Evaluating service performance of public bus transit service: a case study of Addis Ababa, Ethiopia

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**ABSTRACT**
To determine the operators’ strengths and shortcomings in the delivery of transit service, it is crucial to evaluate bus transit service performance from the viewpoint of the consumer. This study highlights the priority features that demand immediate attention in service supply and assesses users’ levels of satisfaction. A questionnaire was used to gather information from 500 respondents, and models for Factor Analysis, Customer Satisfaction Index and Importance Performance Analysis were used to assess the data. According to the results, clients were quietly satisfied with the service they received in 55% of cases. It suggests that the city’s transit system needs immediate attention if it wants to increase passenger satisfaction ratings above the existing level. Nine service quality attributes were identified by IPA’s analysis as belonging to quadrant one, which is a quadrant with high importance but low performance. As a result, the study recommends transit service providers, local governments, and other interested parties concentrate and allocate their resources on enhancing transit services that emphasize the qualities found in the first quadrant.

**1. Introduction**

A country’s overall development is significantly influenced by the transport industry (Agarwal, 2009). Transport is primarily responsible for the transportation of people and things, and it is also a key component of a healthy economy (Iles, 2005). A conventional bus is the primary form of public transportation in the majority of developing country cities because of its inexpensive beginning and operating costs, adaptable route system, and accessibility to town and city centers (Iles, 2005; Verma & Ramanayya, 2014). Buses are also the most popular choice for most commuters because they are the least expensive form of transportation, according to Iles (2005). Therefore, one of the most dynamic aspects of the well-being of developing metropolitan regions is the provision of effective public bus transit services (Niger, 2011).

Also, as Amiruddin and Mohammad (2011), buses are the most widely used in transit technology nowadays; bus networks are easily reachable and cheaper than other public transportation kinds. In most developing countries, buses are inefficient and hazardous and a significant pollution and noise source (International Energy Agency (IEA), 2002).
Thus, city authorities are just starting to become aware of new kinds of efficient, clean, and affordable buses that can improve this image and maintain or even raise their share of trips while improving total mobility (Ibid).

In the city of Addis Abeba, public transportation is provided by a variety of small taxis, minibusses, larger buses, buses, and light rail trains. However, the number of vehicles in Addis Ababa city has recently exploded. According to the Federal Transport Authority, there are 574,636 registered vehicles in the city as of 2018, with 37.7% of those being private cars and 2.7 % buses (with more than 11 seats). Thus, it demonstrates the growth in the city’s registered automobile number. Comparing other car kinds in the city, the percentage of people who own an automobile is likewise the greatest. On the other hand, the expansion of the transportation network, such as the length of the roads, has stifled growth and was unable to meet the demand for mobility at the time. As a result, difficulties with the city’s transportation infrastructure like traffic congestion, jams, and accidents on the road have become major issues.

In these situations, government policy should promote the use of public transportation via buses (Hafezi et al., 2013; Hwe et al., 2006). Similar to this, governments around the world have employed various schemes to entice drivers of private vehicles to favor using public mass transit, including buses or subways. Additionally, public transportation ought to be viewed as a component of a future solution for sustainable transportation. To meet the needs of users, provide high-quality service, and draw in future riders (Anable, 2005).

Additionally, the study’s author thought that to make the city’s bus transit service both appealing and effective, the city’s services needed to be more than only planned, run, and promoted. Furthermore, it must be continuously measured and monitored. The city’s transit system benefits from improved operational effectiveness and service quality due to the service’s user-centered performance measurement. Based on the fact that the purpose of this study is to measure how satisfied city residents are with the quality of the services provided by public bus transit providers and to pinpoint the most urgently needed quality improvements.

2. Literature Review

In literature, scholars favor using a user-based, or customer-centered, the definition of service quality (Ojo, 2019). Service quality, according to Gržinić (2007), is a system to manage corporate processes to ensure complete customer satisfaction on all levels (internal and external). It is a strategy that boosts the whole company’s flexibility, effectiveness, and competitiveness (Gržinić, 2007).

