

Perception-Satisfaction Based Quality Assessment of Public Transportation Services using SERVQUAL Model.

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Abstract:- The performance evaluation of any public transportation mainly depends on the customer satisfaction level of passengers (referred to as customers). To evaluate the performance of any public transport business, a systemic survey-based model is needed, which critically analyzes the customer's requirement and designs the future line of action for improvement. In the present work, an attempt is made to understand better passenger attitudes and the level of passenger satisfaction towards services provided by the public bus Maharashtra State Road transportation Corporation in India (MSRTC) using the SERVQUAL model. Further, it focuses on the measures taken by the bus transport industries to improve the level of satisfaction of passengers and to avert their problems to retain the passengers' loyalty. This study aims to identify the causes due to which quality is affected and study the responses from a total of 4000 different respondents.

Keywords: *Bus transport, SERVQUAL model, Customers, Satisfaction level.*

Introduction

In India, passenger transport divides into public and private transport. Public transportation, i.e., government-operated transport, provides scheduled services, while private vehicle provides ad-hoc services at the rider's desire. Thus, a business term, passenger satisfaction measures how an industry supplies services to meet passengers' expectations. Passenger satisfaction is an indefinite and conceptual term, the meaning of which will vary from person to person and assistance to service. Measuring passenger satisfaction is too difficult since it relates to the psychological state of mind. In India, the growth of population, advent of large manufacturing industries, and imbalanced regional developments have all contributed to the development of different modes of transport of all the various methods of transportation; road transport is the most popular because of its ready availability, flexibility of operations, and adaptability to individual needs, door-to-door service and reliability. Road transport generally feeds rail, marine, and air traffic. The Government of India recognized in its planned development programs that roads are an inherent infrastructure of the country's socioeconomic development. Rose Luke and Gert J Heyns [1] adapted SERVQUAL model analysis shed light on several areas of concern in Johannesburg's public transport system. By addressing issues related to reliability, responsiveness, assurance, empathy, and tangibles, the city can significantly improve the quality of public transport services and enhance the overall commuting experience for its residents. The study's insights can be valuable for policymakers and transport authorities in developing targeted interventions and policy changes to create a more efficient, reliable, and customer-centric public transport system in Johannesburg, ultimately benefiting the city's mobility. Payel et.al. [2] employed the AHP-SERVQUAL approach provided valuable insights into the quality of tourism and hospitality services along the Sandakphu Trail in the Himalayan region. By understanding tourists' perceptions and satisfaction levels, policymakers and stakeholders can identify specific areas for improvement and prioritize efforts to enhance the overall quality of services. Malathi et.al. [3-8] has effectively used SERVQUAL model

for the transportation system analysis. Charles Atombo and Tina (2021) [9] have examined the service quality factors of bus service in Ghana to identify the perception and expectations of the customers. A sample of 816 public bus users completed a questionnaire on perception and expectation measures at terminals in six regional capitals in Ghana. The "path model" examined that affordability and availability were the most influencing parameters related to service quality. From the expectation model, it observed that availability, security, and reliability were the most influencing service quality attributes associated with passengers' expected satisfaction.

Sohani et al. (2022)[10] have designed a short-term forecaster for public transport to know the future travel trends, which helps improve service quality and reliability. Artificial intelligence-based deep learning models employed for effective investigation. The model was designed for the 18 bus routes in Melbourne City. Sharmin et al. (2020) [11] investigated the interior design perceptions and preferences of young male and female public bus users for different service quality criteria, sub-criteria, and design alternatives using the Analytic Hierarchy Process (AHP) decision-making model. The ultimate objective is to redesign the interiors of the existing public buses in Dhaka City to suit the needs of both genders. Several interior design aspects, their problems, and alternative solutions were discussed in three focus group discussions (FGDs). A customized service quality model based on SERVQUAL and RESCA models uses as the instrument for the FGDs, which eventually led to the design of the AHP study.

R. Shiva et. Al. (2020)[12] has investigated the system for detecting whether or not riders wear helmets without any manual intervention. If a bike rider identifies without wearing a helmet, its corresponding plate number is read and recorded. Data records of every lawbreaker who does not wear a helmet automatically save into a database. A database consequently generates documents used to identify the lawbreaker accurately. This paper aims to explain the ways of automatic detection of motorcyclists without helmets and sending messages to the detected individuals. R.Giahi et al. (2014) [13] investigated service quality using mathematical modeling based on the data. This model aims to minimize the total cost related to passengers at any stop. Particle swarm optimization (PSO) has been used to solve the model. The numerical examples showed that the additional expense caused by service irregularity was reduced by 25% by applying the presented holding model to the given problem. Madhuri Rahatgaonkar and Mayura Mathankar [14] mainly focus on the satisfaction of the passenger traveling through MSRTC to reach various destinations. They find out that by measuring customer satisfaction, an organization can become more customer-focused and thrive in the market. Their research was descriptive and limited to 240 respondents. They found that 59.07% of respondents were satisfied with overall services, and the passengers were confident that MSRTC was a comfortable means of transport for short and long routes. Sudarsanam Padam's [15] paper highlights the need for a compelling urban transport policy without which there will be ad hoc interventions. Apart from not adding up to a comprehensive approach, such interventions will result in more significant confusion. Furthermore, it emphasizes that if public transport is not worthwhile, it will still need to reinvent itself to promote a better quality of life. The need of the hour is formulating an urban transport strategy that is both pragmatic and holistic in its approach.

Marie Tamba et al. [16] (2022) have employed the global Computable General Equilibrium (CGE) model to quantify the impacts of electric vehicles with deployment scenarios derived from energy models. From the experimental findings, it has been observed that greater road transport electrification reduces the overall costs of climate mitigation. Afshin Jafari et al. [17] (2022) have examined the utility and performance of the new design algorithm for the transportation system.

The data was collected from Greater Melbourne, Australia. Javad et al. [18] (2022) have investigated the impact of the pandemic on passenger perceptions of public transport, particularly loyalty. Using a case study of Tehran's bus system, The data were analyzed using structural equation modeling, with the effect of observed heterogeneity evaluated using multiple indicators, multiple causes models, and multi-group analysis. The results indicated that during COVID-19, perceptions of service quality have improved, particularly about comfort (including crowding), safety, reliability, and information. While this has increased customer satisfaction, loyalty to the system has decreased. Thanatorn et al. [19] (2022) have examined the service quality of Public Utility Vehicles (PUV) in the Philippines during the COVID-19 pandemic utilizing the SERVQUAL dimensions. Five

hundred sixty-four participants answered an online questionnaire using the convenience sampling approach, consisting of 58 questions. Structural equation modeling (SEM) was applied to derive the causal relationships between SERVQUAL dimensions, COVID-19 safety protocol, and customer satisfaction simultaneously.

1. Material and Method:

For the present study purpose, descriptive research has been designed to fulfill the objectives with data collection from different sources and to know customers' satisfaction with the services given by Maharashtra State Road Transport Corporation. The questions have been developed to get responses specific to the proposed objectives. For the analysis, primary data was collected by the researcher directly from the passengers. The collected preliminary data was analyzed using the percentile method.

