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EVALUATING USERS' SATISFACTION IN PUBLIC TRANSIT SERVICE: A CASE OF ADDIS ABABA CITY, ETHIOPIA

Summary. Rapid urbanization has resulted in a slew of issues, including urban transportation, in most emerging countries' cities. Public transportation provides transportation for the community and plays an important role in the daily lives of the city's citizens, particularly the urban poor, by reducing travel costs and providing job opportunities. Thus, evaluating public bus service performance from the perspective of users is critical for identifying service operators' strengths and deficiencies. Consequently, the primary goal of this research is to determine the level of consumer satisfaction with public bus service in the city and identify the most important factors that influence satisfaction. Hence, a survey was carried out between December and January 2020. Stratified sampling approaches were used to obtain data from 500 travelers. Factor analysis and customer satisfaction index were used to analyze the data collected. Lastly, the findings show that users were quietly satisfied (0.54) with the quality of the bus services supplied in the city. Moreover, travelers were better satisfied with attributes that related to availability (0.64) and less satisfied with attributes under timeliness (0.50) and security (0.48). Therefore, service operators and other concerned stakeholders should give urgent attention to

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attributes under timeliness and security to enhance users' satisfaction in the provision of bus service in the city.

Keywords: public bus, service quality, customer satisfaction, factor analysis, Addis Ababa, Ethiopia

1. INTRODUCTION

The transportation sector contributes significantly to a country's overall growth [1]. The movement of people and goods is mostly dependent on transportation, which is also an important aspect of maintaining a healthy economy [2]. Because of its low startup and operating costs, route flexibility, and permeability into town and city centers, the conventional bus is the most popular means of public transportation in most developing countries [2- 6]. Furthermore, rapid development in the use of public bus transportation can be attributed to its numerous benefits, including improved personal and economic prospects, reduced congestion and fuel consumption, and reduced carbon dioxide emissions [7]. Accordingly, public transportation is identified as a critical component of the country's economic, energy, and environmental challenges, as well as a means of enhancing the quality of life [2, 7, 8,].

Therefore, one of the most critical components for the well-being of increasing and expanding metropolitan regions is the provision of sufficient and proper public bus transportation services [10]. Although public transportation plays an important role in metropolitan areas, as [7] pointed out, its services are frequently insufficient to meet travel demand, and even when they are, they are often laden with inefficiencies, hence low efficiency. On the other hand, it is stated that growing transportation supply does not always imply an increase in travel demand and satisfaction [11]. It posits that assuring value for money or returns on investment in sustaining existing and attracting new consumers, as well as knowledge of satisfaction and service performance, should give policymakers and public transportation operations managers' useful information.

Furthermore, a scholar proposed that transportation research should shift from a purely theoretical investigation to an empirical approach to identify practical instruments for improving service quality [12]. Various components of customer value should be investigated as well [13]. This will assist service providers in transitioning from an operationally-based to a customer-focused dispensation, allowing them to not only satisfy existing customers but also to invite new ones, which is critical for the organization's long-term viability[14, 15]. However, the question remains as to which specific factors predominate in the supply of services and passenger satisfaction; this is the target of this study.

Importantly, the purpose of this study is to examine the satisfaction level of users in services delivered in the city. Besides, it attempts to identify the key factors that influence the satisfaction of users in the provision of public bus transportation in Addis Ababa.

2. LITERATURE REVIEW

Service quality is a method of managing business operations to provide complete customer satisfaction on all levels (internal and external). It improves the company's overall competitiveness, effectiveness, and flexibility [16]. Service quality is a measure of how well the level of service supplied meets customer expectations [17]. It has also been defined as the gap between consumers' expectations for service performance and their perceptions of

the service delivered [18]. Thus, knowing the quality of the supplied service is critical for business companies to ensure their survival and market competitiveness [19]. Furthermore, investing in the quality of service by industries accrue a variety of benefits, for example, improvement of customer happiness, loyalty, repeat purchases, and long-term profit through positive word of mouth [20].

Bus transit service quality is determined by a variety of variables, including average journey time and reliability, transit waiting time, monetary costs, riding comfort, information, and personal security [21, 22]. Hence, 31 service quality attributes were chosen from existing literature and studies [23-30] (Table 1) and a questionnaire was developed for this study based on specified characteristics.

