

Cultivating Sustainable Urban Mobility: Investigating Commuters' Reuse Intentions for Transport Network Vehicle Services in Metro Manila

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ABSTRACT

Ridesharing services like Uber and Lyft have revolutionized global travel behavior, impacting mode choice, urban mobility, and the broader sharing economy. While these services have drawn users away from traditional transportation modes and served as complementary options, their widespread adoption has also increased traffic in major cities. This study focuses on Metro Manila's Transport Network Vehicle Services (TNVS), particularly Grab's market dominance following Uber's exit. It investigates key factors influencing commuters' intentions to continue using TNVS, including economic benefits, perceived usefulness, trust, safety, and security. Additionally, the research explores how user satisfaction and service quality moderate the relationship between TNVS usage and the intention to reuse these services. By integrating global literature with an analysis of TNVS dynamics in Metro Manila, this study enhances our understanding of the sustainability of emerging transportation models in urban environments. The findings provide crucial insights for commuters, TNVS operators, and policymakers, supporting the goals of the Public Utility Vehicle Modernization Program and underscoring the importance of strategic investments and safety measures for the long-term sustainability of TNVS in Metro Manila.

Keywords: Sustainable urban mobility, transport network vehicle services, reuse intention, Metro Manila.

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1. INTRODUCTION

Urban mobility is essential for sustainable development, especially in cities like Metro Manila, which are expanding quickly. As metropolitan areas grow and populations rise, conventional transportation systems frequently fail to accommodate commuter needs, resulting in traffic congestion, pollution, and operational inefficiencies (Ewing & Cervero, 2001). In response to these difficulties, popular substitutes known as Transport Network Vehicle Services (TNVS)—like Grab—have surfaced, providing urban dwellers with adaptable, reasonably priced, and practical transportation options (Alemi et al., 2019; Jin et al., 2018). In addition to improving mobility, these services offer a vital substitute for private vehicle ownership and signify a move toward a more dynamic, user-centered transportation paradigm. However, commuters' ongoing usage of TNVS is also essential to its sustainability. Therefore, service providers must guarantee high user satisfaction and trust (Shamsudin et al., 2022).

The urban transportation scene in Metro Manila has undergone a fundamental transformation due to the widespread use of TNVS. After Uber's withdrawal from the

Philippine market in 2018, Grab emerged as the predominant player, prompting critical inquiries on the quality and sustainability of its services (ABS-CBN, 2024). Nowadays, TNVS platforms are an essential part of commuters' everyday life, helping with more than simply mobility—they also boost economic growth and lessen the need for ineffective public transportation options (Dias et al., 2017; Wang et al., 2020). The government's acknowledgment of TNVS as an important component of urban transportation and growing demand for these services are both highlighted by the Land Transportation Franchising and Regulatory Board's (LTFRB) recent expansions, which include the installation of 10,000 new TNVS spaces (Philstar, 2024).

Developing a sustainable transportation strategy requires understanding the factors motivating passengers to use TNVS. The user experience and retention are shaped by perceived utility, safety, trust, cost savings, and service quality (Cheah et al., 2020; Ert et al., 2016). Policymakers and TNVS providers must consider these variables, particularly in light of the competitive environment and difficulties presented by urban congestion. According to studies conducted in Cairo and Jakarta, commuters in developing nations prioritize safety and cost when selecting ride-hailing services (Elnadi & Gheith, 2022; Sukmadewi et al., 2023). The findings suggest that insights from Metro Manila might offer significant lessons for other cities in Southeast Asia and Latin America with similar difficulties.

This research substantially enhances the global dialogue on sustainable urban transportation by pinpointing essential factors influencing TNVS reuse relevant to Metro Manila and similar urban markets globally. By emphasizing trust-building techniques, safety enhancements, and loyalty initiatives, TNVS providers may elevate service quality and augment customer retention. Safety measures, like driver background checks and real-time trip tracking, have demonstrated efficacy in other markets for fostering trust and enhancing participation (Lyft, 2021). Targeted marketing methods, such as Grab's student discount programs in Singapore, exemplify how TNVS providers may customize services for certain groups to enhance customer happiness and loyalty (Grab, 2023).

These findings give significant insights for TNVS providers, legislators, and urban planners aiming to establish integrated sustainable transportation frameworks. Cooperation between TNVS operators and public transit agencies may alleviate congestion and enhance multi-modal mobility. For instance, Uber's collaborations with local transit authorities in the U.S. offer reduced fares for trips to train stations, promoting the usage of TNVS in commuters' everyday travel (Hall & Krueger, 2017). Executing analogous activities in Metro Manila might synchronize TNVS with governmental endeavors to improve public transportation infrastructure while fostering sustainable development.

This research offers concrete suggestions that encourage the long-term adoption of TNVS by utilizing empirical analysis and international literature. The findings can help politicians and urban planners develop policies that support sustainable mobility. This study enhances the existing knowledge on sustainable urban transportation and fits with broader initiatives to enhance urban infrastructure and elevate the quality of life in rapidly expanding metropolitan regions.

2. THEORETICAL BACKGROUND

2.1 Theoretical Framework

This research is grounded in three complementary theories that comprehensively understand travel behavior and decision-making processes.

