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Analyzing the Digital Transformation Competence of Vietnamese Students Using Exploratory Factor Analysis (EFA)

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Abstract

In Vietnam, digital transformation has been taking place strongly in all fields, especially education. Universities are very interested and focused on promoting digital transformation activities at their facilities. Students are individuals who participate and directly benefit from this process. The question is how competent students are when participating in digital transformation at the institution. This article focuses on researching the digital transformation competency of Vietnamese students in general, and at Commerce University in particular. From there, it provides educational institutions with the perspective of the digital transformation competency of students. Especially, based on experiments conducted with 405 students at the Universities of Commerce, the research group applied the Exploratory Factor Analysis (EFA) method and multiple linear regression to identify seven factors influencing digital transformation competence: "Interest", "Usefulness", "Importance", "Personal capacity", "Relationship", "University" and these seven factors explained 71.7% of the variation in digital transformation competence. In summary, the research provides support for educational institutions to develop plans for enhancing the digital transformation competency of students in general and at Thuongmai University in particular.

Keywords

Digital transformation, Competency, Education, Students

Introduction

Digital transformation is an inevitable and objective trend in Vietnamese education, led by higher education institutions. As of 2020, Vietnam had 460 universities and colleges with 2.2 million students enrolled. All schools recognize that digital is both an opportunity and a challenge, helping higher education establishments enhance the quality of their management, teaching, and learning, and improve their position on the rankings of high-quality institutions.

Students play an important role in largely determining the success of the digital transformation mission. They participate in learning and using management support features from the school, specifically: online classes, LMS courses, quality assessment exams, digital libraries, digital learning resources, and personalization of work. learning, the ability to detect gaps in

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learners' knowledge, assess the level of learners' interest in the learning process, and suggest learning paths.

The current state of digital transformation among Vietnamese students

In fact, according to a survey conducted in the 2019-2020 academic year, 76% of Vietnamese students were not ready for online learning (Quyen, 2021). According to the Principal of the Faculty of Social Sciences and Humanities at the Hanoi National University, Vietnamese students are not meeting the requirements of digital transformation (Quan, 2021). The research by author Tran Thi Phuong Hien and et al found that the majority of the participants at the National Economics University lack sufficient knowledge and a deep understanding of the essence of digital transformation (Hien, Nguyen, & Minh, 2022). Another study conducted at Tra Vinh University found that 16.9% of the university's students do not clearly understand of Digital Transformation in education (Dung & Vi, 2023)

Faced with this reality, educational institutions need to improve their ability to convert the number of students. Therefore, the researchers conducted a study of factors affecting the capacity to convert the number of students to improve capacity. This is done through a case study of Thuongmai University, a multidisciplinary public university, ranked among the top 5 universities in Vietnam in the fields of economics, accounting, management, business, and commerce.

Methodology

Theoretical basis

Expectancy Value Theory (*EVT*) was used by the research team as the theoretical basis in this study. EVT was first studied by Atkinson (1957). According to (EVT), the degree to which individuals expect to succeed (expectancy for success) and the value they attach to the learning task (task value) are the basic determinants of actions related to learning. Individuals engage in specific learning tasks, thereby developing digital transformation capacity during their participation in research and learning at educational institutions. Expectancy for success represents a student's belief about how well they will perform on a learning task, while task value represents subjective reasons that can impact students' ability to perform tasks. Task value includes four types: (1) intrinsic value, which is the enjoyment that individuals derive from performing the task; (2) utility value, referring to the individual's assessment of the task's relevance to their plans; (3) attainment value, indicating the extent to which participation in the activity contributes to one's self-image or allows for the advancement of personal identities; (4) cost, representing what the individual perceives they will have to sacrifice when participating in the task.

Proposed Research Model

Based on the reference to EVT expectancy-value theory theory (Eccles et al., 1983) combined with an understanding of previous research and the actual situation of digital transformation in the field of education and training, The research team proposes the following research model:

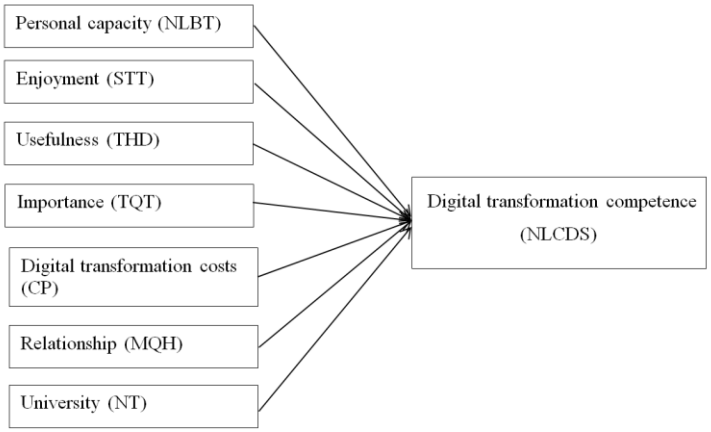

Figure 1. Proposed research model

Sampling method: Using stratified random sampling method. First, dividing individuals into strata based on the characteristics of the school year and the faculty that the students are studying. Then, the team conducted random surveys in each strata.

