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Demand-responsive Users' Travel Behavior and Satisfaction Analysis in Small Cities

Case Study of the Public Transportation System in Palestine

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Abstract

This study examines the differences in travel behavior between regular and occasional demand-responsive transport users (public transport users), determines the level of service satisfaction, and identifies the key factors of commuters' preferences of using the demand-responsive transport regularly or occasionally for a small-sized urban area (<50 km^2). Data were supplemented through field surveys and by focus group discussions. Binary logistic regression and correlation models were used. It is found that probabilities of irregularity are higher for rural areas, male commuters, short trips, educational trips, low-income groups, and non-direct trips. All users are generally satisfied with the service. The most important factors for occasional users are waiting time, trip cost, and trip duration. On the other hand, regular users pay more attention to cleanliness, safety, and comfort. Scheduling of public transportation lines that serve educational zones and provide accessibility to rural areas are needed to improve the quality and attractiveness of the services.

Keywords

public transportation, irregularity, satisfaction, car ownership, binary regression, correlation

1 Introduction

The assumption that public transportation (PT) is only crucial for large urban areas with major traffic congestion is not valid, as PT can also play a key role in rural areas and small urban contexts (Jaber et al., 2022; Litman and Hughes-Cromwick, 2017). Road network characteristics such as coverage, accessibility, availability, and regularity (using the same transport mode on a regular daily basis) are varied from one city to another. In small cities (lower than 50 km^2), the network is limited due to the land obtainability and spatial options of roads expanding longitudinally or within the right of way. Typically, the PT service is fixed, and not flexible (Broderick, 2018). Thus, the travel behavior and PT options are different compared to large cities. As a result, an obvious dependency and exclusive use of private cars are observed, mainly due to the lack of an effective service (Giuffrida et al., 2021). Nearly, fifty percent of the world's urban residents live in relatively small and mid-sized settlements with populations of less than 100,000 inhabitants (Abou-Korin, 2014). While various geographic regions reach different degrees of urbanization, the fact remains that the world continues to urbanize, particularly in low- and lower-middle-income countries, such as the State of Palestine. This requires more sustainable development with successful management of urban growth (United Nations, Department of Economic and Social Affairs, Population Division, 2019). As transportation and urbanization complement each other, it is necessary to understand the current travel behavior in order to develop and plan the cities properly. In the case of Palestine, urbanization has been growing both hastily and steadily. The urban population has almost tripled in the last 25 years, amounting to 75% of Palestine's total population (CAPSUS, 2019). It is worth mentioning that all cities in Palestine are classified as small urban contexts

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(United Nations, Department of Economic and Social Affairs, Population Division, 2019).

The current PT situation in Palestine is more like a demand responsive transport which is a flexible service that provides shared transport to users who share similar locations (point-to-point) and times of pick-up and drop-off (Földes and Csiszár, 2018). Although, it is referred to "public transportation system" in the country and in all studies and reports. As this context is somewhat neglected in the research of PT, this study contributes to the literature on several points. First, it is a case study of small cities in developing countries. Secondly, this study deals with the unique characteristics of the public transportation service in Palestine that is running without scheduling unlike other PT services in the transport systems. Putra et al. (2014) stated that the knowledge of commuters' behavior provides optimal results to improve the performance of PT according to the prospects and interests of users. Therefore, to understand the service of PT, the study focuses on passengers' behavior and satisfaction to build up the results. The main objectives of this study are:

1. to find the travel behavior differences between regular and occasional bus commuters, and
2. to determine the level of satisfaction in bus services as well as key factors impacting commuters' evaluation of the service based on car ownership.

Ramallah's urban area was selected as a case study representing the Palestinian PT system, which is an example of small-sized urban areas in developing countries (OECD, 2016).

The next section presents a selection of the previous studies related to the topic. The following section comprises the data gathered with detailed illustrations and the methods of analysis. In the subsequent section, results are presented and discussed with elaboration and comparisons among other studies. Afterward, the conclusions are summarized.

2 Literature review

Several research examined the overall travel behavior of PT users. Others examined the behavior including cycling and private cars, which resulted in taking into consideration car ownership. Badami and Haider (2007) explored the factors, which contribute to improving the public bus transit service in four metropolitan cities in regard to switching from personal vehicles. Commuters of low and high income in India were examined to evaluate the situation, and the study found that high-income users are likely to keep depending on their own vehicles however attractive the public transit service may be, unlike low-income who lack other options. Vicente and Reis (2016) conducted a survey on the adult population that uses PT in Lisbon City to find their travel behavior and perceptions. More than one-thousand responses were obtained as well as focus group interviews with regular and occasional users. The findings described disparity of modes, trip purposes, and frequency, which pointed out the variety of segments classification into positive and negative evaluations. Eluru et al. (2012) investigated the factors that discourage individuals from using PT, as well as the reasons that influence commuting by public transit in Montreal, Canada. The results clearly highlighted the role of travel time, the number of transfers, walking time, and initial waiting time on the tendency to choose PT. Ortega-Tong (2013) attempted to understand the travel pattern of PT users in London. The study depended on an extensive database of smart cards and found that the spatial and temporal aspects are the main features that affect the pattern, while it doesn't differ in the regularity of commuters. Kuhnimhof et al. (2006) examined the difference between regular and occasional users of PT commuting. The study found that less than 20% are regular commuters and that the key factors to this differentiating are age and gender. Moreover, Giuliano (2005) indicated that regular users have the lowest level of mobility, and the trends are likely to continue for this small portion. De Oña et al. (2020) analyzed only regular commuters using a survey in Madrid, Spain. The study identified the important factors affecting the overall satisfaction in favor of private vehicle users. The results indicated that the inhabitants are satisfied with PT, and the most important attributes are frequency and speed.

