

Smart Card Implementation Project in Vietnamese Campuses: A Case of National Economics University

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Abstract

This paper is aimed at analysing determinants of the behavioural intention of smart card adoption in the university campuses. The Unified Theory of Acceptance and Use of Technology (UTAUT) model is applied, with primary data are collected from in-depth interviews and survey questionnaires with students and lecturers at the National Economics University in Vietnam. The key findings are: in an open-minded and developing environment such as National Economics University, the smart card implementation in campus is most influenced by Effortless Conditions- a new determinant combining from Effort Expectancy and Facilitation Conditions. The other factors are respectively Performance Expectancy, Perceived Risk, and Trust. By determining these factors, the Boards of the university will have an overall look on the demand and preferences of the university students, teachers, and staffs towards smart card, hence, start the smart card project and develop as one of the smart campuses in Vietnam.

Keywords: *Financial Technology, Smart Campus, Smart Card Education, UTAUT model.*

Introduction

The world is experiencing together a modern civilization - Industry 4.0, characterized by convergent technology implementation (Budanov et al., 2017). Among Asian countries, Indonesia, Malaysia, and Singapore are top - driving to a digital revolution, mainly for payment, transportation, telecommunication (Sartiges et al., 2020) and even e-tourism (Watkins et al., 2018).

In a rising trend of global cashless society, there are several universities and colleges adopting smart card thanks to its convenience and modernization (Lee, Cheng, Depickere, 2003; Mohamad et al., 2011; Sartiges et al., 2020). Also, a university campus is a successful environment to assess and spread the benefit of smart card technology.

Recently in Vietnam, the smart card is having its first adoption in the education field. In 2011, the decree no 101/2012/ND-CP about significant promoting cashless payments in Vietnam had been approved by the Prime Minister (Gov, 2012). Implementing the above decision, Ho Chi Minh City Education and Training sector has built a "Non-cash schools" project since 2014 - 2015 with more than 300 participants from secondary and high schools (Thu, 2019). This project encouraged parents to pay tuition fee online and provided smart card (SC) for secondary students to check attendance, library access, pay for canteen services, and bus services. Moreover, several Vietnamese universities provide student cards integrated with ATM card such as National Economics University (NEU), Foreign Trade University, and Vietnam National University, etc. ("6-In-1 Student Card", 2018). Thus, the smart card is still an opened box to research and discover, especially in the technology revolution era. Considering a

potential opportunity for NEU teachers, students, and staffs to experience an advanced card, the analysis topic "Smart card implementation project in NEU" was chosen for detecting their demand and preferences towards using an all-in-one (AIO) smart card in the future.

Generally, the initial purpose of this research is to provide more information about the smart card technique to students, school managers and staffs, then, analyze the practical application of the smart card in one specific Vietnamese university based on the respective of supply and demand. In detail, this paper is choosing NEU to evaluate its capability of all-in-one smart card implementation. The opinions of NEUers, including students, teachers, staffs and managers, will be collected to study the demand side of applying smart card. Due to the lack of data about infrastructure conditions in NEU, author focuses on the demand only and supposes supply to be on an ideal state. Secondly, it shows explanation for applying smart card in NEU campus and NEUers' preferences on that all-in-one item. Finally, ideas will be raised in order to consider all-in-one smart card implementation as a feasible project in NEU campus.

The questionnaire was spread randomly to collect responses from students, teachers, staffs, and managers of NEU. Before analyzing step, the data was processed and filtered. The valid responses were analysed to answer for the key research question: "Why NEU should implement an all-in-one smart card system?"

To answer this key research question, the following sub-research questions will be explored:

- What are the demand and preferences of NEUsers towards smart card?
- Which determinants influencing on the behavioural intention of smart card adoption in the NEU campus?

2 Brief Literature Review

Smart cards

A smart card was defined as a small, rectangle, and plastic item like a credit card but including an “embedded microprocessor chip” in order to store an enormous amount of data and process basic computing calculation (CardWerk, 2005; Damien Deville et al., 2004; Smith, 2005). Compare to a magnetic stripe card, smart card has three main outstanding points. Firstly, its storage and task-execution ability were larger than the magnetic stripe ones 100 times. Furthermore, Rakers et al. (2001) also stated that smart card had a longer lifetime. Lastly, the most outstanding function was its ability to encrypted saved data to prevent from unauthorized access and card-counterfeit (Dara & Gundemoni, 2006). Thus, people gradually prefer smart card as a replacement for old-technique magnetic stripe card.

