



Research Paper

# Factors affecting students' decision to use bus services in Hanoi

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## Abstract

This study identifies the factors affecting students' decision to use bus services in Hanoi. We surveyed 250 university students in Hanoi and analyzed the data using structural equation models. The results show that there are three factors affecting students' decision to use bus services in Hanoi, namely: accessibility, awareness, and safety and comfort. In particular, safety and comfort is the most important factor, followed by awareness and accessibility.

**Keywords:** SEM, students' decision, Hanoi

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## I. Introduction

A public transport system, including buses, is important in reducing traffic congestion and environmental pollution. For that reason, many countries have invested in a modern public transport system. In particular, the bus system plays a vital role in transporting passengers and connecting different types of traffic. However, in many developing countries, including Vietnam, public buses are not a top priority.

In Vietnam, as of 2020, there are nearly 4.5 million cars and more than 60 million motorbikes, concentrated in big cities. In Hanoi, the number of motorbikes accounts for 86% of the total number of vehicles on the road. This calls for more efforts to develop a modern, accessible public transport system and to form among people the habit of using public transport, which should be aided by proper understanding of people's choices of means of transportation. Since students are among the potential passengers, this study investigates students' decision to use bus service.

## II. Overview of factors affecting the decision to use the bus

A number of studies have investigated the factors affecting the decision to use public transport. These factors are accessibility, safety, comfort and cleanliness, quality of service delivery, and user perception. The factors affecting the decision to use public transport (buses) vary across countries due to differences in economic conditions, culture, and norms.

### 2.1. Accessibility

Accessibility is one of the critical factors determining passenger satisfaction with the quality of public transport. Several studies have shown that the distance from home to public transport stops (Huong et al., 2015) or the distance between stops (Gkiotsalitis et al., 2021; Vu Hong Tuong and Ha Thanh Tung, 2018) have a strong influence on the decision to use public buses. In addition, accessibility to public bus services is reflected in other aspects such as availability of bus schedule information (display screens on the bus or at bus stops, apps, etc.), and availability of vehicles in the event of an emergency.

### 2.2 Safety

Safety is one of the leading factors determining passenger satisfaction with public transport. On and Hang (2020) evaluated the safety of buses in terms of safety with property, life, security, and order on the bus and driving style. Tuong and Tung (2018) indicated that in 2010 the number of people choosing the bus due to safety was 20%. As passengers prioritize safety and security more and more, the figure has gone up to 30%, and is expected to be even higher in the future.

### 2.3. Comfort and cleanliness

Comfort and cleanliness directly influence the quality of public transport services, therefore, directly affects the decision to choose the service (D' Ovidio et al., 2013). Comfort and cleanliness are measured by: spacious, clean, odor-free, garbage-free, clean stops, seats and covers, average occupancy, and air conditioning on the vehicle (Truong and Tung, 2018; Fairouz et al., 2021; Silva et al., 2021).

### 2.4. Awareness

Accessibility, safety and comfort and cleanliness have been proved as important factors affecting people's choice of bus use. However, there have been few studies examining factors affecting students' decision, a very important group of passengers. Furthermore, awareness of the impact of bus use on socio-economic issues as a potential factor has not been studied in previous research. Today, green growth has become an inevitable trend in the modern world economy. Awareness of the impact of bus use on economic - environmental - social issues is reflected in aspects such as: reducing emissions, saving natural resources, reducing traffic congestion. This study aims to bridge these gaps, investigating students's decision to use bus services, including students's awareness as a potential determinant.

## III. Analysis results of factors affecting the decision to choose to use buses in Hanoi

### 3.1. Research methods

The study surveyed 250 university students in Hanoi using questionnaires. The data collected were then analyzed using the linear structural models to identify the factors influencing the decision to use bus. The analysis consists of four steps: descriptive statistics, data reliability analysis using Cronbach's Alpha, Exploratory Factor Analysis - EFA, and Confirmatory Factor Analysis - CFA.

### 3.2. Evaluation of the results of analysis of factors affecting the decision to choose to use buses in Hanoi

#### a. Descriptive statistics results

Table 1 presents the descriptive statistics of the study.

