International Journal of Research and Review
Vol. 10; Issue: 12; December 2023
Website: www.ijrrjournal.com
Research Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Factors That Influence the Intention to use the IoT Services at Retail Stores Among Vietnamese Students

Duc Trong Tran[1], Van Thu Bui[2]

[1]School of Trade and International Economics, National Economics University, Hanoi, Vietnam
[2]Faculty of Business Management National Economics University, Vietnam

Corresponding Author: Duc Trong Tran

DOI: https://doi.org/10.52403/ijrr.20231212

ABSTRACT

Rapid scaling of adopting the Internet of Things (IoT) technology has been widely seen in several application in retail industry. Developing such technology has been well investigated in the literature; however, few studies have explored the impacts of determinants on its adoption in the retail in-store scenario. This paper aims to investigate the factors influencing the intention to use IoT services at retail stores among Vietnamese students with a research framework developed from the extended United Theory of Acceptance and Use of Technology model that features informational-based readiness. The findings reveal that Performance Expectancy has the strongest impact and Financial Cost is the key barrier to the IoT behavioral intention. This research contributed to the existing knowledge by investigating the factors that influence the student's intention to use the IoT services at the retail stores in such developing country – Vietnam. Based on the findings of our study, IoT adoption might be an effective method to improve the retail shopping experience.

Keywords: Internet of Things, Extended UTAUT model, Informational-based readiness

INTRODUCTION

The rapid development of new technology has sparked a worldwide upheaval known as the 4th Industrial Revolution, resulting in changes in social and economic systems. With the fast growth of the Internet of Things (IoT), artificial intelligence, blockchain, Big Data, and machine learning, Industry 4.0 is dramatically altering human lifestyles and considerably contributing to the creation of new manufacturing techniques and new services. IoT, especially, has been becoming a trend within the business, technology, and social leaders across the globe. Currently, the adoption of IoT has been witnessed in numerous industries such as transportation, logistics, finance, healthcare, and production facilities (Balaji & Roy, 2016). This study concentrates on one of the most momentous drivers of the 4th Industrial Revolution, namely, the IoT, and sheds light on its importance in retail industry. Specifically, we investigate the IoT services' intention to use at retail store from customer viewpoint and by considering the key determinants for its intention to use.

As a result of this digital age, customer demand has escalated due to the obvious widespread use of the Internet for activities such as purchasing, socializing, and just exploring. Thus, combining virtual and dimensions has become a vital part of achieving a successful corporate strategy. Among a variety of business and technological fields, the retail industry is one the prominent areas that adopt IoT. RFID inventory monitoring chips, classic in-store infrared foot-traffic counters, cellular and Wi-Fi tracking systems, digital signage, a kiosk, or even a customer's mobile device are all examples of "things" in retail. With the rapid development of online shopping,

retailers are putting enormous efforts to extend the seamless consumer experience of online purchasing into the store wherever they can, given the tremendous expansion of internet shopping. They want the same rich data and high-performance analytics that retailers use to power their websites and mobile shopping excursions. Their ambition is to have the same level of unrestricted control over the consumer experience while also collecting precise data to assist them forecast how people will purchase. Despite the fact that e-commerce has gained in popularity over the past couple of years, brick-and-mortar stores continue to hold essential benefits to customers that are yet to be caught by the Internet. On the matter, trust is still raising concern among customers with regard to online shopping. These aspects, along with human interaction and the need to "feel" the product, all play a significant influence in the purchasing decision, since they all bring a distinct value to the consumer experience that e-commerce cannot equal (Blázquez, 2014; Oliveira et al., 2017; Piotrowicz & Cuthbertson, 2014).

