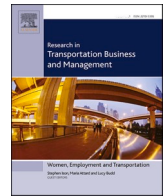




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# Understanding the perceived behavior of public utility bus passengers during the era of COVID-19 pandemic in the Philippines: Application of social exchange theory and theory of planned behavior

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## ABSTRACT

Over the years, passengers in the Philippines have relied on public utility bus (PUB) to reach a destination. However, PUB has been greatly affected by the adverse effects of the coronavirus disease (COVID-19) outbreak. Therefore, the study analyzed passengers' behavior using PUB during the COVID-19 pandemic by integrating social exchange theory (SET) and the theory of planned behavior (TPB). A total of 505 PUB users completed the online questionnaire containing sixty-seven (67) measures. Through confirmatory factor analysis – structural equation modeling (CFA-SEM), all the twelve (12) hypotheses were found significant. Accessibility, safety, economic benefit, and crisis management had a significant and positive influence on passengers' trust. Moreover, passengers' trust produced a significant positive influence on attitude, subjective norm, and perceived behavioral control. Additionally, attitude, subjective norm, and perceived behavioral control generated a significant positive influence on the intention to use PUB. Furthermore, perceived behavioral control had a significant positive influence on perceived passenger behavior. Lastly, the intention to use PUB developed a substantial and positive influence on perceived passenger behavior. PUB companies and policymakers can utilize these findings to develop additional PUB reforms for the benefit of passengers, drivers, operators, companies, and the government during the COVID-19 pandemic.

## 1. Introduction

Public utility bus (PUB), one of the standard transport services in the Philippines, is used by passengers to easily travel between cities (Mayo & Taboada, 2020). Public transport services were not permitted to operate at the onset of coronavirus disease (COVID-19) in the Philippines. Most importantly, the governing bodies had only permitted private cars and specific company automobiles to use the road (Mayo, Maglasang, Moridpour, & Taboada, 2021; Vallejo & Ong, 2020). Additionally, people could not leave their homes except for healthcare workers and other essential workers (Gregorio, 2020; Parrocha & Dela Cruz, 2020). The passengers criticized the policymakers for the strict

restrictions. Several workers, who were demanded to work onsite but do not own private vehicles, were immensely affected by the lack of public transport services (Mercado, 2020). Fortunately, different public transport services offered free services to essential workers (Patag, 2020). As months passed, the number of COVID-19 cases eased; hence, the Department of Transportation (DOTR) permitted the restricted operation of public transport services (Cable News Network Philippines, 2020). Since then, PUB has been allowed to operate at 50% to 75% capacity considering that standing passengers are not allowed and sitting passengers must follow a one-seat-apart setup (Department of Transportation, 2021; Prasetyo, Castillo, Salonga, Sia, & Seneta, 2020). Moreover, passengers must undergo a temperature check and spray

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alcohol disinfectant on their hands before boarding the PUB, which are deemed necessary to protect themselves from the COVID-19.

The COVID-19 affects the behavior of PUB passengers because of its contagious effect (Chuenyindee et al., 2022). Passengers are the primary users of PUB; hence it is important to identify the factors affecting their behavior. The factors are subdivided into external and internal factors. External factors are the variables outside the passengers' control, such as accessibility, safety, economic benefit, and crisis management (Atombo & Dzigbordi Wemegah, 2021; Chuenyindee et al., 2022; Rasoolimanesh, Seyfi, Rastegar, & Hall, 2021; Tiglao, De Veyra, Tolentino, & Tacderas, 2020). Meanwhile, internal factors pertain to the passengers' opinions and emotions, such as trust, attitude, subjective norm, perceived behavioral control, and intention (Ajzen, 1991; Chuenyindee, Ong, Ramos, et al., 2022). Since many variables affect the PUB passengers' behavior, a multivariate statistical tool is crucial to interpret the significance and relationship between the variables. For instance, accessibility produces a significant and positive effect on trust. One hypothetical reason is that an adequate number of buses positively affect passengers' trust in the PUB system. If PUBs are adequate regardless of the time (peak hours and non-peak hours), passengers can easily reach their destinations. Hence, passengers start to trust PUB with their daily activities despite the presence of COVID-19. Furthermore, the findings allow PUB companies and policymakers to plan PUB systems and routes. There should be an adequate number of PUBs according to the ridership analysis. In the aforementioned example, the declined PUB ridership is addressed through statistical techniques and variables bounded by theories.

The theories utilized in the study were the Social Exchange Theory (SET) and Theory of Planned Behavior (TPB). SET is derived from psychology and sociology; thus, the theory highlights the application of reinforcement psychology to social situations (Emerson, 1976). It is vital to use SET because it is comprised of external variables focused on social interaction, resulting in rewards or consequences. In the PUB sector, the SET's practical applications refer to the connection among passengers, drivers, operators, companies, the government, and policymakers. For example, passengers gain convenience from riding a PUB due to its affordability and security features. However, some passengers may also feel inconvenienced because of the unsystematic PUB system. Hence, the PUB drivers, operators, companies, the government, and policymakers can quickly identify the factors needed to improve the current PUB system. Overall, SET represents the variables that PUB stakeholders can improve. Some studies also utilized SET in analyzing public transport modes and travel management (Rasoolimanesh, Jaafar, Kock, & Ramayah, 2015; Santoso & Maureen Nelloh, 2017).

On the other hand, TPB is considered one of the best predictors to understand people's intentions and alleged behavior (Ajzen, 1991; Geman et al., 2022). Since passengers have their perceptions towards PUB, one's insight is most likely different from another passenger's. Therefore, TPB is an integral theory to identify internal variables influencing the passengers' emotions, opinions, and behaviors. For instance, passengers' intention to ride PUB influences their perceived behavior. In view of a passenger who has a firm intention, the passenger would perform the preferred behavior regardless of the challenges. However, many underlying variables affect the passengers' intention. Thus, it is important to utilize TPB variables to identify the significant variables. Additionally, past studies revealed that TPB effectively described passengers' motivating factors, psychological habits, and purposes in using PUB (Forward, 2019; Gao, Chen, Shan, & Fu, 2018; Zailani, Iranmanesh, Masron, & Chan, 2016).

The motivation of this study is to help the passengers adjust to the new normal of riding PUB. Consequently, this study assists PUB companies, operators, drivers, policymakers, and the government in contributing to the well-being of passengers. PUB system and passengers' behavior during the COVID-19 are assessed by combining SET and TPB. The two theories complement each other because they identified external and internal variables affecting PUB passengers' behavior.

Therefore, structural equation modeling (SEM) was utilized to determine the significant variables. SEM is a multivariate statistical technique that identifies causal relationships between variables (Hair, 2010). It creates a framework bounded by latent variables and measures. Latent variables are considered formative, indirectly observed through measures (Anderson & Gerbing, 1988). Measures, also known as indicators, reflect the behavioral or situational observations of the subject (Anderson & Gerbing, 1988). SEM is derived from the two approaches: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Anderson & Gerbing, 1988). EFA allows unknown measures to be connected with all latent variables, whereas CFA associates known measures with selected latent variables (Anderson & Gerbing, 1988; Curran, West, & Finch, 1996). The disadvantage of EFA is the presence of trial and error, resulting in higher failures to find the most significant variables affecting a particular behavior. This study utilized the CFA-SEM approach because the integrated theories specified measures and latent variables that support PUB passengers' behavior during the COVID-19. In CFA-SEM, measures and latent variables are acknowledged.

Currently, there is a distinct lack of comprehensive academic research focusing on Social Exchange Theory (SET) and Theory of Planned Behavior (TPB) with the application of confirmatory factor analysis – structural equation modeling (CFA-SEM) to the Filipino passenger's behavior using PUB during the COVID-19 pandemic. Although there are studies that analyzed the Philippines' public transport services, they only focused on habits, convenience, cost, reliability, socio-demographic characteristics, travel purpose, and community quarantine protocol. Before the COVID-19 pandemic, several researchers published studies associated with the Philippines' public transportation system. Specifically, the studies investigated PUB (Guillen, Ishida, & Okamoto, 2013; Mayo & Taboada, 2020), public utility jeepney (PUJ) (Guillen et al., 2013; Mateo-Babiano, Recio, Ashmore, Guillen, & Gaspay, 2020; Mayo & Taboada, 2020; Tiglao et al., 2020), taxi (Guillen et al., 2013; Mayo & Taboada, 2020), motorcycle (Mayo & Taboada, 2020), tricycle (Guillen et al., 2013; Mayo & Taboada, 2020), pedicab (Guillen et al., 2013), and Metro Manila's Light Rail Transit Line 1 (LRT-1) (Lu, Mateo-Babiano, & Sorupia, 2019). Moreover, Mayo et al. (2021) focused on Cebuanos' (one of the largest Filipino ethnic groups) travel behavior despite the pandemic and Chuenyindee, Ong, Ramos, et al. (2022) evaluated public utility vehicles and passenger satisfaction during the era of COVID-19. Since this current study aims to identify the PUB passengers' behavior, the inclusion of specific public transportation (PUB) and travel behavior changes introduce the novelty compared to the past studies. Furthermore, none of the aforementioned studies used theories with a strong foundation to support the variables. There are also repetitive and inconsistent variables presented in the past studies. Hence, their variables lack data reliability, which is crucial to assess the relevance of variables in the studies' objectives. In addition, SEM is not commonly utilized in transport-related studies in the Philippine setting. As of this writing, only Tiglao et al. (2020) focused on SEM but used the EFA approach. EFA produces a lesser significance and model fit, contributing to disadvantaged results (Anderson & Gerbing, 1988). Nonetheless, many international researchers used SEM in the transportation sector. They used SEM to identify the intention to use public transport mode dependent on travel purposes (Zailani et al., 2016), students' public transport behavior (Gao et al., 2018), PUB passengers' satisfaction (Atombo & Dzigbordi Wemegah, 2021), future long-distance travel behavior due to the COVID-19 (Rasoolimanesh et al., 2021), and willingness to use public transport despite the COVID-19 risks (Lee, Baig, & Pervez, 2021). These past studies did not combine SET and TPB, making the current study's approach a novel one.

This study aims to analyze PUB passengers' behavior during the era of COVID-19 pandemic by integrating Social Exchange Theory (SET) and Theory of Planned Behavior (TPB). CFA-SEM approach is utilized because of the two theories' principles, including passenger behavior, quality of life, public transportation system, and travel management. In

a nutshell, CFA-SEM is the optimal statistical tool to find the most significant variables supported by the strong foundation of SET and TPB. It is essential to integrate all the presented methods to address the difficulties of PUB passengers brought by the COVID-19. PUB is designed to be a shared space that everyone can use; hence there is a higher risk of getting infected with COVID-19. In view of the presented gaps and objectives, the following research questions are developed: (1) What are the significant factors affecting the PUB passengers' behavior during the COVID-19 pandemic?; and (2) How does the CFA-SEM tool support the integrated SET and TPB?

The contributions of this study are as follows: (1) The integration of SET and TPB through CFA-SEM statistical tool analyzes passengers' behavior using PUB, which can be applied to the joint problematic COVID-19 cases and PUB systems. As of September 2021, the COVID-19 situation in the Philippines is seemingly unending as the cases rampantly increase. Based on the statistics disclosed by [World Health Organization \(2021\)](#), the highest weekly increase of 144,991 confirmed COVID-19 cases were identified from August 31, 2021 to September 6, 2021. Moreover, Filipinos constantly plead for a better public transportation system. [Social Weather Stations \(2021b\)](#) revealed that a total of 87% of participants agreed that private vehicles were prioritized over public transport services. The continuous COVID-19 effects on the transportation sector can be mitigated by applying the theoretical principles and tools; (2) Identifying significant factors affecting the passengers' behavior in riding PUB during the COVID-19 pandemic. Individuals rely on quick and reliable transportation during the crisis. It is crucial to address the negative implications in the PUB system caused by the pandemic; and (3) The practical applications derived from the proposed method by establishing systematic PUB guidelines for policymakers and PUB stakeholders (companies, operators, drivers, passengers, government). This study connects all PUB stakeholders to gain equally positive returns and benefits. All stakeholders play an important role in uncovering PUB's areas of improvement.

## 2. Literature review

The unprecedented impact of COVID-19 forced PUB passengers to adapt to the new normal. Since the new normal may lead to either positive or negative implications, several researchers assessed the different types of public transport modes. For instance, [van Wee and Witlox \(2021\)](#) discussed that individuals transitioned from public to private or active transportation (cycling/walking). This instance was perceived as a long-term effect of the COVID-19 because of personal attitude and social norm changes. [Bian et al. \(2021\)](#) investigated the public transport demand (subway, bus, and bike) and traffic volume due to the COVID-19 restriction policies. The past study utilized data concerning COVID-19 cases and travel patterns to assess policy lags and effects on the transportation sector in New York City and Seattle City, United States. [Cusack \(2021\)](#) explored the employees' alternative transport modes aside from public transits and private vehicles. They found that almost half of the employees residing in Philadelphia City, Pennsylvania, United States transitioned from public transits to active transportation (bicycling and walking). The study utilized the theory of planned behavior and social-ecological model to identify the factors affecting behavioral dynamics. [Kartal, Depren, and Depren \(2021\)](#) assessed the relationship between transportation purposes and the active COVID-19 patients and death in Turkey. However, they found a lack of causal relationship when individuals use private vehicles, active transits, and public transits. [Currie, Jain, and Aston \(2021\)](#) discovered the current and future impacts of COVID-19 on public transportation in Melbourne, Australia. They found that public transportation users declined during the pandemic. If the virus is gone, the situation is not expected to return to the pre-pandemic situation because commuters are expected to shift from public transport to private car. [Thomas, Charlton, Lewis, and Nandavar \(2021\)](#) studied the domestic travel behavior (air and road transportation) in New Zealand and Australia before, during,

and after the COVID-19 travel restrictions. The study examined passenger's perception of road public transport, private vehicle, and air transport. [Deveci, Çiftçi, Akyurt, and Gonzalez \(2022\)](#) examined the short-term and long-term effects of the Turkey aviation industries' COVID-19 early and late responses. It was expected that airlines would suffer in the coming years, and the researchers proposed guidelines to help the airlines recover.