**Table 1:** Descriptive statistics results

Group		N	Rate
Gender	Female	170	68%
	Male	80	32%
Place of birth	Hanoi	93	37.2%
	Other	157	62.8%
Part time job	Yes	139	55.6%
	No	111	44.4%
Living arrangement	With family	148	59.2%
	Hostel	41	16.4%
	Dormitory	61	24.2%
Owning personal vehicles	Yes	153	61.2%
	No	97	38.8%
Frequency	Do not use	12	4.8%
	Sometimes	129	51.6%
	Regularly	65	26%
	Very often	44	17.6%
Purpose	Go to work	64	25.6%
	Go to school	112	50.8%
	Go to play	54	21.6%
	Other	5	2%

#### b. Cronbach's alpha reliability test

Table 2 presents the results of the reliability test of the scale of each group of factors. The results of Cronbach's Alpha analysis show that all five groups of factors meet the requirements of Cronbach's Alpha coefficient greater than 0.8.

**Table 2:** Cronbach's Alpha reliability analysis

No	Factors	Cronbach's Alpha
1	Accessibility (KNTC)	0.849
2	Safety (TAT)	0.852
3	Comfort and cleanliness(TTSS)	0.847
4	Awareness (NT)	0.825
5	Deciding to use the bus (QSDS)	0.818

#### c. Exploratory factor analysis (EFA)

After performing Cronbach's Alpha analysis, we conducted exploratory factor analysis (EFA) to determine the convergence and discriminant of the scales. We used Principal Axis Factoring and Promax rotation to analyze EFA exploratory factors.

The fourth result, with 20 observed variables; the KMO coefficient is 0.896 ( $0.5 < \text{KMO} < 1$ ), and the Bartlett Test has a significance level of 0.000 ( $< 0.05$ ), the total variance extracted is 55.8%, all meet the requirements. The factor loading factors in the matrix pivot table are all greater than 0.5. The results also show four factors extracted, and the observed variables are satisfied regarding the loading coefficient (Table 3). Thus, 20 observed variables converge and divide into four factors. After four times of EFA analyses, the results obtained are four groups of factors with 20 observed variables that fit the model. However, the groups of factors have mixed composition. Some components of the scale belonging to the safety factor (TAT) and the comfort and cleanliness factor (TTSS) are grouped together. The excluded observed variables include: TAT2, TAT1, KNTC3, KNTC7, QDSD4, TAT4, TAT3, NT6.

**Table 3:** Factor rotation matrix

Variables	Factors			
	1	2	3	4
TAT5	.818			
TMSS4	.792			
TMSS2	.771			
TAT6	.738			
TMSS3	.592			
TMSS1	.592			
TMSS5	.511			
NT1		.875		
NT2		.864		
NT3		.838		
NT5		.538		
NT4		.537		
KNTC4			.895	
KNTC5			.792	
KNTC6			.620	
KNTC1			.518	
KNTC2			.513	
QDSD3				.911
QDSD2				.750
QDSD1				.616

*d. Confirmatory factor analysis*

After performing exploratory factor analysis, the study conducted confirmatory factor analysis CFA, and the standardized regression weights showed that most of the consequences were more significant than 0.5. The CFA results show that the model has 164 degrees of freedom  $\text{CMIN}/\text{df} = 2,339/3$  (Carmines and Mciver, 1981);  $\text{CFI} = 0.91 > 0.9$ ;  $\text{GFI} = 0.864 > 0.8$  (Tabacknick et al., 2007),  $\text{TLI} = 0.896 > \text{RMSEA} = 0.073 < 0.08$  (Hu and Bentler, 1999) is shown below (Figure 1). Thus, the model perfectly fits the data set.

