FUDMA Journal of Earth and Environmental Sciences (FUDJEES), Vol. 2, No. 1, 2025
Print ISSN: 1595-9686
EISSN: 1595-9708

PASSENGERS' PERCEPTION OF THE QUALITY OF INTER-STATE PUBLIC TRANSPORT SERVICES IN KATSINA, NIGERIA

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https://doi.org/10/33003/jees.2025.0201/01

ABSTRACT
Ensuring high-quality service is crucial in the highly competitive transportation industry, where service excellence plays a key role in customer satisfaction, operational efficiency, and overall industry sustainability. Accordingly, this study examines passengers' perceptions of the quality of service in inter-state public transport services in Katsina. A random sampling technique was employed to distribute 384 questionnaires to passengers using public transportation services in the study area. Data were analysed using principal component analysis and multiple regression analysis. The findings reveal that the comfort of seats and leg space are the most crucial factors, with a mean value of 3.9844, followed by travel time after boarding the bus, vehicle cleanliness, and delay at checkpoints, in that order, with mean values of 3.8333, 3.7083, and 3.6953, respectively. The study also revealed that the travel time after boarding the bus (89.8%) is the most significant factor determining passenger satisfaction. Furthermore, the results of the multiple regression analysis reveal a strong positive relationship ($R^2 = 0.662$) between the quality of service and passenger satisfaction, indicating that an improvement in the services provided by public transport leads to increased passenger satisfaction in Katsina State, and vice versa. It is recommended that implementation of measures to reduce travel time after passengers' board the bus and enhance the overall quality of service such as optimising bus schedules to minimise wait times, implementing real-time tracking systems to inform passengers about bus arrival and departure times, improving vehicle maintenance, ensuring punctuality, and providing driver training programs focused on customer service, may significantly boost passenger satisfaction.

Keywords: Travel, perception, satisfaction, choice, service quality. Northern Nigeria

INTRODUCTION

Towards the end of the twentieth century, the growing significance of the service sector in the economies of many global cities underscored the need for excellence in service provision. This shift was pivotal in shaping strategies that could provide a competitive edge in service delivery while also informing policies that enhance customer satisfaction and retention (Morton, Caulfield, & Anable, 2016). The focus on service quality has traditionally centred on understanding customers' perspectives, encompassing both technical aspects, such as transit times in the transportation sector, and functional aspects, including interactions with service staff (Morton et al., 2016).

In the field of public transportation, understanding transit passengers' perceptions of service quality is crucial for several reasons. First, it helps service providers retain existing customers and attract potential passengers from other providers or modes of transportation (Ismail, Adeniji, & Paul, 2018). As Harvey (2015) noted, service quality refers to the evaluation of how effectively a service meets customer expectations. Therefore, to enhance customer satisfaction, service providers must swiftly identify and address shortcomings, ensuring better service delivery. Regular assessment of

service quality is essential for providers seeking to improve the service they render to customers continually.

One of the most influential models used to assess service quality is the Servqual Model, developed by Parasuraman, Zeithaml, and Berry (1988). This model identifies five key dimensions that service providers can employ to regulate and modify service quality. These include: tangibles (the physical appearance of facilities and equipment), assurance (employees' knowledge, courtesy, and ability to inspire trust), empathy (personalized and caring attention to customers), responsiveness (willingness to assist customers and provide prompt service), and reliability (consistent and accurate service delivery).

Building on these service quality dimensions, several studies have examined passenger satisfaction with public transportation, including those by Mohamed (2018), Oluwaseyi and Olaniyi (2018), Singh (2016), and Nwachukwu (2014). While these studies primarily focused on intra-city public bus services in Africa and Asia, they evaluated only a limited number of service quality attributes and often relied on small sample sizes. This gap highlights the need for a more comprehensive assessment of service quality parameters, particularly in the context of inter-state public transport services in Katsina, northern Nigeria.