There were also past studies that focused on bus passengers and systems. [Deveci, Öner, Canitez, and Öner \(2019\)](#) identified the technical requirements that Istanbul, Turkey's public bus operators must meet to satisfy the passengers' demands. They distinguished that capacity, scheduling, and real-time tracking must be systematic because passengers prioritized the environment, waiting time, and travel time. [Deveci, Aydın, and Kusakci \(2021\)](#) inspected the COVID-19 impacts and protocols on passengers of public transport modes (bus, train, and ferry) in Istanbul, Turkey. The results unveiled that passengers of public transits decreased by at least 90%. Nonetheless, the study ensured that the COVID-19 protocols effectively addressed the protection of passengers. [He, Li, and Sun \(2021\)](#) proposed customized bus services to help passengers in Shanghai, China adapt to the COVID-19 aftermaths. Since long-term effects are anticipated, the researchers developed guidelines that will cater to the needs of passengers. [Kim, Lee, Ko, Jang, and Yeo \(2021\)](#) identified the COVID-19 impacts on private vehicles and public buses and their corresponding relationships with land use and land price. They found that road users in Daejeon, South Korea were lessened during the daytime and weekends. They also noted that commercial areas with higher foot traffic and land price had fewer visitors than non-commercial areas with lower foot traffic and land price. [Chen et al. \(2021\)](#) developed an optimal bus passenger boarding and disembarking system. This approach guaranteed bus efficiency dependent on the passenger volume and routes. [Nguyen and Pojani \(2021\)](#) assessed the bus passenger's compliance with the implemented COVID-19 protocols in Hanoi, Vietnam. The researchers disclosed a higher level of compliance equated to low COVID-19 cases compared to other cities worldwide. [Cheranchery, Krishnan, Asif Navas, Mohamed Shahid, and Suresh \(2021\)](#) observed the differences between pre-pandemic and post-lockdown passenger behavior in Kerala, India. They disclosed that bus companies must prioritize cleanliness, low crowding level, and satisfactory pedestrian environment during the COVID-19 pandemic. [Cheng et al. \(2022\)](#) scrutinized the exposure dose, infection risk, and effect on the passengers who were affected by the COVID-19 from riding two buses in Hunan, China. The results suggested that COVID-19 was transmitted through air and the buses' poor ventilation system played a significant role. In India, [Naveen and Gurtoo \(2022\)](#) used clustering to segment bus passengers based on travel behavior changes. The past study also suggested strategies to help public transportation passengers widen their routes.

Aside from the public transportation system, past researchers also evaluated the behavior of passengers during the COVID-19. [Mayo et al. \(2021\)](#) evaluated the travel behavior of Cebuanos around the cities of Metro Cebu, Philippines. They found that individuals frequently traveled to work pre-pandemic but shifted to buying necessities a year after the onset of the pandemic. In addition, the demographic characteristics of participants (educational attainment, employment status, monthly salary, and household size) were statistically significant. [Rasoolimanesh et al., 2021](#) assessed the tourists' willingness to support a travel destination and post-pandemic travel intention in ten different countries. This study used the cognitive destination image to develop the necessary variables. [Lee et al. \(2021\)](#) utilized the theory of reason action to identify the public transport behavior of passengers before the pandemic, during the rising COVID-19 cases, and after the rising COVID-19 cases ended in Pakistan. They discovered that passengers lost intention to ride public transport during the rising COVID-19 cases. [Shamshiripour, Rahimi, Shabanpour, Mohammadian, and K. \(2020\)](#) determined the changes in individual's travel attitudes, behaviors, and habits for daily activities. Specifically, they explored the individual's travel perception pre-

pandemic, during the pandemic, and post-pandemic in Chicago City, Illinois, United States. Parady, Taniguchi, and Takami (2020) explored travel behavior changes dependent on COVID-19 risk perception and social influence for individuals residing in Kanto, Japan. The variables considered are essential and non-essential activities performed alone or by the group. Aghabayk, Esmailpour, and Shiwakoti (2021) compared the passenger's crowding behavior on Tehran's metro rail before and during the COVID-19 pandemic. Results showed that passengers were uncomfortable when crowding levels increased and passengers preferred to sit than stand.

The presented studies discussed several types of public transport modes, the short-term and long-term effects of the COVID-19 on the transportation sector, and the passengers' travel behavior changes. Table 1 reflects the summary of past studies' contributions. However,

none of the studies evaluated the PUB passenger's behavior through CFA-SEM supported by SET and TPB. The CFA-SEM approach plays a role in determining significant variables affecting passenger's behavior. It serves as the foundation for the reliability of data and the combined theories. Furthermore, there was a lack of studies on SET and TPB applications on the PUB sector and passenger's behavior during the COVID-19 pandemic. These theories consider the guidelines for policymakers and PUB stakeholders to help the recovery of the public transport sector. Determining PUB travel behavior changes during the COVID-19 contributes a substantial impact, and none of the Philippine-related studies evaluated this matter. Given the presented gaps, the inclusion of SET and TPB bounded by CFA-SEM approach was overlooked in the Philippines' PUB system and PUB passenger's behavior.

**Table 1**  
Relevant studies on public transportation during the COVID-19.

Author(s)	Year	City / Country	Public transport mode	Purpose of the study	Methodology
van Wee & Witlox	2021	General	General	The transition of individual's travel behavior from public to private or active transportation	Based on research
Bian et al.	2021	New York City and Seattle City, United States	Subway, bus, bike	Investigation of the public transport demand and traffic volume due to the COVID-19 restriction policies	Likelihood ratio, regression with dynamic programming, and Bayesian change point detection
Cusack	2021	Philadelphia City, Pennsylvania, United States	Bicycling and walking	The exploration of the employees' alternative transport modes through the theory of planned behavior and social-ecological model.	Bivariate analysis and logistic regression
Kartal et al.	2021	Turkey	General	Assessment of the relationship between transportation purposes and the active COVID-19 patients and death	Toda-Yamamoto causality test
Currie & Aston	2021	Melbourne, Australia	General	Discovery of the current and future impacts of COVID-19 on public transportation	Descriptive statistics
Thomas et al.	2021	New Zealand and Australia	Air and road	Study of the domestic travel behavior before, during, and after the COVID-19 travel restrictions	Descriptive statistics
Deveci et al.	2022	Turkey	Airline	Examination of the effects of the COVID-19's early and late responses in the aviation industry	Descriptive analysis
Deveci et al.	2019	Istanbul, Turkey	Bus	The identification of technical requirements that public bus operators must meet to satisfy the passengers' demands	Principal Component Analysis and Quality Function Deployment with integrated interval-valued intuitionistic fuzzy
Deveci et al.	2021	Istanbul, Turkey	Bus, train, ferry	Inspection of the COVID-19 impacts and protocols on passengers of public transport modes	Based on research
He et al.	2021	Shanghai, China	Bus	Proposal of customized bus services to help passengers adapt to the COVID-19 aftermaths	Multinomial logit and nested logit model
Kim et al.	2021	Daejeon, South Korea	Bus	The COVID-19 impacts on private vehicles and public buses and their corresponding relationships with land use and land price	Econometric modeling and mixed-effect regression model
Chen et al.	2021	General	Bus	Development of optimal bus passenger boarding and deboarding system	Dynamic programming model based on nonlinear integer programming
Nguyen & Pojani	2021	Hanoi, Vietnam	Bus	Compliance of bus passengers with the implemented COVID-19 protocols	Descriptive statistics and exploratory factor analysis
Cheranchery et al.	2021	Kerala, India	Bus	Observation of the differences between pre-pandemic and post-lockdown passenger behavior	Importance-Satisfaction Analysis with fuzzy c-means clustering
Cheng et al.	2022	Hunan, China	Bus	The investigation of exposure dose, infection risk, and effect on the passengers who were affected by the COVID-19 from riding two buses	Least-squares fitting
Naveen & Gurtoo	2022	India	Bus	Segmentation of bus passengers based on travel behavior changes and implementation of public transportation strategies	Demographic analysis and k-means clustering
Mayo et al.	2021	Cebu, Philippines	General	Evaluation of Cebuanos' travel behavior changes based on pre-pandemic and a year after the pandemic behavior	Data visualization and multinomial logistic regression
Rasoolimanesh et al.	2021	China, South Korea, Italy, Germany, Iran, USA, Sweden, UK, New Zealand, and Turkey	General	Analysis of the tourists' willingness to support a travel destination and post-pandemic travel intention	Partial least squares – structural equation modeling
Lee et al.	2021	Pakistan	General	Identification of passenger's public transport behavior before, during and after the rising COVID-19 cases by utilizing the theory of reason action	Descriptive analysis, random parameter bivariate probit modeling, and structural equation modeling
Shamshiripour	2020	Chicago City, Illinois, United States	General	Determination of changes in individual's travel attitudes, behaviors, and habits for daily activities	Descriptive statistics
Parady et al.	2020	Kanto Region, Japan	General	Exploration of travel behavior changes dependent on COVID-19 risk perception and social influence	Statistical analysis
Aghabayk et al.	2021	Tehran, Iran	Metro rail	Comparison of the passenger's crowding behavior before and during the COVID-19 pandemic	Mixed logit model with lognormal distribution

### 3. Theoretical research framework

#### 3.1. Public utility bus (PUB) system in the Philippines

PUB ranks among the Philippines' top 3 economic public transport services (Guillen et al., 2013; Mayo & Taboada, 2020; Tiglao et al., 2020). It is mainly found all over the country, both in rural and urban areas. Moreover, PUB offers city-to-city and long-distance travel. Guillen et al. (2013) disclosed that most passengers depend on PUB and that women prefer to use PUB because it is safer than other public transport services. Due to the pandemic, the PUB system changed. Several PUB system restrictions and COVID-19 preventive measures are implemented. Passengers expressed difficulties accessing public transport services in the pandemic era compared to the pre-pandemic period (Social Weather Stations, 2021a). This digital media also specified that passengers who experienced significant hardship came from Mindanao (60%), followed by Visayas (48%), then Metro Manila (36%), and lastly by other parts of Luzon (27%).

#### 3.2. Social exchange theory (SET) and theory of planned behavior (TPB)

SET focuses on people's social behavior in exchanging resources, be it tangible or intangible, which only occurs when a substantial reward is present (Ap, 1992; Lambe, Wittmann, & Spekman, 2001). Tangible aspects pertain to any form of materials with physical existence such as money, vehicle, and land. Meanwhile, intangible aspects have no physical form, and some examples include emotion, relationship, and experience. Additionally, SET has direct connection with economics in view of people's instincts to measure value and cost simultaneously (Homans, 1958).

In this study, the representative variables of value and cost are accessibility, safety, economic benefit, and crisis management in using PUB. SET validates that people carefully weigh determining factors before one concludes a decision (Ap, 1992; Blau, 1965; Emerson, 1976). Mulley and Daniels (2012) emphasized the importance of the accessibility of bus services. Tiglao et al. (2020) conducted a public transportation study and concluded that passengers positively trusted accessibility of public transits while safety had negative results. Another study verified that safety (security) and economic benefit (affordability) were factors affecting trust in using PUB (Atombo & Dzigbordi Wemegah, 2021). Moreover, it was highlighted by Rasoolimanesh et al. (2015) that economic benefit had positively influenced people's trust in travel reforms. These travel reforms are associated with the Philippines' PUB reforms and projects during the COVID-19 pandemic. Before the COVID-19 pandemic, PUB and private vehicles used the same road lanes. During the COVID-19 pandemic, the government implemented exclusive PUB lanes with corresponding loading and unloading system (Dela Cruz, 2021; Sy, 2021). All PUB companies and operators enhanced the vehicle's design by conforming to the safety protocols (Sy, 2021). The Philippine railway's cashless payment was adapted to the PUB system to reduce physical contact (Dela Cruz, 2021; Sy, 2021). The salaries of PUB drivers and operators were initially dependent on the ridership. Fortunately, the government promised a fixed salary according to their performance and distance traveled (Sy, 2021). The government exercised its authority over the PUB operators and companies to comply with the recommended reforms and projects (Yap, 2021). They aim to reduce the spread of the COVID-19 virus and accommodate more passengers. Due to the ongoing pandemic, crisis management is identified as part of the latent variables. Crisis management aims to determine the efficacy of government strategies during the pandemic era, which should be followed by passengers, drivers, and bus companies (Rasoolimanesh et al., 2021). Based on the study of Khan, Kamruzzaman, Rahman, Mahmood, and Uddin (2021), government strategies significantly reduced the psychological distress caused by the pandemic. In parallel, the reduction of psychological distress is highly connected to people's trust. Through supporting studies, this study hypothesized that:

**H1.** Accessibility of PUB has a significant positive influence on passengers' trust.

**H2.** Safety measures of PUB have a significant positive influence on passengers' trust.

**H3.** Economic benefit of using PUB has a significant positive influence on passengers' trust.

**H4.** Crisis management relative to COVID-19 preventive measures has a significant positive influence on passengers' trust.

Past studies that integrated SET and TPB accentuated knowledge sharing through personal experience (Razak, Pangil, Zin, Yunus, & Asnawi, 2016; Wang & Noe, 2010; Wang, Yen, & Tseng, 2015). Since this study is fixated on the COVID-19 pandemic, the experiences of all PUB stakeholders absolutely matter. PUB stakeholders are the passengers, government, drivers, bus operators, and bus companies. According to Ajzen (1991), trust is considered a positive perception gained through social experiences. The study of Breckler and Wiggins (1989) demonstrated that a person who had a positive emotional experience would most likely repeat its attitude but a person who experienced negatively tends to execute a different attitude. Individuals commonly share their experiences through the subjective norm (Wang & Noe, 2010). Subjective norm is defined as the individual's probable behavior influenced by other people's insights (Devika, Harikrishna, & Anjaneyulu, 2020; Ong et al., 2021). Meanwhile, perceived behavioral control determines a person's capability to perform a specific behavior (Ajzen, 1991). One study proposed an extended TPB to evaluate car owners' perception of public transit (Borhan, Ibrahim, & Miskeen, 2019). In the aforementioned study, passenger's trust significantly influenced attitude, subjective norm, and perceived behavioral control. Contrary to the study of Chen and Chao (2011), passengers who own a car had a negative perception towards public transits, and this demeanor is considerably associated with perceived behavioral control. The occurrence of conflicting results from past studies has paved the way for this study to evaluate the connection of trust to other variables. Based on these relevant studies, the following hypotheses were formulated:

**H5.** Passengers' trust in using PUB has a significant positive influence on attitude.

**H6.** Passengers' trust in using PUB has a significant positive influence on subjective norm.

**H7.** Passengers' trust in using PUB has a significant positive influence on perceived behavioral control.

TPB has been widely used in transportation and COVID-19 related studies. According to Ajzen (1991), the purpose of TPB is to identify motivational factors that affect an individual's intention to perform a specific behavior. These motivational factors comprised of attitude, subjective norm, and perceived behavioral control. In Lee et al. (2021) study, an individual's attitude had a positive and significant relationship with intention to use public transportation during the COVID-19 pandemic. However, van Wee and Witlox (2021) stated that an individual's attitude sporadically changes due to the presence of the COVID-19 pandemic, which stimulates new information, experiences, and emotions. Additionally, subjective norm was the most significant latent variable in determining an individual's intention to use public transit (Devika et al., 2020). Meanwhile, Ng and Phung (2021) evaluated the passengers' pre-pandemic behavior using PUB, whereas Lee et al. (2021) examined the passengers' intention to use public transit during the COVID-19 pandemic. Both studies hypothesized that subjective norm has a positive effect on the intention to use public transit. Surprisingly, subjective norm did not produce any significant impact on the intention to use public transit. Moreover, perceived behavioral control affects behavioral changes and is deemed pertinent to behavioral intention (van Wee & Witlox, 2021). Perceived behavioral control was positively significant to the intention to use public transit for work

(Shaaban and Maher (2020) and education purposes (Bamberg, Ajzen, & Schmidt, 2003)). Hence, these hypotheses were proposed:

**H8.** Passengers' attitude has a significant positive influence on intention to use PUB.

**H9.** Subjective norm has a significant positive influence on intention to use PUB.

**H10.** Perceived behavioral control has a significant positive influence on intention to use PUB.

Gao et al. (2018) suggested that perceived behavioral control and behavioral intention contributed to the students' use of public transits. Among the two, behavioral intention produced a greater direct effect. New York City and Seattle City, the most affected cities by the COVID-19 in the United States, encountered a downtrend in public transits usage (Bian et al., 2021). In another study, Thomas et al. (2021) examined the behavior of passengers from New Zealand and Australia, where the COVID-19 outbreak is deemed under control. Although the countries have reported very few cases of COVID-19, there is a significant decrease in the intention to use public transport services during the COVID-19 travel restrictions and despite the removal of COVID-19 travel restrictions. Furthermore, Cusack (2021) discovered that passengers who frequently rode public transits opted to use active transportation (walking and bicycling) during the COVID-19 pandemic. Indeed, passengers' commuting behavior and public transportation system have been greatly affected by the current adversity. Through the aforementioned studies, the subsequent hypotheses were proposed:

**H11.** Perceived behavioral control has a significant positive influence on perceived passenger behavior.

**H12.** Intention to use PUB has a significant positive influence on perceived passenger behavior.

Several studies utilized theories to analyze public transport services and people's travel behavior. SET is commonly used in developing travel and tourism sector (Rasoolimanesh et al., 2015) and public transportation systems (Santoso & Maureen Nelloh, 2017). On the other hand, Zailani et al. (2016) and Forward (2019) used TPB to identify passengers' intention to use public transits for essential and non-essential purposes. In this study, SET and TPB were considered to determine passengers' behavior contingent on the varying Philippines' public transportation system due to the COVID-19 pandemic. Fig. 1 shows the study's initial theoretical framework derived from integrating SET and TPB.

