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Evaluation of Public Transport among University Commuters in Rural Areas

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Abstract: This study aimed to evaluate the quality of Public Transport (PT) in the Jordan University of Science and Technology (JUST) area, Irbid, Jordan. The study focused on two different analytical techniques. The first was the Partial Least Squares Structural Equation Model (PLS-SEM) method to analyze student satisfaction and loyalty toward using PT. The second method was binary logistic regression (BLR), which analyzed factors such as socioeconomic status and travel habits that might make someone choose PT or their car to travel to JUST. Data were collected through an electronic and paper-based questionnaire with 572 participants. This study concluded that the proposed structural model could explain 76% of the loyalty variance. Passenger satisfaction, perceived service quality, perceived costs, and environmental impact were four of the five factors directly influencing passenger loyalty that demonstrated significant impact. In addition, it was concluded that through Multi-Group Analysis (MGA), gender group was the most influential categorical moderator variable. Moreover, the indirect analysis showed that perceived service quality was the most important mediator between the observed constructs' relationships. BLR showed that the mode of transportation at JUST was statistically correlated with occupancy, travel cost, travel time, average use of PT, and car ownership, with an overall model accuracy of 90.0%. In conclusion, by considering the discussed influencing factors, it is recommended that transportation agencies consider perceived costs, information, reliability, safety, and vehicle characteristics variables while improving PT service quality and travel time, especially in rural areas, which may raise passenger satisfaction, shift car users to PT, and lower emissions. Thus, research results can assist policymakers in implementing sustainable modes of PT.

Keywords: rural campus; public transport; travel habits; least square structural equation model; binary logistic regression

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1. Introduction

Transportation systems are one of the major components of the infrastructure in cities and one of the essential elements in the daily lives of their inhabitants. Millions of people leave their homes every day to travel to a workplace, office, classroom, or distant area. It is also essential for economic activity because it promotes the movement of products and people, which boosts the economy. Specifically, public transportation (PT) is a system of vehicles, such as buses and trains, typically managed on a schedule, operated on established routes, and charged a posted fee for each trip [1,2]. In addition, PT (also known as public transit, mass transit, or simply transit) is a transportation system for travelers by group travel systems available for use by the general public [1,2]. Jordan had a population of more than 10 million in 2021 [3], and the congestion levels have increased significantly due to the continuous population growth. In addition, due to the civil crisis in Syria, the government has received a significant influx of individuals. According to Jordan's most recent census, 1.3 million Syrians have crossed its borders in the ten years since the start

of the country's civil war in 2011 [4]. Almost 90% of Syrian refugees live in urban and rural areas of major cities such as Amman, the capital, Irbid, Mafraq, and Zarqa [5]. This increases the demand for transportation in general and PT in particular.

The need for transportation has expanded considerably over time [6]. Proper PT is necessary to ensure a livable city for its citizens. Due to the slow expansion of road infrastructure and keeping pace with the increasing demand for transport, the development of PT has become one of the best choices for meeting the demand for social sustainability and economic competency. Environmental and climate change issues have been identified as worldwide concerns, and the transportation industry has been acknowledged as a significant contributor to the escalation of environmental problems since it is responsible for 23% of worldwide CO_2 emissions via fuel combustion [7–10]. Thus, to address the escalating environmental issues associated with transportation, such as traffic noise, air pollution, and CO_2 emissions, it is essential to minimize the usage of private car ownership and shift to more sustainable modes, including PT. The ability of a PT system to attract and retain passengers is critical to its success, such as providing park-and-ride (P&R) services. Memon et al. (2021) [11] found that individuals are open to P&R services to minimize mental stress and protect the environment. As a result, service quality has emerged as one of the most pressing concerns because an increase in the level of service leads to the highest level of passenger satisfaction and increases the use of the system. When a city's PT system is developed to the point where inhabitants begin to rely on PT instead of private cars, it reduces congestion and pollution, including air and noise, owing to the reduction of private car usage [12]. Furthermore, Soehodho (2017) [13] found that car accidents are also projected to drop. As the quality of PT is closely tied to the level of service, transportation managers must try to provide better amenities for bus riders by enhancing the service quality in these aspects.

Being a rural campus, Jordan University of Science and Technology (JUST) lacks a reliable PT. This causes a significant shift in transportation into privately owned vehicles (PCs—passenger cars) [14]. JUST has twelve bus lines (108 buses) operated by local transportation agencies in 2022. These routes immediately connect the JUST campus to nearby towns, cities, and destinations popular with students and locals. Since 2018, the fare has been 55 Jordan piastres (USD 0.78). The cost of this fare fluctuates with fuel prices. The institution does not offer any financial assistance to staff or students who take a bus to the campus.

The main objectives of this study can be summarized as follows:

- To evaluate the PT system serving JUST and the community's travel patterns, considering various attributes related to passenger points of view on specified bus routes, including vehicle characteristics used in the PT system, safety, information, reliability, environmental impact, and perceived costs.
- To identify the relationships between these attributes and overall satisfaction, passenger loyalty, and passenger compliment.
- To gain insight into respondents' preferences for using public and private transportation for travel to and from JUST University.
- To assess how much respondents' basic demographic, socioeconomic, and travel habits can affect how they use these two modes of transportation and how often they access them.

In the existing literature studies, almost all authors focused on urban areas to evaluate the quality of transit service. They also included all PT users without considering their importance to a specific group with a specific destination for trips. This is important to consider because of the variety of socioeconomic features of users and the diversity of preferences and attitudes toward PT that result in heterogeneity in the users' perceptions. It is necessary to concentrate on university areas because campuses are among the most appealing destinations for various trips throughout the year. They are a major center for many students, teachers, workers, and visitors both locally and internationally, and JUST University is one of the most popular universities in Jordan. Even though a study was

conducted to evaluate the quality of PT at the Yarmouk University campus in the city of Irbid [15], it has gaps; since the study did not consider the passengers' satisfaction, there were no models for estimating the quality of service. Therefore, it is necessary to focus on the user's perceptions, and developing models can estimate the quality of PT in universities.

This study is organized into six sections, starting with the introduction and the literature review. Then, the methodology briefly describes the techniques used to collect the data on passengers' socioeconomic status and satisfaction. Accordingly, data analysis is presented, including a structural equation model (SEM) for passenger satisfaction and loyalty, and a binary logit model (BLM). Finally, the conclusions, recommendations, and future studies are described.

2. Literature Review

The number of bus lines, coverage area, frequency of service, hours of operation, punctuality, fares, safety, service reliability, and comfort are all critical factors in defining the quality of a bus service [16]. First and foremost, we must model service customers' attitudes and satisfaction by considering perceived quality based on personal experience and predicted change, indicating what users desire from an efficient PT service [17]. In the following subsections, a brief review of the literature sums up the best ways to measure and estimate service quality and passenger satisfaction, as well as the essential factors in both areas.

2.1. Passengers' Satisfaction

In 2018, a study was conducted in Vietnam [18] (which, like Jordan, is also a developing country) to investigate the direct and indirect relationships between four factors (satisfaction, perceived service quality, involvement, and perceived safety) and passenger loyalty in terms of ride-sourcing services. The authors collected the data through a questionnaire uploaded online using the Qualtrics survey platform and analyzed the mining data from respondents to conceptualize the model using PLS-SEM. The researchers found a predictive capability of the proposed model with R^2 = 58.5%, 31.9%, and 30.7%, and with the Stone–Geisser Q^2 = 0.392, 0.246, and 0.204 for loyalty, involvement, and satisfaction, respectively. They also found that satisfaction, perceived service quality, and involvement were reasonable enough to predict passengers' loyalty to ride-sourcing services. In contrast, perceived safety was not a good predictor of loyalty unless involvement was taken as a full mediator between perceived safety and loyalty.

In another study, Wan et al. (2016) [19] proposed and tested the conceptual constructs of perceived performance of select bus service (SBS) attributes to customers' socioeconomic information and riders' overall satisfaction with the bus rapid transit (BRT) service in New York City, United States. The researchers used SEM, obtained their data from a bus users' survey, ranked their overall satisfaction from 1 to 10, and with a Likert scale for measuring the passenger's attribute satisfaction from 1 very unsatisfied to 5 very satisfied. The researchers found that service quality was the most influential factor in overall satisfaction for all groups. Other attributes like comfortability and cleanliness, real-time information, the nearest bus station from home, ticket system, limited stations, and other attributes were varied according to the riders on routes with different locations and among all three groups.

Eboli and Mazzulla (2007) [20] proposed a model that identified the service quality of PT attributes to be improved to provide bus services of better quality in the area of Calabria University in Cosenza, Italy. The researchers based the survey on features that influence students' satisfaction. Using SEM, student survey results showed that service planning reliability is the most critical latent variable for overall student satisfaction, represented by frequency, reliability, personnel, information, complaints, and promotion.

Thirteen cities, including 58 PT operatorships in 2014 in China, were used by Zhang et al. (2019) [21] to measure PT customer satisfaction, evaluate and modify the American customer satisfaction theory, and construct the conceptual model of the passenger satisfaction index

(PSI) using PLS-SEM. They concluded that passengers' perceived quality attributes, such as convenience, safety, reliability, comfort, and operational service, have a significant positive impact on passenger satisfaction. Moreover, the relationships between passenger expectations, perceived value, loyalty, and satisfaction are significant direct positive correlations. On the other hand, passenger satisfaction and loyalty are negatively related to passenger complaints. Overall, they found that in 13 Chinese cities, the passenger satisfaction index value is as low as 68.88.

Another study was conducted by Stojic et al. (2020) [22] to explore the specific attributes of PT service that impacted overall customer satisfaction among younger people between 18 and 26 years, assisting in the sustainability of PT in Subotica, Serbia. After conducting factor analysis, they discovered four factors embedded in the 13 initial variables that influenced the overall satisfaction score. General travel information, general onboard comfort, general bus station condition, and punctuality/price were the original variables that were factored in, and the regression analysis gave R2 = 0.79. They also found that young people or students place a premium on online information, comfort, and PT prices. Another exciting aspect of this research was the possibility of lowering CO_2 and fine particulate matter (PM) emissions by replacing private vehicles with PT.

An extensive study [23] on rider satisfaction was carried out in nine European countries. This study compared the overall customer satisfaction with PT. A total of 9542 respondents were collected (BEST 2006), consisting of people between 16 and 96 years old from Barcelona, Geneva, Stockholm, Berlin, Copenhagen, Manchester, Oslo, Vienna, and Helsinki. The survey findings identified four general categories of satisfaction: safety (on the bus and at the bus station, as well as safety from traffic accidents); staff (concerning skill, knowledge, and attitude toward customers); design (concerning comfort and overall travel experience); and systemic (concerning satisfaction with traffic supply, reliability, and information). Furthermore, this study clearly showed differences in how PT was perceived. In India, Wagale et al. (2017) [24] conducted a questionnaire survey in rural areas to evaluate the quality of bus service. A model was built using the ANN technique to predict the quality of service of buses based on 401 users' feedback, according to 13 key quality indicators of service. The study's findings found that most indicators are in the moderately satisfied category, implying that the users are satisfied. On the other hand, the study reveals dissatisfaction with bus stations, service punctuality, and the availability of seats on PT. Baig et al. (2019) [25] measured the livability as perceived by the residents in Six urban settlements in Pakistan. They found a negative relationship between PT satisfaction and perceived neighborhood livability. In addition, the availability of PT was low in all neighborhoods except the lower-income residents, which had slightly higher scores for this indicator.

2.2. Socioeconomic and Travel Behavior of Passengers

The changes in society's socioeconomic conditions significantly impact the existence and operation of PT systems. In the long-term, it is feasible to track the decline in transportation performance in road PT (particularly regular) due to increased personal transportation. Due to its current state, PT on the road is losing its appeal and competitiveness compared to other modes of transportation [26]. To identify PT users' satisfaction with transport company services in suburban areas in Slovakia, Kral et al. (2018) [26] studied the relationship between the respondents' socioeconomic characteristics and the frequency with which people use PT. They found an exciting result that proved that age was one of the most significant variables influencing the intensity of use of suburban bus transportation, particularly for those aged 15 to 26, who are more likely to use the suburban bus system regularly. They also demonstrated that respondents with a high level of education and a net monthly income were more likely to reduce the frequency of using suburban bus transportation.

In Croatia, Miletic et al. (2017) [27] examined the demographic and socioeconomic factors that could affect the decision between PT and private cars through a survey (face-to-face). The researchers used binary logistic regression (BLR) analysis to look at preferences

based on the respondent's age, the size of the settlement, travelers' satisfaction, PT accessibility to the destinations, the number of cars in the household, and whether the participant is the primary car user inside the household. According to the findings, the number of people who frequently use PT in Croatia is far lower than those who frequently use passenger cars. Talpur et al. (2022) [28] investigated the impedance components of rural homes in Badin, Pakistan, utilizing the trip generation regression model as the optimal accessibility metric. In comparison to travel time and distance, the results revealed that a larger population and a lower family income were cited as acute obstacles.

2.3. Related Studies in Jordan

The primary function of PT in developing countries (like Jordan) is to transport large groups of people across the city [29]. Compared to developed countries, the efficiency of PT in developing countries is poor. Shtayat et al. (2018) [30] found that PT in developing countries has not been able to meet the demand for several reasons, such as not reaching all areas, rising accident rates, and problems with service. Imam (2014) [31] studied user satisfaction with the PT system in Amman, the capital of Jordan, by considering all PT forms, including bus, minibus, and jitney users. The researcher collected data by installing a user survey of 367 respondents, with 119 being bus users; each respondent rated his/her satisfaction on a scale from 1 to 10, where one is the least satisfied and ten is the most satisfied. At the same time, she asked to rate the importance of each item using a scale from 1 (not important) to 5 (very important). The results of this study were that users of buses are the most satisfied, followed by users of jitneys and minibuses, respectively. However, the analysis of the ANOVA results showed that all users are not satisfied with the transit systems since the highest satisfaction score across all the transit systems is the bus user; (101/180) satisfaction score was scored in this mode, meaning just 56%. Moreover, in an interesting study in Amman in 2020, Alkharabsheh et al. (2021) [32] suggested new multicriteria decision-making (MCDM) technique using the Analytic Hierarchy Process (AHP) grey values. The researchers collected the data using a survey where the participants were randomly picked from the PT customers (employees, students, and laborers) regardless of gender or age category. The results demonstrate the grey-AHP model's capacity to provide in-depth analysis to support PT development decisions. The authors found that from the analysis, "frequency of lines" and "safety of travel" were the most important factors that needed to be improved.