Accordingly, this study investigates passenger perceptions of interstate public transport services in Katsina, Nigeria. Using eighteen service quality factors embedded in the SERVQUAL model (Parasuraman et al., 1988) and a large sample size, this research aims to provide a comprehensive analysis that the aforementioned studies have overlooked. Thus, by incorporating additional service attributes and a broader dataset, the study seeks to offer a robust understanding of the current state of inter-state public transport services in Katsina, a low-income region, and to propose strategies for improvement in Nigeria and similar areas.

Katsina State, located in northern Nigeria, has experienced a growing demand for efficient and reliable interstate public transport services due to increasing wages and a thriving local economy. The quality of these services has a significant impact on the daily lives of residents and visitors, shaping their travel experiences and overall satisfaction. Therefore, understanding passenger perceptions of service quality is crucial for identifying areas for improvement that benefit all stakeholders, including passengers, service providers, and policymakers.

Furthermore, this study aims to identify the strengths and weaknesses of inter-state public transport services in Katsina. In doing so, it aims to provide valuable insights that can guide service providers and policymakers in their efforts to improve service quality and passenger satisfaction. Ultimately, improving interstate public transport services contributes not only to a better travel experience but also to economic growth and development by enhancing mobility and accessibility for all.

Study Area

The study area is Urban Katsina, Katsina State, Nigeria. It lies between latitudes 12°40’N and 12°59’N and longitudes 7°35'E and 7°40’E, with a total land area of approximately 2,448 km² and a projected population of 541,126 as of 2022. The population of Katsina Local Government Area is quite large. Urban Katsina's population is increasing at a yearly rate of 4.27%, while the city's death rate is 1.6% (Dabo & Yunus, 2020). As few as 52,672 people were counted in the town in the 1952 census, and by 1991, when the city had already become the state capital, the population had increased to 223,644. The population, as reported by the 2006 census, was 237,336 (National Population Commission, 2006). Katsina Local Government's population was estimated to be

FUDMA Journal of Earth and Environmental Sciences (FUDJEES), Vol. 2, No. 1, 2025
Print ISSN: 1595-9686
EISSN: 1595-9708

541,126 persons in 2022. The Hausa Muslim socio-cultural characteristics and trade in agro-commodities necessitate movement to different parts of Nigeria for social and business visits, hence the need for inter-city transport.