## 4. Methodology

### 4.1. Participants

The purposive sampling technique, a non-probability sampling method, was used to strategize data collection by targeting specific participants. The study also employed a multiple cross-sectional design to collect samples easily. According to Yamane (1967), Slovin's formula guides researchers to find an acceptable sample size. Tejada and Punzalan (2012) believed that 5% error is the most optimal solution. Hence, this study incorporated the same principle and it was expected to collect at least 399 responses (German et al., 2022). In conclusion, the form accumulated 505 participants who experienced riding PUB during the pandemic era in the Philippines. None of the participants were disregarded because everyone met the required criteria.

Fig. 2 shows the demographic characteristics of the 505 participants. This research collected a more significant number of female participants (82.57%) than male participants (17.43%). Females were more inclined to use PUB because riding it was safer than other public transport modes. In the Philippines, PUB was considered a formal type of public transportation because it provided an organized system than informal public transport modes (Guillen et al., 2013). More than half of the study's participants ranged in age from 18 to 24 years old (52.87%), followed by 25 to 34 years old (29.11%), 35 to 44 years old (9.31%), ≤ 17 years old (6.14%), 45 to 54 years old (1.78%), and ≥ 55 years old (0.79%). Moreover, 35.05% were students, 29.70% were unemployed, 23.96% were full-time employees, 6.73% were self-employed, and 4.55% were part-time employees. Students and unemployed individuals aged 18 to 44 years old were the primary users of PUB because PUB was inexpensive and offered comfortability. They would minimize their expenses and care for comfort and safety since they lacked financial resources. Meanwhile, full-time employees ranked 3rd in the most frequent users of PUB because PUB could provide long-distance travel. Some employees were required by their employers to work onsite; hence, they had to ride PUB because other public transport modes were not allowed on the main road. Moreover, riding a PUB was safer during the COVID-19 pandemic than jeepney (minibus). Although jeepney could offer long-distance travel, jeepney passengers were unprotected because they would have physical contact due to poor jeepney design. In addition, this demographic result transpired due to the Philippines COVID-19 quarantine restrictions that allowed 18 to 65 years old to go out of their residences. In contrast, younger and older individuals were not permitted. Individuals aged 45 and above had a higher risk of death, while 17 years old and below were more susceptible to the COVID-19 virus because they were unvaccinated (Thompson, 2021). Similarly, Mayo et al. (2021) found that individuals aged 18 to 44 years old who were students, unemployed, and full-time employees frequently traveled despite

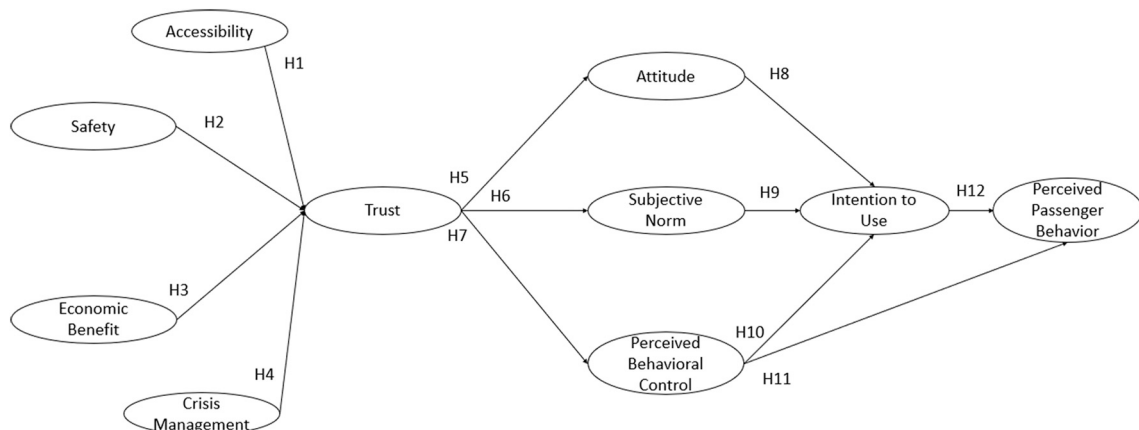


Fig. 1. Initial theoretical research framework.

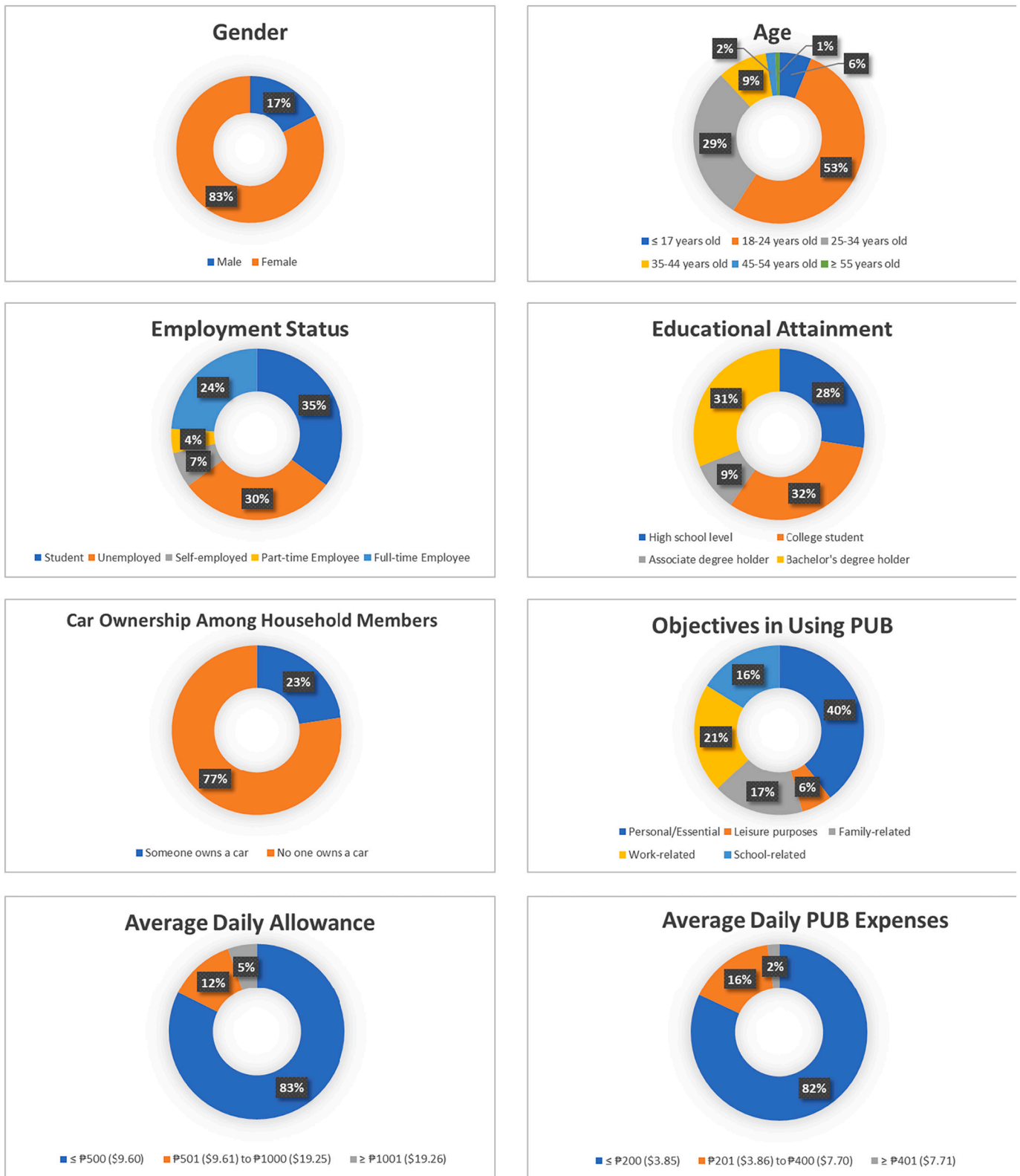


Fig. 2. Demographic profile of participants.

the COVID-19 pandemic.

Furthermore, the education level of participants varies from high school to college level. College students (32.08%) and bachelor's degree holders (31.09%) ranked 1st and 2nd, respectively. High school level (27.52%) ranked 3rd and associate degree holders (9.31%) ranked 4th. Since the study mostly comprised college students and bachelor's degree

holders, the education level coincided with the aforementioned ages and occupations of the participants. Additionally, 77.43% of the participants disclosed that household members did not own a car whereas 22.57% mentioned that some household members own a car. An individual who did not own a car had no other option but to use a public transport mode to move around the area. The study's participants mainly used PUB for



personal and essential purposes (40%). This result supported the current COVID-19 situation since people preferred going out for important matters such as grocery shopping. The participants' second reason was for work purposes (21%) since essential workers (healthcare/food/logistics/public administration) were still mandated to work onsite due to the nature of their jobs. The third reason was family (17%) to visit a family member, go to important occasions, and plan for relocation. The fourth reason was for school demands (16%). Although face-to-face classes have not resumed yet, some students prefer co-working spaces, cafes, and other places suitable for online learning. They also needed to purchase school materials to comply with academic requirements. There were only a few PUB users for leisure purposes (6%) because buses were mainly found on busy roads, and leisure places were commonly found in secluded areas. Finally, at least 80% of the participants chose the smallest amount for allowances and expenses. Most of the participants allotted at most ₱500 for daily allowance and at most ₱200 for daily PUB expenses. This result suggested that individuals prioritize inexpensive public transport mode because the COVID-19 pandemic impacted the global economy and individual's resources. Passengers were inclined to save money since they realized the importance of needs over wants.

Following the demographic profile of participants, cross-tabulation analysis was developed, as seen in Table 2. This analysis helped further understand the relationship of PUB passengers' expenses, allowances, and employment status. Among all the groupings, the combination of students, ≤ ₱200/day of PUB expenses, and ≤ ₱500/day of allowances gained the highest frequency (144 participants = 28.51%). It was followed by the combination of unemployed individuals, ≤ ₱200/day of PUB expenses, and ≤ ₱500/day of allowances (110 participants = 21.78%). The third-highest frequency was the combination of employed individuals, ≤ ₱200/day of PUB expenses, and ≤ ₱500/day of allowances (71 participants = 14.06%). Compared to the top three

**Table 2**  
Cross-tabulation analysis according to passengers' expenses, allowances, and employment status.

Employment status			Average allowance (₱/day)			Total
			≤ 500	501 to 1000	≥ 1001	
Student	Average PUB Expenses (₱/day)	≤ 200	144	6	1	151
		201 to 400	23	1	0	24
		≥ 401	1	0	1	2
	Total		168	7	2	177
Unemployed	Average PUB Expenses (₱/day)	≤ 200	110	11	6	127
		201 to 400	9	10	1	20
		≥ 401	0	2	1	3
	Total		119	23	8	150
Self-employed	Average PUB Expenses (₱/day)	≤ 200	22	5	3	30
		201 to 400	1	1	0	2
		≥ 401	1	0	1	2
	Total		24	6	4	34
Employed (part-time)	Average PUB Expenses (₱/day)	≤ 200	11	4	2	17
		201 to 400	3	2	0	5
		≥ 401	0	0	1	1
	Total		14	6	3	23
Employed (full-time)	Average PUB Expenses (₱/day)	≤ 200	71	13	5	89
		201 to 400	18	7	4	29
		≥ 401	2	0	1	3
	Total		91	20	10	121
Total	Average PUB Expenses (₱/day)	≤ 200	358	39	17	414
		201 to 400	54	21	5	80
		≥ 401	4	2	5	11
	Total		416	62	27	505

mentioned combinations, other combinations produced trivial percentages (< 5.0% for each combination).

#### 4.2. Questionnaire

Due to the COVID-19 community restrictions, participants were asked to respond through a cloud-based platform. Specifically, the questionnaire was created through Google form and it was disseminated from September 12, 2021 to October 10, 2021. The questionnaire comprised two parts: (1) Demographic profile of participants; and (2) Passengers' perception of using PUB during the pandemic era. The first part asked nine (9) questions related to participants' personal information. It includes gender, age, employment status, education level, common days of using PUB during the pandemic, objectives in using PUB during the pandemic, average daily allowance, average daily cost of riding PUB, and car ownership among household members. The second part of the questionnaire followed 5-point Likert scale format wherein one (1) was considered "strongly disagree" and five (5) was considered "strongly agree".