Parasuraman et al. (1985) described service quality as a measure of how well the service level provided contests customer expectations. Providing quality service means conforming to customer expectations consistently. It has also been defined as the difference between the customers’ expectations about the service performance and their perceptions about the service performed (Mercangöz et al., 2012). Accordingly, knowing the quality of the delivered service is essential for all businesses to guarantee survival and maintain their competitiveness in the market (Allen et al., 2020). Besides, various benefits are obtained by investing in the quality of the service by the sectors. It enhances customer satisfaction, loyalty, repeat purchase, and long-run profit through positive word of mouth (Haron et al., 2013).
The quality of bus transit service depends on numerous factors, such as average travel time and reliability, transit waiting time, monetary costs, comforts of riding, information, and personal security (Cascetta & Carteni, 2014). There is still an ongoing debate regarding the best quality definition in the scientific community and how should measure it. It is mainly recognized that service quality is intrinsically related to the user (Cascetta & Carteni, 2014; Parasuraman et al., 1994).

In doing so, it is indispensable to measure the quality of delivered services beforehand to recognize their strengths and weaknesses. Works of literature show various approaches to measuring service quality. For instance, the Service Quality Index (SQI) was used to measure quality based on customers’ judgments rating the service’s quality attributes (L. and Eboli & Mazzulla, 2009; Hensher et al., 2003). The Customer Satisfaction Index (CSI) is also employed to measure customer satisfaction with the quality of services based on customers’ judgments conveyed through a numeric (L. and Eboli & Mazzulla, 2009; Lambert et al., 2018; Putra et al., 2014; Staszków, 2013). SERVQUAL, which is also developed by Parasuraman et al. (1985), is another common and widely used approach to measure the actual or perceived service quality and the customer perceptions of the service delivered as well (Parasuraman et al., 1988; Randheer et al., 2011; Sam et al., 2018; Sundaryanto, 2007). Moreover, TRANSQUAL and SERVPERF are used to measure the quality of public transport services related to SERVQUAL (Haron et al., 2013; Yuda Bakti & Sumaedi, 2015).

Moreover, among the various techniques developed for investigating transit service quality, the Importance-Performance Analysis (IPA), which Martilla and James first presented in the 1970s to advance marketing strategy. Since then, numerous practitioners and researchers have applied IPA to identify the critical performance factors in customer satisfaction survey data for products and services (Allen et al., 2020; Grujičić et al., 2014; Haron, 2015; Matariya & Rahul, 2017; Putra, 2013; Sezhin et al., 2011).

Lastly, many studies measure transit service quality using various tools, mainly using the SERVQUAL model. Thus, considering the existing literature and studies (i.e. L. and Eboli & Mazzulla, 2009; Dell’Olio et al., 2011; Friman, 2004; Haron, 2015; Hensher et al., 2003; Nathanail, 2008; Putra et al., 2014; Rabiul et al., 2014; Tyrinopoulos & Antoniou, 2008) 31 service quality attributes are selected, and a questionnaire was developed based on specified characteristics for this study.

3. Materials and method

3.1. Study Area

The capital of Ethiopia is Addis Ababa. Due to its historical, diplomatic, and political significance, it is frequently referred to as ‘the political capital’ of Africa. Geographically, it is situated in the middle of the nation at a height of 2,400 meters above mean sea level and has a hilly, undulating surface. The city occupies an area of 527 square kilometers. The city is further divided into 116 woredas levels and ten sub-cities. State-owned buses, including the Anbessa city bus, Sheger city bus, Public Service Employees Transport bus, and Light Rail Transport bus, provide the city’s mass transit service. However, the study’s main focus is on the city’s road-based public bus transportation.
3.2. Data Collection

To find actual respondents for the study, a multistage sampling technique was employed. Before selecting the route lines from the terminals chosen for the study, stratified sampling was utilized to choose the terminals. Last but not least, respondents were chosen by convenience sampling while they were on the chosen bus route line. The study used a 500-participant sample size. Using Yamane’s (1967) formula, it was discovered.