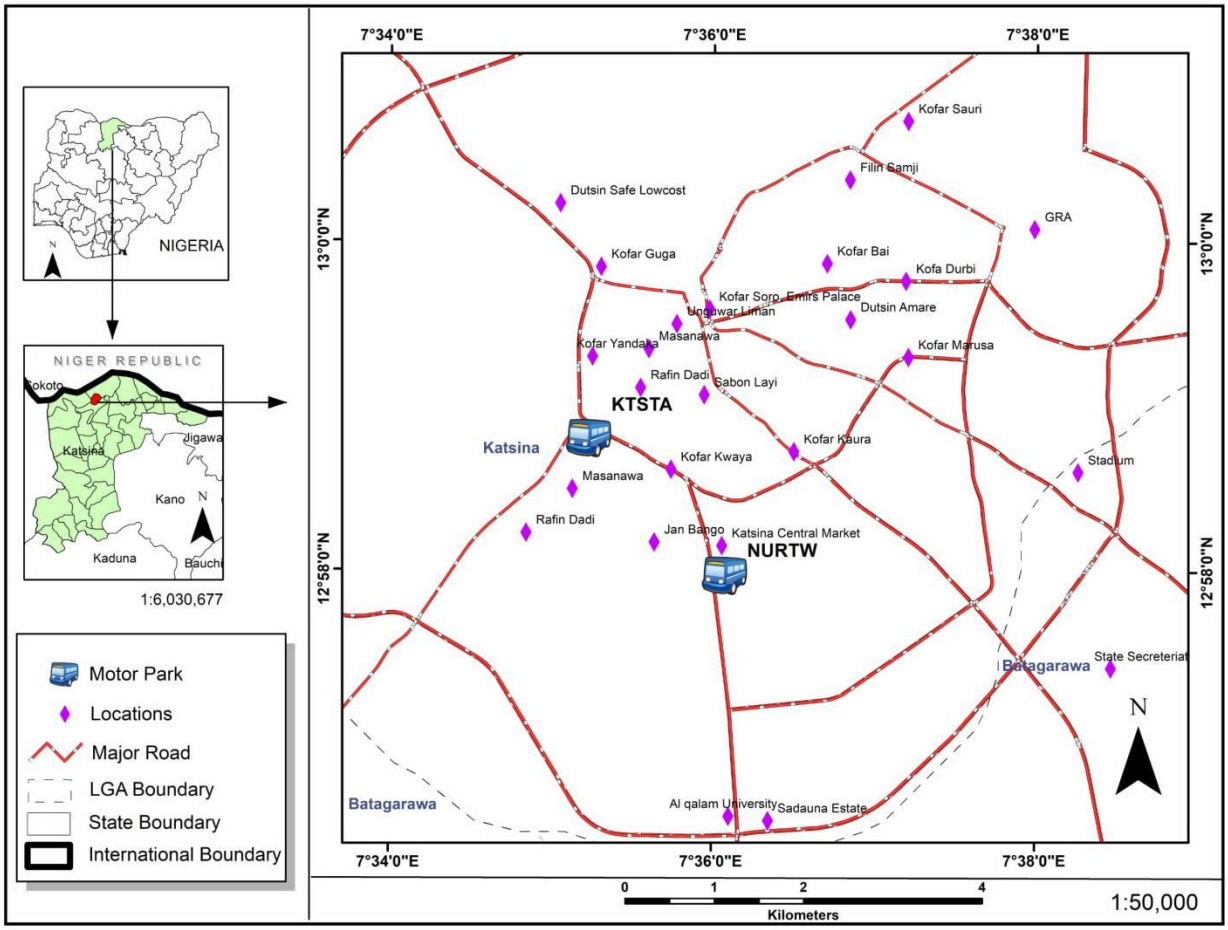

Figure 1: Road Map of Urban Katsina Showing Studied Transport Terminals (Source: Adopted from (Google Earth Imagery and Open Street Map, 2021)

Materials and Methods

The paper's content takes into account passengers' perception of the quality of public transport services using eighteen service quality parameters. Two major interstate bus terminals were used. The total population of registered interstate passengers from the two major terminals, which was 250,794 for the year, was also used. The study utilised primary data collected through a questionnaire administered to inter-state passengers in Katsina at two major inter-state bus terminals. The bus terminals are the Katsina State Transport Authority (KTSTA) and the Nigerian Union of Road Transport Workers (NURTW). A sample size of 384 was determined using Cochran's (1977) formula. The distribution of the respondents by terminals from the questionnaire administration is presented in Table 1

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Table 1; Sample size

Terminal	Passengers	Bus	Cars	Total
KTSTA	137,937	158	53	211
NURTW	112,857	130	43	173
TOTAL	**250,794**	**258**	**96**	**384**

Source: Field survey, 2023

The study employed a combination of systematic and simple random sampling techniques in the data collection process. Purposive sampling was used in determining the bus terminals. The service quality parameters in the questionnaire were presented in a manner that required respondents to indicate the weight they assigned to each service quality parameter using a Likert-type scale. These items include comfort of seats and load space, vehicle cleanliness, travel time after boarding the bus, delay at check-points, vehicles always arriving on time, vehicles never breaking on the road, condition of terminals and stops, availability of restroom facilities, adequate shade for passengers, safety from accidents, safety of passenger luggage, behaviour of the driver, driving ability of the driver, price of tickets, general information, access to the ticket office, communication with staff is clear and helpful, and lastly, information about price changes.

A combination of Relative Importance Index (RII), Principal Component Analysis (PCA), and multiple linear regression analysis was employed as techniques for data analysis. The RII was used to weigh the relative importance of the factors that determine passenger satisfaction. The mean value of each factor is used as a measure of relative importance. The PCA was used to identify the most significant factors (with eigenvalues greater than 1) that contribute to passenger satisfaction. The commonalities as a significant output of factor analysis indicate the amount of variance in each variable that is accounted for by the PCA. Commonalities estimates give the initial and extracted values of the variance in each variable accounted for by the factors in the PCA solution. For this study, values less than 0.400 at extraction are considered small and indicate variables that do not fit well with the factor solution, and which should therefore possibly be dropped from the analysis. The estimate of commonalities is computed by summing the squared loadings for each variable across all items. The multiple linear regression for the study followed the expression of Laudau and Everitt (2004), which is a method of analysis for assessing the strength of the relationships between each of a set of independent variables and a single dependent variable.