Table 3 reveals sixty-seven (67) measures relevant to the ten (10) latent variables. The latent variables were accessibility (AC), safety (SA), economic benefit (EB), crisis management (CM), trust (TR), attitude (AT), subjective norm (SN), perceived behavioral control (PBC), intention to use (IU), and perceived passenger behavior (PPB). Each latent variable had at least six (≥ 6) measures to carefully examine the associated construct. As seen in Table 3, all questions or measures had corresponding references. While most of the measures were generated from the references' questionnaires, other measures were devised by extracting the references' results and discussion sections. Past researchers presented the questionnaires in their published studies (Aghabayk et al., 2021; Currie et al., 2021 and Salomonson & Felleson, 2014). However, the current study recognized the association of past studies' results and discussion sections with the respective measures and latent variables. Hence, the researchers utilized the results and discussion sections of Salomonson and Felleson (2014), Currie et al. (2021), and Aghabayk et al. (2021). Furthermore, the Thomas et al. (2021) research questionnaire was inaccessible. Thus, this study adopted the Thomas et al. (2021) results and discussion section to address the corresponding measures. Finally, New Zealand's government report was deemed relevant due to the COVID-19 situation in public transportation. Therefore, the researchers maximized and used the reported results presented by Waka Kotahi NZ Transport Agency (2020).

Since Thomas et al. (2021) disclosed positive mean ratings in using public transport, we combined the results presented by Thomas et al. (2021) and Waka Kotahi NZ Transport Agency (2020). Some of the results from Waka Kotahi NZ Transport Agency (2020) were mentioned in the manuscript of Thomas et al. (2021), while others were indirectly reported. But we realized that Waka Kotahi NZ Transport Agency (2020) was not appropriately cited in our manuscript. Hence, we properly cited them in Table 3.

Their findings also emphasized that many commuters perceived riding a bus provided their primary public transportation needs during the pandemic.

PPB7 (I believe that following appropriate social practices can lessen the negative implications on public utility bus system) and PPB8 (I believe that following COVID-19 precautions can lessen the negative implications on public utility bus system) were formulated accordingly:

#### 4.3. Confirmatory factor analysis - structural equation modeling

This study utilized Confirmatory Factor Analysis (CFA) to determine the model fit based on the proposed framework. According to Anderson and Gerbing (1988), CFA identifies causal relationships between the observed latent variables complemented by theories. One of the CFA's assumptions is Structural Equation Modeling (SEM) (Curran et al., 1996). SEM is a multivariate technique that determines factor loadings,

**Table 3**  
Constructed questionnaire according to the theoretical framework.

Latent variable	Indicator	Measure	Reference
Accessibility	AC1	During the pandemic, public utility buses are accessible on weekdays.	Tiglaio et al. (2020)
	AC2	During the pandemic, public utility buses are accessible on weekends.	Tiglaio et al. (2020)
	AC3	During the pandemic, public utility buses are accessible within daytime working hours (7 AM to 7 PM).	Tiglaio et al. (2020); Currie et al. (2021)
	AC4	During the pandemic, public utility buses are accessible outside normal working hours (7 PM to 7 AM).	Tiglaio et al. (2020); Currie et al. (2021)
	AC5	During the pandemic, the waiting time at bus stop is short.	Deveci et al. (2019); Tiglaio et al. (2020)
	AC6	There is a sufficient number of public utility buses despite the pandemic.	Tiglaio et al. (2020)
	AC7	Bus stops are located in a reasonable distance.	Atombo and Dzigbordi Wemegah (2021)
	AC8	There is a variety of payment methods.	Tiglaio et al. (2020); Atombo and Dzigbordi Wemegah (2021)
Safety	SA1	During rush hour, there is an order of getting on or off the public utility bus.	Shen, Xiao, and Wang (2015); Aghabayk et al. (2021)
	SA2	Accidents seldom happen when riding public utility bus.	Salomonson and Felleson (2014); Atombo and Dzigbordi Wemegah (2021)
	SA3	Crimes seldom happen when riding public utility bus.	Salomonson and Felleson (2014); Tiglaio et al. (2020); Atombo and Dzigbordi Wemegah (2021)
	SA4	Safety measures are followed by drivers and bus operators.	Salomonson and Felleson (2014); Deveci et al. (2019); Atombo and Dzigbordi Wemegah (2021)
	SA5	I feel safe every time I ride public utility bus.	Deveci et al. (2019); Nordhoff, Malmsten, van Arem, Liu, and Happee (2021); Aghabayk et al. (2021)
	SA6	I feel comfortable sharing the public utility bus space with fellow passengers.	Deveci et al. (2019); Nordhoff et al. (2021); Aghabayk et al. (2021)
Economic Benefit	EB1	Public utility bus fares are fair and affordable.	Jeong & Oh (2017); Cusack (2021)
	EB2	I only allot a small percentage of my income for travel expenses.	Rasoolimanesh et al. (2015)
	EB3	I am able to save money when riding public utility bus.	Santoso and Maureen Nelloh (2017); Cusack (2021)
	EB4	I ride public utility bus due to its affordability.	Santoso and Maureen Nelloh (2017); Cusack (2021)
	EB5	Through public utility bus, both me and transport operators obtain financial gains.	Atombo and Dzigbordi Wemegah (2021)
	EB6		

**Table 3 (continued)**

Latent variable	Indicator	Measure	Reference
Crisis Management		Increasing the number of public utility buses would result in positive economic gain.	Rasoolimanesh et al. (2015)
	CM1	Passengers of public utility buses follow COVID-19 precautions.	Thomas et al. (2021)
	CM2	Drivers and bus operators follow COVID-19 precautions.	Thomas et al. (2021)
	CM3	Drivers and bus operators value COVID-19 precautions to protect the commuters.	Thomas et al. (2021)
	CM4	I believe that the government values the health of commuters.	Rasoolimanesh et al. (2021)
	CM5	The government ensures that appropriate COVID-19 precautions are followed in public utility buses.	Rasoolimanesh et al. (2021)
	CM6	I appreciate the COVID-19 precautions mandated by public utility bus system and government.	Rasoolimanesh et al. (2021)
Trust	CM7	I acknowledge the effectiveness of COVID-19 precautions followed in public utility buses.	Rasoolimanesh et al. (2021)
	TR1	Drivers and bus operators have good manners.	Tiglaio et al. (2020)
	TR2	Frequent use of public utility buses would create employment opportunities.	Rasoolimanesh et al. (2015)
	TR3	I think that public utility buses are reliable during the pandemic.	Nordhoff et al. (2021)
	TR4	I think that public utility buses are essential during the pandemic.	Nordhoff et al. (2021)
	TR5	I feel comfortable riding public utility buses during the pandemic.	Atombo and Dzigbordi Wemegah (2021)
	TR6	I trust public utility buses for my daily commute despite the pandemic.	Nordhoff et al. (2021)
Attitude	TR7	I feel satisfied with the implemented COVID-19 precautions practiced in public utility buses.	Atombo and Dzigbordi Wemegah (2021)
	AT1	I prefer to use public utility bus than private car despite the pandemic.	Devika et al. (2020)
	AT2	I feel content with traveling by public utility bus despite the pandemic.	Devika et al. (2020)
	AT3	I trust that everyone in public utility bus follows appropriate COVID-19 precautions.	Thomas et al. (2021)
	AT4	I feel that I have smaller risk of getting infected with COVID-19 when	Thomas et al. (2021)

(continued on next page)

Table 3 (continued)

Latent variable	Indicator	Measure	Reference
Subjective Norm	AT5	riding public utility buses.	Deveci et al. (2019); Devika et al. (2020)
		I feel satisfied with the current public utility bus system.	
	AT6	It is highly acceptable to use public utility bus despite the pandemic.	Wang, Li, Wu, and Bai (2013); Currie et al. (2021)
	SN1	People around me often use public utility bus despite the pandemic.	Cusack (2021)
	SN2	If people around me choose to ride public utility bus, I feel the need to go along with them despite the pandemic.	Cusack (2021)
	SN3	If I choose to ride public utility bus, people around me would also do the same despite the pandemic.	Wu, Gu, Gu, and You (2021)
Perceived Behavioral Control	SN4	People whose opinions I value affect my decision to use public utility bus.	Alzahrani, Hall-Phillips, and Zeng (2017)
	SN5	During the pandemic, my friends and family expect me to use public utility bus.	Devika et al. (2020)
	SN6	During the pandemic, everyone supports me in using public utility bus.	Devika et al. (2020)
	PBC1	The choice to take public utility bus is dependent on my decision.	Devika et al. (2020)
	PBC2	I find it easy to ride public utility bus despite the pandemic.	Devika et al. (2020)
	PBC3	I find it acceptable to actively use public utility bus despite the pandemic.	Biehl and Stathopoulos (2020)
Intention to Use	PBC4	I am equipped with knowledge of COVID-19 precautions followed in public utility buses.	Thomas et al. (2021)
	PBC5	I believe that COVID-19 precautions in public utility buses protect me from getting infected with COVID-19.	Lee et al. (2021)
	PBC6	I am confident that I would not get infected with COVID-19 when riding public utility buses.	Lee et al. (2021)
	IU1	I will make an effort to use public utility bus despite the pandemic.	Lee et al. (2021)
	IU2	I will definitely ride public utility bus during rush hour despite the pandemic.	Lee et al. (2021)
	IU3	I will definitely ride public utility bus to carry out essential duties despite the pandemic.	Zailani et al. (2016)
IU4	I will definitely ride public utility bus for leisure purposes despite the pandemic.	Zailani et al. (2016)	

Table 3 (continued)

Latent variable	Indicator	Measure	Reference
Perceived Passenger Behavior	IU5	I plan to increase my travel frequency using public utility bus despite the pandemic.	Lee et al. (2021)
	IU6	My intention to use public utility bus is strong despite the pandemic.	Devika et al. (2020)
	PPB1	I have frequently used public utility bus despite the pandemic.	Thomas et al. (2021); Currie et al. (2021)
	PPB2	I have no other choice but to take public utility bus during the pandemic.	Waka Kotahi NZ Transport Agency (2020); Thomas et al. (2021)
	PPB3	I believe that riding public utility bus is absolutely convenient during the pandemic.	Ma, Seydel, Zhang, & Ding (2019)
	PPB4	I believe that public utility bus should be actively utilized despite the pandemic.	Rasoolimanesh et al. (2015)
	PPB5	I believe that it's relatively safe to use public utility bus despite the pandemic.	Waka Kotahi NZ Transport Agency (2020); Thomas et al. (2021)
	PPB6	I believe that public utility bus system satisfies the passengers' primary needs during the pandemic.	Waka Kotahi NZ Transport Agency (2020); Thomas et al. (2021)
	PPB7	I believe that following appropriate social practices can lessen the negative implications on public utility bus system.	Waka Kotahi NZ Transport Agency (2020); Thomas et al. (2021)
PPB8	I believe that following COVID-19 precautions can lessen the negative implications on public utility bus system.	Waka Kotahi NZ Transport Agency (2020); Thomas et al. (2021)	
PPB9	I believe that the Philippines' public utility bus system is compatible with the current situation.	Nordhoff et al. (2021)	

correlations between latent variables, and correlations between errors (Anderson & Gerbing, 1988; Gumasing, Prasetyo, Ong, & Nadlifatin, 2022). Since this study aims to identify the significant variables from the integrated SET and TPB, CFA ensures a valid and reliable research method. Thus, CFA helps further develop the existing theories by incorporating hypotheses and variables. Although CFA had substantial contributions, a past study itemized the disadvantages of CFA. First, large sample size is needed to ensure reliable data (Prudon, 2015). The same author acknowledged that the number of latent variables is unstandardized and highly exposed to subjective opinion. Therefore, this study collected numerous participants, and past studies supported the utilized latent variables.

The validity of latent variables and measures was supported through factor loading (FL), Cronbach's alpha ( $\alpha$ ), composite reliability (CR), and average variance extracted (AVE). First, the minimum suggested value for factor loading is 0.50 but 0.70 indicates strong support for the corresponding measure or indicator (Hair, 2010). Second,  $\alpha$  measures internal consistency and the recommended value is at least 0.70 (Nunnally & Bernstein, 2010). Next, CR signifies data consistency and the suggested value is least 0.70 (Hair, 2010). Lastly, AVE identifies the amount of variance for each latent variable and the minimum cutoff is 0.50 (Hair, 2010; Ong et al., 2021).

After consistency checking and data validation, the SEM framework was administered via SmartPLS 3. Through the maximum likelihood estimation approach, SEM fit indices were generated. Normed Fit Index (NFI) was measured to evaluate the correlation and covariance estimates in the model (Hair, 2010; Hu & Bentler, 1999). The least acceptable value for NFI is 0.80 (Gefen, Straub, & Boudreau, 2000). Additionally, Standardized Root Mean squared Residual (SRMR) was employed to assess the model fit and the recommended value is less than 0.08 (Hair, 2010; Hu & Bentler, 1999).

### 5. Results

The initial framework presented in Fig. 1 was modified to adhere to the CFA-SEM method. Table 4 shows that the collected data signifies internal consistency and data reliability. All measures with FL of less than 0.70 (<0.70) were removed since these values implied a weak relationship (Hair, 2010). Next, the generated  $\alpha$  and CR for all latent variables were greater than or equal to 0.70 ( $\geq 0.70$ ), which supported acceptable internal consistency (Hair, 2010; Nunnally & Bernstein, 2010). Additionally, the AVE of all latent variables passed the suggested value of 0.50 (Hair, 2010; Ong, Cleofas, et al., 2021). For easier interpretation, Fig. 3 demonstrates that FL,  $\alpha$ , CR, and AVE passed the minimum cutoff. Finally, R-squared ( $R^2$ ) of all the endogenous variables (trust, attitude, subjective norm, perceived behavioral control, intention to use, and perceived passenger behavior) were at least 0.40 ( $\geq 0.40$ ) and this value was considered an acceptable model predictor (Latan & Ramli, 2013).

**Table 4**  
Consistency and reliability of the data.

Latent variable	Indicator	FL	$\alpha$	CR	AVE	$R^2$
Accessibility	AC5	0.80	0.75	0.86	0.67	-
	AC6	0.85				
	AC7	0.80				
Safety	SA4	0.76	0.74	0.85	0.66	-
	SA5	0.87				
	SA6	0.80				
Economic Benefit	EB1	0.78	0.84	0.89	0.68	-
	EB3	0.85				
	EB4	0.84				
	EB5	0.83				
Crisis Management	CM2	0.80	0.91	0.94	0.75	-
	CM4	0.87				
	CM5	0.89				
	CM6	0.88				
	CM7	0.87				
Trust	TR3	0.77	0.86	0.91	0.71	0.61
	TR5	0.88				
	TR6	0.88				
	TR7	0.84				
Attitude	AT1	0.79	0.84	0.90	0.68	0.58
	AT2	0.85				
	AT3	0.83				
	AT5	0.83				
Subjective Norm	SN2	0.82	0.86	0.91	0.71	0.40
	SN3	0.86				
	SN5	0.84				
	SN6	0.84				
Perceived Behavioral Control	PBC2	0.87	0.78	0.87	0.70	0.50
	PBC3	0.84				
	PBC6	0.79				
Intention to Use	IU1	0.82	0.91	0.93	0.68	0.70
	IU2	0.86				
	IU3	0.81				
	IU4	0.81				
	IU5	0.80				
	IU6	0.86				
Perceived Passenger Behavior	PPB1	0.80	0.86	0.90	0.65	0.75
	PPB3	0.86				
	PPB4	0.76				
	PPB5	0.80				
	PPB6	0.81				

Table 5 summarizes the results of the 12 hypotheses incorporated in the SEM framework. There was 100% approval rating because all the 12 hypotheses were supported. Out of the 12 hypotheses, only 1 hypothesis (H1) generated a  $p$ -value of 0.008 and the other 11 hypotheses (H2 to H12) produced 0.001. Furthermore, this study utilized 1% error. The results signified strong evidence favoring the proposed framework since all the  $p$ -values were less than 0.01 ( $\leq 0.01$ ). On the other hand, all the 12 hypotheses' direct effect ( $\beta$ ) resulted in positive values ranging from 0.12 to 0.76. The  $\beta$  of each hypothesis with the corresponding latent variable's connection path is presented in Fig. 4. There was no minimum cutoff for the  $\beta$ , but a value closer to 1.00 indicated a strong positive direct relationship.