On the other hand, the topic of satisfaction of PT users has been covered in several studies using different approaches. The dissimilarity of literature occurs in the factors that have been tested, the commuters' social and demographic characteristics, modes of PT, and urban area of functionality. Putra et al. (2014) determined the level of satisfaction effect of PT services on performance in Indonesia. The results showed that the main priority of users' expectations to get an improvement of PT services is an indicator of accessibility, capacity, convenience, and safety. In this regard, Olsen (2007) stated that PT users feel the quality of service. This is because every individual is likely to have a different quality assessment of PT, and will continue to use PT services if there is a feeling of satisfaction, which is consistent with the results of Cavana et al. (2007) but with travel time as an additional indicator.

In Europe, several studies and projects have been conducted in this aspect as case studies of large cities. Fellesson and Friman (2008) explored a survey in nine European cities to identify factors that travelers use to evaluate PT. Although there were slight differences, the overall pattern showed that safety, reliability, comfort, and staff behavior are the main factors of quality. In another case study, Lunke (2020) investigated how the journey's characteristics affected commuters' satisfaction on their last trip to work. A comprehensive survey in Oslo, Norway, a large city, showed that short distances to stations and direct routes are less significant than effective transportation routes with short waiting times and relative time use. However, de Oña (2021) found that frequency, punctuality, and speed are the attributes that contribute the most to service quality. Other studies found that functionality, comfort, security, and reliability are the main factors (Fonseca et al., 2010; Sukhov et al., 2021). Abenoza et al. (2017) identified and characterized these users in Sweden. The cluster analysis of inactive, long distances, urban, rural, and student segments resulted in three key attributes that should be prioritized; customer interface, operation, network, and length of trip time. Considering the age of commuters, Soza-Parra et al. (2019) found that comfort played an essential part in service satisfaction for customers under 35 years old, while women over 35 years old were substantially more sensitive to this attribute. Most importantly, there is a negative assessment of crowding.

Focusing on bus commuters' research; Aidoo et al. (2013) interviewed passengers at bus stations to acquire information about their satisfaction with the service in Accra, Ghana. The binary model was used for prediction. According to the findings, bus traffic safety records are the most important service segment and determinant of total service quality. While dell'Olio et al. (2011) used multinomial discrete choice models to measure the level of service required by PT users in the city of Santander, Spain. The study discovered that the PT aspects that users appreciated the most were waiting time, cleanliness, and comfort. Unlike the conventional studies, del Castillo and Benitez (2013) collected ratings for several disaggregated attributes alongside overall global satisfaction through a survey in Bilbao, Madrid. It has been found that the most influencing items are:

- reliability,
- adequacy of the bus stop location,
- punctuality,
- connection to lines of other operators, and
- service frequency.

Similarly, with a smaller number of respondents, (Wojuade and Badiora, 2017) figured out passengers' evaluation of service quality attributes in Ibadan, Nigeria. The result indicated that users were satisfied with the comfort, service reliability, security, and accessibility, in line with the findings of a study conducted in Cosenza, Italy (Eboli and Mazzulla, 2007). De Oña et al. (2021) examined the main factors influencing the quality of service and satisfaction between PT and private vehicle users. Through non-parametric tests and ordinal logit models, an online survey was done in Madrid, Spain. The results showed that proximity is a significant difference between the two groups, as well as gender, age, and income.

The literature indicates that there is a gap in the public transportation commuters' behavior and satisfaction within small urban-sized cities, as well as rural areas. Several studies have been conducted with varying results on quality, satisfaction, and evaluation of public transportation modes. On the other hand, the behavior is limited within studies related to overall choice modeling.

3 Methodology

The main information related to PT users was obtained using a questionnaire distributed at all major PT stations/terminals in Ramallah urban area; a total of seven. The survey was conducted on board and at the stations while passengers were waiting. It should be noted that the questionnaire was distributed and information was collected before the Covid-19 pandemic hit Palestine (in March 2020), as PT travel behavior changed dramatically during and after that. Schools and businesses were closed and relied on distant and online practices, and PT ridership dropped drastically. It was initially intended to collect a larger sample size; however, due to the pandemic, it was decided to stop fieldwork in order to collect representative data under normal operating conditions. Therefore, this was supplemented by conducting focus group discussions.

Two main statistical methods were applied; the binary regression model and Pearson's correlation test. To determine the commuters' characteristics and behavior, the field obtained database contains several attributes such as trip characteristics, users' behavior, social, and demographic aspects. The "Multi-collinearity" test was used to decide whether these factors should be used in the model to be developed or not. In the final stage, seven factors are included in the extracted binary model. The model is then evaluated regarding the goodness of fit, significance, and prediction accuracy. For each independent variable, the significance of the sub-group is tested to decide whether to be included in the equation of a logit model or not.

For the second objective, the methodology depends on finding the satisfaction level of each attribute, then the commuters' rating with the overall rating for the service is tested using Pearson's test. The most correlated relationship between the attribute and overall rating is the top ranking factor that has an effect on satisfaction.