1. **Utility Maximizing Theory** (McFadden, 1974; Van Acker & Witlox, 2016): This theory posits that individuals choose options that maximize their utility. The utility function, typically linear, incorporates attributes of the chosen option and individual socioeconomic factors representing personal preferences. While acknowledging individual perceptions and attitudes, the theory primarily focuses on predicting rather than explaining travel behavior mechanisms. It establishes connections between short-term and long-term decisions in daily travel behavior, such as mode of transportation and destination selection.
2. **Theory of Reasoned Action (TRA)** (Fishbein & Ajzen, 1975): TRA proposes a causal chain linking beliefs, attitudes, intentions, and behavior. According to this theory, behavior is directly influenced by the intention to perform it, which is shaped by attitudes toward the behavior and subjective norms. Attitudes represent positive or negative evaluations of performing a behavior, while subjective norms reflect perceived social pressure to engage in the behavior. TRA suggests that individuals with positive attitudes toward a behavior and who believe others want them to perform it are more likely to form stronger intentions and, consequently, to engage in the behavior.
3. **Activity-Based Approach** (Goodwin & Hensher, 1978): This approach extends the utility-maximizing theory by emphasizing that travel behavior is determined by the activities individuals wish to engage in. It recognizes that spatial separation of living, working, shopping, and recreational activities necessitates travel. The approach assumes that two main factors influence activity patterns: a) The propensity to engage in an activity, shaped by individual characteristics such as goals, mindsets, roles, and socioeconomic conditions. b) The opportunity to engage, which relates to the individual's perception of the quantity and quality of available alternatives, essentially representing the perceived environment in which activities occur.

By integrating these theories, this research aims to provide a holistic understanding of the factors influencing commuters' intentions to continue using TNVS in Metro Manila, considering rational decision-making processes and the broader context of individual activities and perceptions.

2.2 Literature Review

The intention to reuse Transport Network Vehicle Services (TNVS) among commuters in Metro Manila is influenced by several key factors, including economic benefits, perceived usefulness, trust, safety and security, attitude, actual usage, and satisfaction.

Economic Benefit

Economic Benefit is a major driver of TNVS adoption. Studies by Alemi et al. (2019) and Jin et al. (2018) highlight the cost-effectiveness of ride-hailing services, making them attractive alternatives to traditional transportation. Amirikiaee and Evangelopoulos (2018) found that economic savings are crucial in encouraging users to opt for ridesharing over personal car ownership. Bistaffa et al. (2021) further quantify these benefits, showing how economic considerations influence ride-sharing decisions. Pham and Ton (2023) emphasize that economic benefits significantly impact consumer decisions, especially among younger demographics, aligning with TNVS adoption in urban settings like Metro Manila.

Perceived Usefulness

Perceived Usefulness is another critical determinant of TNVS adoption. Cheah et al. (2020) and Dias et al. (2017) note that the convenience and time-saving aspects of TNVS significantly influence user attitudes. Zaigham et al. (2022) and Feng and Jantarakolica (2023) further support this, showing that perceived usefulness drives technology adoption across various contexts, including ride-hailing.

Trust

Trust is essential in the sharing economy, especially for TNVS. Ert et al. (2016) and Rosenblat and Stark (2016) highlight the importance of trust in ensuring user engagement and satisfaction. Moody et al. (2019) and Grimaldo and Uy (2020) emphasize that building and maintaining trust is critical for long-term usage. Trust in the reliability and safety of TNVS platforms is a significant factor in both initial adoption and continued use.

Safety and Security

Safety and Security are paramount concerns for TNVS users. Lyft (2021) and Elnadi and Gheith (2022) emphasize that perceived safety directly affects user retention. Ouali et al. (2020) and Tarnovetckaia and Mostofi (2022) note that safety concerns, especially among female users, influence transportation choices and must be addressed to maximize the benefits of TNVS. Sukmadewi et al. (2023) further explore how safety perceptions influence technology adoption, reinforcing the importance of robust safety measures in ride-hailing services.

Attitude

Factors like perceived usefulness, trust, and prior experiences shape attitudes toward TNVS. Cheah et al. (2020) and Si et al. (2023) highlight those positive attitudes driven by convenience, cost savings, and safety are crucial for TNVS adoption. Pham and Ton (2023) suggest that targeted marketing strategies focusing on these attributes can enhance user attitudes and drive greater adoption, particularly among younger users in urban areas.

Economic benefits

Economic benefits, perceived usefulness, and safety concerns influence Actual Usage of TNVS. Studies by Alemi et al. (2019) and Dias et al. (2017) underscore the importance of understanding usage patterns to optimize service delivery. Jiang et al. (2018) and Hall and Krueger (2017) provide insights into how competition, accessibility, and driver behavior affect usage frequency. Sukmadewi et al. (2023) highlight that actual usage is critical for continued engagement with TNVS.

Satisfaction

Satisfaction is crucial for fostering loyalty and reuse intention in TNVS. Shamsudin et al. (2022) and Jahan (2019) emphasize that high satisfaction levels increase loyalty and positive word-of-mouth. Van Lierop and El-Geneidy (2016) highlight the role of service quality in driving satisfaction and reuse intentions. Grimaldo and Uy (2020) confirm that satisfaction strongly predicts continued usage across various service industries, including TNVS.

Service Quality

Service Quality is a crucial determinant of customer satisfaction and reuse intentions in TNVS. Wang et al. (2020) and Van Lierop and El-Geneidy (2016) demonstrate that consistent service quality enhances user trust and satisfaction, leading to higher reuse intentions. Feng and Jantarakolica (2023) reinforce that high service quality is crucial for securing customer loyalty in technology-based services, including ride-hailing.

Reuse Intention

Reuse Intention is closely linked to satisfaction and service quality. Shamsudin et al. (2022) and Erjavec et al. (2016) show that trust and consistent service quality are essential for developing customer loyalty and ensuring long-term engagement. Pham and Ton (2023) emphasize the importance of understanding demographic-specific preferences in driving reuse intentions, suggesting that targeted marketing strategies can enhance repeat usage, particularly among younger urban users.