The CFA-SEM fit indices were determined through the goodness of fit measures, specifically the NFI and SRMR. These indices were generated through SmartPLS 3. According to Gefen et al. (2000), 0.8 is a critical NFI value. This study produced 0.81 NFI value which was deemed acceptable. Moreover, Hu and Bentler (1999) and Hair (2010) stated that SRMR must be less than or equal to 0.08 ( $\leq 0.08$ ). The produced SRMR for this study is 0.05, suggesting that a lower value yielded a better result. Therefore, the results suggested that the data fit the final SEM framework well. The final SEM framework was developed through these significant results, as seen in Fig. 5.

### 6. Discussion

#### 6.1. Interpretation of results

The exogenous variables of SET were accessibility, safety, economic benefit, and crisis management. Thus, H1, H2, H3, and H4 were bounded by SET principles. This study incorporated SET to determine the fundamental factors affecting passengers' behavior using PUB. Aside from passengers' perceptions, SET principles also effectively identified the perceptions of other PUB stakeholders such as drivers, operators, bus companies, and the DOTR. Interestingly, all four (4) hypotheses passed the required  $p$ -value and thus supported the SEM framework.

The effect of accessibility to passengers' trust had a direct effect coefficient ( $\beta$ ) of 0.12 and  $p$ -value of 0.008. Although the generated  $\beta$  was weak, the  $p$ -value passed the 0.01 minimum cutoff. Hence, H1 was significant and this research verified that accessibility of PUB positively influenced passengers' trust. This research claimed that waiting time at bus stops became relatively shorter. PUB stops are also located within a reasonable distance since the DOTR has started implementing exclusive PUB lanes and appropriate bus stops. Unlike the pre-pandemic situation where unsystematic waiting lines and inappropriate PUB loading and unloading were practiced, the current situation has developed despite the pandemic's restrictions. Passengers also believed that the deployed number of PUB is sufficient to cater to the public needs. If these PUB reforms are continuously followed by PUB stakeholders and adamantly implemented by the DOTR, then passengers will most likely trust the Philippines' PUB system. Tiglao et al. (2020) evaluated one of the Philippines' public transits; the researchers suggested that passengers appreciated the availability of public transits. Among all the measures, they emphasized that weekday and daytime availability were the most significant measures. Meanwhile, this research removed measures related to time because they had weak factor loading values (< 0.70). Another study claimed that accessibility is a supportive variable promoting public transport equity which posits fairness and trust among passengers (Wang et al., 2020). In contrast to a PUB-related study, Atombo and Dzibordi Wemegah (2021) found that PUB was not accessible in Ghana, and the accessibility factor negatively affected passengers' actual experience. Contrasting results are plausible due to differences in the country's PUB system. This research also adopted an accessibility indicator from Atombo and Dzibordi Wemegah (2021) relevant to the payment method. Both studies concluded that the PUB payment method needs improvement.

Next, H2 was supported because safety positively influenced trust

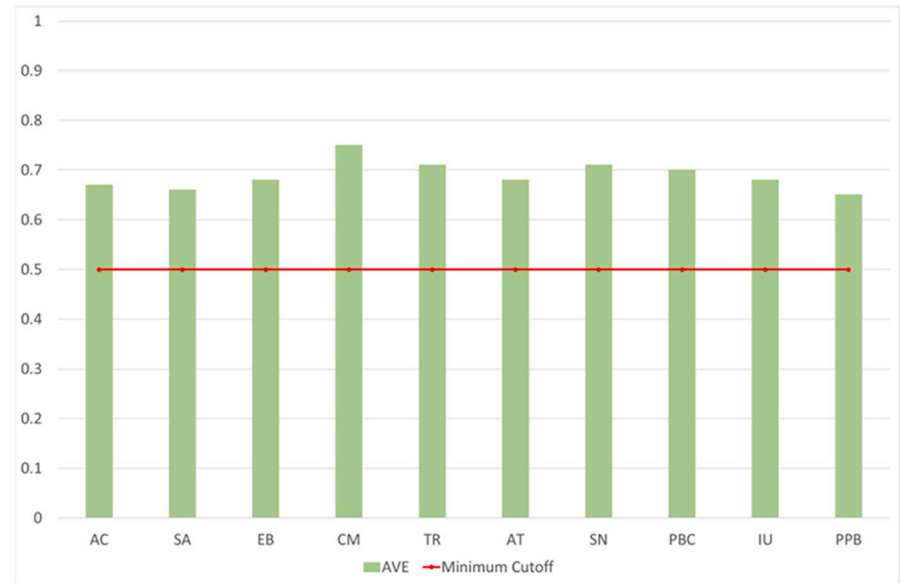
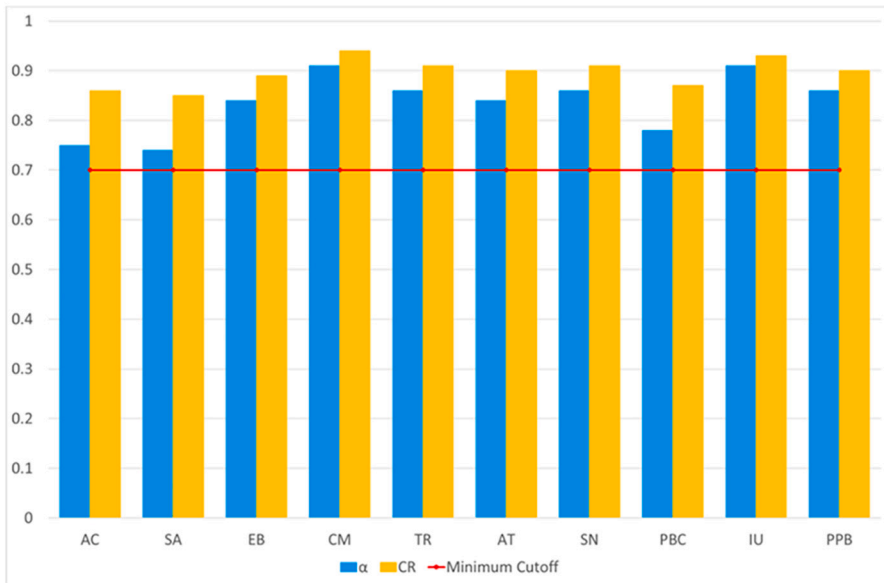
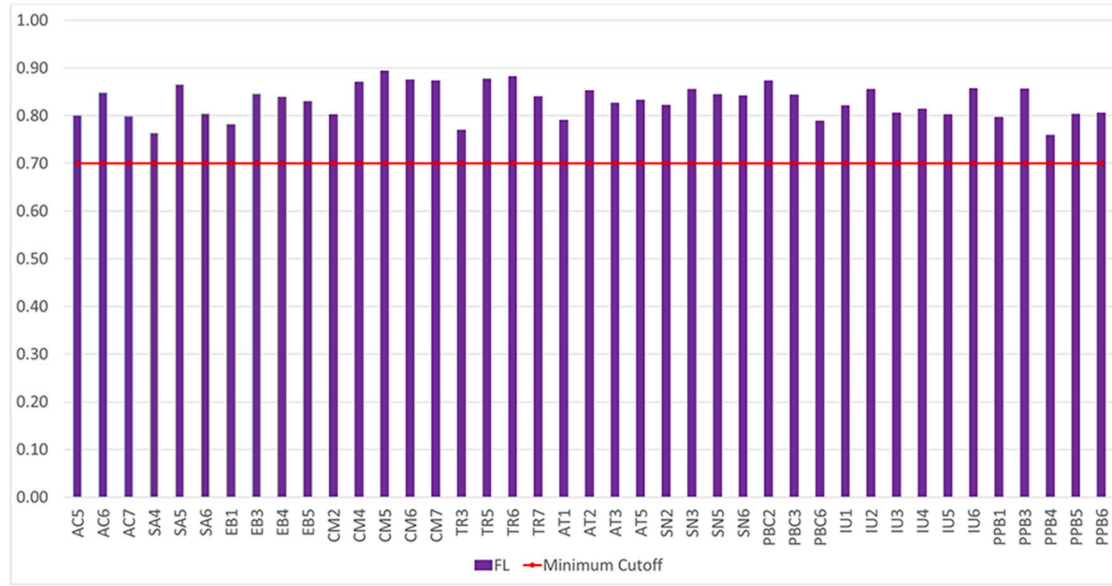
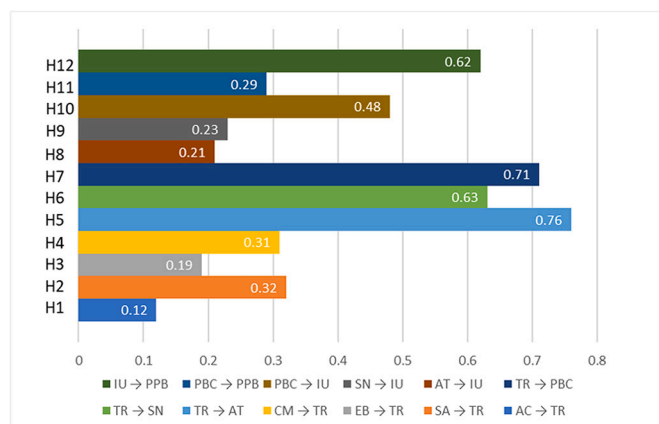


Fig. 3. Factor loading, Cronbach's alpha, composite reliability, and average variance extracted of the variables.

**Table 5**  
Hypothesis test results.

Hypothesis	Latent variable	$\beta$	P-value	Result
H1	AC $\rightarrow$ TR	0.12	0.008	Supported
H2	SA $\rightarrow$ TR	0.32	0.001	Supported
H3	EB $\rightarrow$ TR	0.19	0.001	Supported
H4	CM $\rightarrow$ TR	0.31	0.001	Supported
H5	TR $\rightarrow$ AT	0.76	0.001	Supported
H6	TR $\rightarrow$ SN	0.63	0.001	Supported
H7	TR $\rightarrow$ PBC	0.71	0.001	Supported
H8	AT $\rightarrow$ IU	0.21	0.001	Supported
H9	SN $\rightarrow$ IU	0.23	0.001	Supported
H10	PBC $\rightarrow$ IU	0.48	0.001	Supported
H11	PBC $\rightarrow$ PPB	0.29	0.001	Supported
H12	IU $\rightarrow$ PPB	0.62	0.001	Supported



**Fig. 4.** The direct effect of each hypothesis.

( $\beta$ :0.32,  $p$ :0.001). PUB stakeholders, including the passengers, drivers, operators, bus companies, and DOTR, were involved in PUB safety measures. According to the results, passengers wanted PUB drivers and operators to practice safe driving. It was highly advised to check the vehicle's battery, lights, oil, water, brake, tire, gas, and engine before PUB drivers and operators look for passengers. PUB drivers and operators should be mentally stable, not intoxicated nor sleepy. The seatbelt must be worn appropriately as well. In the Philippines, PUB speed limits were dependent on the type of roads and country's regions; hence, PUB drivers must be equipped with knowledge and follow the guidelines. Although PUB is a shared public space, most passengers felt safe riding PUB. In a past study, passengers prioritized safety before choosing a public transit (Atombo & Dzigbordi Wemegah, 2021). Safety was also positively trusted by the passengers, but safety's  $\beta$  produced the smallest influence among all exogenous variables (Shen et al., 2015). However, this study disclosed that safety had the 2nd highest  $\beta$  among four (4) exogenous variables leading to trust. Moreover, other studies highlighted safety-related factors such as crime (Atombo & Dzigbordi Wemegah, 2021; Gao et al., 2018) and accident (Atombo & Dzigbordi Wemegah, 2021; Borhan et al., 2019; Gao et al., 2018) that generated significant factor loading. Nevertheless, this study disregarded crime and accident measures because they had weak factor loading ( $< 0.70$ ). Therefore, passengers who value PUB drivers' and operators' work ethics and safe driving plans trust the PUB system.

Economic benefit had a significant and positive influence on passengers' trust ( $\beta$ :0.19,  $p$ :0.001). Hence, this study supported that H3 was substantial in the SEM framework. Passengers believed that the current PUB fares were affordable and that one could easily manage transportation allowance. The demographic characteristics of participants also supported the affordability of the PUB fares. It appeared that 81.98% of the participants spent the least PUB daily expenses ( $\leq \text{P}200$ ) among all choices. In addition, 64.75% of the participants were students,

fresh graduates, and unemployed. Thus, more than half of the participants have limited income and they could only allocate a small amount of transportation expenses from their allowance. Participants of this study also thought that riding PUB would equally help the finances of PUB drivers and operators. In the Philippines, the compensation of drivers and operators is dependent on fixed income, ridership, and safety record (Sunio, Gaspay, Guillen, Mariano, & Mora, 2019). Due to ridership incentives, drivers and operators typically gain more than the minimum wage. At the moment, ridership incentives were not maximized because the DOTR only allowed PUB to operate at 50% to 75% capacity depending on the region's quarantine restrictions. Hence, it was highly recommended to add incentive programs related to proper adherence to COVID-19 preventive measures to help the finances of PUB drivers and operators. Past studies also suggested that the economic benefit or affordability positively affected passengers' trust in PUB (Atombo & Dzigbordi Wemegah, 2021; Santoso & Maureen Nelloh, 2017; Wang et al., 2020).

Crisis management, another exogenous variable, significantly and positively influenced passengers' trust ( $\beta$ :0.31,  $p$ :0.001). It was hypothesized that crisis management would greatly impact the framework since this study focused on its setting during the pandemic era. According to Thomas et al. (2021), people's travel behavior is dependent on the restrictions imposed in their country. In this study, passengers agreed that the drivers, operators, and DOTR must follow and implement appropriate COVID-19 preventive measures. These measures were deemed effective to prevent the spread of COVID-19 while using PUB. Although there were insufficient studies that considered the importance of PUB drivers and operators during the pandemic, this study concluded that PUB drivers and operators played a significant role in crisis management. All passengers were required to wear face mask and face shield at all times. Before passengers get on the PUB, operators check their temperature and those with  $\leq 37.4$  °C are allowed to ride the PUB. However, passengers with  $> 37.4$  °C are advised to rest in an isolated area or PUB stop. Furthermore, one-seat-apart setup and unpermitted standing passengers are social distancing methods implemented by the DOTR. Another study also verified that the government strategies were significant and positively influenced social distancing (Khan et al., 2021). Indeed, trust in public transits is contingent on COVID-19 preventive measures (Lee et al., 2021).

