

ANALYZING THE TRAVEL INTENTION OF ELDERLY PASSENGERS IN THAILAND'S PUBLIC TRANSPORTATION SYSTEM: A STRUCTURAL EQUATION MODELING APPROACH

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Abstract

This study aims to investigate the factors influencing the intention to use public transportation among older adults in Thailand. The analysis was conducted using Structural Equation Modeling (SEM), guided by the Theory of Planned Behavior (TPB) and the SERVQUAL framework. Data were collected from 2,250 individuals aged 60 and above, across five regions of the country, through structured questionnaires and in-depth interviews. The survey instrument consisted of sections on demographic information, travel experience, and perceived service quality. The findings reveal that passenger satisfaction plays a significant and strong role in shaping the intention to use public transport. Positive attitudes toward public transportation were found to have both direct and indirect effects mediated by satisfaction on the behavioral intentions of elderly individuals. In contrast, habitual use of private cars exerts a negative influence on the intention to use public transport. This highlights the need to foster an environment that supports the development of new travel habits, encouraging older adults to shift from private vehicle dependence to public transportation. These insights offer valuable implications for policymakers and relevant stakeholders in understanding the perspectives and needs of elderly public transport users. By implementing a policy framework that promote inclusive and age-friendly public transportation, the results of this study can contribute to advancing social equity and long-term societal resilience.

Keywords: Elderly; Habit; Intention; Public Transportation; Structural Model

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Introduction

The 21st century has witnessed a rapid demographic shift toward an “aged society,” particularly in Asia, where population aging is accelerating at an unprecedented rate. According to estimates from the United Nations (UN) (United Nations, n.d.), the global population aged 60 and over is expected to increase from approximately 1 billion today to over 2 billion by the year 2050. By 2030, the number of people aged 80 and above will surpass the number of infants. Asia will be the region with both the largest number and the highest proportion of older adults worldwide.

Thailand officially entered the status of an “aged society” in 2022 and is projected to become the first developing country in Asia to reach “super-aged society” status by 2030 in just five years with over 28% of the population, or roughly 18 million people, aged 60 and above. This demographic transformation has far-reaching implications beyond the economy and healthcare systems. One of the most immediate and significant areas of impact is transportation, particularly public transit, which plays a critical role in the daily lives of older adults. A significant proportion of older Thais rely heavily on public transportation due to limitations in income and physical mobility. Consequently, their travel behavior tends to center around “essential trips,” such as visiting healthcare providers, going to markets, or attending to government-related matters, rather than recreational or social travel. The quality of life for older adults may significantly diminish if public transportation systems fail to meet these essential needs. Thailand must therefore prepare for this major demographic shift by developing public transport systems that are inclusive and accessible to aging populations. Addressing this issue is not merely a matter of infrastructure; it is central to building an equitable society and achieving long-term social sustainability. Previous research in this field has employed various approaches to evaluate public transport satisfaction. Studies have explored user perceptions regarding accessibility and service quality among Thai residents aged 20–60 (Wathanaklang *et al.*, 2024), decision-making processes of school travel among children through surveys of their parents (Nanthawong *et al.*, 2024), and the effectiveness of key attributes influencing satisfaction among older passengers (Chaisomboon *et al.*, 2020). Additional investigations have analyzed retrospective travel behaviors during the COVID-19 pandemic in the Bangkok area (Thaithakul *et al.*, 2023), as well as examined the application of universal design principles in public

projects with a focus on elderly needs (Srichuae *et al.*, 2016). Furthermore, factors influencing the travel mode choice of the elderly in Thailand have been analyzed (Philuek *et al.*, 2025). In addition, a study was conducted to examine the impact of elderly individuals’ attitudes toward the acceptance of high-speed rail technology in Thailand, employing a multigroup structural equation modeling (Multigroup SEM) approach to compare differences between urban and rural elderly populations (Dangbut *et al.*, 2024).

The present study adopts a Structural Equation Modeling (SEM) approach to investigate travel intention among older adults, drawing upon key constructs from the Theory of Planned Behavior (TPB) including attitude, subjective norms, and perceived behavioral control (Ajzen, 1991). The model also incorporates satisfaction and habitual behavior, the latter reflecting past tendencies toward private transport use. By doing so, the study seeks to bridge the gap in public policy design related to elderly mobility and promote the use of public transportation among older populations. The findings aim to offer practical recommendations for public policy improvements and contribute toward fostering equality in everyday living for one of the fastest-growing demographic segments in the country.

Literature Review & Hypotheses

Habit and Intention

In the context of explaining human behavior in daily life, previous studies have noted that past behavior can be a strong predictor of future actions (Ouellette & Wood, 1998). However, this predictive power does not necessarily stem from conscious memory or deliberate intention. Intention plays a significant role primarily when a behavior has not yet become habitual or still requires active decision-making. As behaviors become more habitual, actions tend to be triggered more by situational cues than by conscious intention for example, entering a coffee shop every morning without deliberate thought (Lee, 2022). Therefore, changing behavior requires more than simply altering intentions. It also demands modifications to the environmental or situational cues that reinforce habitual behavior. This is particularly relevant in the context of public transportation systems, where behavioral patterns can be shaped by routine, accessibility, and environmental factors. Prior research in the field of public transportation has provided robust conceptual frameworks that are valuable for guiding the design and development of infrastructure and

services that align with diverse user needs. In the Thai context, investigations into the link between accessibility perception and public transport quality have found that user attitudes are the strongest predictors of the intention to use such services (Wattanaklang *et al.*, 2024). Habits influence individuals' intentions and behaviors in selecting modes of transportation. For instance, habitual use of private vehicles has been shown to affect changes in travel behavior among vehicle users (Luathep *et al.*, 2015). Similarly, Domarchi *et al.* (2008) found that a strong car-use habit is positively associated with favorable attitudes and emotions toward car usage, indicating that altering such behavior can be challenging (Kaewklueklom *et al.*, 2017). In line with these findings, a study conducted in Thailand revealed that although participants expressed positive opinions about BRT, recognizing it as a superior new mode of transportation, they continued to exhibit habitual reliance on private vehicles in daily life. This was attributed to the low cost and maintenance of motorcycles. It was also found that individuals with a high level of private vehicle use habit demonstrated lower intention to adopt BRT, a finding that can be used to support Hypothesis 7.

In light of this, the current study aims to examine the factors influencing travel intention among older adults in relation to public transportation, a population with specific limitations concerning physical ability, accessibility, and travel safety. To achieve this, Structural Equation Modeling (SEM) is employed as the primary analytical tool to assess the relationships among variables such as satisfaction, perceived service quality, attitude, and subjective norms. Additionally, this study introduces a novel hypothesis by incorporating habit as a mediating variable. Habit, in this context, refers to prior patterns of using private transportation, which may influence an individual's intention to shift toward public transport usage. This relationship is presented in Hypothesis 7, as summarized in Table 1. The inclusion of the habit construct enhances the explanatory power of the model and contributes to more accurate recommendations for developing public transportation systems that truly support the daily lives of older adults.