Smart card for smart school campuses

In the past, smart card was mainly used for its security, portability, and multi-tasking (Chadwick, 1999; Damien Deville et al., 2004). This all-in-one smart card is being spread globally because of its diversity applications such as information technologies, mobile telecommunications, commercial application, health care, education, and electronic and biometrics passport (“A short review of smart cards”, 2019). To summarize, this research used the concepts of smart card as an all-in-one chip card for data storage and payment to apply in education fields.

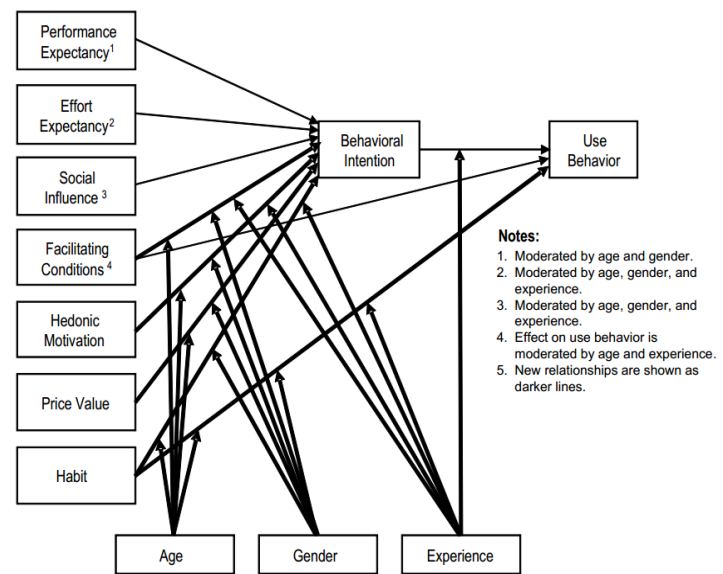
According to Davis (2001); Robinson (2001); and Taherdoost (2017), school campus was one of the best environments to adopt smart card. Recently, many smart cards have been provided to university students. In 1990s, smart cards were introduced inside United States’ colleges as multiple-functional card including identity card of staffs and students (Marlowe, 2000; and Yang, 1999); campus building access (Marlowe, 2000; Wahlander, 2019); study records, library records (Kennedy, 2000; Marlowe, 2000; and Yang, 1999) and a store value card (Farrell, 1996; Marlowe, 2000). Recently, after being upgraded continuously, smart card has become an electronic purse, especially in European countries. Money was recharged by vending machine inside school campuses to pay for student services such as canteen, photocopy, parking, internet access, and even public transportation (Marlowe, 2000). According to Taherdoost (2017); and Zheng et al. (2011), tuition fee could be paid through smart cards.

In 2015, Korean universities continued to develop a smart campus project, which focused on “revolutionizing the education system through diversification of contents and IT technology” (“World’s Best Smart Campus”, 2015). Beside common students’ services, this project included totally new cyber lectures, online attendance checking, library reservation system and campus safety control. Consequently, Korean cashless campuses have contributed dramatically to Korean’s 2020 goal to become a cashless society. However, it is significant to notice that the attitude and behavior of customers towards using smart card technique are essential for its further development because of the underlying problems, which need to control such as security and privacy (Marlowe, 2000; Rakers et al., 2001).

The upgraded UTAUT Model

The UTAUT Model was first proposed and introduced in Venkatesh et al. (2003). in order to test the technological acceptance and usage of customers in a wider range of context. The UTAUT was outstanding when explaining approximately 70% of variance in behavioral intention and 50% in usage of technology (Venkatesh et al. 2003, Venkatesh et al. 2012). In the context of technology development, Venkatesh et al. (2012) renovated UTAUT to UTAUT2, which could cover all consumers’ perceptions and “explain 74% of the variance in behavioral intention. In this update, three new direct determinants “Hedonic motivation, Price value, and Habit” are added while indirect element “Voluntariness of Use” is eliminated. Furthermore, the influence all independent variables are moderated by “age, gender, and experience”.

Figure 1: The upgraded Unified theory of acceptance and use of technology (UTAUT2)



Source: Venkatesh, Thong and Xu (2012)

Venkatesh, Thong, and Xu (2012) recommended that other researchers could combine different determinants to build their own models with different type of aging, countries, or kinds of technologies. For example, in several technological researches, authors dropped “Habit” variable from their models because the technology device in their areas were still new, which was not able to create consumers’ habit (Akossou and Palm, 2013).