The city’s regular bus riders were surveyed using a questionnaire to gather information for the study. Questions on passengers’ socioeconomic status and travel habits, including gender, age, destination, the purpose of the trip, frequency of use, etc., were asked in the questionnaire’s first section. The second section includes 31 ratings from passengers on different factors of the public bus system. On a seven-point Likert scale, respondents were asked to assess 31 service quality indicators. The study was conducted for one month (i.e. January 2020) on a particular bus route in the city.

3.3. Data Analysis

3.3.1. Factor Analysis

The reliability measures of the constructs for the study are measured using the factor analysis approach. It is one of the multivariate data analysis techniques used to investigate the key variables that govern a collection of measured, correlated variables in the survey (Field, 2009; Joseph et al., 2010; Lai & Hitchcock, 2015). Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis are the two forms (CFA). To identify the latent (unobserved) variables, EFA is used. The link between common factors and observed variables is also confirmed or tested using CFA (Deb & Ali Ahmed, 2018). Therefore, before undertaking CFA modeling, the researcher needs to comprehend the total number of factors and the relationship between observable and unobserved variables (Jomnonkwao et al., 2016). Due to this, EFA is initially used in this study to group variables into a limited number of bus service quality dimensions and to undertake interpretation using the questionnaire’s items. The outcomes of the EFA are then verified using CFA.

3.3.2. Customer Satisfaction Index

The Customer Satisfaction Index was used to measure customer satisfaction based on selected variables and their factor loading cut-off of 0.4 for both the importance and satisfaction data sets.

CSI, which is measured using means of the satisfaction rates stated by users, weighted based on the importance rates, based on the following formula:

\[
CSI = \sum_{k=1}^{N} [\bar{S}k.Wk]
\]

in which:

\(\bar{S}k\) is the mean of the satisfaction rates conveyed by users on the service quality k attribute

\(Wk\) (Importance weight) is a weight of the k attribute, evaluated based on the importance rates conveyed by users. Precisely, 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 (L. and Eboli & Mazzulla, 2009). Lastly, the value of CSI can be interpreted based on the categories forwarded by Supranto (1977). Criteria for Customer Satisfaction Index as shown in Table 1.

### 3.3.3. Importance Performance Analysis

IPA is also known as quadrant analysis applied in different areas due to its ease of identifying varying quality attributes that can improve service quality. The IPA technique’s primary thought is to scrutinize the importance of an attribute and the consumer’s satisfaction with that feature. Thus, as an assessment tool, IPA graphically illustrates the relationship between the importance and performance of service quality attributes. As John and John (1977) mentioned graphically, importance and performance statistics are plotted on a couple of coordinate axes, where ‘importance’ is demonstrated along the Y-axis, and ‘performance’ is shown along the X-axis. Then, the data are diagrammed into four quadrants, as shown in Figure 1. Every quadrant shows the ranking of importance and performance of a component of the service allocated by customers.

| 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        |

(Supranto 1977; Windyani et al., 2013)

![Figure 1. The IPA Map.](Source: adapted from Bacon, 2003; John & John, 1977)
4. Results and Discussion

4.1. Demographic Characteristics of Samples

Male respondents composed 59.4% of the sample while female respondents made up 40.6%. 35.0% of the participants were under the age of 35 (30.6% were between 36 and 50), and 30.6% were between those ages. In terms of employment status, the majority (38.8%) worked under private direction, while 28.8% were working on their own business. Table 2 displays summary data for various variables.

Table 2. Socio-demographic profile of the 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     |
| Average Monthly Income | Less than and equal to 600 birr  | 57        | 11.4    |
|                     | 601–1650 birr                        | 70        | 14.0    |
|                     | 1651–3200 birr                       | 106       | 21.2    |
|                     | 3201–5250 birr                       | 131       | 26.2    |
|                     | 5251–7800 birr                       | 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     |

Source: Field survey, 2020

4.2. Factor Analysis

In this study, EFA and CFA separately analyzed the importance and performance data set for service quality attributes of the bus transport service from the passengers’ perspective.

4.2.1. Importance of Service Quality Attributes (Expectation)

4.2.1.1 Exploratory Factor Analysis. Principal Component Analysis for factor extraction and Oblimin rotation has performed first using Jamovi 1.1.9.0 Software to optimize the measurements (Aljandali, 2017; Askari et al., 2020). Variables that have a factor loading of lower than 0.4 were removed from further analysis, and the value for eigenvalue is decided one and above to find the number of factors.