Table 1. Overview of Research Hypotheses

Hypothesis	Relationship
H ₁	Satisfaction →(+) Intention
H ₂	Attitude →(+) Intention
H ₃	NORM →(+) Intention
H ₄	PCB →(+) Intention
H ₅	Expectation →(+) Perceived Service
H ₆	Perceived Service →(+) Satisfaction
H ₇	Habit →(-) Intention
H ₈	Attitude →(+) Satisfaction

The research hypotheses are as follows:

- H₁: Satisfaction with public transportation directly enhances users' intention to continue using the service.
- H₂: Holding a favorable view of public transportation positively influences the intention to use it.
- H₃: Social influence (subjective norms) significantly contributes to the intention to use public transportation.
- H₄: Users' perceived control over their travel choices positively affects their intention to use public transit.
- H₅: Customer expectations positively shape how service quality is perceived in public transportation.
- H₆: Perceived quality of service plays a key role in shaping customer satisfaction with public transit systems.
- H₇: Regular reliance on private transport negatively impacts the intention to switch to public transportation.
- H₈: A positive attitude toward public transit contributes directly to user satisfaction with the service.

Perceived Service Quality, Expectation and Satisfaction

The relationship between Perceived Service Quality (PSQ) and customer satisfaction is notably close and interdependent. Service quality is widely recognized as a key determinant in shaping customer satisfaction (Chumpitaz Caceres & Paparoidamis, 2007). According to James *et al.* (2017), Service Quality Satisfaction refers to a customer's positive emotional response such as satisfaction or happiness arising from the perceived alignment between their expectations and the service they voluntarily received from the provider. Rubogora (2017) further conceptualizes it as a form of attitude related to service experiences, although it should not be conflated with satisfaction that results specifically from the comparison between expectations and actual service outcomes. When the service delivered exceeds the customer's expectations, the customer is considered to have had a positively disconfirmed experience, resulting in a level of satisfaction greater than initially anticipated (Zeithaml *et al.*, 1990). This notion underscores the critical importance of understanding customer satisfaction, particularly in the context of public transportation. For public transport operators and agencies, recognizing how expectations and perceived service quality interact to shape satisfaction is essential. Such understanding provides the foundation for developing targeted

service improvements aimed at elevating the overall satisfaction levels among passengers. In this regard, continuous investment in service quality not only enhances customer loyalty but also contributes to more sustainable and inclusive transportation systems.

Within the context of public transportation systems, considerable attention has been paid to the key service quality dimensions that influence passenger satisfaction, especially in multimodal transport networks. In India, a study conducted in a medium-sized urban area identified the major latent factors contributing to passenger satisfaction in multimodal systems. Using Structural Equation Modeling (SEM), the researchers tested the relationships among six latent variables reliability, comfort, safety, accessibility, information, and customer service and found them to be significantly associated with overall satisfaction levels (Tanwar & Agarwal, 2024). In Malaysia, another study examined passenger satisfaction with Malaysia Airlines using Partial Least Squares SEM (PLS-SEM). The research explored how service quality and satisfaction impact passengers' intention to shift travel modes, employing the SERVQUAL model as the conceptual framework for its survey instrument (Farooq *et al.*, 2018; Hamzah *et al.*, 2023). In Europe, a study conducted in three Italian cities surveyed individuals aged 65 and above to assess satisfaction with residential environments and local public transport. The findings, analyzed using both Structural Equation Modeling and the Ordered Logit Model, confirmed that satisfaction with transport services significantly contributed to the perceived quality of life among the elderly (Rossi *et al.*, 2023). A broader literature review of 16 peer-reviewed studies focused on public transport accessibility for older adults, emphasizing equity and age-friendliness. Notably, all of these studies originated from developed countries, underscoring a research gap in developing regions such as Thailand and the ASEAN bloc. These regions remain underrepresented in global research on aging populations and transport accessibility (Ravensbergen *et al.*, 2022). In Thailand, service quality in public transport has likewise emerged as a growing area of focus. Comparative studies on intercity rail services have applied various analytical techniques to evaluate the gaps and opportunities for improvement (Jomnonkwao *et al.*, 2020). Additionally, a domestic study assessed the needs of parents concerning children's travel safety and used SEM to examine the relationships among variables such as service quality, expectations, satisfaction, and trust in a Thai context (Nanthawong *et al.*, 2024). The analysis results indicated that expectations influence service perceptions, which in

turn lead to higher satisfaction. Perception acts as a mediating variable between expectations and satisfaction. These findings can be applied to support Hypotheses 5 and 6.

Research also points to the mediating role of service quality attributes particularly convenience, responsiveness, and safety influencing how users perceive accessibility and their decision to use public transport (Wattanaklang *et al.*, 2024). In rural Thailand, accessibility to healthcare services among older adults has been studied using GIS-based network analysis, revealing how poorly connected or deteriorated roads adversely affect health outcomes and restrict daily functioning (Iamtrakul *et al.*, 2023). Other studies have emphasized the importance of applying universal design principles in public infrastructure and transport planning to ensure accessibility for all age groups (Srichuae *et al.*, 2016). A recent study focusing on older adult rail passengers in Thailand (Lieophairet *et al.*, 2025), who utilize the services of the State Railway of Thailand (SRT), found that perceived value significantly influences passenger loyalty among the elderly through enhanced satisfaction. The study further emphasized the importance of maintaining service quality such as facilities, assistance, and cleanliness as satisfaction serves as a key mediating factor. These findings can therefore be used to support Hypothesis 1. Moreover, during the COVID-19 pandemic, changes in travel behavior were observed in Bangkok, where the overall demand for public transportation significantly declined. Yet, there remains a notable absence of targeted research on how such changes have impacted older adult populations specifically. In response to this research gap, this study seeks to support the creation of inclusive transportation policies and designs that reflect Thailand's shift toward an aging population (Thaithatkul *et al.*, 2023).

Intention to Use Public Transportation

The Theory of Planned Behavior (TPB) is an extension of the Theory of Reasoned Action and is widely used to study attitudes and their influence on behavioral change. According to TPB, human behavior is influenced by behavioral intention, which in turn is shaped by three key factors (Ajzen, 1991):

- **Attitudes toward the behavior** refer to an individual's overall evaluation of a behavior, derived from both positive and negative beliefs about that behavior. Previous studies have shown that the intention to use public transportation systems can be explained by attitude, subjective norm, and perceived behavioral control (PBC) in accordance with the TPB model. Elderly individuals

with a positive attitude toward high-speed rail (HSR) are more likely to intend to use it (Wathanaklang *et al.*, 2024; Dangbut *et al.*, 2024). Attitude has been found to be the most significant factor, supporting Hypotheses 2 and 8.

- **Subjective norms** refer to an individual's perception of social pressure or expectations regarding certain behavior, especially from close relations such as family members.

- **Perceived Behavioral Control (PBC)** relates to how easy or difficult an individual feels it is to perform a behavior, based on their beliefs about facilitating or hindering factors (control beliefs). PBC also has a direct influence on behavior. For example, a study investigating the psychological factors influencing travel mode choice in the case of the Bus Rapid Transit (BRT) system in Khon Kaen found that if passengers perceive BRT as a quality and viable option, their intention to use it increases. Moreover, the influence of family, friends, or society can make the BRT seem "less complicated" for example, through accessible platforms and clear fare information thereby enhancing elderly individuals' intention to use the service (Kaewkluengkrom *et al.*, 2017).

Another study in China extended the TPB model by incorporating Descriptive Norms (DN) and elements of the walking environment to understand the factors affecting elderly individuals' behavioral intention to walk within their residential neighborhoods (Liu *et al.*, 2022). It was found that those with a positive attitude toward walking had a higher intention to walk. PBC was a key predictor when elderly individuals perceived walking near home as easy and low in barriers, their intention increased. DN had a significant influence on intention, while Subjective Norms (SN) did not. These findings support Hypotheses 3 and 4. Although TPB posits intention as the primary determinant of behavior, habit has been shown to directly predict actual behavior. For example, even if someone intends to try using BRT, those accustomed to private car use may continue driving. Habit serves as an additional variable that enhances the explanatory power of the model. When habit is integrated into TPB, the model better explains travel mode choice behavior than TPB alone (Kaewkluengkrom *et al.*, 2017). Similarly, a study conducted in Beijing developed an integrated model combining TPB with habit to examine the influence of psychological variables on travel mode choice, particularly subway usage. The results indicated that intention was positively influenced by attitude, while habit negatively moderated the relationship between intention and behavior (Huang *et al.*, 2016).