There are many existing research primarily focusing on IoT design and implementation from the technical perspective (Gao & Bai, 2014), yet there is still lack of studies on the behavioral aspects that influence customers' acceptance and perceptions of IoT technology and/or, their intention to use. Considering the gap in the literature related to both contexts of Vietnam and quantitative research on the adoption of IoT, the key research question of this study is: What are the main factors influencing the student's intention to use IoT services at retail stores in Viet Nam? The research is theoretically based on UTAUT model; we extend it by including financial cost, and informational-based readiness variables, with gender and level of experience as demographic factors. Understanding customers' decision and behaviors when adopting IoT technology is crucial for both retailers and technology suppliers to create appropriate strategies to improve smooth execution as well as to increase the rate of their intention to use. The remainder of this paper is organized as follows. First, we present a literature review on general research about IoT adoption. In the next section, we develop the hypothesis and propose the research model, followed by the research methodology and then research findings and discussions. The final section concludes.

LITERATURE REVIEW

IoT Ecosystem

The IoT was invented in year 1999 by Kevin Ashton, a British technology enthusiast, being its primary objective to connect information captured in the actual world to the Internet under the premise of "supporting the communication between anything from anywhere, at any time through context-aware applications". The Internet's high penetration rate, as well as the development of smart computers with remote control and data sharing capabilities can benefit the business world. At its most basic level, IoT is made up of a a microprocessor and a communication antenna. Radio frequency identification (RFID) controls inventories or conducts other related activities based on the principle of scanning and reusing information several times (Gubbi et al., 2013).

IoT is advancing at a tremendous pace throughout the globe. The global IoT market was estimated at US$190 billion in 2018, according to the "Fortune Business Insight" report, and is expected to be worth US$1102.6 billion by 2026. Moreover, another study conducted by the insurance company Lloyd's, namely "Networked World: Risks and Opportunities in the Internet of Things", demonstrates that more than 20 billion connected devices will be available all over the globe in 2025, while it was forecasted by McKinsey that IoT applications will affect the economy up to US$11,1 trillion per year by 2025 (McKinsey Global Institute, 2015).

The Internet of Things (IoT) is the connection and exchange of information between all entities (people or things) in life, creating a network of connections between all entities, allowing any entity to be

connected. link to other entities in the network, collect and exchange data with each other. Thanks to the emergence of IoT, the world has become open, offering endless opportunities and almost endless connections at home, at work or at play. This is partly because IoT is not just a single technology, but an overarching phrase used to describe a broad set of application technologies. Executives and strategists from businesses share that IoT is "just getting started" and will contribute to powerful business transformation in the future.

For retailers, creating an IoT ecosystem inside their organization can be a complex and difficult activity. IoT is a relatively new market with many layers of inventors and users, communication services, software providers, and information technology service providers. It is clear that the IoT system has been shortening the distance from the seller to the consumer. Customers will experience the feeling of walking and shopping around the stores using smartphones, tablets or other devices connected to the internet. Customers can search for any product in the store using their own device, contact customer support, find the right products for them.

Behavioral intention

Intention is a measure of an individual's ability to perform a behavior. The Theory of Reasoned Action (TRA) built in the late 60s of the twentieth century and revised extensively in the 1970s is one of the most popular and important theories when it comes to behavioral intention studies. This theory shows that behavioral intention is the most important factor to predict consumption behavior (Actual Behavior). A decade later, Davis (1985) proposed the Technology Acceptance Model (TAM) to explain the factors affecting technology acceptance and technology user behavior on the basis of the TRA theory. The TAM model investigates the relationship and impact of perceived ease of use and perceived usefulness factors on attitudes, thereby affecting users' intention and behavior in accepting technology. Therefore, researchers identify intention as a direct antecedent to technology use behavior in the TAM model.

Hill et al. (1987) found that through behavioral intentions, user actions can be significantly predicted. Therefore, behavioral intention is considered as the extent to which a conscious individual is willing to make a planning decision, thereby performing the behavior.

Ajzen (1991) inherited and developed from the TRA theory to give birth to the Theory of Planned Behavior (TPB), which holds that intentions help motivate and demonstrate a person's efforts when they willing to perform a particular behavior. Intention to use mobile applications is the willingness of users to use applications on mobile devices in the future (Venkatesh & Davis, 2000). The study of Zhang et al. (2012) also made the comment that the intention to use is a very important concept in the study of consumer behavior, and at the same time, they found that the intention to use is a prerequisite factor. determine actual consumer behavior.