Results and Discussion

Following Eboli and Mazulla (2011), the quality of service can be evaluated based on passengers' perceptions and expectations. Accordingly, this section first presents the results on RII of the factors that determine service quality. This is followed by the results of the KMO and Bartlett's Test, which measure the adequacy of the sampling. Next, are the results on the Variance of factors in the PCA, and lastly, the simple linear regression analysis to examine the strength of the relationship between the dependent variables and the independent variable

1.1. Factors Determining the Quality of Transportation Services

The RII values for the variables that determine service quality are presented in Table 2. The comfort of seats and leg space is the most important factor, with a mean value of 3.9844, followed by travel time after boarding the bus, vehicle cleanliness, and delay at the checkpoint, which rank as

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EISSN: 1595-9708

2nd, 3rd, and 4th, with mean values of 3.8333, 3.7083, and 3.6953, respectively. On the other hand, general information on transport services, access to the ticket office, and availability of restroom facilities were the least important factors in determining service quality, with mean values of 3.2630, 3.1927, and 3.0000, respectively, ranked 16th, 17th, and 18th. The implications of these findings suggest that passengers were more concerned about the comfort of the seats, the available legroom, and travel time after boarding the bus. Therefore, transport service providers should focus more on improving these aspects to retain their passengers and attract new ones.

Table 2: Relative Importance Index of the Factors that Determine Quality of Service

Variables	Mean	Rank
Comfort of seats and leg space	3.9844	1st
Travel time after boarding the bus	3.8333	2nd
Vehicle cleanliness	3.7083	3rd
Delay at checkpoints	3.6953	4th
Safety from accidents	3.6563	5th
Vehicles never break down on the road	3.6406	6th
Vehicles always arrive on time	3.6224	7th
Safety of passenger luggage	3.6224	7th
The driving ability of the driver	3.6068	9th
Behaviour of the driver	3.5833	10th
Price of tickets	3.4922	11th
Adequate shed for passengers	3.4609	12th
Communication with staff is clear and helpful	3.3984	13th
Condition of terminals and stops	3.3776	14th
Staff inform passengers of changes in price	3.2630	15th
General information	3.2083	16th
Access to the ticket office	3.1927	17th
Availability of restroom facilities	3.0000	18th

Source: Field survey, 2023

Analysis of the factors determining the quality of service in public transport in Katsina

The data obtained on the quality of service and its influence on passenger satisfaction are also subjected to factor analysis (principal component analysis). It is crucial to evaluate the dataset through an appropriate and thorough analysis to investigate this influence. The primary objective is to assess the appropriateness and internal consistency of the data by applying the Bartlett (1951) test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sample adequacy (Table 3).

Table 3: KMO and Bartlett's Test for determining quality of service

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.705
Bartlett's Test of Sphericity	Approx. Chi-Square	662.395
	Df	153
	Sig.	.000

Source: Author's Computation, 2023

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Print ISSN: 1595-9686
EISSN: 1595-9708

The result in Table 3 shows a sampling adequacy value of 0.705 with $p<0.005$. This indicates that the data is adequate and suitable for the analysis. It follows the assumption of Zeynivandnezhad (2019) that a KMO result should be 0.70 or above to be considered sufficiently correlated. Therefore, with a value above this threshold, the data could be considered reliable for the use of PCA. The 18 factors considered are comfort of seat and leg space, travel time after boarding the bus, vehicle cleanliness, delay at checkpoints, safety from accidents, vehicle never breaking on the road, vehicle always arriving on time, safety of passenger luggage, driving ability of the driver, behaviour of the driver, price of tickets, adequate shed for passengers, communication with staff is clear and helpful, condition of terminal and stops, staff inform passengers of changes in price, general information, access to the ticket office and availability of rest-room facilities.
The result of the Principal Component Analysis (PCA) of the variables that determine passenger satisfaction revealed that eight principal components, whose eigenvalues are greater than 1, accounted for 61.4% of the total variability among the 18 variables.