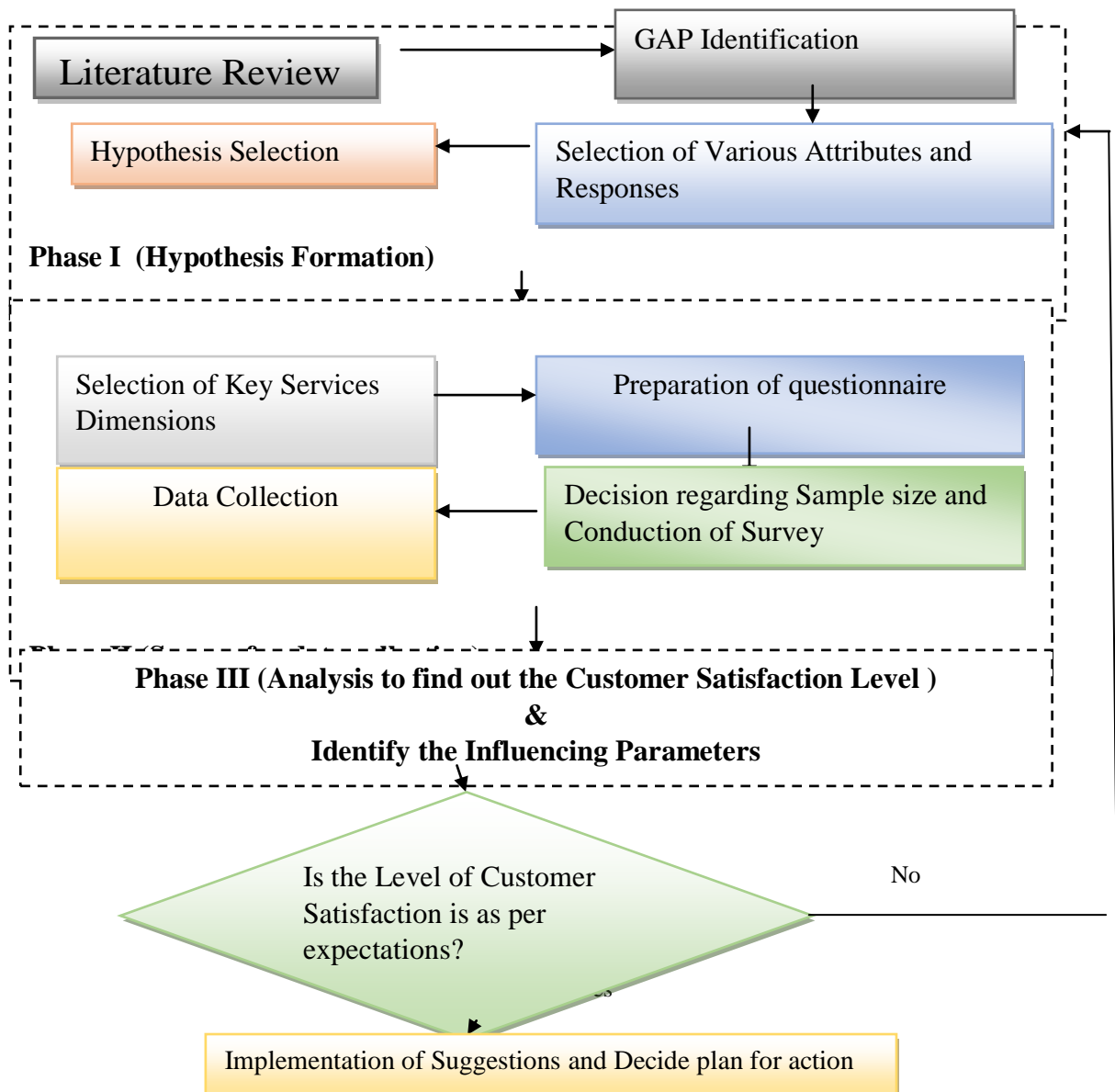


Fig 1: Research Methodology Adopted

Figure 2 shows the critical service parameters for the SERVQUAL Customer Satisfaction Model. It includes the input parameters mainly categorized as reliability, assurance, tangibles, empathy, and responsiveness. The response is measured in terms of service quality and customer satisfaction.

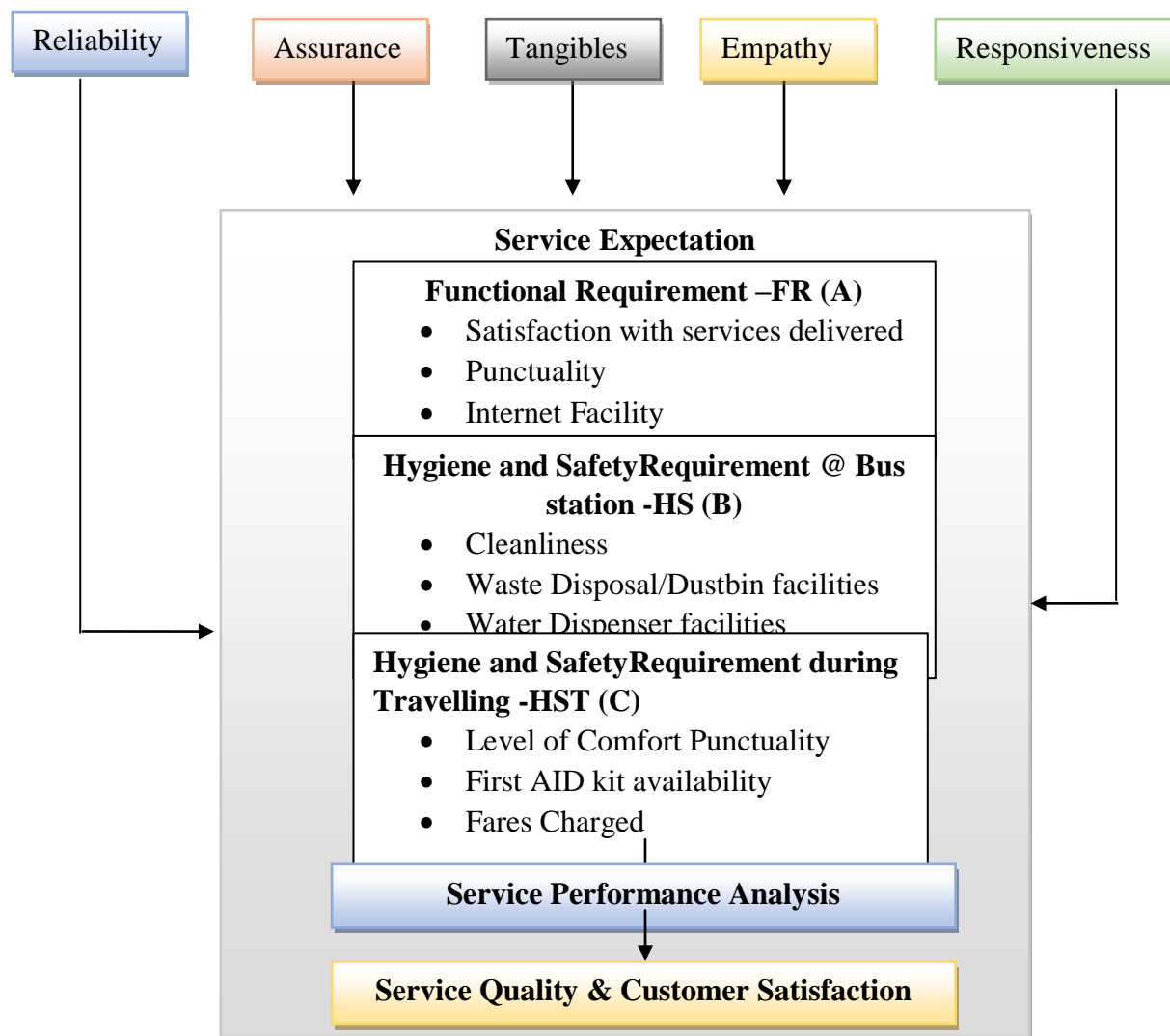


Fig 2 : Key service parameters for the SERVQUAL Customer Satisfaction Model

Maharashtra State Road Transport Corporation (MSRTC) is a state-owned corporation that provides transport services to remote or unreachable rural areas in Maharashtra. However, it is still known as a provider of poor-quality service and needs to meet the passengers' expectations. There are several private transport services providing comfort services to passengers; therefore, most of the passengers attract these personal transport services. So many efforts have been taken by MSRTC to attract passengers, programs, discounts, etc., have been implemented, but there has yet to be an expected response from the passengers. The present study would help to get feedback on efforts taken by the management of state transport corporations for implementing the various profit-oriented schemes. This study is also essential to examine the values of such systems from the passengers' point of view in light of the information collected from them. Apart from this, the present study would also be significant to know whether the methods of implementing the schemes, its objectives are approximate, and whether the profitability of MSRTC. Satisfaction of passengers is an ambiguous and abstract concept, and the actual manifestation of the state of satisfaction varies from person to person and service to service. The state of satisfaction depends on several psychological and physical variables. Taking into consideration the significance of the present study, the following objectives were formulated by the researcher.

1. To find out the opinions of passengers regarding services provided by MSRTC
2. To highlight the passengers' needs and attitude towards using the transport services.

3. To identify and interpret the psychological factors influencing the passengers to use particular bus transport services.

Figure 1 shows the research methodology adopted for the analysis. The research methodology starts with the objectives and hypothesis formation. Then the selection of some key attributes parameters related to MSRTC customer services parameters and, finally, the satisfaction level calculations associated with the service for performance improvement

The research hypothesis is categorized into three groups:

- a) Relationship between customer satisfaction and service quality dimensions
- b) Relationship between service quality and service quality dimensions
- c) Relationship between service quality and customer satisfaction.