2.3. Conceptual Framework

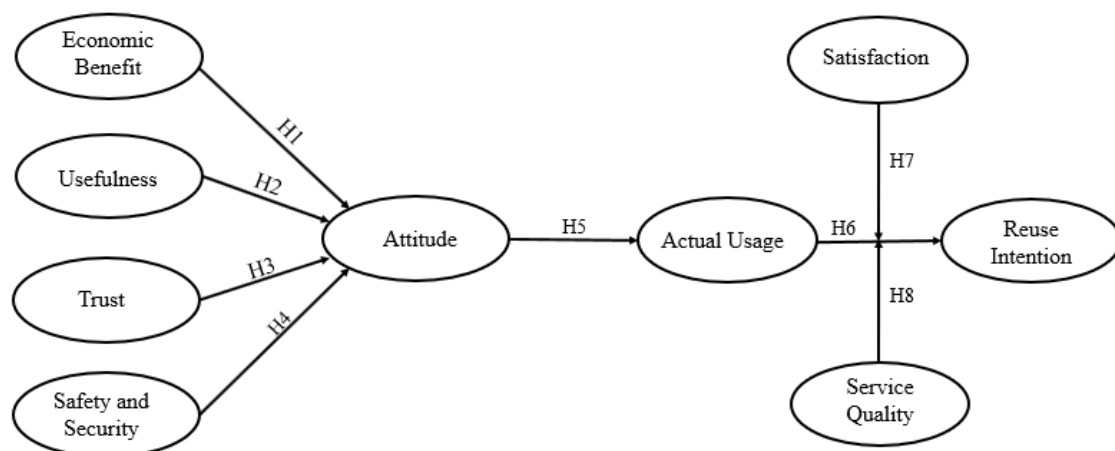


Figure 1. Hypothesized Model

The conceptual framework shows the factors that influence the attitude towards TNVS, which leads to actual usage and then influences the reuse intention of TNVS. The identified factors are economic benefit, usefulness, trust, safety, and security. It also shows the moderating role of service quality and satisfaction on the causal relationship between actual usage and intention to reuse TNVS.

3. METHODS

3.1 Research Design

The researcher utilized a quantitative method using a descriptive-correlational analysis. Descriptive analysis will present the respondents' demographic characteristics and provide an overview of their perception of the attributes of TNVS, such as economic benefit, perceived usefulness, trust, safety, and security, as well as their assessment of service quality, satisfaction, attitude toward TNVS, and reuse intention. Likewise, a correlational analysis was used to test the effect of the independent variable on the study's dependent variable. In Particular, Partial Least Square-Structural Equation Modelling (PLS-SEM) was used to test the hypotheses.

3.2 Subjects and Study Site

The target respondents are the Grab commuters in Metro Manila who are at least 18 years of age and have used it at least once in the past 6 months. A purposive random technique and snowball sampling were used to gather respondents. The researcher collected 584 participants from different cities and municipalities in Metro Manila. However, only 563 satisfied the criteria.

Table 1. Respondents' characteristics

Demographic	Category	F	%
Sex	Female	313	55.6
	Male	233	41.4
	Prefer not to say	17	3.0
Civil Status	Single	504	89.5
	Married	49	8.7
	Separated	3	.5
	Widowed	7	1.2
Age	18 - 24	443	78.7
	25 - 31	51	9.1
	32 - 38	18	3.2
	39 - 45	22	3.9
	46 and above	29	5.1
Occupation	Employed	184	32.7
	Student	349	62.0
	Unemployed	12	2.1
	Retired	5	.9
	Others	13	2.3
Place of Residence	Caloocan	35	6.2
	Makati	23	4.1
	Malabon	10	1.8
	Mandaluyong	12	2.1
	Manila	201	35.7
	Marikina	11	2.0
	Muntinlupa	7	1.2
	Navotas	4	0.7
	Option 17	22	3.9
	Paranaque	15	2.7
	Pasay	22	3.9
	Pasig	24	4.3
	Quezon City	140	24.9
	San Juan	3	0.5
Taguig	10	1.8	
Valenzuela	24	4.3	
Frequency of using TNVS	More than twice per week	45	8.0
	Weekly	83	14.7
	3-4 Times a month	107	19.0
	Twice a month	61	10.8
	Once a month	30	5.3

	Occasional	237	42.1
Amount spent on TNVS per week	Less than 300	195	34.6
	301 - 500	181	32.1
	501 - 700	94	16.7
	701 - 900	35	6.2
	901 - 1,100	22	3.9
	1,101 - 1,300	15	2.7
	1,301 - 1,500	8	1.4
	More than 1,500	13	2.3
Destination of Rider	Mall	414	72.1
	Friend's/Relative's House	295	51.4
	School	289	50.3
	Restaurant	232	40.4
	Office	172	30
	Hotel	122	21.3
	Church	59	10.3

The demographic characteristics of a sample population utilizing Transportation Network Vehicle Services (TNVS) in the Philippines reveal a skewed gender distribution, with more female (55.6%) than male (41.4%) respondents. Most respondents are single (89.5%), while students (62.0%) constitute the predominant occupational category. Geographically, Manila represents the highest proportion of respondents (35.7%), with diverse participation across other areas. Usage patterns vary, with 42.1% utilizing TNVS occasionally and 72.1% frequently visiting malls as a common destination. These insights provide valuable information for service providers and policymakers to tailor TNVS services to the preferences and needs of this diverse user base in the Philippines.

3.3 Instrumentation

In this study, the researchers employed a questionnaire that was meticulously developed by the researcher, ensuring that each variable had a comprehensive representation established in the existing literature. The questionnaire was used to gauge various constructs: economic benefit, perceived usefulness, trust, safety and security, attitude, actual usage, satisfaction, service quality, and reuse intention concerning Transportation Network Vehicle Services (TNVS). To validate the questionnaire, a panel of two experts and two faculty members examined its face and content validity, thoroughly scrutinizing its components. Following this initial evaluation, the researcher adjusted the instrument as the validators recommended, ensuring it was well-refined before proceeding with pilot testing.

The instrument demonstrated strong internal consistency during the pilot testing phase, as reflected by Cronbach Alpha coefficients. Specifically, the coefficients were 0.781 for economic benefit, 0.884 for perceived usefulness, 0.848 for trust, 0.901 for safety and security, 0.825 for attitude, 0.757 for actual usage, 0.739 for satisfaction, 0.959 for service quality, and 0.930 for reuse intention concerning TNVS. These coefficients affirm the questionnaire's reliability and suitability for our research.