Later, the identified attributes of the differences between regular and occasional commuters were examined by conducting focus group discussions. The focus group study is a qualitative approach that is frequently used in the social sciences to examine problems in detail (Demaidi and Al-Sahili, 2021). The participants were volunteer regular and occasional users of public transport, in addition to technical staff from the four municipalities in the study area, the Ministry of Transport, and the Ministry of Local Government, as well as specialized academic staff; a total of 12 members. It should be noted that some of the technical staff are also users of the PT in the study area. The focus group met face-to-face several times as well as online; due to the Covid-19 pandemic conditions. Five focus group meetings were held starting from introducing the study and its objectives to discussing the results and verifying outcomes. Additional separate meetings were held with PT operators and managers.

A focus group of twelve people is feasible since it is large enough to gain unique viewpoints and small enough not to become disorderly (Samanci et al., 2021). Half of the participants are regular PT users, while the other half own cars and use PT occasionally. The focus group discussions were held under the moderation of a professional who worked in the field of management. The discussions continued until the participants reached an agreement and consensus about the users' attributes. Mixed-gender groups improve the quality of discussions, allowing for more precise results (Freitas et al., 1998), and for this reason, a mixed-gender group was formed consisting of six males and six females. The ages of the participants ranged between 20 and 60 years. The detailed results for each attribute are presented in the subsequent sections of this study. More elaboration of the methodology is illustrated in Fig. 1.

The case study in this research is Ramallah urban area, which has an approximate population of 200,000 extracted from the Palestinian Central Bureau of Statistics (PCBS, 2020); it is central and vital within the Palestinian context. It includes four localities: City of Ramallah, City of AlBireh, City of Betunia, Surda-AbuQash Town, as shown in Fig. 2. The rapid increase in population, as well as vehicle ownership and economic activities in the area have considerably increased vehicular trips and started congesting the area. Traffic conditions have worsened despite the fact that several road rehabilitation projects and traffic improvements have been conducted in the last few years. The PT service in the urban area is owned and operated by a private sector, and is composed of buses, mini-buses, and taxis. The internal roads are generally narrow and congested especially in the CBD area and the vicinity. Buses, currently play a relatively minor role in the provision of PT; mini-buses and taxis are the predominant forms. They do not operate on a schedule; the drivers decide when to leave the terminal based on their experience of demand. The Public transport networks are deficient, transport infrastructure is insufficient, and there are increasing congestion and mobility issues. An integrated traffic and transportation plan was created for the urban

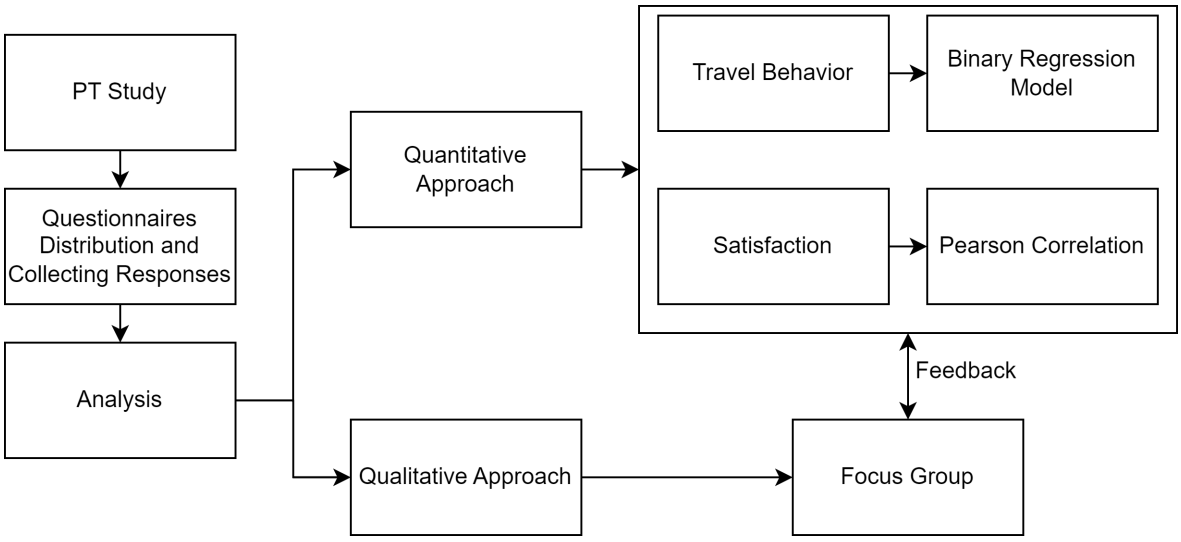

Fig. 1 The methodology

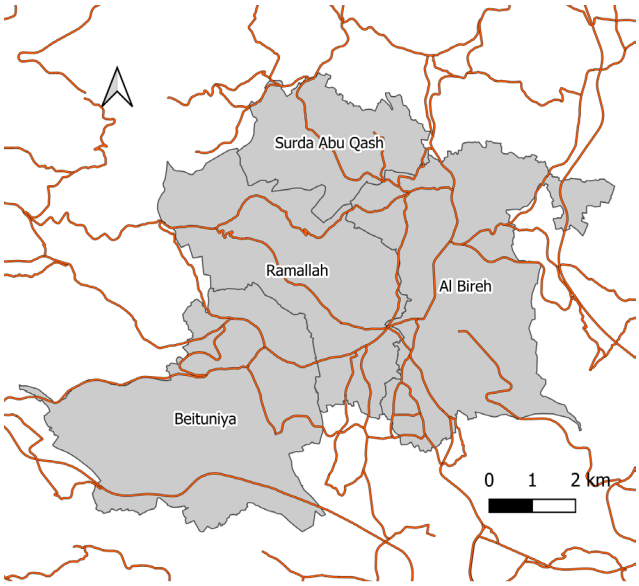

Fig. 2 Existing main roads network in Ramallah urban area

area. It focused on growth orientation and future land-uses between districts, with some policies regarding infrastructure, and recommended studying the public transport issues (CAPSUS, 2019).