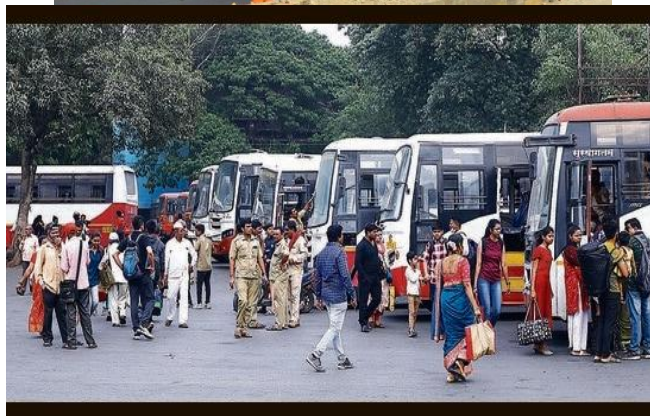




Fig 3 : MSRTC bus facilities and services at station.

- Null hypothesis = H_0 : There is no significant relationship between customer satisfaction and service quality dimensions.
 - Alternative hypothesis = H_a : There is a significant relationship between customer Satisfaction and service quality dimensions
- 1) Functional requirements:-
 - a. Satisfaction with services delivered
 - b. Punctuality
 - c. Internet facility
 - 2) Hygiene and Safety at bus station:-
 - a. Cleanliness
 - b. Dustbin facilities
 - c. Water dispenser facilities
 - 3) Hygiene and safety during travelling:-
 - a. Level of comfort
 - b. First aid kit availability
 - c. Fares charged

The SERVQUAL model is a framework developed by Parasuraman, Zeithaml, and Berry in the 1980s to measure and evaluate service quality. It is widely used in service marketing and management to assess customers' perceptions of service quality and identify areas for improvement. SERVQUAL is an acronym derived from "service" and "quality." The model consists of five dimensions that capture different aspects of service quality:

· From the SERVQUAL model, the following conclusions are made:-

o Responsiveness:- Responsiveness measures the willingness and promptness of service providers to help customers and quickly respond to their inquiries, requests, or problems. It examines whether the service staff is attentive, helpful, and willing to go the extra mile to meet customer needs. The current study shows that; this dimension is satisfied by the MSRTC on an average value. Both the parameters of responsiveness are fulfilled but only at a satisfactory level. For an increase in customer footfall, this dimension should be enough attention, and the quality of services should improve to achieve excellence.

o Empathy relates to the caring, personalized attention, and understanding service providers demonstrate toward customers. This dimension shows sharp negative feedback for its various parameters. The most important aspect of this dimension is interaction with the passengers. It should be done in the most warm and friendly way. This will effectively improve service quality which in turn gives more customers.

o Reliability:- Reliability is the ability to perform the promised service accurately and dependably. It focuses on the consistency and timeliness of service delivery and the ability to fulfill customer expectations. This dimension shows a positive response from the parameters. The organization effectively provides service parameters such as punctuality from the employees and timely services delivered by the bus employees.

o Tangibles:- This dimension refers to the physical facilities, equipment, appearance of personnel, and other tangible elements associated with the service. It assesses the extent to which the service environment conveys professionalism and competence. This dimension shows negative feedback from the passengers. The standard service needing to improve in all the analysis methods was the drinking water dispenser facility and, to some extent internet facility. As this dimension is associated with the physical and functional facilities provided to its customer, to achieve overall development, this should be given ample time to develop those loopholes and retain its customer.

o Assurance refers to the knowledge, competence, and courtesy of service providers and their ability to inspire trust and confidence in customers. It evaluates the service personnel's expertise, credibility, and reliability. This quality is associated with the level of human belief regarding work, people, things, etc., on human keeps on other. From the study, it was observed that the employees' honesty was seen to be the most vital parameter for this dimension. Most of the customers assured that the employees at MSRTC are honest in their work and the services provided. The sample questionnaire is given below :

1. **Tangibles:**

- a) The buses are clean and well-maintained.
- b) The bus stops and terminals are clean and well-organized.
- c) The buses have comfortable seating and adequate space.

2. **Reliability:**

- a) The buses depart and arrive according to the published schedule.
- b) The buses reach their destinations without significant delays.
- c) The bus service operates consistently and reliably.

3. **Responsiveness:**

- a) The bus drivers and staff are helpful and friendly.
- b) The bus service promptly addresses customer inquiries or complaints.
- c) The bus service staff provides accurate and useful information.

4. **Assurance:**

- a) The bus drivers are skilled and ensure passenger safety.
- b) The bus service has clear and visible signage and information.
- c) I feel confident in the reliability and security of the bus service.

5. **Empathy:**

- a) The bus service personnel treat passengers with respect and courtesy.
- b) The bus service considers the needs of different types of passengers (e.g., elderly, disabled).
- c) The bus service personnel are attentive to passenger concerns and requests.

6. **Overall Service Quality:**

- a) My overall expectations for the bus transport facility were met.
- b) I am satisfied with the bus transport facility service received.

2. **Results and Discussion:**

Table 1 : Data based information for the presented work

Total number of forms circulated	4500
Number of forms received	4000
Number of forms not received	500
Number of male respondents	1910
Number of female respondents	2090
Number of respondents from age group of 15-22	1349
Number of respondents from age group of 23-45	1603
Number of respondents from age group of 46-60	719
Number of respondents from age group of 60+	329

○ **Data analysis based on age and gender: -**

The data collected from various respondents are sorted by age-wise and gender-wise. The age group classify into ages 15-22, 23-45, 45-60, and 60+. Various parameters were included in our surveys, such as functional requirements of employees of MSRTC, hygiene and safety related to services at the bus station in MSRTC, and bus services during traveling in MSRTC. This parameter, The parameters are summarised as per the list given below:

1. Functional requirements:-
 - a. Satisfaction with services delivered
 - b. Punctuality
 - c. Internet facility
2. Hygiene and Safety at bus station:-
 - a. Cleanliness
 - b. Dustbin facilities
 - c. Water dispenser facilities
3. Hygiene and safety during travelling:-
 - a. Level of comfort
 - b. First aid kit availability
 - c. Fares charged

Case Study

□ Analysis of age group 15-22 :-

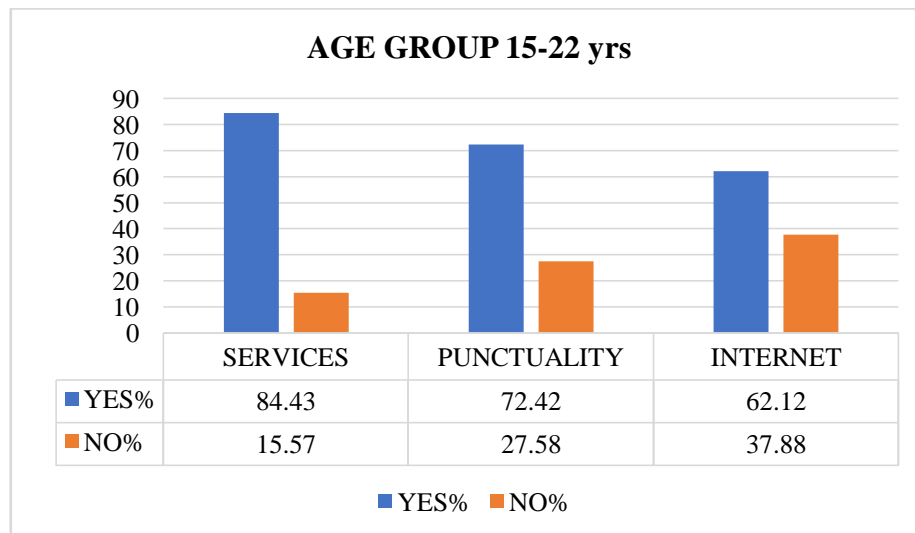


Fig 4 :Analysis based on functional requirement of employees 15-22

The above chart shows that the age group of 15-22 is very much satisfied with the services provided by MSRTC. Around whoopingly 85% of people have supported the services provided by MSRTC. Also, about 73% rated positively for the punctual services of MSRTC. Surprisingly, around 62% of this age group has rated internet facilities given by MSRTC in a positive.