Sample size: Sample size equals =100 (bad), = 200 (fair), = 300 (good), = 500 (very good), = 1000 or more (excellent) (Comrey & Lee, 1992). Some other researchers suggest the sample size according to the rule of multiplying by 5 (Bollen, 1989), that is, the number of observed variables multiplied by 5 will create the minimum sample size to ensure the reliability of the research.

In this study, the team determined that the sample size of about 400 is good according to the rules of Comrey & Lee (1992), and it also ensures Bollen's rule.

Analysis method: After receiving feedback from survey participants, the team cleaned the data, eliminated invalid samples, and finally gained 405 valid samples. Next, the team conducted three main analysis steps. Analyzing descriptive statistics on students' personal information to determine the characteristics of the obtained survey sample. EFA analysis and reliability analysis aim to preliminarily test the scale, determine the main factors, the loading factor of each factor and the reliability level of the scale (Cronback alpha). Multivariate regression analysis to examine the impact between independent variables on the dependent variable. Analyzes were performed with SPSS 25 software.

Results And Discussion

Characteristics of the survey sample

Frequency analysis of the 3 main characteristics of the research sample gave the results as shown in the table 1.

Table 1. Characteristics of research students

Sample parameters		Frequency	Ratio (%)
Gender	Male	135	33.3
	Female	270	66.7
Year of student	First-year student	83	20.5
	Second-year student	145	35.8
	Third-year student	113	27.9
	Fourth-year student	64	15.8
Faculty name	Faculty of Economic Information Systems and E-commerce	69	17.0
	Faculty of Law	23	5.7
	Faculty of Human Resource Management	28	6.9
	Faculty tourist hotel	26	6.4
	Faculty of Business Administration	38	9.4
	Faculty of Marketing	39	9.6
	Faculty of Economics and International Business	36	8.9
	Faculty of Accounting and Auditing	32	7.9
	Faculty of English	28	6.9
	Faculty of Banking and finance	29	7.2
	Institute of International Education	30	7.4
	Faculty of Economics	27	6.7
Total		**405**	**100**

The proportion of surveyed students is not balanced in terms of gender and year of student. Research participants were mainly girls, accounting for 66.7%, with second and third year students accounting for nearly 65% of the total number of research students. Regarding faculties, the largest number of students from the Department of Economic Information Systems and E-commerce participated in the survey, accounting for 17%, with the proportion of students from the remaining 10 faculties distributed quite evenly from 6.4 % to 9.6%.

Measurement Validation

We evaluated the reliability of the scale based on the Cronbach α coefficient. According to Hair et al., (2014) suggested the following criteria need to be met to produce valid and reliable results: Cronbach's Alpha>=0.6; Corrected item-total correlation > 0.3; When a factor is removed from the analytical model, the Cronbach's Alpha value increases.

Table 2. Assessing the reliability of the scale and exploratory factor analysis

No	Factor	Symbol	Remaining observed variables	Cronbach's Alpha	Variables are eliminated
1	Enjoyment	STT	3	0.716	0
2	Usefulness	THD	3	0.821	0
3	Importance	TQT	3	0.798	0
4	Personal capacity	NLBT	4	0.684	1
5	Relationship	MQH	3	0, 760	0
6	School	NT	3	0.735	0
7	Digital transformation costs	CP	3	0.774	0
8	Digital transformation capacity	NLCDS	3	0.796	0

Based on the obtained results table, we see that 1 observed variable was eliminated due to Corrected Item-Total Correlation = 0,203 so the total number of variables obtained is 25. In addition, all factors have a Cronbach's Alpha coefficient greater than 0.6, ensuring the factors meets reliability.

Exploratory Factor Analysis (EFA)

The EFA factor analysis method is used to reduce a set of *k* observed variables into a set F (F<k) of more meaningful factors. The Kaiser-Meyer-Olkin (KMO) test is an index used to measure the adequacy of sampling. According to Kaiser (1970), the KMO needs to be between 0.5 and 1 in order to conclude that factor analysis will be useful for the sample obtained. In this study, KMO = 0.848 > 0.5 with Sig < 0.05, so it is suitable for EFA analysis.

Next step, the Principal Components extraction method and Varimax rotation, factor analysis has extracted 7 groups of factors from 22 observed variables with Eigenvalues criteria greater than 1 (standard) with a total square after extraction reaching 68.454%> 50% (qualified), this means that the seven factors can explain 68,454% of the variation in the data set.

The results of the Varimax rotation matrix show that the variables are kept the same and have factor loadings greater than 0.5, which means that the variables in a factor are highly correlated with each other, so they achieve convergent validity.