These findings are summarized in Table 1 of this study and are intended to inform the development of a truly elderly-friendly public transportation system.

Materials and Methods

Participants

Attention was given to older adults (60+ years) identified as vulnerable, with an emphasis on those using public transit. The sample was drawn from five major regions across Thailand. Provinces were selected based on medium to high population densities of older adults (defined as provinces with more than 100,000 elderly individuals). The selected provinces include Chiang Mai, Chiang Rai, Lampang, Nakhon Sawan, Phetchabun, Khon Kaen, Nakhon Ratchasima, Buriram, Ubon Ratchathani, Sisaket, Udon Thani, Surin, Roi Et, Chaiyaphum, Maha Sarakham, Ayutthaya, Pathum Thani, Suphan Buri, Ratchaburi, Chonburi, Nakhon Si Thammarat, Songkhla, Surat Thani, Nonthaburi, Samut Prakan, Samut Songkhram, Samut Sakhon, and Bangkok. To analyze behavioral intentions and travel-related perceptions among older adults, Structural Equation Modeling (SEM) was employed. SEM has been widely adopted in travel behavior research, particularly in the fields of travel demand forecasting and travel attitude analysis, due to its robustness in modeling both physical and psychological variables such as attitude, perceived service quality, information access, and travel intention. According to Golob (2003), SEM application requires adherence to several sampling standards: (1) A minimum sample size of 200 respondents is generally considered acceptable for SEM analysis (Kline, 2011). (2) For Maximum Likelihood Estimation (MLE), the number of cases should be at least 15 times the number of observed variables. Stevens (2002) also suggests that there should be at least 15–20 respondents per indicator, or a minimum of 10 respondents per item, to ensure statistical reliability. (3) To ensure statistical reliability, a widely recognized standard recommends at least 10 respondents for each estimated parameter. This study collected 450 responses per region, satisfying the minimum requirements for robust SEM application.

Data collection and questionnaires

This study focuses on a vulnerable population group older adults aged 60 and above. A pilot test was conducted with a subset of passengers prior to the main data collection phase in order to refine the

language and improve respondent comprehension. Visual aids were included in the survey materials, and face-to-face interviews were employed due to their flexibility in accommodating participant needs. Content validity was verified by transportation experts. Moreover, the study received approval from the Human Research Ethics Office (Project Code: EC-72-62). The trained data collection team conducted fieldwork at various locations such as public transport stations, bus stops, elderly activity centers, shopping malls, government offices, and healthcare facilities. A convenience sampling method was used, selecting participants based on accessibility, willingness, and availability rather than random sampling. As such, the sample may not fully represent the broader population due to the limitations inherent in this sampling technique.

A total of 2,250 questionnaires were administered across the selected regions. The questionnaire was structured into three sections as follows:

- **Section 1:** This section gathered socio-demographic and travel behavior data, including variables such as gender, monthly income, household composition, travel purpose, and travel time periods, among others.
- **Section 2:** This section included items assessing respondents' expectations and perceived service quality regarding public transportation systems. The items were developed based on a thorough literature review and aligned with validated service quality dimensions.
- **Section 3:** This section measured attitudes toward public transportation, using statements evaluated through a 5-point Likert scale, where 1 indicated "strongly disagree" or "least satisfied" and 5 represented "strongly agree" or "most satisfied."

Validation of the questionnaire content was conducted by experts using the IOC framework to evaluate item relevance. The items were assessed by professionals in transportation and statistical analysis to ensure they corresponded with the defined constructs. Reliability of the questionnaire was assessed using Cronbach's Alpha, with an acceptable threshold set at 0.70 (Tavakol & Dennick, 2011). The results indicated that all constructs achieved reliability values ranging from 0.70 to 0.805, which fall within an acceptable range, confirming internal consistency of the instrument. All measurement items and public transport service quality indicators were derived from an extensive review of related literature and are presented in Table 3.

Data analysis

In this study, exploratory factor analysis (EFA) was employed using principal component extraction as the core technique for identifying underlying structures among observed variables. This method served to develop appropriate measurement scales and classify survey items into relevant dimensions. To improve interpretability of the extracted components, Varimax rotation was applied. This orthogonal rotation technique is particularly effective at maximizing the variance shared among items within each factor, thereby clarifying the separation between components. Only items with factor loadings greater than 0.50 were retained, as this threshold indicates practical significance in applied behavioral research. To ensure structural robustness, each latent construct was designed to include at least three to five observable indicators, and sampling adequacy was maintained in accordance with methodological guidance provided by Velicer and Fava (Velicer & Fava, 1998). The selection of factors also adhered to the criterion of eigenvalues exceeding 1.0, consistent with the standard set forth by Joseph F. Hair, *et al.* (Hair *et al.*, 2010), indicating that each retained factor explained a meaningful proportion of the total variance. The study further employed structural equation modeling (SEM), which integrates both measurement and structural models. The measurement model specifies the relationships between latent constructs and their observed indicators, while the structural model outlines the hypothesized relationships among the latent constructs themselves. To evaluate the fit between the hypothesized model and the empirical data, multiple fit indices were considered. A non-significant chi-square statistic ($p > 0.05$) suggests acceptable model fit (Kline, 2011), and the ratio of chi-square to degrees of freedom (χ^2/df) is expected to be less than 3. As Hu and Bentler (Hu & Bentler, 1999) suggest, comprehensive model assessment should incorporate both absolute and incremental fit indices. These include the standardized root mean square residual (SRMR), the comparative fit index (CFI), and the Tucker–Lewis index (TLI). For complex models, the root mean square error of approximation (RMSEA) should be below 0.06, while values of 0.95 or higher are recommended for both CFI and TLI, and SRMR should not exceed 0.08. The internal consistency and reliability of each latent construct were evaluated through composite reliability (CR) and average variance extracted (AVE). As Bagozzi and Yi (Bagozzi & Yi, 1988) noted, CR values above 0.60 reflect acceptable

internal reliability. Fornell and Larcker (Fornell & Larcker, 1981) further explained that even in cases where AVE falls below 0.50, the construct may still demonstrate adequate convergent validity if CR exceeds 0.60. Nonetheless, Hair and Anderson (2006) recommends an AVE threshold of 0.50 or greater to ensure sufficient shared variance among indicators. The results of reliability and validity assessments are reported in Table 3.

Results and Discussion

Descriptive Statistics

The sample comprised a total of 2,250 respondents, including 1,259 males (55.96%) and 991 females (44.04%). A substantial proportion of the participants, accounting for 41.56%, reported an average monthly income ranging between 20,000 and 30,000 Thai baht. More than half of the respondents (56.27%) indicated that they typically spent more than one hour per trip using public transportation. Travel behavior data further revealed

that 44.93% of older adults preferred to travel during the morning hours between 7:00 and 10:00 a.m., while only 11% reported traveling after 4:00 p.m., and a mere 3% after 6:00 p.m. Regarding travel companionship, 41.29% of the respondents reported traveling alone, whereas 45.60% commonly traveled in pairs. Among the respondents, 2.76% reported using public transportation on a daily basis, while 18.2% used it weekly and 11.9% used it monthly. The majority, however, indicated that they used public transportation once every two to three months, accounting for 28% of the sample.