2.4. The Affection of PT Attributes on the Perceived Service Quality

Redman et al. (2013) [33] used a systematic qualitative review to examine the most influential attributes of PT that could attract car users to shift to PT. Their goal was to ask two questions: First, what are the quality characteristics of PT amenities that make them appealing to car users? Secondly, what are the most encouraging changes in quality attributes of PT amenities to modal change from private car to PT? They concluded that reduced fare promotions and other habit-breaking transportation policy measures might successfully encourage car users to try PT services. After promotional tactics have expired, attributes other than essential accessibility, reliability, and mobility provision perceived by the target market as important service attributes must be provided to sustain the switch from car use. Furthermore, the authors gave four keys for more research on this topic: Firstly, studies into the impact of improvements in the reliability of PT services would significantly contribute to this field of study. Secondly, more emphasis should be placed on perceived attributes when developing PT evaluation methods. Thirdly, more specifically, targeting car users in future PT improvement studies would reveal more precisely what service attributes appeal to car users. Lastly, consider the methods for enabling PT services to be perceived as having an affective and symbolic value in addition to their primary, instrumental value.

Based on that, it is necessary to determine which PT attributes are essential to evaluate, which could be detected by the previous works on analyzing PT quality. Table 1 shows the most critical factors that have been looked at in studies of service quality.

Table 1. The Most Influencers Attributes on the Service Quality from Previous Studies.

	Index	Ingvardson & Nielsen, (2019) [34]	Su et al. (2021) [18]	del Castillo & Benitez (2013) [35]	Barbosa et al. (2017) [36]	Zhang et al. (2019) [21]	Vicente et al. (2020) [37]	Eboli & Mazzulla (2009) [38]
Service Quality	Transport service coverage area		√					
	Service hours		√					
	Speed						√	
	Punctuality		√	√			√	√
Accessibility	The location of nearest station	√		√			√	√
	Wheelchair space				√			
Comfort	Illumination of bus station			√	√			
	Coziness at the bus station			√		√		√
	Seat availability	√			√		√	
	Ventilation system				√			√
Vehicle	Age of buses	√	√	√	√	√		
	Cleanliness of buses	√	√	√	√	√		√
Safety	Security on buses	√	√	√		√		√
	Safety at bus station	√		√				√
Information	Competence of drivers					√		√
	Information about trips	√		√	√	√		√
	Availability of information by internet, and phone.							√
Environmental impact	Capability to reduce traffic noise			√				√
	Capability to reduce traffic noise			√				
Costs and fears	The reasonability of public transport fears	√	√					
Reliability	Waiting time				√	√	√	
	Punctuality			√	√	√	√	√
Passenger complaint	Level of complaint related to transportation services					√		

This study proposes a structural equation modeling (SEM) model to achieve this purpose. Researchers can use SEM as a multivariate technique that combines regression, factor analysis, and variance analysis (ANOVA) to assess interconnected dependent relations simultaneously. Many researchers have proposed SEM applications in PT. For example, SEM was explicitly used in PT services to describe customer satisfaction [19,20,34,37].

The sample size was determined by looking at prior studies that used surveys to gather responses to determine the quality of PT services [19,37,39–42]. The most common were those that employed SEM or BLR as an analysis technique. Table 2 shows some of the previous sample sizes related to thesis work.

Table 2. Samples Size from Previous Related Works.

Works	Location & Year	Type of Transportation	Sample Size	Type of Analysis
Su et al. (2021) [18]	2018, Vietnam	Ride-Sourcing	564	SEM
Wan et al. (2016) [19]	2016, USA	Bus rapid transit	495	SEM
Vicente et al. (2020) [37]	2020, Portugal	Public transport	583	SEM
Eboli & Mazzulla (2007) [20]	2006, Italy	Public transport	763	SEM
Githui et al. (2009) [40]	2010, Kenya	Bus & minibus	140	SEM
Lai & Chen (2011) [43]	2011, Taiwan	Rail	763	SEM
Imaz et al. (2015) [41]	2015, Canada	Subway, Streetcar & Bus	270	BLR
Özlem et al. (2015) [42]	2015, Norway	Public transport	546	SEM & BLR

2.5. Measurement Model

Table 3 shows the constructs along with their corresponding item and question. All of the questions were tailored to fit a constant theme of this study, which entails

measuring the level of satisfaction with PT attributes, overall satisfaction, loyalty, and passengers' complaints.

Table 3. Constructs, their items, and sources.

Constructs	Items	Description
Vehicle Characteristic's	VEH1	The buses are modern [36]
	VEH2	Appropriateness of the bus's temperature (AC conditions) [36]
	VEH3	Generally, I find the bus seats clean [36]
	VEH4	The ventilation system in the buses is good [36]
	VEH5	When I travel with PT, I have quite enough seat space [36]
	VEH6	Traveling with PT is convenient, with adequate privacy [34]
	VEH7	When I travel with PT, I normally get a seat [34]
Safety	SAF1	On bus lines, I feel secure [34]
	SAF2	I feel safe at bus stations [34]
	SAF3	I am feeling secure using PT during the day [18]
	SAF4	I am feeling secure using PT at night [18]
	SAF5	The buses are reliable, and the drivers are competent [21]
Information	INF1	It is easy to obtain the necessary information prior to a trip [34]
	INF2	I receive precise information about where the bus will station [34]
	INF3	My questions about the trip are correctly answered by the staff [34]
	INF4	Service information by phone, internet, email is available [38]
Perceived Costs	COS1	The cost of a trip to JUST with PT is reasonable [34]
	COS2	PT is economic and I can save my money [34]
Environmental Impact	ENV1	PT reduces traffic noise [35]
	ENV2	PT reduces traffic congestion [35]
Reliability	REL1	Travel time on PT is reasonable [21]
	REL2	Waiting time is short and acceptable between the trips [21]
	REL3	PT usually runs on schedule [21]
	REL4	The frequency of trips to JUST is satisfactory to me [36]
Perceived service quality	SQ1	The coverage area of PT is extensive [18]
	SQ2	Somewhat the nearest station is close to where I live [34]
	SQ3	Drivers are always available [18]
	SQ4	PT is good for JUST trips [34]
	SQ5	The speed of buses is reasonable [37]
	SQ6	The location of the frequently used bus station is sufficient [35]
Overall Satisfaction	OSA1	I'm happy I decided to travel by PT [18]
	OSA2	Generally, I am satisfied with PT [34]
	OSA3	The service quality difference between my current transportation service and ideal transportation service is not considerable [21]
	OSA4	In general, I am confident and feel safe using PT [18]
Passenger Complaint	PCOMP1	The level of aversion when contemplating taking the bus the next time is high [21]
	PCOMP2	The level of complaint concerning the transportation service's frequency is high [21]
	PCOMP3	The level of complaint about buses not being available at early or late times is high [21]
Loyalty	LOY1	I gladly recommend PT to others who ask me about the best mode of transportation to JUST [18]
	LOY2	I have absolute confidence in the PT service [21]
	LOY3	I regard PT to be my first choice for a trip to JUST [18]
	LOY4	In the future, I intend to travel by PT more frequently [18]

2.6. Structural Model—Hypotheses Development

2.6.1. Vehicle Characteristics

Model year, car size, mass, make, and style are among the vehicle characteristics [44]. Although PT is a good mobility solution in many developed countries, Jordan and other developing countries still require substantial improvements in their systems [45,46]. Many issues related to this simple fact, such as recurring strikes, poor vehicle performance, quality, and expensive repairs, cause PT services to suffer from many inadequacies [36], which implies how much vehicle characteristics significantly affect the quality of PT. Therefore, the following hypotheses are expected to be significant, where almost all of them were detected from previous works, and some of them were proposed by the author.

H1: *There is a positive relationship between vehicle characteristics and perceived service quality [19].*

The measure of reliability in PT services is related to the service's commitment to maintaining punctuality and adhering to a schedule [47]. As a result, this may explain why, as the vehicle becomes more modern, it means fewer breakdowns, higher speeds on the road, and arriving on time. As a consequence, the author proposed this relationship based on this fact.

H2: *There is a positive relationship between vehicle characteristics and reliability*.

2.6.2. Safety

Many individuals believe that the safety and security of PT operations are critical because PT involves human lives on a larger scale or in greater numbers, as many passengers may be riding in a single vehicle. The Transport Research Laboratory (TRL) researched PT safety and found that public vehicles in developing countries (such as Jordan) are frequently under-maintained and overloaded, with drivers receiving insufficient training [48].

H3: *There is a positive relationship between perceived safety and overall satisfaction [21].*

H4: *There is a positive relationship between perceived safety and perceived service quality [49].*

2.6.3. Information

In general, an information system can be considered a set of well-connected basic components that perform tasks ranging from data collection to presentation [50]. Moreover, travel information, which can be classified as static, dynamic, or real-time, is a significant aspect of the quality of PT. It also contains information on many aspects of the PT system that assists travelers in planning and executing their trips [51]. Therefore, the following hypothesis is proposed.

H5: *There is a positive relationship between the information and perceived service quality [19].*

Because real-time is one of the aspects of travel information [51], it is logical to conclude that if accurate travel information is provided, PT reliability will be high. Thus, the author created a relationship between information and reliability.

H6: *There is a positive relationship between the information and reliability*.

2.6.4. Perceived Costs

The perceived cost of an activity is the unit cost that a consumer believes he/she will incur by engaging in a specific activity in general [52]. In the PT system specifically, represents reasonable ticket prices [34], which may help to encourage passengers to turn toward this system. Thus, the following hypothesis is suggested as the following.

H7: *There is a positive relationship between perceived costs and passengers' loyalties [34].*

H8: *There is a positive relationship between perceived costs and passengers' overall satisfaction [34].*

H9: *There is a positive relationship between perceived costs and perceived service quality [53].*

2.6.5. Environmental Impact

Concern for environmental protection grew when countries realized that global warming, ozone depletion, and acid rain are severe problems that harm people's quality of life [37]. Moreover, the UN Climate Summit in 2014 underlined the PT sector's broad commitment to environmental sustainability—"The PT sector is dedicated to being a climate leader." [54]. Therefore, the following hypotheses are suggested.

H10: *There is a positive relationship between environmental impact and passengers' overall satisfaction [37].*

H11: *There is a positive relationship between environmental impact and passengers' loyalty [37].*

2.6.6. Reliability

Reliability is a critical component in determining the level of PT service. Unreliable service raises the uncertainty of multiple vehicles arriving simultaneously at a transfer point [55]. Reliability can also be defined as the likelihood that a transportation service will perform a required function under specified environmental and operational conditions for a specified period [56]. Besides, the system's performance is assessed using metrics that measure system reliability and efficiency. Schedule deviation, which is calculated across all bus journeys at the reference stations, measures system reliability [55]. Based on these factors, the following hypotheses are proposed.

H12: *There is a positive relationship between reliability and perceived service quality [39].*

H13: *There is a positive relationship between reliability and passengers' overall satisfaction [21].*

2.6.7. Perceived Service Quality

Since most services cannot be counted, measured, inventoried, tested, or confirmed before sales, service quality is more difficult to describe than product quality [37]. Many researchers defined the concept of service quality in different aspects. Parasuraman et al. (1988) [57] described the ability of a company to satisfy customers as service quality. Moreover, Brady and Cronin. Jr (2001) [58] found that service quality perceptions were derived from comparing consumer expectations with actual service performance. Customer dissatisfaction occurs when customers' expectations exceed their perceptions of the service provided by suppliers.

According to that, the following hypotheses are constructed.

H14: *There is a positive relationship between perceived service quality and passengers' overall satisfaction [18].*

H15: *There is a positive relationship between perceived service quality and passenger loyalties [18].*

H16: *There is a negative relationship between perceived service quality and passengers' complaints [59].*

2.6.8. Overall Satisfaction

Customer satisfaction is a multi-faceted notion that is widely considered one of the essential success criteria for organizations [60]. Furthermore, it is described in PT firms as when the performance of PT services meets or exceeds expectations, the passenger is satisfied; however, when the contrary is true, the passenger is dissatisfied and reacts negatively to the experience [61]. It is critical to note that customer satisfaction is closely related to customer loyalty because when a customer is satisfied, he or she is more likely to purchase the same services or products again and can attract more customers through recommendations and suggestions to friends, family, or by making favorable comments about it [62]. Thus, the following relations are suggested.

H17: *There is a positive relationship between passengers' overall satisfaction and passengers' loyalties [37].*

H18: *There is a negative relationship between passengers' overall satisfaction and passengers' complaints [21].*

2.6.9. Passenger Complaint

While customer complaints are frequently viewed as a negative reflection of an agency's services, it is essential to realize that they may also increase overall customer satisfaction [63]. Unfortunately, few studies have used this construct to determine customer loyalty. However, those who examined it have found interesting results, such as [64], who studied the impact of customer complaints on loyalty in South Korea and Taiwan and

found that as passenger complaints increased in Korea, loyalty decreased. The same finding was found in China [21], whereas passenger complaints increased loyalty in Taiwan [64]. These findings are likely to be useful for PT agencies in designing policies that attempt to use customer complaints to promote customer satisfaction and loyalty, as the Taiwanese have done. Therefore, it is crucial to examine this relationship in the current study, as shown below.

H19: *There is a negative relationship between passenger complaints and passengers' loyalties [21].*

2.6.10. Loyalty

Loyalty, in general, refers to how committed customers are to a given service provider and how likely they are to choose that firm over competitors [65]. Mainly, most PT customer loyalty studies use a two-dimensional approach, implying that passenger loyalty can be divided into two categories: a passenger's ongoing behavior toward using PT, and a passenger's ongoing attitudes and emotions toward PT in general [43].