Determinants of smart cards for smart school campuses

Combining the UTAUT model with the characteristics of universities, the following factors have been defined as determinants of using smart cards for smart school campuses:

- **Performance Expectancy**

According to Commer et al. (2018); and Taherdoost et al. (2009), performance expectancy means an awareness about the technology innovation in the individual’s routine. Venkatesh et al. (2003) defined it as the expectation of customers about item’s usefulness to gain their performance. Overall, performance expectancy means users believed that using this technology will give them benefits (Venkatesh et al., 2012). The greater this component is, the stronger users intend to use technological devices. Chao (2019); Lee, Cheng, and Depickere (2003), and Taherdoost (2017) proved that the relationship between performance expectancy and

students' intention to use smart card is significant positive. For this research, the expected sign of performance expectancy variable is positive.

- **Effort Expectancy**

Effort Expectancy was conceptualized as "the degree to which a person believes that using a particular system is free of effort" (Taherdoost et al., 2009). The expected sign of this variable tends to be positive due to most of previous studies (Chang et al., 2007; Chao, 2019; and Taherdoost, 2017). However, a research of Arman and Hartati (2015) concluded that effort expectancy has no correlation to smart card using intention. The possible explanation for Arman and Hartati's study could be the characteristic of their sample while about 70% of their research participants were under 50 and 67% were experts. As the subjects of this research are mainly students and teachers, who have experienced technology era, the sign of effort expectancy is expected to be positive.

By doing reviews of technology adoption models above, the common determinants that tend to make impact on the intention of using smart card are as follow.

- **Social Influence**

According to UTAUT Model Research, social influence is the term which shows a person realized that "his/her important others believe that he/she should use the new technology" (Venkatesh et al., 2012). Most studies forecasted successfully the positive effect between social influence and intentional using a new technique (Taherdoost, 2017; Chang et al., 2007). While Chang et al. (2007) stated that this effect was only marginally significant, social influence became the most outstanding measurement in the study of Alaiad & Zhou (2014). The third hypothesis is also proposed with a positive sign prediction.

- **Facilitating Conditions**

According to Venkatesh et al. (2003), facilitating conditions means a character's perception that available infrastructures and resources can encourage the usage of technology. The more property people have, the higher people tend to try the new technique. Arman & Hartati (2015); and Thakur (2013) showed that facilitating conditions will positively affect to the dependent variable. On the other hand, Taherdoost et al. (2009) eliminated this variable out of his using smart card intention model. This hypothesis sign is ambiguous.

- **Perceived Risk**

Taherdoost et al. (2009) stated that perceived risk was related to an uncertainty and consequences from customers' action. According to TPB model, this variable could reduce ambiguous consumer-behavior control, thus, create a negative impact on their decisions. In contrast, if the risk awareness associated with smart card is reduced and it enables users to control their behavior more, people will be willing to use (Pavlou, 2003). Overall, perceived risk was defined as the potential lost in order to look forward to an outcome of using electronic services. People should have risk awareness and prevention. According to Chang et al. (2007), perceived risk was one of the main reasons why users are afraid to use smart technique. Therefore, the proposed relationship between perceived risk and user's intention is negative (Chao, 2019; Dwivedi et al., 2019; Taherdoost, 2017).

- **Trust**

According to Yue et al. (2013), the definition of trust was summarized as a one-way belief that a party will satisfy another party's desire by completing its duty. Moreover, Yousafzai et.al (2003) concluded that trust reduced perceived risk, thus led to a positive decision in using e-devices. It is clearly that trust can diminish concerns among people. In Manaf and Ariyant's research (2017), determinant Trust was added to the UTAUT2- the upgrade of UTAUT. As the result, trust has a positive impact on the behavioral intention to use smart card of customers (Chao, 2019; Taherdoost, 2017). This relationship is revealed as positive connection.

- **Price Value**

Price value is understood as a customer's balanced perception between the benefits and the cost of using a technology application (Venkatesh et al., 2012). (Moghavvemi et al., 2017) stated that this is one of the most important elements towards the customers when a new technology is being applied. A difference between an individual and an organization when they use a technological device is that paying out can affect to their using behavior (E. Slade et al., 2013). The impact level of price value on the technology acceptance behavior is stated differently in numerous researches. (E. Slade et al., 2013) proved that the price value has a negative influence on the customers' intention to use new technology. Yue, Liu, and Lang (2013) argued that this determinant has no effect on the behavioral intention.

- **Hedonic Motivation**

Hedonic motivation is defined as a happiness from using technology in an individual's own way and realizing that technology's expected benefits (Davis, 2001). In several researches, hedonic motivation was proved to have a direct impact on the technology acceptance (Brown & Venkatesh, 2005; Mohamad et al., 2011). Hence, Venkatesh et al. (2012) decided to add this determinant into the UTAUT2 Model as a prediction element of users towards technology acceptance. However, hedonic motivation is still a new determinant for the researches about smart card application in universities. Thus, it is difficult to predict the significant sign of this determinant.