Cronbach alpha was calculated to measure the reliability of factors. Also, a factor with a reliability analysis results in less than 0.5 is rejected from the study. Thus, Cronbach’s alpha for factor 1 to factor 5 is between 0.579 to 0.889. Even if Cronbach’s alpha value of 0.7 is commonly accepted for measuring a scale’s reliability, a range between 0.5 and 0.75
shows a moderately reliable scale (Hinton et al., 2014). Due to that, the results of the reliability test of factors of the study are accepted.

Moreover, the data’s sampling adequacy and factorability were evaluated using Kaiser-Meyer-Olkin (KMO = 0.954) and Bartlett’s Test of Sphericity. Then, as shown in Table 3 the result for KMO and Bartlett’s Test of Sphericity (p < 0.001) verified the adequacy of the fit (Field, 2009). Also, PCA identified five component factors that explained 52.13% of the variance for the importance (expectation) data set of service quality attributes. These were labeled as Factor 1: Customer care, Factor 2: Facilities, Factor 3: Availability, Factor 4: Comfort, and Factor 5: Timeliness, as shown in Table 3.

| Factor          | code | Loadings | Eigenvalue | Variance Explained (%) | Cronbach’s alpha |
|-----------------|------|----------|------------|------------------------|------------------|
| 1 Customer Care |      |          | 11.216     | 17.99%                 | 0.889            |
|                 | V27  | 0.811    |            |                        |                  |
|                 | V30  | 0.807    |            |                        |                  |
|                 | V29  | 0.801    |            |                        |                  |
|                 | V28  | 0.795    |            |                        |                  |
|                 | V26  | 0.659    |            |                        |                  |
|                 | V24  | 0.587    |            |                        |                  |
|                 | V25  | 0.562    |            |                        |                  |
|                 | V23  | 0.547    |            |                        |                  |
| 2 Facilities    |      |          | 1.530      | 12.27%                 | 0.826            |
|                 | V18  | 0.713    |            |                        |                  |
|                 | V15  | 0.692    |            |                        |                  |
|                 | V17  | 0.588    |            |                        |                  |
|                 | V14  | 0.514    |            |                        |                  |
|                 | V22  | 0.509    |            |                        |                  |
|                 | V19  | 0.474    |            |                        |                  |
|                 | V13  | 0.434    |            |                        |                  |
| 3 Availability  |      |          | 1.333      | 7.37%                  | 0.579            |
|                 | V1   | 0.704    |            |                        |                  |
|                 | V2   | 0.725    |            |                        |                  |
|                 | V9   | 0.436    |            |                        |                  |
| 4 Comfort       |      |          | 1.076      | 7.23%                  | 0.622            |
|                 | V10  | 0.537    |            |                        |                  |
|                 | V11  | 0.762    |            |                        |                  |
|                 | V12  | 0.486    |            |                        |                  |
|                 | V16  | 0.511    |            |                        |                  |
| 5 Timeliness    |      |          | 1.001      | 7.26%                  | 0.773            |
|                 | V3   | 0.402    |            |                        |                  |
|                 | V4   | 0.619    |            |                        |                  |
|                 | V5   | 0.555    |            |                        |                  |
|                 | V6   | 0.600    |            |                        |                  |

Therefore, as can be observed from the data set’s user importance level, customer care is the latent variable that mostly determines the quality of public bus service. With an eigenvalue of 11.216, it contributes 18.0% of the variance’s overall 52.13% variance. Eight public bus service quality measure factors are also included in this factor. It demonstrates how, in comparison to other aspects, the level of customer care activities is where users’
expectations of bus service quality are most strongly influenced. To increase consumers’ pleasure in the city, the service’s future improvement should carefully take into account each variable under this component.

The second latent factor has to do with the facilities used to deliver transit services. It has an Eigenvalue of 1.530, seven characteristics related to service quality, and explains 12.27% of the variance which is 52.13%. Therefore, from the perspective of users, public transportation facilities are the second most important component that is greatly anticipated.