3.4 Data Gathering Procedure

The questionnaire was uploaded through Google Forms, and the link was sent through email and group chats with friends and relatives through Snowball. Snowball or referral sampling technique is used since the researcher also requested assistance from the participants to share the link to their friends who were qualified to be respondents to ensure that the required sample size was achieved.

3.5 Ethical Considerations

In performing the study, the researcher observed ethical practices. The researcher added a privacy statement as part of the major disclaimer to guarantee that all important information acquired was solely used for its intended purpose. No sensitive personal information such as name, email address, or the like was gathered to minimize needless complications. A questionnaire cover letter was also sent to clarify the scope of the research study and ensure that the study participants understood why the questions were asked. Furthermore, by assigning respondents codes, the researcher ensured the secrecy of all gathered replies.

3.6 Data analysis

The data was thoroughly organized, summarized, and analyzed, employing various statistical methods to comprehensively understand the study's key components. Descriptive statistics, such as frequency and percentage, were used to elucidate the characteristics of the respondents. Mean, and standard deviation was employed to delineate the respondents' perspectives on various aspects of Transportation Network Vehicle Services (TNVS) and their intentions to reuse these services, yielding a detailed portrayal of the factors influencing TNVS features and the satisfaction that drive reuse intentions.

Structural Equation Modeling (SEM), particularly Partial Least Squares-Structural Equation Modeling (PLS-SEM), was selected as the analytical approach to investigate the impact of these features and satisfaction on reuse intentions. PLS-SEM is preferred for modeling intricate path models involving latent variables and their interrelationships and offers a robust solution when dealing with limited participant numbers. The researcher utilized WARP PLS version 8.0 for inferential analysis, while Statistical Packages for Social Sciences (SPSS) version 22 was pivotal in facilitating descriptive analyses. This multifaceted approach ensured a thorough examination of the study's variables and their influence on the respondents' reuse intentions.

4. RESULTS

Respondents' Perception of Factors of TNVS

Table 2 shows the respondents' perception of TNVS factors. Based on the results, Economic Benefit (Overall Mean = 4.23) encompasses cost-efficiency, timesaving, fair pricing, and promotional incentives. Perceived Usefulness (Overall Mean = 4.67) highlights TNVS's convenience for luggage transport, faster travel, efficiency, and comfort, especially in adverse weather. Trust (Overall Mean = 4.45) relates to protecting personal information, account security, and fair pricing practices. Safety and Security (Overall Mean = 4.84) is paramount, emphasizing driver screening, training, real-time tracking, and professional conduct. These factors collectively contribute to a positive TNVS experience, shaping commuters' perceptions and preferences. The high mean scores across all categories indicate positive sentiment towards TNVS, particularly in safety, usefulness, and economic value.

Table 2. Respondent's perception of the factors of TNVS

Factors of TNVS	Mean	SD
Economic Benefit	4.23	1.210
1. Using TNVS is more cost-efficient than driving my car.	4.17	1.299
2. Using TNVS saves me time.	4.42	1.234
3. TNVS is worth its price.	4.13	1.208
4. TNCs provide incentives to their regular riders.	4.21	1.156
5. TNCs have a fair price for every trip.	4.07	1.212
6. TNVS regularly provides economic benefits to riders through promos and discounts.	4.36	1.154
Perceived Usefulness	4.67	1.180
1. I find TNVS helpful, especially if I have luggage.	4.84	1.255
2. Using TNVS allows me to reach my destination faster.	4.56	1.163
3. Using TNVS makes my travel efficient.	4.67	1.067
4. Booking TNVS is convenient anytime, anywhere.	4.48	1.242
5. TNVS provides a more comfortable mode of transportation when I go out for leisure.	4.76	1.161
6. TNVS is a convenient way of transportation during bad weather.	4.82	1.276
7. TNVS Drivers know the shortest route possible to make the trip faster.	4.55	1.114
Trust	4.45	1.150
1. I believe the TNC protects my personal information.	4.42	1.163
2. I believe my personal account will not be used illegally.	4.46	1.160
3. I am confident that my transaction will always be protected.	4.51	1.110
4. The TNC protects my destination.	4.62	1.082
5. I believe TNC charges a fair amount for my destination.	4.23	1.219
Safety and Security	4.84	1.040
1. TNVS provides a safe trip to all riders.	4.76	1.001
2. TNCs ensure that the drivers have no criminal records.	4.78	1.031
3. TNCs provide orientation and training to their drivers regarding customer service.	4.84	1.007
4. TNCs have a tracking device for the location of the driver.	5.00	.990
5. The drivers maintain due respect for the riders.	4.95	.968
6. I take TNVS whenever I need to go to unfamiliar places.	4.72	1.244

*5.15-6.00- Strongly Agree; 4.32-5.14-Agree; 3.49-4.31-Slightly Agree; 2.66-3.48-Slightly Disagree; 1.83-2.65-Disagree; 1.0-1.82-Strongly Disagree

Respondents' Attitude and Usage of the TNVS

Respondents generally view Transportation Network Vehicle Services (TNVS) positively (Mean=4.24, SD=1.280), preferring it for lifestyle improvement (Mean=4.30, SD=1.222) and over air-conditioned taxis (Mean=4.97, SD=1.113). However, TNVS's impact on self-esteem (Mean=3.99, SD=1.401) and socio-economic status (Mean=3.96, SD=1.390) received lower ratings. Actual TNVS usage is also viewed favorably (Mean=4.25, SD=1.360), with preferences for promotional periods (Mean=4.50, SD=1.337) and when safety is a concern in other transport modes (Mean=4.60, SD=1.229). While TNVS is preferred when public transport is unavailable (Mean=4.62, SD=1.302) or destinations are unfamiliar (Mean=4.37, SD=1.347), it is less commonly used as the primary transport mode (Mean=3.68, SD=1.527).