In addition to the term behavioral intention, academics have researched and developed the term technology usage intention, which is defined as the extent to which consumers want to use technology in the future. Teo (2011)id entify the intention to use a technology as a form of technology acceptance behavior related to ease of use and usefulness that customers feel. Several studies have shown that teachers are more likely to intend to use technology because they perceive the ease and usefulness of technology in teaching and learning. Therefore, the study focuses on examining and evaluating the factors affecting the intention to use IoT services at retail stores of students in Hanoi city.

RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

Based on the literature and the conceptualization of the TAM, TRA, TPB, IDT, SCT, and UTAUT, we develop a conceptual model of factors for IoT's behavioral intention as presented in Fig 1.

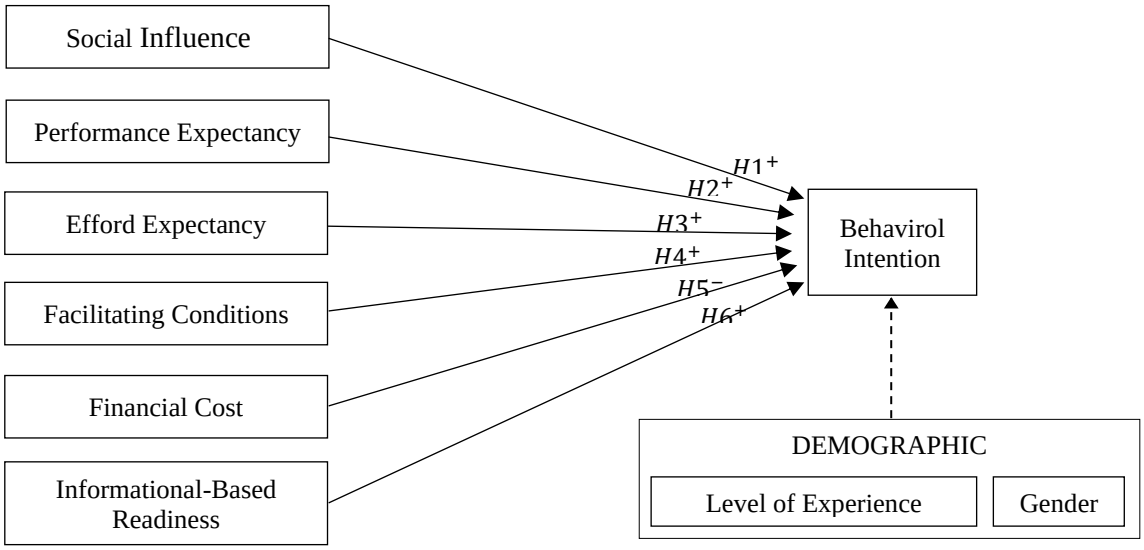

Figure 1: Conceptual Model

The model consists of six independent variables that are extracted from the literature, namely Social Influence, Performance Expectancy, Effort Expectancy, Facilitating Conditions, Financial Cost, and Informational-based Readiness. Additionally, there are two demographic factors in our model, including gender and level of experience. Table 1 illustrates the research hypotheses.

Table 1. Research Hypotheses.

Hypotheses	
H1	Social Influence positively influences Vietnamese student's intention to use the IoT services in retail stores.
H2	Performance Expectancy positively influences Vietnamese student's intention to use the IoT services in retail stores.
H3	Efford Expectancy positively influences Vietnamese student's intention to use the IoT services in retail stores.
H4	Facilitating Conditions positively influences Vietnamese student's intention to use IoT services in retail stores.
H5	Financial Cost negatively influences Vietnamese student's intention to use the IoT services in retail stores.
H6	Informational-Based Readiness positively influences Vietnamese student's intention to use IoT services in retail stores.