- **Habit**

As the smart card is still a new practical application in the universities and education field, it has not yet achieved a widespread in using or past experiencing enough to generate a habit among customers. The similar ideas were proposed in (Nguyễn, 2013); and (Hair et al., 2014). In contrast, this determinant will have a significant effect on customers' perception towards a familiar technology application such as payment card ((E. Slade et al., 2013)).

Research Gaps

Although a lot of countries and universities has adopted successfully smart card, there are only few outdated researches about smart card implementation in campuses from Malaysia (Mohamad, Rosli, and Ahmi, 2011; Taherdoost, Zamani, and Namayandeh, 2009), Singapore (Lee, Cheng, and Depickere, 2003), Iran (Taherdoost, 2016), and Bahrain (Al-Alawi, Al-Amer, 2007). In comparison, this paper used different theoretical framework (UTAUT) and research method (survey questionnaire and indepth-interview) instead. Particularly, all of these researches had a very small respondents of questionnaire, in the range of 64 and 159. Both two papers about Malaysia were analyzed without a theoretical framework and displayed by only descriptive study.

Besides, Lee, Cheng, and Depickere (2003) and Taherdoost (2016) used model PCI as their empirical models, which was not an updated model when compare to UTAUT. Hence, in this paper, several statements are collected from another technology adoption device and from the experiment of survey respondents.

3 Methodology and research model

Research process

To research topic “The analysis of smart card implementation project at NEU, Vietnam”, author uses both qualitative and quantitative methods after conducting a pilot survey. The below figured is a research framework (Figure 1).

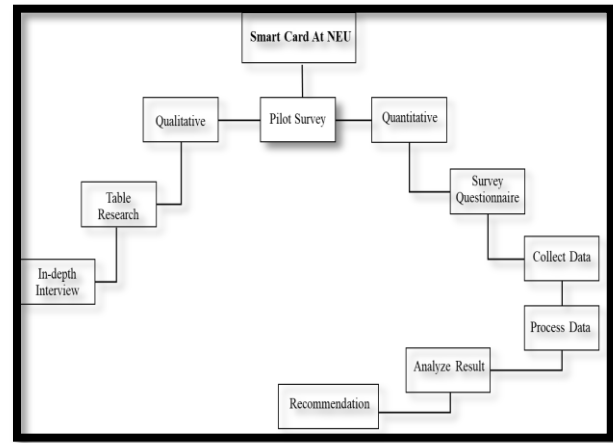


Figure 2: Steps of the paper’s research approach

❖ Hypothesis

UTAUT Model is only a foundation to build this paper’s model because different researches have different aims and ways to approach (Foon and Fah, 2011; Loo, Yeow, and Chong, 2009). After researching and collecting data, author proposed the research model with six key determinants, including “Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Perceived Risk, and Trust” to validate their effects on the behavioral intention of a new technology adoption. The Table 1 reveals a summary of the hypothesis from the key determinants of all-in-one smart card adoption in NEU campus.

Table 1: Summary of AIO-smart card- adoption hypothesis

Determinants	Hypothesis	Expected sign
Performance Expectancy (PE)	H1: PE has a positive effect on NEUers’ behavioral intention to use smart card	(+) Chao (2019); Lee et al. (2003); Taherdoost (2017)
Effort Expectancy (EE)	H2: EE has a positive effect on NEUers’ behavioral intention to use smart card	(+) Chao (2019); Taherdoost (2017) (no sig) Arman & Hartati (2015)
Social Influence (SI)	H3: SI has a positive effect on NEUers’ behavioral intention to use smart card	(+) Alaiad & Zhou (2014); Chang et al. (2007); Taherdoost (2017)
Facilitating Conditions (FC)	H4: FC has a positive effect on NEUers’ behavioral intention to use smart card	(+) Arman & Hartati (2015); Thakur (2013) (no sig) Taherdoost et al. (2009)
Perceived Risk (PR)	H5: PR has a negative effect on NEUers’ behavioral intention to use smart card	(-) Chang et al. (2007); Chao (2019); Dwivedi et al. (2019); Taherdoost (2017)
Trust (TR)	H6: TR has a positive effect on NEUers’ behavioral intention to use smart card	(+) Chao (2019); Taherdoost (2017); Yousafai et al. (2003); Yue et al. (2013)