These findings are summarized in Table 2. The measurement of public transport service quality in this study was based on eight key dimensions comprising a total of 31 observed indicators. The dimensions included vehicle characteristics, accessibility, safety, reliability, convenience, staff, information, and station/stop facilities. These factors were identified based on an extensive literature review and validated through factor analysis to reflect service quality as perceived by elderly passengers.

Table 2. Overview of Respondent Characteristics

Demo graphics	Category	Frequency	Percentage (%)
Gender	Male	1259	55.96
	Female	991	44.04
Age	60-69 Years	1563	69.47
	70-79 Years	457	20.31
	over 80 Years	230	10.22
Monthly income	Less than 10,000 THB	31	1.38
	10,000-20,000 THB	653	29.02
	20,000-30,000 THB	935	41.56
	30,000-40,000 THB	264	11.73
	40,000-50,000 THB	217	9.64
	50,000-60,000 THB	94	4.18
	60,000-70,000 THB	37	1.64
Travel Time	Over 70000 THB	19	0.84
	Less than 15 mins	183	8.13
	15-30 mins	253	11.24
	30-60 mins	548	24.36
Travel Purpose	more than 1 hour	1266	56.27
	back to hometown	160	7.11
	Travel	935	41.56
	Work	183	8.13
	Visit	288	12.80
	Healthy	163	7.24
	Shopping	258	11.47
	Government	230	10.22
	Religion	1	0.04
	Study	2	0.09
Travel Period	Others	30	1.33
	5-7 am.	284	12.62
	7-10 am.	1011	44.93
	10 am- 1 pm	501	22.27
	1-4 pm.	201	8.93
	4-6 pm	166	7.38
	6-9 pm	87	3.87
Travel Member	Travel alone	929	41.29
	2 Persons	1026	45.60
	3 Persons	262	11.64
	4 Persons	31	1.38
	5 Persons	2	0.09
Living Status	Alone	227	10.09
	With Mate	973	43.24
	With Young	1050	46.67

Reliability analysis

The reliability of the questionnaire was assessed through internal consistency testing using Cronbach's alpha, which is generally considered acceptable when exceeding a threshold of 0.70 (Hair *et al.*, 2010). In this study, the Cronbach's alpha values for the measured constructs ranged from 0.700 to 0.791, indicating acceptable reliability for all items. Within the measurement model, the composite reliability (CR) values for public

transport service quality constructs ranged from 0.602 to 0.820, while the average variance extracted (AVE) ranged from 0.521 to 0.626. When evaluated against established benchmarks, these values meet the recommended thresholds, suggesting that the observed indicators are both reliable and valid for representing their respective latent constructs. These results support the suitability of the items within the context of the measurement model and are detailed in Table 3 and Table 4.

Table 3. Expectations Scale – Factor Loadings and Cronbach's Alpha

			Description	Reliability Statistics			
Factor	N of Items	Variable	Question	Factor Loadings	Cronbach's α	AVE	CR
Vehicle characteristics	4	EV1	The vehicle is expected to be modern and kept in a hygienic condition.	.693	.703	0.503	0.801
		EV2	Passengers anticipate a sense of safety throughout their journey.	.656			
		EV3	The climate inside the vehicle is expected to be suitably regulated.	.786			
		EV4	Vehicles are equipped with age-friendly features such as handrails.	.694			
Access	3	EA1	Access paths and walkways should accommodate mobility needs, including wheelchair parking.	.781	.701	0.594	0.655
		EA2	The station should be conveniently located within a reasonable distance.	.788			
		EA3	Stations are expected to have physical support facilities like ramps, elevators, and handrails.	.742			
Safety	3	ES2	Onboard environments should be secure from potential criminal activity.	.757	.700	0.616	0.671
		ES3	Stations should be safeguarded with adequate crime prevention measures.	.840			
		ES4	Vehicles should include standard safety devices like seat belts and emergency tools.	.755			
Reliability	3	ER2	Journey duration should be efficient and not excessively time-consuming.	.763	.708	0.618	0.673
		ER3	Service frequency should meet the expected intervals.	.841			
		ER4	Timeliness in departure and arrival schedules is expected.	.752			
Convenience	4	EC2	Basic amenities such as Wi-Fi, restrooms, stairs, and lifts should be available.	.660	.700	0.528	0.606
		EC3	Seating should be sufficient and include priority seating for older passengers.	.758			
		EC4	Adequate space should be provided for storing luggage.	.758			
		EC5	The step height into the vehicle should be comfortable and manageable for seniors.	.686			
Staff	4	EF1	Driving behavior is expected to be cautious and prioritizing safety.	.705	.741	0.542	0.616
		EF2	Vehicles should not depart until passengers are properly seated.	.736			
		EF3	Transport personnel should exhibit a service-oriented attitude.	.803			
		EF4	Staff are expected to act courteously and respectfully.	.697			
Information	5	EI1	Clear and complete travel-related information should be available.	.698	.791	0.529	0.607
		EI2	Timetable changes should be communicated promptly.	.792			
		EI3	Guidance on intermodal transfers should be provided to travelers.	.713			
		EI4	A feedback or complaint mechanism should be accessible to passengers.	.713			
		EI5	Announcements at the station should be comprehensive and audible.	.716			
Station/STOP	5	ET1	Stop signage should be legible and appropriately sized.	.684	.781	0.523	0.602
		ET2	Stations are expected to maintain cleanliness and hygiene.	.689			
		ET3	Sufficient seating and sun protection (e.g., roofed waiting areas) should be available.	.820			
		ET4	Parking space should meet demand and be easily accessible.	.690			
		ET5	Commercial amenities such as food outlets, drinks, and ATM services should be present.	.722			

Note: Average Variance Extracted (AVE), Composite Reliability (CR)

Table 4. Factor Loadings of Perceived Service Quality and Reliability Analysis

Factor	N of Items	Description		Factor Loadings	Reliability Statistics		
		Variable	Question		Cronbach's α	AVE	CR
Vehicle characteristics	4	VC1	The vehicle is expected to be modern and kept in a hygienic condition.	.814	.720	0.534	0.820
		VC2	Passengers anticipate a sense of safety throughout their journey.	.665			
		VC3	The climate inside the vehicle is expected to be suitably regulated.	.774			
		VC4	Vehicles are equipped with age-friendly features such as handrails.	.657			
Access	3	AC1	Access paths and walkways should accommodate mobility needs, including wheelchair parking.	.864	.709	0.612	0.668
		AC2	The station should be conveniently located within a reasonable distance.	.776			
		AC3	Stations are expected to have physical support facilities like ramps, elevators, and handrails.	.699			
Safety	3	ST2	Onboard environments should be secure from potential criminal activity.	.775	.718	0.626	0.679
		ST3	Stations should be safeguarded with adequate crime prevention measures.	.822			
		ST4	Vehicles should include standard safety devices like seat belts and emergency tools.	.776			
Reliability	3	RL2	Journey duration should be efficient and not excessively time-consuming.	.771	.722	0.614	0.670
		RL3	Service frequency should meet the expected intervals.	.762			
		RL4	Timeliness in departure and arrival schedules is expected.	.818			
Convenience	4	CN2	Basic amenities such as Wi-Fi, restrooms, stairs, and lifts should be available.	.821	.709	0.545	0.618
		CN3	Seating should be sufficient and include priority seating for older passengers.	.685			
		CN4	Adequate space should be provided for storing luggage.	.700			
		CN5	The step height into the vehicle should be comfortable and manageable for seniors.	.681			
Staff	4	FF1	Driving behavior is expected to be cautious and prioritizing safety.	.789	.703	0.521	0.601
		FF2	Vehicles should not depart until passengers are properly seated.	.729			
		FF3	Transport personnel should exhibit a service-oriented attitude.	.689			
		FF4	Staff are expected to act courteously and respectfully.	.675			
Information	5	IN1	Clear and complete travel-related information should be available.	.849	.775	0.526	0.602
		IN2	Timetable changes should be communicated promptly.	.622			
		IN3	Guidance on intermodal transfers should be provided to travelers.	.640			
		IN4	A feedback or complaint mechanism should be accessible to passengers.	.843			
		IN5	Announcements at the station should be comprehensive and audible.	.635			
Station/STOP	5	SP1	Stop signage should be legible and appropriately sized.	.824	.786	0.533	0.607
		SP2	Stations are expected to maintain cleanliness and hygiene.	.627			
		SP3	Sufficient seating and sun protection (e.g., roofed waiting areas) should be available.	.641			
		SP4	Parking space should meet demand and be easily accessible.	.884			
		SP5	Commercial amenities such as food outlets, drinks, and ATM services should be present.	.633			