Overall, TNVS is positively perceived and used situationally but not universally adopted as the main transportation option. Hence, the data suggests that respondents hold a positive attitude towards TNVS and use it in various situations, particularly during promos and when they perceive a potential compromise in their safety when using other public

transportation options. However, not all respondents consider TNVS to be their primary mode of transportation.

Table 3. Respondent's attitude and actual usage of TNVS

Construct	Mean	SD
Attitude toward TNVS	4.24	1.280
1. I prefer to use TNVS wherever I go.	4.07	1.290
2. I prefer TNVS as a mode of transportation.	4.16	1.283
3. TNVS is a better option than an ordinary air-con taxi.	4.97	1.113
4. Using TNVS improves my lifestyle.	4.30	1.222
5. Using TNVS boosts my self-esteem.	3.99	1.401
6. The use of TNVS enhances my socio-economic status.	3.96	1.390
Actual Usage	4.25	1.360
1. I use TNVS whenever there is a promo.	4.50	1.337
2. I use TNVS during rush hour only.	3.75	1.441
3. I only use TNVS if there is no available public transportation in the area.	4.62	1.302
4. I only use TNVS if my destination is an unfamiliar place.	4.37	1.347
5. I only use TNVS if I feel my safety is compromised in other Public Transportation	4.60	1.229
6. I use TNVS as my primary mode of transportation.	3.68	1.527

Respondents' Perceived Service Quality and Satisfaction with TNVS

Transportation Network Vehicle Services (TNVS) receive positive feedback, with high ratings for service quality (Mean=4.80, SD=1.020) and overall satisfaction (Mean=4.76, SD=1.050). Key strengths include well-maintained vehicles (Mean=4.89, SD=0.969), comfortable rides (Mean=5.01, SD=0.937), and driver consideration (Mean=4.79, SD=0.960). Users enjoy hassle-free journeys (Mean=4.86, SD=1.078) and feel confident about safety (Mean=4.75, SD=1.023). The TNVS app (Mean=4.77, SD=1.004) and driver treatment (Mean=4.84, SD=0.971) are also highly rated. However, there is room for improvement in personalizing rider experiences, as evidenced by slightly lower ratings for drivers asking about route preferences (Mean=4.52, SD=1.219) and listening to suggestions (Mean=4.74, SD=1.062). TNVS is viewed favorably for its quality, convenience, and safety, with opportunities to enhance user engagement and personalization.

Table 4. Respondent's Perceived Service Quality and Satisfaction with TNVS

Construct	Mean	SD
Service Quality	4.80	1.020
1. TNVS Drivers considered the rider's request.	4.79	0.960
2. The car is well-maintained and sanitized.	4.89	0.969
3. The ride is comfortable.	5.01	0.937
4. TNVS Driver asks about the rider's preference regarding the route for the destination.	4.52	1.219
5. TNVS Driver listens to the suggestions of the riders.	4.74	1.062
6. TNVS Driver is responsive to the rider's needs.	4.85	0.980
Satisfaction	4.76	1.050
1. I enjoy my travel using TNVS.	4.82	1.033
2. I am hassle-free whenever I use TNVS.	4.86	1.078
3. I am confident that TNVS can guarantee my travel safely.	4.75	1.023

4. I believe TNVS can promote a quality transportation system.	4.70	1.062
5. I consider the TNVS an efficient mode for a quality transportation system.	4.67	1.118
6. I am satisfied with the TNVS apps.	4.77	1.004
7. I am satisfied with the security features of TNVS.	4.66	1.045
8. I am satisfied with the way the TNVS drivers treat me.	4.84	0.971
9. I am satisfied with how TNC customer representatives respond to my concerns.	4.73	1.087

Respondents' Reuse Intention of the TNVS

Respondents intend to continue using Transportation Network Vehicle Services (TNVS) (Overall Mean=4.76, SD=1.050). They express high commitment to TNVS as their preferred transport mode (Mean=4.81, SD=1.060), even with erratic fares (Mean=4.28, SD=1.237) and under new normal circumstances (Mean=4.58, SD=1.144). Users are willing to adapt to changes (Mean=4.43, SD=1.138) and value quick booking times (Mean=4.89, SD=1.125). While general intention is high, regular usage scored slightly lower (Mean=4.16, SD=1.359), suggesting some prefer on-demand use. Respondents are also willing to promote TNVS to colleagues (Mean=4.47, SD=1.217). The data indicates strong user loyalty and potential for service growth, with users committed to TNVS despite potential challenges.

Table 5. Respondent's reuse intention of the TNVS

Intention to Re-use		
1. I will continue to use TNVS as a mode of transportation.	4.81	1.060
2. I will continue to use TNVS as a mode of transportation, though the fare is erratic.	4.28	1.237
3. I will continue to use TNVS as a mode of transportation under the new normal.	4.58	1.144
4. The TNVS may have issues, but I will still use it.	4.52	1.092
5. I am willing to adjust to changes in the TNVS.	4.43	1.138
6. I will continue to use TNVS if the booking time is less than 1 minute.	4.89	1.125
7. I will continue to use TNVS regularly.	4.16	1.359
8. I will encourage my colleagues to use TNVS.	4.47	1.217
Overall	4.76	1.050

*5.15-6.00- Strongly Agree; 4.32-5.14-Agree; 3.49-4.31-Slightly Agree; 2.66-3.48-Slightly Disagree; 1.83-2.65-Disagree; 1.0-1.82-Strongly Disagree

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Evaluation of the Measurement Model and Structural Model

Confirmatory Factor Analysis was used to validate the measurement model's convergent validity, construct reliability, and discriminant validity.

Convergent Validity and Construct Reliability

Table 6 showed that the range of Cronbach's alpha reliability coefficients was between .829 and .948, and the composite reliability coefficients were all higher than 0.80, indicating that the set of constructs has good reliability and internal consistency (Fornell & Larcker, (1981).