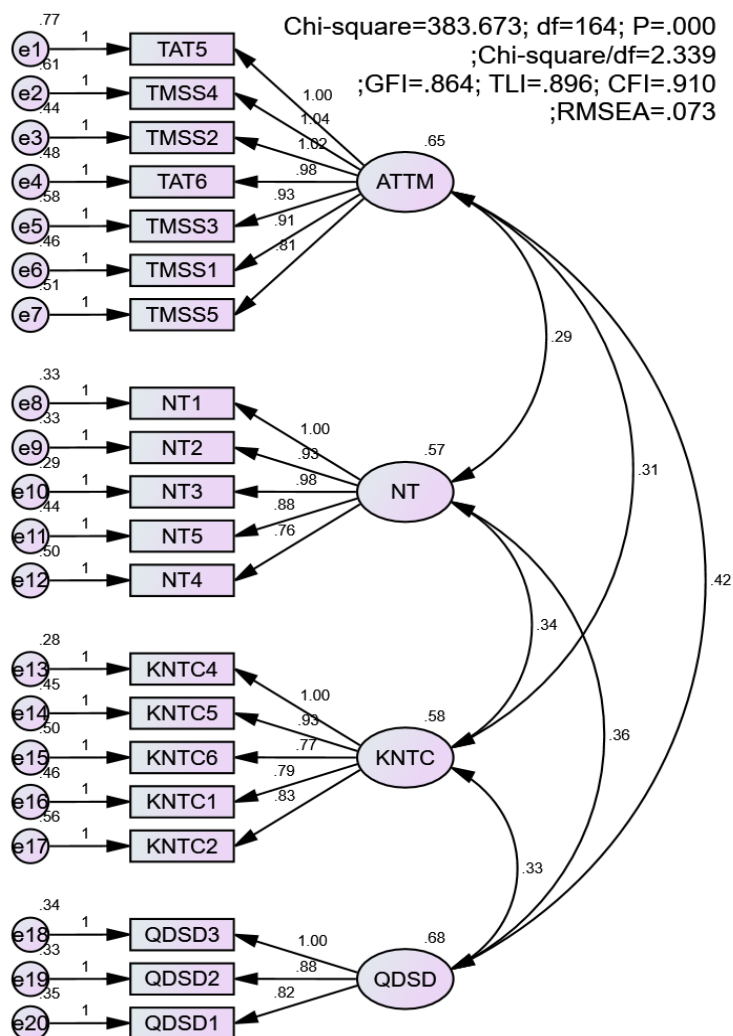


Figure 1: The results of factor analysis confirm the overall model scale

Gerbring and Anderson (1988) showed that the qualified scale achieves the convergent value when the normalized weights of the scale are all higher than 0.5, and are statistically significant ( $p < 0.05$ ). Thus, the obtained research results show that all observed variables satisfy the requirements, as shown in Table 4.

Table 4: Standardized Regression Weight

			Estimate
TAT5	<---	ATTM	.676
TMSS4	<---	ATTM	.730
TMSS2	<---	ATTM	.777
TAT6	<---	ATTM	.754
TMSS3	<---	ATTM	.699
TMSS1	<---	ATTM	.735
TMSS5	<---	ATTM	.675
NT1	<---	NT	.796
NT2	<---	NT	.775
NT3	<---	NT	.811
NT5	<---	NT	.709
NT4	<---	NT	.631
KNTC4	<---	KNTC	.822
KNTC5	<---	KNTC	.726
KNTC6	<---	KNTC	.642
KNTC1	<---	KNTC	.664
KNTC2	<---	KNTC	.647

QDSD3	<---	QDSD	.814
QDSD2	<---	QDSD	.785
QDSD1	<---	QDSD	.752

The results after adjustment show that the model has 164 degrees of freedom  $CMIN/df = 2,139 < 3$  (Carmines and McIver, 1981);  $CFI = 0.925 > 0.9$ ;  $TLI = 0.925 > 0.9$  (Tabachnick et al., 2007),  $GFI = 0.879 > 0.8$  (Baumgartner and Homburg (1995)  $RMSEA = 0.068 < 0.08$  (Hu and Bentler, 1999) is shown in Figure 2. Thus, the model perfectly fits the data set.