Using structural equation modeling, the significance of these proposed hypotheses is examined. Figure 1 depicts all the constructs with their hypothetical relationships considered in this study.

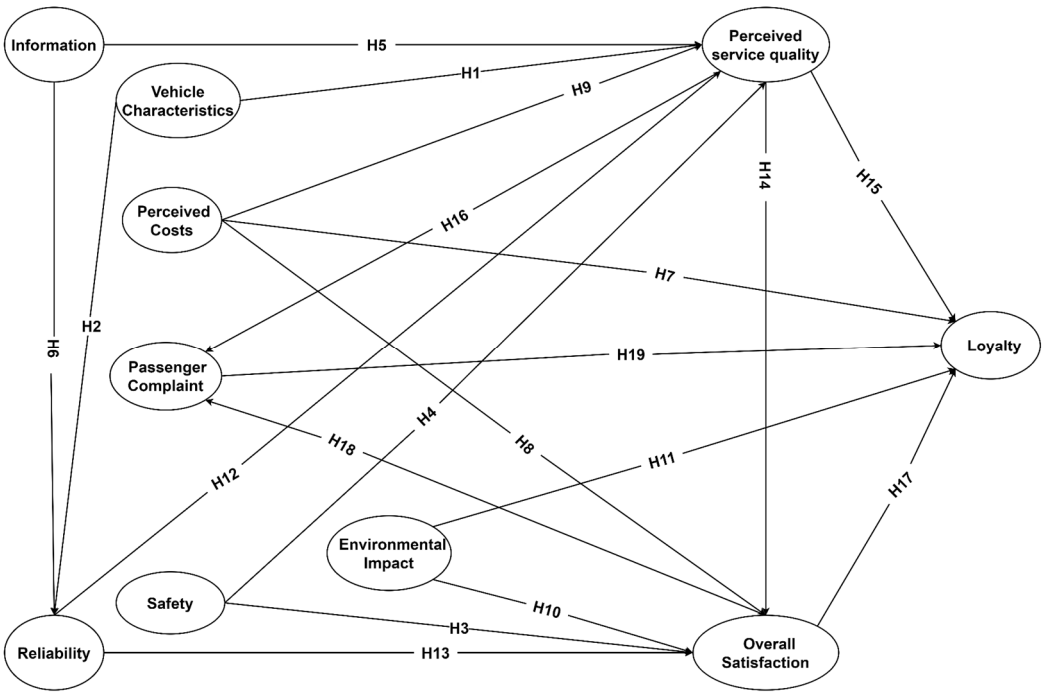

Figure 1. Conceptual research model.

2.7. Binary Logistic Regression (BLR)

The BLR analysis has been used in SPSS software to create a model that allows insights into developing the interrelationship of independent variables and their relative contributions in determining whether a passenger traveling to JUST university will use a private car or PT. The analysis used independent variables, including basic sociodemographic and socioeconomic characteristics of respondents (occupancy, gender, age, monthly income, people living in households) and whether they lived inside or outside Irbid city. They also asked about their travel habits, such as which method they used to get to JUST university, the cost of going back and forth to JUST each day, total travel time, arrival and departure time, and which day was the most difficult to get to university. Then indicators related to using PT networks were also asked, such as the number of buses that participants used to get to JUST university, the distance to the nearest PT from their home, and the frequency with which they used PT. Furthermore, the availability of car transportation is determined

by asking whether the respondent owns a car or not, as well as the number of cars in the household. The utility function is usually represented by a linear model consisting of independent variables influencing mode selection. Equation (1) shows a utility function of mode (i) for several independent variables, according to Ben-Akiva and Bierlaire (1999) [66].

$$U_i = C + A_1 \cdot X_1 + A_2 \cdot X_2 + A_3 \cdot X_3 + \ldots + A_n \cdot X_n \quad (1)$$

where:

- U_i = Utility function of mode "i".
- C = Constant.
- An = Coefficients (weight of each attribute based on survey data).
- Xn = Independent Variables correlated with the mode choice selection.

This study aims to determine customer satisfaction with PT services in the JUST rural area, particularly among students, because students make up most PT users. As a result, using the structural equation modeling (SEM) method, it is vital to assess their satisfaction and loyalty to PT. The first technique is used because the companies have gradually focused on customer satisfaction and loyalty over the past few years. This technique benefits the company (transit agencies) and the clients (passengers). This is because the relationship between user loyalty and overall satisfaction and service quality attributes such as reliability, safety, vehicle characteristics, and perceived costs can be explored based on the needs and expectations of PT customers. As a result, there will be an effective improvement in PT service quality; then, existing clients will be preserved while new ones are attracted. This fact could help solve various issues, including minimizing traffic accidents, traffic congestion, and air and noise pollution, as well as helping to strengthen the economy by reducing energy consumption by reducing individual transportation use.

As a result, developing a technique for evaluating consumer satisfaction is required. Therefore, the key features of the provided services can be recognized, and customer satisfaction can be improved [20]. Furthermore, the research conducted to investigate PT satisfaction in Jordan is minimal. Almost all of the studies were conducted in Amman, the capital of Jordan [31,32], with very limited ones using SEM to analyze and model PT's quality. As a result, more research is needed in other cities, such as Irbid, as well as rural areas, such as in the area of JUST university. Secondly, to gain insight into respondents' preferences for public and private transportation for travel to and from JUST and to determine the extent to which respondents' essential demographic and socioeconomic characteristics influence their use of these two modes and their ability to travel by them. BLR analysis is used to develop a model that reveals the structure of the interrelationships among independent variables and their relative influence on the possibility of a person using public or private car transportation regularly.

3. Materials and Methods

JUST University was chosen as the study location since it is located in a rural area outside of the city of Irbid (northern Jordan), representing one of the most attractive locations in the region (Figure 2). Surveys are an important way to get information that can be used to solve transportation problems in rural areas [67]. The data were collected through an electronic questionnaire using the Google Forms platform during November and December 2021. On Facebook, research participants were recruited from academic groups related to many colleges, such as engineering, medicine, applied science, and postgraduate. In addition to the online survey, a paper-based survey was conducted since most participants did not respond to the online survey. Before beginning the questionnaire, the respondent was asked to choose one of two available languages, Arabic or English. Following that, the respondents were introduced to a brief overview of the questionnaire's goals, a description of the PT situation in the JUST area, and who is expected to respond to the questionnaire. All questions regarding the questionnaire were answered directly during the survey.

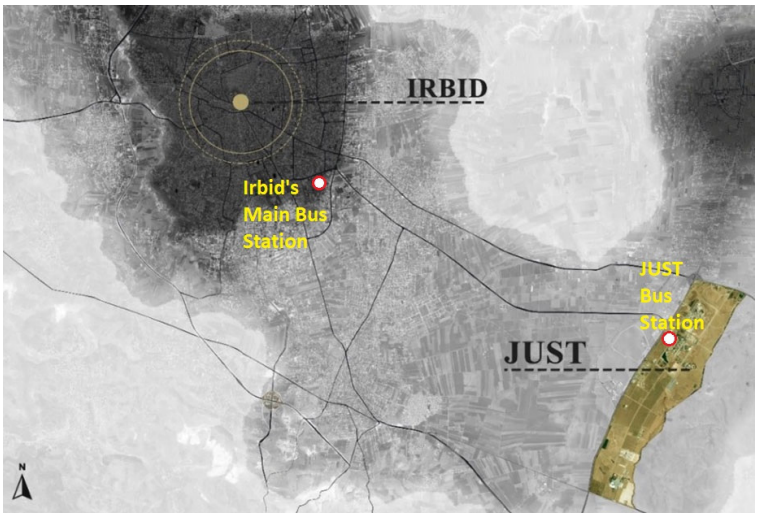

Figure 2. Irbid city and JUST campus map [14].

The questionnaire contains several attributes to gain a fuller understanding of the sociodemographic, socioeconomic, travel behavior, the preferred mode of transportation for traveling to JUST, satisfaction with many transport services attributes, overall satisfaction, and passengers' loyalty to using PT for traveling to JUST. Furthermore, the participants' opinions on what factors prevent them from using PT as a mode of transportation to JUST University were considered in the questionnaire, as were the factors that would motivate them to use this mode. The questionnaire also explored participants' opinions on the most effective strategies for encouraging the use of PT. This set of questions aimed to involve participants in the decision-making process to find effective alternatives to make the PT system more sustainable [26].

3.1. Selection of Sample Size

The sample of 572 responses is large enough to analyze. In order to double-check the measured sample, G*Power software was used to compute the required sample size depending on the number of predictors employed in the proposed model. The sample size was calculated using G*Power [68], which is the most helpful power analysis application for a range of statistical tests in behavioral and social sciences [69]. With $f^2 = 0.15$ (effect size), $\alpha = 0.05$ (error type one), $\beta = 0.20$ (error type two), as indicated by Cohen (1992) [69], and the number of predictors 8 to predict the passengers' overall satisfaction and loyalty. A sample size of 160 was obtained. As a result, this is evidence to accept the sample of 572 responses. Notably, only 482 responses will be used in SEM analysis, which represents students' responses who attend JUST for their studies.

3.2. Descriptive Analysis

The normality check of measurement items mainly has two primary components: skewness and kurtosis [70]. Moreover, Hair et al. (2006) [71] gave the critical skewness and kurtosis values as ± 2.58 at the significance level of 1%. The range of skewness values is between (0.001 and -1.057), and the range of kurtosis values is between (-0.875 and 1.561) for all measurement items. Hence, as a result, all of them are within the normal range, and it can be concluded that the collected data obey the normal distribution.

The associations between variables in the collected data are examined using contingency table analysis [14]. The dependent variable in this study is the mode of transportation used to get to JUST University. Moreover, independent variables are socioeconomic and demographic characteristics and travel habits. The Chi-squared test has been used to determine the statistical significance of the cross-tabulation table.

Variables that significantly influence transportation mode choice to get to the JUST area, according to the Chi-squared test and *p*-value results in Table 4, include occupancy,

age, monthly income, people in the household, travel cost, travel time, number of buses through the trip, average using PT, leaving time, and car ownership. Noting that, the significant level is represented as follows: (* $p < 0.05$), (** $p < 0.0001$).

Table 4. Crosstabulation Analysis.

Variables		Respondents	(%)	X^2	df	*p*-Value
Education	Less than High School	0	0.0	2.676	3	0.444
	High school	6	1.0			
	Collage (Diploma)	13	2.3			
	Undergraduate Uni Degree	305	53.3			
	Postgraduate Uni Degree	248	43.4			
Occupancy	Student Only	395	69.1	92.758	3	<0.0001 **
	Student (Part-time employee)	87	15.2			
	Staff (Full-time employee)	57	10.0			
	Staff (Part-time employee)	33	5.8			
Gender	Female	303	53.0	2.35	1	0.125
	Male	269	47.0			
Age	18–24	297	51.9	68.85	4	<0.0001 **
	25–35	223	39.0			
	36–44	36	6.3			
	45–54	14	2.4			
	55–64	2	0.3			
	65 or above	0	0.0			
Location of living	Inside Irbid city	347	60.7	0.002	1	0.963
	Outside Irbid city	225	39.3			
Monthly Income Reduced (JD)	<50–200	374	65.4	55.512	2	<0.0001 **
	200–500	160	28.0			
	500- > 700	38	6.6			
People in household	1	21	3.7	17.362	4	0.002 *
	2	56	9.8			
	3	76	13.3			
	4	117	20.5			
	5≤	302	52.8			
Number of buses	1	143	25.0	36.831	4	<0.0001 **
	2	300	52.4			
	3	109	19.1			
	4	13	2.3			
	5≤	7	1.2			
Travel cost	Less than 1 JD	34	5.9	62.937	5	<0.0001 **
	1 to 2 JD	199	34.8			
	2 to 3 JD	158	27.6			
	3 to 4 JD	89	15.6			
	4 to 5 JD	47	8.2			
	More than 5 JD	45	7.9			
Travel time	Less than 1/2 an hour	105	18.4	45.399	4	<0.0001 **
	1/2 to 1-h	241	42.1			
	1 to 2 h	149	26.0			
	2 to 3 h	67	11.7			
	4 h or more	10	1.7			

Table 4. *Cont.*

Variables		Respondents	(%)	X^2	df	*p*-Value
Avg using PT	Daily	267	46.7	119.036	4	<0.0001 **
	Weekly	224	39.2			
	Monthly	20	3.5			
	Occasionally	31	5.4			
	Rarely	30	5.2			
Hardest day to get JUST	Sunday	181	31.6	0.511	5	0.992
	Monday	30	5.2			
	Tuesday	31	5.4			
	Wednesday	13	2.3			
	Thursday	150	26.2			
	Saturday	167	29.2			
Arriving time	Early Morning (5:00 a.m.–8:30 a.m.)	222	38.8	2.731	3	0.435
	Late Morning (8:30 a.m.–Noon)	295	51.6			
	Early Afternoon (Noon–3:00 p.m.)	48	8.4			
	Late Afternoon (3:00 p.m.–6:00 p.m.)	7	1.2			
Leaving time	Late Morning (8:30 a.m.–Noon)	30	5.2	16.524	3	0.001 *
	Early Afternoon (Noon–3:00 p.m.)	145	25.3			
	Late Afternoon (3:00 p.m.–6:00 p.m.)	303	53.0			
	Evening (6:00 p.m.–9:00 p.m.)	94	16.4			
Time to arrive nearest station	Less than 5 min	139	24.3	5.787	4	0.216
	5 to 10 min	206	36.0			
	10 to 15 min	114	19.9			
	15 to 30 min	80	14.0			
	30 min to 1 h	33	5.8			
Car Ownership	No	421	73.6	149.67	1	<0.0001 **
	Yes	151	26.4			

The stars represent the commonly employed significance levels. If a p-value is less than 0.05, it is flagged with one star (*). If a *p*-value is less than 0.001, it is flagged with (**) stars.