Additionally, the item loadings of the indicators of the constructs were higher than the threshold value of .70, which implies that the latent variables have a good convergent validity (Hair et al., 2011). Similarly, the average variance extracted from the latent variable range from .511 to .736 was higher than the threshold value of .50, indicating the construct has acceptable validity (Hair et al., 2011).

Table 6. Latent Variable Coefficients

Construct	Items	Factor Loading	Cronbach's Alpha	Composite reliability	Ave. Variance Extracted
Perceived Benefit	PB 1-6	.779-.852	.829	.873	.511
Perceived Usefulness	PU 1-7	.703-.853	.867	.901	.604
Trust	Tr 1-5	.739-.895	.909	.933	.736
Safety and Security	SS 1-6	.819-.849	.894	.919	.656
Attitude	Att 1-6	.839-.882	.861	.902	.653
Actual Usage	AU 1-6	.737-.830	.812	.854	.519
Service Quality	SQ 1-6	.746-.891	.891	.920	.699
Satisfaction	Sat 1-9	.818-.868	.948	.956	.685
Reuse Intention	RUI 1-8	.843-.880	.933	.945	.695

Discriminant Validity

Tables 7 and 8 assess the instrument's discriminant validity by presenting the square roots of Average Variance Extracted (AVE) coefficients and the Heterotrait-Monotrait (HTMT) Ratios. As per Fornell and Larcker (1981), discriminant validity is established when the values on the main diagonal of Table 6 (square root of the AVEs) exceed those in the off-diagonal positions (squared correlations between constructs). In addition, Table 7 displays HTMT ratios, all below the threshold of 0.85, indicating a solid level of discriminant validity.

Consequently, the results in Tables 7 and 8 affirm the instrument's robust discriminant validity, a crucial prerequisite for making reliable inferences from the gathered data. This suggests that we can have a high degree of confidence in the outcomes of our study and the subsequent conclusions we draw.

Table 7. Square Roots of AVE Coefficients and Correlation Coefficients

Latent Variables	EB	PU	Tr	SS	Att	AU	SQ	Sat	RUI
Economic Benefit	0.817	0.512	0.572	0.478	0.614	0.447	0.498	0.584	0.588
Perceived Usefulness	0.512	0.802	0.584	0.639	0.571	0.485	0.602	0.666	0.598
Trust	0.572	0.584	0.859	0.744	0.592	0.47	0.659	0.717	0.643
Safety and Security	0.478	0.639	0.744	0.841	0.542	0.486	0.76	0.753	0.647
Attitude	0.614	0.571	0.592	0.542	0.858	0.497	0.535	0.655	0.721

Actual Usage	0.447	0.485	0.47	0.486	0.497	0.740	0.519	0.553	0.493
Service Quality	0.498	0.602	0.659	0.76	0.535	0.519	0.834	0.775	0.688
Satisfaction	0.584	0.666	0.717	0.753	0.655	0.553	0.775	0.855	0.804
Reuse Intention	0.588	0.598	0.643	0.647	0.721	0.493	0.688	0.804	0.857

Diagonal values are the square roots of AVE, and off-diagonals are inter-construct correlations

Table 8. *HTMT Ratios*

Latent Variables	<i>EB</i>	<i>PU</i>	<i>Tr</i>	<i>SS</i>	<i>Att</i>	<i>AU</i>	<i>SQ</i>	<i>Sat</i>	<i>RUI</i>
Economic Benefit									
Perceived Usefulness	0.600								
Trust	0.668	0.655							
Safety and Security	0.553	0.717	0.823						
Attitude	0.704	0.638	0.658	0.598					
Actual Usage	0.569	0.596	0.574	0.593	0.612				
Service Quality	0.573	0.672	0.726	0.840	0.588	0.627			
Satisfaction	0.661	0.731	0.779	0.820	0.709	0.660	0.837		
Reuse Intention	0.666	0.656	0.700	0.703	0.780	0.598	0.742	0.674	

Note: Ratios are Good if $< .90$, best $< .85$

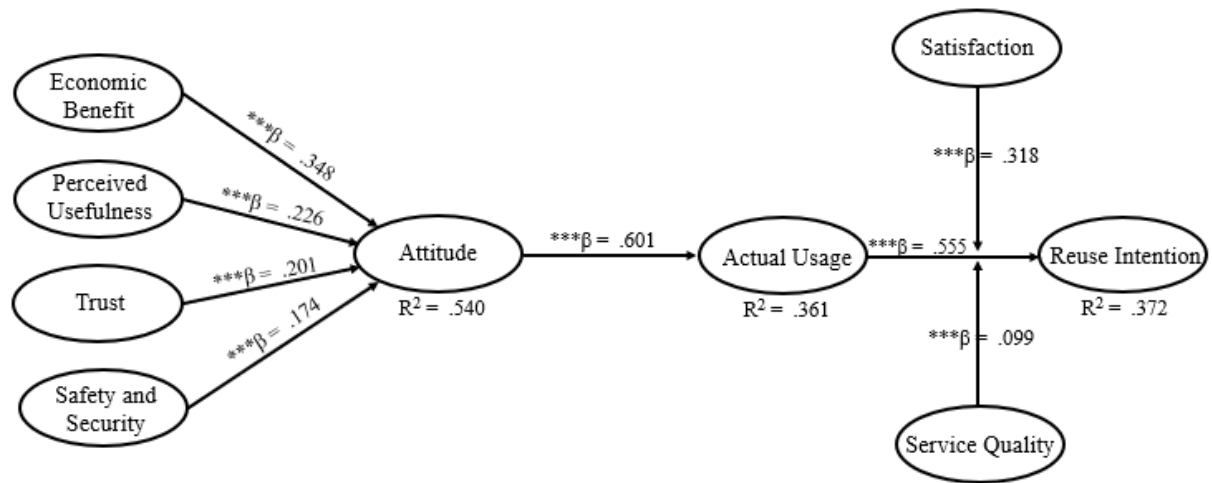
Structural Model and Hypotheses

The emerging model demonstrates strong validity and quality across various fit indices. With APC, ARS, and AARS showing statistical significance ($p < .001$), the model's overall significance is established. The absence of multicollinearity is indicated by AVIF and AFVIF values below 5.0. Moreover, a model fit is confirmed by the Tenenhaus GoF exceeding .36. Furthermore, ideal values of 1.000 for SPR, RSCR, and SSR confirmed that the model has an acceptable model fit, which is further supported by the STDSR exceeding 0.70, and SMAR which is below 0.10, indicating low residuals. Collectively, these measures suggest a robust and reliable model that meets ideal thresholds, providing a solid foundation for drawing valid inferences.