Multiple linear regression analysis

Table 3. Level of explanation of the model (Model Summary [b])

	R	R Square	Adjusted R Square	Std. Error of Estimate	Durbin-Watson
1	0.8 47 [a]	0.7 17	0.71 2 _	0.3 9392	2.146

a. Predictors: (Constant) THD, NLBT, TQT, CP, NT, MQH, STT
b. Dependent Variable: NLCDS

Adjusted R2 value reaches 0.717, meaning that the independent variable included in the regression affects 71.7 % of the change in the dependent variable, the remaining 28.3 % is due to external variables. model and random error. Durbin – Watson coefficient = 2.146, so the model does not have first-order serial correlation.

To test the suitability of the regression model, the research team calculated the sig value of the F test.

Table 4. Model fit: ANOVA analysis of variance

ANOVA [a]

Model		Sum of Squares	DF	Mean Square	F	Sig.
1	Regression	156,455	7	22,349	144,026	0.000 [b]
	Residual	61,604	397	0.155		
	Total	218,049	404			

a. Dependent Variable: NLCDS

b. Predictors: (Constant) THD , NLBT , TQT , CP , NT , MQH, STT

In the ANOVA table, the Sig. value in the model is less than 0.05, proving that this data set is suitable for the Multiple Linear Regression model. To test the significance of the regression coefficient of each independent variable, we use the Sig value of the T-test in the Coefficients table.

Table 5. Results of regression analysis

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-0.179	0.200		-0.891	0.373		
	THD	0.242	0.041	0.216	5,922	0.000	0.536	1,866
	NLBT	0.288	0.041	0.249	7,025	0.000	0.565	1,769
	TQT	0.158	0.031	0.162	5,046	0.003	0.691	1,446
	CP	-0.106	0.023	-0.130	-4,542	0.000	0.875	1,142
	NT	0.120	0.035	0.113	3,434	0.001	0.656	1,524
	MQH	0.076	0.029	0.084	2,584	0.010	0.679	1,473
	STT	0.246	0.038	0.227	6,405	0.000	0.569	1,758

a. Dependent Variable: NLCDS

From table 5, we obtain the unstandardized multiple linear regression equation:

$$\mathbf{NLCDS = -0.179 + 0.242*THD + 0.288*NLBT + 0.158*TQT - 0.106*CP + 0.120*NT + 0.076*MQH + 0.246*STT + \varepsilon} \quad (1)$$

The above regression equation shows that there are six factors with a positive correlation, only one factor (CP) has a negative correlation with students' digital transformation competencies.

Standardized regression equation:

$$\mathbf{NLCDS = 0.216*THD + 0.249*NLBT + 0.162*TQT - 0.130*CP +0.113*NT +0.084*MQH + 0.227*STT+ \varepsilon} \quad (2)$$

To compare the impact of each factor on the dependent variable - students' digital transformation capacity (NLCDS), we consider the standardized Beta coefficient. The larger the normalized absolute Beta value of a factor, the stronger the impact that factor has on NLCDS. The results show that the impact of the factor "self-efficacy" on digital transformation capacity is the strongest (Beta = 0.249), the second is the factor "enjoyment" (Beta = 0.227), the third is factor "usefulness" (Beta = 0.216), fourth is factor "importance" (Beta = 0.162), fifth is "cost" (Beta = -0.130), sixth is "school" (Beta = 0.113), and finally the factor "relationship" (Beta = 0.084).

Based on the results obtained, the team identified six factors that have a statistically significant positive impact and 1 factor that has a negative impact on the dependent variable. Specifically, "self-efficacy" is the most influential factor.

The results of this study can suggest some recommendations for stakeholders such as:
From the School's perspective: From research results, the school has a positive impact on students' digital transformation capacity. To raise awareness and capacity for students, schools need to do: (1) open seminars, workshops, and forums on digital transformation, discuss ways of learning in the era of digital transformation; (2) integrate digital technology content into the curriculum such as Big data, IoT, AI, ...; (3) provide infrastructure for students such as free wifi, computer room, etc.

From students' perspective: Students need to be active and proactive in all digital transformation activities: participating in studies, seminars, studying, etc., changing the passive learning mindset of waiting for teachers to guide them with independent thinking and lifelong learning based on digital information technology and digital technology.

From teachers' perspective: Teachers need to (1) organize the redesign/composition of courses following blended learning models, open educational resources, interactive lessons... (2) innovate teaching methods, and apply technology to lectures."

Conclusion

This study addresses the factors influencing the digital transformation capability of students and has identified six factors that positively impact this capability and one factor that negatively impacts it. Based on these results, the group has proposed several recommendations for the universities and students to enhance their capabilities. However, this study has some limitations, such as not examining certain personal characteristics that may affect digital transformation capabilities, such as gender, academic year, and faculty. Additionally, the subjects in the study are still limited in scope and not representative nationwide. Addressing these limitations will await further research.

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