The percentage of the total variance explained (Table 4) indicates that component 1 has an eigenvalue of 2.897, accounting for 16.1% of the total variance explained. Similarly, component 2 shows an eigenvalue of 1.333, thereby accounting for 7.4. Components 3, 4, 5, 6, 7, and 8 reveal eigenvalues of 1.308, 1.215, 1.110, 1.087, 1.067, and 1.043, accounting for 7.27%, 6.75%, 6.12%, 6.04%, 5.93%, and 5.8%, respectively. The significance of these component loadings provides a clear indication of passengers' perception of contributory factors to their satisfaction with the quality of service of inter-state public transport in Katsina. In all, the variables have been reduced to eight major principal components with eigenvalues greater than 1.00, which represent the dominant loading for each component. These eigenvalues represent the proportion of the total variation in the data set that is explained or, at best, summarised by the components. The cumulative percentage of the variance reveals that the eight components alone account for 61.4% of passenger satisfaction with the quality of services provided by the transport companies.

The issue under consideration requires an attempt to identify the variables that can be used to explain the underlying dimensions of the significant variables. However, to identify the major variables that explain passenger satisfaction with the quality of services provided by transport companies, the varimax method of rotation was employed. The purpose was to maximise the variance of the squared loadings to produce orthogonal variables to interpret the results of the PCA. The rotated component matrix of the explanatory variables for passenger perception of service quality is shown in Table 5. A careful examination of Table 5 shows the variable with the highest loading value for each of the extracted components. For instance, general information, with a loading of 62.9%, is highest on factor 1. Vehicle cleanliness accounts for a high percentage (68.8%) of factor 2, while component 3 is characterised by vehicles that rarely break down on the road, with a loading of 77%. Communication with staff is clear and helpful, with 69.3% on component 4. The driving ability of the driver accounts for 72.3% of factor 5. Adequate sheds for passenger loads score 72.2% on component 6, travel time after boarding the bus scores 89.8% on component 7, while the availability of restroom facilities scores 86.5% on component 8. These are found to be the most important factors that influence passenger perception of service quality in Katsina.

Relationship between passenger satisfaction and Quality of services in Katsina

The relationship between passenger satisfaction and the most significant variables identified by the PCA from passenger responses was examined through regression analysis to determine the extent to which these variables contributed to passenger satisfaction regarding the quality of services provided

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Table 4: Total Variance of factors that determine quality of service parameters Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.897	16.093	16.093	2.897	16.093	16.093	2.118	11.764	11.764
2	1.333	7.407	23.501	1.333	7.407	23.501	1.428	7.933	19.696
3	1.308	7.269	30.769	1.308	7.269	30.769	1.385	7.694	27.390
4	1.215	6.750	37.519	1.215	6.750	37.519	1.283	7.126	34.517
5	1.110	6.167	43.686	1.110	6.167	43.686	1.278	7.102	41.619
6	1.087	6.037	49.723	1.087	6.037	49.723	1.229	6.825	48.444
7	1.067	5.930	55.652	1.067	5.930	55.652	1.218	6.769	55.213
8	1.043	5.797	61.449	1.043	5.797	61.449	1.122	6.236	61.449
9	.921	5.116	66.565						
10	.848	4.710	71.275						
11	.821	4.558	75.833						
12	.767	4.263	80.096						
13	.719	3.993	84.089						
14	.680	3.776	87.865						
15	.622	3.453	91.318						
16	.582	3.235	94.552						
17	.513	2.849	97.401						
18	.468	2.599	100.000						

Extraction Method: Principal Component Analysis.