Table 9. *Model Fit and the Quality Indices of the Emerging Model*

Measure	Estimate	Threshold	Interpretation
Average Path Coefficient (APC)	0.301, $p < .001$	$p < .05$	Significant
Average R-squared (ARS)	0.429, $p < .001$	$p < .05$	Significant
Average Adjusted R-squared (AARS)	0.426, $p < .001$	$p < .05$	Significant
Average block VIF (AVIF)	2.535	≥ 5.0	Ideally
Average Full Collinearity VIF (AFVIF)	3.022	≥ 5.0	Ideally
Tenenhaus Goodness of Fit (GoF)	0.551	$\geq .36$	Large
Simpson's paradox ratio (SPR)	1.000	$= 1.000$	Ideally
R-squared contribution ratio (RSCR)	1.000	$= 1.000$	Ideally
Statistical suppression ratio (SSR)	1.000	$= 1.000$	Ideally
Standardized threshold difference sum	0.847	≥ 0.70	Acceptable
Standardized mean absolute residual	0.068	≤ 0.10	Acceptable

Emerging Model



Note: ***significant at <0.001

Figure 2. The emerging model

Table 10. Result of the Hypothesis Testing

Relationship	Path	Effect	Effect Size	Description	Decision		
Exogeneous Variable	Endogenous Variable	Coefficient (β)	P-values	Sizes (f^2)	Interpretation (Cohen, 1988)**		
EB	→ Att	0.348	< 0.001	0.226	Medium	Significant	H1 is supported
PU	→ Att	0.226	< 0.001	0.131	Small	Significant	H2 is supported
Tr	→ Att	0.201	< 0.001	0.119	Small	Significant	H3 is supported
SS	→ Att	0.174	< 0.001	0.105	Small	Significant	H4 is supported
Att	→ AU	0.601	< 0.001	0.362	Large	Significant	H5 is supported
AU	→ RUI	0.555	< 0.001	0.383	Large	Significant	H6 is supported
SQ*AU	→ RUI	0.099	0.009	0.037	Small	Significant	H7 is supported
Sat*AU	→ RUI	0.318	< 0.001	0.090	Small	Significant	H8 is supported

**0.02 – small, 0.15 – medium, 0.35 - large

Table 10 presents the findings of a path analysis examining factors influencing commuters' interactions with Transportation Network Vehicle Services (TNVS). The study revealed several significant relationships:

Economic benefit ($\beta = .348, f^2 = .226, p < 0.001$), perceived usefulness ($\beta = .195, f^2 = .120, p < 0.001$), trust ($\beta = .158, f^2 = .097, p < 0.001$), and safety/security ($\beta = .174, f^2 = .105, p < 0.001$) positively impact attitude towards TNVS. Commuters with more favorable perceptions in these areas exhibit a more positive attitude.

Attitude towards TNVS significantly influences actual usage ($\beta = .621, f^2 = .385, p < 0.001$). Improved attitude leads to increased usage.

Actual TNVS usage positively affects the intention to reuse ($\beta = .610, f^2 = .388, p < 0.001$). More frequent usage increases reuse intention.

Service quality ($\beta = 0.099, p = 0.009, f^2 = 0.037$) and satisfaction ($\beta = 0.318, p < 0.001, f^2 = 0.090$) moderate the relationship between actual usage and intention to reuse. Higher service quality and satisfaction strengthen the effect of usage on reuse intention.

5. DISCUSSION

As summarized in Table 10, the study's findings highlight the key factors influencing user attitudes toward Transportation Network Vehicle Services (TNVS). These attitudes are crucial determinants of economic benefit, perceived usefulness, trust, safety, and security.

Economic Benefit plays a significant role in shaping user attitudes, as supported by findings from Alemi et al. (2019) and Amirkieae and Evangelopoulos (2018), who emphasize the cost-efficiency of TNVS as a critical motivator for adoption. This aligns with Zhang's (2023) study in Beijing, which demonstrated that economic advantages positively impact TNVS user attitudes. Similarly, Chen et al. (2016) and Raza et al. (2020) confirm that perceived economic benefits drive the popularity of shared services, underscoring their importance in motivating TNVS adoption.

Perceived Usefulness is strongly linked to positive user attitudes, as demonstrated by Cheah et al. (2020) and Dias et al. (2017), who found that the convenience and efficiency of TNVS significantly influence their adoption. This finding is corroborated by Grimaldo and Uy (2020) and Nagy (2018), who also identify a strong association between perceived usefulness and favorable attitudes toward technology-based systems. Feng and Jantarakolica (2023) further support this by highlighting the role of perceived usefulness in technology acceptance, which directly impacts TNVS user attitudes.

Trust is another critical factor influencing TNVS user attitudes, as noted by Ert et al. (2016) and Rosenblat and Stark (2016), who emphasize the importance of trust in the sharing economy. Barnes and Mattsson (2016) and Mohlmann (2015) similarly underscore trust as essential for user satisfaction and repeat usage in collaborative consumption, making it a pivotal element in shaping TNVS attitudes.