Social Influence

According to Bearden et al. (1989), Social influence has been identified in sociology, social psychology, economics, and consumer research as one of the important determinants of individual behavior. In the case of technology adoption, Venkatesh et al. (2003) suggest that there is a positive relationship between social influence and behavioral intention. Hsu & Lu (2004) also argue that technology adoption behaviors are mostly influenced by social factors, that is, people follow others to gain social approval. A study by Chong et al. (2010) found that consumers consider the opinions of family and friends before using a mobile device, and if others disapprove of the adoption, they will reject the new technology.

Kulviwat et al., (2009) stated that social influence plays an essential role in consumer adoption, especially in technological innovations. Kulviwat et al. (2009) illustrated that social influence affects social media users' intention to adopt technological innovation and confirmed that social influence has a positive impact on customer adoption intention. Hence, the following first hypothesis are drawn:

H1: Social influence positively influences Vietnamese student's intention to use the IoT services in retail stores.

Performance Expectancy

Performance expectancy (PE) is defined as the degree to which adopting a technology brings effectiveness to users in performing certain activities (Venkatesh et al., 2003). Benefits and advantages of the system can increase perceived usefulness of end customers. The benefits and advantages that are gained from the system could enhance the

perceived usefulness of the customers (Venkatesh et al., 2003). In the context of IoT, perceived usefulness suggests that individuals find the IoT services useful because it enables them to enhance his or her overall performance in everyday situations (Kowatsch & Maass, 2012). Technology performance expectancy can predict the behavioral intention to adopt the technology for future use. Acquity Group (2014) found that one of the most important factors for the adoption of IoT services in the US is the usefulness of the technology. Similarly, Coughlan et al. (2012) and Gao & Bai (2014) suggested that perceived usefulness is a significant predictor of the intention to use IoT services. Therefore, performance expectancy of IoT can enhance the adoption of IoT. Thus, we can hypothesize as follows:
H2: Performance expectancy positively influences Vietnamese student's intention to use the IoT services in retail stores.

Effort Expectancy

Effort expectancy (EE) refers to "the degree of ease associated with using the system" (Venkatesh et al., 2003). The concept of effort expectancy is closely related to the concept of ease of use in TAM. In the initial use of a technology especially, such as the acceptance of an innovation, the level of ease associated with using that technology strongly affects the acceptance behavior (Cimperman et al., 2016). Accordingly, the degree to which users perceive a technology as being easy to use affects their perception of the utility of the technology, making effort expectancy the precursor to perceived usefulness (Pal et al., 2018). Gao & Bai (2014) pointed out that perceived ease of use has a significant effect on the behavioral intention to use IoT services in China. Similar findings were derived by Yong Wee et al. (2011) who investigated the adoption of technology among students. The findings show the ease of use is one of the factors that affect the behavioral intention of students. Abu et al. (2014) in their literature review found that ease of use is one of the most important factors for the adoption. Therefore, Effort expectancy may have positive influences on intention to use IoT services. Accordingly, the following is hypothesized:
H3: Effort Expectancy positively influences Vietnamese student's intention to use the IoT services in retail stores.

Facilitating Conditions

Facilitating Conditions (FC) refer to the availability of technological resources and technical infrastructure. Facilitating conditions can significantly predict the intention to adopt technology or innovation. Moreover, facilitating conditions are closely associated with the conceptualization of perceived behavioral control (Gao & Bai, 2014; Venkatesh et al., 2003). At the same time, facilitating conditions may positively influence consumers' perceived ease of use of connected devices. Moreover, previous studies have highlighted the connection between the availability of technological resources and technical infrastructure, and their perceived usefulness. The authors of these studies argue that there is a positive connection between the perceived usefulness of using connected devices and associated facilitating conditions (Bhattacherjee & Hikmet, 2008; Heinz et al., 2013). Therefore, the following hypothesis is proposed:
H4: Facilitating Conditions positively influences Vietnamese student's intention to use the IoT services in retail stores.