Source: Author's Computation, 2023

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Table 5: Rotated component Matrix of factors that determine quality of service

	Factor							
	1	2	3	4	5	6	7	8
Comfort of seats and leg space		.636						
Vehicle cleanliness		.688						
Travel time after boarding the bus							.898	
Delay at checkpoints							.549	
Vehicles always arrive on time.			.570			.401		
Vehicles never break down on the road.			.770					
Condition of terminals and stops.								.457
Availability of restroom facilities								.865
Adequate shed for passengers						.722		
Safety from accidents	.472							
Safety of passenger luggage	.626							
Behaviour of the driver		.542						
The driving ability of the driver	.623							
Price of tickets					.723			
General information	.629							
Access to the ticket office	.611							
Communication with staff is clear and helpful.				.693				
Staff inform passengers of price changes.				.411				

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation.
Source: Author's Computation, 2023

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Print ISSN: 1595-9686
EISSN: 1595-9708

by the transport companies. Therefore reliability (vehicle cleanliness, cleanliness, vehicle never breaking down on the road, travel time after boarding the bus,) empathy (general information on the services provided, price of tickets), tangibility (adequate shed for passengers, availability of restroom facilities and responsiveness (communication with staff is apparent and helpful) determine the quality of public transport services in the study area.To evaluate the degree of correlation between the independent and dependent variables, Table 6 displays the model summary of the multiple linear regression analysis. The model correlation coefficient (R) is also displayed. The summary metrics of the model fit are its square (R^2) and a modified version of this coefficient.

Table 6 Model Summary of factors that determine quality of service

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.814[a]	.662	.655	.14270	1.751

a. Dependent variable: Passenger satisfaction
b. Independent variables: General information, vehicle cleanliness, vehicle never breaking down on the road, communication with staff is clear and helpful, price of tickets, adequate shed for passengers, travel time after boarding the bus, and availability of restroom facilities.

Source: Author's Computation, 2023

The R^2 value of 0.662 indicates that the variables can explain 66.2% of the variance in satisfaction. In other words, 66.2% of the quality of service can be explained by the contributions of general information, vehicle cleanliness, the vehicle never breaking on the road, communication with staff is clear and helpful, price of tickets, adequate shed for passengers, travel time after boarding the bus and availability of restroom facilities. The adjusted R-squared is an effort to improve the estimation of R-squared in the population, as, by definition, R-squared will increase when additional components are added to the model, even if they do not explain variability in the population. To counteract the random increase in R^2, the index is shifted downward; larger sets of explanatory variables result in larger modifications. A revised estimate that accounts for 65.5% of the variability in passenger perception of service quality is produced by using this adjusted measure.

Discussion

The study's findings highlight the crucial role of travel time in influencing passenger satisfaction in inter-state public transport services in Katsina State. The principal component analysis revealed that travel time after boarding the bus significantly influences satisfaction levels, accounting for 89.8% of the variance. This aligns with existing literature that emphasises the critical impact of travel time on user satisfaction in public transportation (Arroyo, Ruiz, Casquero, & Mars, 2018). Reducing travel time can enhance passengers' overall travel experience by minimising delays and increasing reliability (Li et al., 2020).

Moreover, the multiple regression analysis revealed a strong positive relationship ($R^2 = 0.662$) between the quality of service and passenger satisfaction. This suggests that improvements in service quality, such as punctuality, vehicle condition, and driver behaviour, are directly correlated with higher satisfaction levels. Similar studies have highlighted the importance of these factors in shaping passengers' perceptions and satisfaction (Eboli & Mazzulla, 2012).

To enhance public transport services in Katsina State, the Nigerian Union of Road Transport Workers (NURTW) and the Katsina State Transport Authority (KSTA) should collaborate with relevant stakeholders. Implementing measures such as optimising bus schedules, introducing real-time tracking systems, and providing regular driver training can significantly improve service quality and passenger satisfaction. Such initiatives would not only enhance the user experience but also contribute to a more efficient and reliable public transportation system.

Conclusion

This study has examined passengers' perception of the quality of interstate public transport services in Katsina. Katsina State, Nigeria. The study concludes that travel time after boarding the bus is the most critical determinant of passenger satisfaction in inter-state public transport services in Katsina State. Furthermore, given the considerable use of the interstate public transportation system in the area, it is clear that improvements in service quality directly enhance passenger satisfaction.

Acknowledgment

The contributions of field assistants who assisted with the administration of the questionnaire and various organisations that provided the researchers with secondary data are greatly acknowledged.

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