Safety and Security are confirmed as significant influences on user attitudes, consistent with findings by Ouali et al. (2020) and Elnadi and Gheith (2022), who highlight the importance of safety perceptions in the continued use of ride-hailing services. This aligns with Mohan and Suresh (2019), who demonstrate that safety and security concerns critically impact attitudes toward technology-based systems. The emphasis on safety measures, such as those reported by Lyft (2021), further reinforces the trust and confidence users place in TNVS.

User Attitudes and Usage are strongly correlated, as shown by the confirmation of Hypothesis 5, which aligns with the findings of Aguiluz and Campo (2019) and Chen and Mokhtarian (2016). Their research indicates that positive attitudes significantly increase the likelihood of TNVS usage, reinforcing the importance of favorable perceptions in driving service adoption.

Usage and Reuse Intention are also positively linked, with Hypothesis 6 supported by previous research from De Pelsmacker et al. (2005) and Yi and Gong (2013). Their studies demonstrate that prior usage strengthens future usage intentions, a finding that is critical for understanding customer retention in the TNVS market.

Moderating Role of Service Quality and Satisfaction

The study further reveals that service quality and satisfaction significantly moderate TNVS user intentions. This supports Hypothesis H7, aligning with Kim and Lee's (2019) findings that service quality enhances users' propensity to reuse TNVS. Additionally, Hypothesis

H8, which underscores the role of satisfaction, is consistent with the broader literature, including Van Lierop and El-Geneidy (2016), highlighting satisfaction as a critical determinant of reuse intentions.

As TNVS continues to reshape urban transportation, these findings provide valuable insights for service providers. By focusing on these critical factors—economic benefit, perceived usefulness, trust, safety, and service quality—providers can effectively cultivate a loyal and satisfied user base, ensuring sustained growth in the competitive TNVS market.

6. CONCLUSION

This research thoroughly explains the crucial elements affecting Metro Manila's Transport Network Vehicle Services (TNVS) uptake and continued usage. User behavior is shaped in this local environment by key drivers consistent with patterns seen in other urban marketplaces, including perceived utility, trust, safety, contentment, and economic rewards. The results give significant insights for TNVS providers, politicians, and urban planners in Metro Manila and other swiftly urbanizing areas worldwide, including Southeast Asia, Latin America, and Africa.

The findings of this research have more significance for metropolitan areas dealing with fast population expansion and transportation obstacles, such as Jakarta, Bangkok, and Cairo, where comparable trends in TNVS adoption have been noted. Studies indicate that commuters emphasize cost-effectiveness and safety in these markets—elements also underscored in our research (Elnadi & Gheith, 2022; Sukmadewi et al., 2023). This suggests that the strategy frameworks outlined here, focusing on cost efficiency, trust cultivation, and safety measures, apply to similar markets.

Moreover, nations adopting multi-modal transportation strategies—combining public transit with ride-hailing services—can gain from the insights presented below. As an illustration, Grab in Singapore combines ride-hailing services with public transportation while incentivizing multi-modal travel (Grab, 2023). Comparable models might be used in Metro Manila and other metropolitan areas, along with initiatives to alleviate congestion and improve mobility.

Augmented Managerial Implications with Practical Illustrations

The research findings include substantial management implications that might guide practical initiatives for TNVS providers. The concrete advice, bolstered by empirical examples, enables the audience to instill a sense of efficacy in effecting change.

Trust and Safety as Strategic Advantages

To experience sustainable development, clear and fair fare rules, data security, and strong safety procedures must establish user trust. Safety measures, including real-time tracking and trusted contacts, have been added by Lyft and Uber in the US, increasing rider confidence and loyalty (Lyft, 2021). Furthermore, in line with this established standard are Grab's safety features in the Philippines, which emphasize the necessity for ongoing investment in safety and include ride monitoring and driver background checks. The audience should feel reassured and gain confidence in the TNVS industry's future due to this emphasis on trust and safety.

Economic Advantages and Variable Pricing

One of the most important ways to encourage adoption is to continue to provide loyalty programs and discounted rates. In order to assist TNVS providers in managing demand and improving affordability, for instance, GrabStudent programs in Singapore and Indonesia offer targeted discounts to students during off-peak hours (Grab, 2023). This strategy might be duplicated in other metropolitan areas, guaranteeing that TNVS maintains a cost-effective alternative to private automobile ownership.

Service Excellence and Consumer Satisfaction

Upholding superior service quality, timeliness, vehicle cleanliness, and driver professionalism can augment consumer satisfaction and promote recurrent usage (Kim & Lee, 2019). To enhance the user experience, providers might potentially implement personalized features like route preferences and driver communication choices, similar to Uber's "Quiet Mode" (Lyft, 2021).

Partnership with Policymakers for Sustainable Urban Mobility

This study advocates for cooperative initiatives between TNVS providers and public transportation agencies. Uber's collaboration with local transit authorities in New York City offers reduced fares to train stations, encouraging public transportation usage (Hall & Krueger, 2017). Establishing such collaborations in Metro Manila will further the objectives of the Public Utility Vehicle Modernization Program by improving last-mile connectivity and alleviating vehicle congestion (Philstar, 2024).

Advancement of Sustainable Urban Development

TNVS services are becoming more and more necessary for environmentally friendly urban transportation systems, particularly in areas with high levels of pollution and traffic jams. This research provides valuable frameworks that TNVS providers may use to match their tactics to sustainable objectives, such as encouraging shared mobility and lowering the use of private cars. Providers can improve their service offerings by utilizing knowledge from Metro Manila and similar marketplaces to guarantee sustained engagement and promote sustainable growth.

Finally, the study offers a strategic roadmap highlighting the significance of economic value, safety, trust, quality of service, and cooperative efforts for TNVS providers and policymakers. These results add practical knowledge for improving TNVS uptake in global urban markets, which advances the conversation on sustainable urban transportation. TNVS providers may establish themselves as essential participants in the changing transportation ecosystem and further the more general objective of sustainable urban development by consistently innovating and working with public authorities.

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