3.3. Analysis Techniques

This study included two methods to analyze the quality of PT in the JUST region. First, the Partial Least Square Structural Equation Model (PLS-SEM) focused on customer satisfaction and loyalty to PT. The second method, Binary Logistic Regression (BLR), was used to look at factors like socioeconomic status and travel habits that may affect whether people use public or private transportation. Details will be discussed in the Results and Discussion section.

4. Results and Discussion

4.1. Partial Least Square-Structural Equation Model (PLS-SEM)

The study reveals nineteen hypotheses that represented causal links between ten constructs: vehicle characteristics, information, safety, environmental impact, reliability, perceived costs, passenger complaints, perceived service quality, overall passenger satisfaction, and loyalty. Moreover, only 482 responses were used in SEM analysis, representing students' responses who attend JUST for their studies. As a result, SEM, which "maps paths to multiple dependent (theoretical or observable) variables in the same research model and analyzes all of the paths at the same time rather than one at a time," is used [72].

The indicator loadings and average variance extracted (AVE) assess the measurement model's convergent validity. Next, the structural model is evaluated to determine the strength and direction of the links between the constructs. Hair et al. (2010) [73] recommend factor loadings of at least 0.5 and preferably 0.7 for a good measurement indication, construct reliability should be at least 0.7, and AVE for each construct should equal or exceed 0.5. In the second step, the internal consistency is measured using Composite Reliability (CR). CR is used to examine the constructs' reliability due to Cronbach's alpha's

limitations as a measurement metric. CR should be greater than or equal to 0.7 [74] for all constructs. Finally, it is important to examine "the amount to which a construct is distinct from other constructs by empirical standards," which can be reached according to discriminant validity assessment [75].

Some measurement items, such as VEH7, SQ4, SQ6, and LOY3, are removed from the proposed model because their presence caused discriminant validity issues, as indicated in Table 5, which examines the constructs in the proposed model's convergent validity and internal consistency. All measurement items have outer loadings larger than 0.5, ranging from (PCOMP1 = 0.762) to (PCOMP3 = 0.956), indicating that the measurement items are very good indicators since their factor loadings are greater than 0.7 [73]. In addition, all constructs have an AVE that ranges from (Perceived Service Quality = 0.65) to (Environmental Impact = 0.901), showing that they are all greater than 0.5 [76]. As a result, the adequate convergent validity of these constructs is demonstrated.

Table 5. Results of Measurement Model Assessment.

Constructs	Items and Their Description	Outer Loading	AVE	CR
Vehicle Characteristics	The buses are modern. (VEH1)	0.902	0.735	0.943
	There is the appropriateness of the bus's temperature (AC conditions). (VEH2)	0.882		
	Generally, I find the bus seats clean. (VEH3)	0.868		
	The ventilation system in the buses is good. (VEH4)	0.877		
	When I travel with PT, I have quite enough seat space. (VEH5)	0.792		
	Traveling with PT is convenient, and I have privacy throughout the trip. (VEH6)	0.818		
Safety	On bus lines, I feel secure. (SAF1)	0.848	0.707	0.923
	I feel safe at bus stations. (SAF2)	0.832		
	I am feeling secure using PT during the day. (SAF3)	0.847		
	I am feeling secure using PT at night. (SAF4)	0.801		
	The buses are reliable, and the drivers are competent. (SAF5)	0.874		
Information	It is easy to obtain the necessary information prior to a trip. (INF1)	0.872	0.699	0.903
	I receive precise information about where the bus will station. (INF2)	0.852		
	The staff correctly answers my questions about the trip. (INF3)	0.818		
	The service information by phone, internet, email is available. (INF4)	0.8		
Perceived Costs	The cost of a trip to JUST with PT is reasonable. (COS1)	0.937	0.877	0.934
	PT is economical and I can save my money. (COS2)	0.935		
Environmental Impact	PT reduces traffic noise. (ENV1)	0.945	0.901	0.948
	PT makes a significant contribution to traffic congestion reduction. (ENV2)	0.954		
Reliability	Travel time on PT is reasonable. (REL1)	0.808	0.697	0.902
	Waiting time is short and acceptable between the trips. (REL2)	0.876		
	PT usually runs on schedule. (REL3)	0.839		
	The frequency of trips to JUST is satisfactory to me. (REL4)	0.815		
Perceived service quality	The coverage area of PT is extensive. (SQ1)	0.807	0.65	0.881
	Somewhat the nearest station is close to where I live. (SQ2)	0.81		
	Drivers are always available. (SQ3)	0.835		
	The speed of the buses is reasonable. (SQ5)	0.772		
Overall Satisfaction	I'm happy I decided to travel by PT.(OSA1)	0.911	0.754	0.924
	Generally, I am satisfied with PT. (OSA2)	0.912		
	The service quality difference between my current transportation service and my ideal transportation service is not considerable. (OSA3)	0.873		
	In general, I am confident and feel safe using PT. (OSA4)	0.768		
Passenger Complaint	The level of aversion when contemplating taking the bus the next time is high. (PCOMP1)	0.762	0.776	0.912
	The level of complaint concerning the transportation service's frequency is high. (PCOMP2)	0.914		
	The complaint level about buses not being available at early or late times is high. (PCOMP3)	0.956		
Loyalty	I gladly recommend PT to others who ask me about the best mode of transportation to JUST. (LOY1)	0.914	0.822	0.933
	I have absolute confidence in the PT service. (LOY2)	0.928		
	In the future, I intend to travel by PT more frequently. (LOY4)	0.876		

Table 5 is also helpful in analyzing the internal consistency reliability based on the related CR of the ten constructs proposed in the structural model; all of those constructs have a CR of greater than 0.7, ranging from (Perceived Service Quality = 0.881) to (Environmental Impact = 0.948), satisfying the rule of thumb suggested by Nunnally (1994) [74].

The discriminant validity will be evaluated in the next stage. The Fornell–Larcker criterion is used to check discriminative validity, as shown in Table 6 since the diagonal values are higher than the correlation of that construct with the others, which is the square root of AVE. Therefore, discriminant validity is checked through the Fornell–Larcker criterion [76].

Table 6. Fornell–Larcker Criterion of Validated Measurement Model.

	COST	ENV	INF	LOY	OSA	PCOMP	REL	SAF	SQ	VEH
COST	**0.936**									
ENV	0.466	**0.949**								
INF	0.454	0.43	**0.836**							
LOY	0.594	0.48	0.624	**0.907**						
OSA	0.585	0.449	0.672	0.858	**0.868**					
PCOMP	0.015	0.046	−0.069	−0.086	−0.089	**0.881**				
REL	0.518	0.375	0.662	0.687	0.724	−0.167	**0.835**			
SAF	0.532	0.499	0.688	0.674	0.768	−0.029	0.63	**0.841**		
SQ	0.612	0.447	0.726	0.74	0.781	−0.137	0.747	0.705	**0.807**	
VEH	0.484	0.391	0.655	0.714	0.759	−0.103	0.705	0.758	0.701	**0.857**

4.1.1. The Results of the Proposed Structural Model

The assessment results for the structural model will be presented in this section. The estimates for path coefficients using 5000 bootstrapping for a significance level of 5% [77] are shown in Table 7. Assessing the T- and *p*-values of the proposed model, only the hypotheses (passenger complaint with overall satisfaction and loyalty) and the relationship between environmental impact and overall satisfaction are found to be insignificant. Even though the relations between perceived service quality with both passenger complaints and vehicle characteristics are not significant at the 5% level, they can be significant at the 10% level. Table 8 shows the R^2 evaluation.

Table 7. Relationship Assessment of the proposed model.

Hypothesis No.	Relationship	Hypothesis Effect	Beta β	T Values	*p* Values	Description
1	COST -> LOY	Positive	0.087	2.6	0.009	Supported
2	COST -> OSA	Positive	0.088	2.049	0.04	Supported
3	COST -> SQ	Positive	0.21	5.007	0	Supported
4	ENV -> LOY	Positive	0.084	2.575	0.01	Supported
5	ENV -> OSA	Positive	0.008	0.232	0.817	Not Supported
6	INF -> REL	Positive	0.349	6.841	0	Supported
7	INF -> SQ	Positive	0.266	4.642	0	Supported
8	PCOMP -> LOY	Negative	−0.015	0.624	0.533	Not Supported
9	REL -> OSA	Positive	0.217	4.634	0	Supported
10	REL -> SQ	Positive	0.297	5.657	0	Supported
11	SAF -> OSA	Positive	0.367	8.285	0	Supported
12	SAF -> SQ	Positive	0.139	2.694	0.007	Supported
13	OSA -> LOY	Positive	0.673	15.754	0	Supported
14	PCOMP -> OSA	Negative	−0.002	0.088	0.93	Not Supported
15	SQ -> LOY	Positive	0.122	2.382	0.017	Supported
16	SQ -> PCOMP	Negative	−0.137	1.758	0.079	Supported
17	SQ -> OSA	Positive	0.302	5.533	0	Supported
18	VEH -> REL	Positive	0.476	9.325	0	Supported
19	VEH -> SQ	Positive	0.11	1.774	0.076	Supported

Table 8. R^2 Values of the proposed model.

Construct	R^2	R^2 Interpretation		
		Hair et al. (2011) [77]	Hair et al. (2019) [78]	Cohen (1988) [79]
LOY	0.76	Substantial	Acceptable	Substantial
PCOMP	0.019	Rejected	Rejected	Weak
REL	0.567	Moderate	Acceptable	Substantial
OSA	0.731	Moderate	Acceptable	Substantial
SQ	0.719	Moderate	Acceptable	Substantial

The primary construct of interest is loyalty (LOY), which the proposed model explains 76% of its variance. Following the rule of thumb, the R^2 value of loyalty reported a substantial level of predictive accuracy. Hair et al. (2019) [78] and Cohen (1988) [79] agree with this level. However, with R^2 = 1.9% of passenger complaints (PCOMP), only Cohen (1988) [80] accepts this value and gives it a weak level of predictive accuracy.

The Stone–Geisser Q^2 value is calculated by applying the blindfolding procedure in SmartPLS 3. According to Hair et al. (2019) [78], values greater than 0, 0.25, and 0.50 represent the PLS path model's small, medium, and considerable predictive relevance for a specific endogenous construct.

As shown in Table 9, loyalty and overall satisfaction have significant predictive relevance, with Q^2 = 0.616 and 0.542, while passenger complaints have only 0.009, which is considered a minor predictive relevance. Overall, this study's R^2 and Q^2 values show that the proposed model can be used to make predictions.

Table 9. Predictive Relevance Q^2 for proposed Model.

Construct	SSO	SSE	Q^2 (=1-SSE/SSO)	Level of Predictive Relevance [78]
LOY	1446	555.985	0.616	Large
PCOMP	1446	1433.088	0.009	Small
REL	1928	1181.555	0.387	Medium
OSA	1928	883.441	0.542	Large
SQ	1928	1039.783	0.461	Medium

The results of the effect size analysis indicate that most of the effects are small since f2 is between 0.02 and 0.15 [80]. The proposed structural model is ideal and free of any possible collinearity issues [78]. Finally, the proposed model's fitness is tested using the standardized root mean square residual. Since the obtained SRMR = 0.053 is less than the cut-off value of 0.08, the proposed model has appropriate fitness [18].

As shown in Figure 3, the proposed structural model shows that all paths are significant except three (Hypotheses 10, 18, and 19), which have a T-value of less than 1.96 at the 5% significance level. Even though hypotheses 1 and 16 are not significant at this significance level, they are significant at a 10% level with a T-value greater than 1.65. Overall satisfaction has the most significant influence on loyalty, with a value of 0.673, out of four predictors of loyalty: overall satisfaction, perceived service quality, environmental impact, and costs. With β = 0.122, 0.084, and 0.087, perceived service quality, perceived costs, and environmental impact come in second, third, and fourth, respectively.

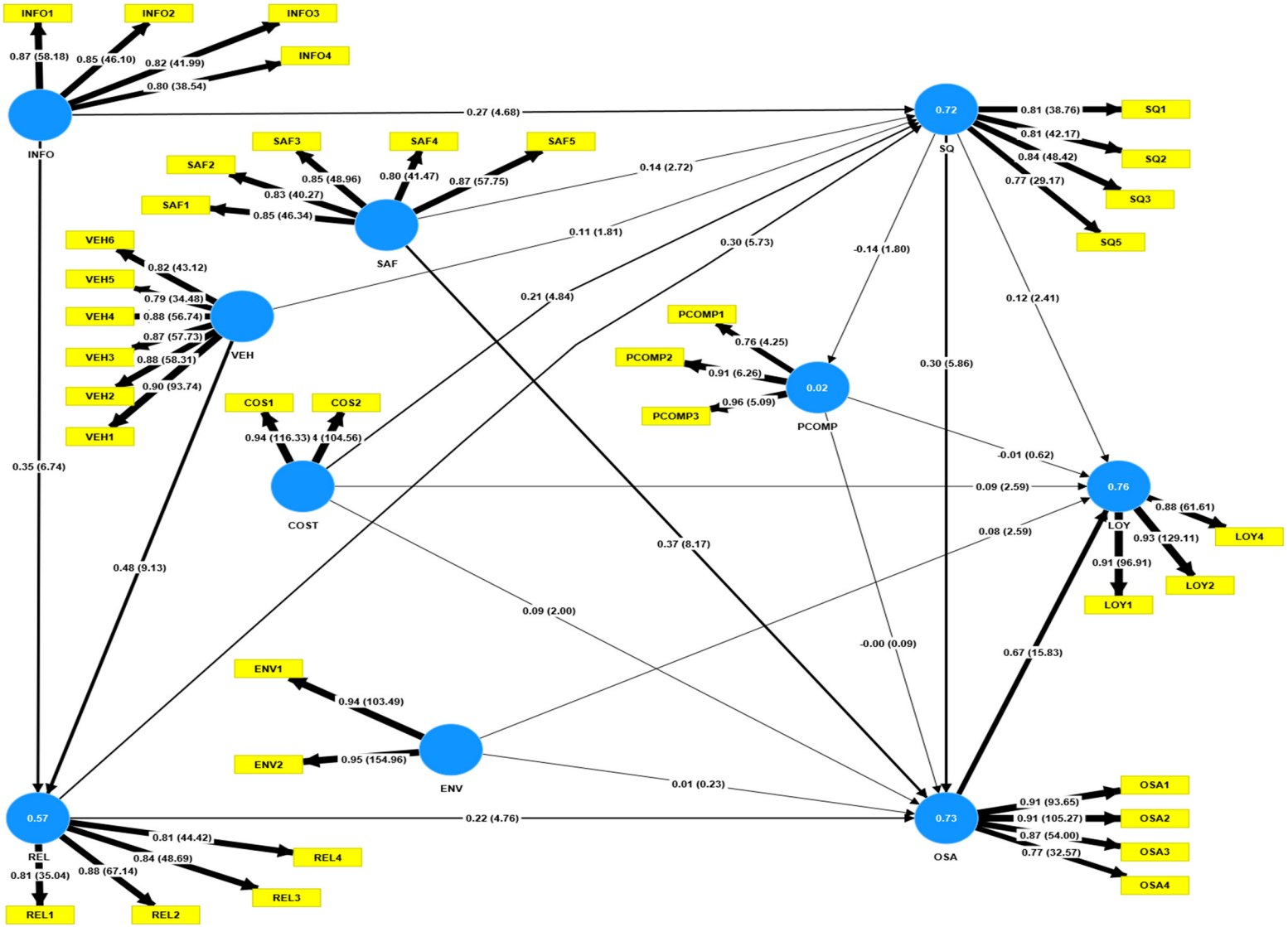

Figure 3. Results of the proposed structural model.

