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Databases: Ebsco, Google scholar, Researchgate, Science direct, Springer link, Tandfonline, Transportation agencies, TRB, Wiley online,

Search Terms: Behavioural intention, Bus frequency, Bus journey experience, bus network, Bus optimisation, Bus patronage, bus reliability, bus stopping pattern, bus timetable, bus, case study, Customer benchmarking, Customer impact, customer outcomes, Data61, Finland, Germany, Helsinki, Implementing adjustments, Measure, network optimisation, Passenger assessment, Passenger behaviour, Passenger impact, Passenger intentions, Passenger opinion, Passenger perception, Passenger perspectives, Passenger satisfaction, planning tools, priority / prioritisation, Public transport optimisation, public transport, Satisfaction, service quality, Testing adjustments, train, transport planning tools, transport policy, User perception, Waiting time.

1. ‘Daily Drags’ and ‘Wannabe Walkers’ – Identifying dissatisfied public transport users who might travel more actively and sustainably
   Bösehans, Gustav; Walker, Ian
   This paper sought better to understand the motives and experiences of bus users, with a view to identifying subgroups who might be persuaded to use healthier and more sustainable modes. Student and staff bus users of a middle-sized university in the UK participated in an online survey, indicating their agreement with a series of statements about local bus services. These statements were combined into independent factors using principal component analysis. Then, using cluster analysis, respondents were split into different types of bus users. The analysis suggested six distinct types, four of which broadly support the captive versus choice user distinction made in earlier studies and two of which were novel. The findings are discussed in relation to previous research and implications for public transport operators and promoters of active travel are outlined. Specifically, the current research suggests that two subgroups of bus users, together accounting for around 41% of this sample, may quite easily be persuaded to travel actively; the other groups, more committed to buses, might have their journeys improved if public transport operators address their concerns. Future research may address the generalisability of the proposed cluster solution and test its applicability in applied settings. (Ebsco)

2. Analysis of satisfaction factors at urban transport interchanges: Measuring travellers’ attitudes to information, security and waiting
   Lois, David; Monzón, Andrés; Hernández, Sara
   Transport Policy online, 2017, pp. 1-8
   Transport interchanges can be seen as nodes where people transfer from one mode to another, and also as a place to stay and use facilities, services and waiting areas. Reducing transfer disruption in multimodal trips is a key element for ensuring seamless mobility in big cities. Based on previous research (Hernández and Monzón, 2016), this paper aims to explore how attitudes towards several service factors can predict general satisfaction with a transport interchange. It also analyses how personal and trip characteristics
affect the evaluation of some variables, and examine the relationship between waiting time and perceived quality. A two-step methodology (personal and online interview) was applied to a representative sample of 740 users (54% female, 55% travelling for work purposes). The model was tested with path analysis and showed a satisfactory statistical fit. The model performed well when predicting general satisfaction with the Moncloa transport interchange (Madrid, Spain). The outputs indicate that Information and Safety and Security factors predicted 49% of general satisfaction. The results also revealed a strong association between Design and Environmental quality, although these factors do not affect general satisfaction directly, but through the perception of Information and Safety & Security, which act as mediator variables. Time spent queuing inside the interchange is negatively correlated with Information and Safety & Security, while the age of participants negatively affects Information, indicating that older individuals have some cognitive problems with accessibility. Our data shows gender differences in safety perception, since women (particularly younger women) feel less safe inside the interchange. The results point to a number of priority measures to enhance the perceived quality and efficiency of interchanges. (Science Direct)

3. Assessing Passengers’ Satisfaction Level on Bus Services in Selected Urban and Rural Centres of Peninsular Malaysia
Ponrahono, Zakiah; Bachok, Syahriah; Ibrahim, Mansor; Osman, Mariana Mohamed
Procedia - Social and Behavioral Sciences, 2016, Vol. 222, pp. 837-844
This research highlights the urban-rural bus services passenger's satisfaction level in the selected settlements in Peninsular Malaysia. Johor is to represent the southern states while Penang is to represent the northern states. For eastern-coast states, Pahang is selected while Perak is to represent a still developing state, which is yet to reach the advanced level of large conurbations. The main objectives are to evaluate the bus service quality through passengers' satisfaction survey. A total of 1130 survey questionnaire forms are collected. The result shows socio-demographic and trip characteristics influenced the satisfaction level and passengers’ expectation of future bus services improvements. (Elsevier) https://ac.els-cdn.com/S1877042816302580/1-s2.0-S1877042816302580-main.pdf?_tid=3e0bb95-6596-4c47-a6cd-d27d2751b65d&acdnat=1525411310_27108480327d163b885e7a50efa68675

4. Assessment of Passenger Satisfaction with Public Bus Transport Services: A Case Study of Lucknow City (India)
Singh, Sanjay
The main aim of this study is threefold. First, it tries to assess the passenger satisfaction with public bus transport services in the city of Lucknow in India. Second, it tries to examine the service quality attributes that influence the passenger satisfaction. Third, it tries to evaluate the relative importance of service quality attributes to find out the priority for service quality improvements to enhance passenger satisfaction. The study is based on a survey of objective as well as subjective questions conducted between May and July 2014. Five major bus stops of Lucknow were selected for the survey. Total 148 respondents were randomly selected to elicit their overall satisfaction and factors that influence their satisfaction in the use of public bus transport services in Lucknow using a self-rated questionnaire. The collected sample of responses is subjected to principal component analysis, a statistical technique for dimensionality reduction of the dataset, and descriptive analysis. The result of these analyses shows that passengers are mostly dissatisfied with public bus transport services in Lucknow. Using principal component analysis, five underlying factors were extracted that influenced passenger satisfaction with public bus transport services in the city. Out of these five factors, comfort and safety has the greatest impact on overall satisfaction, followed by the adequacy of capacity of public bus transport services, orderly and clean environment inside buses, elegant design of buses and bus stops, and accessibility to public bus transport services in the city. The study thus provides a direction for public bus transport administration in the city to understand the gaps that exist and try to fill them to improve its services so that passenger satisfaction can be enhanced and consequently more people can be attracted towards public bus transport.