Financial Cost

According to Venkatesh et al. (2012), the financial costs demonstrate the consumer's perception of the trade-off between the benefits of using services and the monetary costs of using them. It incorporates things, for example, the cost of the data service operators (mobile Internet), the cost of purchasing the equipment, and also the service charges. Numerous researchers in IoT Technology have found that cost is an important factor. For instance, Kin and Shin (2015) found that cost significantly affects the adoption of IoT services in Taiwan. Similarly, the results of a survey conducted by Acquity Group (2014) in the United States

discovered that one of the most concerns of customers when considering adopting IoT services is cost. Researchers have observed that low expense is one factor that encourages customers to take on technology while higher cost is the opposite (Seyal & Rahim, 2006). Nagy et al. (2018) demonstrated that since IoT is a new definition for consumers, they face many difficulties regarding the reception of IoT products/services. As a result, potential clients do not understand the value IoT will bring to them and may not address high prices for their utilization. Therefore, the financial cost can be considered as a barrier in the intention to use devices that applied IoT technology. We hypothesize as follow:

H5: Financial cost negatively influences Vietnamese student's intention to use the IoT services in retail stores.

Informational-based Readiness

In 2009, the term "User's Informational-Based Readiness- UIBR) was proposed by Zolait, Mattila, and Sulaiman in an attempt to understand the influence of related information on the application of new technology to the behavioral intentions of potential users. The UIBR is defined as the perception of potential users of the relevance of a new technology introduced or recommended in the market by the influencers like the experts. Accordingly, UIBR is evaluated through 4 parts of the individual level:

Awareness- the potential adopter's awareness that innovation exists (Roger, 1995)

Customers' awareness of new technology is one of the key factors affecting acceptance or adoption of any innovative service and product. Kwon & Zmud (1987) argue that awareness is an important prerequisite for innovation and that users' positive awareness of innovation can lead to their adoption. Research by Diagne & Demont (2007) also emphasizes that awareness is the cause of the rapidly increasing rate of new technology adoption. Therefore, the adoption of new technology is a significant stage in the perception of information about the innovation or new technology (Gichuki & Milcah, 2018; Mannan et al., 2017).

Knowledge- refer to the fact that an individual has the necessary information and understanding about how to use new technologies (Rogers, 1995; Hall et al., 1977)

Khatun et al. (2015) argue that the current user's knowledge of how to use the network will influence the future adoption of network-related services. In addition, Martins & Oliveira (2008) also found that individuals possessing higher levels of knowledge are more likely to become early adopters and intensive users of innovation or technology.

In a study conducted in Finland and Korea by Lee et al. (2007), Finns were interviewed about the need to use mobile banking, and a conclusion was reached that one of the factors hindering the use of mobile banking is the lack of knowledge about the services available and how to use them.

Experience - personal experiences of using technology-related services or work (Mattila et al., 2001)

Mattila et al. (2001) assert that personal experience can influence attitudes towards the use of an information system, thereby increasing the willingness to use it.

In 2003, Wang and colleagues explored previous studies and showed a positive relationship between experience and computer technologies. The experience that an individual has accumulated through the process of learning is extremely important because it contributes to the understanding of certain properties or features of the new technology.

Exposure - the individual's exposure to new technology (Chang, 2004)

Al-Ashban & Burney's (2001) have studied the findings of online banking and found that adoption is a process in which the more customers can be exposed to innovation the more they understand and trust the service. Therefore, their frequency of use of that innovation or technology could increase.

The results of the above assessment have shown that potential users' ability to access and contain information is a tool to enhance individuals' beliefs and decisions to the intention of adopting or rejecting innovation or new technology. Furthermore, Zolait et al.(2009) also confirmed that users with a higher level of information-based readiness have a higher intention to adopt online banking. From there, the authors propose the following hypothesis:

H6: Informational-Based Readiness positively influences Vietnamese student's intention to use the IoT services in retail stores.

