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Research Article

Factors affecting passengers' satisfaction with rail transit systems

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Abstract: Ensuring a high traveller satisfaction level in public transportation systems is a vital goal for managers and decision-makers working for municipalities/city governments. Accordingly, transportation service providers need to recurrently assess the quality of their service to determine its adequacy and effectiveness. Providing public transportation services to millions of people, Istanbul Municipality conducts regular surveys to assess the perception of Istanbulers on the quality of public transportation. In this study, we analysed the data obtained from one of these surveys administered to people who use the rail transit lines. We particularly focused on the set of questions that covers the following five dimensions: comfort, fee, safety, accessibility, and overall travel satisfaction. There were 6646 participants answered questions related to these five dimensions. Using the structural equation model, we explored the effects of comfort, fee, safety, and accessibility on travellers' overall satisfaction with the rail transit lines. We used two step modelling. The CFA (confirmatory factor analysis) model (CFI =.99; SRMR=.017; RMSEA =.026) and proposed structural model (CFI =.98; SRMR=.019; RMSEA =.031) showed close model fit for the data. We found that travellers' perceived level of comfort, accessibility, and fee affordability has a significant effect whereas the perceived level of safety does not have a significant effect on passengers' general satisfaction with the rail transit lines.

Key words: Traveller satisfaction, structural equation modelling, comfort, fee, safety, accessibility

Yolcuların raylı ulaşım sistemlerinden memnuniyetini etkileyen faktörler

Özet: Toplu taşıma sistemlerinde yüksek yolcu memnuniyetinin sağlanması belediyeler/şehir yönetimlerinde çalışan yöneticiler ve karar vericiler için hayati bir hedeftir. Buna göre, seyahat hizmeti sağlayıcılarının, yeterliliğini ve etkinliğini belirlemek için hizmetlerinin kalitesini tekrar tekrar değerlendirmeleri gerekir. Milyonlarca kişiye toplu ulaşım hizmeti sunan İstanbul Belediyesi, İstanbulluların toplu ulaşım kalitesine yönelik algısını ölçmek için düzenli olarak anketler yapmaktadır. Bu çalışmada, raylı ulaşım hatlarını kullanan yolculara uygulanan bu anketlerin birinden elde edilen verileri analiz ettik. Analizleri yaparken, özellikle şu beş boyutu kapsayan sorulara odaklandık: konfor, ücret, güvenlik, erişilebilirlik ve genel seyahat memnuniyeti. Bu beş boyuta ilişkin maddelerin tamamına cevap veren 6646 katılımcı analizimize dahil edildi. Bu doğrultuda, yapısal eşitlik modelini kullanarak konfor, ücret, güvenlik ve erişilebilirliğin yolcuların hafif metro hatlarına ilişkin genel memnuniyeti üzerindeki etkilerini araştırdık. Analizimizde iki aşamalı modelleme kullandık. DFA (doğrulayıcı faktör analizi) modeli (CFI =.99; SRMR=.017; RMSEA =.026) ve önerilen yapısal model (CFI =.98; SRMR=.019; RMSEA =.031) veriye yakın model uyumu göstermiştir. Sonuçları dikkate aldığımızda, algılanan konfor, erişilebilirlik ve ücret düzeyinin yolcuların demiryolu transit hatlarıyla ilgili genel memnuniyeti üzerinde anlamlı bir etkiye sahip olduğunu, algılanan güvenlik düzeyinin ise anlamlı bir etkisi olmadığını bulduk.

Anahtar Kelimeler: Yolcu memnuniyeti, yapısal eşitlik modeli, konfor, erişebilirlik, ücret, güvenlik