5. Considering passenger choices and overtaking in the bus bunching problem
Sun, Wenzhe; Schmöcker, Jan-Dirk
Bus bunching is a well-known phenomenon on many bus routes where an initial delay to one service can disturb the whole schedule due to resulting differences in dwell times of subsequent buses at stops. This
paper deals with the passenger behaviour when there is more than one bus serving the stop, focusing on their choices and possible switching actions from the queue of the bus they are waiting to board. A parameter $\gamma$ is introduced to denote the percentage of passengers boarding the front bus of two buses boarding at the same time. Cases when overtaking is allowed or not are distinguished as this will also influence the passenger behaviour. A set of discrete state equations is then implemented to obtain the departure times of the buses following the occurrence of an exogenous delay to one of the buses. Evaluation indices are introduced to measure the performance of the bus service along a corridor under different $\gamma$ levels. We show that it is advantageous to keep the percentage of passengers boarding the front bus low. Beside, overtaking is a favourable counter-measure against comparatively high front-bus preference. (Tandfonline) https://www.tandfonline.com/doi/abs/10.1080/21680566.2017.1387876?journalCode=ttrb20

6. Customer Power: Doing Business on Customer’s Terms (editor Peter Fisk)
This chapter describes customer power and doing business on customer’s terms. Customers are real people with a diversity of motivations and aspirations. However, before jumping into the customer world, it is useful to focus the effort on the customers who are likely to be most relevant and ultimately most valuable to us. This chapter further looks at customer perspective and customer-centered business, putting customer thinking into practice in terms of ideas generation or even a service culture. It can affect every aspect of one’s business. ‘Outside in’ rather than ‘inside out’ thinking starts with opportunities rather than capabilities – finding the best markets, then developing the capabilities to win in them; finding the best customers, then bringing together the right products and solutions that enables to achieve their goals. (Wiley onlinelibrary) https://onlinelibrary.wiley.com/doi/10.1002/9780857086556.ch7

7. Customer satisfaction research (Qld Queensland Public Transport Customer Satisfaction Research Program)

8. Customer satisfaction survey (Sweden) HSL : HSL to survey public transport customer satisfaction and conduct fleet quality controls
Customer satisfaction survey in spring 2018. HSL conducts surveys on public transport to measure passenger satisfaction with public transport services in the HSL area. By responding to the survey, you help us improve our services. The survey results are used for public transport development, staff training and calculating quality incentives for tendered services. The results will be available in HSL’s open online database at https://hsl.louhin.com/asty/ In spring 2018, we will be surveying customer satisfaction on buses, trams, the Metro and commuter trains from 15 January to 18 May. The goal is to obtain responses from 28,000 passengers. https://www.hsl.fi/en/news/2018/hsl-survey-public-transport-customer-satisfaction-and-conduct-fleet-quality-controls-14232

9. Customer satisfaction survey OV Customer Barometer (Netherlands)
The public transport customer barometer is the customer satisfaction survey for city and regional transport. All carriers and all lines are participating. From Zeeland to Groningen and from Limburg to North Holland. In the months of November and December, interviewers travel across the country to conduct questionnaires among travelers in the bus, train, tram, regional train and boat. The research has been conducted since 2001. The OV Customer Barometer will be carried out by I & O Research in the period 2012-2017. In the period from late October to mid-December 2017, customer appreciation was measured in 70 research areas. The research areas largely correspond to the concession areas and the line concessions and contracts. Because the questions are the same everywhere, the results between areas can be compared. The commissioning authorities can adjust their policy on the basis of the results and the transport companies can perform their performance on the street. The public transport customer barometer, with almost 90,000 passenger opinions, is the largest research in public transport. The fact that research is conducted in the same way across the country is unique in Europe. The reports with results from the 2017 survey per public transport authority and per carrier can be found on this website under
LITERATURE REVIEW

10. Determination of level-of-service scale values for quantitative bus transit service attributes based on user perception

Das, Shreya; Pandit, Debapratim

The need to assess service quality of existing transportation systems based on users’ perceptions has received increased attention in recent years. In this context, researchers have identified level of service (LOS) as an effective tool to measure users’ perceptions of service quality on a linguistic scale ranging from LOS A to LOS F which denote ‘best’ to ‘worst’ levels of service according to users’ perceptions. However, contrary to the definition of LOS that requires it to be measured based on user perception, the existing LOS benchmarks available for public transportation are based on expert judgment. This research attempts to develop LOS benchmarks for bus transit services based on user perception using the ‘Law of Successive Interval Scaling’ which converts an ordered categorical scale into an interval scale. The results obtained through this analysis for the city of Kolkata, India, highlight the difference in LOS scale values between developed and developing nations and between expert opinion and user perception.


11. Drivers of customer satisfaction with public transport services

Mouwen, Arnoud

Highlights: In Dutch PT the same performance is perceived differently by different user segments. / Attributes on-time performance, travel speed and service frequency are very important. / Characteristics urbanization, NSSEs, age and PT mode-choice have significant impact. / Gender, PT trip frequency, trip motive and car availability are less influential.

This paper aims to improve the understanding of the drivers of customer satisfaction with public transport (PT). The methodology provides a relevant contribution to the previous studies since it highlights the complex interaction between the level and composition of satisfaction, negative social safety experiences (NSSEs), urban settings, and the PT mode used. Overall, PT users see the service attributes on-time performance, travel speed, and service frequency as the most important, followed by personnel/driver behaviour and vehicle tidiness. A generic policy aimed at achieving these attributes may yield favourable results with respect to satisfaction. Further, we demonstrate the influence of differences in customer characteristics on satisfaction. A policy aimed at increasing the service frequency and putting new vehicles into operation will probably lead specifically to more satisfied older people (>65), passengers travelling by regional train, and people living in dense urban areas. These findings may be of help to PTAs intending to exert an influence on the actions of PT operators, for instance by using them as a measuring rod in incentive contracts. (Science direct) https://www.sciencedirect.com/science/article/pii/S0965856415001251