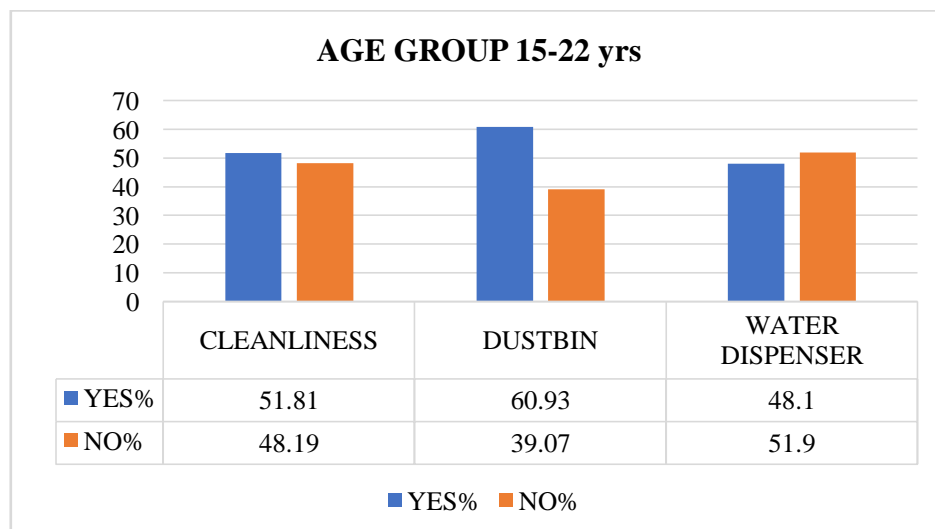


Fig 5 :Analysis based on safety and hygiene at bus station

The above chart represents the responses for safety and hygiene at the bus station. It can see that in terms of cleanliness, the reactions are on the saturation level, i.e., 50%-50%. The availability of dustbins for collecting garbage was rated around 60%, and facilities for water dispensers showed a dip of about 48%, where 52% of people faced this problem during their interaction at bus stations.

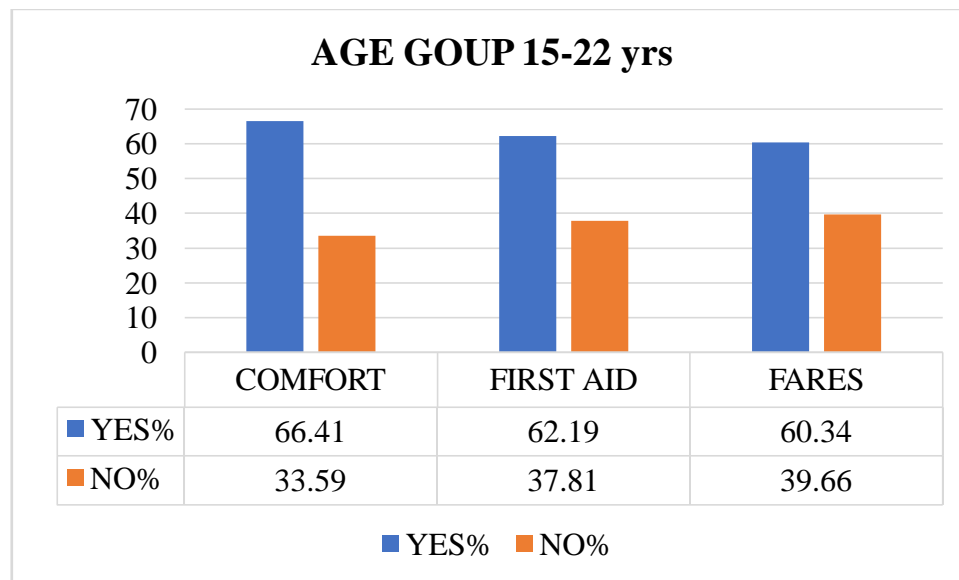


Fig 6 : Analysis based on safety and hygiene during travelling 15-22

When this age group passengers were traveling through the buses, around 66% of people in this age group rated positively for their comfort level. Also, 62% find out that first aid kits are available while traveling in buses. And the most crucial point is that around 60% of people are comfortable with the fares charged by MSRTC buses.

□ **Analysis of age group 23-45:-**

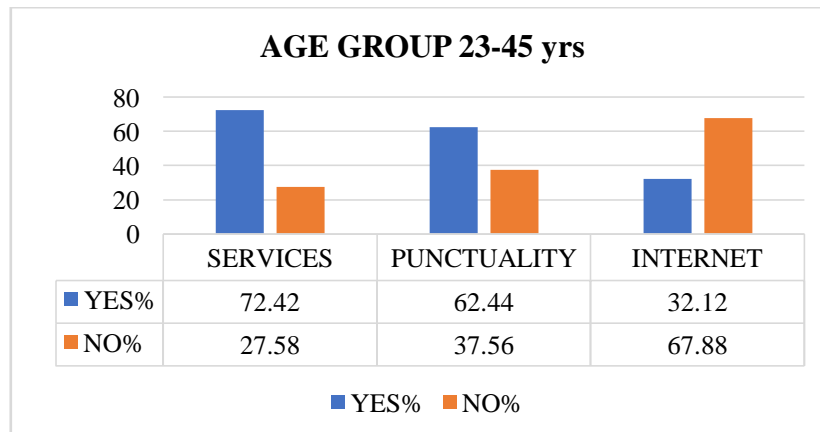


Fig 7 :Analysis based on functional requirement of MSRTC employees (23-45)

The above chart represents the responses collected from the age group 23-45, as generally, peoples from this age group belong to working professions and higher studies students. It can see from the chart that around 73% of people appreciated the service delivered by MSRTC. Also, about 63% of people agreed on the punctual services provided by the employees. Only 32% of people have availed of the internet facility effectively.

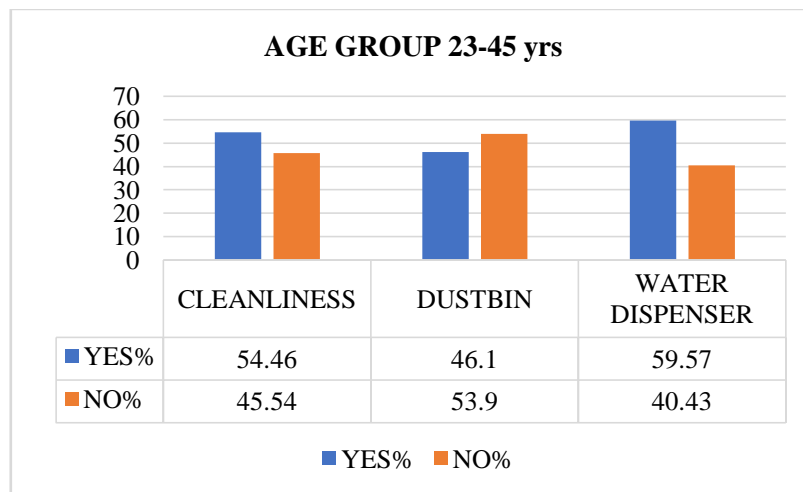


Fig 8 :Analysis based on safety and hygiene at bus station (23-45)

From the above chart, it can see that the selected age group has some mediatory responses in terms of safety and hygiene at the bus station. There are around 55% of people who found the station clean. It was surprising to note that only 46% of people found dustbin facilities on the premises. Also, around 60% of people were avail of the water dispenser facilities.

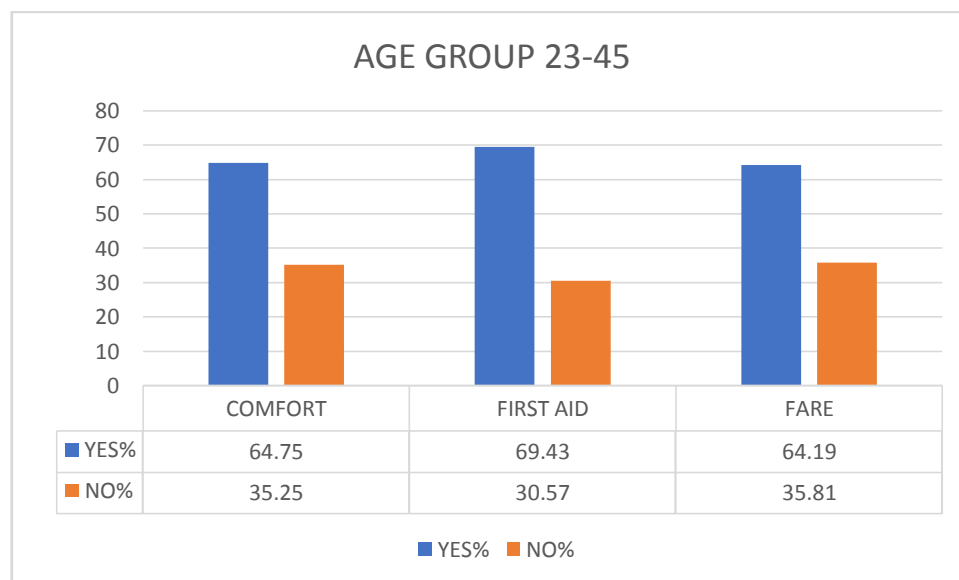


Fig 9 Analysis based on safety and hygiene during travelling (23-45)

The above chart represents the services provided to customers during traveling. It can see that around 65% of the customer from this age ground feels their journey is comfortable. About 70% of passengers noticed the first aid kit during traveling. And about 64% of people are satisfied with the fares charged by MSRTC.