The findings also show that vehicle characteristics and information have a higher impact on reliability than perceived service quality, with Betas 0.476 and 0.349 against 0.11 and 0.266, respectively, supporting (hypotheses 2, 6) proposed by the author. However, the effect of reliability on overall satisfaction (β = 0.217) is weaker than the impact of perceived service quality on overall satisfaction (β = 0.302). Furthermore, safety significantly impacts overall satisfaction (β = 0.367) more than perceived service quality (β = 0.302). Lastly, Figure 3 depicts how the weakness of passenger complaints on overall satisfaction and loyalty. Similarly, the environmental impact construct has only a significant relationship with loyalty (β = 0.084).

4.1.2. The Results of Indirect Effects in the Proposed Model

Using a bootstrapping method described by Zhao et al. (2010) [81], the study looks at the indirect effects between constructs in the model. As a result, if zero were not included between the lower and upper values of the 97 percent confidence intervals, the mediator effect between the two observed variables would be significant [82].

Overall satisfaction mediated the causative links from reliability, safety, and perceived service quality to loyalty with coefficients (0.146, 0.247, and 0.203, $p < 0.001$, respectively), as well as the causal links from perceived costs to loyalty with a coefficient (0.06, $p < 0.05$). The results also show how much perceived service quality is a significant mediator between the relationships of observed constructs, as follows: from perceived costs, information, and reliability toward loyalty with coefficients (0.025, 0.032, and 0.036, $p < 0.005$, respectively), and from those mentioned constructs toward overall satisfaction with coefficients (0.063, 0.08, and 0.09, $p < 0.001$ respectively), as well as safety with (0.042, $p < 0.05$). Furthermore, with coefficients (−0.036, −0.051, −0.051, and −0.024, $p < 0.05$, respectively), perceived service quality provides a causal link between passenger complaints from perceived costs and reliability (−0.029, and −0.041, $p < 0.1$).

The reliability also demonstrates superior mediation between information and vehicle characteristics toward overall satisfaction (0.076, 0.103, $p < 0.001$) and in terms of perceived service quality (0.104, 0.141, $p < 0.001$). Finally, the safety construct has the greatest indirect effect on loyalty, with significant mediation effects on overall satisfaction (0.247, $p < 0.001$).

4.1.3. The Proposed Structural Model through Multi-Group Analysis (MGA)

The Multi-Group Analysis provided in SmartPLS 3.0 allows group moderation in this section, making it a vital tool for appropriately interpreting if different individuals' characteristics would influence their perspective. In other words, MGA assists in determining whether two or more variables have the same or different relationships across groups [83]. Furthermore, MGA evaluates and compares the impact of each structural path among various groups [84]. As a result, meaningful differences in multiple relationships across group-specific results can be easily identified [85].

Before running the MGA in SmartPLS 3.0, some points must be considered to ensure that the MGA provides valuable insights and examines disparities between the groups [86]. The sample size for each group must be greater than 64 observations at a power level of 80%. However, nearly similar sample sizes across the moderator-based subgroups are required during subgroup construction, as unequal sample sizes would reduce statistical power and lead to underestimating moderating effects [87]. The selected groups are based on this condition, as shown above. Table 10 shows the selected groups and subgroups' sample sizes used in MGA. Finally, measurement invariance was tested by Measurement Invariance of Composite Models (MICOM) [88].

Table 11 represents the MGA results for all the identified moderators and the significant difference in relationships across subgroups. The following is a list of the significance: Confidence level (* 90%, ** 95%), significance level (* $p < 0.10$, ** $p < 0.05$). As seen in Table 11, the gender group is the most influential moderator in the proposed model, with four relationships that have a significant level ($p < 0.05$) association through the impact of information on service quality, the impact of overall satisfaction on loyalty, the effect

of the environmental impact on overall satisfaction, and the influence of safety on overall satisfaction. Moreover, the impact of safety on perceived service quality and the effect of perceived service quality on passenger loyalty is significant at $p < 0.1$, implying a significant difference across gender classes. As seen below, people in the household class have significant differences: The relation between overall satisfaction and loyalty with ($p < 0.05$), as well as the impact of reliability on overall satisfaction and the impact of vehicle characteristics on service quality, were both significant ($p < 0.1$). At the same time, the travel time group owns the influence of information on reliability with ($p < 0.1$), and safety influences overall satisfaction with ($p < 0.05$).

Table 10. The selected groups and subgroups' sample sizes.

Group	Subgroups	Subgroups Sample Size
Gender	Female-(F) Male-(M)	F = 260 M = 222
Age	Old < 25 years-(<25) Old ≥ 25 years-(≥25)	<25 = 284 ≥25 = 198
Location	Inside Irbid-(II) Outside Irbid-(OI)	II = 300 OI = 182
People in household	People < 5-(<5) People ≥ 5-(≥5)	<5 = 205 ≥5 = 277
Travel cost	Low cost ≤ 2-(≤2 JD) High cost > 2(>2 JD)	≤2 JD = 216 >2 JD = 266
Travel time	Time ≤ 1 h-(≤1 h) Time > 1 h-(>1 h)	≤1 h = 289 >1 h = 193
Avg using PT	Daily-(D) Not Daily-(ND)	D = 230 ND = 252

Table 11. Multi-Group Analysis of the proposed structural model.

Hypothesis	Moderators						
	Gender β (F-M)	Age β (<25–≥25)	Location β (II–OI)	People in Household β (<5–≥5)	Travel Cost β (≤2 JD >2 JD)	Travel Time β (≤1 h–>1 h)	Avg. Using β (D–ND)
COST -> LOY	−0.039	−0.08	0.035	0.015	−0.054	−0.076	0.007
COST -> OSA	−0.041	0.001	0.144 *	0.049	0.038	−0.019	0.142 *
COST -> SQ	−0.092	−0.092	−0.016	0.092	0.141 *	0.11	−0.101
ENV -> LOY	−0.025	0.051	−0.101	0.04	0.069	0.01	−0.05
ENV -> OSA	0.146 **	−0.096	0.101	0.066	−0.079	0.031	0.069
INF -> REL	0.007	−0.077	−0.148	−0.085	−0.12	−0.185 *	0.055
INF -> SQ	0.223 **	−0.198 *	0.028	−0.032	−0.179 *	−0.165	−0.018
OSA -> LOY	0.209 **	−0.021	0.062	−0.174 **	−0.026	−0.109	0.081
PCOMP -> LOY	0.034	0.029	−0.027	−0.024	0.042	−0.054	0.031
PCOMP -> OSA	0.002	−0.09 *	−0.052	0.005	−0.065	−0.065	−0.007
REL -> OSA	−0.133	−0.057	0.111	−0.155 *	0.01	0.089	−0.008
REL -> SQ	0.016	0.128	0.034	−0.164	−0.081	−0.009	0.122
SAF -> OSA	0.175 **	0.098	−0.126	−0.046	−0.127	−0.201 **	0.027
SAF -> SQ	−0.168 *	0.088	−0.056	−0.086	0.042	−0.013	−0.135
SQ -> LOY	**−0.177 ***	0.102	−0.062	0.155	0.052	0.143	−0.043
SQ -> OSA	−0.063	−0.024	−0.159	0.116	0.083	0.073	−0.138
SQ -> PCOMP	−0.053	0.069	0.094	0.017	0.119	0.107	−0.064
VEH -> REL	0.004	0.032	0.119	0.059	0.118	0.124	0.009
VEH -> SQ	−0.061	0.028	0.001	**0.202 ***	0.119	0.126	0.047

Confidence level (*90 %, **95 %), Significance level (* $p < 0.10$ ** $p < 0.05$).

Table 12 shows the bootstrapping results to determine the differences between the selected moderators' path coefficients by comparing the bootstrapping results. When using gender as a categorical moderator variable, the effect of environmental impact on overall

satisfaction through females (students) (β = 0.072) is substantially stronger than when they join with males (β = 0.008). This is due to an unexpected negative relationship for males (β = −0.075). According to the influence of information on perceived service quality, females (β = 0.359) have a higher effect than males (β = 0.137). Furthermore, they rely more on overall satisfaction to raise their loyalty to PT (β = 0.762) than males (β = 0.552). This is because males are the majority of car owners, and females rely on PT services more than males in developing countries such as Jordan. Females are also shown to be more safety-sensitive to their overall satisfaction (β = 0.435) than males (β = 0.26); in contrast, when they relate to the perceived service quality, females are less safety-sensitive (β = 0.067) than males (β = 0.235). Moreover, they are less service quality-sensitive (β = 0.056) than males (β = 0.232) when they relate to their loyalties.

Table 12. Paths Coefficient for MGA.

Hypothesis	Moderators													
	Gender		Age		Location		People in HH		Travel Cost		Travel Time		Avg. Using	
	β (F)	β (M)	β (<25)	β (≥25)	β (II)	β (OI)	β (<5)	β (≥5)	β (≤2 JD)	β (>2 JD)	β (≤1 h)	β (>1 h)	β (D)	β (ND)
COST -> LOY														
COST -> OSA					0.14	−0.004							0.158	0.016
COST -> SQ									0.301	0.159				
ENV -> LOY														
ENV -> OSA	0.072	−0.075												
INF -> REL											0.273	0.458		
INF -> SQ	0.359	0.137	0.178	0.376					0.16	0.34				
OSA -> LOY	0.762	0.552					0.556	0.731						
PCOMP -> LOY														
PCOMP -> OSA			−0.045	0.046										
REL -> OSA							0.137	0.292						
REL -> SQ														
SAF -> OSA	0.435	0.26									0.286	0.487		
SAF -> SQ	0.067	0.235												
SQ -> LOY	0.056	0.232												
SQ -> OSA														
SQ -> PCOMP														
VEH -> REL							0.232	0.03						
VEH -> SQ														

According to the categorical People in the household variable, when the household members are less than five, they are less reliant on overall satisfaction to raise their loyalty to PT with (β = 0.556), rather than those bigger than them (β = 0.731). Furthermore, according to Table 12, the smaller families are more vehicle characteristics-sensitive to perceived service quality (β = 0.232), while the bigger families with more than five people (=0.03). When looking at the proposed model in terms of travel time, the travelers who spend time less than one hour to reach JUST university are less information sensitive to reliability (β = 0.273) than those who spend more than one hour (β = 0.458), which makes sense, when travel time increased this may result from the number of stations between the origin location and JUST university. The headway time between buses leads to the critical need for the good reliability of PT by giving accurate information about the trips.

Another interesting relationship is shown in the impact of safety on overall satisfaction; travelers with less than one hour of travel time are less safety-sensitive (β = 0.286) than those who spend more than one hour (β = 0.487). This may be because some hazards associated with increased travel time include thefts at bus stations and accidents caused by weariness due to the length of the journey.

4.2. The Influence of Socioeconomic Characteristics and Travel Habits on JUST University Transportation Mode Choices

Discrete choice models identify an individual's preferences among various options. These models were created using the utility maximization hypothesis, which states that a person chooses the mode that maximizes utility [67]. The logit function is crucial in discrete choice and logistic regression [89]. The simple BLM, nested BLM, and multinomial logit models are part of the logit function family. The simple binary model is used for discrete choices with only two alternatives, whereas the multinomial logit model is used for discrete choices with more possibilities (more than two). The nested binary logit model is used for two discrete options; one or both are subsets of choices.

Due to their ability to capture complex features of individual travel decisions by including crucial socioeconomic characteristics and travel habits, logit models were used for logistic regression analysis. The relationships between the independent and dependent variables are not assumed to be linear, and the variables are not required to be normally distributed. Based on the independent variables, the logistic regression calculates the likelihood of a specific event occurring [90]. The binary logit model was used as an analytically appropriate modeling tool for this study.