Note: Average Variance Extracted (AVE), Composite Reliability (CR)

Measurement Model: Confirmatory Factor Analysis (CFA)

The outcomes of the confirmatory factor analysis (CFA) for the measurement model are detailed in Table 5, offering empirical evidence on public transport users' expectations. The model's fit indices are as follows: $\chi^2/df = 2.394$, CFI = 0.964,

TLI = 0.959, RMSEA = 0.025, and SRMR = 0.026. These values surpass commonly recommended thresholds, indicating a strong model-data fit. Similarly, the CFA evaluating perceived service quality yielded favorable fit metrics: $\chi^2/df = 2.791$, CFI = 0.960, TLI = 0.953, RMSEA = 0.028, and SRMR = 0.027. These results confirm that the

measurement model effectively represents the latent constructs and is appropriate for assessing user perceptions of public transport service quality.

Structural equation modeling results

The structural model demonstrated an excellent fit with the observed data, satisfying all established benchmarks for model adequacy. The fit indices were $\chi^2/df = 354.988/305$, CFI = 0.998, TLI = 0.997, RMSEA = 0.009, and SRMR = 0.026, all of which indicate strong model performance. The results of the SEM analysis, as presented in Figure 1, Table 6, and Table 7, demonstrate the statistical significance of all the hypotheses proposed in this study. The measurement model analysis revealed that some indicators exhibited factor loadings approaching 1. This may reflect a

high degree of response homogeneity (Kline, 2011), particularly among older adults, who often share similar characteristics, behaviors, or experiences. Consequently, their responses to the questionnaire tend to align in a consistent direction, which represents a specific feature of the data unique to this population group rather than a broader demographic. Therefore, while high factor loadings indicate strong consistency between indicators and latent constructs, it is important to interpret such results with caution. Potential redundancy among indicators should be considered to maintain model parsimony and efficiency.

When examining the hypotheses regarding causal relationships among latent variables representing factors influencing elderly passengers' intentions to use public transportation, all proposed

Table 5. Summary of Confirmatory Factor Analysis Outcomes

Factors		Expected Services		Factors		Perceived Services	
		Standardized Estimates	Standardized Estimates			Standardized Estimates	R-Square
EQ1: Vehicle characteristics (Cronbach's α =0.703, CR=0.503, AVE=0.801)	EV1	0.569***	.324	PQ1: Vehicle characteristics (Cronbach's α =0.720, CR=0.534, AVE=0.820)	VC1	0.708***	.501
	EV2	0.549***	.301		VC2	0.604***	.365
	EV3	0.728***	.529		VC3	0.781***	.610
	EV4	0.606***	.367		VC4	0.491***	.241
EQ2: Access (Cronbach's α =0.701, CR=0.594, AVE=0.655)	EA1	0.683***	.466	PQ2: Access (Cronbach's α =0.709, CR=0.612, AVE=0.668)	AC1	0.577***	.332
	EA2	0.681***	.464		AC2	0.955***	.913
	EA3	0.628***	.394		AC3	0.827***	.684
EQ3: Safety (Cronbach's α =0.700, CR=0.616, AVE=0.671)	ES2	0.586***	.343	PQ3: Safety (Cronbach's α =0.718, CR=0.626, AVE=0.679)	ST2	0.611***	.373
	ES3	0.821***	.673		ST3	0.753***	.567
	ES4	0.600***	.360		ST4	0.669***	.447
EQ4: Reliability (Cronbach's α =0.708, CR=0.618, AVE=0.673)	ER2	0.656***	.431	PQ4: Reliability (Cronbach's α =0.722, CR=0.614, AVE=0.670)	RL2	0.622***	.387
	ER3	0.781***	.610		RL3	0.660***	.436
	ER4	0.585***	.343		RL4	0.768***	.590
EQ5: Convenience (Cronbach's α =0.700, CR=0.528, AVE=0.606)	EC2	0.456***	.208	PQ5: Convenience (Cronbach's α =0.709, CR=0.545, AVE=0.618)	CN2	0.724***	.524
	EC3	0.591***	.349		CN3	0.601***	.362
	EC4	0.728***	.530		CN4	0.663***	.440
	EC5	0.650***	.423		CN5	0.545***	.297
EQ6: Staff (Cronbach's α =0.741, CR=0.542, AVE=0.616)	EF1	0.552***	.304	PQ6: Staff (Cronbach's α =0.703, CR=0.521, AVE=0.601)	FF1	0.785***	.616
	EF2	0.657***	.432		FF2	0.657***	.432
	EF3	0.782***	.611		FF3	0.506***	.257
	EF4	0.600***	.360		FF4	0.463***	.215
EQ7: Information (Cronbach's α =0.791, CR=0.529, AVE=0.607)	EI1	0.616***	.379	PQ7: Information (Cronbach's α =0.775, CR=0.526, AVE=0.602)	IN1	0.898***	.807
	EI2	0.739***	.547		IN2	0.492***	.242
	EI3	0.638***	.407		IN3	0.492***	.242
	EI4	0.633***	.400		IN4	0.805***	.648
	EI5	0.663***	.439		IN5	0.576***	.331
EQ8: Station/STOP (Cronbach's α =0.781, CR=0.523, AVE=0.602)	ET1	0.604***	.365	PQ8: Station/STOP (Cronbach's α =0.786, CR=0.533, AVE=0.607)	SP1	0.585***	.342
	ET2	0.597***	.356		SP2	0.436***	.190
	ET3	0.805***	.647		SP3	0.635***	.404
	ET4	0.600***	.359		SP4	0.742***	.551
	ET5	0.638***	.407		SP5	0.612***	.375

Note: ***p < 0.001; Composite Reliability (CR); Average Variance Extracted (AVE).

hypotheses were supported. The statistical significance of these relationships is evaluated as follows:

- H₁: Passenger satisfaction has a direct positive effect on the intention to use public transportation ($\beta = 0.912$, $p < 0.01$).
- H₂: A favorable attitude toward public transportation has a direct positive effect on intention ($\beta = 0.582$, $p < 0.05$).
- H₃: Subjective norms exert a direct positive effect on the intention to use public transportation ($\beta = 0.085$, $p < 0.01$).
- H₄: Perceived behavioral control (PBC) has a significant direct effect on intention ($\beta = 0.112$, $p < 0.001$).

