). Difficult students always desire to get out of poverty, and studying is the way to that dream. This has become the motivation to help them overcome difficulties and succeed in learning.

H1: *Income positively influence technology adoption, therefore accelerating student satisfaction in higher education.*

In learning, the effectiveness of the learning process is largely determined by the amount of time spent studying (Chen & Cuong, 2020). Self-study not only helps students enhance the quality and efficiency of their studies while still in school, but it also helps them develop into capable scientific and technical personnel with good habits and methods. Students enhance their general cultural level to meet life's requirements through self-studying in addition to completing learning assignments according to the training schedule (Barbalet, 2012; Guolla, 1999). Self-study activities of students can take place anywhere, anytime. Whenever students mobilize all their existing cognitive abilities and conduct self-discovery activities, then they are conducting self-study (Lai & Van Nguyen, 2017). Thus, the core of self-study and when considering the relationship between teaching and learning, teaching is only an external force (Fatani, 2020; Guolla, 1999). In contrast, self-study is a decisive factor for learners themselves - internal forces. Therefore, self-study and self-training are extremely important and are given much attention and encouragement in learning because students can only succeed in learning, scientific research, and certain achievements in their studies. The future is also by the process of self-study (Pham et al., 2019).

H2: *Learning motivation and hard-working level are positively associated with student satisfaction in higher education.*

Teaching and learning methods are the forms and ways of teachers and students to achieve the correct teaching objectives according to specific teaching contents and conditions (Annamdevula & Bellamkonda, 2016; Beecham, 2009). The learning method is carried out to equip students with knowledge about different learning models that can be applied at the university level and training students to

be familiar with self-study and self-discovery (Alves & Raposo, 2007). Materials, active preparation for oneself, and active discussion of lessons with friends and teachers are all things that students should be doing. They are developing new learning strategies to boost self-efficacy and increase learning quality. Learning is becoming increasingly valued in today's culture (Aldemir & Gülcan, 2004; Mulyono, 2020). Therefore, learners need to adapt and be fully equipped with foundational knowledge, solid expertise, self-study, and self-creation. Thus, the learning method greatly affects the student's learning satisfaction.

H3: *Appropriate learning method leads to higher satisfaction in higher education.*

The level of intelligent technology deployment in teaching improves student learning satisfaction (Buchanan et al., 2013; Chen et al., 2002). The application of IT to innovate teaching content and methods is a long and difficult job that requires a lot of conditions in terms of facilities, finance, and capacity of the teaching staff (Aldunate & Nussbaum, 2013). But it is thought that, with inherent pedagogical ability plus a little training in computer knowledge, teachers can completely design electronic lectures to better represent pedagogical methods, and contribute to changing new teaching methods (Bergman, 2016). The level of application of technology in teaching directly affects students' learning outcomes, and good application leads to improved learning outcomes (Benjamin, 2014).

H4: *The level of technology adoption in teaching has a positive impact on student learning outcomes.*

With the implementation of technologies for electronic classrooms, smart classrooms, developing digital data warehouses, electronic libraries, electronic textbooks, and shared e-learning lecture notes, the role of IT in the innovation of teaching and learning methods have become increasingly obvious (Aldunate & Nussbaum, 2013; Buchanan et al., 2013). Furthermore, some universities have adopted investment programs to develop courses as part of their student-centered development strategy (Abrahams, 2010). The Information and Documentation Center focuses on researching and producing programs that apply modern information technology to management, particularly teaching and practicing for students, while also doing research that transforms technology transfer (Aldunate & Nussbaum, 2013; Buchanan et al., 2013). The level of technology application in school management directly affects the results of students in learning.