The attributes under availability are related to the third latent factor. It consists of three variables to assess the quality of bus service, accounting for 7.37% of the 52.13% variance and having an Eigenvalue of 1.333.

Last but not least, the fourth and fifth latent factors, Comfort and Timeliness, account for 7.23 and 7.26% of the total 52.13% variance, respectively, with Eigenvalues of 1.076 and 1.001. These two criteria are crucial for measuring service quality. The results of the EFA were then verified by the CFA.

**4.2.1.2. Confirmatory Factor Analysis.** Confirmatory Factor Analysis (CFA) with AMOS 18.0 is used to further confirm the aforementioned five-factor model. The criteria proposed by Randall and Richard (2016) and Joseph et al. (2010) are used to evaluate model fit. Table 5 depicts the predicted values for the five-factor model in comparison to the fit criteria for each index.

![Figure 2. Confirmatory Factor Analysis for Expectation.](image-url)
It begins by noticing the standardized loading. As Figure 2 shows, factor loading for V2 to V30 is in the range of 0.46–0.76, above the study’s cut-off value (i.e. 0.4). Though most of the cut-off value of factor loading in CFA is 0.5 (Sum et al., 2020; Deb & Ali Ahmed, 2018), it is stated that for the sample size of 350 and above, a factor loading of 0.3 is significant(Joseph et al., 2010).

4.2.1.3. Model Fit Indices. The Goodness-of-fit results shows CMN/DF = 1.918, RMSEA = 0.043, CFI = 0.945, TLI = 0.939. So, compared to the criterion shown in Table 4, the model fits the data very well. Therefore, based on the obtained fit of indices, the structure of the model has been accomplished without amendments, which leads to a good fitting of data. The best fit model is shown as follows.

| Table 4. The goodness of fit statistics. |
|----------------------------------------|
| Modal Fit Parameters                  | Fit Standard | Results |
|----------------------------------------|--------------|---------|
| CMIN/DF                                | < 3.00       | 1.918   |
| Comparative Fit Index (CFI)            | ≥0.90        | 0.945   |
| Root Mean Square Error of Approx. (RMSEA) | ≤ 0.08 | 0.043   |
| Tucker Lewis Index(TLI)                | ≥0.90        | 0.939   |

4.2.2. Performance of Service Quality Attributes (Satisfaction)

4.2.2.1 Exploratory Factor Analysis. Table 5 displays the findings for factor loading, Eigenvalue, Variance Explained, and Cronbach alpha for the satisfaction data set, similar to the previous section. Therefore, PCA and Oblimin rotation are applied, and 0.4 is chosen as a distinct cut-off for the variable analysis.

Based on the result, five variables with the loading of less than 0.4 and one factor resulting from Cronbach’s alpha of less than 0.5 are rejected from further analysis of the study. Cronbach alpha for other factors ranged from 0.520 to 0.614, and they are accepted for the study. Moreover, the result for KMO = 0.861 and Bartlett’s Test of Sphericity x² = 3084.5 (P < 0.001) shows the adequacy of sampling for the study. Similarly, PCA identified seven component factors that together explained 55% of the variance for the performance (satisfaction) data set of service quality attributes. These were labeled as Factor1: Timeliness, Factor 2: Customer care, Factor 3: Comfort, Factor 4: Facilities, Factor 5: Image, Factor 6: Availability, and Factor 7: Security, as shown in Table 5.

Timeliness is the initial latent factor that, as demonstrated above, scored best in the analysis. With an Eigenvalue of 5.400, it contributes 7.72% of the overall 55.0 % variation. Additionally, this component includes four bus quality of service parameters. This indicates that punctuality is more strongly correlated with users’ overall satisfaction with bus service quality than any other aspect. Therefore, these factors should be emphasized in any improvement directions for bus service providing.

Customer care and service comfort are the second and third latent factors, accounting for 7.65% and 7.27 % of the variance and having an eigenvalue of 1.691 and 1.434, respectively, of the total variance. Both of them also include the four bus service quality measurement variables. The outcome thus suggests that tasks related to comfort and
customer service are the second and third most important elements that, respectively, influence passengers’ overall satisfaction levels.