4.2.1. Model Specification

For the proposed logit model in this study, the utility function can be written as follows:

$$U_{PT\,(PT)} = \beta_0 + \beta_1{*}Education + \beta_2{*}Occupancy + \beta_3{*}Gender + \beta_4{*}Age + \beta_5{*}Location\ of\ living + \beta_6{*}Monthly\ income + \beta_7{*}People\ in\ household + \beta_8{*}Number\ of\ buses + \beta_9{*}Travel\ cost + \beta_{10}{*}Travel\ time + \beta_{11}{*}Avg\ using\ PT + \beta_{12}{*}Hardest\ day\ to\ get\ JUST + \beta_{13}{*}Arriving\ time + \beta_{14}{*}Leaving\ time + \beta_{15}{*}Time\ to\ arrive\ nearest\ station + \beta_{16}{*}Car\ ownership \quad (2)$$

where β_0 is the constant, β_1, β_2, β_3, β_4, β_5 … … β_{16} are the coefficients of variables. The probability that the *n*-th individual chooses alternative *i* (P_{in}), according to Ben-Akiva et al. (1985) [91], is as follows:

$$P_{in} = 1/(1 + e^{-Un}) = e^{Uin}/(e^{Uin} + e^{Ujn}) \quad (3)$$

Therefore, the probability that an individual will choose PT can be written as follow:

$$P_{PT} = e^{UPT}/(e^{UPT} + e^{Ucar}) \quad (4)$$

$$P_{car} = 1 - P_{PT} \quad (5)$$

For JUST university commuter trips, a binary logit model was created for two choices: PT and private car, to assess the utility of these modes of transportation and find the variables that can motivate car users to switch from driving to taking PT services. The dependent variable in this model is "1" if the passenger used PT and "0" for private car use. SPSS software was used to generate the logistic regression results.

4.2.2. Identifying Associated Variables

Only 75% of the collected data were used for training the proposed model. The significance of each attribute is estimated based on the analysis results using the forward stepwise-Likelihood Ratio (LR) in Table 13. The *p*-value determines whether dependent and independent variables have a statistical relationship. Moreover, variables with *p*-values less than 0.05 are considered significantly correlated [92]. The origins of *p*-values can be traced back to hypothesis testing in statistics. There are two hypotheses in hypothesis testing, namely:

- H_0: There is no relationship between the variables.
- H_1: There is a relationship between the variables.

Table 13. SPSS Output of BLM Analysis.

	Variables	B	S.E.	*p*-Value	Exp(B) Odds Ratio
Occupancy	Student Only =1	1.314	0.648	0.043 *	3.722
	Student (Part-time employee) = 2	0.614	0.710	0.387	1.847
	Staff (Full-time employee) = 3	−0.893	0.829	0.282	0.410
	Staff (Part-time employee) = 4				
Travel cost	Less than 1 JD = 1	4.147	1.011	<0.0001 **	63.224
	1 to 2 JD = 2	4.087	0.808	<0.0001 **	59.552
	2 to 3 JD = 3	2.834	0.757	<0.0001 **	17.011
	3 to 4 JD = 4	1.971	0.752	0.009 **	7.176
	4 to 5 JD = 5	1.235	0.777	0.112	3.439
	More than 5 JD = 6				
Travel time	Less than 1/2 an hour = 1	−3.377	1.257	0.007 **	0.034
	1/2 to 1-h = 2	−3.222	1.228	0.009 **	0.040
	1 to 2 h = 3	−1.264	1.175	0.282	0.282
	2 to 3 h = 4	0.591	1.152	0.608	1.806
	4 h or More = 5				
Avg using PT	Daily = 1	2.376	0.720	0.001 **	10.767
	Weekly = 2	1.058	0.715	0.139	2.882
	Monthly = 3	−0.147	0.981	0.881	0.863
	Occasionally = 4	−0.192	0.958	0.841	0.826
	Rarely = 5				
Car ownership	No = 0	1.534	0.367	<0.0001 **	4.636
	Yes = 1				
Constant		−3.156	1.595	0.048 *	0.043
Summary of Statistics					
−2LL			261.922		
Model χ^2 (Sig.)			226.510 (0.000)		
Nagelkerke R^2			0.604		

The stars represent the commonly employed significance levels. If a p-value is less than 0.05, it is flagged with one star (*). If a *p*-value is less than 0.001, it is flagged with (**) stars.

Table 13 summarizes the variables used in the binary logit model. All of the independent variables are categorical. As a result, the binary logit model evaluated these independent variable categories concerning the transportation mode choice to JUST. Noting that, the significant level is represented as follows: (* $p < 0.05$), (** $p < 0.0001$). According to Table 13, the only significant variables (in the last step of the forward stepwise-LR method) are occupancy, travel cost, travel time, average use, and car ownership. When all other independent variables are kept constant, the odds ratio can evaluate the probability of an occurrence based on a one-unit change in one independent variable. Students, for example, are 3.722 times more likely than employees to take PT to attend JUST university. According to the findings, the predicted coefficient for students is positive, meaning that students are more likely to choose PT than staff. The predicted coefficient for PT travel time is negative, meaning that an increase in PT travel time will likely enhance the likelihood of private car users continuing to choose the car as their preferred mode of transportation. In other words, longer journey times will likely raise resistance to the transfer from a private car to a public bus. Table 13 shows that passengers who do not own a car are more likely to use PT than those who do. In addition, when travel costs are low, people are more likely to use PT. Furthermore, as the frequency of use of this mode increases, so will its utility.

4.2.3. Model Validation

One of the logistic regression analysis outputs is the accuracy of the developed model, which is shown in Table 14 as the number and percentages of true and false predictions

for each mode of transportation and the overall accuracy. A better model should correctly identify a more significant percentage of the cases. According to Table 14, the classification matrices evaluate whether the proposed model fits the data. It was discovered that the model correctly classified approximately 96.9% of PT cases and approximately 70.0% of private car cases. The prediction model's overall accuracy is 90.0%, indicating a better model.

Table 14. Results of the Proposed Model's Accuracy.

		Privet Car Predicted (0)	PT Predicted (1)	Percentage Correct
Privet Car Observed	0	77	33	70.0
PT Observed	1	10	309	96.9
Overall Percentage				90.0

Moreover, the area under the Receiver Operating Characteristic (ROC) curve, which is a plot of true rates versus false rates, is the best measure of the accuracy of a logistic regression model. The ROC curve should be interpreted as follows: The prediction is poor if the area under the ROC curve is between 0.5 and 0.7 but reasonable if it is between 0.7 and 0.9. The area above 0.9 implies that the prediction is very good [93]. The closer the ROC plot is to the upper left corner, the better the test's overall accuracy [94].

According to ROC results (Figure 4), the area under the curve for the training model is 0.894 with a 95% confidence interval (0.852, 0.937). For the testing model, which concludes with 25% of the collected data, the area is 0.786 with a 95% confidence interval (0.701, 0.870). As the *p*-value for both curves is 0.000, the areas under the curves are significantly different from 0.5. This means that the logistic regression classifies the group much better than chance.

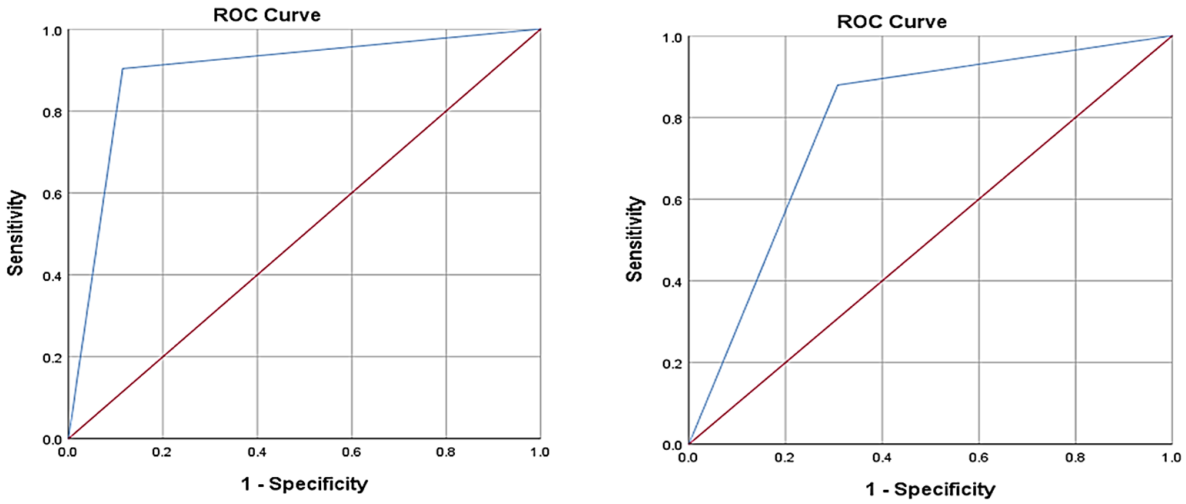

Figure 4. ROC Curve for Training (**left**) and Testing (**right**) Model Validation.

4.3. Comparison of the Present Study's Findings to Related Previous Works

After completing the PLS-SEM and BLR, it is vital to compare the obtained results with other previous studies to see which agree with the current study's findings and which disagree.

4.3.1. SEM Comparisons

Table 15 shows the comparisons between the present study and the previous studies. As shown in the table below, almost all the relationships in the proposed structural model agree with previous works' relationship impact. However, in the proposed structural model,

the relationship between passenger complaints and loyalty is negative but insignificant, as Zhang et al. (2019) [21] and Chou and Kim (2009) [64] suggest. In addition, the relationship between satisfaction and passenger complaints, conducted by Chou and Kim (2009) [64], has the opposite impact from that expected in the present study.

Table 15. Comparing SEM with Previous Works.

Author(s) & Year	Location	Relationship	($p < 0.05$)	Agree/Disagree
Zhang et al. (2019) [21]	China	Safety-> Satisfaction	0.58	Agree
		Reliability-> Satisfaction	0.62	Agree
		Satisfaction->P. Complaint	−0.50	Agree
		Satisfaction-> Loyalty	**0.95**	Agree
		P. Complaint-> Loyalty	−0.04	Agree
Chou and Kim (2009) [64]	Korea	Service quality->Satisfaction	0.226	Agree
	Taiwan	Service quality->Satisfaction	0.343	Agree
	Korea	Satisfaction-> Loyalty	1.139	Agree
	Taiwan	Satisfaction-> Loyalty	**1.474**	Agree
	Korea	Satisfaction ->P. Complaint	**1.162**	Disagree
	Taiwan	Satisfaction ->P. Complaint	0.930	Disagree
	Korea	P. Complaint-> Loyalty	0.169	Disagree
	Taiwan	P. Complaint-> Loyalty	−0.171	Agree
Vicente et al. (2020) [37]	Portugal	Service quality->Satisfaction	**0.707**	Agree
		Satisfaction-> Loyalty	0.490	Agree
		ENV. impact->Satisfaction	0.195	Agree
		ENV. impact->Loyalty	0.433	Agree
Ingvardson & Nielsen (2019) [34]	Europe	Costs->Satisfaction	0.20	Agree
		Costs->Loyalty	0.15	Agree
Su et al. (2021) [18]	Vietnam	Service quality->Safety	0.412	Agree
		Service quality->Satisfaction	0.497	Agree
		Service quality->Loyalty	0.216	Agree
		Safety->Satisfaction	0.119	Agree
		Satisfaction->loyalty	**0.509**	Agree
Wan et al. (2016) [19]	United States	Information->Service quality	0.332	Agree
		Veh.Characteristic->service quality	0.332	Agree

Another notable finding in Table 15 is that, except for the studies in Portugal and Korea, practically all previous studies had the most significant influencing relationships between satisfaction and loyalty, which is the same as in the current study. While the relationship between service quality and satisfaction was highest in Portugal, passenger satisfaction and complaints were most substantial in Korea, with a positive impact, which was unexpected in this study. The reason for the unexpected relationship could be that in Korea, many considerations are given to managing passenger complaints, resulting in higher passenger satisfaction.

According to the association between passenger complaints and perceived service quality, Hussain et al. (2015) [59] dropped all passenger complaint-related relationships due to measurement model internal consistency issues. However, the relationship between service quality and the complaint was negative, which is confirmed by the present study results.

Loyalty and passenger satisfaction had R^2 = 0.76 and 0.731, respectively, according to the current study's R^2 results. Where the satisfaction R2 was similar to that of Taiwan (0.74) but lower than that of Korea (0.93) [64]. In terms of loyalty R^2, both of these countries (0.79, 0.74) have similar values to those found in this study. In Europe [34], the value of satisfaction R^2 was (0.61) lower than the one conducted in this study.

In the results of MGA, it was found that females (students) were more reliant on overall satisfaction to raise their loyalty toward PT with (β = 0.762) rather than males

(β= 0.552). This finding is somewhat consistent with the finding of Nadimi et al. (2021) [95], which concluded that females typically have greater time and transportation mode choice flexibility, making PT systems more appealing to them in Iran (classified as a developing country, same as Jordan).

4.3.2. BLR Comparisons

The only significant variables in the binary logit model were as follows: occupancy, travel cost, travel time, average use, and car ownership. One of the dropped variables was gender; moreover, this variable was not statistically significant through the Chi-squared test. However, an interesting finding in the same study area discovered that being a female student at JUST reduces driving-alone behavior patterns [14]. The same study discovered that educational level was not significantly related to driving-alone behaviors in JUST students, which is somewhat consistent with the current study. Moreover, Al-Alawneh et al. (2021) [14] discovered that as the cost of traveling by PT rises, driving alone also rises slightly. They associated this finding with the correlation between cost and travel mode: rational students will intend to use their cars when other alternative modes are more expensive. This result is supported by the current study results, shown in Table 13, implying that passengers are less likely to use PT if travel costs increase.

In this study, passengers who do not own a car are more likely to use PT than those who do; this finding agrees with Puan et al. (2019) [96]. Finally, the current study discovered that students are more likely than staff to use PT to get to JUST university. This finding was confirmed by another study by Anwar and Yang (2017) [90], which also discovered another similar finding in terms of the effect of travel time on the PT mode, implying that an increase in travel time makes the passengers less likely to use PT to get to JUST university.

5. Conclusions

This research focused on evaluating the quality of PT in the JUST area using two techniques. The PLS-SEM method was used for the first method, which focused on customer satisfaction and loyalty to PT. The second technique focused on analyzing factors such as socioeconomic characteristics and travel habits that may contribute to the use of public or private transportation using BLR. The data were collected through an electronic questionnaire using the Google Forms platform in 2021. A paper-based survey was conducted since most participants did not respond to the online survey. The total number of participants was 572, which was examined to see whether it was an adequate analysis.