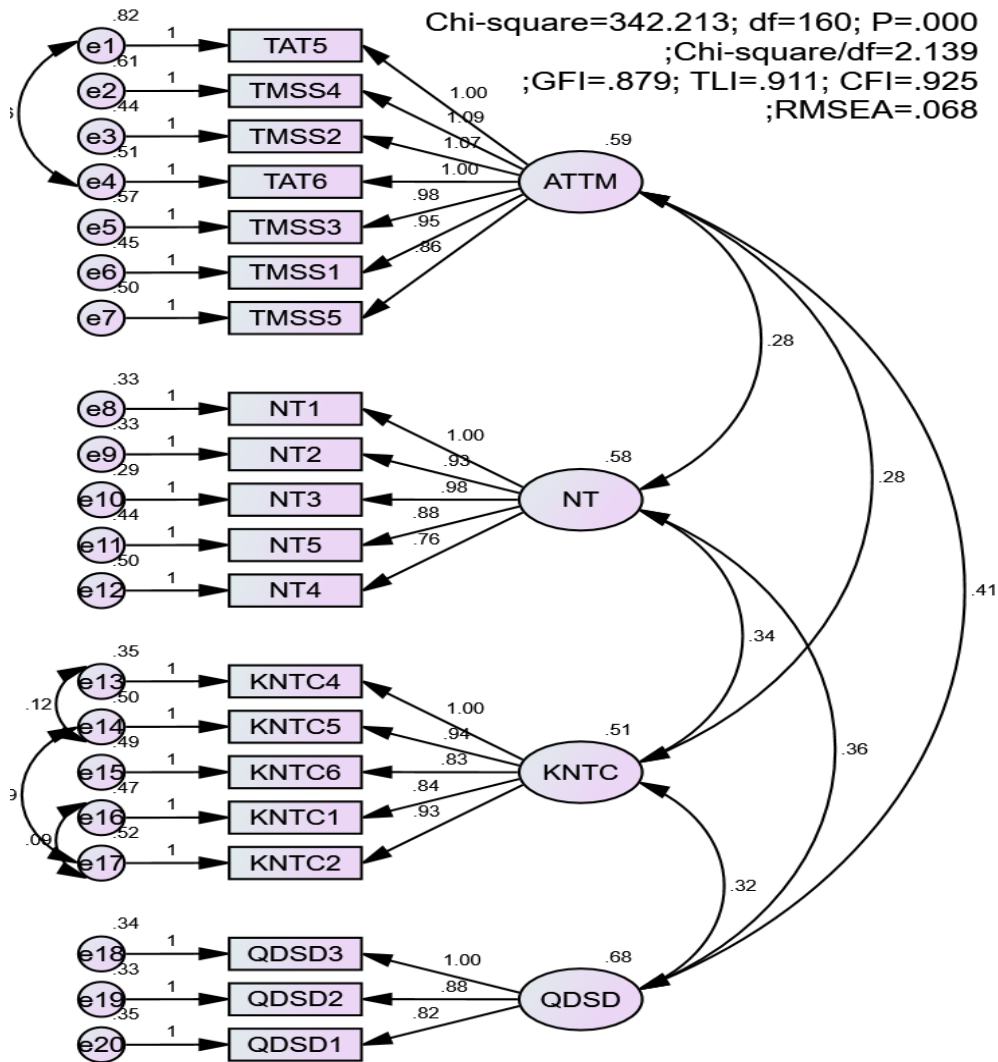


Figure 2: Confirmatory factor analysis results

f. SEM analysis results

We test the SEM model on AMOS software. Based on the results of CFA analysis, the the SEM models show that the model has 160 degrees of freedom,  $CMIN/df$  (Chi-square/df) criteria.  $=2,139 < 3$  (Carmines and McIver, 1981) and the  $GFI$  index =  $0.879 > 0.8$  (Baumgartner and Homburg, 1995);  $TLI = 0.911 > 0.9$ ;  $CFI = 0.925 > 0.9$  (Tabachnick et al., 2007);  $RMSEA = 0.068 < 0.08$  (Hu and Bentler, 1999). Thus, the model responds well to the research data.