12. Effect of Price Reduction and Increased Service Frequency on Public Transport Travel

Brechan, Inge

A random effects meta-analysis of the results from 15 projects involving price reduction and 9 projects involving increased service frequency showed that both price reduction and increased service frequency generated public transport travels. On average, the increased service frequency projects generated more travels by public transport than the price reduction projects. In the increased service frequency projects the proportion of travels generated by the increased frequency was strongly influenced by the size of the frequency increase. In the price reduction projects, we did not find a significant effect of the size of the price reduction on the proportion of travels generated by the price reduction. Finding that people’s use of public transport was related to the extent of the service offered suggests they have a need for transport that can be fulfilled with public transport. Although people appreciate lower fares in general, finding that use of public transport was not significantly related to the size of a price change suggests the effect of price change is uncertain.

http://scholarcommons.usf.edu/ Journal of Public Transportation/vol20/iss1/8/
13. Elderly users’ level of satisfaction with public transport services in a high-density and transit-oriented city
Wong, RCP; Szeto, WY; Yang, Linchuan; Li, YC; Wong, SC
Ageing populations are becoming common in many cities, and their rapid growth may lead to serious transportation issues when elderly users' mobility is compromised by their inability to access or use public transport. It is of paramount importance to provide good public transport services to the elderly to maintain their quality of lives. An interviewer-administered face-to-face interview survey was conducted in March 2015 in Hong Kong, an example of a high-density and transit-oriented city, among elderly residents aged 60 and above to evaluate their level of satisfaction with various public transport modes. In this paper, an ordered probit model is calibrated to evaluate the relative importance of the quality of nine service aspects to the overall service performance. An importance-satisfaction analysis is conducted to visualize how best to prioritize actions for improving each of the nine service aspects. The findings reveal that the interviewed elderly individuals considered seat availability as the worst performed service aspect, with which 17.8% of them were dissatisfied or very dissatisfied. The condition of stations or stops is identified as the most influential factor affecting the overall satisfaction level with public transport services. These two service aspects hold the top priority for enhancement. The drivers' attitude is suggested to be improved additionally if resources allow. For better public transport services to the elderly and thus enhancing their mobility to more actively participate in social activities, appropriate training and guidance to public transport drivers are recommended to enhance their awareness of driving behavior and attitude; provision of seats and shelters is recommended at the bus stops typically frequented by the elderly; and the culture of offering seats to the needy should be promoted through education. (Ebsco)

14. Evaluating the impacts and benefits of public transport design and operational measures
Fadaei, Masoud; Cats, Oded
Transport Policy, 2016, Vol. 48, pp. 105-116
Highlights: Evaluation framework for the impacts of public transport measures / Quantifying and monetarizing both operators’ and passengers' benefits / Integrates the implications of reliability on operations and travel times / Applied to a field experiment on a trunk bus line in Stockholm.
Design and operational measures are designed and implemented to improve public transport performance and level-of-service. In the case of urban bus systems, priority, operational and control measures are aimed to elevate bus services to buses with high level of service (BHLS). Even though there is an explosive growth in design and operational measures implementation and growing research interest in investigating their impact on performance indicators, there is lack of a systematic evaluation of their benefits. We present an evaluation framework and a detail sequence of steps for quantifying the impacts of public transport design and operational measures. The effects of service performance on travel times and costs are assessed by accounting for relations between reliability and waiting times, crowding and perceived travel times, and vehicle scheduling and operational costs. The evaluation integrates the implications of reliability on generalized passenger travel costs and operational costs. We deploy the proposed evaluation framework to a field experiment in Stockholm where a series of measures were implemented on the busiest bus line. The results suggest that the total passenger and operator benefits amount to 36.8 million Swedish crowns on an annual basis. The overall assessment of the impacts of design and operational measures enables the comparison of different implementations, assess their effectiveness, prioritize alternative measures and provide a sound basis for motivating investments.

15. Examining values and influences affecting public expectations of future urban mobility: A Singapore case study
Kurniawan, Jude Herijadi; Ong, Corinne; Cheah, Lynette
Transport Policy, 2018, Vol. 66, pp. 66-75
This paper presents a qualitative study of two focus group discussions on Singapore's state of current and future urban mobility. The findings of this study, which applied a grounded theory approach of analysis, led to the development of a theoretical framework that displays the dynamic interrelationships between individuals' external and internal influences, and their roles in shaping individuals' travel mode behaviors and future mobility expectations. This framework also shows the complex process by which individuals evoke value negotiations and adjustments before arriving at their desirable choice of travel mode. Coping mechanisms or strategies are also innovated by commuters when the available mobility services are not perceived to meet their value expectations and needs for different commuting purposes. The variables
constituting the external and internal influences of our theoretical model remind us that a “typical” transport user should be ideally considered and defined in light of some fundamental parameters. The findings of this study are expected to benefit policymakers in identifying and navigating potential barriers and drivers of change that could support the formulation of future transport policies and the adoption of transport technologies. (Ebsco) https://www.sciencedirect.com/science/article/pii/S0967070X16305194

16. **Exploring Passenger Assessments of Bus Service Quality Using Bayesian Networks**

Wu, Jingxian; Yang, Min; Rasouli, Soora; Xu, Chengcheng

Studies on public transit have emphasized the role of passenger satisfaction with service quality in travel choice decisions and indicated that satisfaction depends on various service attributes. Few studies have, however, systematically examined the underlying relationships among service attributes to assess their influence on passenger overall satisfaction. Therefore, to contribute to this rapidly-emerging literature, this paper applies Bayesian networks to quantify the influence of each service aspect on passenger overall satisfaction. This analysis involved 609 passengers who participated in a 2013 regular bus service survey in Nanjing, China. The derived Bayesian network shows the relationships among service attributes and passenger overall satisfaction graphically. In particular, service aspects such as running on schedule, acceptable waiting time, available seats, clean onboard environment, pleasant environment at stations, convenient design for transfers, and air-conditioning were the key determinants of overall satisfaction with bus service. (Ebsco) http://scholarcommons.usf.edu/ Journal of Public Transportation/vol19/iss3/3/

17. **Factors of Perceived Waiting Time and Implications on Passengers’ Satisfaction with Waiting Time**