- H₅: Customer expectations positively influence perceived service quality (PSQ) ($\beta = 0.570$, $p < 0.05$).

- H₆: Perceived service quality (PSQ) positively influences customer satisfaction with public transportation ($\beta = 0.286$, $p < 0.01$).

- H₇: Habit exerts a negative influence on intention ($\beta = -0.100$, $p < 0.01$).

- H₈: Public transportation satisfaction is enhanced by a favorable user attitude ($\beta = 0.649$, $p < 0.01$).

These results underscore the multifaceted nature of intention formation among elderly users and highlight the critical roles of satisfaction,

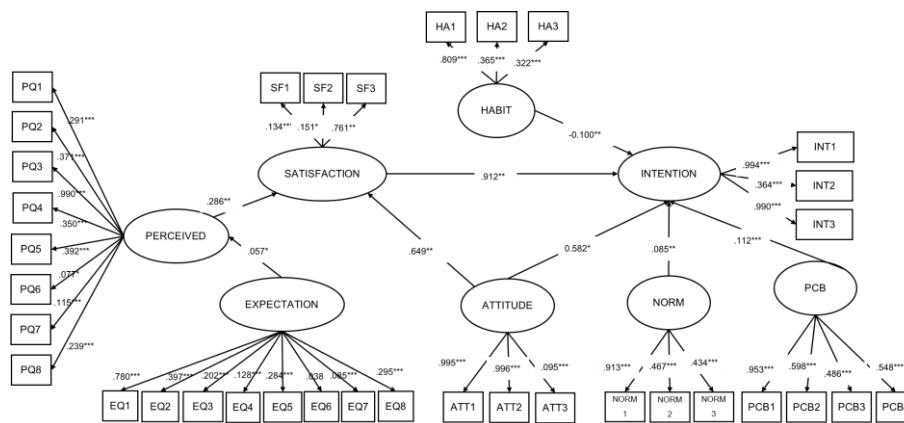


Figure 1. SEM Framework for Public Transportation Usage Intention

Note: Model fit information: Chi-square value (χ^2) = 354.988, degree of freedom (df) = 305 (p-value = 0.000), Root mean square error of approximation (RMSEA) = 0.009, CFI = 0.998, TLI = 0.997, Standardized Root Mean Square Residual (SRMR) = 0.026

Table 6. Standardized Loadings in the SEM Analysis

Independent Variables	Std. Estimates	Std. Error	P-Value	Independent Variables	Std. Estimates	Std. Error	P-Value
Intention				Satisfaction			
INT1	0.994	0.000	<0.001***	SF1	0.134	0.049	<0.01**
INT2	0.364	0.017	<0.001***	SF2	0.151	0.070	<0.05*
INT3	0.990	0.001	<0.001***	SF3	0.761	0.250	<0.05*
Attitude				Perceived Services			
ATT1	0.995	0.000	<0.001***	PQ1	0.291	0.037	<0.001***
ATT2	0.996	0.000	<0.001***	PQ2	0.371	0.038	<0.001***
ATT3	0.095	0.027	<0.001***	PQ3	0.990	0.000	<0.001***
Subject Norm				PQ4	0.350	0.040	<0.001***
NORM1	0.913	0.099	<0.001***	PQ5	0.392	0.048	<0.001***
NORM2	0.467	0.052	<0.001***	PQ6	0.077	0.033	<0.05*
NORM3	0.434	0.049	<0.001***	PQ7	0.115	0.035	<0.001***
PCB				PQ8	0.239	0.030	<0.001***
PCB1	0.953	0.035	<0.001***	Expected Services			
PCB2	0.598	0.026	<0.001***	EQ1	0.780	0.053	<0.001***
PCB3	0.486	0.023	<0.001***	EQ2	0.397	0.033	<0.001***
PCB4	0.548	0.027	<0.001***	EQ3	0.202	0.045	<0.001***
Habit				EQ4	0.128	0.026	<0.001***
HA1	0.809	0.180	<0.001***	EQ5	0.284	0.027	<0.001***
HA2	0.365	0.083	<0.001***	EQ6	0.038	0.026	<0.001***
HA3	0.322	0.073	<0.001***	EQ7	0.085	0.026	<0.001***
				EQ8	0.295	0.030	<0.001***

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 7. Result of Structural Model

Relationship	Standardized Coefficients	Result
Attitude →(+) Intention	0.582*	Supported
NORM →(+) Intention	0.085*	Supported
PCB →(+) Intention	0.112***	Supported
Expectation →(+) Perceived Service→(+)Satisfaction→(+)Intention	0.015**	Supported
Habit →(-) Intention	-0.100**	Supported
Attitude →(+) Satisfaction→(+)Intention	0.591**	Supported

Note; *** p < 0.001, ** p < 0.01, * p < 0.05.

Table 8. Comparison of Fit Indices and Recommended Thresholds for the Structural Equation Model

Fit Index / Statistical Measure	Recommended Threshold	Analysis Result	Index Interpretation
χ^2/df	>5	1.16	Good model fit
Comparative Fit Index:CFI	≥0.90	0.998	Good model fit
Tucker-Lewis Index:TLI	≥0.80	0.997	Good model fit
Standardized Root Mean Square Residual:SRMR	≤0.08	0.026	Good model fit
Root Mean Square Error of Approximation:RMSEA	≤0.05	0.009	Good model fit

service quality, and habitual behavior in shaping future mobility choices.

Based on the results of the structural equation modeling and mediation analysis, as presented in Table 8, both the direct and indirect effects of attitude on behavioral intention through satisfaction were observed. These findings indicate that higher levels of satisfaction with public transportation among older adults positively influence their intention to use such services. Satisfaction acts as a mediating factor linking attitude to behavioral intention. When older adults are satisfied, they are more likely to reuse the service, recommend it to others, or intend to use it again in the future.

Attitude plays a preceding role in shaping satisfaction. For example, attitudes toward travel safety, service reliability, fare affordability in relation to income, and improvements in service quality especially those features relevant to the elderly, such as ease of boarding and alighting, station accessibility, and amenities like handrails, elevators, and designated seating help determine the level of satisfaction. In turn, satisfaction enhances the likelihood of future service usage.

Discussion

This study demonstrates that, even when considering different passenger age groups, a positive attitude toward public transportation exerts a favorable influence on the elderly's intention to travel using public transit. To promote the use of public transit instead of private cars, emphasis should be placed on nurturing positive attitudes toward public transportation consistent with the findings of Watthanaklang *et al.* (2024), which examined public transit intention in Thailand. That study suggests public transit systems should be

designed to meet users' needs and ensure equitable accessibility. The present findings indicate that enhancing capacity or shifting intentions is valuable not only for older adults but also for making transit more user friendly across all age groups.

From our results, a favorable attitude toward public transportation has both direct and indirect effects on behavioral intention, mediated by satisfaction. Indeed, the most powerful predictor of intention among elderly passengers is satisfaction with the service. This aligns with earlier Thai studies Dangbut *et al.* (2024) on the effect of attitudes toward high speed rail technology in urban and rural areas. When infrastructure is well designed e.g., adequate lighting, nonslippery surfaces, handrails, clear signage older adults feel more confident and safe, thereby improving perceptions of usability and perceived benefits, which in turn influence attitude and behavioral intention. If positive attitudes are cultivated, satisfaction and intention among elderly users increase. Similarly, research in China (Sun *et al.*, 2020), (using an extended ecological model rather than strict TPB) found that perceived usefulness and perceived convenience positively affect mode choice intention. Older adults perceive public transport as useful and convenient, thereby raising their intention to choose that mode. This highlights that older adults' attitudes toward public transport as a practical and reliable mode are critical. Parallel findings have been recorded in Kuala Lumpur and peri urban areas, where service quality and satisfaction positively influence users' intention to switch modes and generate word-of-mouth (WOM) advocacy (Hamzah *et al.*, 2023). This suggests that in developing countries like Malaysia, policies promoting modal shift from private vehicles to public transit should focus on fostering positive attitudes, which improve

satisfaction, thereby driving intention to use public transport over private cars.