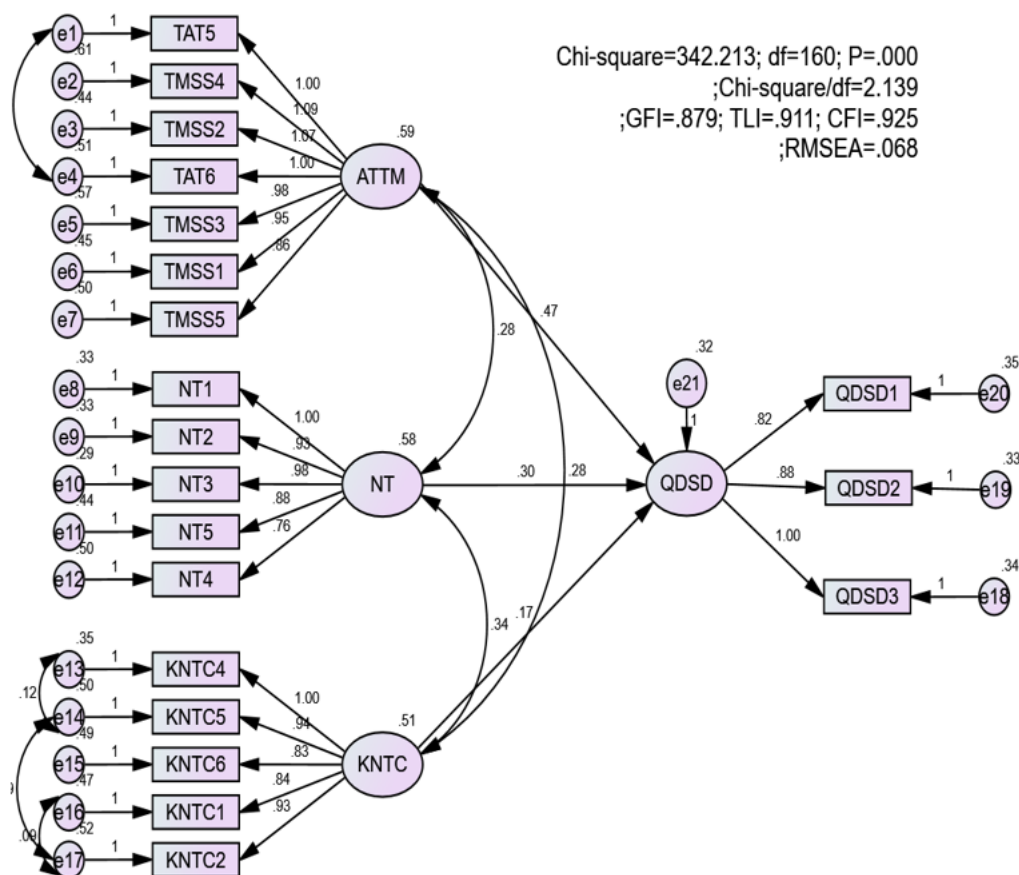


Figure 3: SEM analysis results

Tables 5 and 6 show that three factors affect students' decision to use buses, namely KNTC, ATTM, and NT. Among them, ATTM has the strongest impact, followed by NT and KNTC.

Bảng 5: Regression Weights (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P
QDSD	<---	ATTM	.468	.088	5.322	***
QDSD	<---	NT	.303	.092	3.301	***
QDSD	<---	KNTC	.173	.103	1.682	.043
TAT5	<---	ATTM	1.000			
TMSS4	<---	ATTM	1.090	.113	9.656	***
TMSS2	<---	ATTM	1.068	.105	10.128	***
TAT6	<---	ATTM	.999	.089	11.179	***
TMSS3	<---	ATTM	.980	.104	9.411	***
TMSS1	<---	ATTM	.953	.098	9.702	***
TMSS5	<---	ATTM	.862	.094	9.168	***
NT1	<---	NT	1.000			
NT2	<---	NT	.932	.073	12.767	***
NT3	<---	NT	.982	.073	13.424	***
NT5	<---	NT	.878	.076	11.493	***
NT4	<---	NT	.759	.076	10.028	***
KNTC4	<---	KNTC	1.000			
KNTC5	<---	KNTC	.942	.081	11.563	***
KNTC6	<---	KNTC	.831	.090	9.183	***
KNTC1	<---	KNTC	.838	.093	8.997	***
KNTC2	<---	KNTC	.928	.102	9.130	***

			Estimate	S.E.	C.R.	P
QDSD3	<---	QDSD	1.000			
QDSD2	<---	QDSD	.881	.071	12.361	***
QDSD1	<---	QDSD	.818	.069	11.882	***

**Bảng 6:** Standardized Regression Weights

			Estimate
QDSD	<---	ATTM	.437
QDSD	<---	NT	.279
QDSD	<---	KNTC	.151
TAT5	<---	ATTM	.646
TMSS4	<---	ATTM	.731
TMSS2	<---	ATTM	.779
TAT6	<---	ATTM	.731
TMSS3	<---	ATTM	.707
TMSS1	<---	ATTM	.735
TMSS5	<---	ATTM	.684
NT1	<---	NT	.797
NT2	<---	NT	.775
NT3	<---	NT	.810
NT5	<---	NT	.709
NT4	<---	NT	.630
KNTC4	<---	KNTC	.770
KNTC5	<---	KNTC	.690
KNTC6	<---	KNTC	.647
KNTC1	<---	KNTC	.659
KNTC2	<---	KNTC	.676
QDSD3	<---	QDSD	.815
QDSD2	<---	QDSD	.784
QDSD1	<---	QDSD	.752

#### IV. Conclusion

The study determined the factors affecting students' decision to use bus services in Hanoi. Structural equation modeling was used for the evaluation of the study. The research results showed that there are three factors affecting students' decision to use bus services in Hanoi, namely: accessibility, awareness, and safety and comfort. In particular, safety and comfort has the strongest impact, followed by awareness and accessibility.

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