Feng, Shumin; Wu, Haiyue; Sun, Xianglong; Li, Zhenning

In order to explore the influence factors on perceived waiting time, a multiple linear regression model has been used to quantitatively describe the relationship between perceived waiting time and various factors. The model is established with 234 data, which is surveyed with questionnaire at three stops in Harbin, China. The results show that several certain factors (“trip purpose - where to”, “presence of a companion - whether one has a companion or not”, “having a timing device - whether one has a timing device or not”, “riding frequency - how many times one takes one line per week” and “waiting behaviour - what one does while waiting for a bus”) have significant influence on perceived waiting time, which confirms previous findings and supports transferability of results. The significance of “waiting mood – how about the mood while waiting for a bus” and “reserved waiting time - how long one will wait” are confirmed for the first time in this study. In contrast to previous studies, “waiting time interval - for how long in one day” is a negative variable and socioeconomic variables are non-significant. And it is found that the relationship between perceived waiting time and passengers’ satisfaction with the waiting time follows a decreasing exponential distribution. With this model, the variation trend of the section, where passenger satisfaction value is larger than 0 is obviously steeper than the section smaller than 0. Such result proves that passenger mood with short waiting time is more sensitive than with longer waiting time. And the borderline perceived waiting time, distinguishing satisfied from dissatisfied passengers is proven to be 7.87 minutes when assignment interval of satisfaction is (-25.25, [25.25], when satisfaction is positive (larger than 0), the accuracy being 70.30%, while the accuracy is 82.71% for negative satisfaction (less than 0).

http://www.fpz.unizg.hr/traffic/index.php/PROMTT/article/viewFile/1726/1430

18. **Impact of perceptions of bus service performance on mode choice preference**

Hu, Xiaojian; Zhao, Linna; Wang, Wei

As transit service performance should be considered from the transit passengers’ perspectives, it is essential to determine passengers’ perceptions of service performance and to understand the role of these perceptions in travel decisions. As the bus market share has steadily declined, the aim of this study is to explore the impact of perceptions of bus service performance on mode choice preference to increase bus ridership. To achieve this research objective, an intention survey is conducted to obtain bus passengers’ attitudes. Exploratory factor analysis and confirmatory factor analysis are used to measure passengers’ perceptions and to extract the main factors from the bus service attributes. Next, structural equation modeling is used to reveal how passengers’ perceptions vary by demographics and trip characteristics. Finally, multinomial logit modeling is used to explore the impact of perception factors on mode choice preference. The results of this study show that perceptions of the reliability and comfort of bus services
have a more significant impact on passengers’ mode choice preference than perceptions of availability and safety do. The implications in terms of improving bus service reliability and comfort can increase bus ridership. (Sage)

http://journals.sagepub.com/doi/full/10.1177/1687814015573826

19. **Improving predictions of public transport usage during disturbances based on smart card data**

Yap, MD; Nijënstein, S; Oort, N van

Transport Policy, 2018, Vol. 61, pp. 84-95

Highlights: Prediction of public transport ridership in case of disturbances. / Use of observed smart card data from multiple case studies to infer passenger behavior. / Development of a three-step search method to determine a better fitting model parameter set. / New parameter set improves prediction accuracy during planned disturbances up to 13%.

The availability of smart card data from public transport travelling the last decades allows analyzing current and predicting future public transport usage. Public transport models are commonly applied to predict ridership due to structural network changes, using a calibrated parameter set. Predicting the impact of planned disturbances, like temporary track closures, on public transport ridership is however an unexplored area. In the Netherlands, this area becomes increasingly important, given the many track closures operators are confronted with the last and upcoming years. We investigated the passenger impact of four planned disturbances on the public transport network of The Hague, the Netherlands, by comparing predicted and realized public transport ridership using smart card data. A three-step search procedure is applied to find a parameter set resulting in higher prediction accuracy. We found that in-vehicle time in rail-replacing bus services is perceived ≈1.1 times more negatively compared to in-vehicle time perception in the initial tram line. Waiting time for temporary rail-replacement bus services is found to be perceived ≈1.3 times higher, compared to waiting time perception for regular tram and bus services. Besides, passengers do not seem to perceive the theoretical benefit of the usually higher frequency of rail-replacement bus services compared to the frequency of the replaced tram line. For the different case studies, the new parameter set results in 3% up to 13% higher prediction accuracy compared to the default parameter set. It supports public transport operators to better predict the required supply of rail-replacement services and to predict the impact on their revenues. (Ebsco)


20. **In pursuit of the happy transit rider: dissecting satisfaction using daily surveys and tracking data**

Carrel, Andre; Mishalani, Rabi G; Sengupta, Raja; Walker, Joan L


This paper demonstrates the power and value of connecting satisfaction surveys from public transportation passengers to smartphone tracking data and automatic vehicle location (AVL) data. The high resolution of the smartphone location data allows travel times to be dissected into their individual components, and the connection with AVL data provides objective information on personal-level experiences of the respondents. Analyses show how these data can provide a quantitative understanding of the relationship between planned and provisioned service, and customer satisfaction. In-vehicle travel time data from 2,403 trips made by 529 unique participants could be obtained, along with origin wait time data for 779 of the trips and transfer time data for 188 trips. The addition of unreliability to the measurement of travel times, which is enabled by the highly detailed tracking data, shows that the relationship between passenger satisfaction and experienced travel times may be more nuanced than has previously been acknowledged. Ordinal logit model estimation results show a strong sensitivity of passenger satisfaction toward in-vehicle delays, and show that delays on board metro trains are perceived as more onerous than delays on board buses. This study also reveals the importance of obtaining a general measurement of satisfaction with transit service when repeated satisfaction measurements are conducted with respect to individual experiences. A baseline satisfaction level and a variable component as a function of experiences can be observed in the model results. Furthermore, the survey data include a measure of subjective well-being, which is a relatively new element in travel surveys. Insights are presented on the importance of this potential new covariate for future survey designs. (Tandfonline)

https://www.tandfonline.com/doi/full/10.1080/15472450.2016.1149699

21. **Intervention analysis of the impact of opening a new railway line on passenger ridership in Seoul**