□ Analysis of age group 45- 60:-

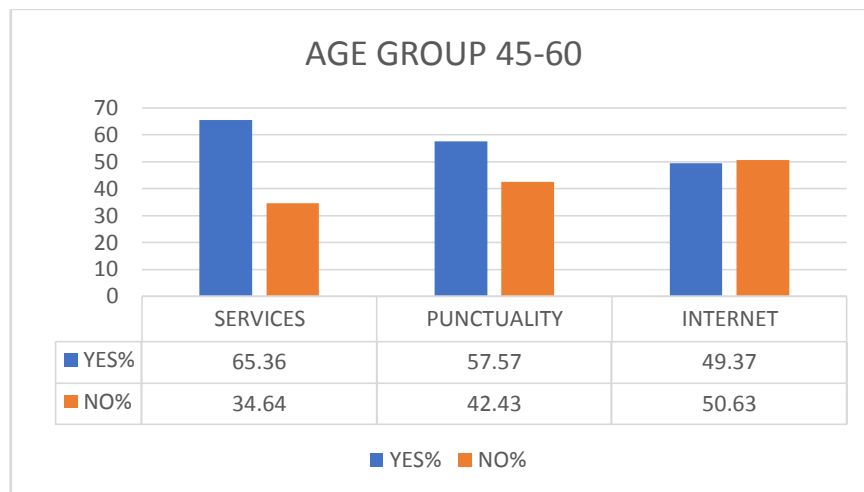


Fig 10 : Analysis based on functional requirement of MSRTC employees (45-60)

In this age group, passenger traveling is generally from the middle age group, which is on the verge of retirement. The above chart shows passenger responses to the functional requirements of employees. Around 65% of the passengers are satisfied with the services provided. About 58% of people nodes that MSRTC provides punctual services. And 50% of people find internet facilities at bus stations.

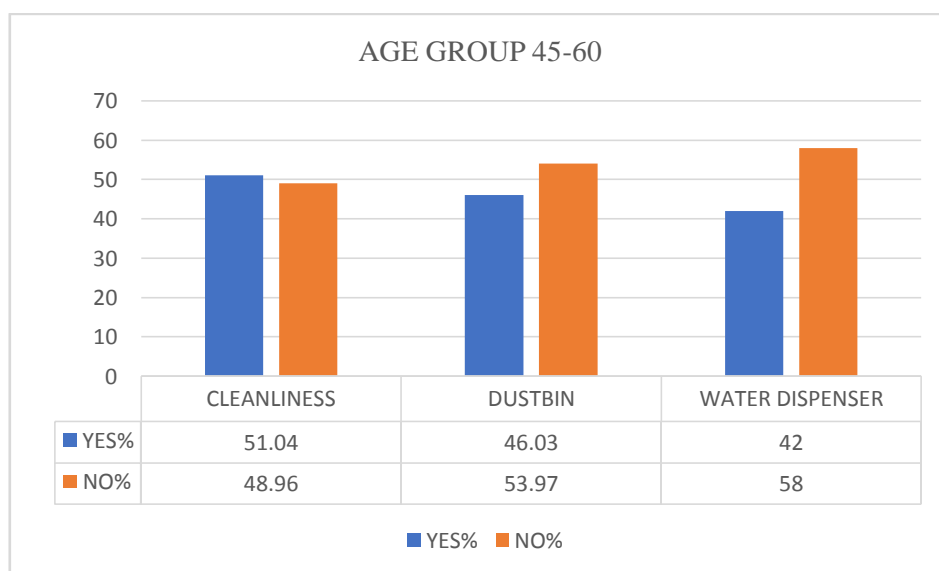


Fig 11 :Analysis based on safety and hygiene at bus station (45-60)

The above charts represents the safety and hygiene at bus station. It is observed that around 51% of respondents found that station is neat and clean. Around 46% of people locates dustbins at station. And 42% people gets the facilities of water dispensers.

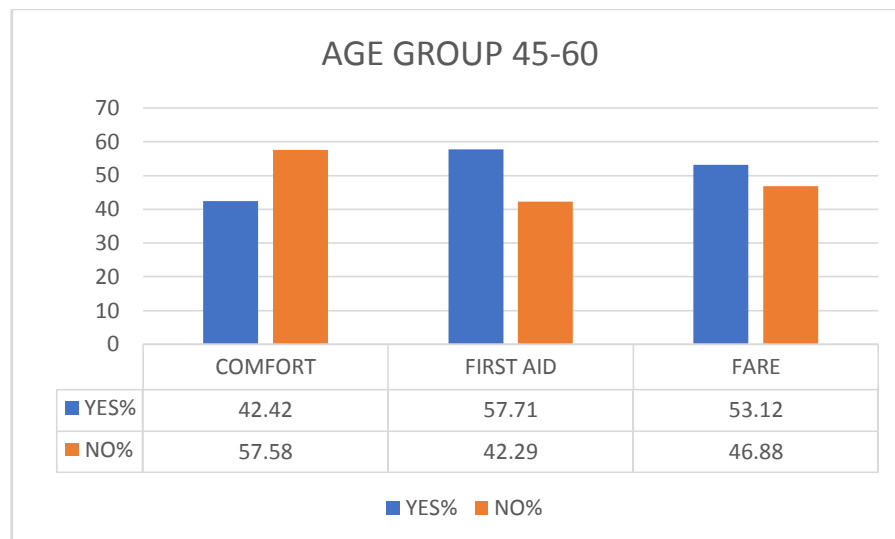


Fig 12: Analysis based on safety and hygiene during travelling (45-60).

The above chart represents safety and hygiene services during traveling. Around 42% of respondents are comfortable with their journey with MSRTC buses. About 58% of respondents locate the first aid kit on the bus. And almost 53% of passengers responded fares were reasonable.

□ Analysis of age group 60+ :-

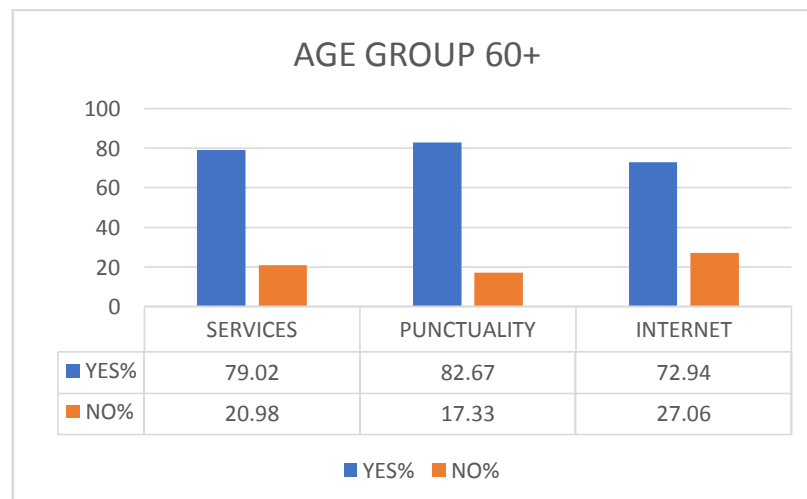


Fig 13 :Analysis based on functional requirement of MSRTC employees (60+)

The age group 60+ is studied in this section. Generally, under this age group, respondents are retired from their work life, and the most critical factor during traveling is their comfort level. From the above chart, it can see that almost 80% of passengers from this age group are satisfied with the services delivered by MSRTC employees. Around 82 % of passengers rated the punctual services of MSRTC employees. And most importantly, in this new internet era, senior citizens, around 73%, are getting those facilities.