Source: Authors’ compilation

➤ Model equation

The research model is expressed in a form of multivariate linear model with behavioral intention (BI) as dependent variable and PE, EE, SI, FC, PR, and TR as independent variables.

$$BI = \beta_1PE + \beta_2EE + \beta_3SI + \beta_4FC + \beta_5PR + \beta_6TR$$

In which $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$: estimated coefficients

From questionnaire method, the sample size by accidental sampling method is 356 people who studying and working in NEU. The first questionnaire was built based on the research model’ determinants and various sources as a pilot survey. After receiving responses and feedbacks, the pilot survey was fixed and updated to a completed questionnaire. The final questionnaire has total 20 questions, including 5 demographical questions. To increase reliability, these questions to measure each variable were generated and revised based on previous related studies. The five-point Likert-type scale is used as a measurement. The answer choices in all questions range from “strongly disagree” (1) to “strongly agree” (5).

Both questionnaire and in-depth interview are used to collect insight in this research. From questionnaire method, the sample size by accidental sampling method is 356 people who studying and working in NEU. A survey questionnaire was public on the social media groups of NEU to collect students, teachers, managers, and staffs’ responses. In qualitative method, the theoretical researches are collected and applied into the in-depth interview content for 5 students, who experienced all-in-one smart cards in during their study exchange. The final questionnaire has total 20 questions, including 5 demographical questions. To increase reliability, these questions to measure each variable were generated and revised based on previous related studies. The five-point Likert-type scale is used as a measurement. The answer choices in all questions range from “strongly disagree” (1) to “strongly agree” (5)

The research objects are chosen from NEU because NEU is the Authors’ university, which make data collection more convenient. Moreover, NEU has planned to become a smart campus since 2020, which is suitable for an all-in-one smart card implementation project. Overall, NEU is a potential environment to develop as a smart university. The characteristics of this research samples

presented in several tables below are collected and summarized from 327 valid survey responses. Among 327 people, there are 268 students, which occupy about 82% of the total answers; 47 teachers as 14.4%, and 12 managers and staffs, which only take 3.7%.

Table 2: Summary of respondents' occupation

Job		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Student	268	82.0	82.0	82.0
	Teacher	47	14.4	14.4	96.3
	Manager /Staff	12	3.7	3.7	100.0
	Total	327	100.0	100.0	

Source: Authors' compilation

4 Research Results

Among 327 NEUers, there are 73 people who have not experienced smart card before. In general, students and teachers in NEU are familiar with a smart card device both using inside and outside the campus. From the survey responses, they experience smart card mostly as a payment card and a connection with a related app. Considering a deeper analysis, only 254 responses from who experienced smart card are used as data for the statistical analysis.

Statistical Analysis

Rotated component matrix number is the highest factor loading of each observation component, which expresses the correlated relationship between a component and a variable. According to Hair et al. (2014), an EFA result with good statistical significance requires a factor loading in the range of 0.6 and 0.9. In the Table 4.1, all observative components are in the range of 0.6 and 0.9. This mean those components are significant to remain in the model and appropriate to represent major variables.

Table 3: Rotated component matrix of independent variables

		Component				
		1	2	3	4	5
FCE	FC2	.875				
	FC3	.837				

	FC1	.836				
	E2	.734				
	E3	.700				
	E1	.698				
	FC4	.670				
PE	PE3		.818			
	PE1		.717			
	PE2		.707			
PR	R2			.827		
	R1			.813		
	R3			.707		
SI	SI2				.885	
	SI3				.807	
	SI1				.743	
TR	T1					.789
	T3					.764
	T2					.749

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 5 iterations.

Source: Authors' compilation

However, 19 original scale items are grouped in only five big components like explanation in table 4.12, including performance expectancy (PE1, PE2, PE3), social influence (SI1, SI2, SI3), perceived risk (R1, R2, R3), and trust (T1, T2, T3). Noticeably, facilitating conditions (FC1, FC2, FC3, FC4) and effort expectancy (EE1, EE2, EE3) are both represented for the component 1, which integration as variable FCE- named as Effortless Conditions. Overall, after validating the reliability and factor analysis, all 19 chosen scale items are qualified for the next investigation.

Correlation analysis reveals the relationship between two separated variables using Pearson coefficient (r). Beside measuring the strength of linear correlation, it provides collinearity signals between two strong-correlated variables (Pallan, 2010). The Pearson coefficient has value ranging from -1 to 1, but it only has meaning if the Sig. is lower than 0.05. The result of correlation analysis of this paper is summarized in Table 4.2 below.