MATERIALS & METHODS

Questionnaire Development

The structured questionnaire consists of two main sections: Section A requested demographic information, and Section B (which contained 31 measurement items; Table 1 examined the factors affecting Vietnamese student's behavioral intention to use IoT services at the retail stores. The 31 measurement items were adapted from the extentend UTAUT model by Venkatesh et al. and to make them relevant to the current context and were measured on a five-point Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Data Collection

The target population for this study was Vietnamese youngsters who have the habit of shopping at the retail stores and different levels of using technology. Also, they are experienced in using advance technology applied in retail stores such as QR code payment, self-service store, Virtual Reality (VR)… The focus of the research is to collect data on the IoT users' behavioral intention in the retail stores. The survey aims to measure the main factors influencing the intention to use the IoT services at the retail stores among the students. These factors are Social Influence, Informational-based Readiness, Performance Expectancy, Effort Expectancy, Facilitating Conditions, and Financial Cost.

We applied the quantitative method, and the data was collected through online survey of the questionnaire. The questionnaire was created using Google.Doc tools and after a week conducting survey, the questionnaire received 1536 responses, of which 36 demonstrated that they were not young people and/or answering all the same responses. Consequently, all the invalid responses were removed from the sample, and this left the study with a total of 1500 responses for analysis. Table 2 summaries the basic demographic characteristics of the sample.

Data Analysis

The data was analyzed using descriptive techniques and the computer program Statistical Package for Social Sciences (SPSS) version 22.0. To test H1, H2, H3, H4, H5, H6 relating to the relationship between those proposed determinants and the intention to use the IoT services, multiple regression analysis is performed. Also, Exploratory Factor Analysis (EFA) is used in order to determine the constructs' convergent and discriminant validity.]

RESULT

Demographic Analysis

A total number of 1500 responses were utilized in the analysis. The demographic information of the respondents is shown in Table 2. With regard to gender, females dominated (58.67%) over males (41.33%). In terms of age, the majority of respondents was 23 -to-27-year-old people with over a half, which doubled the figure for 18 – 22 group. Most of the youngsters surveyed were employee, while the undergraduate and the postgraduate made up about 26% and 5% respectively. Besides, it is obvious that most of respondents earn over 10 million Vietnam Dong per month, with roughly 45%. Additionally, the vast majority of the respondents were reported to go shopping at retail stores, with nearly 98%. To be specific, those shopping at retail stores 3 – 5 times per month constitute approximately 28.73% while over 6 times categories made up over a

half. In terms of well-known technological services applied at retail stores, the majority of the respondents consider online payment to be the most prominent one (99.73%), followed by "self service" (61.60%) and "facial recognition" (27.20%). Finally, most of the respondents are experienced with technological services, at about 97%.

Table 2. Demographic Characteristics

Number	Demographic		Frequency	Proportion (%)
1	Gender	Male	620	41,33%
		Female	880	58,67%
2	Age	18 – 22	387	25,80%
		23 – 27	842	56,13%
		28 – 32	211	14,07%
		33 and above	60	4,00%
3	Occupation	Undergraduate	385	25,67%
		Postgraduate	77	5,13%
		Employee	1038	69,20%
4	Income per month	Under 2 million VND	265	17,67%
		2 – 5 million VND	348	23,20%
		5 – 10 million VND	219	14,60%
		Above 10 million VND	668	44,53%
5	Shopping at retail stores	Yes	1463	97,53%
		No	37	2,47%
6	Shopping at retail stores frequency per month	<3 times	306	20,40%
		3-5 times	431	28,73%
		6-10 times	453	30,20%
		>10 times	310	20,67%
7	Technological services known (multiple answers are accepted	Self-service	924	61,60%
		Online payment (QR code, Zalo Pay, MoMo, VNPay…)	1496	99,73%
		Facial recognition	408	27,20%
		Others	4	0,27%
8	Experience with technological services	Less experienced	44	2,93%
		Experienced	1456	97,07%

Reliability and Validity Measurement

The reliability of the construct measures was evaluated via analysis using Cronbach's α. Table 3 shows the result of the reliability analysis, and it is seen that all Cronbach's α topped 0.70, (an adequate cut-off as noted by Hair et al. (2010), thereby confirming that all measures are rigorous in terms of their reliability.