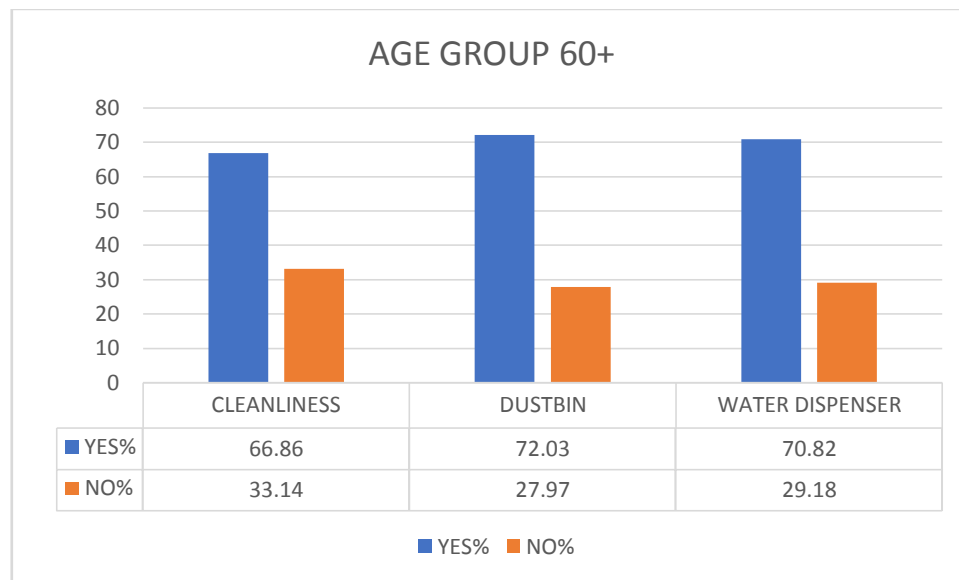


Fig 14 :Analysis based on safety and hygiene at bus station (60+)

The above chart represents safety and hygiene at the MSRTC bus station. It can see that around 66% of respondents in this age category find the station area neat and clean. About 72 % of passengers find dustbin services up to date on the premises. And around 70% of customers find that water dispenser is available at the station premises.

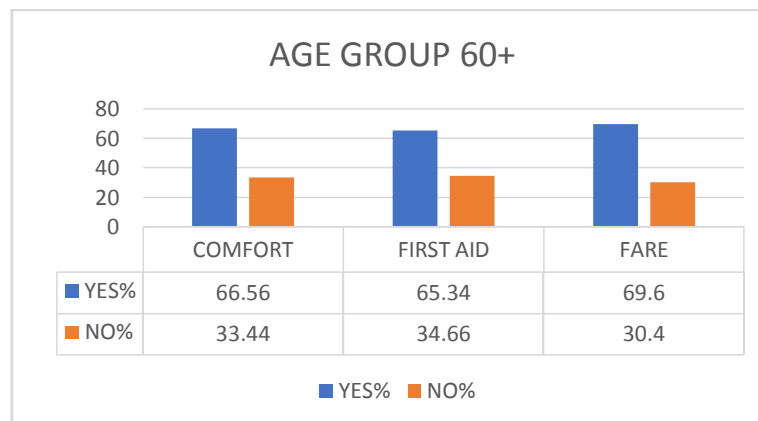


Fig 15 : Analysis based on safety and hygiene during travelling (60+)

The above chart shows that around 60% of respondents feel their journey with MSRTC buses is comfortable. 65% of passengers spotted first aid services during traveling. As these age groups, people are prone to various health emergencies. And almost 70% of passengers are very comfortable with fares charged by MSRTC. This is because senior citizens are given travel concessions with MSRTC.

□ Data analysis based on SERVQUAL model: -

For carrying out the analysis of survey in the most effective way and present our result accurately, we choose a sample size of over 250 responses, we collected from using various data collection methods discusses in the previous chapter.

Table no 02): SERVQUAL dimensions and Service sectors classifications for the study

Parameters	SERVQUAL Dimensions	Means of service quality
Functional	Responsiveness	Response to customer problems
Functional		Response time of enquiry center
Functional	Empathy	Employees greets in friendly manner
Functional		Use of proper language
Functional		Maintains neat and orderly work area
Functional	Reliability	Punctuality in services by employees
Hygiene and Safety at bus station		Regular sanitization of bus stations
Hygiene and Safety at bus station		Timely services delivered by buses
Hygiene and Safety at bus station	Tangibles	Availability of water dispenser at bus stations and quality of water available
Functional		Availability of internet facilities during travelling and at bus station
Hygiene and safety during travelling:-		Availability of fire extinguisher to avoid any mishaps
Hygiene and safety during travelling:-	Assurance	Employees communicates effectively
Hygiene and safety during travelling:-		Availability of cops in order to avoid robbery, eve teasing, etc.
Hygiene and safety during travelling:-		Honesty of employees at MSRTC

The above chart relates the SERVQUAL dimensions to the attributes used for defining service quality by the different customers for this study. The analysis of various extents derived while comparing with the SERVQUAL model is discussed in detail as follows.

1. **Responsiveness:** - SERVQUAL describe responsiveness as “willing next to help and provide prompt service”. In the analysis, our organization (MSRTC) display this dimension in the services the provides to there customer. This includes effective response with immediate solution to passengers’ problems, when the passengers face some issue the enquiry department should give them proper guidance and solutions to customer problems.

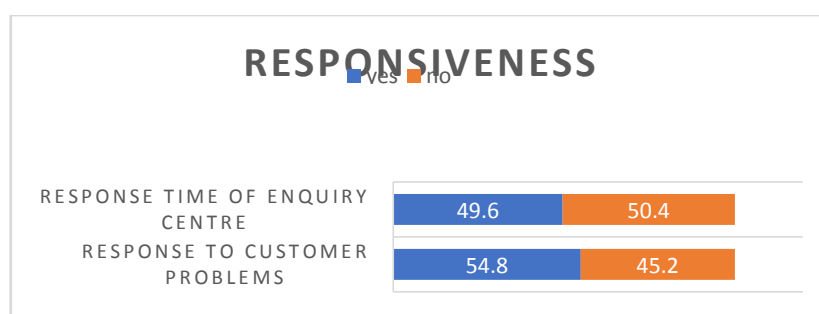


Fig : 16 Analysis of SERVQUAL dimension- Responsiveness

The above chart represents the first dimension of SERVQUAL, i.e., responsiveness. From the above data, the primary factor contributing are response time at the inquiry center and effective response to customer problems. It can see from the chart that around 49% of people's problems were solved quickly and effectively at the inquiry center. Also, about 55% of the issues were solved by the employees at MSRTC.

2. Empathy: - SERVQUAL described empathy as “caring, individual attention the firm provides to its customers.” From the above chart, it is observed that there were three main factors in our survey in which the serval dimension was observed and carried out effectively. This includes a warm gesture from the MSRTC employees, using proper language while communicating with the customers, and maintaining a neat and orderly work environment.

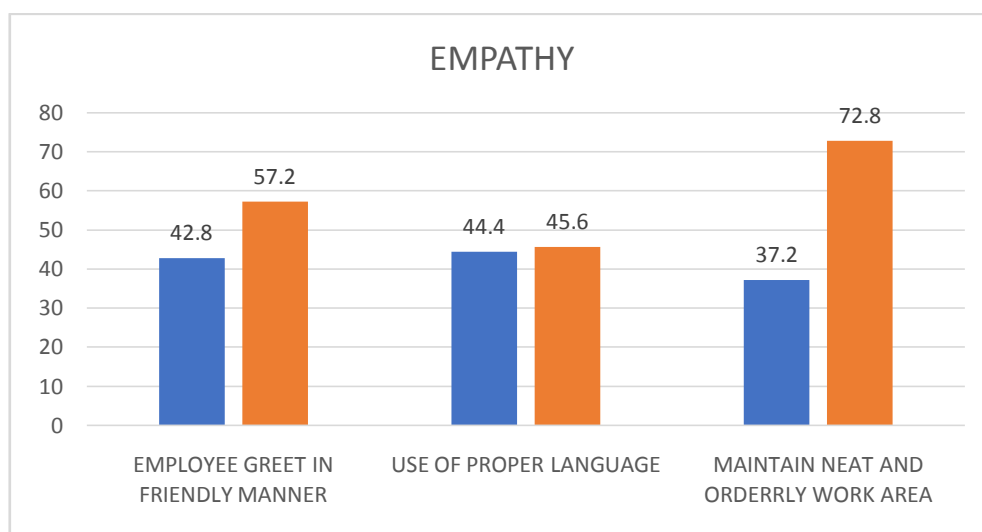


Fig 17 : Analysis of SERVQUAL dimension- Empathy

It is observed from above data chart, that the main factors in Empathy dimensions are rated from the passengers. Around 43% of peoples were greeted in friendly manner by the employees. While communicating with them, 45% of people agreed for using proper language. And 38% of peoples noticed that there was neat and clean, orderly work area maintained.

3. Reliability: - SERVQUAL describes reliability as “ability to perform the promised service dependably and accurately”. In this dimension, our organization contributes in three most necessary factors. These includes punctual services from the employees at MSRTC, in the view of recent global pandemic and for public health regular sanitization of buses and bus station and at last the promised time within which the bus services operate without getting delayed.