Park, Man Sik; Eom, Jin Ki; Heo, Tae-Young; Song, Jiyoung

In this study, using public transport smart card data observed in Seoul, Korea, we provide empirical evidence related to the impact of the opening of a new railway line on passenger demand changes at transfer stations. An intervention time series modeling framework was applied to evaluate the travel demand patterns based upon massive card data collected before and after a new line opened. The results show that the new line opening has had meaningful intervention effects on passenger demand, but significant changes were not observed at all stations. This implies that the trends have been changed structurally and the changes may last for a long time. Consequently, it is found that the new line opening changed the trends of passenger ridership and these changes can be successfully explained by various intervention patterns derived from extensive Automatic Fare Collection (AFC) data. The intervention analysis will provide valuable information to transit agencies to enable them to make better decisions related to transit planning, pricing, and the deployment of new transit services. (Springer) https://link.springer.com/article/10.1007/s12205-015-1190-6

22. Is It Time for a Public Transit Renaissance?: Navigating Travel Behavior, Technology, and Business Model Shifts in a Brave New World
Shaheen, Susan; Cohen, Adam
Travel behavior is undergoing a period of significant change in the United States. In 2016, public transit ridership fell in almost all major U.S. metropolitan regions. While Americans are still heavily dependent on the personal automobile for mobility, technological and societal changes are transforming how mobility is accomplished. This paper reviews the convergence of five trends leading to fundamental changes in public transportation: (1) changing generational behavior toward suburbanization and automobility; (2) new attitudes toward information communications technology; (3) shifting attitudes toward sharing and mobility on demand; (4) innovative alternatives to work and non-work travel; and (5) an increasing number of on-demand flexible route transportation options. The paper concludes with recommendations and guiding principles for public agencies to consider in responding to these trends. (Ebsco) http://scholarcommons.usf.edu/Journal_of_Public_Transportation/vol21/iss1/8/

23. Measuring Passenger Loyalty to Public Transport Modes
Shiftan, Yoram; Barlach, Yotam; Shefer, Daniel
This paper incorporates insights from relevant consumer behavior research in marketing to travel mode choice by adopting the loyalty model, a decision-making model, to better understand and evaluate passenger attitudes toward public transport modes. This paper describes the loyalty model and demonstrates and validates its use in transportation using a case study of a choice between two modes, rail and bus. Based on factor analysis, two factors from the loyalty model were identified: loyalty, which measures the repeat purchase of the service and the passenger’s attitude toward it; and hedonic commitment, which measures the emotional feeling after using a mode. The full loyalty model was validated for both rail and bus passengers. The research shows that, like other consuming products toward which subjective emotional feelings affect the consumer’s behavior, passenger choice is significantly affected by subjective emotional feelings toward the mode. Additionally, the subjective effect can be measured easily using marketing research techniques. (Ebsco) http://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1027&context=Journal_of_Public_Transportation

24. Measuring the influence of bus service quality on the perception of users
Mahmoud, Moataz; Hine, Julian
Encouraging the use of public transport is a key policy goal in many countries. Therefore, public transport should offer the level of quality that accommodates the demands of current users, and importantly, the desires of potential users. This study investigates the influence of the perceived quality of bus service on the perception of both current and potential users. The study draws upon data from 512 questionnaires distributed across Belfast City in the UK. The study utilises a binary logistic regression model to quantify the relationships between the perceived quality of 29 bus indicators (independent) and the perceptions of users towards the overall bus service (dependent). Eleven significant indicators are reported to have significant influence on the perception of users. These indicators are utilised to propose scenarios for optimising the quality of bus service with the perceptions of current and potential users. (Tandfonline) https://www.tandfonline.com/doi/full/10.1080/03081060.2016.1142224?src=recsys
25. **Modeling Transit Users Stop Choice Behavior: Do Travelers Strategize?**
Hassan, Mohammad Nurul; Rashidi, Taha Hossein; Waller, S Travis; Nassir, Neema; Hickman, Mark
Transit choice research focuses predominantly on mode choice and route choice, whereas very few studies on stop choice are conducted. To fill this gap, this research aimed to study transit stop choice behavior with a focus on how people strategize when making their choices. It is hypothesized that travelers treat stops differently based on various schemes (strategies); minimizing travel time, access time, and the number of transfers are the schemes considered in this study, and the effectiveness of several discrete choice model specifications was examined. The study found that path attributes and stop attributes have significant impacts on stop selection behavior. Furthermore, users’ socioeconomic characteristics along with trip timing play important roles in choosing transit stops. The outcomes of this study could facilitate the recent move toward development of behavioral route choice models using smart card data, which can then assist travel demand estimation models with a focus on public transport. (Ebsco)
http://scholarcommons.usf.edu/jpt/vol19/iss3/6/

26. **Passenger boarding choice prediction at a bus hub with real-time information**
Bin Yu, Ting Li, Lu Kong, Keming Wang & Yanxia Wu
Transportmetrica B: Transport Dynamics, 2015, Vol. 3, No. 32015, pp. 192-221
Providing real-time bus information (e.g. current situation of an arriving bus) to passengers is becoming increasingly possible with the development of transportation information technology, such as intelligent transport systems. When multiple routes can reach a given destination, real-time information could be an important reference for passengers’ decision-making regarding which bus to board. This paper presents a method for predicting passengers' boarding choice behaviours on common bus lines at a bus hub with real-time information. To account for the uncertainty in the decision-making process, cloud model theory, which is based on fuzzy sets, was adopted. Data from a bus hub in Dalian city of China are also presented to illustrate the applicability and effectiveness of the proposed method. The results show that providing real-time information could lead to a deviation from passengers’ typical choices that are made without real-time information. The proposed model effectively predicts passenger's boarding choices and could be used to improve bus-dispatching models in the future. (Tandfonline)
https://www.tandfonline.com/doi/full/10.1080/21680566.2015.1007400

