INTENTION TO USE AND WILLINGNESS TO PAY PREMIUM FOR ENHANCED DISINFECTION OF PUBLIC TRANSPORTATION

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ABSTRACT

During the outbreak of COVID-19, customers are more concerned with cleanliness as the psychological link to the risk of disease transmission. As a result, demand for public transport has declined significantly over the world. The purpose of this study is to determine the factors that influenced public transport and a willingness to pay a premium for public transport using enhanced disinfection. The online survey was employed with convenient sampling to determine the influencing factor to use public transport and willingness to pay a premium. The findings indicated that attitudes toward cleanliness, subjective norms, perceived efficacy, and perceived usefulness have an effect on the intention to use public transportation. Female passengers may be willing to pay a significant premium, which can be marketable segments for public transit operators.

Keywords: Public Transport, Enhanced Disinfection, Disinfected Public Transport, Willing to Pay

INTRODUCTION

Public transport is an essential part of many people's daily lives. It is vital to the development of social, economic, and environmental. Certain groups of people, particularly those with low to middle incomes, may have no other mode of transportation and may rely solely on public transportation. Even during the COVID-19 pandemic, this group of people continues to use public transit as usual (Tirachini & Cats, 2020). In contrast, higher incomes who have other options may choose alternative transportation modes such as private cars or choose to work from home. Differential rates of adaption among social groups may promote social inequity (Tan et al., 2020). The pandemic has dramatically affected the demand for public transport. The outbreak drastically lowered demand for public transportation, with some cities reporting reductions of up to 93% in Santander, Spain (Aloi et al., 2020); 80% in Budapest, Hungary (Bucsky, 2020); 60% in Stockholm, Sweden (Jenelius & Cebecauer, 2020). The decline in demand affects the finances of public transport operators. Public transportation operators are forced to seek government funding in order to remain viable (Kaske, 2020; Mehmet, 2020). According to expert observations from around the world, passengers who stopped or limited their use of public transit largely shifted their mode of transport to cars (Zhang et al., 2021). These can cause the subsequent problems of road traffic and air pollutions. A recent study showed that 75% of those who leave public transportation would return once the pandemic situation improves, but 25% may remain afraid of returning

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(Przybylowski et al., 2021). Sustainable mobility is a struggle if public transport is doubted and not be interested anymore to users.

Numerous studies have been conducted to determine the factors of service quality influencing the satisfaction of using public transport. The goal of such studies is to increase public transportation utilization. These factors included service availability, accessibility, reliability, comfort, cleanliness, safety and security, information, customer care, and environmental impacts (Eboli & Mazzulla, 2012). These influencing factors conform to EN 13816:2002, the European standard of service quality management for public passenger transport (European Committee for Standardization, 2002). The EN 13816:2002 standard addresses eight service quality aspects: availability, accessibility, information, time, customer care, comfort, security, and environmental impact, with cleanliness included as a sublevel of comfort. The survey study found the safety factor was in the top list in terms of important level to satisfying for use public transport. However, safety was previous studied only in terms of traffic accidents and injuries. Although cleanliness is critical for determining consumer satisfaction with a service, it appears to have been prioritized lower than other variables (Ngoc et al., 2017). In a pandemic, the fear of infection causes anxiety and stress in society, which negatively affects the perception of safety and satisfaction to public transport. Researchers indicated that preventive measures such as wearing the face mask and temperature scan enhance the perceived safety and increased satisfaction to public transport (Dong et al., 2021). Passengers are more concerned about the hygiene of public transport. According to a survey, 58% of respondents expressed concern about the level of hygiene on public transit during the pandemic, up from 5% before COVID-19 (Beck & Hensher, 2020).

Cleaning and disinfecting public buses is now an important factor in ensuring passenger safety. There has been an increase in the usage of enhanced disinfection technology in public transportation, for example, the automatic aerosolization of hydrogen peroxide to disinfect the bus (Roman, 2020). The purpose of this study is to explore the perceived usefulness of enhanced disinfection technology, specifically aerosol hydrogen peroxide disinfection, on intentions to use public transportation and Willingness to Pay (WTP) for this technology. Additionally, the survey included question about the respondents' attitude toward cleanliness, subjective norms, perceived efficiency, perceived risk, perceived usefulness, and the intention to use public transport.