Table 4: Pearson correlation analysis

		BI	FCE	SI	PE	RI	TR
BI	Pearson Correlation	1					
	Sig. (2-tailed)						
FCE	Pearson Correlation	.578**	1				
	Sig. (2-tailed)	.000					
SI	Pearson Correlation	.167**	.181**	1			
	Sig. (2-tailed)	.008	.004				
PE	Pearson Correlation	.455**	.496**	.139*	1		
	Sig. (2-tailed)	.000	.000	.027			
PR	Pearson Correlation	-.471**	-.485**	.253**	.394**	1	
	Sig. (2-tailed)	.000	.000	.000	.000		
TR	Pearson Correlation	.213**	.154*	.036	.138*	-.310*	1
	Sig. (2-tailed)	.001	.014	.056	.028	.008	

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Source: Authors' compilation

Generally, all coefficients are statistically significant, except the correlation between TR and SI (Sig. > 0.05). Both positive and negative relationships are expressed in the table. The strongest correlations are between BI (behavioral intention) and FCE (effortless conditions) as 0.578. Hence, there are enough conditions to conduct a multiple linear regression for six variables. Noticeably, only PR has a negative connection with BI among five

variables, while the others' coefficients are positive. Regression results

□ **Standardized Coefficients and Multiple Collinearity testing**

Initially, significant variables should be identified and collected from the table 5.

Table 5: Multiple linear regression analysis including SI variable

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Constant	.370	.360		1.028	.305		
FCE	.622	.066	.534	9.444	.000	.484	1.868
SI	.010	.035	.011	.271	.787	.939	1.065
PE	.215	.058	.192	3.683	.000	.568	1.760
PR	-.149	.047	-.150	-3.204	.002	.705	1.419
TR	.147	.058	.102	2.545	.012	.961	1.041
Dependent Variable: BI							

Source: Authors' compilation

As can be seen in the Table 5, except SI, the p-value of four independent variables: FCE, PE, PR, and TR are significant (Sig. < 0.05). That means the Social Influence indicator are not correlated with the Behavioral Intention. Therefore, the variable SI is eliminated from the regression equation. The new equation is formed including 4 independent variables PE, FEC, PR, TR and dependent variable BI in order to run the multivariate regression again:

$$BI = \beta_1PE + \beta_2FCE + \beta_3PR + \beta_4TR$$

In which $\beta_1, \beta_2, \beta_3, \beta_4$: estimated coefficients

The new result is in the Table 6 below.

Table 6: Multiple linear regression analysis excluding SI variable

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Constant	.403	.338		1.193	.234		
FCE	.623	.066	.535	9.478	.000	.484	1.865
PE	.215	.058	.192	3.684	.000	.569	1.759
PR	-.152	.046	-.153	-3.329	.001	.733	1.364
TR	.147	.058	.102	2.559	.011	.962	1.040
Dependent Variable: BI							

Source: Authors' compilation

Firstly, the Sig coefficient of three independent variables including Effortless Conditions (FCE), Performance Expectancy (PE), and Perceived Risk (PR) are less than 0.01, which means that independent variables are statistically significant at 1% of the significant level. Alternatively, the Sig coefficient of Trust variables are less than 0.05, which means the Trust (TR) indicator are statistically significant at 5% of the significant level. According to the regression result, the level of AIO smart card implementation in the NEU campus is mainly measured by Effortless Condition determinant with standardized β coefficient as 0.535. In contrast, Trust has the lowest influence with standardized β coefficient as 0.102.

Especially, there are both positive and negative correlation between the Behavioral Intention and other independent variables. Effortless Condition, Performance Expectancy, and Trust have positive impact on the AIO smart card-implementation demand

with positive Beta, while Perceived Risk brings negative influence with -0.153 Beta. From the result, it is undeniable that all four indicators above do have their impact on the smart card implementation project in National Economics University. Secondly, from Table 4.15, the variance inflation factor (VIF) value of four indicators are all lower than 10, which means that there is no multicollinearity problem in the research model (Pallan, 2010).

Model Summary

According to Akossou & Palm (2013), an adjusted R square reflects the impact level of independent variables on dependent variable. It has a range from 0 to 1, however, a good model will contain an "adjusted R square greater" than 50%. The table below compared the model summary before and after excluding the Social Influence variable.