Tab. 1

Selected service quality attributes for this study

Service Quality Attributes	
1. Service coverage	17. Cleanliness of bus interior, seats, and windows
2. Availability of bus stops and their proximity	18. Cleanliness of bus exterior
3. Service frequency	19. Ticket cost/fare
4. Total hour of service	20. Availability of timetable/map on bus/bus stop
5. Availability of service on weekends/holidays	21. Provision of information using media and other ways
6. Availability of services at night	22. Safety and competence of drivers
7. Convenience of the bus for everybody	23. Security against crime on a bus
8. Punctuality of bus (runs on schedule)	24. Security against crime at bus stops and stations
9. Waiting time at the bus stop	25. Staff behavior (drivers and conductors)
10. Journey time (operating speed)	26. Personnel helpfulness and friendliness
11. Bus crowding level	27. Ease of buying a ticket
12. Comfort while riding the bus	28. Administration of complaints
13. Bus stop comfort	29. Ease of service use
14. AC – Availability on bus	30. Accessibility of bus for people with disability
15. Shelter and benches at a bus stop	31. Image of the company
16. Level of noise on buses	

3. METHODOLOGY

3.1. Study Area

Ethiopia's capital city is Addis Ababa. It is usually referred to as Africa's "political capital" due to its historical, diplomatic, and political significance. It is situated in the country's middle, at a height of 2,400 meters above mean sea level, with a rolling hilly surface. The city covers a total area of 527 square kilometers. Addis Ketema, Akaki Kality, Arada, Bole, Kolfe Keranio, Gulele, Kirkos, Lideto, Nifasilk Lafto, and Yeka are among the city's ten sub-cities. These sub-

cities are further divided into 116 woredas levels for administrative purposes. The city's mass transit service is delivered by state-owned buses, such as Anbessa city bus, Sheger city bus, and Public Service Employees Transport bus and Light Rail Transport. However, the focus of this study is on road-based public bus transport of the city.

3.2. Sampling and data collection

To reach actual respondents for this study, a multistage sampling procedure was conducted. To choose terminals, stratified sampling was used first, followed by systematic sampling to select route lines from the terminals chosen for the study. Finally, respondents were chosen using convenience sampling while traveling on the chosen bus route line. The study had a sample size of 500 people. Yamane's (1967) formula was used to discover it. To gather data for the study, a questionnaire survey of regular bus riders in the city was conducted. On a Seven-point Likert scale, respondents were asked to rate the importance and performance level of 31 service quality attributes. The survey was done on a specific route line (bus) from Monday to Sunday for one month, starting December 2019 to January 2020.

3.3. Analytical methods

Factor analysis

This is a multivariate data analysis method for examining the fundamental factors that influence the collection of associated variables in a survey [31, 32]. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are the two types. The latent (unobserved) variables are determined using EFA. While CFA is used to confirm or assess the association between observed variables and common factors [33].

Customer Satisfaction Index (CSI)

The customer satisfaction index was conducted to measure user satisfaction levels based on selected variables using their factor loading (Table 2). The following formula is used to compute CSI:

$$CSI = \sum_{k=1}^N [\bar{S}_k \cdot W_k] \quad (1)$$

in which:

\bar{S}_k is the average of user satisfaction ratings for the service quality k attribute.

W_k (importance weight) is a k attribute weight that is calculated based on the importance ratings provided by users. Precisely, it is the ratio between the mean of the importance rates stated by users on the k attribute and the sum of the average importance rates of all the service quality attributes [24].

Finally, the value of CSI can be inferred from the categories proposed by Supranto (1977).

Tab. 2

Criteria for customer satisfaction index

CSI score ranges	Interpretation
0.81 – 1.00	Very Satisfied
0.66 – 0.80	Satisfied
0.51 – 0.65	Quite satisfied
0.35 – 0.50	Less Satisfied
0.00 – 0.34	Not satisfied

Source: [34, 35]

4. RESULTS AND DISCUSSION

4.1. Profile of sample respondents

Males accounted for 59.4% of the sample, while females were 40.6%. Further, 35.0% of participants were between the ages of 26 and 35, and 30.6% were between the ages of 36 and 50. For employment, the majority (38.8%) worked in private institutions, while 28.8% were self-employed. Table 3 shows the summary statistics for the other variables.