Facilities, Image, Availability, and Security are the additional significant latent factors, each accounting for 6.93, 6.79, 6.33, and 6.77 % of the overall variance of 55.0% with an Eigenvalue greater than one. The conclusion demonstrates the importance of these criteria and how they varied in their impact on users’ overall satisfaction with bus transportation quality.

4.2.2.2. **Confirmatory Factor Analysis.** Like the above procedure, it starts by looking at the standardized factor loading. Thus, as in Figure 3, the loading of V2 to V31 is between 0.31 to 0.67 and most of the variables are above the cut-off value (i.e. 0.4) except for three variables less than 0.4 (i.e V5, V6, and V2). But to Joseph et al. (2010) for the sample size of 350 and above, a factor loading of 0.3 can be significant. So, it can be used for the study.
4.2.2.3. Model Fit. As shown in Table 6, CMIN/DF value is 1.709, which is less than 3.00. RMSEA is less than 0.08, CFI, and TLI values are greater than 0.9. All the fit indices have reached the relevant standards by applying the Modification index to the first model. Hence, the construction of the index system shown in Figure 3 is considered reasonable.

![Figure 3. Confirmatory factor analysis for satisfaction.](image)

Table 6. 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   |
| Tucker Lewis Index(TLI)                   | ≥0.90        | 0.901   |

4.3. Direct Measure

The Customer Satisfaction Index and Importance Performance analysis were then conducted based on the findings of the factor analyses (EFA and CFA) to evaluate user satisfaction levels and indicate the critical areas that require the operators’ immediate attention. Additionally, for both the importance and performance data
sets, a common variable with a loading cut-off of 0.4 and above has been used in CSI and IPA analyses.

4.3.1. Customer Satisfaction for Public transit Service in the City

According to Putra (2013), client satisfaction is a function of the variance between perceived performances to expectations. Then, the service performance of public transportation in Addis Ababa is evaluated by the CSI using selected quality attributes of public transport services.

Customers are less satisfied with the indicators of availability of services at night, bus stop comfort, level of noise on buses, security against crime at bus stops and stations, easiness to buy the ticket, and administration of complaints because the value of CSI for the indicators lies between 0.4 to 0.50. While, users are satisfied with the indicators of cleanliness of bus interior, seats and windows, ticket fare, and safety and competence of drivers since the value of CSI is found in the range between 0.66 to 0.80. However, users are quite satisfied with the remaining indicators of service quality. The overall CSI score for public transport service in Addis Ababa is 0.55(55%) and is interpreted as users being quietly satisfied with the service of public bus transport. CSI of the public transport system in the cityas shown in Table 7.

4.3.2. Importance Performance Analysis

To estimate the importance and performance of service attributes in the study, the mean for the aggregated data was determined. The IPA matrix intersection is then made available using the mean level of performance at (3.8) and the mean level of importance, as indicated in Table 6 above (4.9). As a result, Figure 4 shows the outcomes of IPA.

As shown above, the first quadrant contains nine service attributes such as;

- availability of bus service on weekends/holidays
- availability of services at night
- security against crime at bus stops and station
- easiness to buy the ticket
- bus crowding level
- administration of complaints
- driver and conductors behavior
- security against crime on a bus, and
- accessibility of buses for people with disability in need of improvements because they have high importance but relatively low performance.

On the other hand, six services attribute such as;

- availability of bus stops and their proximity
- cleanliness of bus interior, seats, and windows
- personnel helpfulness and friendliness
- ease of service use
- safety and competence of drivers and ticket cost/fare were found under the second quadrant.
### Table 7. CSI of the public transport system in the city.