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1. Introduction

One of the most important tasks for decision-makers working for metropolitan municipalities is to achieve a high degree of customer satisfaction and loyalty in public transportation systems. Consequently, public transportation providers need to frequently assess the quality of their service to determine their adequacy and effectiveness. This assessment should be a comprehensive one and focus on the existing and forecasted demand trends, most important activities, concerns of stake holders, as well as unmet service needs (Hassan et al., 2013). Studying service quality and customer satisfaction is not easy because these constructs are complex and intangible (Parasuraman et al., 1985; Carman, 1990). Furthermore, these constructs consist of a series of observed and unobserved variables underlying them (De Ona et al., 2013). With the advancement in statistical analysis techniques and with the advent of structural equation modeling (SEM), researchers are better equipped to study these complex- and intangible-constructs. Therefore, recent studies have utilized the use of SEM to better understand the interacting effects of observed and unobserved variables on customer satisfaction (Aktepe et al., 2015; Eboli and Mazzula, 2012; Hadiuzzman et al., 2017; Mohajerani, 2013; Shen et al., 2016; Zaim et al., 2010). In line with these recent studies, we aimed to study the factors affecting traveler satisfaction of the rail transit network in Istanbul. Based on the survey conducted by Istanbul Municipality, we studied the effects of service accessibility, fare, comfort, and safety on passengers' satisfaction with the rail transit service of Istanbul.

1.1 Literature review

Authorities and researchers consider rail transit as one of the vital public transportation modes (Özgür, 2011; Givoni and Banister, 2012; Aydin, 2017; Aydin et al., 2022), and according to some researchers it helps reducing the traffic congestion (Litman, 2007; Manzolli et al., 2021). It is not just effective in reducing traffic congestion but also effective in reducing costs. Since rail transit systems are effective in decreasing traffic congestion and help travellers to trip in a shorter time its customers increase over time. Thus, to continue this trend and make cities more sustainable, providing high service quality in rail transit systems is very important. Further, the quality of transportation modes plays a role here; if the quality of other modes is worse, passengers of other transportation modes will be more willing to shift modes. Consequently, enhancing rail transit service quality decreases the lag or number of vehicle-car trips, which helps all commuters.

Passengers are the main agent for public transportation systems. Therefore, traveler satisfaction has been studied for decades by researchers who applied a variety of approaches to examine passengers' satisfaction level with the transportation service they received. For example, Aydin et al. (2015) applied statistical analyses of SERVQUAL and fuzzy-VIKOR on a survey conducted in rail transit network (metros, trams, light rail, and funicular). Their proposed approach provides directions for future investments to have a higher traveler satisfaction. Hasan et al. (2013), Eboli and Mazzulla (2009, 2011), and Tyrinopoulos and Antoniou (2008) have considered traveler perceptions in determining passenger satisfaction level and service quality with multiple methods. Yannis and Georgia (2008) and Nathanail (2008) analyzed both passenger satisfaction and transit performance measures simultaneously.

Previous research has used a variety of criteria when examining traveler satisfaction. These criteria are reliability, frequency, capacity, information, safety, comfort, ticketing, cleanliness, personnel, and fees. Tyrinopoulas and Antoniou (2008) analyzed five public transport systems operating three different modes of transport (i.e. bus, trolleybus and rail/metro) in Athens and Thessaloniki, the two largest cities in Greece. Their work suggested that the main goal of policy makers in Athens should be a well-coordinated transport environment followed by other quality features such as service frequency and accessibility.

In this study, we analyzed the satisfaction level of passengers who use the rail transit network in Istanbul and provide suggestions for future investments. Regardless of having a private car or not, a considerable amount of people prefer public transportation in Istanbul (Toplu Tasima, 2022). Although the rate of people using public transportation is high; people still suffer from traffic jams in Istanbul (Yogunluk, 2022). Congestion occurs in both the railway and other public transport vehicles during rush hour. Because traffic jam and congestion occur on public transportations whereas only congestion occurs in rail transit network, most of the passengers who commute daily during the peak hours prefer

rail transit. Thus, ensuring these daily commuters' satisfaction with the transit network becomes a very important factor for managers and decision makers to keep them using public transportation (Celik et al., 2014).

1.2 Hypothesis

In this study, based on the existing customer satisfaction studies (Jain et al., 2014; Chaloux et al., 2019), we adopted attitudinal measures and identified comfort, fee, safety, and accessibility as significant variables affecting rail transit line passengers' satisfaction level. The definition and operationalization of these variables and the proposed hypotheses are discussed below.