The next three (3) hypotheses (H5, H6, and H7) connected SET and TPB. Results showed that H5, H6, and H7 were significant. As stated in the results, passengers' trust in using PUB positively influenced their attitude, hence H5 was significant ( $\beta$ :0.76,  $p$ :0.001). H6 was supported as well because passengers' trust in using PUB positively influenced subjective norm ( $\beta$ :0.63,  $p$ :0.001). Moreover, H7 was deemed significant since passengers' trust in using PUB positively influenced perceived behavioral control ( $\beta$ :0.71,  $p$ :0.001). Trust produced a relatively high R-squared ( $R^2$ :0.61), which implied that 61% of the data connected to trust fit the model. Consequently, trust was a reliable SET variable linked to TPB primary variables, which were attitude, significant norm, and perceived behavioral control. The generated results were also similar to the study of Borhan et al. (2019). Specifically, trust directly and positively influenced passenger's attitude, subjective norm, and perceived behavioral control. Borhan et al. (2019) evaluated Libya's high-speed rail, which is considered a public transport mode. The current study also assessed a public transportation mode in the Philippines. Both Libyan and Filipino passengers trusted the public transport's safety, reliability, and efficiency. These factors contributed to a positive personal perception, social acceptance, and ease of riding public transportation. Trust was also considered a multifaceted principle because it involves entities other than the subject (Wang et al., 2015). In this case, PUB stakeholders were the entities and passengers were the primary subject of trust. Additionally, Rasoolimanesh et al. (2021) revealed that trust in the COVID-19 preventive measures implemented by the government minimized people's uncertainties. Mora Cortez and Johnston (2020) also suggested that trust was intensified through positive

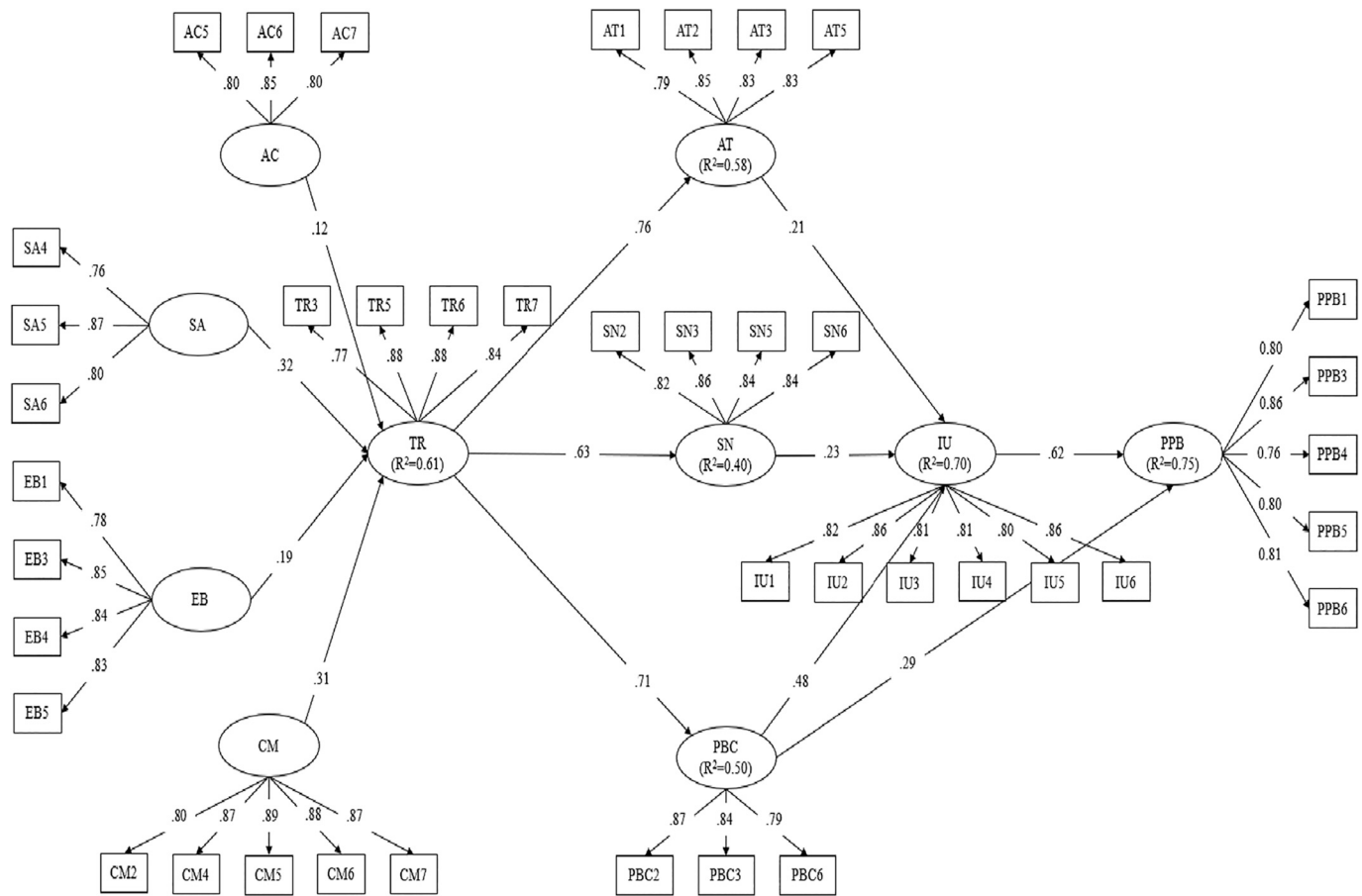


Fig. 5. Final theoretical research framework.

outcomes affecting the interlinked variables. Therefore, the participants of this study trusted a PUB system that was reliable, comfortable, dependable, and adherent to COVID-19 preventive measures.

The succeeding hypotheses (H8, H9, H10, H11, and H12) were developed through TPB principles. The main variables of TPB are attitude, subjective norm, perceived behavioral control, intention to use PUB, and perceived passenger behavior. TPB was applied to determine the current PUB system in the Philippines. It was also supported that TPB strongly contributed to the results of this study by generating significant hypotheses. Consequently, the imperative inclusion of TPB helped the analysis of perceived passenger behavior, which was the study's objective.

Based on H8, passengers' attitude significantly and positively influenced intention to use PUB ( $\beta$ :0.21,  $p$ :0.001). In parallel with the findings of Devika et al. (2020) and Lee et al. (2021), attitude positively influenced the intention to use public transits despite the pandemic. Although the study of Borhan et al. (2019) was conducted pre-pandemic era, they confirmed that attitude was the most significant variable influencing passengers' intention to use public transits. Interestingly, Thomas et al. (2021) reported that regular passengers had a negative attitude towards using public transits when COVID-19 restrictions were implemented in New Zealand and Australia. Citizens of these countries preferred the removal of COVID-19 restrictions when using public transits. On the contrary, passengers in the Philippines gave importance to appropriate COVID-19 precautions when using public transits. The conflicting situations for each country were possibly the consequences of increasing COVID-19 cases in the Philippines and diminishing cases in New Zealand and Australia. As part of this study, passengers' attitude was explored by knowing their preferences in PUB system during the pandemic. COVID-19 preventive measures were part of the attitude's

measures to gauge passengers' observation effectively. Most importantly, attitude generated a relatively high value of R-squared ( $R^2$ :0.58), representing 58% data fit.

Results also showed that H9 was significant because subjective norm positively influenced intention to use PUB ( $\beta$ :0.23,  $p$ :0.001). However, subjective norm was insignificant to the intention to use public transits in other studies (Borhan et al., 2019; Ng & Phung, 2021; Lee et al., 2021). Ajzen (1991) also revealed that subjective norm is instigated by social pressure, hence it commonly receives lesser impact than personal attitude. Nonetheless, this study suggested that the  $\beta$  of the subjective norm was higher than the  $\beta$  of attitude. However, the subjective norm's R-squared ( $R^2$ :0.40) had the least value among all endogenous variables. Despite this result, 40% variance in the data fit was considered acceptable (Buitendach, Bobat, Muzvidziwa, & Kanengoni, 2016). Since this study covered the COVID-19 situation, passengers valued the opinions of the people surrounding them. Most participants were not equipped with personal cars (77.43%) as well. Thus, participants were easily convinced if a person advised them to use PUB.

Furthermore, H10 ( $\beta$ :0.48,  $p$ :0.001) and H11 ( $\beta$ :0.29,  $p$ :0.001) were supported. Specifically, perceived behavioral control significantly and positively influenced intention to use PUB (H10) and perceived passenger behavior (H11). The R-squared of perceived behavioral control ( $R^2$ :0.50) was also deemed to fit roughly 50% of the data model. Perceived behavioral control of participants was dependent on the sole insights of a person. This study gauged the acceptance of passengers in adapting to the new normal of using PUB. Similarly, perceived behavioral control was found significantly positive to the intention to use public transits (Borhan et al., 2019; Ng & Phung, 2021). Bamberg et al. (2003) also identified that students' perceived behavioral control significantly affected their intention to use PUB but students' perceived

behavioral control was insignificant towards their behavior. For this study, most of the participants were primarily students (35.05%). Hence, this research further supported the students' intention to use PUB, particularly during the COVID-19 pandemic. Another study specified that perceived behavioral control was insignificant to intention to use public transits and passengers' behavior (Devika et al., 2020). Therefore, H10 was undoubtedly supported by this study alongside past studies. However, this study and past studies disclosed conflicting results for H11, which was considered the effect of participants' demographic profile and social situation (pre-pandemic and pandemic era).

Lastly, H12 was significant because the intention to use PUB significantly and positively influenced perceived passenger behavior ( $\beta:0.62$ ,  $p:0.001$ ). The R-squared of intention to use ( $R^2:0.70$ ) and perceived passenger behavior ( $R^2:0.75$ ) were higher than other variables. High R-squared values concluded that the data of the two variables tremendously contributed to the model fit. It was hypothesized that H12 would significantly impact the model because Ajzen (1991) characterized the dominant effects of significant attitude, subjective norm, and perceived behavioral control towards intention to use. Thus, perceived passenger behavior was dependent on the frequency, necessity, safety, and satisfaction of using PUB during the pandemic. Frequency pertains to the passengers' PUB usage that is also connected to the purpose of riding PUB. According to the demographic profile of participants, most passengers utilized PUB every Monday (39.80%) for personal or essential purposes (56.83%). Passengers limit their exposure to the COVID-19 virus by choosing a specific day in a week for grocery shopping and health-related activities. In addition, safety and satisfaction refer to passengers' overall perception of the PUB system during the COVID-19 pandemic. If these aforementioned factors were acceptable for the passengers, then passengers would be enticed to use PUB despite the pandemic. Similar results were found in the studies of Bamberg et al. (2003) and Devika et al. (2020). Country of residence also influenced the passengers' intention to use public transits (Thomas et al., 2021). Meanwhile, an indicator related to the single choice of public transit was insignificant. This implied that PUB was not the only public transit option in the Philippines. Aside from PUB, researchers from the Philippines identified that jeepney, taxi, motorcycle, multicab, tricycle, and ferry boat were the common public transits in the Philippines (Mayo & Taboada, 2020). Additionally, measures associated with mitigating negative implications on the PUB system were insignificant. Hence, the participants were unconvinced that COVID-19 preventive measures helped lessen the negative perceptions relevant to the PUB system. Therefore, stricter implementation of COVID-19 preventive measures shall be imposed to identify the significance of the removed measures under perceived passenger behavior.

6.2. Practical implications

This study intends to help all the PUB stakeholders, including passengers, drivers, operators, policymakers, and the government. Table 6 shows the detailed contributions derived from the study's results. It is suggested that all PUB stakeholders follow the recommended strategies. These strategies ensure that everyone can quickly adapt to the new normal of riding PUB and mitigate COVID-19 cases in the Philippines. Therefore, the problematic PUB systems and COVID-19 cases in the Philippines are addressed by applying the CFA-SEM tool bounded by SET and TPB principles.

7. Conclusion

The adverse effects of COVID-19 in the Philippines' PUB sector have affected passengers, the economy, and the business sectors. The COVID-19 situation affected everyone's quality of life, resulting in social and economic changes. PUB passengers developed negative perceptions of sharing space with other people. Since PUB passengers were the primary

Table 6  
Practical implications.

Person in charge	Recommendation	Expected Results
PUB companies	The drivers and operators must undergo training programs at least once a month. PUB companies should spearhead the training, consisting of etiquette and refresher technical courses.	The training program will improve drivers' and operators' professionalism and technical skills. It will also bring a harmonious employer-employee relationship among PUB companies, drivers, and operators. If drivers and operators continuously receive appropriate training, they will help mitigate road accents and increase passenger satisfaction and safety.
PUB drivers and operators	The drivers and operators should ensure that every passenger riding the PUB adheres to the COVID-19 preventive measures. A passenger whose temperature is above 37.5 degrees Celsius is not permitted to ride PUB. The drivers and operators should also disinfect passengers' hands prior to boarding the transportation mode. Also, they must ensure that passengers wear a face mask and face shield before boarding and while riding PUB. Lastly, passengers cannot stand and must maintain a one-seat-apart setup, which drivers and operators must check throughout the journey.	If everyone follows the COVID-19 preventive measures, there will be a lower chance of COVID-19 transmission. This approach ensures that the drivers, operators, and passengers can safely ride PUB without feeling anxious.
Department of Transportation (DOTR)	The DOTR should perform a random inspection at least once every week. The governing body should check the passengers' behavior at bus stops and while riding PUB. They should also ensure that PUB companies, drivers, and operators adhere to the COVID-19 protocols.	A random inspection is an unbiased approach that can help improve the PUB system. Overall, it aims to check the drivers' and operators' capability and the passengers' attitude, given the COVID-19 protocols.
Policymakers and Department of Transportation (DOTR)	Develop and implement sanctions for the violators of COVID-19 protocols. For instance, first-time offenders must pay ₱1000 (\$20). Second-time offenders must pay ₱2000 (\$40). Third-time offenders must pay ₱5000 (\$100) and up to ten (10) days imprisonment for passengers, or ten (10) days suspension for drivers.	It is expected that people will follow COVID-19 protocols when negative consequences are present. This strategy will also ensure that the spread of COVID-19 is mitigated.
Department of Transportation (DOTR)	The PUB fare must be maintained at its current price since everyone is struggling during the pandemic. Fare increase is not encouraged at the moment. If an unprecedented situation affects the oil prices in the country, the DOTR should ensure that PUB companies, drivers,	By maintaining an affordable PUB fare, passengers can save money that can be used for other essential products. Passengers' productivity may also increase because they do not need to drive their private cars; this instance is also associated with a sustainable environment. It also

(continued on next page)



Table 6 (continued)

Person in charge	Recommendation	Expected Results
	and operators receive subsidies while waiting for the situation to normalize.	improves the country's economy because a reasonable price is equated to higher demand.
Department of Transportation (DOTR)	Increase the number of PUBs deployed on the road due to the limited public transport modes and increasing number of passengers.	This strategy contributes a positive impact on passengers because some companies start to ask employees to return to the office. There should be an adequate number of PUBs to accommodate increasing passenger demand. It is also expected to decrease waiting time and mitigate virus transmission among the waiting passengers. This approach will also create employment opportunities for PUB drivers and operators.
Department of Transportation (DOTR)	Fast-track the PUB and other road construction projects because they are the leading cause of traffic congestion. The DOTR should ensure a satisfactory workforce and apply project management principles.	Once the DOTR has finished PUB-related projects, PUB exclusive lanes will benefit everyone because drivers can quickly transport passengers to their respective destinations. Thus, passengers have lower exposure to possible COVID-19 transmission due to lesser travel and waiting time. The passengers' demands, such as accessibility, safety, economic benefit, and crisis management are met.

revenue sources of PUB companies, all PUB stakeholders were affected. The research gap was addressed by utilizing CFA-SEM to the combined SET and TPB. This study aimed to determine the factors affecting PUB passengers' behavior during the COVID-19 pandemic. SET and TPB were the theories utilized to evaluate accessibility, safety, economic benefit, crisis management, trust, attitude, subjective norm, perceived behavioral control, intention to use, and perceived passenger behavior.