H5: *The quality of technology administration is positively correlated with student satisfaction in higher education.*

The strong impact of Industry 4.0 on education requires universities to change their goals, educational content, and teaching methods (Barbalet, 2012). Online teaching, along with teaching tools of the digital age, has been making great changes to the teaching and learning situation at universities, helping to modernize education and integrate with the world (de Nooijer et al., 2021). However, it causes numerous issues, prompting lecturers and administrators to explore modifying teaching methods to achieve the highest level of efficiency in higher education today (Guolla, 1999). Additionally, increasing students' access to technology application is a positive and correct direction, a modern approach to students, and enhances students' effectiveness and learning capacity. The ability to access good technology creates conditions for learners to learn and acquire knowledge flexibly and conveniently (Benjamin, 2014; Pham et al., 2019). People can self-study anytime, anywhere, can participate in discussing an issue where each person is far away from each other, contributing to creating a learning society in which learners can study throughout. That will promote the development of talents. Access to technology directly affects student satisfaction (Blood-Siegfried et al., 2008).

H6: The ability to use and access technology facilities has a positive impact on students' learning satisfaction.

4. Results

4.1. Reliability Analysis

4.1.1. Technology Adoption

The test results show that the observed variables have correlation coefficients of total fit variables greater than 0.3.

Cronbach's Alpha coefficient = 0.940 > 0.8, so the variables TEC1, TEC2, TEC3, TEC4, TEC5, TEC6, TEC7 meet the need for reliability and are a very good scale representing TEC variables.

4.1.2. Technology Administration

The test results show that the observed variables have correlation coefficients of total fit variables greater than 0.3. Cronbach's Alpha coefficient = 0.839 > 0.8, so the variables ADM1, ADM2, ADM3, ADM4 meet the need for reliability and are a very good scale representing the ADM variables.

From the analysis of the independent variables included in the model, we can see three factors extracted at Eigenvalue: 1,066. This figure shows that the extracted factor is 70.397% of the observed variables. If the model uses one more factor (4th factor), the Eigenvalue is now 0.638 < 1. Therefore, if based on the criterion of Eigenvalue 1 or higher, we stop at the 3rd position. In addition, because the total variance extracted is 70.397% > 50%, it shows that the EFA model is suitable.

From the results of the rotation matrix, the variables TEC1, QLTN3, QLTN4, PUR3 will be eliminated (Table 2).

After that, this paper will check the scale value by EFA. The following table presents the results obtained from SPSS (Table 3).

The variable TEC1 uploads in all three factors Component 1, Component 2, and Component 3, violating the discriminant in the rotation matrix with a load factor of 0.625, 0.386, and 0.401, respectively. The load factor difference is less than 0.3.

Variable ADM3 uploads in both Component 1 and Component 2 factors, violating the discriminant in the rotation matrix with the load factor of 0.456 and 0.728, respectively. The load factor difference is less than 0.3.

Table 2: Cronbach's Alpha Test

Name	Measurement	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
TEC	Presentation and display	0.934	0.94
	Availability of supporting documents	0.929	
	Accessibility of reference	0.936	
	The implication of students' discussion	0.931	
	The fairness of assessment	0.929	
	Critical analysis function	0.927	
	Software applications	0.929	
	Technology implications	0.926	
ADM	Wi-Fi coverage and transmission quality	0.837	0.839
	Technological equipment	0.804	
	E-library	0.769	
	E-learning website	0.778	

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.938
Bartlett's Test of Sphericity	Approx. Chi-Square	2479.105
	df	105
	Sig.	0.000

Variable ADM4 uploads in both Component 1 and Component 2 factors, violating the discriminant in the rotation matrix with the load factor of 0.434 and 0.708 respectively. The load factor difference is less than 0.3.

The PUR3 variable uploads in both Component 1 and Component 2 factors, violating the discriminant in the rotation matrix with the load factor of 0.369 and 0.666 respectively. The load factor difference is less than 0.3.

Therefore, after the EFA test, we eliminate 4 variables namely: TEC1, ADM3, ADM4, PUR3.

Pearson Correlation:

Sig Pearson correlation between independent variables TEC, ADM, PUR, and the dependent variable SAT has no value of 0. Thus, there is a linear relationship between these independent variables and the SAT variable. PUR and SAT have the strongest correlation with an r coefficient of −0.072, and the weakest correlation is between ADM and SAT with an r coefficient of −0.018.

Sig Pearson correlation between independent variables TEC, ADM, PUR, and the dependent variable PT has no value of 0. Thus, there is a linear relationship between these independent variables and PT. PUR and PT have the strongest correlation with an r coefficient of −0.118, and the weakest correlation is between ADM and PT with an *r* coefficient of 0.012.