1.2.1 Comfort

Passengers' comfort during the time when they use rail transit network is evaluated through three sub-criteria, which are crowdedness of the train cars, noise level and vibration inside the train cars, and air-conditioning system (i.e., temperature and humidity) of the train cars (Aydin et. al., 2015). Comfort has been considered as one of the main variables that affects the loyalty (Shiftan et al., 2015) and satisfaction (Brons et al., 2009; Eboli and Mazzula, 2011; Nathanail, 2008) of rail transit passengers. Comfort level was measured by criteria such as larger seats, cleanness and noise in these studies and the results indicated that comfort level has a significant effect on traveler satisfaction and loyalty. In line with these results, we are expecting that comfort level of train cars will have a positive effect on train passengers' satisfaction in Istanbul.

H1: Passengers' perceived level of comfort will have a positive effect on their general satisfaction.

1.2.2 Fee

In this study, the price of metro and transfer (train change or mode change) tickets are considered as fees. Aydin et al. (2015) indicated that fee, as criterion of traveler satisfaction, can be considered as a function of a price-quality ratio and passengers evaluate their satisfaction with fee based on the quality of the service they are given. If passengers are paying relatively high fees, they expect a relatively high-quality service in return to be satisfied. If they are paying relatively low fees, they may be satisfied with a relatively moderate quality of service. All in all, if passengers are happy with the fee, the perceived benefit should be high; otherwise, the perceived value should be low or none (Wen et. al., 2005). Therefore, we are expecting that as passengers' satisfaction with the fare increases, their overall satisfaction with the metro rail service will increase.

H2: Passengers' satisfaction with fee will have a positive effect on their general satisfaction.

1.2.3 Safety

Previous studies evaluated safety using various sub-criteria, which includes but not limited to safety at metro stations, safety inside the trains, and the behaviors and attitudes of safety crew toward passengers (e.g., Aydin et.al, 2015). Safety has been found to be positively associated with the traveler's satisfaction (Shiftan et al., 2015). The higher the passengers' feeling of safety and safety toward a rail transit, the more satisfied they are with the metro rail service they have. Therefore, we are expecting that safety will have a significant positive effect on passengers' overall satisfaction with the metro-rail service.

H3: Passengers' perceived level of safety will have a positive effect on their general satisfaction.

1.2.4 Accessibility

Metropolitan cities provide residents with bus and train connections to make their daily commute easier. When there are lots of connection options, it becomes significant to inform the passengers correctly and clearly about the schedules, routes and transfers regarding the daily bus and metro-rail services. Additionally, metropolitan cities need to make their transportation services easily accessible to millions of passengers by providing them with moving walkways, elevators, well-functioning tollgates, etc. Otherwise, it will be difficult for disabled individuals and senior citizens to use the public transportation. All these additional services will increase the accessibility of the public transportations service. Therefore, we measure the perceived level of accessibility based on six sub-criteria: information and guidance in trains, easier transfer within modes and trains, escalators, moving

walkways and elevators, ticketing system and vending services, and tollgates. Aydin et al. (2015) indicated that accessibility of metro-rail service can be increase by using screen displays for schedule, train departures/arrivals, routes information, route map(s), announcements in stations during and after breakdowns, and announcements in trains during the travel. As the accessibility increase through effectively providing these additional services, traveler satisfaction also increases (Shiftan et.al, 2015). Therefore, we expect that the accessibility of metro-rail services will positively affect passengers' overall satisfaction.

H4: Passengers' satisfaction with accessibility will have a positive effect on their general satisfaction.

In summary, we expect that the higher the perceived comfort level, the more acceptable the fees, the higher the level of safety and the higher the level of accessibility, the more satisfied the passengers will be.

2. Methodology

In this section, we first discuss the details of the survey conducted by Istanbul Transportation Authority (ITA). Later, we will present the results of descriptive and structural equation modeling (SEM) analyses. This section will be concluded with the discussions of the results.

2.1 Participants

SEM requires no missing data. Thus, we included participants who answered all 13 indicator items in the SEM analysis. There were 6646 participants in total. We started data analysis with cross tabulation analyses to get the descriptive statistics pertaining to participants. The results of these analyses are provided in Table 1 and Table 2.