LITERATURE REVIEW

The Theory of Planned Behavior (TPB) started as the Theory of Reasoned Action, developed by Ajzen to describes the factors that influence human behavior. These factors can be classified into three categories: 1) Attitude toward the behavior 2) Beliefs about the subjective norm 3) Beliefs about the ability to control (Perceived behavioral control) (Ajzen, 1991). Individuals believe that if they gain positive results from an action, they will have a favorable attitude toward the behavior. On the contrary, people will have a negative attitude toward the behavior when they believe that doing so will result in negative consequences. People intend to do the behavior when they have a positive attitude toward the behavior. The subjective norm refers to the belief that the reference group is important and individuals pretend to behave in that manner when the reference group does or desires that behavior. The perceived behavioral control refers to the individual are believed to be able to conduct behavior in a state that can be controlled to achieve the desired outcome. They are likewise to performing that behavior.

The protection motive theory (Rogers, 1975) describes how individuals defend themselves against health threats using two factors: threat appraisal and coping appraisal. Threat appraisal is used to determine the severity of a situation and how serious it is, whereas coping appraisal is used to determine how an individual responds to a situation. Threat assessment is composed of two components: the perceived severity of a threatening event and the perceived likelihood of its

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recurrence or vulnerability. Although coping appraisal involves the danger response that results in an adaptive response that is contingent upon one's belief in one's ability to modify behavior (self-efficacy). When an individual is aware of potential health danger, they are more inclined to avoid engaging in that action. Passengers' perceptions of the risk associated with public transportation increased during the COVID-19. Perceived risk is also dependent on one's state of anxiety and psychological proximity (Dong et al., 2021). Perceived risk increases when public news reports on cases of infection involving public transportation or when close relatives become sick.

Perceived usefulness can result in technological adoption, as described in the technology acceptance theory (Davis, 1989). Cleaning and disinfection technologies have been employed to resolve issues throughout the outbreak. Particularly prevalent in the tourism business. It was discovered that using cleaning technology resulted in a reduced perception of health risks (Shen & Wilkoff, 2020) and perceived cleanliness also effect the hotel's brand image and returning business (Shen & Wilkoff, 2020).

RESEARCH METHODS

Survey Instrument

An online survey instrument was developed and distributed, and the results were collected *via* Survey Monkey. The questionnaire is divided into two sections. The first section contains the respondents' demographic information measured by checklist questions. The second section of the survey comprised seven latent variables: attitude to cleanliness, subjective norm, perceived efficacy, perceived risk, perceived usefulness to enhanced disinfection, intention to use public transport, and WTP. All variables were measured by a 5-points Likert scale except for WTP with contain two indicators which one measured by a 5-points Likert scale and another measured by open-ended question. The 5-points Likert scale ranged from 1=“"extremely disagree" to 5="extremely disagree". The open-ended questions of WTP required respondents to indicate the premium for enhanced disinfection. The regular fare was given as the baseline that the respondents can add more for the premiums. The definition, description and pictures of automated enhanced disinfection were provided in the introduction of the questionnaire to obtain the respondent's perception of the enhanced disinfection system.

Data Collection

The cross-sectional survey was conducted with the intended respondents of public transport passengers in Thailand. The possible respondents were screened by asking if they had ever used public transportation and were at least 18 years old. The sampling was done using a convenient selection method as it was during the outbreak and the purpose of the research was to study the relationship of variables. A total of 406 respondents were completed the survey.