Table 7: The Model Summary

Model	R	R Square	Adjusted Square	R Std. Error	df	Mean Square	F	Sig.
Excluding SI	.785	.616	.610	.53754	4	28.911	100.056	.000

Source: Authors' compilation

It can be revealed that four main indicator Effortless Conditions, Performance Expectancy, Perceived Risk, and Trust can explain 61% the behavioral intention of smart card implementation in NEU. The other 39% is decided by the unknown variables and random error. From the table outcome, the significant level of F-test is 0.000, which is lower than 0.05. Thus, the research model is created suitably for the whole population.

Result Summary Result

The multivariate regression equation of this research is written as follows:

$$BI = 0.192PE + 0.535FCE - 0.153PR + 0.102TR$$

The summary results of all research hypotheses are illustrated in Table 4.7.

Table 8: Summary results of hypothesis testing

Hypothesis	Coef.	p-value	Result
H1: <i>Performance expectancy</i> has a positive effect on NEUers' behavioral intention to use smart card	0.192	0.000	Supported
H3: <i>Social influence</i> has a positive effect on NEUers' behavioral intention to use smart card	-	0.787	Rejected
H5: <i>Perceived risk</i> has a negative effect on NEUers' behavioral intention to use smart card	-0.153	0.001	Supported
H6: <i>Trust</i> has a positive effect on NEUers' behavioral intention to use smart card	0.102	0.011	Supported
H2: <i>Effort expectancy</i> has a positive effect on NEUers' behavioral intention to use smart card	0.535	0.00	Supported
H4: <i>Facilitating conditions</i> has a positive effect on NEUers' behavioral intention to use smart card			

Source: Authors' compilation

5 Discussions

❖ **Performance Expectancy**

From results of the multivariate regression, performance expectancy is proved to have a positive effect on the behavioral intention to adopt all-in-one smart card. This finding is following several previous studies including Venkatesh et al., (2012); (Taherdoost et al., 2009), and Lee, Cheng, and Depickere (2003). Generally, the all-in-one smart card contains a benefit package that users can experience from the ID card, payment card, assess card. Especially, during cashless and minimalism society, a multi-application device can increase life efficiency (Simon Kemp, 2019). In NEU campus, students, teachers, and staffs are compulsory to keep both student/teacher ID card, daily parking card, and their own payment card simultaneously during working time. Because they have already experienced the necessities of those cards, one integration card containing every above function is definitely more convenient and timesaving. However, based on the survey demographical result, all NEU respondents have experienced at least one year in NEU, which means they are used to NEU ID card and parking card. This fact likely leads them to be less astonishing with a new all-in-one smart card. Thus, the effect of Performance Expectancy toward AIO smart card implementation in NEU campus is not so crucial.

❖ **Effortless Conditions**

Effortless Conditions is a combination between two variables Effort Expectancy and Facilitation Conditions, which explains the conditions to use a technology device easier. This finding is not consistent with any prior research because this is the first time the Effort Expectancy and Facilitation Conditions being integration

into one main variable. An unpredictable similar trend in those answers of survey respondents or unqualified answers might create this result. However, Effortless Conditions is revealed to have the strongest positive impact on the behavioral intention to adopt multi-application smart card in NEU campus. The discussion is based on the literature review of these two variables separately.

It is declared that technology customers tend to have open-minded to try a new high-tech equipment if it is not so complicated (E. Slade et al., 2013). On the other hand, the result is different from the research of Arman and Hartati (2015). They stated that the Effort Expectancy had no impact on the using intention. That difference is caused by the popularity of the Internet. More common internet using can relate to easier smart card experiencing because the internet will help the smart card synchronize every information and conduct its function as a payment card. In detailed, using internet is gradually developed in Vietnam by 70% of total population, which increases by 10% between 2019 and 2020 (Simon Kemp, 2020). Considering the survey result, 82% of the total respondents are NEU students, who access to high technology frequently and tend to be quick learning than other ages.

The Facilitation Conditions having a positive effect to the dependent variable is consistent with the result from several researchers (Arman & Hartati, 2015; Thakur, 2013). If there is infrastructure and support for using smart card, the behavioral intention toward using all-in-one smart card will increase. Considering NEU context, it is one of the top economics university in Hanoi, Vietnam with a modern infrastructure and broaden partnership network. Usually, NEU has provided the ID cards with ATM integration for students and teachers. Thus, updating and providing a new AIO smart card is believed should be within the ability of the university. Moreover, mostly survey respondents

experiencing smart card agreed that they had enough essential knowledge to use it.

Overall, the Effortless Condition has a certain influence on the multi-application smart card adoption intention in NEU campus.