Based on the results in Table 1, 53% of the passengers are between 15 and 25, about 30% are between 26 and 35, and 10% are between 36 and 45 years of old. Overall, 93% of the participants were younger than 45 years old. These results confirm Aydin (2017) who indicated that young people prefer public transportation and older people prefer private cars. We should also note that only about 60% of the people surveyed answered both questions ("What is your sex?" and "How old are you?").

Table 1: Participants' age by gender

			Age					
			15-25	26-35	36-45	46-55	56+	Total
Gender	Male	Count	853	433	73	30	10	1399
		%	22,0	11,1	1,9	0,8	0,3	36,0
	Female	Count	1205	729	313	167	73	2487
		%	31,0	18,8	8,1	4,3	1,9	64,0

Table 2 provides information on participants' occupation. Eighty percent of the passengers have a job, and they mostly use rail transit system to commute to their work. Five percent of them are either student or intern and they also mostly use rail transit system to commute to their schools. Passengers who are between ages of 26 and 35 and self-employed constitute the largest percentage. We should note that in total 4075 passengers answered both questions ("How old are you?" and "What is your job?").

2.2 Survey

In this study, we examined the customer satisfaction surveys conducted in 2014. Participants were passengers using seven rail transit lines, namely F1, M1, M2, M3, M4, T1, and T4. F1 connects M2 line to Taksim-Tünel Heritage Tram and other public transportation modes in Kabataş. M1 is Istanbul's first light rail system, opened in 1989, and serves between Aksaray and Atatürk Airport. Serving since 2000, M2 serves between Yenikapı and Hacıosman. The M4 is one of the the newest (in operation since 2012) and longest railway line at 22.7 km. It serves between Kadıköy and Kaynarca/Tavşantepe. T1 was first put into service in 1992 and has been expanded since 2011 to connect Kabataş to Bağcılar. The T4 was developed in 2007 and integrates rail lines with Bus Rapid Transit lines. It serves between

Topkapi and Masjid Selam Tram Line. The M3 was first put into service in November 2013 and connected Kirazlı to the Olympic station. All lines are under constant surveillance and monitoring with CCTV cameras placed all over the stations. The most crowded line, the M1, serves approximately 320,000 passengers per day, and passengers can find the metro every 2 minutes during peak hours (Metro Istanbul, 2021)

Table 2: The distribution of participants' occupation by age

	Age Group											
	15-25		26-35		36-45		46-55		56+			
Occupation	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Total Count**	**Total %**
S. Employed	595	12,6%	763	16,2%	102	2,2%	49	1,0%	21	0,4%	1530	32,5%
Manager	48	1,0%	34	0,7%	5	0,1%	1	0,0%	0	0,0%	88	1,9%
Public	302	6,4%	398	8,5%	85	1,8%	40	0,9%	8	0,2%	833	17,7%
Private	385	8,2%	468	9,9%	156	3,3%	57	1,2%	12	0,3%	1078	22,9%
Athlete/Artist	139	3,0%	89	1,9%	5	0,1%	1	0,0%	0	0,0%	234	5,0%
Intern	53	1,1%	16	0,3%	1	0,0%	0	0,0%	0	0,0%	70	1,5%
Student	632	13,4%	35	0,7%	3	0,1%	1	0,0%	0	0,0%	671	14,3%
Housewife	4	0,1%	17	0,4%	20	0,4%	8	0,2%	4	0,1%	53	1,1%
Retiree	1	0,0%	0	0,0%	4	0,1%	3	0,08%	38	0,8%	46	1,7%
Unemployed	41	0,9%	19	0,4%	5	0,1%	4	0,1%	0	0,0%	69	1,5%
Total	2200	46,8%	1839	39,1%	386	8,2%	164	4,2%	83	1,8%	4672	100,0%

Note. *N=4672. S. Employed = self-employed; Public = public sector employee; Private = private sector employee.*

Table 3. Survey Items Measuring Passengers' Satisfaction

Dimension	Items
Accessibility	Satisfaction with information provided and leadings in Satisfaction with transferring between rail lines. Satisfaction with escalators, walking bands and elevators. Satisfaction with ticketing and ticket vending machines. Satisfaction with tourniquets and tollgates. Satisfaction with informing and leading services.
Fee	Satisfaction with the fee.
Comfort	Satisfaction with noise and vibration levels in trains. Satisfaction with ventilation service. Satisfaction with crowdedness level in trains.
Safety	Satisfaction with feeling safe on trains. Satisfaction with behaviors of safety and workers towards Satisfaction with feeling safe at stations.
Customer/Traveler Satisfaction	Overall satisfaction with rail transit lines.