Data Analysis

Descriptive statistics data analysis was carried out by using SPSS (version 22) for analysis of the sociodemographics and relevant questions of respondents. The Kruskal-Wallis test, the non-parametric alternative to the one-way Analysis of Variance (ANOVA), was used to analyze the relationship between these variables: attitude, subjective norm, perceived efficacy, perceived risk, perceived advantage, intention, and WTP. The binary logistic regression analysis was used to analyze the relationship between the segment of respondents and WTP. The reliability of the

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variables by assessed by Cronbach's alpha. The Cronbach's alpha value greater than 0.7 indicates the variables are reliable (Table 1).

Table 1
RELIABILITY ANALYSIS

Variables	Number of items	Cronbach's Alpha
Attitude to cleanliness	3	0.701
Subjective norms	3	0.773
Perceived efficacy	3	0.703
Perceived risk	3	0.803
Perceived usefulness	3	0.746
Intention	4	0.755

RESULTS

Sample Characteristics

There was a total of 406 respondents, and a majority (82%) were female. The majority of respondents were between the ages of 23-34, accounting for 43% of all respondents. Most of the respondents were single (71%). According to education level, 68% of respondents earned a bachelor's degree. Income levels of 9,000-15,000 baht and 15,001-30,000 baht accounted for 26.6% and 27.6% of respondents, respectively. Additionally, 58% of respondents reported having a driver's license (Table 2).

Table 2
DEMOGRAPHIC OF THE RESPONDENTS (N=406)

Characteristics	Frequency, n	Percent, %
Gender		
Male	73	18.0
Female	333	82.0
Age		
18-22	92	22.7
23-34	176	43.3
35-44	102	25.1
45-54	35	8.6
55-60	1	0.2
Marital Status		
Single	291	71.7
Married	98	24.1
Widowed	9	2.2
Divorced	6	1.5
Separated	2	0.5
Education Level		
Under BS	62	15.3
Bachelors (BS)	278	68.5
Master (MS)	54	13.3
Doctorate (PhD)	12	3.0
Income Level		
Less than 9,000 baht	79	19.5
9,001 – 15,000 baht	108	26.6
15,001 – 30,000 baht	112	27.6
30,001 – 60,000 baht	75	18.5
60,001 – 100,000 baht	25	6.2
More than 100,000 baht	7	1.7
Driver's license		
Yes	239	58.9
No	167	41.1

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Table 3 reveals the characteristic of variables. Almost all respondents, 99.3% were agreed or strongly agreed that they are concerned about cleanliness in public transport, and the vast majority of respondents, 93.3%, show that they tend to believe or act in the same way as their friends or relatives. 74.9% concern public transport poses a health risk. Around half (54.9%) of respondents confident they could choose to travel by clean public transport. However, 83% of respondents intend to use public transport, and 67% expressed their WTP additional fees.

Table 3
CHARACTERISTIC OF VARIABLES

	Top box rated as 5, n (%)	Top two box rated as 4 or 5, n (%)	Mean
Attitude to Cleanliness	315 (77.6%)	403 (99.3%)	4.76
Subjective Norm	247 (60.8%)	379 (93.3%)	4.53
Perceived Efficacy	99 (24.4%)	223 (54.9%)	3.55
Perceived Risk	118 (29.1%)	304 (74.9%)	4.01
Perceived usefulness	296 (72.9%)	393 (96.8%)	4.69
Intention	171 (42.1%)	337 (83.0%)	3.98
Willing to Pay	126 (31.0%)	273 (67.2%)	3.91

According to surveys regarding the WTP a premium for the fare to enhanced disinfection public buses, the majority of respondents (67.2%) were willing to pay the premium. The mean and median WTP a premium on top of the regular fare of $9 (30 Thai baht:1 USD exchange rate) were $2.13 and $1, respectively, among all respondents. However, the mean and median were higher from analysis in the respondents willing to pay the premium, which was $2.39 and $1.67.

Table 4
MEAN AND MEDIAN OF WILLINGNESS TO PAY (WTP)

Variables	Mean	Median	Std.Deviation
WTP			
All respondents (n=406)	$2.13	$1	$1.91
WTP group (n=273)	$2.39	$1.67	$1.87

According to the binary logistic regression models, the socioeconomic variables are not statistically significant for WTP. However, we further investigated the dependent variable of WTP by categorizing it into two groups: below the median WTP and above the median WTP, in order to identify segments of people willing to pay significant premiums. Table 5 reveals that the only statistically significant independent variable was gender, indicating that females pay a higher premium than males.