27. **Passenger Perspectives in Railway Timetabling: A Literature Review**
Parbo, Jens; Nielsen, Otto Anker; Prato, Carlo Giacomo
Transport reviews, 2016, Vol. 36, No. 4, pp. 500-526
When looking at railway planning, a discrepancy exists between planners who focus on the train operations and publish fixed railway schedules, and passengers who look not only at the schedules but also at the entirety of their trip, from access to waiting to on-board travel and egress. Looking into this discrepancy is essential, as assessing railway performances by merely measuring train punctuality would provide an unfair picture of the level of service experienced by passengers. Firstly, passengers’ delays are often significantly larger than the train delays responsible for the passengers to be late. Secondly, trains' punctuality is often strictly related to too tight schedules that in turn might translate into knock-on delays for longer dwelling times at stations, trip delays for increased risk of missing transfer connections, and uncertain assessment of the level of service experienced, especially with fluctuating passenger demand. A key aspect is the robustness of railway timetables. Empirical evidence indicates that passengers give more importance to travel time certainty than travel time reductions, as passengers associate an inherent disutility with travel time uncertainty. This disutility may be broadly interpreted as an anxiety cost for the need for having contingency plans in case of disruptions, and may be looked at as the motivator for the need for delay-robust railway timetables. Interestingly, passenger-oriented optimisation studies considering robustness in railway planning typically limit their emphasis on passengers to the consideration of transfer maintenance. Clearly, passengers’ travel behaviour is far more complex and multi-faceted and thus several other aspects should be considered, as becoming more and more evident from passenger surveys. The current literature review starts by looking at the parameters that railway optimisation/planning studies are focused on and the key performance indicators that impact railway planning. The attention then turns to the parameters influencing passengers’ perceptions and travel experiences. Finally, the review proposes guidelines on how to reduce the gap between the operators’ railway planning and performance measurement on the one hand and the passengers’ perception of the railway performance on the other hand. Thereby, the conclusions create a foundation for a more passenger-oriented railway timetabling ensuring that passengers are provided with the best service possible with the resources available.
28. Passenger Satisfaction and Mental Adaptation under Adverse Conditions: Case Study in Manila
Mijares, Andra Charis; Suzuki, Mio; Yai, Tetsuo
Public transportation systems in several developing cities face congestion, air pollution, and safety problems, yet many passengers use them regularly. This study examines the structure of passenger satisfaction and the role of mental adaptation under such conditions. Metro Manila MRT-3 was analyzed as a case study. The actual and perceived conditions at the MRT-3 were assessed using surveys. Results of the waiting time and PM2.5 monitoring surveys revealed that passengers queue for 30 minutes, on average, while being exposed to unsafe levels of PM2.5. The questionnaire survey results show some discrepancies between actual and perceived values, suggesting a perception gap. Passenger satisfaction in MRT-3 was then modeled using ordered logit, with actual and perceived conditions (waiting time, in-vehicle time, fare levels, risk perception, and air quality perception) as significant explanatory variables. Mental adaptation was found to moderate passenger satisfaction, which may explain why some passengers are satisfied despite MRT-3’s shortcomings. (Ebsco)

29. Public transport customer satisfaction monitor
Victoria, 2012

30. Public transport users' and policy makers' perceptions of integrated public transport systems
Chowdhury, Subeh; Hadas, Yuval; Gonzalez, Vicente A; Schot, Bart
Transport Policy, 2018, Vol. 61, pp. 75-83
The planning of public transport systems plays a critical role in improving accessibility for all users. It provides people with opportunities for employment, social activities and involvement in the community. In recent times, many transport agencies are investing in their public transport systems to transform them into an integrated system. However, despite some advancement in this area, the understanding of public transport users' perceptions and how this aligns with policy makers' perceptions of an integrated system is limited. This understanding is critical to attract more commuters to use public transport. This paper conducted an analytical comparison between the users' and policy makers' perception of the various attributes that are used to develop an integrated system. A regional plan, produced in Auckland, New Zealand to implement an integrated system, was used as a case study. User-preference surveys and semi-structured interviews were used to collect the data. Data analysis was performed using the Analytic Hierarchy Process to determine the relative weight of the various attributes. Cluster analysis was used to identify groups of public transport users with similar characteristics. The findings provide the similarities and differences in users' and policy makers' perception of the attributes used to create an integrated system. Future research will investigate the needs of disadvantaged users such as elderly and disabled people, to understand how they are met by an integrated system. (Ebsco)

31. Quality improvement strategies of highway bus service based on a fuzzy quality function deployment approach
Kurtulmuşoğlu, Feride Bahar; Pakdil, Fatma; Atalay, Kumru Didem
In this study, fuzzy quality function deployment (FQFD) is used as a tool to improve service quality in the passenger transportation industry. QFD enables firms to hear the voice of the customer appropriately and integrate it with the technical language in design processes. However, the nature of uncertainty and subjectivity in service delivery processes makes it difficult to employ QFD consistently. This study provides an empirical example of how FQFD could be appropriately used. ‘Employee’ and ‘tangibility of buses’ are the items from the hybrid views of both customers and service provider managers who require the most attention when differentiating a passenger transportation service from a rival’s. The vital technical requirements relate to ‘employees’, ‘the features of buses’, and ‘error-free services’. (Researchgate)
32. **Recommendation of a New Transit Performance Measure in the National Transit Database**  
Baratian-Ghorghi, Fatemeh; Ahmadianyazdi, Hossein  
The frequency of incidents negatively changes public perception with regard to the public safety in transit systems. The level of safety expressed as performance measures, ensures contractors and users that a quality safety level is maintained. Both the private and public sectors in the U.S. annually report accurate data to the National Transit Database (NTD) to be used in assessing the progress of the nation's public transportation systems. Although they must provide both the annual report and monthly reports including Safety and Security data, measures are only grouped into the indicators of efficiency and effectiveness of a system and there is a distinct lack of safety performance measures. This paper makes a comparison between the safety indicator values in large and small areas, and finds the correlation between system effectiveness and safety measures. Comparison results provide evidence that not every effective system is safe. Finally, three safety indicators are suggested which enables transit agencies to find their system’s weaknesses in terms of safety. (Ebsco)  
http://scholarcommons.usf.edu/Journal of Public Transportation/vol20/iss2/5/  

33. **Regularity of Public Transport Usage: A Case Study of Bus Rides in Lisbon, Portugal**  
Foell, Stefan; Phithakkitnukoon, Santi; Veloso, Marco; Kortuem, Gerd; Bento, Carlos  
This paper presents an analysis of regularity in public transport usage based on a large-scale bus transportation data of Lisbon, Portugal. By exploring the combined information from the bus boarding history of riders and bus arrivals at each bus stop, an analysis of individual bus usage was performed. Daily and weekly patterns were extracted, from which it was observed that a rider takes, on average, 2 trips, visits 1.93 distinct stops, and uses 1.55 distinct bus lines daily. Inter-trip time analysis revealed a daily cycle, and a study of the interaction between riders and bus infrastructure explored how usage was concentrated on particular bus lines and stops. (Ebsco)  
http://scholarcommons.usf.edu/Journal of Public Transportation/vol19/iss4/10/  