| Code | Attributes                                              | Performance (X) | Importance (Y) | Weight Factor | Weight Score |
|------|---------------------------------------------------------|-----------------|----------------|---------------|--------------|
| V2   | Availability of bus stops and their proximity           | 4.33            | 5              | 1.02          | 4.42         | 0.63         |
| V5   | Availability of service on weekends/holidays           | 3.6             | 5.18           | 1.06          | 3.81         | 0.54         |
| V6   | Availability of services at night                      | 3.1             | 5.34           | 1.09          | 3.38         | 0.48         |
| V10  | Journey time (operating speed)                         | 4               | 4.47           | 0.91          | 3.65         | 0.52         |
| V11  | Bus crowding level                                     | 3.39            | 5.15           | 1.05          | 3.56         | 0.51         |
| V13  | Bus stop comfort                                       | 3.41            | 4.67           | 0.95          | 3.25         | 0.46         |
| V14  | AC – Availability on bus                              | 3.84            | 4.55           | 0.93          | 3.57         | 0.51         |
| V15  | Availability of shelter and benches at the bus stop    | 4.02            | 4.65           | 0.95          | 3.81         | 0.54         |
| V16  | Level of noise on buses                                | 3.32            | 3.94           | 0.80          | 2.67         | 0.38         |
| V17  | Cleanliness of bus interior, seats, and windows        | 4.34            | 5.37           | 1.10          | 4.76         | 0.68         |
| V18  | Cleanliness of bus exterior                            | 4.66            | 4.55           | 0.93          | 4.33         | 0.62         |
| V19  | Ticket cost/fare                                       | 4.75            | 5.08           | 1.04          | 4.92         | 0.70         |
| V22  | Safety and competence of drivers                       | 4.37            | 5.21           | 1.06          | 4.65         | 0.66         |
| V23  | Security against crime on a bus                        | 3.6             | 5.09           | 1.04          | 3.74         | 0.53         |
| V24  | Security against crime at bus stops and station        | 3.16            | 5.12           | 1.04          | 3.30         | 0.47         |
| V25  | Staff behavior (driver and conductors)                 | 3.58            | 5.15           | 1.05          | 3.76         | 0.54         |
| V26  | Personnel helpfulness and friendliness                 | 3.85            | 4.96           | 1.01          | 3.90         | 0.56         |
| V27  | Ease of buy the ticket                                 | 3.19            | 5.14           | 1.05          | 3.35         | 0.48         |
| V28  | Administration of complaints                           | 3.42            | 4.96           | 1.01          | 3.46         | 0.49         |
| V29  | Ease of service use                                    | 4.14            | 5.07           | 1.03          | 4.28         | 0.61         |
| V30  | Accessibility of bus for people with disability        | 3.64            | 5.1            | 1.04          | 3.79         | 0.54         |
| **Total** |                                                | **79.7**        | **103.7**      | **21.17**     | **11.48**    |
| **Average** |                                              | **3.8**         | **4.9**        |               | **0.55**     |

Source: Field survey, 2019/20
The features in the second quadrant are indicative of the service’s strength, so operators should maintain a high standard for these attributes to get a competitive edge. Finally, all additional service characteristics found in the final two quadrants can be regarded as low-priority service characteristics. The company shouldn’t concentrate its efforts. Notably, due to a lack of resources, transit service providers in developing nations like Addis Abeba identified the areas where policy-based actions would probably result in the greatest improvement in such features associated with variables under quadrant one. Mainly because they are the most important and have a lower performance score than other service traits, services linked to the timeliness, customer care, and security are crucial concerns for policymaking.

Given the foregoing, this study recommends managers and decision-makers use the IPA findings to organize their resources according to priority, control expenses associated with attributes in quadrants three and four and reevaluate their resources.

5. Conclusion

This study assesses the level of customer satisfaction with the quality of the services provided by public transportation in Addis Abeba. Additionally, it lists the top quality characteristics that demand urgent attention from all involved transport stakeholders. A survey was used to gather information from 500 respondents as they traveled the chosen bus route.

The study used the Customer Satisfaction Index, Importance Performance Analysis, and Factor Analysis (EFA and CFA) to analyze the data. A modal fit test was performed using CFA for both the importance and performance data sets on variables with a loading of 0.4 and above based on factor analysis.

First, for the consumers’ expectation data set, exploratory factor analysis was used to group variables into five categories: customer care, facilities, availabilities, comfort, and timeliness. The outcome would indicate that these components, which have a total of 26 variables, are influential indices that can assess the relevance of bus service quality at
a 0.001 level of significance. The findings demonstrate above the necessary criterion, and this result is further supported by the modal fit using CFA.