3.1 Questionnaire and data

A total of 861 passengers (approximately 1% of 93,000 daily users) were involved in the survey using a paper questionnaire that has been conducted at 7 PT stations for 4 typical workdays during the morning peak period. This is consistent with the simplified formula (Munira and Santoso, 2017) to get a representative sample size of the population. Hence, when the precision level = ±5%, confidence level = 95%, and p = 0.05, the minimum desired sample size is 398. Focus groups were involved for more verification and better accuracy.

The respondents cover the majority of the PT lines and their geographic distribution. Half of the respondents have medium income, while the rest are distributed over low and high-income categories. Most of the trips (73%) are longer than 30 minutes. The main trip purpose is work-based followed by education, and the majority of trips included transfers between origins and destinations; only 10% are direct trips. The locational distribution of trips is 87:13 between rural and urban trips, respectively. Fig. 3 shows the relevant variables obtained with their percentages.

3.2 Binary regression model

For conducting a binary logistic regression, there are several requirements that need to be fulfilled, these are:

- Data are either nominal or continuous.
  Check: All variables of trip purposes, trip time, income, gender, number of transfers, and area are nominal.
- There is no correlation between the variables (no multi-collinearity).
  Check: Two tests were examined. The first one is the variance inflation factor (VIF). All VIF values were between 1 and 10, which is acceptable (Singh and

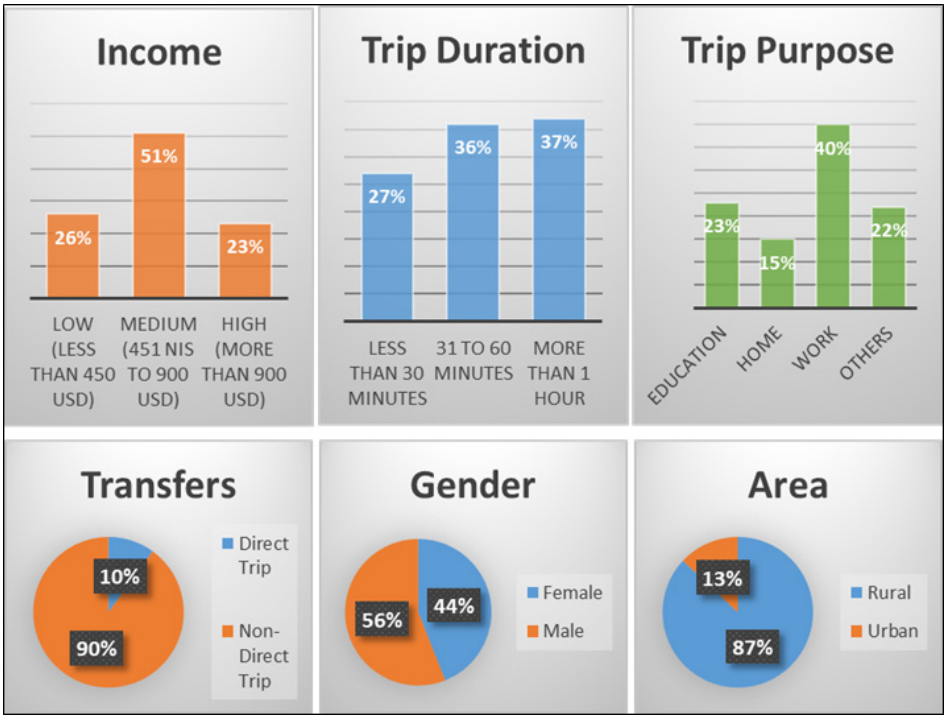

Fig. 3 Public transportation users' study variables

Kumar, 2021). The second one is a correlation matrix. All variables are weakly correlated; (Pearson's correlation is less than 0.3 in all cases).

- Number of cases per independent variable should be at least 15.
  Check: The lowest number of cases is 83; direct trips.
- There are no significant outliers to minimize the impact on regression.
  Check: The study uses case-wise diagnostics test. The standardized residuals are less than ±2.0.

After checking that data meets all the requirements and assumptions, the binary regression model is generated. The binary logistic regression allows for a relationship to be modelled between multiple independent variables and a single dependent variable (Tang et al., 2020).

3.3 Pearson correlation

This test is conducted to find the correlation between the commuters' rating and the overall rating for the PT service. The most correlated relationship between the attribute and overall rating is the top ranked factor that has an effect on the satisfaction.

The Pearson correlation coefficient's magnitude determines the correlation's strength. Although there are no hard-and-fast criteria for allocating strength of connection to certain variables, there are some broad principles provided by (Cohen, 1988). If the coefficient value $|r|$ is between 0.1 and 0.3, then it is a weak correlation, while between 0.3 and 0.5, then it is a moderate correlation, and finally, if it is higher than 0.5, then it is a strong correlation.