Tab. 3

Socio-economic characteristics of the survey sample

Variables	Response	Frequency	Percent
Gender	Male	297	59.4
	Female	203	40.6
Age category	Under 18 years	11	2.2
	18-25 years	107	21.4
	26-35 years	175	35.0
	36-50 years	153	30.6
	51-60 years	52	10.4
	Above 61	2	0.4
Education level	Read and write	8	1.6
	Primary school graduate	27	5.4
	High school Graduate	90	18.0
	Vocational/ diploma graduate	176	35.2
	BA graduate	185	37.0
	MA and above	14	2.8
Average Monthly Income	Less than and equal to 600 birr	57	11.4
	601-1650 birr	70	14.0
	1651-3200birr	106	21.2
	3201-5250 birr	131	26.2
	5251-7800birr	94	18.8
	7801-10,900 birr	34	6.8
	10,901 and above	8	1.6

Travel Frequency	Daily	134	26.8
	4-5 times a week	182	36.4
	2-3 times a week	126	25.2
	Sometimes, not always	58	11.6
Journey Purpose	Work	192	38.4
	Education	134	26.8
	Market/shopping	67	13.4
	Social activities	89	17.8
	Other	18	3.6

4.2. Factor analysis

Factor analysis was used in this part to identify the crucial item that influences customer satisfaction. Accordingly, EFA was used initially to investigate the most influential variables on the city's public transportation system service quality. The fitness of the model identified by EFA is then tested using CFA. However, before moving on to factor analysis, a reliability test was performed. The Cronbach's alpha test value was 0.857 (Table 4), indicating that the data was consistent and valid for factor analysis.

Tab. 4

Reliability analysis result

<i>Scale Reliability Statistics</i>			
N	mean	SD	Cronbach's α
31	3.79	0.843	0.857

The Kaiser-Meyer –Oklin (KMO) and Bartlett's tests were also used to assess the data's validity and sample adequacy. The KMO test is used to determine the study's sample adequacy, and it must be more than 0.5 to proceed with proper factor analysis [32]. As shown in Table 5, the KMO test value is greater than 0.5, and Bartlett's test value is 0.000, which is highly significant.

Tab. 5

KMO and bartlett's spherical inspection

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.861
Bartlett's Test of Sphericity	Approx. Chi-Square	3084.546
	df	465
	Sig.	.000

The study similarly used Principal Component Analysis and Oblimin rotation, with 0.4 serving as a clear cut-off for assessing the variables. Consequently, five variables with a loading of less than 0.4 and one factor with a Cronbach's alpha of less than 0.5 were dropped from

the study's further research. Other factors had Cronbach alphas ranging from 0.520 to 0.614, which is acceptable for the study.

As indicated in Table 6, seven component factors explained 55% of the variance in service quality attributes satisfaction. Timeliness, Customer Care, Comfort, Facilities, Image, Availability, and Security were the categories assigned. Table 6 likewise shows the results for the satisfaction data set for factor loading, Eigenvalue, Variance Explained, and Cronbach alpha.

Tab. 6.

EFA results for the performance of service quality attributes

Factor	Attributes	Code	Loadings	Eigenvalue	Variance Explained (%)	Cronbach's alpha
1	Timeliness			5.400	7.72%	0.570
	Availability of services at night	V6	0.714			
	Availability of service on weekends/holidays	V5	0.634			
	Punctuality of bus/runs on schedule	V8	0.521			
	Journey time (operating speed)	V10	0.475			
2	Customer care			1.691	7.65%	0.591
	Drivers and conductors behavior	V25	0.699			
	Ease of buying a ticket	V27	0.623			
	Personnel helpfulness and friendliness	V26	0.563			
	Ease of service use	V29	0.422			
3	Comfort			1.434	7.27%	0.613
	Cleanliness of bus exterior	V18	0.694			
	Cleanliness of bus interior	V17	0.607			
	Level of noise on buses	V16	0.430			
	Bus crowding level	V11	0.415			
4	Facilities			1.306	6.93%	0.614
	AC – Availability on bus	V14	0.703			
	Availability of shelter and benches at a bus stop	V15	0.696			
	Bus stop comfort	V13	0.475			
	Convenience of the bus for everybody	V7	0.434			

5	Image			1.212	6.79%	0.585
	Accessibility of bus for disabled people	V30	0.829			
	Image of the company	V31	0.608			
	Administration of complaints	V28	0.480			
6	Availability			1.123	6.33%	0.520
	Ticket cost/fare	V19	0.717			
	Availability of bus stops and their proximity	V2	0.565			
	Safety and competence of drivers	V22	0.495			
7	Security			1.075	6.77%	0.566
	Security against crime on a bus	V23	0.758			
	Security against crime at bus stops and stations	V24	0.730			

Timeliness is the first latent factor that received the highest score in the analysis as seen above. With an Eigenvalue of 5.400, it accounts for 7.72% of the overall 55.0% variation. In addition, this factor includes four bus service quality measure factors. This suggests that users' total satisfaction with bus service quality is most strongly linked to timeliness than any other factor. Thus, any improvement direction for bus service supply should emphasize these variables.