The proposed measurement model was successfully validated using the SmartPLS. Nineteen hypotheses have been proposed in the conceptual model. The proposed structural model contained significant hypotheses, all of which were significant at 95% except for the relationship between perceived service quality and passenger complaint and the impact of vehicle characteristics on perceived service quality, which was significant at a level of 90%. Some measurement items, such as VEH7, SQ4, SQ6, and LOY3, were removed from the model due to their lack of discriminative validity. The bootstrapping non-parametric test with 5000 samples was used to examine the significance levels at 95%. The proposed structural model could explain around 76% of the variance. Passenger satisfaction, perceived service quality, perceived costs, and environmental impact were four factors directly influencing passenger loyalty that demonstrated a significant impact.

The correlation coefficients between the perceived costs, information, reliability, safety, and vehicle characteristic with the perceived service quality were positive with betas (0.21, 0.266, 0.297, 0.139, and 0.11, respectively). They were significant at level 5, except for vehicle characteristics at 10%, indicating a significant direct positive effect of those variables on PT service quality. In addition, safety was the most influential measurement of overall satisfaction (0.367, $p < 0.001$), implying that safety plays a significant role in students' acceptance of PT services, particularly in rural areas like the JUST area. This result strengthens the finding of Githui et al. (2009) [40] and Das et al. (2013) [97], which implies that safety appears to be a stronger predictor of satisfaction outside of European countries

like Jordan. In addition, the findings support the traditional core relationship between satisfaction and loyalty with (0.673, $p < 0.001$), which is supported by earlier research on passenger loyalty to PT services [98,99]. Moreover, vehicle characteristics and information had a higher impact on reliability than perceived service quality, with values of Betas 0.476 and 0.349 against 0.11 and 0.266, respectively, supporting (hypotheses 2,6) proposed by the author. Through the indirect relationships, perceived service quality provided a causal link between passenger complaints from perceived costs and reliability (−0.029 and −0.041, $p < 0.1$). Safety measurement had the greatest indirect effect on loyalty, with significant mediation effects on overall satisfaction (0.247, $p < 0.001$).

One of the paper's essential functions was to investigate the moderating role of socioeconomic and travel habit factors, so the MGA was used. The MGA findings revealed that the seven control variables used to divide the data into seven groups substantially influenced 17 paths. Furthermore, the gender group of students was the most influential moderator in the proposed model. Through the MGA technique, females (students) were more reliant on overall satisfaction to raise their loyalty to PT with ($\beta = 0.762$), rather than males ($\beta = 0.552$). This finding is somewhat consistent with the finding of Nadimi et al. (2021) [95], which concluded that females typically have greater time and transportation mode choice flexibility, making PT systems more appealing to them in Iran (classified as a developing country, same as Jordan).

Indirect analysis was also used to discover more links between the constructs. The most notable finding was that perceived service quality was the most important mediator between the observed constructs' relationships. The BLR results demonstrated that the mode choice of transportation in the area of JUST university was statistically correlated with occupancy, travel cost, travel time, average use of public transportation, and car ownership. Moreover, the prediction model's overall accuracy was 90.0%, and the areas under the ROC curves for the training and testing models were 0.894 and 0.786, respectively, which implies that the prediction was reasonable.

According to the importance of involving users' opinions in PT improvement strategies, a section of the questionnaire asked participants to rate their opinions on some of the strategies that may improve the capability of PT and the factors that prevent or reduce their ability to use it. As a result, the participants assigned 81% of the importance of preventing them from using PT to the total travel time. Furthermore, regardless of the mode of transportation chosen, the most critical factor dictating their decision was safety, which accounted for 85% of the importance. When asked about the most effective strategy to encourage PT, 85% wished for an increase in bus routes. When asked about the most effective advertising method to promote PT, the majority chose social media and email, with an effectiveness of 70%. Regarding the impact of socioeconomic characteristics and travel habits of passengers committed to JUST University on transportation mode choice, travel cost, travel time, avg using PT, and car ownership were the most significant variables ($p < 0.0001$).

6. Recommendations

Based on the results, it is recommended that transportation agencies consider perceived costs, information, reliability, safety, and vehicle characteristics variables while improving PT service quality, especially in rural areas, which may raise passenger satisfaction; thus, their intention to use this service in the future will be increased. Furthermore, shifting car users to PT may be possible if relevant policies to reduce travel time on this service are implemented. One way to get closer to this goal would be to create special lanes for buses only or cut down on the dwell time between trips.

Furthermore, safety was discovered to have the most significant indirect impact on passenger loyalty. As a result, it is always critical for transportation agencies to implement several safety standards, such as crime prevention: staff/police presence; illumination; accident prevention: risk avoidance/visibility; active staff safeguarding; and security perceptions: conspicuousness of safety measures. Therefore, a PT system must pay close

attention to this critical feature to ensure the passengers' safety. The findings also revealed that safety was the most influential measurement of overall satisfaction, which is consistent with many studies conducted in developing countries. Thus, more research is required to understand why safety performs strongly in these countries.

The age distribution of the respondents was not normally distributed, with most of the sample being under the age of 36. In future studies, older respondents should be interviewed. This will allow for comparisons between passengers' overall satisfaction and loyalty between age groups. Moreover, due to a lack of time to further investigate more comprehensive points, only a questionnaire was used to collect demographic and satisfaction data. However, because the interviewer can observe the respondent's body language, facial expressions, and other responses to the questions, face-to-face interviewing is also a recommended effective method for data collection [100].

More research, particularly in Jordan, is required to identify effective strategies that can assist transportation agencies in increasing their adequacy and reducing the use of cars toward sustainable mobility. Some relevant and feasible suggestions were made from the perspective of PT operations to reduce traffic congestion by reducing private car usage and fuel consumption because Jordan is classified as a developing country with limited energy resources. Furthermore, to reduce pollution, we need to focus on lowering emissions, making PT more appealing, making it easier to implement strategies that focus on PT services, and prioritizing these services so the PT system can develop in a healthy and sustainable way.

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References

1. English Oxford Living Dictionaries. Public Transport. Oxford University Press: Oxford, UK. 2018. Available online: https://web.archive.org/web/20180131023414/https://en.oxforddictionaries.com/definition/public_transport (accessed on 1 November 2022).
2. Collins English Dictionary. Public Transport. HarperCollins. Available online: https://www.collinsdictionary.com/dictionary/english/public-transport (accessed on 1 November 2022).
3. Worldometers. Real Time World Statistics. Available online: https://www.worldometers.info (accessed on 15 August 2022).
4. Omer, K. Syrian Refugees in Jordan: A Decade and Counting. Available online: https://www.brookings.edu/blog/future-development/2022/01/27/syrian-refugees-in-jordan-a-decade-and-counting/ (accessed on 1 November 2022).
5. X15. ACAPS. Syrian Refugees—Overview. Available online: https://www.acaps.org/country/jordan/crisis/syrian-refugees (accessed on 1 November 2022).
6. Chandio, I.A.; Matori, A.N.B.; WanYusof, K.B.; Talpur, M.A.H.; Balogun, A.-L.; Lawal, D.U. GIS-based analytic hierarchy process as a multicriteria decision analysis instrument: A review. *Arab. J. Geosci.* **2013**, *6*, 3059–3066. [CrossRef]
7. United Nations. *The Sustainable Development Goals Report*; Department of Economic and Social Affairs: New York, NY, USA, 2019, Available online: https://unstats.un.org/sdgs/report/2019/The-Sustainable-Development-Goals-Report-2019.pdf (accessed on 1 November 2022).

8. Tan, Q.; Wang, M.; Deng, Y.; Yang, H.; Rao, R.; Zhang, X. The cultivation of electric vehicles market in China: Dilemma and solution. *Sustainability* **2014**, *6*, 5493–5511. [CrossRef]
9. World Bank Urban Transport and Climate Change. Available online: https://www.worldbank.org/en/news/feature/2012/08/14/urban-transport-and-climate-change (accessed on 1 November 2022).
10. Lee, J.; Baig, F.; Talpur, M.A.H.; Shaikh, S. Public Intentions to Purchase Electric Vehicles in Pakistan. *Sustainability* **2021**, *13*, 5523. [CrossRef]
11. Memon, I.A.; Kalwar, S.; Sahito, N.; Talpur MA, H.; Chandio, I.A.; Napiah, M.; Tayyeb, H. Mode choice modeling to shift car travelers towards park and ride service in the city centre of Karachi. *Sustainability* **2021**, *13*, 5638. [CrossRef]
12. Bull, A. Traffic Congestion—The Problem and How to Deal with it? United nations: Economic Commission for latin America and the Caribbean, Deutsche gesellschaft für Technische Zusammenarbelt (GTZ) GmbH. 2004. Available online: www.cepal.org/es/suscripciones (accessed on 15 August 2022).
13. Soehodho, S. PT development and traffic accident prevention in Indonesia. *IATSS Res.* **2017**, *40*, 76–80. [CrossRef]
14. Al-Alawneh, D.A.M.; Gharaibeh, A.A.; Mahasneh, J.K.; Alomari, A.H. Modeling of Driving Alone Decisions and Parking Behaviors Among University Students in Rural Areas. In Proceedings of the Transportation Research Board 100th Annual Meeting, Washington, DC, USA, 5–29 January 2021.
15. Alomari, A.H.; Aldalalah, M.H.; Al-Dalaika, M.A.-D.M.; Sawae, G.K.; Sawae, S.K.; Al-Alawneh, D.M. Evaluation of Urban PT: A Case Study of Yarmouk University. *Saudi J. Civ. Eng.* **2021**, *5*, 8–17. [CrossRef]
16. Ngoc, A.; Hung, K.; Tuan, V. Towards the Development of Quality Standards for Public Transport Service in Developing Countries: Analysis of Public Transport Users' Behavior. *Transp. Res. Procedia* **2017**, *25*, 4560–4579. [CrossRef]
17. Paquette, J.; Bellavance, F.; Cordeau, J.-F.; Laporte, G. Measuring quality of service in dial-a-ride operations: The case of a Canadian city. *Transportation* **2011**, *39*, 539–564. [CrossRef]
18. Su, D.N.; Nguyen-Phuoc, D.Q.; Johnson, L.W. Effects of perceived safety, involvement and perceived service quality on loyalty intention among ride-sourcing passengers. *Transportation* **2019**, *48*, 369–393. [CrossRef]
19. Wan, D.; Kamga, C.; Hao, W.; Sugiura, A.; Beaton, E.B. Customer satisfaction with bus rapid transit: A study of New York City select bus service applying structural equation modeling. *Public Transp.* **2016**, *8*, 497–520. [CrossRef]
20. Eboli, L.; Mazzulla, G. Service quality attributes affecting customer satisfaction for bus transit. *J. Public Transp.* **2007**, *10*, 21–34. [CrossRef]
21. Zhang, C.; Liu, Y.; Lu, W.; Xiao, G. Evaluating passenger satisfaction index based on PLS-SEM model: Evidence from Chinese public transport service. *Transp. Res. Part A Policy Pr.* **2018**, *120*, 149–164. [CrossRef]
22. Stojic, D.; Ciric, Z.; Sedlak, O.; Horvat, A.M. Students' Views on Public Transport: Satisfaction and Emission. *Sustainability* **2020**, *12*, 8470. [CrossRef]
23. Fellesson, M. and Friman, M. Perceived Satisfaction with PT Service in Nine European Cities. *J. Transp. Res. Forum* **2011**, *47*, 93–103. [CrossRef]
24. Wagale, M.; Singh, A.P.; Singh, A. Neural networks approach for evaluating quality of service in PT in rural areas. In Proceedings of the 2016 1st India International Conference on Information Processing (IICIP), Delhi, India, 12–14 August 2016. [CrossRef]
25. Baig, F.; Rana, I.A.; Talpur, M.A.H. Determining Factors Influencing Residents' Satisfaction Regarding Urban Livability in Pakistan. *Int. J. Community Well-Being* **2019**, *2*, 91–110. [CrossRef]
26. Kral, P.; Janoskova, K.; Kliestik, T. Key determinants of the PT user's satisfaction. *Adm. Manag. Public* **2018**, *2018*, 36–51. [CrossRef]
27. Miletić, G.-M.; Gašparović, S.; Carić, T. Analysis of Socio-spatial Differentiation in Transport Mode Choice Preferences. *PROMET* **2017**, *29*, 233–242. [CrossRef]
28. Talpur, M.A.H.; Khahro, S.H.; Ali, T.H.; Bin Waseem, H.; Napiah, M. Computing travel impendences using trip generation regression model: A phenomenon of travel decision-making process of rural households. *Environ. Dev. Sustain.* **2022**, *24*, 1–24. [CrossRef]
29. Armstrong-Wright, A.; Thiriez, S. *Bus Services—Reducing Costs, Raising Standards*; World Bank Technical Paper; World Bank: Washington, DC, USA, 1987; p. 56. Available online: http://www.timesofmalta.com/articles/view/20040718/letters/bus-services.117521#.Ut0wyhBFB6l (accessed on 20 August 2022).
30. Shtayat, A.; Al-masaied, H.; Moridpour, S. Performance of Urban Transit in Jordan. *EasyChair* **2018**. Available online: https://wwww.easychair.org/publications/preprint_download/rc79 (accessed on 20 August 2022).
31. Imam, R. Measuring PT Satisfaction from User Surveys. *Int. J. Bus. Manag.* **2014**, *9*, 106–114. [CrossRef]
32. Alkharabsheh, A.; Moslem, S.; Oubahman, L.; Duleba, S. An Integrated Approach of Multi-Criteria Decision-Making and Grey Theory for Evaluating Urban Public Transportation Systems. *Sustainability* **2021**, *13*, 2740. [CrossRef]
33. Redman, L.; Friman, M.; Gärling, T.; Hartig, T. Quality attributes of public transport that attract car users: A research review. *Transp. Policy* **2013**, *25*, 119–127. [CrossRef]
34. Ingvardson, J.B.; Nielsen, O.A. The relationship between norms, satisfaction and PT use: A comparison across six European cities using structural equation modelling. *Transp. Res. A: Policy Pract.* **2019**, *126*, 37–57.
35. Del Castillo, J.M.; Benitez, F.G. Determining a public transport satisfaction index from user surveys. *Transp. A Transp. Sci.* **2013**, *9*, 713–741. [CrossRef]