The face-to-face surveys conducted by ITA consist of 48 questions. Fourteen of these 48 questions were related to customer satisfaction, and we focused on these 14 questions in this study. These 14

questions were covering five dimensions pertaining to traveler satisfaction. These dimensions include comfort, safety, fee, accessibility, and overall customer (traveler) satisfaction. Table 3 provides the list of these 14 questions and their respective dimensions.

After cross-tabulation analyses, we continue our analyses with SEM. As suggested by Anderson and Gerbing (1998), Klein (2011), and McDonald (2010) we used two-step modelling and tested CFA measurement model first and the proposed structural model later. The next section provides a discussion of the results of CFA measurement model and SEM analyses.

3. Results

Table 4 presents model fit statistics for the CFA measurement model and proposed structural equation model. CFA measurement model demonstrated a lack of exact fit as indicated by statistically significant X^2 statistics. The indices of approximate model fit, however, indicated close CFA measurement model fit (CFI =.99; SRMR=.017; RMSEA =.026) for the data. In addition to this, the smallest estimated factor loading observed was larger than .50 in the CFA model. This result provided support for convergent validity between measures loading on a factor (Comrey and Lee, 1992). Thus, these results indicated support for the validity of multi-factor measurement model.

As in the case of CFA model, SEM demonstrated a lack of exact fit ($X^2 = 479$, $p < .001$) indicated lack of exact fit. However, model fit statistics (CFI =.98; SRMR=.019; RMSEA =.031) indicated close model fit for the data. Therefore, based on these model fit indices, we retained the proposed SEM model.

Table 4: Model fit statistics for the measurement and the proposed structural modeling for passengers' satisfaction

	χ2	*df*	*P*	CFI	SRMR	RMSEA
Measurement Model	367.73	66	<.001	.99	.017	.026 [.024, .029]
Structural Model	479.6	65	<.001	.98	.019	.031 [.028, .034]

Note. *χ^2 = Chi-squared statistic; df = degrees of freedom; p = significance level of Chi-squared statistic; CFI = comparative fit index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation. Values in brackets are lower and upper limits of %95 confidence intervals of RMSEA.*

The proposed model included five latent constructs which are fee, comfort, safety, accessibility, and customer/traveler satisfaction. Customer/Passenger satisfaction was the outcome variable, and the other four latent variables were predictor variables. The structure equation model of the study is shown in Figure 1.