This study acknowledged limitations that could help other researchers further investigate the passengers' perception of the Philippines' PUB system. The study could be extended by evaluating the passengers' behavior in different Philippine cities since each city's PUB system may vary. It was also recommended to compare several time points (before, during, and after the pandemic) to identify travel behavior changes depending on the COVID-19 situation. Additionally, the demographic characteristics of participants could be used as SEM moderating effects to compare the generated results. Lastly, it was suggested to include service quality variables for a more comprehensive theoretical framework.

Furthermore, the study provided practical implications to help the PUB stakeholders adjust to the passengers' needs. Passengers' negative perceptions of PUB would be mitigated through strict implementation and adherence to the appropriate COVID-19 and safe driving protocols. In addition, Filipinos' socio-economic status and residence were crucial factors in using PUB during the pandemic. Finally, the DOTR and policymakers played a critical role since they authorized road projects and policies. Overall, PUB companies, drivers, and operators assisted the projects implemented by the government (policymakers and DOTR). Meanwhile, the government was encouraged to present impactful PUB projects supporting Filipino passengers' well-being.

## CRedit authorship contribution statement

**Maela Madel Cahigas:** Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Visualization. **Yogi Tri Prasetyo:** Validation, Writing – review & editing, Supervision. **Satria Fadil Persada:** Conceptualization, Methodology, Validation, Resources, Writing – original draft, Writing – review & editing, Supervision. **Ardvin Kester S. Ong:** Validation, Formal analysis, Writing – review & editing. **Reny Nadlifatin:** Validation, Writing – review & editing.

## Data availability

The data that has been used is confidential.

## References

- Aghabayk, K., Esmailpour, J., & Shiwakoti, N. (2021). Effects of COVID-19 on rail passengers' crowding perceptions. *Transportation Research Part A: Policy and Practice*, 154, 186–202. <https://doi.org/10.1016/j.tra.2021.10.011>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-t](https://doi.org/10.1016/0749-5978(91)90020-t)
- Alzaharani, K., Hall-Phillips, A., & Zeng, A. Z. (2017). Applying the theory of reasoned action to understanding consumers' intention to adopt hybrid electric vehicles in Saudi Arabia. *Transportation*, 46(1), 199–215. <https://doi.org/10.1007/s11116-017-9801-3>
- Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended TWO-STEP approach. *Psychological Bulletin*, 103(3), 411–423. <https://doi.org/10.1037/0033-2909.103.3.411>
- Ap, J. (1992). Residents' perceptions on tourism impacts. *Annals of Tourism Research*, 19(4), 665–690. [https://doi.org/10.1016/0160-7383\(92\)90060-3](https://doi.org/10.1016/0160-7383(92)90060-3)
- Atombo, C., & Dzibordi Wemegah, T. (2021). Indicators for Commuter's satisfaction and usage of high occupancy public bus transport service in Ghana. *Transportation Research Interdisciplinary Perspectives*, 11, Article 100458. <https://doi.org/10.1016/j.trip.2021.100458>
- Bamberg, S., Ajzen, I., & Schmidt, P. (2003). Choice of travel mode in the theory of planned behavior: The roles of past behavior, habit, and reasoned action. *Basic and Applied Social Psychology*, 25(3), 175–187. [https://doi.org/10.1207/s15324834basp2503\\_01](https://doi.org/10.1207/s15324834basp2503_01)
- Bian, Z., Zuo, F., Gao, J., Chen, Y., Pavuluri Venkata, S. S., Duran Bernardes, S., ... J., & Wang, J. (2021). Time lag effects of COVID-19 policies on transportation systems: A comparative study of new York City and Seattle. *Transportation Research Part A: Policy and Practice*, 145, 269–283. <https://doi.org/10.1016/j.tra.2021.01.019>
- Biehl, A., & Stathopoulos, A. (2020). Investigating the interconnectedness of active transportation and public transit usage as a primer for mobility-as-a-service adoption and deployment. *Journal of Transport & Health*, 18, Article 100897. <https://doi.org/10.1016/j.jth.2020.100897>
- Blau, P. M. (1965). Exchange and power in social life. *Social Forces*, 44(1), 128. <https://doi.org/10.2307/2574842>
- Borhan, M. N., Ibrahim, A. N., & Miskeen, M. A. (2019). Extending the theory of planned behaviour to predict the intention to take the new high-speed rail for intercity travel in Libya: Assessment of the influence of novelty seeking, trust and external influence. *Transportation Research Part A: Policy and Practice*, 130, 373–384. <https://doi.org/10.1016/j.tra.2019.09.058>
- Breckler, S. J., & Wiggins, E. C. (1989). Affect versus evaluation in the structure of attitudes. *Journal of Experimental Social Psychology*, 25(3), 253–271. [https://doi.org/10.1016/0022-1031\(89\)90022-x](https://doi.org/10.1016/0022-1031(89)90022-x)
- Buitendach, J. H., Bobat, S., Muzvidziwa, R. F., & Kanengoni, H. (2016). Work engagement and its relationship with various dimensions of work-related well-being in the public transport industry. *Psychology and Developing Societies*, 28(1), 50–72. <https://doi.org/10.1177/0971333615622895>
- Cable News Network Philippines. (2020, June 20). *Modern jeeps, buses allowed back on the road starting June 22*. CNN. Retrieved September 15, 2021, from <https://cnnphilippines.com/news/2020/6/20/jeep-uv-express-buses-back-on-the-road-June-22.html?fbclid>
- Chen, C.-F., & Chao, W.-H. (2011). Habitual or reasoned? Using the theory of planned behavior, technology acceptance model, and habit to examine switching intentions toward public transit. *Transportation Research Part F: Traffic Psychology and Behaviour*, 14(2), 128–137. <https://doi.org/10.1016/j.trf.2010.11.006>
- Chen, F., Peng, H., Ding, W., Ma, X., Tang, D., & Ye, Y. (2021). Customized bus passenger boarding and deboarding planning optimization model with the least number of contacts between passengers during COVID-19. *Physica A: Statistical Mechanics and its Applications*, 582, Article 126244. <https://doi.org/10.1016/j.physa.2021.126244>
- Cheng, P., Luo, K., Xiao, S., Yang, H., Hang, J., Ou, C., ... Li, Y. (2022). Predominant airborne transmission and insignificant fomite transmission of SARS-COV-2 in a two-bus covid-19 outbreak originating from the same pre-symptomatic index case. *Journal of Hazardous Materials*, 425, Article 128051. <https://doi.org/10.1016/j.jhazmat.2021.128051>
- Cheranchery, M. F., Krishnan, M. G., Asif Navas, K. R., Mohamed Shahid, P. A., & Suresh, R. (2021). Investigating the impact of COVID-19 on user perception for

- deriving policies and intervention areas for urban bus service in India. *Case Studies on Transport Policy*, 9(4), 1965–1973. <https://doi.org/10.1016/j.cstp.2021.11.007>
- Chuenyindee, T., Ong, A. K., Prasetyo, Y. T., Persada, S. F., Nadlifatin, R., & Sittiwatethanasiri, T. (2022). Factors affecting the perceived usability of the COVID-19 contact-tracing application “Thai chana” during the early COVID-19 omicron period. *International Journal of Environmental Research and Public Health*, 19(7), 4383. <https://doi.org/10.3390/ijerph19074383>
- Chuenyindee, T., Ong, A. K., Ramos, J. P., Prasetyo, Y. T., Nadlifatin, R., Kurata, Y. B., & Sittiwatethanasiri, T. (2022). Public utility vehicle service quality and customer satisfaction in the Philippines during the COVID-19 pandemic. *Utilities Policy*, 75, Article 101336. <https://doi.org/10.1016/j.jup.2022.101336>
- Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, 1(1), 16–29. <https://doi.org/10.1037/1082-989x.1.1.16>
- Currie, G., Jain, T., & Aston, L. (2021). Evidence of a post-covid change in travel behaviour – Self-reported expectations of commuting in Melbourne. *Transportation Research Part A: Policy and Practice*, 153, 218–234. <https://doi.org/10.1016/j.tra.2021.09.009>
- Cusack, M. (2021). Individual, social, and environmental factors associated with active TRANSPORTATION commuting during the COVID-19 pandemic. *Journal of Transport & Health*, 22, Article 101089. <https://doi.org/10.1016/j.jth.2021.101089>
- Dela Cruz, R. C. (2021, February 19). Dotr to speed up, increase public transport under new normal. In *Philippine news agency*. Retrieved September 13, 2021, from <https://www.pna.gov.ph/articles/1131259>.
- Department of Transportation. (2021, March 28). *GOVPH*. DOTr. Retrieved September 15, 2021, from <https://dotr.gov.ph/55-dotnews/3282-dotr-announces-omnibus-guidelines-on-public-transportation-in-the-enforcement-of-enhanced-community-quarantine.html>.
- Deveci, M., Aydin, N., & Kusacki, A. O. (2021). Managing public transport during COVID-19: An analysis of the impact and preventive response in Istanbul. *Journal of Naval Sciences and Engineering*, 17(1), 77–102. Retrieved from <https://dergipark.org.tr/en/pub/jnse/issue/61654/885907>.
- Deveci, M., Çiftçi, M. E., Akyurt, İ. Z., & Gonzalez, E. D. R. (2022). Impact of COVID-19 pandemic on the Turkish civil aviation industry. *Sustainable Operations and Computers*, 3, 93–102. <https://doi.org/10.1016/j.susoc.2021.11.002>
- Deveci, M., Öner, S. C., Camtez, F., & Öner, M. (2019). Evaluation of service quality in public bus transportation using interval-valued intuitionistic fuzzy QFD methodology. *Research in Transportation Business & Management*, 33, Article 100387. <https://doi.org/10.1016/j.rtbm.2019.100387>
- Devika, R., Harikrishna, M., & Anjaneyulu, M. V. (2020). Influence of psychological factors in mode choice decision making: A structural equation modeling approach. *Transportation Research Procedia*, 48, 2821–2830. <https://doi.org/10.1016/j.trpro.2020.08.236>
- Emerson, R. M. (1976). Social exchange theory. *Annual Review of Sociology*, 2(1), 335–362. <https://doi.org/10.1146/annurev.so.02.080176.002003>
- Forward, S. E. (2019). Views on public transport and how personal experiences can contribute to a more positive attitude and behavioural change. *Social Sciences*, 8(2), 47. <https://doi.org/10.3390/socsci8020047>
- Gao, Y., Chen, X., Shan, X., & Fu, Z. (2018). Active commuting among junior high school students in a CHINESE MEDIUM-SIZED city: Application of the theory of PLANNED behavior. *Transportation Research Part F: Traffic Psychology and Behaviour*, 56, 46–53. <https://doi.org/10.1016/j.trf.2018.03.029>
- Gefen, D., Straub, D., & Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of the Association for Information Systems*, 4. <https://doi.org/10.17705/1cais.00407>
- German, J. D., Redi, A. A., Prasetyo, Y. T., Persada, S. F., Ong, A. K., Young, M. N., & Nadlifatin, R. (2022). Choosing a package carrier during COVID-19 pandemic: An integration of pro-environmental planned behavior (PEPB) theory and service quality (SERVQUAL). *Journal of Cleaner Production*, 346, Article 131123. <https://doi.org/10.1016/j.jclepro.2022.131123>
- Gregorio, X. (2020, March 16). *Movement of people in Luzon restricted as island placed under 'enhanced' community quarantine*. CNN. Retrieved September 13, 2021, from <https://cnnphilippines.com/news/2020/3/16/luzon-enhanced-community-quarantine-covid-19.html?fbclid>.
- Guillen, M. D., Ishida, H., & Okamoto, N. (2013). Is the use of informal public transport modes in developing COUNTRIES habitual? An empirical study in Davao City, Philippines. *Transport Policy*, 26, 31–42. <https://doi.org/10.1016/j.tranpol.2012.03.008>
- Gumasing, M. J., Prasetyo, Y. T., Ong, A. K., & Nadlifatin, R. (2022). Determination of factors affecting the response efficacy of Filipinos under typhoon Conson 2021 (jolina): An extended protection motivation theory approach. *International Journal of Disaster Risk Reduction*, 70, Article 102759. <https://doi.org/10.1016/j.ijdrr.2021.102759>
- Hair, J. F. (2010). *Multivariate data analysis: A global perspective*. Prentice Hall.
- He, L., Li, J., & Sun, J. (2021). How to promote sustainable travel behavior in the post covid-19 period: A perspective from customized bus services. *International Journal of Transportation Science and Technology*. <https://doi.org/10.1016/j.ijst.2021.11.001>
- Homans, G. C. (1958). Social behavior as exchange. *American Journal of Sociology*, 63(6), 597–606. <https://doi.org/10.1086/222355>
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- Jeong, M., & Oh, H. (2017). Business-to-business social exchange relationship beyond trust and commitment. *International Journal of Hospitality Management*, 65, 115–124. <https://doi.org/10.1016/j.ijhm.2017.06.004>
- Kartal, M. T., Depren, Ö., & Depren, S. K. (2021). The relationship between mobility and covid-19 pandemic: Daily evidence from an emerging country by causality analysis. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3823738>
- Khan, A. G., Kamruzzaman, M., Rahman, M. N., Mahmood, M., & Uddin, M. A. (2021). Quality of life in the COVID-19 outbreak: Influence of psychological distress, government strategies, social distancing, and emotional recovery. *Heliyon*, 7(3). <https://doi.org/10.1016/j.heliyon.2021.e06407>
- Kim, S., Lee, S., Ko, E., Jang, K., & Yeo, J. (2021). Changes in car and bus usage amid the COVID-19 pandemic: Relationship with land use and land price. *Journal of Transport Geography*, 96, Article 103168. <https://doi.org/10.1016/j.jtrangeo.2021.103168>
- Lambe, C. J., Wittmann, C. M., & Spekman, R. E. (2001). Social exchange theory and research on business-to-business relational exchange. *Journal of Business-to-Business Marketing*, 8(3), 1–36. [https://doi.org/10.1300/j033v08n03\\_01](https://doi.org/10.1300/j033v08n03_01)
- Latan, H., & Ramli, N. A. (2013). The results of partial least squares-structural equation modelling analyses (PLS-SEM). *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2364191>
- Lee, J., Baig, F., & Pervez, A. (2021). Impacts of covid-19 on individuals' MOBILITY behavior in Pakistan based on self-reported responses. *Journal of Transport & Health*, 22, Article 101228. <https://doi.org/10.1016/j.jth.2021.101228>
- Lu, Y., Mateo-Babiano, I., & Sorupia, E. (2019). Who uses smart card? Understanding public transport payment preference in DEVELOPING contexts, a case study OF Manila's LRT-1. *IATSS Research*, 43(1), 60–68. <https://doi.org/10.1016/j.iatssr.2018.09.001>
- Ma, L., Seydel, J., Zhang, X., & Ding, X. Y. (2019). Users' recommendation intentions for Shared Bike Services: A Social Exchange Theory Perspective. *International Journal of Sustainable Transportation*, 15(1), 1–10. <https://doi.org/10.1080/15568318.2019.1676484>
- Mateo-Babiano, I., Recio, R. B., Ashmore, D. P., Guillen, M. D., & Gaspay, S. M. (2020). Formalising the JEEPNEY industry in the Philippines – A confirmatory thematic analysis of key TRANSITIONARY ISSUES. *Research in Transportation Economics*, 83, Article 100839. <https://doi.org/10.1016/j.retrec.2020.100839>
- Mayo, F. L., Maglasang, R. S., Moridpour, S., & Taboada, E. B. (2021). Exploring the changes in TRAVEL behavior in a developing country amidst the COVID-19 pandemic: Insights from metro Cebu, Philippines. *Transportation Research Interdisciplinary Perspectives*, 100461. <https://doi.org/10.1016/j.trip.2021.100461>
- Mayo, F. L., & Taboada, E. B. (2020). Ranking factors affecting public transport mode choice of commuters in an urban city of a developing country using ANALYTIC hierarchy process: The case of metro Cebu, Philippines. *Transportation Research Interdisciplinary Perspectives*, 4, Article 100078. <https://doi.org/10.1016/j.trip.2019.100078>
- Mercado, N. A. (2020, March 17). *Without public transport, workers resort to walking for hours*. Inquirer.net. Retrieved September 13, 2021, from <https://newsinfo.inquirer.net/1243803/without-public-transport-workers-resort-to-walking-for-hours>.
- Mora Cortez, R., & Johnston, W. J. (2020). The coronavirus crisis in B2B settings: Crisis uniqueness and managerial implications based on social exchange theory. *Industrial Marketing Management*, 88, 125–135. <https://doi.org/10.1016/j.indmarman.2020.05.004>
- Mulley, C., & Daniels, R. (2012). Quantifying the role of a flexible transport service in reducing the accessibility gap in low density areas: A case-study in north-West Sydney. *Research in Transportation Business & Management*, 3, 12–23. <https://doi.org/10.1016/j.rtbm.2012.04.006>
- Naveen, B. R., & Gurtoo, A. (2022). Public transport strategy and epidemic prevention framework in the context of covid-19. *Transport Policy*, 116, 165–174. <https://doi.org/10.1016/j.tranpol.2021.12.005>
- Ng, P. Y., & Phung, P. T. (2021). Public transportation IN HANOI: Applying an INTEGRATIVE model of behavioral intention. *Case Studies on Transport Policy*, 9(2), 395–404. <https://doi.org/10.1016/j.cstp.2020.10.012>
- Nguyen, M. H., & Pojani, D. (2021). Covid-19 need not spell the death of public transport: Learning from Hanoi's safety measures. *Journal of Transport & Health*, 23, Article 101279. <https://doi.org/10.1016/j.jth.2021.101279>
- Nordhoff, S., Malmsten, V., van Arem, B., Liu, P., & Happee, R. (2021). A structural equation modeling approach for the acceptance of driverless automated shuttles based on constructs from the unified theory of acceptance and use of technology and the diffusion of innovation theory. *Transportation Research Part F: Traffic Psychology and Behaviour*, 78, 58–73. <https://doi.org/10.1016/j.trf.2021.01.001>
- Nunnally, J. C., & Bernstein, I. H. (2010). *Psychometric theory*. Tata McGraw-Hill.
- Ong, A. K., Cleofas, M. A., Prasetyo, Y. T., Chuenyindee, T., Young, M. N., Diaz, J. F., ... Redi, A. A. (2021). Consumer behavior in clothing industry and its relationship with open innovation dynamics during the COVID-19 pandemic. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(4), 211. <https://doi.org/10.3390/joitmc7040211>
- Ong, A. K., Prasetyo, Y. T., Salazar, J. M., Erfe, J. J., Abella, A. A., Young, M. N., ... A. A. (2021). Investigating the acceptance of the reopening Bataan nuclear power plant: Integrating protection motivation theory and extended theory of planned behavior. *Nuclear Engineering and Technology*. <https://doi.org/10.1016/j.net.2021.08.032>
- Parady, G., Taniguchi, A., & Takami, K. (2020). Travel behavior changes during the COVID-19 pandemic in JAPAN: Analyzing the effects of risk perception and social influence on going-out self-restriction. *Transportation Research Interdisciplinary Perspectives*, 7, Article 100181. <https://doi.org/10.1016/j.trip.2020.100181>
- Parrocha, A., & Dela Cruz, R. C. (2020, March 16). Mass transport suspended under Enhanced Community Quarantine. *Philippine News Agency*. Retrieved September 13, 2021, from <https://www.pna.gov.ph/articles/1096849>.
- Patag, K. J. (2020, March 17). Health workers walk to work, sleep in clinics as quarantine halts transportation. In *Philstar global*. Retrieved September 13, 2021, from <https://www.philstar.com/headlines/2020/03/17/2001601/health-workers-walk-work-sleep-clinics-quarantine-halts-transportation>.