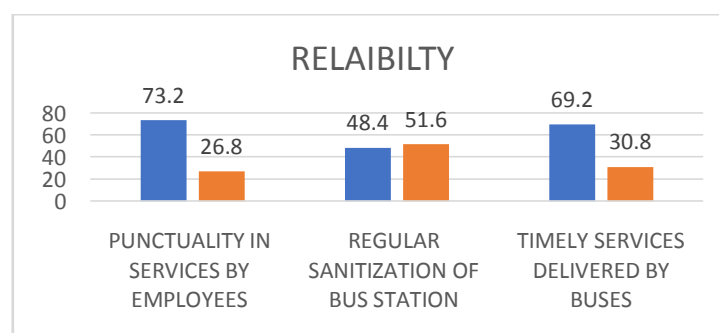


Fig 18 : Analysis of SERVQUAL dimension- Reliability

From the above chart, it is observed that about 73% of people rated much more positively for maintaining punctuality in services. During the recent pandemic outbreak, 48% of people noticed that bus station is regularly sanitized. And around 69% of people agreed that the bus reaches their destination in the most punctual way consistently.

4. **Tangibles:** - Tangibles refers to physical facilities, equipment, personnel, and communication material. Tangibles represent the physical facilities, employees' appearance, equipment, machines, and information system. In the chart, this dimension includes various facilities available such drinking water dispensers, internet facilities and various safety devices such as fire extinguisher, first aid, etc. to avoid any mishaps.

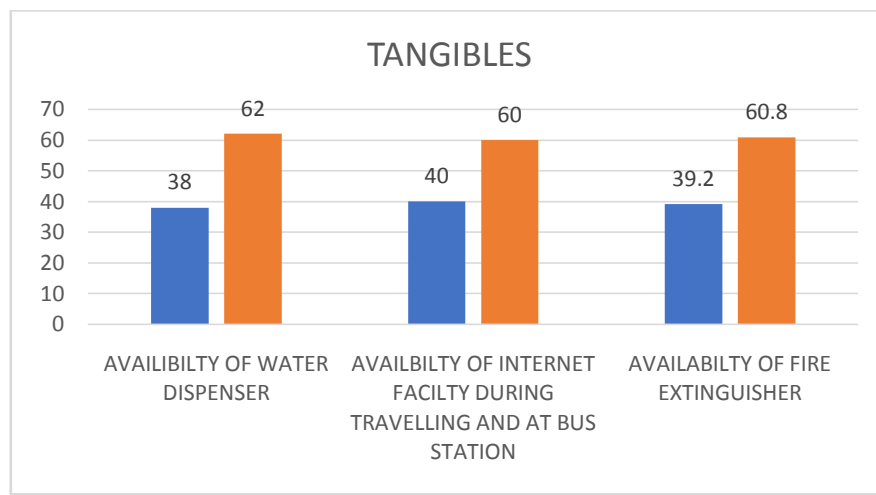


Chart no.22) analysis of SERVQUAL dimension- Tangibles

From the above SERVQUAL dimension chart, it is observed that around 38% of people were provided with the water dispenser facilities. Around 40% of people avails the internet facility at bus station and during their journey in buses. Also 39% of passengers spotted fire extinguisher at bus station and inside buses in order to avoid any unwanted mishaps.

5. **Assurance:** - SERVQUAL describes assurance as “knowledge and courtesy of employees and their ability to inspire trust and confidence”. The service quality of this dimension includes assertive and supportive communication from various employees of MSRTC, for security purposes, presence of cops and honesty of the employees working in MSRTC.

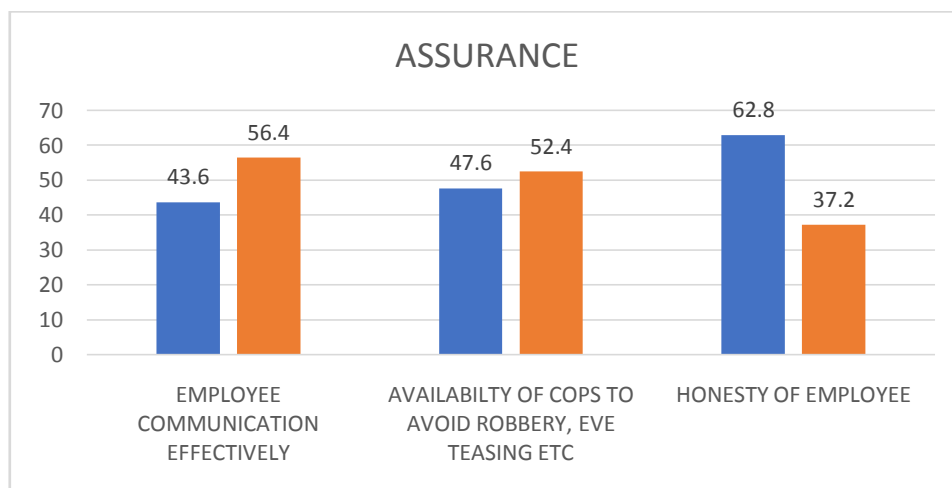


Fig 19 : Analysis of SERVQUAL dimension- Assurance

From the above chart, it is observed that around 43% of passenger were interacted with the employee's in the most effective way i.e. their problems were given an ear, the communication of employees was very effective. Around 47% of peoples spotted security officials in the station premises in order to avoid any unlawful activities such as robbery, chain snatching, eve teasing, etc. And finally around 63% of passengers agreed the honesty of the employees at MSRTC.

Analysis based on performance rating: -

Various services provided by MSRTC are rated in this section by the passengers. These services classify into three categories, i.e., functional requirements from employees, safety and hygiene at the station, and services provided during traveling. The data from all 4000 respondents are analyzed. The performance of these services is scaled on four factors, poor, satisfactory, better, and excellent. Numerical designation for the performance factors ranges from 1 to 10.

Poor - (1-2)

Satisfactory- (3-5)

Better - (6-8)

Excellent - (9-10)

i. Performance analysis of functional services from employees: -

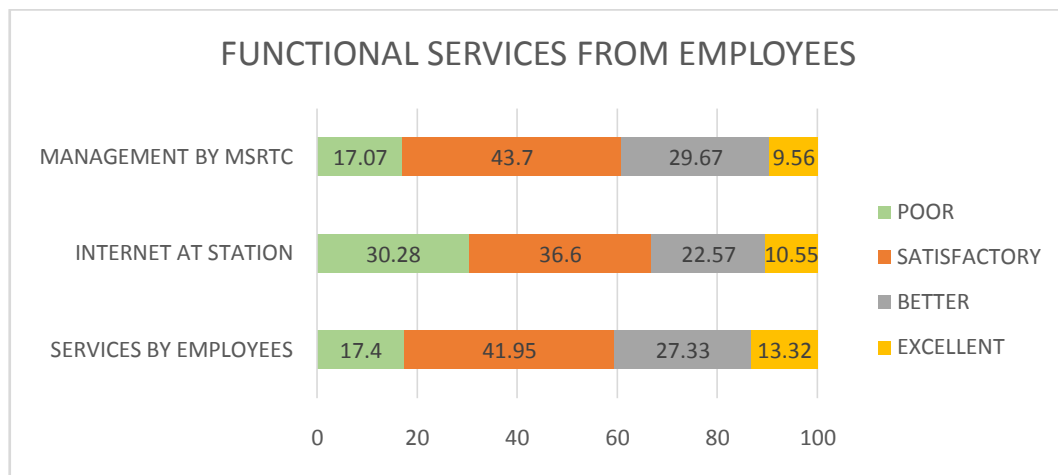


Fig 20: Functional services from employees

From the above chart, passengers rating for quality of services are recorded. It includes three factors. For the overall management delivered by MSRTC, most people, around 48%, are satisfied, whereas about 17% of passengers rated the management as poor quality. Also, only 9.5% of passengers rated the management as excellent quality.

The need of the modern generation, i.e., the internet services provided by the MSRTC at station premises, is evaluated. Around 36% of people are satisfied with the quality of internet service provided. Another significant majority of passengers, about 30%, rated the internet services quality poor.

For the services provided by MSRTC employees, which includes responsiveness to passengers' problems, proper communication, etc., around the majority of the passenger, 42%, are satisfied with this service. And around 17% and 13% of passengers rated the service as poor and excellent, respectively.