4 Results and discussion

4.1 Travel characteristics and behavior

There are two main types of outputs:

1. discover which of the factors have a statistically significant effect on the regularity of using PT service, and
2. determine how well the model predicts each group.

SPSS is used to generate the results.

4.1.1 Model fit

Hosmer and Lemeshow test and Omnibus tests of Model Coefficients are used to evaluate the competence of the model (Table 1). The model is statistically significant ($p > 0.005$ and $p < 0.005$, respectively). Both are based on the Chi-square test to check whether categorical variables are statistically associated.

Table 1 Significance of model

	Sig
Hosmer and Lemeshow test	0.139
Omnibus tests of model coefficients	0.000

Nagelkerke *R*-Square was used to calculate variation. This value is referred sometimes to as the pseudo R^2 value. In the model, the variation of irregularity probability is 14.5%. Compared to the wider literature that used pseudo R^2, the research model has an accepted value. For example, some models described the variation as less than 3% (The International Multiple Sclerosis Genetics Consortium (IMSGC), 2010) while others explained with a range from 7.3% to 21% in a relevant study (Böcker et al., 2017). The severity of bikers' injuries estimated the model by 10% (Jaber et al., 2021), while traffic accidents research estimated the model of cycling severity with a range between 2% and 9% (Green et al., 2016).

The number of correct predictions was calculated (Table 2). The rates of correct predictions were 55.2% and 78.8% of owning cars or not, respectively. The overall correctness was 73.9%, which indicated that the model predicts an acceptable percentage.

4.1.2 Variables

Table 3 shows the contribution of each independent variable to the model and its statistical significance. However, using the odds ratios of each of the independent variables allows for understanding the change in the odds ratio for each increase in one unit of the independent variable.

From these results, all variables are significant as $p < 0.05$. The *b* coefficients are used in the equation to predict the probability of irregularity. It is found that rural areas are attracting occasional users by nearly 64% more than regular users. The focus group emphasized that inhabitants living in towns and villages are highly dependent on their own cars. This is due to the weak PT accessibility in rural areas. The ratio is consistent with the National Census indication of 63% of population living in rural areas (PCBS, 2020). Regarding gender, male passengers are 36% more than females regarding the irregular use of PT. The meaning is that there are more male commuters

Table 2 Effectiveness of category prediction

Observed car ownership	Percentage correct
No	78.8
Yes	55.2
Overall percentage (PAC)	73.9

Table 3 Contribution of the independent variables in the model

		b	Sig.	Exp(*B*)
Area	Rural	0.497	0.020	1.644
Gender	Male	0.305	0.099	1.357
Trip time	Less than 30 minutes		0.001	
	31 to 60 minutes	−0.672	0.003	0.511
	More than 1 hour	−0.658	0.001	0.518
Trip purpose	Education		0.035	
	Home	−0.494	0.051	0.610
	Work	−0.704	0.017	0.495
	Others	−0.481	0.044	0.618
Income	Low		0.000	
	Medium	−1.467	0.000	0.231
	High	−0.641	0.001	0.527
Transfers	Non-direct trip	0.500	0.064	1.648

who own cars but use public transportation than females. The gender-mixed focus group argued about the differences in gender behavior. One of explained reasons was the size and composition of families. It was agreed that when a household owns a car, then it is more evocative to be used by female members, especially in a small-sized society that care more about privacy.

According to the trip duration, any trip that takes more than 30 minutes is less appealing for occasional users by nearly 49%. It was confirmed by the group that passengers depend on PT in longer trips (mainly for less cost), while short ones are made by private cars or walking. Compared with educational trip purposes, work-based trips are more likable for regular users by 50%, while home-based and other trip purposes are more interesting for regular users by 39%. The educational trip behavior is explained by the low share of students who own cars. Thus, students act as occasional users in PT more than other users. This was reiterated through the focus group sessions.

Passengers with medium or high-income levels are less likely to be occasional users by 77% and 47%, respectively. As income is related to car ownership usually, people who are in a low-income group depend more on PT. Finally, users without own car are more frequent in trips with transfers by 65%. It is known that transfers make people prefer using their own cars. However, in this case, users are captive because they do not have other options. The focus group added that the main reason behind this is parking, which forms a big concern for people who own cars. The core of Ramallah urban area, where all PT stations are located, lacks appropriate parking facilities either in distribution or availability.

The overall results obtained in this section revealed that there is a clear difference between regular and occasional PT users. The focus group as well as the PT operators and managers confirmed that the nature of the local society (culture), population, and economic situation have relevance to PT dependency and car ownership.

4.1.3 Equation

The general equation of a binary model is shown in Eq. (1). It is used to find the probabilities of irregularity, with different categories of independent variables. Any combination of the variables could be elaborated to find the probability of irregularity in using PT.

$$P = \frac{\exp\left(\sum_{i=1}^{n} b_i x_i\right)}{1+\exp\left(\sum_{i=1}^{n} b_i x_i\right)} \tag{1}$$

Where, P is the probability of irregularity, b_1 to b_n are the coefficients from the first column in Table 3, and x_1 to x_n are binary expressions of 0 and 1 for the existence of the independent variables. The results of the model are shown in Eq. (2). Noting that there is no b_0 because it is not significant.