EFA was then used in the study to classify the variables under the satisfaction data set. As a result, the criteria have been divided into seven categories: availability, comfort, customer care, image, and security. The robust indices used to assess passengers’ satisfaction with the quality of bus transportation in the city at the significance level of 0.001 are hence these parameters with 24 variables. Similar to that, the outcome was verified using CFA’s modal fit, and it meets the requirements.

Researchers like Deb and Ali Ahmed (2018), L. Eboli and Mazzulla (2007), Jomnonkwao et al. (2020), Nwachukwu (2014), Sonita et al. (2020), and Weng et al. (2018) have studied the service quality and consumer satisfaction of public transportation services in various cities. Additionally, some of the outcomes of some of the studies stated above have lined up with the research findings. For instance, it has been shown that the most important aspects that influence passengers’ overall satisfaction with the provision of public transportation service are timeliness, security, safety, comfort, facilities, convenience, reliability, availability, customer service, and company image.

Similarly, results of studies by Aniley and Negi (2010), Mammoo (2010), Mihretie (2013), and Tagagne (2018) revealed that city residents were not satisfied with the public transportation system. These studies, however, have only aimed to measure consumers’ satisfaction with a particular operator’s level of service in the city. The primary shortcoming of their investigations is that they did not try to determine which quality features are more important and which ones operators should prioritize to raise the level of service in the city.

Therefore, this research has utilized a variety of techniques to evaluate the service quality of transportation service in the city to reduce the restrictions indicated above. First, this survey evaluated citywide customer satisfaction, focusing on all citywide road-based public bus transit providers. The study has also determined which qualities in the delivery of public transit services require immediate improvement. As a result, the results of this study have confirmed the value of the IPA model in Addis Ababa’s public transportation system.

To determine the overall user satisfaction level and to pinpoint the important attributes that require immediate attention, the Customer Satisfaction Index and Importance Performance Analysis were conducted in this study. According to the CSI results, there is a 55% overall satisfaction rate among city residents, which suggests that they are quietly satisfied with the city’s bus transportation system. It must be urgently improved to increase user satisfaction. Nine attributes fall under the first quadrant, or ‘concentrate here’, according to the IPA results. To improve the quality of the city’s transportation service, the study advises transit service providers, local government, and other concerned stakeholders to prioritize and allocate resources to the quality qualities that fall in the first quadrant.

6. Contribution of the Study

Although it is widely acknowledged that service quality is a multidimensional concept, the number and types of service quality dimensions remain unclear (Brady & Cronin, 2001; Parasuraman et al., 1985). The literature on service management is currently expanding, and it suggests that service quality dimensions should be determined from the perspectives of culture, service, and country (Micuda & Cruceru, 2010; Van Duong et al., 2004). As a result, this occurrence highlights the importance of validating a model
of service quality that is suitable for the public transportation system of emerging nations like Addis Abeba, Ethiopia.

Thus, after proving the service quality model based on the context of Addis Abeba’s public transportation services, this study’s results revealed the theoretical contribution, i.e. tying factor analysis to the IPA model. Additionally, this model can be used by other researchers to examine consumer satisfaction and service quality in various public transportation options as well as other service industries that are appropriate for cities, such as banks, hospitals, and schools.

Furthermore, this study has particular management ramifications. Public transportation service providers must emphasize the performance and expectation data set based on the Factor Analysis and IPA model to improve service quality. The IPA model can be used by a variety of public transportation providers to analyze their degree of client satisfaction and identify the essential features of their offerings. The outcome can also be used by the management, decision-makers, and concerned stakeholders to monitor service performance and progress upgrading programs.

7. Limitations of the Study

Even though this study has shown that the IPA model works in the city’s public transportation system, there are still some drawbacks to the study. To first understand the model’s stability, which is impossible to see at a different period, the study analyzed cross-sectional data. Based on that, the study’s author advised undertaking additional research utilizing longitudinal data. The study’s second drawback was that it was based solely on the city’s road-based public bus services. But there are numerous kinds of public transportation companies. The FA-IPA model should be evaluated on the city’s various public transportation options, including LRT, private, and public transportation, to reduce this limitation in the future.

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