Customer care and comfort of service are the second and third latent factors, accounting for 7.65 and 7.27% of the variance, respectively, with eigenvalues of 1.691 and 1.434. They both have four quality of service variables. Accordingly, customer care and service comfort duties are the second and third most important factors influencing passengers' overall satisfaction.

The other main latent factors are facilities, image, availability, and security, which account for 6.93, 6.79, 6.33, and 6.77% of the 55.0% variation, respectively, and have eigenvalues larger than one. The overall result demonstrates that these factors are critical and have varying degrees of impact on users' overall satisfaction with bus transportation quality.

Finally, CFA is used to confirm the data acquired previously. Standardized factor loading is the first step. As shown in Figure 1, the loading of V2 to V31 ranges from 0.31 to 0.67, and the majority of the variables are over the cut-off value (that is, 0.4), except for three variables that are less than 0.4 (that is, V5, V6, and V2). However, a factor loading of 0.3 can be significant for sample sizes of 350 and above [32]. Hence, it can be used in research.

Model Fit: The CMIN/DF value is 1.709, which is less than 3.00, as stated in Table 7. CFI, TLI values are greater than 0.9, RMSEA is less than 0.08. By using the Modification index on the first model, all of the fit indices meet the appropriate requirements. Thus, the index system depicted in Figure 1 is thought to be acceptable.