Table 3: The results of the scales' reliability testing

Factors	Cronbach's Alpha coefficient	Cronbach's Alpha if item deleted	Number of variables removed
Social Influence (SI)	0,852	0,685-0,724	0/5
Informational-based readiness (IBR)	0,760	0,681-0,747	0/6
Performance Expectancy (PE)	0,857	0,528-0,706	0/4
Effort Expectancy (EE)	0,907	0,366-0,505	0/4
Facilitating Conditions (FC)	0,751	0,541-0,731	0/4
Financial Cost (FCo)	0,700	0,539-0,794	0/3
Behavioral Intention (BI)	0,879	0,852-0,891	0/5

In an effort to test for the convergent and discriminant validity of the constructs, Exploratory Factor Analysis (EFA) was employed. The Kaiser-Meyer-Olkin measure of sampling adequacy was found to be 0.887. Therefore, the application of factor analysis was deemed appropriate. Hair, Anderson, Tatham, and Black (1998) indicated that in order to determine the minimum loading necessary to include an item in its respective construct, variables with loading greater than 0.3 were considered significant; loading greater than 0.4, more important; and loadings of 0.5 or greater were quite significant. In this study, items with loading of 0.5 or greater are accepted. We conducted two rounds of factor analyses. The initial stage suggested that six factors could be

extracted. As a result, Varimax rotation with factor loading was then generated. The Kaiser's criterion of eigenvalues greater than 1 (see Field, 2009; Stevens, 1992) yielded a six-factor solution as the best fit for the data, accounting for approximately 54.2% of the variance. The results of this factor analysis are presented in Table 4.

Table 4: The results of exploratory factor analysis (EFA) for independent variables.

Pattern Matrix[a]	Factor					
	1	2	3	4	5	6
SI3	0,710					
SI5	0,700					
SI4	0,681					
SI2	0,633					
SI1	0,562					
EE2		0,730				
EE4		0,719				
EE1		0,563				
EE3		0,524				
IBR4			0,748			
IBR5			0,719			
IBR3			0,703			
IBR6			0,664			
IBR2			0,536			
IBR1			0,528			
PE3				0,772		
PE2				0,740		
PE4				0,637		
PE1				0,591		
FC1					0,750	
FC2					0,745	
FC3					0,734	
FC4					0,631	
FCo3						0,854
FCo2						0,825
FCo1						0,661
Eigenvalues	5,882	2,033	1,856	1,646	1,457	1,226
Accumulative distribution (%)	22,623	30,444	37,582	43,914	49,517	54,234

Note: SI: social influence; EE: effort expectancy; IBR: informational-based readiness; PE: performance expectancy; FC: facilitating conditions; FCo: financial cost

Multiple Regression Results

The purpose of conducting a regression analysis using SPSS is to identify the factors that influence young people's intention to use the IoT services at retail stores in Vietnam. The analysis is to test the hypotheses of this study.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Constant	3,926E-018	0,034		0,000	1.000		
Social Influence	0,387	0,034	0,387	8,372	0,000	1,000	1,000
Effort Expectancy	0,371	0,034	0,371	8,043	0,000	1,000	1,000
Informational-Based Readiness	0,299	0,034	0,299	6,775	0,000	1,000	1,000
Performance Expectancy	0,447	0,034	0,447	8,793	0,010	1,000	1,000
Facilitating Conditions	0,295	0,034	0,295	4,369	0,012	1,000	1,000
Financial Cost	-0,260	0,034	-0,260	-1,815	0,01	1,000	1,000
R Square: 0,556; Adjusted R Square: 0,552 *Dependent Variable: Behavioral Intention*							

Table 5 shows the result of hypotheses testing of this study. The results indicate six variables, Social Influence (SI), Performance Expectancy (PE), Effort Expectancy (EE), Informational-based Readiness (IBR), Facilitating Conditions (FC), and Financial Cost (FCo), influence youngsters' behavioral intention (BI) to use the IoT services at the retail stores in Vietnam. PE (β=.447, Sig.= .000) and SI (β=.387, Sig.= .000) made a crucial contribution to BI, followed by EE (β=.371, Sig.= .000), which had made a less

essential influence. Because the Sig. value is less than 0.05, these results supported H1, H2, and H3 about the positive contribution of SI, PE, and EE to BI for IoT use of the student. Also, for the fourth hypothesis, the results demonstrated that FC (β=.295, Sig.= .000) impacts positively to BI. The Sig. value is less than 0.05. Therefore, H4 is accepted.