$$\begin{aligned}
&\sum_{i=1}^{n} b_i x_i = 0.497x_1 + 0.305x_2 - 0.672x_3 - 0.658x_4 - 0.494x_5 \\
&-0.704x_6 - 0.481x_7 - 1.467x_8 - 0.641x_9 + 0.5x_{10} \\
&x_1\{0,1\}: \text{Rural area} \\
&x_2\{0,1\}: \text{Male} \\
&x_3\{0,1\}: \text{Trip duration between 31 and 60 minutes} \\
&x_4\{0,1\}: \text{Trip duration more than 60 minutes} \\
&x_5\{0,1\}: \text{Home-based trip} \\
&x_6\{0,1\}: \text{Work-based trip} \\
&x_7\{0,1\}: \text{Other purpose trips} \\
&x_8\{0,1\}: \text{Medium income} \\
&x_9\{0,1\}: \text{High income} \\
&x_{10}\{0,1\}: \text{Non-direct trips}
\end{aligned} \tag{2}$$

Considering base conditions (urban area, female commuter, trip duration less than 30 minutes, educational trip, low income, and direct trip), p is equal to 50%. However, the probability of irregularity reaches 78.6% in extreme conditions (rural areas, male commuter, and non-direct trips).

In summary; the typical occasional PT user's characteristics are low-income males, with educational trip purposes, for a trip time that is less than 30 minutes to rural areas.

4.2 Satisfaction and ranking factors

The average values of passengers' evaluation for the PT service somehow indicate their satisfaction level. All the evaluations are above average as shown in Fig. 4 (1: low, 2: average, and 3 high). Occasional users' perspective is higher than regular users. While there are several close service factors between both groups, it is found that travel time, driver's behavior, crowdedness, cost, and waiting time evaluations (in that order) are variated between the occasional and regular users.

Beyond running Pearson's correlation test, it is found that all the relations between service factors and overall rating are significant ($p < 0.09$), as shown in Table 4. The strength of correlations varied between strong (in green) and weak (in red). For occasional users, time and cost are the strongest correlated factors with overall rating, while comfort, safety, and security are the weakest. On the opposite, regular users care more about cleanliness, safety, and comfort in the PT vehicle.

In a brainstorming session with the focus group, the participants divided the factors into two classifications. The first one was called "Trip Attributes" and the other was "Vehicle Attributes". The group made a point that occasional commuters are interested more in the trip features as they use PT for a specific reason. On the other hand, regular users are interested more in the PT vehicle and other commuters' behavior, due to daily interaction with these characteristics.

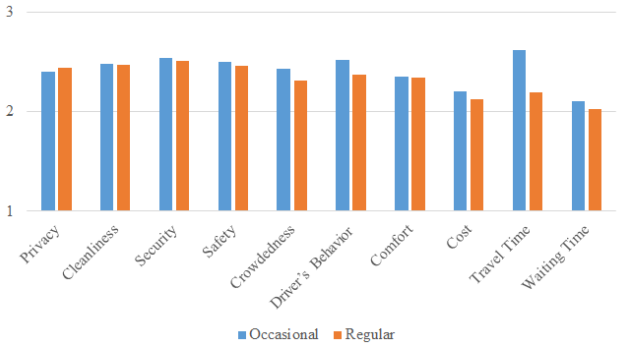

Fig. 4 Evaluation of PT service (1: low, 2: average, and 3 high)

Table 4 Significance and correlation of attributes

Occasional	|r|	Sig	Regular	|r|	Sig
Waiting time	0.51	0.000	Cleanliness	0.643	0.000
Trip cost	0.433	0.000	Safety	0.596	0.000
Trip time	0.410	0.000	Comfort	0.566	0.000
Privacy	0.363	0.000	Privacy	0.514	0.000
Driver behavior	0.328	0.002	Personal security	0.455	0.000
Cleanliness	0.302	0.006	Trip cost	0.420	0.000
Comfort	0.254	0.038	Trip time	0.419	0.000
Crowdedness	0.244	0.053	Waiting time	0.364	0.000
Safety	0.227	0.083	Crowdedness	0.309	0.000
Personal security	0.183	0.085	Driver behavior	0.166	0.088

5 Conclusions

The study revealed the PT users' behavior and attitudes in a small-sized community in Palestine, which is envisioned as typical for developing countries with similar natures and characteristics. Field data collection and focus group discussions were used to examine and understand the behavior and attitudes. The factors affecting the irregularity of PT users were analyzed based on a car ownership index. Probabilities of irregularity are higher in the case of rural areas, male commuters, short trips, educational purposes, low-income groups, and non-direct trips. The nature of society and its culture, population, and economic situation have relevance to PT dependency and car ownership. All PT factors are evaluated above average for both occasional and regular users, which is an indication of satisfying service. The most important factors in PT service for occasional users are waiting time, trip cost, and trip duration. While it is the opposite for regular users, as they pay more attention to cleanliness, safety, and comfort. The main limitation of the study is that the participants were only PT users, and others were neglected. This does not affect the results as we are focusing on their daily behavior. Future research could investigate other users and their connections to PT systems.

To achieve sustainable development, successful transportation management and planning are required through several policy implications. More attention should be paid to public transportation lines that serve educational zones such as scheduling. Accessibility of PT in rural areas is obviously needed. In a more practical way; operators are required to provide more PT lines in educational zones by studying the peak hours mainly to schedule the headways. Also, to provide more PT vehicles to reach the non-served locations in the rural areas. For future research, we aim to study the gender differences in using public transportation services and travel behavior.