Sig Pearson correlation between ADM and two dependent variables SAT, PT is greater than 0.05. Therefore, the linear correlation between the ADM variable and dependent variables is very low. We decided that the ADM variable should be removed when performing multiple linear regression analysis.

4.2. Regression Analysis

The regression analysis shows that the adjusted R^2 value of 0.032 shows that the independent variable included in the regression affects 3.2% of the change of the dependent variable. The remaining 81% is due to out-of-model variables and random error.

Furthermore, because the Durbin – Watson coefficient = 1.57 is in the range of 1.5 to 2.5, so no first-order series autocorrelation occurs

The results presented in Table 4 suggest the positive impact of time spent on learning (TIM), technology adoption

in teaching, administration support, and accessibility to technology on the satisfaction of learning. Particularly, the coefficient of gender equals −0.063, indicating that females seem to be more satisfied with E-learning than males. The coefficient of income and major are positive, but their Sig. Value is more than 0.05, suggesting that these variables do not influence the relationship between technology adoption and student satisfaction. By contrast, the coefficient of the learning method (MET) equals −0.946, but its Sig. Value is higher than 0.05. Therefore, MET does not moderate the relationship between technology adoption and student satisfaction.

Because of the positive coefficient of 0.264, this study also shows that time spent learning has a significant positive impact on student satisfaction. It means that the more diligent a student is, the satisfied they are with their education. The significant positive association between technology adoption in teaching and students' satisfaction (with a standardized coefficient of 0.152), indicates that the more integrated lectures that can be done using technology, the more satisfied students will be with higher education.

Thus, through the results of this study (Table 4), it can be said that student satisfaction depends on many factors, not only the application of technology in learning. Moreover, the internal factors of the research paper depend a lot on the human factors of the students (study purpose, natural ability, effort, self-perception). These factors do not depend on technology that depends a lot on the students themselves. However, research has shown that learning methods also affect students' satisfaction. Together with the research results, we believe that changing the traditional learning method to the technology-assisted learning method impacts students' learning outcomes. However, this effect is not significant.

5. Discussion and Conclusion

This study examines the impact of using information technology on students' learning satisfaction, and the study results find out three factors affecting student satisfaction. We have carried out the survey and quantification through SPSS software and found that technology in teaching at school affects students' awards positively (Blood-Siegfried et al., 2008; Lai & Van Nguyen, 2017). It shows that technology in teaching helps students absorb lessons more effectively, making students' thinking ability superior to students learning with traditional teaching methods (Abrahams, 2010; Alves & Raposo, 2007). Moreover, controlling students' technology use is also very important because it affects student satisfaction. In other words, students who use technology for learning have more awards than students who use technology for other purposes.

According to the survey, access to technology is directly proportional to students' ability to use technology.

Table 4: Regression Analysis

Model Summary						
Model	**R**		**R Square**	**Adjusted R Square**	**Std. An Error of the Estimate**	**Durbin-Watson**
1	0.180a		0.032	0.024	1.135	1.57
ANOVA						
Model	**Sum of Squares**		**df**	**Mean Square**	**F**	**Sig.**
1	Regression	10.523	2	5.261	4.084	0.018b
	Residual	314.303	244	1.288		
	Total	324.826	246			

Coefficients								
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Collinearity Statistics**	
		B	**Std. Error**	**Beta**			**Tolerance**	**VIF**
1	(Constant)	2.092	0.373		5.602	0		
	GEN	−0.063	0.086	−0.172	−2.496	0.039	0.807	1.239
	INC	0.763	0.569	0.567	1.796	0.498	0.976	1.595
	MAJ	0.635	0.697	0.364	1.036	0.698	0.698	1.956
	TIM	0.264	0.079	0.264	2.689	0.027	0.869	1.645
	MET	−0.946	0.097	−0.698	−0.765	0.597	0.466	1.267
	TEC	0.194	0.092	0.152	2.163	0.031	0.807	1.239
	ADM	0.658	0.086	0.278	2.469	0.047	0.987	1.795
	SEL	−0.597	0.068	0.152	2.475	0.045	0.567	1.264
	ACC	0.194	0.091	0.152	2.163	0.031	0.807	1.239
	PUR	−0.244	0.093	−0.184	−2.628	0.009	0.807	1.457