The satisfaction factor exerts the strongest influence on older adults' intention to travel by public transport. This result aligns with Kuo and Tang (2013), a Taiwanese study of individuals aged 65 or older that examined their intention to use high-speed rail via SEM. Although that study did not adopt the Theory of Planned Behavior, it still used behavioral intention as the endpoint variable, as in TPB, and found that service quality has a significant positive effect on customer satisfaction, and satisfaction in turn directly and strongly affects future usage intention. Moreover, it reflects that the cohort aged 45–60 in Bangkok is approaching old age; in a study of travel behavior for tourism in Bangkok, it was similarly observed (Norasan & Seeboonruang, 2019). Station or bus stop design should consider elderly-friendly facilities, such as ramps, shade, rest seats, toilets, and safe, clean walkways. The main problems faced by elderly bus users in Bangkok (Kulachai, 2014) include difficulty boarding and alighting, inadequate infrastructure, and lack of information about schedules and fares. If buses run punctually, offer easy boarding and alighting, and provide comprehensive routes, elderly individuals could travel for daily needs (e.g., to markets, hospitals, or to meet friends), thereby improving quality of life.

Likewise, a study on older Thai adults in three northeastern provinces (Nakhon Ratchasima, Buriram, and Khon Kaen) by Suangka (2015) found that service quality particularly vehicle condition, staff service, schedules, and station condition directly influences older adults' choice and frequency of use. An Importance–Satisfaction analysis (Wong *et al.*, 2017) showed that station or stop condition is the most influential factor on overall satisfaction among elderly passengers; notably, 17.8% of respondents expressed strong dissatisfaction with “seat availability,” emphasizing the need to improve pedestrian environments for older adults (Liu *et al.*, 2022).

In both Thailand and abroad, satisfaction has a major effect on intention among elderly passengers. When comparing the statistical influence of satisfaction factors, the effect size on use intention among older Thai adults is higher than in studies conducted in Taiwan and Malaysia. This suggests that Thai elders place special importance on “creating a satisfying service experience.” Considering the Thai cultural context, older persons often receive assistance from children or family members, such as being escorted to stations, ticket booking, or help with luggage. Having supportive or empathetic service (service empathy) aligns with the cultural norm of filial piety and respect for elders,

which affects older Thais emotionally. Receiving such assistance from family or community strengthens confidence, safety, and perceived ease of use (PEU), which in turn fosters more positive attitudes toward public transport use. It is thus recommended to train drivers to adopt positive, respectful, and attentive attitudes toward elders (driver attitude). Because of this cultural value of gratitude, meeting this need influences satisfaction, and encouragement from close ones helps increase the elderly's intention to try or accept public transport modes (Sun *et al.*, 2020).

Beyond contributing to the SERVQUAL framework, this research expands existing theory by demonstrating that the negative impact of private car usage also influences older adults' intention to use public transport. Dependence on private vehicles lowers the intention to use public transport; older adults often rely on public modes only when necessary (e.g., car breakdowns or lack of alternatives). Long periods of private car use foster habits anchored in travel comfort, reducing the tendency for elders to experiment with or adapt to public transport. Accordingly, public transport promotion policies should target reducing the habitual reliance on private cars by making them less convenient or more costly and by creating opportunities for new habits such as monthly passes, easily accessible stations, and consistently reliable services. Fu (2021) recommended that, to effect behavioral change (mode shift), friction from habitual behaviors must be lowered either by making alternative modes more efficient or restricting strong modes such as private car use and by giving privileges to public transit consistent with Bangkok's context (Thaithakul *et al.*, 2023). It was found that demand for public transport dropped markedly during key events like the COVID 19 pandemic, with people switching to private cars, walking, or biking rather than using major transit stations. Similar trends were observed in Iran during COVID 19: although service quality improved and satisfaction rose, user loyalty declined. The main factor reducing loyalty during the pandemic was the shift to private cars. Therefore, in post COVID 19 (the “new normal”) studies in which daily life and technology (especially online) have shifted (Raghavan *et al.*, 2021), it is advisable to explore applications of technology for elderly passengers (e.g., mobility apps), as well as aspects of safety and health such as seat distancing and reserved seating, since this group is particularly vulnerable to health risks. In Hong Kong, the top priorities for improvement were seat availability and station or stop conditions areas with high importance but low satisfaction (Wong *et al.*, 2018). Effective communication that reassures passengers about

system safety and the implementation of disease prevention measures is also critical.

Esmailpour *et al.* (2022) note that customer expectation factors have a positive influence on perceived service quality (PSQ), which in turn positively influences customer satisfaction in public transport usage. This is consistent with Thai guardians who have high expectations: perceiving good service quality leads to satisfaction and trust, and they are more inclined to allow their children to use public transport (Nanthawong *et al.*, 2024). Behavioral change thus must not only shift attitudes but also adjust or transform the situational circumstances that lead to habitual behaviors. For

example, a study of older adults in Italy (Rossi *et al.*, 2023) revealed that developing elder-supportive communities and an accessible, high-quality, friendly public transport system affects seniors' life satisfaction. Moreover, research on Kuala Lumpur's public transport suggests that improving only structural quality (tangibles or reliability) is insufficient to trigger behavioral change; services must also be empathetic, responsive to users' needs, comfortable, and capable of generating satisfaction, thereby fostering public transport adoption and positive word-of-mouth (WOM). The key findings from related research compared to this study are summarized in Table 9.

Table 9. Summary of related research

Authors	Country	Methodology	Data used	Key findings
Kuo and Tang (2013)	Taiwan	SEM (service quality, corporate image, customer satisfaction, and behavioral intention)	341 elderly participants	Satisfaction directly affected travel behaviors, while service quality and corporate image played indirect roles. Service quality plays a significant role on the effect of satisfaction.
Kulachai (2014)	Thailand / Bangkok	SEM / Quality of life	400 elderly participants	Mobility and social inclusion affect quality of life in terms of mental health, independence, and sense of worth.
Suangka (2015)	Thailand	SEM / CFA	325 elderly from 3 Provinces	The quality of public transportation systems and the health of the elderly directly influence how often they use public transportation.
Srichuae <i>et al.</i> (2016)	Thailand	Logistic regression	Elderly survey data: 292 elderly participants in Bangkok	The community urban development and planning and neighborhood design is important for supporting elderly mobility.
Kaewklueklom <i>et al.</i> (2017)	Khonkan, Thailand	Habit/TPB / The utility function	215 private car users, 220 motorcycle users, and 165 public transport users (Non-elderly)	Attitude and habit are the most important variables influencing the intention to use BRT.
Wong <i>et al.</i> (2017)	Hong Kong	SEM / Satisfaction	613 elderly participants	The factors that have the greatest influence on satisfaction are accessibility and comfort & safety.
Wong <i>et al.</i> (2018)	Hong Kong	A binary logistic regression	613 elderly participants	Elderly people place more importance on the accessibility of bus stops and the short waiting time than on other factors.
Norasan and Seeboonruang (2019)	Thailand	CFA (Quality of public transport system)	Elderly people and entering the elderly age (45-60 Years) :204 tourists	The factor that most affects the evaluation of public transport system quality is the physical characteristics of the transport stations.
Sun <i>et al.</i> (2020)	China	MIMIC, the ecological model	438 elderly participants	The elderly believe that public transport, AVs, and SAVs are useful and convenient travel modes for themselves.
Liu <i>et al.</i> (2022)	Nanjing, China	SEM /TPB (walking behavioral intention)	501 elderly participants	PBC is highly correlated with older people's behavior intention.
Hamzah <i>et al.</i> (2023)	Kuala Lumpur, Malaysia	SEM/ Satisfaction	Survey of 421 rail and bus passengers (Non-elderly)	Satisfaction affected to switching intention and WOM.
Iamtrakul <i>et al.</i> (2023)	Thailand	spatial analysis	Examining health care access in older adults aged 60 years and older in the Ban Phaeo, Samut Sakhon	Geospatial modelling shows that access to health care was impacted by poor road connectivity and road conditions.