Table 6. Results of hypothesis testing

	Hypothesis	Results
H1	Social Influence positively influences Vietnamese student's intention to use the IoT services in retail stores.	Supported
H2	Performance Expectancy positively influences Vietnamese student's intention to use the IoT services in retail stores.	Supported
H3	Efford Expectancy positively influences Vietnamese student's intention to use the IoT services in retail stores.	Supported
H4	Facilitating Conditions positively influences Vietnamese student's intention to use IoT services in retail stores.	Supported
H5	Financial Cost negatively influences Vietnamese student's intention to use the IoT services in retail stores.	Supported
H6	Informational-Based Readiness positively influences Vietnamese student's intention to use IoT services in retail stores.	Supported

Furthermore, it is shown that FCo (β=-.260; Sig.= .013) had a considerably negative influence on BI. As the Sig. value is less than 0.05, H5 is accepted. For the last hypothesis, the effect of IBR on Behavioral Intention is remarkable (β=.299; Sig.= .000). The Sig. value is less than 0.05, which lead to H6 is accepted.

DISCUSSION

The extended UTAUT model is applied in this study to determine factors that impact the student's intention to use the IoT services at the retail stores in Vietnam. The results indicate various useful insights into the behavioral intention to use the IoT services from youngsters' perspective. The impact of the UTAUT variables of PE, EE, SI, and FC on BI was examined by extending the model with Informational-based readiness, in order to response to the study's question. All of six hypotheses were supported, which presented in Table 5. This finding supported most of the hypothesized relationships among UTAUT model variables (H1, H2, H3, H4). As a result, the most influential determinants were found to be PE and SI. PE is often conceptualized as the strongest factor of BI (Reyes-Mercado, 2018; Tavares & Oliveira, 2017; van der Vaart et al., 2016; Venkatesh et al., 2003), since adopters are generally interested in knowing the benefits of technology for their performance. PE might be critical for the technology choice (Reyes-Mercado, 2018; Tavares and Oliveira, 2017; van der Vaart et al., 2016). Moreover, based on the findings, we found that financial cost is the biggest hindrance of behavioral intention to use the IoT services among Vietnamese students. Thus, inventors, retailers or/even marketers must consider cost when implementing this technology for retail sector.

CONCLUSION

IoT has turned into the innovation of choice for the current society and the future as well. Previously, IoT adoption by purchasers and business associations is ignored. This study has made a significant contribution to the current knowledge pertaining to consumer behavioral intention of IoT. Also, it addressed the issue of technology-related determinants for performance expectancy, effort expectancy with the prevailing facilitative condition for technology, and other additional determinants namely social influence, financial cost, and informational-based readiness. Moreover, it is seen that most studies explored IoT adoption in developed nations and western countries. This research contributed to the existing knowledge by investigating the factors that influence the student's intention to use the IoT services at the retail stores in such developing country – Vietnam. Based on the findings of our study, we believe that IoT adoption might be an effective method to improve the retail shopping experience.

The biggest limitation of this study is its research design, which severely limits the generalizability and representativeness of its findings, though it effectively demonstrates in-depth conclusions in a narrowly-

examined context. Moreover, the study did not incorporate the actual use of IoT in the proposed model. Finally, future research should focus on the qualitative aspects of IoT adoption to explore the prospective adopters' perceptions of IoT adoption. Also, adding potentially moderating variables into the model, for example, age, and perceived trust would be useful in order to expand the explanatory information.

Declaration by Authors
Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Duc Trong Tran, Van Thu Bui. Factors that influence the intention to use the IoT services at retail stores among Vietnamese students. *International Journal of Research and Review*. 2023; 10(12): 91-103. DOI: *https://doi.org/10.52403/ijrr.20231212*

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