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References

Abenoza, R. F., Cats, O., Susilo, Y. O. (2017) "Travel satisfaction with public transport: Determinants, user classes, regional disparities and their evolution", Transportation Research Part A: Policy and Practice, 95, pp. 64–84. https://doi.org/10.1016/j.tra.2016.11.011

Abou-Korin, A. A. (2014) "Small-size urban settlements: Proposed approach for managing urban future in developing countries of increasing technological capabilities, the case of Egypt", Ain Shams Engineering Journal, 5(2), pp. 377–390. https://doi.org/10.1016/j.asej.2013.12.001

Aidoo, E. N., Agyemang, W., Monkah, J. E., Afukaar, F. K. (2013) "Passenger's Satisfaction with Public Bus Transport Services in Ghana: A Case Study of Kumasi-Accra Route", Theoretical and Empirical Researches in Urban Management, 8(2), pp. 33–44.

Badami, M. G., Haider, M. (2007) "An analysis of public bus transit performance in Indian cities", Transportation Research Part A: Policy and Practice, 41(10), pp. 961–981. https://doi.org/10.1016/j.tra.2007.06.002

Böcker, L., van Amen, P., Helbich, M. (2017) "Elderly travel frequencies and transport mode choices in Greater Rotterdam, the Netherlands", Transportation, 44(4), pp. 831–852. https://doi.org/10.1007/s11116-016-9680-z

Broderick, A. (2018) "The Future of Rural Transportation and Mobility for Older Adults: Current Trends and Future Directions in Technology-enabled Solutions", CITRIS and the Banatao Institute, Berkeley/Davis/Merced/Santa Cruz, CA, USA, Grantmakers In Aging (GIA), White Plains, NY, USA.

CAPSUS (2019) "Palestine: Assessing alternatives for comprehensive Master Plans at metropolitan scale", [online] Available at: https://www.urbanperformance.in/case-studies/palestine [Accessed: 15 December 2021]

Cavana, R. Y., Corbett, L. M., Lo, Y. L. (G.) (2007) "Developing zones of tolerance for managing passenger rail service quality", International Journal of Quality & Reliability Management, 24(1), pp. 7–31. https://doi.org/10.1108/02656710710720303

Cohen, J. (1988) "Statistical Power Analysis for the Behavioral Sciences", 2nd ed., Psychology Press. ISBN 9780805802832

del Castillo, J. M., Benitez, F. G. (2013) "Determining a public transport satisfaction index from user surveys", Transportmetrica A: Transport Science, 9(8), pp. 713–741. https://doi.org/10.1080/18128602.2011.654139

dell'Olio, L., Ibeas, A., Cecin, P. (2011) "The quality of service desired by public transport users", Transport Policy, 18(1), pp. 217–227. https://doi.org/10.1016/j.tranpol.2010.08.005

Demaidi, M. N., Al-Sahili, K. (2021) "Integrating SDGs in Higher Education—Case of Climate Change Awareness and Gender Equality in a Developing Country According to RMEI-TARGET Strategy", Sustainability, 13(6), 3101. https://doi.org/10.3390/su13063101

de Oña, J., Estévez, E., de Oña, R. (2020) "Perception of Public Transport Quality of Service among Regular Private Vehicle Users in Madrid, Spain", Transportation Research Record, 2674(2), pp. 213–224. https://doi.org/10.1177/0361198120907095

de Oña, J., Estévez, E., de Oña, R. (2021) "Public transport users versus private vehicle users: Differences about quality of service, satisfaction and attitudes toward public transport in Madrid (Spain)", Travel Behaviour and Society, 23, pp. 76–85. https://doi.org/10.1016/j.tbs.2020.11.003

de Oña, J. (2021) "Understanding the mediator role of satisfaction in public transport: A cross-country analysis", Transport Policy, 100, pp. 129–149. https://doi.org/10.1016/j.tranpol.2020.09.011

Eboli, L., Mazzulla, G. (2007) "Service Quality Attributes Affecting Customer Satisfaction for Bus Transit", Journal of Public Transportation, 10(3), pp. 21–34. http://doi.org/10.5038/2375-0901.10.3.2

Eluru, N., Chakour, V., El-Geneidy, A. M. (2012) "Travel mode choice and transit route choice behavior in Montreal: insights from McGill University members commute patterns", Public Transport, 4(2), pp. 129–149. https://doi.org/10.1007/S12469-012-0056-2

Fellesson, M., Friman, M. (2008) "Perceived Satisfaction with Public Transport Service in Nine European Cities", Journal of the Transportation Research Forum, 47(3), pp. 93–103. https://doi.org/10.22004/ag.econ.206965

Fonseca, F., Pinto, S., Brito, C. (2010) "Service Quality and Customer Satisfaction in Public Transports", International Journal for Quality Research, 4(2), pp. 125–130.

Földes, D., Csiszár, C. (2018) "Framework for planning the mobility service based on autonomous vehicles", In: 2018 Smart City Symposium Prague (SCSP), Prague, Czech Republic, pp. 1–6. ISBN 978-1-5386-5018-9 http://doi.org/10.1109/SCSP.2018.8402651

Freitas, H., Oliveira, M., Jenkins, M., Popjoy, O. (1998) "The Focus Group, a Qualitative Research Method", ISRC, Merrick School of Business, University of Baltimore, Baltimore, MD, USA, WP ISRC No. 010298.