36. Barbosa, S.B.; Ferreira, M.G.G.; Nickel, E.M.; Cruz, J.A.; Forcellini, F.A.; Garcia, J.; Garcia, J.; de Andrade, J.B.S.O. Multi-criteria analysis model to evaluate transport systems: An application in Florianópolis, Brazil. *Transp. Res. Part A: Policy Pr.* **2017**, *96*, 1–13. [CrossRef]
37. Vicente, P.; Sampaio, A.; Reis, E. Factors influencing passenger loyalty towards public transport services: Does public transport providers' commitment to environmental sustainability matter? *Case Stud. Transp. Policy* **2020**, *8*, 627–638. [CrossRef]
38. Eboli, L.; Mazzulla, G. A New Customer Satisfaction Index for Evaluating Transit Service Quality. *J. Public Transp.* **2009**, *12*, 21–37. [CrossRef]
39. Nguyen-Phuoc, D.Q.; Tran, A.T.P.; Van Nguyen, T.; Le, P.T.; Su, D.N. Investigating the complexity of perceived service quality and perceived safety and security in building loyalty among bus passengers in Vietnam—A PLS-SEM approach. *Transp. Policy* **2021**, *101*, 162–173. [CrossRef]
40. Githui, J.N.; Okamura, T.; Nakamura, F. The structure of users' satisfaction on urban PT service in developing country: The case of Nairobi. In Proceedings of the Eastern Asia Society for Transportation Studies, the 8th International Conference of Eastern Asia Society for Transportation Studies, Surabaya, Indonesia; 2009; Volume 7, p. 232.
41. Imaz, A.; Habib, K.M.N.; Shalaby, A.; Idris, A.O. Investigating the factors affecting transit user loyalty. *Public Transp.* **2015**, *7*, 39–60. [CrossRef]
42. Özlem, Ş.; Nordfjærn, T.; Rundmo, T. The role of attitudes, transport priorities, and car use habit for travel mode use and intentions to use PT in an urban Norwegian public. *Transp. Policy* **2015**, *42*, 113–120.
43. Lai, W.-T.; Chen, C.-F. Behavioral intentions of PT passengers—The roles of service quality, perceived value, satisfaction and involvement. *Transp. Policy* **2011**, *18*, 318–325. [CrossRef]
44. Evans, L.; Wasielewski, P. Risky driving related to driver and vehicle characteristics. *Accid. Anal. Prev.* **1983**, *15*, 121–136. [CrossRef]
45. Willoughby, C. How much can public private partnership really do for urban transport in developing countries? *Res. Transp. Econ.* **2013**, *40*, 34–55. [CrossRef]
46. Sohail, M.; Maunder, D.A.C.; Cavill, S. Effective regulation for sustainable PT in developing countries. *Transp. Policy* **2006**, *13*, 177–190. [CrossRef]
47. Van Oort, N. Service Reliability and Urban PT Design. 2011. Available online: http://www.narcis.nl/publication/RecordID/oai%3Atudelft.nl%3Auuid%3A68f6dd34-53cf-4792-81e7-799c3d552b94 (accessed on 20 August 2022).
48. Joewono, T.B.; Kubota, H. Safety And Security Improvement In Pt Based On Public Perception In Developing Countries. *IATSS Res.* **2006**, *30*, 86–100. [CrossRef]
49. Mandhani, J.; Nayak, J.K.; Parida, M. Interrelationships among service quality factors of Metro Rail Transit System: An integrated Bayesian networks and PLS-SEM approach. *Transp. Res. Part A Policy Pr.* **2020**, *140*, 320–336. [CrossRef]
50. Solotruk, M.; Krištofič, M. Increasing the degree of information system integration and developing an integrated information system. *Inf. Manag.* **1980**, *3*, 207–212. [CrossRef]
51. Grotenhuis, J.-W.; Wiegmans, B.W.; Rietveld, P. The desired quality of integrated multimodal travel information in PT: Customer needs for time and effort savings. *Transp. Policy* **2007**, *14*, 27–38. [CrossRef]
52. Neuburger, H.L.I. Perceived Costs. *Environ. Plan. A Econ. Space* **1971**, *3*, 369–376. [CrossRef]
53. Ni, A. Influence mechanism of the corporate image on passenger satisfaction with PT in China. *Transp. Policy* **2020**, *94*, 54–65. [CrossRef]
54. UNECE. Economic Commission for Europe of the United Nations. Climate Action and PT. 2021. Available online: https://unece.org/climate-change-and-sustainable-transport (accessed on 5 September 2022).
55. Nesheli, M.M.; Ceder, A. Improved reliability of PT using real-time transfer synchronization. *Transp. Res. Part C Emerg. Technol.* **2015**, *60*, 525–539. [CrossRef]
56. Iida, Y.; Wakabayashi, H. An approximation method of terminal reliability of road network using partial minimal path and cut sets. In *Transport policy, Management & Technology towards 2001: Selected Proceedings of the Fifth World Conference on Transport Research*; The National Academies of Sciences, Engineering, and Medicine: Washington, DC, USA, 1989.
57. Parasuraman, A.P.; Zeithaml, V.; Berry, L. SERVQUAL A Multiple-item Scale for Measuring Consumer Perceptions of Service Quality. *J. Retail.* **1988**, *64*, 12–40.
58. Brady, M.; Cronin, J., Jr. Some New Thoughts on Conceptualizing Perceived Service Quality: A Hierarchical Approach. *J. Mark.* **2001**, *65*, 34–49. [CrossRef]
59. Hussain, R.; Al Nasser, A.; Hussain, Y.K. Service quality and customer satisfaction of a UAE-based airline: An empirical investigation. *J. Air Transp. Manag.* **2015**, *42*, 167–175. [CrossRef]
60. Yeung MC, H.; Ging, L.C.; Ennew, C.T. Customer satisfaction and profitability: A reappraisal of the nature of the relationship. *J. Target. Meas. Anal. Mark.* **2002**, *11*, 24–33. [CrossRef]
61. Kotler, P. *Marketing Management: The Millennium Edition*; Prentice Hall: Upper Saddle River, NJ, USA, 2000.
62. Gagić, S.; Tešanović, D.; Jovičić, A. The vital components of restaurant quality that affect guest satisfaction. *Turizam* **2013**, *17*, 166–176. [CrossRef]

63. Van Lierop, D.; Badami, M.G.; El-Geneidy, A.M. What influences satisfaction and loyalty in PT? A review of the literature. *Transp. Rev.* **2018**, *38*, 52–72. [CrossRef]
64. Chou, J.-S.; Kim, C. A structural equation analysis of the QSL relationship with passenger riding experience on high speed rail: An empirical study of Taiwan and Korea. *Expert Syst. Appl.* **2009**, *36*, 6945–6955. [CrossRef]
65. Butcher, K.; Sparks, B.; O'Callaghan, F. Evaluative and relational influences on service loyalty. *Int. J. Serv. Ind. Manag.* **2001**, *12*, 310–327. [CrossRef]
66. Ben-Akiva, M.; Bierlaire, M. Discrete choice methods and their applications to short term travel decisions. In *Handbook of Transportation Science*; Springer: Berlin/Heidelberg, Germany, 1999; pp. 5–33.
67. Talpur, M.A.H.; Napiah, M.; Chandio, I.A.; Khahro, S.H. Transportation Planning Survey Methodologies for the Proposed Study of Physical and Socio-economic Development of Deprived Rural Regions: A Review. *Mod. Appl. Sci.* **2012**, *6*, 1. [CrossRef]
68. Faul, F.; Erdfelder, E.; Buchner, A.; Lang, A.-G. Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behav. Res. Methods* **2009**, *41*, 1149–1160. [CrossRef] [PubMed]
69. Cohen, J. A power primer. *Psychol. Bull.* **1992**, *112*, 155. [CrossRef] [PubMed]
70. Tabachnick, B.G.; Fidell, L.S.; Ullman, J.B. *Using Multivariate Statistics*; Pearson: Boston, MA, USA, 2007.
71. Hair, J.; Black, W.; Babin, B.; Anderson, R.; Tatham, R. *Multivariate Data Analysis*, 6th ed.; Prentice Hall: New Jersey, NJ, USA, 2006.
72. Gefen, D.; Straub, D.; Boudreau, M.C. Structural equation modeling & regression: Guidelines for research practice. *Commun. Assoc. Inf. Syst.* **2000**, *4*, 7.
73. Hair, J.F., Jr.; Black, W.C.; Babin, B.J.; Anderson, R.E. *Multivariate Data Analysis*; Pearson Education: London, UK, 2010; p. 785.
74. Nunnally, J.C. The assessment of reliability. *Psychom. Theory* **1994**, *3*, 248–292.
75. Hair, J.F., Jr.; Hult, G.T.M.; Ringle, C.M.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling*; Sage: Thousand Oaks, CA, USA, 2014.
76. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [CrossRef]
77. Hair, J.F.; Ringle, C.M.; Sarstedt, M. PLS-SEM: Indeed a silver bullet. *J. Mark. Theory Pract.* **2011**, *19*, 139–152. [CrossRef]
78. Hair, J.F.; Risher, J.J.; Sarstedt, M.; Ringle, C.M. When to use and how to report the results of PLS-SEM. *Eur. Bus. Rev.* **2019**, *31*, 2–24. [CrossRef]
79. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences*; Lawrence Erlbaum Associates: Mahwah, NJ, USA, 1988; p. 567.
80. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences*; Academic press: Cambridge, MA, USA, 2013.
81. Zhao, X.; Lynch, J.G., Jr.; Chen, Q. Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *J. Consum. Res.* **2010**, *37*, 197–206. [CrossRef]
82. Preacher, K.J.; Hayes, A.F. SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav. Res. Methods Instrum. Comput.* **2004**, *36*, 717–731. [CrossRef]
83. MacKinnon, D.P. Integrating mediators & moderators in research. *Res. Soc. Work Pract.* **2011**, *21*, 675–681.
84. Boyd, B.K.; Haynes, K.T.; Bergh, D.D.; Ketchen, D.J., Jr. Contingency hypotheses in strategic management research: Use, disuse, or misuse? *J. Manag.* **2012**, *38*, 278–313. [CrossRef]
85. Schlägel, C.; Sarstedt, M. Assessing the measurement invariance of the four-dimensional cultural intelligence scale across countries: A composite model approach. *Eur. Manag. J.* **2016**, *34*, 633–649. [CrossRef]
86. Cheah, J.-H.; Thurasamy, R.; Memon, M.A.; Chuah, F.; Ting, H. Multigroup Analysis using SmartPLS: Step-by-Step Guidelines for Business Research. *Asian J. Bus. Res.* **2020**, *10*, 1–19. [CrossRef]
87. Hair, J.F., Jr.; Hult, G.T.M.; Ringle, C.M.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; Sage Publications: Thousand Oaks, CA, USA, 2021.
88. Henseler, J.; Ringle, C.M.; Sarstedt, M. Testing measurement invariance of composites using partial least squares. *Int. Mark. Rev.* **2016**, *33*, 405–431. [CrossRef]
89. Allison, P.D. *Logistic Regression Using SAS: Theory and Application*; SAS Institute: Cary, NC, USA, 2012.
90. Anwar, A.H.M.M.; Yang, J. Examining the effects of transport policy on modal shift from private car to public bus. *Procedia Eng.* **2017**, *180*, 1413–1422. [CrossRef]
91. Ben-Akiva, M.E.; Lerman, S.R.; Lerman, S.R. *Discrete Choice Analysis: Theory and Application to Travel Demand*; MIT Press: Cambridge, MA, USA, 1985; Volume 9.
92. Levy, P.S.; Lemeshow, S. *Sampling of populations: Methods and applications*; John Wiley & Sons: Hoboken, NJ, USA, 2013.
93. Swets, J.A. Indices of discrimination or diagnostic accuracy: ROCs & implied models. *Psychol. Bull.* **1986**, *99*, 100.
94. Zweig, M.H.; Campbell, G. Receiver-operating characteristic (ROC) plots: A fundamental evaluation tool in clinical medicine. *Clin. Chem.* **1993**, *39*, 561–577. [CrossRef] [PubMed]
95. Nadimi, N.; Sangdeh, A.K.; Amiri, A.M. Deciding about the effective factors on improving PT popularity among women in developing countries. *Transp. Lett.* **2021**, *13*, 707–715. [CrossRef]
96. Puan, O.C.; Hassan, Y.A.H.; Mashros, N.; Idham, M.K.; Hassan, N.A.; Warid, M.N.M.; Hainin, M.R. Transportation mode choice binary logit model: A case study for Johor Bahru city. *IOP Conf. Series: Mater. Sci. Eng.* **2019**, *527*, 012066. [CrossRef]
97. Das, A.M.; Ladin, M.A.; Rahmat, R.A. Consumers satisfaction of PT monorail user in Kuala Lumpur. *J. Eng. Sci. Technol.* **2013**, *8*, 272–283.

98. Shiftan, Y.; Barlach, Y.; Shefer, D. Measuring passenger loyalty to PT modes. *J. Public Transp.* **2015**, *18*, 7. [CrossRef]
99. Van Lierop, D.; El-Geneidy, A. Enjoying loyalty: The relationship between service quality, customer satisfaction, and behavioral intentions in PT. *Res. Transp. Econ.* **2016**, *59*, 50–59. [CrossRef]
100. Kabir, S.M. Methods of Data Collection. In *Methods Of Data Collection Basic Guidelines for Research: An Introductory Approach for All Disciplines*; Book Zone Publication: New York, NY, USA, 2016; pp. 201–275.