- Prasetyo, Y. T., Castillo, A. M., Salonga, L. J., Sia, J. A., & Seneta, J. A. (2020). Factors affecting perceived effectiveness of Covid-19 prevention measures among Filipinos during enhanced community quarantine in Luzon, Philippines: Integrating protection motivation theory and extended theory of planned behavior. *International Journal of Infectious Diseases*, 99, 312–323. <https://doi.org/10.1016/j.ijid.2020.07.074>
- Prudon, P. (2015). Confirmatory factor analysis as a tool in research using questionnaires: A critique. *Comprehensive Psychology*, 4. <https://doi.org/10.2466/03.cp.4.10>
- Rasoolimanesh, S. M., Jaafar, M., Kock, N., & Ramayah, T. (2015). A revised framework of social exchange theory to investigate the factors influencing residents' perceptions. *Tourism Management Perspectives*, 16, 335–345. <https://doi.org/10.1016/j.tmp.2015.10.001>
- Rasoolimanesh, S. M., Seyfi, S., Rastegar, R., & Hall, C. M. (2021). Destination image during the COVID-19 pandemic and future travel behavior: The moderating role of past experience. *Journal of Destination Marketing & Management*, 21, Article 100620. <https://doi.org/10.1016/j.jdmm.2021.100620>
- Razak, N. A., Pangil, F., Zin, M. L., Yunus, N. A., & Asnawi, N. H. (2016). Theories of knowledge sharing behavior in business strategy. *Procedia Economics and Finance*, 37, 545–553. [https://doi.org/10.1016/s2212-5671\(16\)30163-0](https://doi.org/10.1016/s2212-5671(16)30163-0)
- Salomonson, N., & Felleson, M. (2014). Tricks and tactics used against troublesome travelers—Frontline staff's experiences from Swedish buses and trains. *Research in Transportation Business & Management*, 10, 53–59. <https://doi.org/10.1016/j.rtbm.2014.04.002>
- Santoso, A. S., & Maureen Nelloh, L. A. (2017). User satisfaction and intention to use peer-to-peer online transportation: A replication study. *Procedia Computer Science*, 124, 379–387. <https://doi.org/10.1016/j.procs.2017.12.168>
- Shaaban, K., & Maher, A. (2020). Using the theory of PLANNED behavior to predict the use of an upcoming public transportation service in Qatar. *Case Studies on Transport Policy*, 8(2), 484–491. <https://doi.org/10.1016/j.cstp.2019.11.001>
- Shamshiripour, A., Rahimi, E., Shabanpour, R., Mohammadian, A., & K.. (2020). How is COVID-19 reshaping activity-travel behavior? Evidence from a comprehensive survey in Chicago. *Transportation Research Interdisciplinary Perspectives*, 7, Article 100216. <https://doi.org/10.1016/j.trip.2020.100216>
- Shen, W., Xiao, W., & Wang, X. (2015). Passenger satisfaction evaluation model for urban rail transit: A structural equation modeling based on partial least squares. *Transport Policy*, 46, 20–31. <https://doi.org/10.1016/j.tranpol.2015.10.006>
- Social Weather Stations. (2021a). *Fourth quarter 2020 social weather survey: 42% OF non-home-based working Filipinos say going to work is very much HARDER; 44% of them walk to work*. Social Weather Stations. Retrieved September 13, 2021, from <http://www.sws.org.ph/swsmain/artclidispagg/?artcsyscode=ART-20210507063140>.
- Social Weather Stations. (2021b). *Fourth quarter 2020 social weather survey items for the Department of Health: 85% of Filipino adults say their city/municipality can become a great place for walking and cycling*. Social Weather Stations. Retrieved September 15, 2021, from <http://www.sws.org.ph/swsmain/artclidispagg/?artcsyscode=ART-2021092222939>.
- Sunio, V., Gaspay, S., Guillen, M. D., Mariano, P., & Mora, R. (2019). Analysis of the public transport modernization via system reconfiguration: The ongoing case in the Philippines. *Transportation Research Part A: Policy and Practice*, 130, 1–19. <https://doi.org/10.1016/j.tra.2019.09.004>
- Sy, R. (2021, May 22). EDSA busway: More, better, sooner. In *The Manila times*. Retrieved September 13, 2021, from <https://www.manilatimes.net/2021/05/22/business/edsa-busway-more-better-sooner/1800145>.
- Tejada, J. J., & Punzalan, J. R. B. (2012). On the misuse of Slovin's formula. *The Philippine Statistician*, 61(1), 129–136.
- Thomas, F. M. F., Charlton, S. G., Lewis, I., & Nandavar, S. (2021). Commuting before and after covid-19. *Transportation Research Interdisciplinary Perspectives*, 11, Article 100423. <https://doi.org/10.1016/j.trip.2021.100423>
- Thompson, D. (2021, January 26). How dangerous is coronavirus to the middle-aged?. In *WebMD*. Retrieved February 26, 2022, from <https://www.webmd.com/lung/news/20210126/how-dangerous-is-coronavirus-to-the-middle-aged#1>.
- Tiglao, N. C., De Veyra, J. M., Tolentino, N. J., & Tacderas, M. A. (2020). The perception of service quality among PARATRANSIT users in metro MANILA using structural EQUATIONS MODELLING (SEM) approach. *Research in Transportation Economics*, 83, Article 100955. <https://doi.org/10.1016/j.retrec.2020.100955>
- Vallejo, B. M., & Ong, R. A. (2020). Policy responses and government science advice for the Covid 19 pandemic in the Philippines: January to April 2020. *Progress in Disaster Science*, 7, Article 100115. <https://doi.org/10.1016/j.pdisas.2020.100115>
- Waka Kotahi NZ Transport Agency. (2020, November 17). *Waka Kotahi Covid-19 tracking core report*. Waka Kotahi NZ Transport Agency. Retrieved February 27, 2022, from <https://www.nzta.govt.nz/assets/resources/covid-19-impacts-on-transport/waka-kotahi-nzta-covid-19-tracking-core-report-waves-1-26-20210914.pdf>.
- Wang, H.-K., Yen, Y.-F., & Tseng, J.-F. (2015). Knowledge sharing in knowledge workers: The roles of social exchange theory and the theory of planned behavior. *Innovation*, 17(4), 450–465. <https://doi.org/10.1080/14479338.2015.1129283>
- Wang, L., Li, L., Wu, B., & Bai, Y. (2013). Private car switched to public transit by commuters, in Shanghai, China. *Procedia - Social and Behavioral Sciences*, 96, 1293–1303. <https://doi.org/10.1016/j.sbspro.2013.08.147>
- Wang, S., & Noe, R. A. (2010). Knowledge sharing: A review and directions for future research. *Human Resource Management Review*, 20(2), 115–131. <https://doi.org/10.1016/j.hrmr.2009.10.001>
- Wang, Y., Cao, M., Liu, Y., Ye, R., Gao, X., & Ma, L. (2020). Public transport equity in Shenyang: using structural equation modelling. *Research in Transportation Business & Management*, 100555. <https://doi.org/10.1016/j.rtbm.2020.100555>
- van Wee, B., & Witlox, F. (2021). COVID-19 and its long-term effects on activity participation and TRAVEL behaviour: A MULTIPERSPECTIVE VIEW. *Journal of Transport Geography*, 95, Article 103144. <https://doi.org/10.1016/j.jtrangeo.2021.103144>
- World Health Organization. (2021). *Philippines: Who coronavirus disease (COVID-19) dashboard with vaccination data*. World Health Organization. Retrieved September 15, 2021, from <https://covid19.who.int/region/wpro/country/ph>.
- Wu, D., Gu, H., Gu, S., & You, H. (2021). Individual motivation and social influence: A study of telemedicine adoption in China based on social cognitive theory. *Health Policy and Technology*, 10(3), Article 100525. <https://doi.org/10.1016/j.hlpt.2021.100525>
- Yamane, T. (1967). *Elementary sampling theory*. New Jersey: Prentice-Hall, Inc.
- Yap, E. (2021, September 6). *Toward metro manila's new age in public transportation*. INQUIRER.net. Retrieved September 13, 2021, from <https://business.inquirer.net/330137/toward-metro-manilas-new-age-in-public-transportation>.
- Zailani, S., Iranmanesh, M., Masron, T. A., & Chan, T.-H. (2016). Is the intention to use public transport for different travel purposes determined by different factors? *Transportation Research Part D: Transport and Environment*, 49, 18–24. <https://doi.org/10.1016/j.trd.2016.08.038>