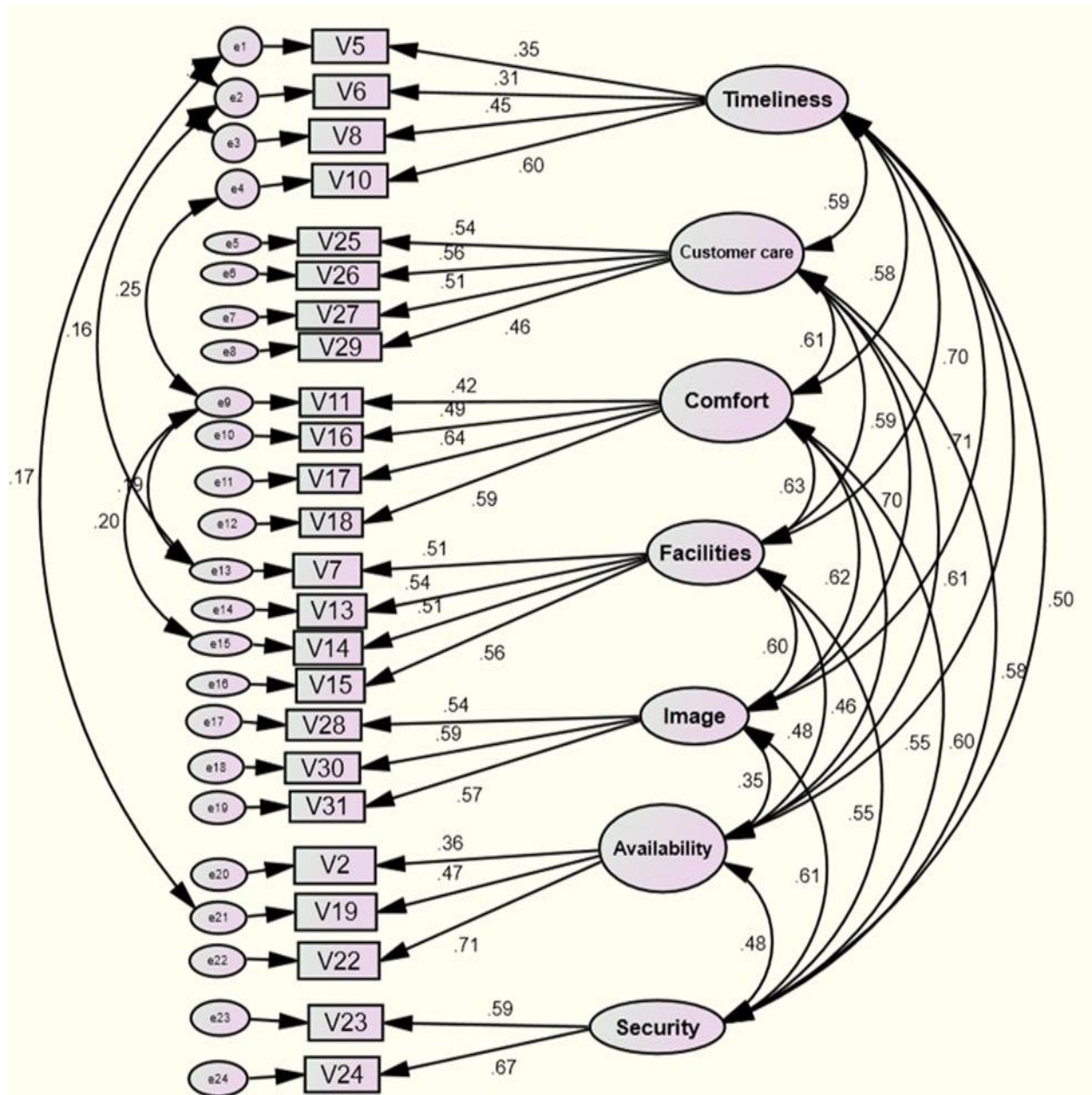


Fig. 1. Confirmatory factor analysis

Tab. 7.

The goodness of fit statistics

Modal Fit Parameters	Fit Standard	Results
CMIN/DF**	< 3.00	1.709
Comparative Fit Index (CFI)	≥0.90	0.920
Root Mean Square Error of Approximation(RMSEA)	≤ 0.08	0.038
Tucer Lewis Index(TLI)	≥0.90	0.901

**CMIN/DF: Minimum Discrepancy Function Divided by Degree of Freedom

4.3. Customer satisfaction analysis

Then, based on the factor analysis results, a customer satisfaction index study was performed on the data set to quantify consumers' satisfaction levels using a variable with a loading cut-off of 0.4 and above. Table 8 displays the outcome.

Tab. 8.

CSI result

Factor	Attributes	Code	Perfor	Importance	Weight	Weight	CSI
			mance		factor	score	
			MSS	MIS	MIS/Av	MSS*W	
					.MIS	F	
1	Timeliness						0.50 (50%)
	Availability of services at night	V6	3.1	5.34	1.05	3.26	0.47
	Availability of service on weekends/holidays	V5	3.6	5.18	1.02	3.67	0.52
	Punctuality of bus/runs on schedule	V8	3.29	5.31	1.05	3.44	0.49
	Operating speed	V10	4	4.47	0.88	3.52	0.50
2	Customer care						0.53 (53%)
	Drivers and conductors behavior	V25	3.58	5.15	1.01	3.63	0.52
	Ease of buying a ticket	V27	3.19	5.14	1.01	3.23	0.46
	Personnel helpfulness and friendliness	V26	3.85	4.96	0.98	3.76	0.54
	Ease of service use	V29	4.14	5.07	1.00	4.13	0.59
3	Comfort						0.56 (56%)
	Cleanliness of bus exterior	V18	4.66	4.55	0.96	4.46	0.64
	Cleanliness of bus interior	V17	4.34	5.37	1.13	4.91	0.70
	Level of noise on buses	V16	3.32	3.94	0.83	2.75	0.39
	Bus crowding level	V11	3.39	5.15	1.08	3.68	0.53
4	Facilities						0.54 (54%)
	AC – Availability on bus	V14	3.84	4.55	0.95	3.65	0.52
	Availability of shelter and benches at a bus stop	V15	4.02	4.65	0.97	3.90	0.56
	Bus stop comfort	V13	3.41	4.67	0.98	3.33	0.48
	Convenience of the bus for everybody	V7	3.76	5.28	1.10	4.15	0.59
5	Image						0.55 (55%)
	Accessibility of bus for disabled people	V30	3.64	5.1	1.01	3.68	0.53
	Image of the company	V31	4.45	5.08	1.01	4.48	0.64
	Administration of complaints	V28	3.42	4.96	0.98	3.36	0.48
6	Availability						0.64 (64%)
	Ticket cost/fare	V19	4.75	5.08	1.00	4.73	0.68
	Availability of bus stops and their proximity	V2	4.33	5	0.98	4.25	0.61