34. **Service quality & customer satisfaction of Singapore public transport**  
Lee, Jane Wai Leng; Mak, Rebekah Suong Ern; Neo, Siok Cheng  
This research seeks to examine the level of customer satisfaction in the public transport sector. It provides a guide for the public transport providers to know which are the factors that may be lacking in quality service. For the purpose of this research, we based our analysis on three mode of public transport. They are buses, mass rapid transit (MRT) and taxis. Light Rail Transit (LRT) though is part of the public transport, is not included in this research. (Researchgate 2018)  

35. **Service quality, customer satisfaction and customer loyalty : an SMRT perspective**  
Chan, Huah Jer; Chua, Ai Teng; Heng, Yih Wei  
An analysis of the relationships between service quality and customer satisfaction, as well as customer satisfaction and customer loyalty, using the Singapore Mass Rapid Transit System (SMRT) as a case study. (Researchgate 2018)  
https://www.researchgate.net/publication/27636400_Service_quality_customer_satisfaction_and_customer_loyalty_an_SMRT_perspective  

36. **The Causal Effect of Bus Rapid Transit on Changes in Transit Ridership**  
Stewart, Orion T; Moudon, Anne Vernez; Saelens, Brian E  
Numerous studies have reported ridership increases along routes when Bus rapid transit (BRT) replaces conventional bus service, but these increases could be due simply to broader temporal trends in transit ridership. To address this limitation, we compared changes in ridership among routes where BRT was implemented to routes where BRT was planned or already existed in King County, Washington. Ridership was measured at 2010, 2013, and 2014. Ridership increased by 35% along routes where BRT was implemented from 2010 to 2013 compared to routes that maintained conventional bus service. Ridership increased by 29% along routes where BRT was implemented from 2013 to 2014 compared to consistent
existing BRT service. These results provide stronger evidence for a causal relationship between BRT and increased transit ridership and a more accurate estimate of the independent effect of BRT on ridership. [http://scholarcommons.usf.edu/Journal of Public Transportation/vol20/iss1/5/]

37. **The influence of bus service satisfaction on university students' mode choice**
Shaaban, Khaled; Kim, Inhi
Journal of advanced transportation, 2016, Vol. 50, No. 6, pp. 935-948
The purpose of this study was to determine the relationship between bus service satisfaction and the transport mode of choice among university students in Qatar. The degree of bus service satisfaction was collected directly from questionnaire surveys, in which university students were asked questions in relation to their satisfaction with the bus service they used and their transport mode of choice. These questions were categorized into three factors according to confirmatory factor analysis: service at bus stops, service of busses, and service of drivers. Furthermore, the students were asked which mode of transport they used given the choice between public and private transport. This study presents a structural equation model to determine how much bus service satisfaction affects people's decisions about their transport mode. The results from the analysis showed that three key factors—namely, service at bus stops, service of busses, and service of bus drivers—were strongly correlated to the mode of choice. In particular, the bus stop was strongly associated with ease of use, shade, cleanliness, safety, and crowdedness level, while the bus itself influenced reliability, travel time, and frequency. Complying with traffic laws and the driver's attitude were also important contributors to the level of bus service satisfaction. Ultimately, this study will be beneficial for policy/decision-makers. It will allow them to determine what needs to be accomplished to encourage people to use public transportation. [Wiley onlinelibrary] [https://onlinelibrary.wiley.com/doi/10.1002/atrl.1383]

38. **Transit in the 2000s: Where Does It Stand and Where Is It Headed?**
Manville, Michael; Taylor, Brian D; Blumenberg, Evelyn
U.S. public transit has experienced something of a renaissance in the 2000s, with per capita service levels increasing nationwide and public investment growing even faster—particularly expenditures on rail transit. Despite this expansion, overall transit patronage has been relatively flat, and has declined significantly since 2014. What is behind these trends, and what do they portend for the future of transit? In this paper we consider three challenges shaping transit today and in the years ahead: (1) the asymmetry of transit supply and use make it especially vulnerable to changes and disruptions; (2) many of the factors that determine transit ridership, such as levels of private vehicle ownership and use, are largely beyond the control of transit agencies; and (3) there remains no consensus about what purpose transit should serve—politically the industry thrives on the idea that it will reduce congestion or clean the air, while in practice it primarily moves poor people, a very different and sometimes conflicting role. How successfully transit systems manage each of these challenges will shape their future roles and significance. [http://scholarcommons.usf.edu/Journal of Public Transportation/vol21/iss1/11]

39. **Transit passengers' behavioural intentions: the influence of service quality and customer satisfaction**
de Oña, Juan; de Oña, Rocio; Eboli, Laura; Forciniti, Carmen; Mazzulla, Gabriella
Knowing passengers' behavioural intentions to use transit service can be a useful support for transit managers and marketers who can define the most convenient strategies to satisfy existing passengers and attract new ones. We retain that analysing passengers' intentions to continue to use transit services in the future together with relevant concepts such as service quality and customer satisfaction is fundamental to understand passengers' behaviour. For this reason, in this paper we propose a structural equation model for investigating the relationship among some aspects influencing passengers' behavioural intentions towards the use of transit services. The light rail transit (LRT) of Seville (Spain) offers the transit service supporting our work. We collected through an ad-hoc survey the opinions of the passengers about the used LRT system and transit system in general, and we propose a methodology to explain how passengers' opinions influence their intentions to use the LRT again. Among the interesting findings from the model, we observe that behavioural intentions are mostly affected by passengers' judgements about LRT service quality and their satisfaction with the service. Moreover, not only direct but indirect effects on behavioural intentions are derived, determining an accurate conclusion about the relationships of the other concepts with LRT' users behavioural intentions. [Tandfonline]
40. Transitory Optimism Changes in Passenger Perception Following Bus Service Improvement over Time
El-Geneidy, Ahmed M
Transportation Research Record, 2015, No. 2415, pp. 97-106
Passengers’ perception and satisfaction have long been seen and used as important measures of transit service quality and attractiveness. This research tried to understand better transit passengers' perception of the implementation of various improvement strategies in bus service over time. The study analyzed three surveys of bus user perceptions conducted over a period of 3 years. The study also used stop-level data collected from the Societe de Transport de Montreal's automated vehicle location and automatic passenger count systems and bus schedules in Montreal, Canada, to measure the actual changes in service. Descriptive statistics and regression models were used for a better understanding of the differences between perceptions and reality. The implementation of various strategies had a limited impact on the short-term overestimation by users of their waiting time benefits, whereas the implementation had a long-term impact on their travel time overestimation. This study can be of interest to marketing and planning departments at transit agencies, because it provides them with new insights into passengers’ perception and satisfaction. (Researchgate) https://www.researchgate.net/publication/267326614_Transitory_Optimism_Changes_in_Passenger_Perc