Table 9. Summary of related research (Continued)

Authors	Country	Methodology	Data used	Key findings	
Dangbut <i>et al.</i> (2024)	Thailand	SEM /the technology readiness index (TRI)/TAM	3200 elderly , in the areas along high-speed rail routes in Thailand (Urban & Rural area)	Attitudes toward using high-speed rail are important in urban areas, whereas attitudes and perceived benefits are important in rural areas.	
Watthanaklang <i>et al.</i> (2024)	Thailand	SEM/ TPB	400 public transport users (Non-elderly)	Attitude has the highest influence on intention to use public transport, Service quality has a direct impact on perceived accessibility.	
Nanthawong <i>et al.</i> (2024)	Nakhonratchasima, Thailand	SEM/ /Satisfaction	750 parents (Non-elderly)	If parents are satisfied with public transportation services, they are more likely to choose to use them.	
Lieophairot <i>et al.</i> (2025)	Thailand	SEM / Loyalty	625 older rail passengers	Innovation exerted the strongest overall effect on Loyalty, both directly and through its influence on service quality and passenger satisfaction.	
Philuek <i>et al.</i> (2025)	Thailand	Multinomial model	Logit	Elderly survey data: 1,000 elderly participants Thailand's four regions,	This study analyzes the factors influencing travel mode choice among the elderly in Thailand by comparing traditional statistical methods with modern machine learning techniques.
This research	Thailand	CFA/SEM/TPB/Habit/ Satisfaction	2250 elderly participants Thailand's 5 regions	Satisfaction has the greatest influence on intention, followed by positive attitudes, which also directly affect the intention to use public transportation. Additionally, attitude exerts an indirect effect on intention through satisfaction. At the same time, the habit of using private vehicles remains a barrier to this intention among older adults.	

Conclusion

This study examined the causal factors influencing travel intention among elderly passengers in Thailand and revealed that a positive attitude toward public transportation has a direct and significant effect on user satisfaction. These findings offer important implications for policymakers and relevant stakeholders, highlighting the necessity to incorporate the perspectives of elderly passengers in the formulation of public transportation policies. Such policies should aim to promote equitable access to transit services for all, particularly aging populations. A critical factor emerging from the analysis is habit specifically, the habitual use of private vehicles, which represents a behavioral pattern contrary to public transport usage. This habitual reliance on self-directed modes of transport negatively impacts the intention to use public transportation among older adults. To encourage habit formation aligned with public transit use, it is essential to foster environments and circumstances that consistently reinforce such behavior. One promising example is Thailand's fare reduction policy for elderly bus riders, which has been widely recognized as a socially progressive subsidy.

This initiative reduces reliance on private vehicles among non-working elderly individuals and promotes equitable access to public services. If elderly passengers can experience seamless and stress-free travel, their satisfaction and long-term commitment to using public transportation can be significantly enhanced. To ensure services meet real user needs, it is recommended that public transportation systems be developed through a value co-creation approach, involving elderly passengers in the design and improvement of services. This participatory process not only aligns services with the lived experiences of older users but also builds trust and satisfaction. The findings of this study suggest that for public transport systems in Thailand to become truly sustainable, greater attention must be paid to the role of past behavior in shaping travel habits. Predicting and influencing future behavior requires more than simply altering intention it necessitates interventions that also reshape habitual responses over time.

Based on the findings of this study, a policy framework can be developed to promote the use of public transportation among Thai elderly individuals as follows:

I. Implementation Stages

- **Short-term:** Focus on improving basic services such as cleanliness, safety, and clear, accessible information. This includes well-marked signage and fare reduction measures specifically for older adults.

- **Medium-term:** Invest in elder-friendly infrastructure, including elevators, ramps, and designated seating.

- **Long-term:** Aim to cultivate a sustainable travel culture through public awareness campaigns, educational programs, and integration with social welfare systems.

II. Resource Requirements

Policy implementation requires budget allocations from both central and local government authorities. It also involves the development of trained personnel equipped to serve elderly passengers and the application of technology to enhance accessibility. This may include user-friendly mobile applications with large fonts, audio instructions, or information presented in simplified Thai language.

III. Evaluation Metrics

Key performance indicators may include: the proportion of elderly individuals shifting from private cars to public transportation, satisfaction levels with public transport services, frequency of use, and improvements in social equity outcomes.

IV. Barriers and Strategies

Potential barriers include habitual reliance on private vehicles, budget constraints, and unequal access to services. Suggested strategies to overcome these challenges include:

- Providing economic incentives for elderly users.
- Encouraging participation of older adults in service design and pilot testing (co-creation).
- Offering free or discounted trial programs for the elderly.
- Launching initiatives such as a “Buddy System” involving volunteers assisting elderly passengers with boarding and alighting.
- Organizing training programs to familiarize seniors with public transport technologies.
- Conducting guided excursions to help older adults learn new routes and services.

- Introducing user trials of new transport systems (e.g., new bus models or BRT) to collect feedback before full-scale implementation.

- Integrating public transport policy with urban development and public health strategies to build strong and sustainable linkages.

Limitations and future studies

Due to the global disruption caused by the COVID-19 pandemic, this study incorporates insights from the pandemic period, during which public transport usage significantly declined as individuals increasingly turned to private vehicles. However, as COVID-19 transitions into an endemic disease and conditions normalize, travel patterns may gradually return to pre-pandemic levels. Nonetheless, the emergence of new lifestyles and behavioral patterns could result in long-term shifts in mobility choices. It is important to note that this study does not include any variables related to COVID-19 prevention measures, as the data were collected prior to the outbreak. If future studies explore the behavior of elderly passengers during the pandemic, they may uncover how COVID-19 prompted this demographic to become more cautious and adaptive in using public transport. Notably, the pandemic influenced changes in attitudes, subjective norms, perceived behavioral control, and satisfaction each of which affected elderly individuals’ travel behavior during and after the outbreak. Health concerns played a significant role, as older adults became increasingly worried about infection risks associated with public transport, leading to more cautious attitudes toward travel in public spaces. Additionally, the need to adapt to technology for instance, in ticket booking or accessing travel information helped increase confidence and convenience among elderly passengers.

Moreover, improvements in public transport service quality such as enhanced cleanliness, social distancing measures, and service accessibility have also contributed to greater satisfaction among older adults with public transport in Thailand. As the situation normalizes, future research should examine underlying heterogeneity in behavior and attitudes by disaggregating the elderly population based on factors such as gender, age subgroups (60-69, 70-79), or geographic region. Identifying these hidden differences would provide valuable insights and represents an important direction for future study.

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