	Safety and competence of drivers	V22	4.37	5.21	1.02	4.46	0.64
7	Security						0.48 (48%)
	Security against crime on a bus	V23	3.6	5.09	1.00	3.59	0.51
	Security against crime at bus stops and stations	V24	3.16	5.12	1.00	3.17	0.45
	Mean		3.80	4.98		CSI res.	0.54 (54%)

Subsequently, the overall CSI score for public transportation in Addis Ababa is 0.54 (54%), indicating that users are quietly satisfied with the service.

In addition, with a CSI score of 0.51 to 0.65, users are quietly satisfied with factors such as availability, image, facilities, comfort, and customer care. Furthermore, on the one hand, users were dissatisfied with security and timeliness, scoring 0.48 and 0.5, respectively, on the CSI scale. While on the other hand, users were more satisfied with a factor of availability with a CSI value of 0.64 and less satisfied with security indicators with a CSI value of 0.48.

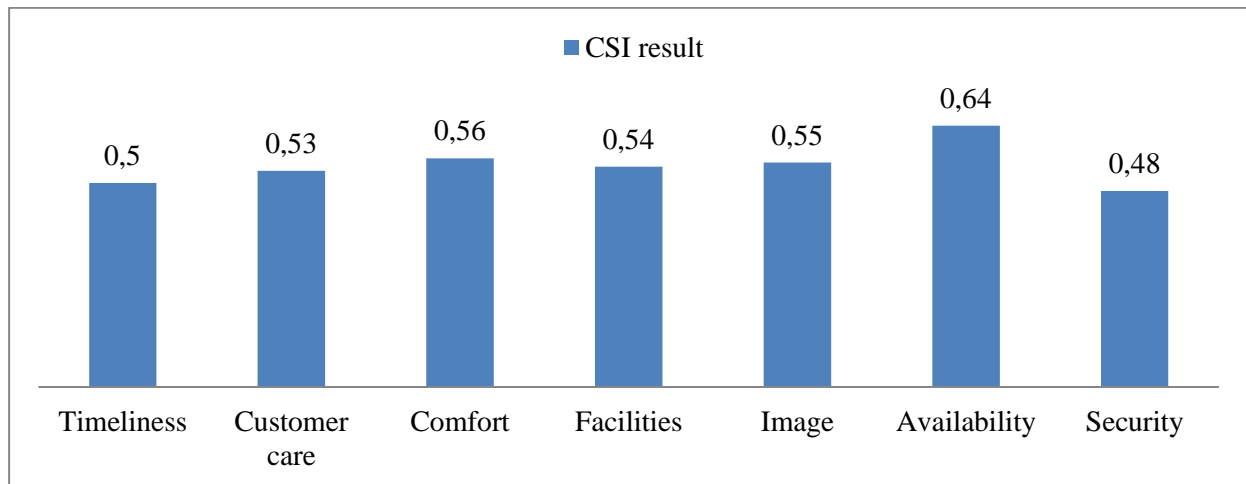


Fig. 2. CSI result

4.3.1. Satisfaction analysis on gender

It is critical to understand the relationship between a client's perception of service quality and demographic factors like age, gender, education, and income level [36]. Demographic characteristics are a recognized basis for segmenting markets and consumers [37]. Investigating gender perceptions of service quality may thus assist public transportation operators in far more detailed market segmentation by specifying which service quality attributes are preferable for different passenger segments [38].

Therefore, this study tried to determine customer impression differences based on gender, based on the aforementioned factors. As demonstrated in Figure 4, male and female users of the city's public transportation have somewhat similar levels of satisfaction, that is, both male and female users were quite satisfied with the CSI score of 0.55 and 0.54, respectively.

Furthermore, as indicated in the graph below, female consumers are more satisfied with availability (CSI score of 0.63) and least satisfied with security (CSI score of 0.47). Similarly, male customers are most satisfied with the availability element, which has a CSI score of 0.65 and least confident in the security, which has a score of 0.49.