Giuffrida, N., Pira, M. L., Inturri, G., Ignaccolo, M. (2021) "Addressing the public transport ridership/coverage dilemma in small cities: A spatial approach", Case Studies on Transport Policy, 9(1), pp. 12–21. https://doi.org/10.1016/j.cstp.2020.06.008

Giuliano, G. (2005) "Low Income, Public Transit, and Mobility", Transportation Research Record: Journal of the Transportation Research Board, 1927(1), pp. 63–70. https://doi.org/10.1177/0361198105192700108

Green, C. P., Heywood, J. S., Navarro, M. (2016) "Traffic accidents and the London congestion charge", Journal of Public Economics, 133, pp. 11–22. https://doi.org/10.1016/j.jpubeco.2015.10.005

Jaber, A., Baker, L. A., Csonka, B. (2022) "The Influence of Public Transportation Stops on Bike-Sharing Destination Trips: Spatial Analysis of Budapest City", Future Transportation, 2(3), pp. 688–697. https://doi.org/10.3390/futuretransp2030038

Jaber, A., Juhász, J., Csonka, B. (2021) "An Analysis of Factors Affecting the Severity of Cycling Crashes Using Binary Regression Model", Sustainability, 13(12), 6945. https://doi.org/10.3390/su13126945

Kuhnimhof, T., Chlond, B., Von Der Ruhren, S. (2006) "Users of Transport Modes and Multimodal Travel Behavior: Steps Toward Understanding Travelers' Options and Choices", Transportation Research Record: Journal of the Transportation Research Board, 1985(1), pp. 40–48. https://doi.org/10.1177/0361198106198500105

Litman, T., Hughes-Cromwick, M. (2017) "Public Transportation's Impact on Rural and Small Towns: A Vital Mobility Link", American Public Transportation Association (APTA), Washington, DC, USA.

Lunke, E. B. (2020) "Commuters' satisfaction with public transport", Journal of Transport & Health, 16, 100842. https://doi.org/10.1016/j.jth.2020.100842

Munira, S., Santoso, D. S. (2017) "Examining public perception over outcome indicators of sustainable urban transport in Dhaka city", Case Studies on Transport Policy, 5(2), pp. 169–178. https://doi.org/10.1016/j.cstp.2017.03.011

OECD (2016) "OECD Regions at a Glance 2016", OECD Publishing, Paris, France. https://doi.org/10.1787/reg_glance-2016-en

Olsen, S. O. (2007) "Repurchase loyalty: The role of involvement and satisfaction", Psychology & Marketing, 24(4), pp. 315–341. https://doi.org/10.1002/MAR.20163

Ortega-Tong, M. A. (2013) "Classification of London's Public Transport Users Using Smart Card Data", MSc Thesis, Massachusetts Institute of Technology.

PCBS (2020) "Transportation and Communications Statistics in Palestine – Annual Report 2019", Palestinian Central Bureau of Statistics (PCBS), Ramallah, Palestine, Rep. 2530.

Putra, A. A., Jinca, M. Y., Riyanto, B., Mulyono, A. T. (2014) "The Satisfaction Analysis for the Performance of Public Transport Urban Areas", International Refereed Journal of Engineering and Science (IRJES), 3(8), pp. 38–44.

Samanci, S., Atalay, K. D., Bahar Isin, F. (2021) "Focusing on the big picture while observing the concerns of both managers and passengers in the post-covid era", Journal of Air Transport Management, 90, 101970. https://doi.org/10.1016/j.jairtraman.2020.101970

Singh, S. G., Kumar, S. V. (2021) "Dealing with Multicollinearity Problem in Analysis of Side Friction Characteristics Under Urban Heterogeneous Traffic Conditions", Arabian Journal for Science and Engineering, 46(11), pp. 10739–10755. https://doi.org/10.1007/s13369-020-05213-y

Soza-Parra, J., Raveau, S., Muñoz, J. C., Cats, O. (2019) "The underlying effect of public transport reliability on users' satisfaction", Transportation Research Part A: Policy and Practice, 126, pp. 83–93. https://doi.org/10.1016/j.tra.2019.06.004

Sukhov, A., Lättman, K., Olsson, L. E., Friman, M., Fujii, S. (2021) "Assessing travel satisfaction in public transport: A configurational approach", Transportation Research Part D: Transport and Environment, 93, 102732. https://doi.org/10.1016/j.trd.2021.102732

Tang, T., Wang, H., Ma, J., Zhou, X. (2020) "Analysis of Crossing Behavior and Violations of Electric Bikers at Signalized Intersections", Journal of Advanced Transportation, 2020, 3594963. https://doi.org/10.1155/2020/3594963

The International Multiple Sclerosis Genetics Consortium (IMSGC) (2010) "Evidence for Polygenic Susceptibility to Multiple Sclerosis—The Shape of Things to Come", The American Journal of Human Genetics (AJHG), 86(4), pp. 621–625. https://doi.org/10.1016/j.ajhg.2010.02.027

United Nations, Department of Economic and Social Affairs, Population Division (2019) "World Urbanization Prospects: The 2018 Revision", United Nations, New York, NY, USA, Rep. ST/ESA/SER.A/420.

Vicente, P., Reis, E. (2016) "Profiling public transport users through perceptions about public transport providers and satisfaction with the public transport service", Public Transport, 8(3), pp. 387–403. https://doi.org/10.1007/s12469-016-0141-z

Wojuade, C. A., Badiora, A. I. (2017) "Users' Satisfaction with Public Transport Operations in Ibadan, Nigeria", The Journal of Social Sciences Research, 3(9), pp. 88–96.