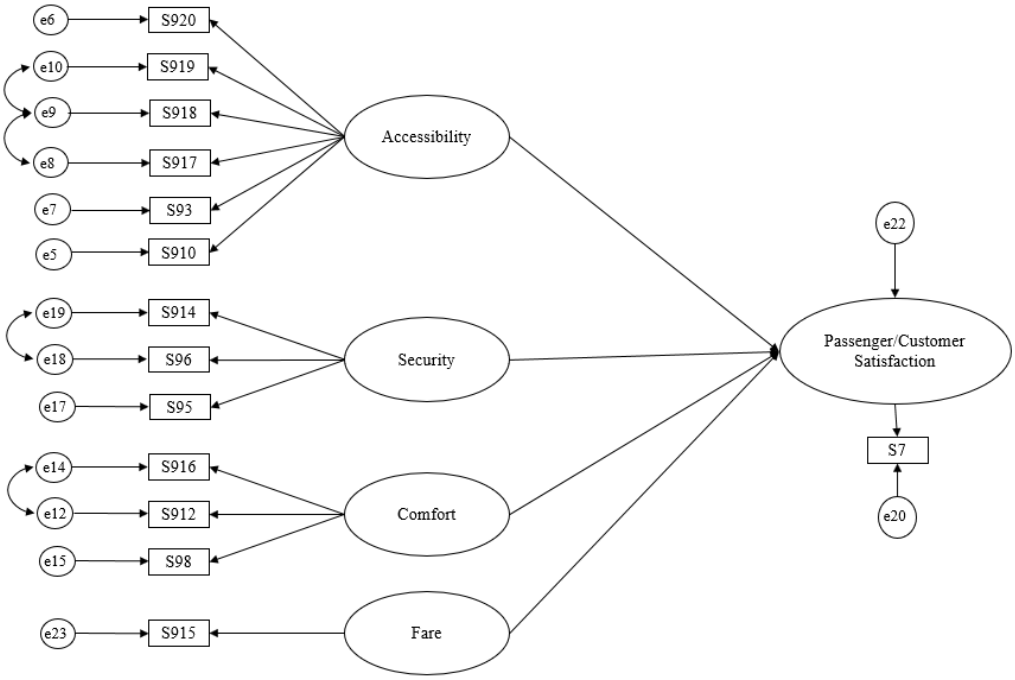

Figure 1. Structure equation modeling of the study

Table 5 presents unstandardized and standardized regression path coefficients for the proposed structural equation model. For each path coefficients, the table also presents the associated standard error (SE) and statistical significance which is based on SE (see Arbuckle, 2011, p. 417). We focused on the standardized regression weights and their significance level to test our hypotheses.

Table 5: Average standardized regression path estimates for the proposed model

			Unstandardized path estimates			*Standardized path estimates*		
Predictor variable		Predicted variable	*B*	*SE*	*p*	*β*	*SE**	*p**
Comfort	→	Passenger satisfaction	.17	.04	<.01	.33	.10	.01
Fee	→	Passenger satisfaction	.14	.04	<.01	.31	.12	.01
Safety	→	Passenger satisfaction	.08	.08	.30	.14	.17	.53
Accessibility	→	Passenger satisfaction	.21	.09	.02	.32	.17	.03

***Note**. B = unstandardized regression weights; β = standardized regression weights; SE = standard errors associated with regression weights; p = two tailed probability values associated with regression weights. * Standard errors and p values for standardized regression weights were obtained using bootstrapping method based on 1,000 resamples with replacement and p values for standardized regression weights were calculated by using bias-corrected percentile method.*

Our first hypothesis explores the effect of passengers' perceived level of comfort on their general satisfaction. The results support our expectations: Passengers' perceived level of comfort has a significantly positive effect on customers'/passengers' general satisfaction with the rail transit lines ($\beta = .33$, $p < .01$). This suggests that as the passengers' perceived level of comfort with Istanbul rail transit system increases their level of satisfaction increases. The second hypothesis addresses the effect of fee on customer/traveler satisfaction. The results indicates that fee is a significant factor in determining passengers' general satisfaction with the rail transit lines ($\beta = .31$, $p < .01$). We further found support for our fourth hypothesis pertaining to the effect of accessibility. The results suggest that accessibility has a positive significant effect on customers/passengers' general satisfaction ($\beta = .32$, $p < .01$). However, the results do not provide support for our third hypothesis; passengers' perceived level of

safety does not have a significant effect on their general satisfaction with the rail transit lines. All in all, the results suggest that as passengers' satisfaction with the fees and the level of comfort and accessibility increases their general satisfaction pertaining to their daily commute with rail transit lines increases.

4. Discussion

Rail transit transportation is the vital mode of transportation in big and crowded cities such as Istanbul, New York, and Tokyo. In such cities, rail transit provides daily commuters with a good option to bypass traffic congestion, particularly during the peak hours. The more satisfied passengers are with the rail transit system, the more likely they are going to use it. As these daily commuters start using the rail transit system instead of their private cars, the problems associated with traffic congestion will be reduced. Therefore, achieving a high customer satisfaction in services provided by the rail transit system is imperative for ITA. Being aware of this fact ITA conducts regular customer satisfaction surveys and asks daily commuters to rate their satisfaction with the various aspects of the services provided by the rail transit system. Upon analyzing the 2014 survey data using SEM, we were able to present a rail transit customer satisfaction framework. Approximate model fit indices indicated that the model we developed provides a close fit to the data. Based on the model, fees, accessibility, and comfort have a significant effect whereas safety does not have a significant effect on passengers' general satisfaction.