41. Transport for NSW customer satisfaction index

42. Understanding the impacts of a combination of service improvement strategies on bus running time and passenger's perception
Diab, Ehab I; El-Geneidy, Ahmed M
Transit agencies implement many strategies in order to provide an attractive transportation service. This article aims to evaluate the impacts of implementing a combination of strategies, designed to improve the bus transit service, on running time and passenger satisfaction. These strategies include using smart card fare collection, introducing limited-stop bus service, implementing reserved bus lanes, using articulated buses, and implementing transit signal priority (TSP). This study uses stop-level data collected from the Société de transport de Montréal (STM)’s automatic vehicle location (AVL) and automatic passenger count (APC) systems, in Montréal, Canada. The combination of these strategies has lead to a 10.5% decline in running time along the limited stop service compared to the regular service. The regular route running time has increased by 1% on average compared to the initial time period. The study also shows that riders are generally satisfied with the service improvements. They tend to overestimate the savings associated with the implementation of this combination of strategies by 3.5–6.0 min and by 2.5–4.1 min for both the regular route and the limited stop service, respectively. This study helps transit planners and policy makers to better understand the effects of implementing a combination of strategies to improve running time and passenger's perception of these changes in service. The article evaluates the implementation of express bus service, exclusive bus way, transit single priority, articulated buses, and smart card system. This combination led to a 10.5% decline in run time along the limited stop service. The regular route run time has increased by 1% compared to the initial situation. Riders are generally satisfied with these service improvements and tend to overestimate the time savings. (Science direct) https://www.sciencedirect.com/science/article/pii/S0965856411001820

43. User perspectives in public transport timetable optimisation
Parbo, Jens; Nielsen, Otto Anker; Prato, Carlo Giacomo
The present paper deals with timetable optimisation from the perspective of minimising the waiting time experienced by passengers when transferring either to or from a bus. Due to its inherent complexity, this bi-level minimisation problem is extremely difficult to solve mathematically, since timetable optimisation is a non-linear non-convex mixed integer problem, with passenger flows defined by the route choice model, whereas the route choice model is a non-linear non-continuous mapping of the timetable. Therefore, a
heuristic solution approach is developed in this paper, based on the idea of varying and optimising the offset of the bus lines. Varying the offset for a bus line impacts the waiting time passengers experience at any transfer stop on the bus line. In the bi-level timetable optimisation problem, the lower level is a transit assignment calculation yielding passengers’ route choice. This is used as weight when minimising waiting time by applying a Tabu Search algorithm to adapt the offset values for bus lines. The updated timetable then serves as input in the following transit assignment calculation. The process continues until convergence. The heuristic solution approach was applied on the large-scale public transport network in Denmark. The timetable optimisation approach yielded a yearly reduction in weighted waiting time equivalent to approximately 45 million Danish kroner (9 million USD). (Science direct).


44. Users’ views on current and future real-time bus information systems
Rahman; Md. Matiur; Wirasinghe, SC, Kattan, Lina
Actual bus arrival times often deviate from the posted schedules due to a variety of factors; hence, providing real-time bus information can improve service quality. This study examined users' views and perceptions towards the possible future availability of real-time bus information systems in Calgary, Alberta, Canada. A face-to-face paper-based survey was conducted to collect the data. Various statistics and methods, such as ANOVA tests, ordinal regression and binary logistic regression, were used to analyse the data. The results showed that 35.5% of the respondents either agreed or strongly agreed that the current information system deterred or discouraged them from using public transport. In addition, a significant portion of respondents (82%) stated that they board the first arriving bus, even though it may take a longer in-vehicle time to complete the trip, because of uncertainty regarding the arrival time of the next alternative bus with a shorter in-vehicle travel time. A majority of the respondents (88%) indicated that real-time transit information would not be necessary if bus headways are less than 10 minutes. As for preferred information content, information on the next bus arrival time received the highest priority. In general, Light Rail Transit (LRT) users showed the least interest in real-time information. Women, younger riders, current car users and infrequent transit users showed a higher interest in real-time information. Display boards at bus stops were perceived to be the most preferred medium to get en-route information, whereas a website/call centre was stated to be the preferred media for pre-trip information. (Wiley onlinelibrary)

45. What influences satisfaction and loyalty in public transport? A review of the literature
Lierop, Dea van; Badami, Madhav G; El-Geneidy, Ahmed M
Transport reviews, 2018, Vol. 38, No. 1, pp. 52-72
Public transport ridership retention is a challenge for many cities. To develop comprehensive strategies aimed at retaining riders, it is necessary to understand the aspects of public transport that influence users to become loyal to the system. This paper analyses relevant literature regarding the causes of satisfaction and loyalty in public transport. We find that the service factors most associated with satisfaction are on-board cleanliness and comfort, courteous and helpful behaviour from operators, safety, as well as punctuality and frequency of service. On the other hand, loyalty is associated with users’ perceptions of value-for-money, on-board safety and cleanliness, interactions with personnel and the image and commitment to public transport that users feels. Furthermore, the results elucidate that the concept of loyalty is best defined based on users’ intentions to continue using the service, their willingness to recommend it to others, their overall satisfaction, but also and most importantly, their image of and involvement with public transport. Public transport users who have a positive image of the agency and consider public transport an integral component of city life are more likely to demonstrate loyalty and act like ambassadors for public transport agencies. (Tandfonline)