As mentioned above, the factor of ability to use technology has a significant impact on satisfaction. Therefore, in geographical areas with easy access to technology, students will have higher satisfaction (Annamdevula & Bellamkonda, 2016; Chen & Cuong, 2020; Fatani, 2020). Access to technology is also a factor that needs attention to improve the school's ability to use personal technology and technology. Finally, the application of technology in school management impacts satisfaction, but this impact is very low. Technology in school management only helps students access technology easily (Abrahams, 2010; Bergman, 2016; Buchanan et al., 2013; Chen et al., 2002). Students can apply technology in learning (Kieng et al., 2021).

After conducting this research, we have made several suggestions for education and training centers as follows. Technology facilitates learning more conveniently, effectively, and accessible, rather than completely affecting learning outcomes and satisfaction. This shows that self-motivation is an important and decisive factor in improving satisfaction through choosing and applying technology effectively and suitably. It is necessary to explain and guide students to use phones and technology devices for the right purposes, effectively (Doan, 2021). Establish classroom rules about not using cell phones for private purposes unrelated to schoolwork. Use appropriate measures for students to raise awareness when using technology. Regularly organize events to propagate moral education and a healthy lifestyle to students. Working hard, learning, researching, and developing learning methods will help maximize work and study productivity. Thereby forming a habit and understanding in applying technology in learning at school and self-studying at home.

Through the study, we can see the impact of technology use on students' learning outcomes. Therefore, if students have enough motivation and learning goals, they should set up appropriate learning methods for themselves. First, students should spend more time on self-study instead of just listening to lectures and studying in class. Use technology devices to take notes or review lectures. Don't let technology distract you from your focus. Second, students should use technology to find out information related to learning most accurately and completely and at the same time apply it to listening to lectures in class so that it can be combined and supported in case some things are not understood. Finally, it should be understood that technology aids in time management and offers access anywhere and at any time, so make use of it and set aside time for studying that is acceptable and appropriate for their lifetime and circumstances. Therefore, students should not be subjective because no matter how convenient the technology is, your efforts and hard work are the decisive factors leading to a good result and satisfaction.

Besides the effective use of technology, mental health is also an extremely important factor affecting learning. Always create confidence, set goals to strive for yourself, have a clear and specific direction and study plan, and equip yourself with a positive attitude, self-discipline, and focus. Improve, practice health, distribute between study time as well as leisure time, relaxation. Do not put too much pressure on yourself, but keep a relaxed and confident mind. In addition, the application of technology in teaching and school management is being widely deployed in schools. The extremely useful and convenient features that technology brings are no longer strange to schools. Technology makes learning incredibly rich, engaging, accessible, and fast. As well as helping the school's management in student affairs, information dissemination is carried out most effectively and completely. The school can apply and implement the following solutions to bring students an increasingly healthy learning environment and help students absorb knowledge in the best way.

At school, it is important to upgrade and maintain the networks effectively. Indeed, the level of Wi-Fi coverage in schools must be good and stable. Because not all students have 3G, it is vital to connect to Wi-Fi for technology devices to update and search for information. As a result, students may connect to Wi-Fi whenever they need it, allowing them to use technology fast. Second, the school should provide students with technology equipment, such as in the library or the classroom. This will assist students if they are unable to carry their things. Furthermore, students use of learning devices should be supervised, as a poor use of technology can lead to a double-edged sword, leading students' grades to suffer. Third, it is very important to control the use of technology in student learning because using technology for purposes such as cheating will cause great harm in assessing competence. At the same time, equity in education has since been lost.

Above all, the school needs to pay attention to the learning process of students. Above all, it is necessary to improve students' access to technology and understanding of technology so that students do not fall behind with the development of the world. At the same time, it's important to keep track of whether students' usage of technology aids their learning or distracts them from their studies. Most importantly, cheating in exams and judging ability is a major concern of the school, especially since it becomes more common and has a negative image in schools.

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