Table 5
BINARY LOGISTIC REGRESSION ON FACTORS AFFECTING WTP

	B	S.E.	Wald	Df	Sig.	Exp(B)
Gender	1.010	0.355	8.075	1	0.004	2.745
Age	-0.168	0.207	0.662	1	0.416	0.845
Marital status	0.125	0.215	0.340	1	0.560	1.133
Education level	-0.043	0.257	0.028	1	0.867	0.958
Income level	0.056	0.156	0.128	1	0.721	1.057
Driver’s license	-0.651	0.345	3.549	1	0.060	0.522

Table 6 shows the Kruskal-Wallis test on the relationship of each variable to the intention to use public transport. The Chi-square statistics is 13.203, 15.816, 29.745, 3.683 and 16.185 with a corresponding p-values are 0.010, 0.003, 0.000, 0.298 and 0.000. This indicates that the statistically

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significant difference among attitude, subjective norm, perceived efficacy, and perceived usefulness to the intention to use public buses. Additionally, the Kruskal-Wallis test on the relationship of intention to use public buses to WTP revealed statistical significance (x^2=19.166, p=0.001)

Table 6
KRUSKAL-WALLIS TEST OF VARIABLES

	Variable	Chi-square	df	P-value
Intention to use public buses	Attitude to Cleanliness	13.203	4	0.010
	Subjective Norm	15.816	4	0.003
	Perceived Efficacy	29.745	4	0.000
	Perceived Risk	3.683	3	0.298
	Perceived usefulness	16.185	2	0.000

DISCUSSION

This study was conducted between May and June 2021, during Phase Three of the COVID-19 outbreak in Thailand. Meanwhile, public bus sanitation is a major concern because 99% of respondents expressed strong concern for cleanliness. Previous research has discovered that while cleanliness has an effect on the quality of service, it is not the most important criterion that travelers consider. The pandemic has increased people's awareness of the importance of cleanliness. Similarly, related research has discovered that the traveler is critical to the cleanliness of the hotel sector (Shin & Kang, 2020).

However, this study discovered that just 83% of respondents planned to use public transportation. This could be because the majority of respondents in this study are employed and may have to travel to work from their homes. As expected, passengers impose a strong weight on the benefits of enhanced disinfection, which is critical for public transportation operators to consider when implementing disinfection. Only half of the respondents expressed confidence in their ability to board a clean and disinfected bus. This could be because a majority of modern public buses have not been extensively disinfected.

The overwhelming majority of respondents indicated that they believe and trust their closest friends, which is critical for policymakers when developing strategies to influence public behavior. Particularly in the post-COVID-19, people continue to be cautious about taking public buses.

The intention to take public transportation has an effect on the WTP a premium fare. This provides an incentive for public transportation operators to clean and disinfect their vehicles. The average premium increased by $1.67 or 18.56% of the regular fare. The study did not find the socioeconomic variables that influenced WTP premiums, but it indicates that females are more willing to pay the premium than men. This finding is consistent with prior research indicating that females are more health-conscious (Yıldırım et al., 2021) and willing to pay for the significant price for enhanced disinfection in the hotel guestroom (Zemke et al., 2015). Public bus operators can target these clients for a marketable segment.

CONCLUSIONS

The influence of the covid-19 pandemic on supply and demand in the public transport business is declining, and passengers are increasingly worried about taking public transport. Public transport operators must focus on the cleanliness and disinfection of their vehicles. The strategies for implementing enhanced disinfection can also be used as tools for generating revenue and offering passengers a new experience that will increase their confidence in using the service. This is the "new normal" for public transport that will allow for the restoration of service in the post-pandemic period.

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The limitation of this study is that it was weighted toward young, female respondents. Future studies should emphasize a more diverse and inclusive sample size.

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