❖ Social Influence

Instead of having positive effect (Alaiad & Zhou, 2014; Arman and Hartati, 2015; Chang et al., 2007), Social Influence determinant in this paper has no significant impact on the intentional using AIO smart card. This result happened because a multi-application smart card in campus is not an individual choice. If the NEU starts this smart card implementation, each of all students, teachers, managers, and staffs will be provided their own card to maintain the university synchronization. A basic function of the smart card such as attendance checking will be used every day without considering any social influence. Secondly, the smallest age of this paper's sample size is 18 years old - the age of a mature person. Using a technology device in the university campus are not needed families or friends' consultancy.

❖ Perceived Risk

According to the regression result, Perceived Risk has a negative effect to the behavioral intention of using AIO smart card in NEU campus. This statement is consistent to the researches of Chang et al. (2007); Chao (2019); Dwivedi et al. (2019); Taherdoost (2017) and Yue et al. (2013). The higher riskiness can lead to a down in customers' satisfaction when using smart card. Similarly, to the other technical device, a technology provider usually asks for personal information of a user to create a new account.

Therefore, smart card users are afraid of losing their accounts and their private data any time. Moreover, NEUers are worried about fixing and re-providing their multi-application cards. The all-in-one smart cards is not popular in education purposes generally and in the university campuses particularly. If the card is broken or lost, it will take time to receive a new individual card for the sake of information assurance. There is always a part of careless students dropping or losing their student cards. Fear of losing a smart card containing simultaneously payment feature, student ID, and parking ticket contributes in the customers' perceived risk. However, owing NEU ID card already makes users aware of the risk and become more careful. Hence, the Perceived Risk determinant only create a small impact on the customers' behavioral intention of using AIO smart card in NEU.

❖ Trust

Among five determinants, Trust is the weakest predictor for the using smart card behavioral intention. Nevertheless, it still has a significant positive impact on a new technology adoption like researches from Chao (2019); Taherdoost (2017); Yousafai et al. (2003); and Yue et al. (2013). If the customers believe in the smart card system, they will tend to use the smart card more.

In the context of NEU, users are not worried about providing personal information because the card provider is the university department, which is trustworthy. Moreover, creating and updating smart card's features diversely based on NEU services such as library utilities, canteen services, or parking can keep the interests in users' mind. Overall, Trust has a crucial impact on the behavioral intention of using all-in-one smart card.

6. Conclusion and Recommendations

The results show that in an open and developed environment like NEU, the deployment of smart cards on campus is most affected by effortless conditions - a combination from ease of use and facilitating conditions factors. Other relevant determinants are Performance Expectancy, Perceived Risk and Trust. Based on the main findings, a number of recommendations are made to enable the university to implement this smart card project as soon as possible. By identifying these factors, the University Board of Directors will have an overview of the needs and interests of university students, teachers, managers and staffs for smart cards, thereby, starting to implement smart card project and developed NEU as one of the smart facilities in Vietnam.

In order to implement all-in-one smart card, the university should work with smart card users and the third parties. In addition to encourage users in using AIO smart card more fluently, NEU should issue monthly parking ticket, which contains more discounts comparing to the regular one. In order to save time in parking and taking out the car, the parking lot should be invested automatic card readers. With multi-application smart card, users can process the library room booking for special occasions and orders to borrow books faster. Furthermore, applying smart card in attendance checking is likely to reduce time and effort of teachers and students. During the 4.0 era, creating a related mobile phone app or website to the university card is totally possible. A mobile app for only NEU students and teachers can contain every information about their schedule, personal records, major documents, and so on. Recently, interactive and collaborative online tools such as e-learning and learning networks are included in the updated teaching program (Berková et al., 2019).

With the third parties, NEU should work with the partner banks to widely promote the discount in order to encourage students using their smart card. Moreover, they can create an event promotion to spread their reputation to students, teachers, and staffs. For instance, recharging money on Monday will receive a discount of 5%. Considering several services inside campus such as canteen, coffee shop, and photocopy store; it is recommended that NEU should consensus with them in payment method.

In addition to the achieved results, there are still limitations that the thesis needs to improve, especially the quality and number of questionnaire responses. The questionnaire is not widespread enough to collect a large number of votes. Moreover, the quality of several answers is superficial, not really logical and related to each other. Those irrational surveys were excluded to collect the best data. Limited space for research is also not a small problem when the research is conducted. A number of students, teachers, and staffs still mislead the basic definition of smart card. Each of them experienced smart card in different context with different usage, thus, the sample did not represent for the whole population. Moreover, the model is lack of significant independent variables. To overcome these limitations, the scope of the study needs to be expanded, increasing the sample size based on data income. The research is proposed to expand the study of influencing factors to increase the persuasiveness and objectivity of the research results.

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