Transportation literature suggest fees as significant factors in determining daily commuters' overall satisfaction with the public transportation (Abou-Zeid and Ben-Akiva, 2012; Li et al., 2018). The experimental results by Abou-Zeid and Ben-Akiva (2012) indicated that being cost-conscious was one of the primary reasons why some of their participants switched from using a personal car to using public transportation. Additionally, Li et al. (2018) discussed switching costs are significant factors in deciding whether to switch from one form of transportation to another form of transportation. Based on the results observed in this study along with the results obtained in transportation literature, we can say that fees are significant to shape the experience/satisfaction of people who use public transportation. The effects of public transportation fees on daily commuters' satisfaction might get even stronger when a country experience economic crisis. This is because switching cost from public transportation to private cars will be higher when a country suffers from an economic crisis.

Accessibility is also one of the significant factors that affected daily commuters' satisfaction with public transportation services and willingness of using these services (Borhan et al., 2019; Brons et al., 2009). Borhan et al. (2019) found that not having an easy access to public transportation was one of the main concerns of locals of Putrajaya, Malaysia. Additionally, the results by Brorns et al. (2009) indicated that the accessibility of train stations was one of the significant elements in determining whether people would use rail transit. In line with these results, our results suggested that Istanbulers' satisfaction with accessibility of the rail system had a significant effect on their overall satisfaction. Thus, ITA might increase Istanbulers' satisfaction with rail transit system by keeping the system accessible by increasing the number of satiations, providing accurate and up-to-date information about the services, and designing user friendly stations with easy-to-use tool gates, ticketing machines, and elevators/walking-bands

Comforts has been also identified as one of the most studied factors of customer satisfaction with public transportation systems (Ibrahim et al., 2020). Weinstein (2000) found that comfortable seats and noise level are among the most significant factors affecting comfort of train ride. Brons and Rietveld (2009) highlighted ventilation of train cars as a significant element of comfort. Additionally, Ettema et al. (2012) discussed the level of crowdedness as a factor influencing passengers' comfort. In line with these studies, our results suggested noise level, ventilation, and crowdedness as significant indicators of passengers' comfort level. Therefore, the more satisfied Istanbulers' with the noise level, ventilation, and crowdedness of train cars and stations, the more satisfied they are with their daily train commute.

Although safety has been considered as a significant factor affecting all aspects (e.g., route, mode, time) of travel choice (Atkins, 1990), our results indicated that it is not one of the significant factors affecting passengers' satisfaction with the rail transit lines in Istanbul. One of the possible explanations for this finding is that most of the rail transit lines (e.g., M1, M4, and T1) included in this study are connecting

districts which has low personal crime rates (Yirmibesoglu and Ergun, 2007). Because personnel crime rates are not a pressing issue for these areas, daily commuters-already feeling safe-might not consider safety as a factor in assessing their satisfaction with the transit rail system. Therefore, this finding might not be generalizable to the other districts of Istanbul as well as to the other geographical locations.

4.1 Practical implications

Considering the four predictor factors of passenger satisfaction in this study, having comfortable, affordable, and accessible metro-rail service increases Istanbulers' satisfaction with the rail transit system. Thus, ITA should consider these factors to improve Istanbulers' experience with their rail transit systems. Although safety was not found as a significant predictor of passenger satisfaction, not taking, or reducing safety measures might negatively affect Istanbulers' experience with their rail transit systems. Safety measures might be especially relevant when there are high safety risks, such as the possibility of a terrorist attack (Elias et al, 2013; Sackett and Botterill, 2006).

4.2 Limitations

The data used in this study was collected in 2014. Thus, these results might not reflect the current experience of Istanbulers with rail transit systems. However, this does not weaken the importance of this study's findings: when daily commuters are satisfied with the fees, accessibility, and comfort of the rail transit system, this will positively affect their overall satisfaction.

Table 6: Author contribution statement

Steps	Contributors
Idea and concept	Authors 1 and 2
Literature search	All authors
Research design	Authors 1 and 2
Data collection and analysis	All authors
Discussion	All authors

Conflict of Interest

The authors have no conflict of interest to declare.

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