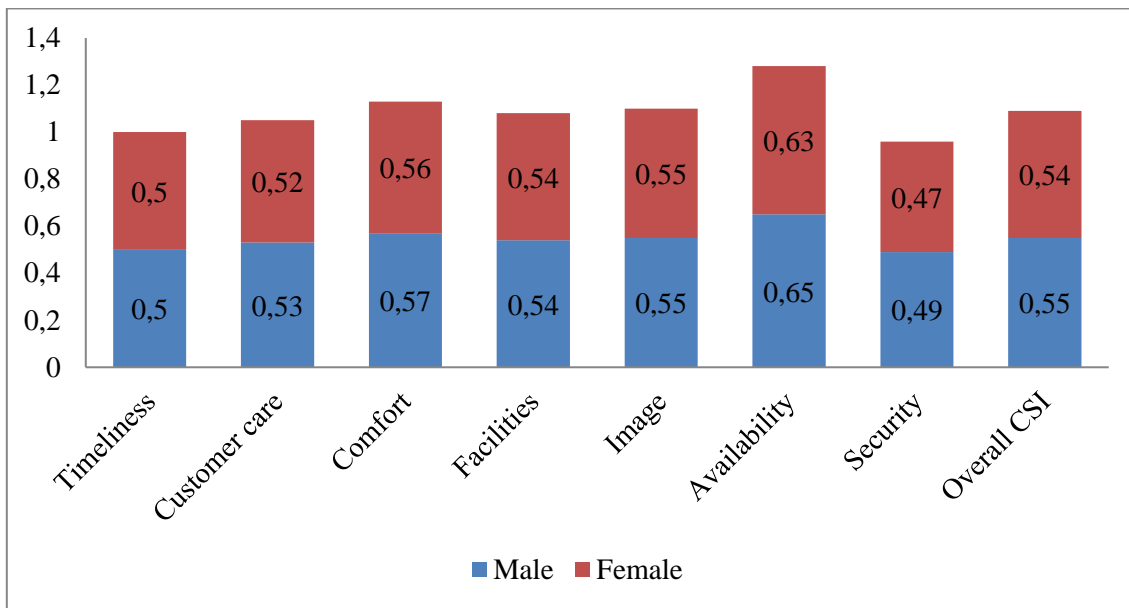


Fig. 3. Segmentation satisfaction analysis

5. CONCLUSION

This research aims to evaluate customers' satisfaction level with the quality of delivered public bus transport service in the city. A questionnaire was used to collect data from 500 users while they were traveling on the systematically selected bus route. The study used factor analysis and customer satisfaction index to analyze the data. Variables with a loading of 0.4 and higher were chosen using the factor analysis approach.

Based on the findings, 24 variables were identified as robust indices to assess passengers' satisfaction with the quality of bus transportation in the city. The variables were grouped into seven factors, that is, timeliness, customer care, comfort, facilities, image, availability, and security.

The findings of this study are consistent with other studies such as [33, 39-42]. These studies agree that timeliness, security, safety, comfort, facilities, convenience, reliability, availability, customer service, and images of the company are the most significant factors that affect passengers' overall satisfaction level in the provision of public transport service in various experiences. Furthermore, findings from city surveys [43, 44] show that service quality is insufficient, and customers are dissatisfied with the Anbessa and Higher city bus transportation services. However, these studies did not illustrate user satisfaction levels in detail based on components or identify traits that need to be improved in service delivery.

Importantly, the customer satisfaction index was conducted to determine the overall user satisfaction level in this study. The CSI result shows the general satisfaction level of users in the city as 54%. This indicates that users were not very satisfied with the public bus transport service in the city. Further, users were also better satisfied with the component of availability and less satisfied with factors of timeliness and security in the city. Given the overall findings, this study recommends that the local government, transit service providers, and other interested parties focus on components with low CSI scores, particularly on timeliness and security to enhance customer satisfaction levels in the city.

6. IMPLICATIONS OF THE STUDY

The ramifications of this study are considerable for both practitioners and scholars. From a management standpoint, the findings of this study may help managers and decision-makers understand how satisfied users are with the city's public bus service quality. It would also assist them in improving service quality by identifying the primary features that require immediate attention depending on users' perceptions. Furthermore, by using the proposed framework to regularly measure their service performance in their company, they may allocate resources for the service's significant quality attributes.

From a research standpoint, this study fills a research gap by employing factor analysis with CSI as an alternative framework for assessing the quality of bus service in the city. Consequently, using this framework, similar techniques can also be used to discover possible areas for policy insight in many service sectors (for example, hospitals, banks, schools, etc.).

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