Performance analysis safety and hygiene at bus station: -

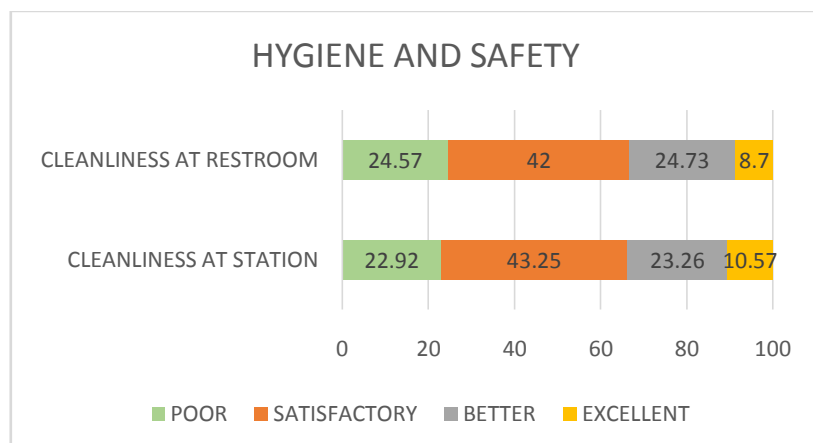


Fig 21 : Rating of Hygiene and safety at bus station

The above chart represents the hygiene and safety quality at the bus station premises. During the survey, hygienic services at restrooms and overall premises were evaluated. From our findings, it is observed that the sanitary condition of bathrooms was rated around 42%, mainly as satisfied by the passenger visiting them. Around 24.5% of passenger faces this condition as poor. And about 25% of passengers rated restroom cleanliness with better conditions.

In terms of neat and clean premises at the MSRTC bus premises, it is observed that around 43.25% of people voted the quality as satisfactory. About 23% of passengers rated the premise's hygiene as poor. Whereas only 10.5% of passengers rated the cleanliness of the bus station as of excellent quality.

□ Performance analysis of services provided during travelling: -

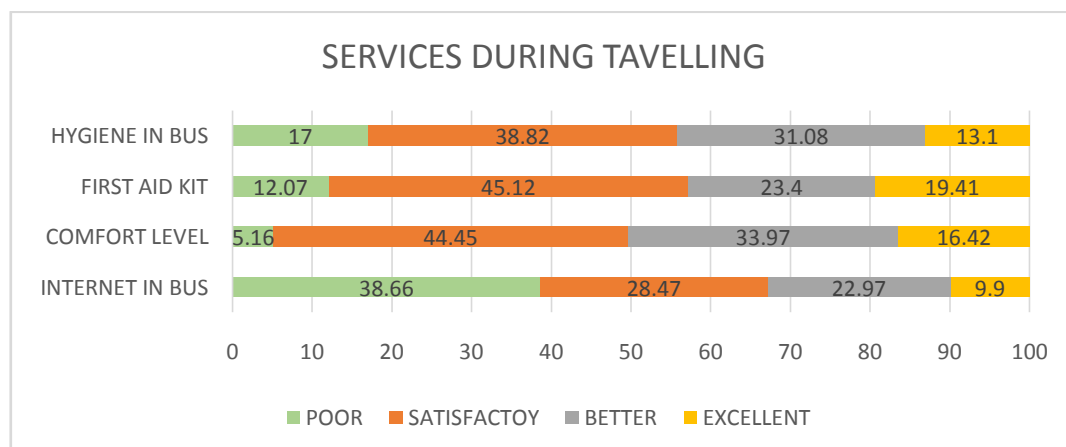


Fig 22 : Rating for quality of services during travelling

The above chart represents the rating of services during traveling by MSRTC buses. The main factors analyzed are hygiene inside the bus, first aid kit, comfort level during traveling, and internet services inside the bus. It can see from the chart that around 39% of passengers rated the hygienic condition of the bus as satisfactory. About 31% of people rated the situation as in a better state. And around 17% of people rated the need as poor.

For the first aid kit around 45% of the passengers are satisfied with the quality of the first aid kit. About 12% rated the quality as poor, and about 20% of passengers rated it as excellent. In terms of the level of comfort, about 45% of passengers completed their journey with satisfaction. Around 5% of people need more comfort with poor quality. And about 17% of people rated the quality as excellent.

And finally, regarding the internet facilities provided inside the bus, most people faced around 39% poor internet services while traveling. About 23% of passengers rated the service quality as a better way, above satisfaction.

Hence, a complete analysis of the collected data is performed. It includes analysis based on age group, research based on gender, analysis of data based on the SERVQUAL model, and performance analysis of various services provided by MSRTC.

Analysis of customer satisfaction and quality of services: -

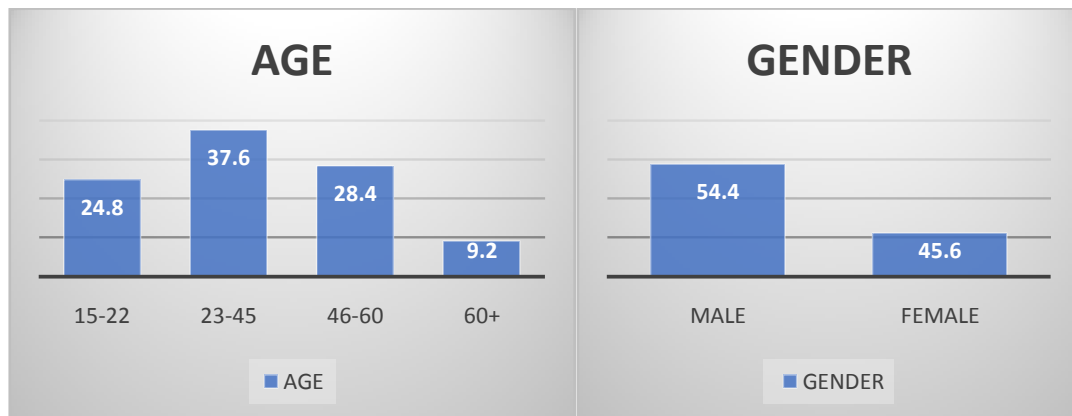


Fig 23: sample presentation of MSRTC

The above chart represents a sample of around 250 respondents from our survey. It can be seen from the chart that the passengers of MSRTC were not equally distributed. With a total of 250 pieces, among the age characteristics, most passengers were from the age group of 23-45. Males comprised around 55% of the samples, while females comprised 45%. Concerning the region, almost all the respondents were from the Amravati region. Also, there were respondents from the neighborhood region too.

Sample characteristics for sample size of 250	SATISFIED	UNSATISFIED
15-22	37	25
23-45	48	46
46-60	38	33
60+	12	11
MALE	63	73
FEMALE	63	51

Table no. 03) Responses from various respondents



Fig 24 : Customer satisfaction of MSRTC

The above bar chart represents customers' satisfaction with the services provided by MSRTC. It shows that around 54% of passengers are satisfied with the services given by MSRTC. Whereas about 46% of passengers are unsatisfied with the services. Their pre-travel expectation didn't match their post-travel experience.

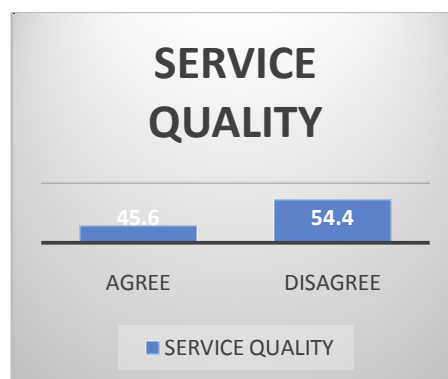


Fig 25 : Quality of services provided by MSRTC

The above chart represents the quality of services MSRTC gives its customer. It can be seen from the graph that around 46% of customers are satisfied with the quality of services. At the same time, about 54% of customers are unhappy with the quality of services. The various dimensions of quality are represented in the following pie chart.

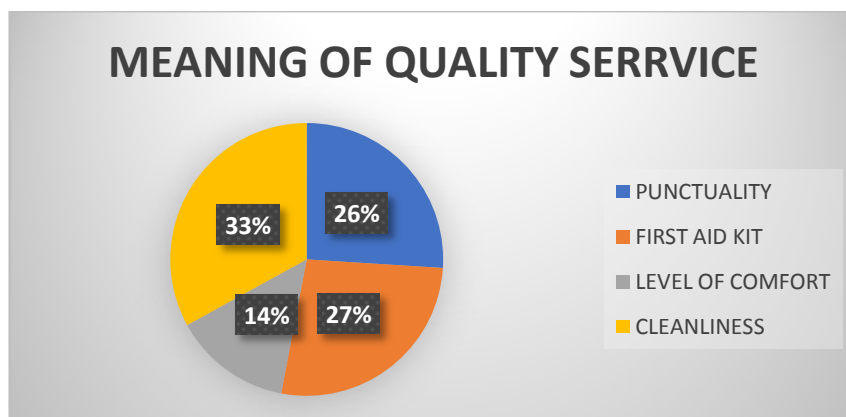


Fig 26: Meaning of service quality for MSRTC

The above chart represents various parameters on which quality services are based. It can see that for over 33% of passengers, quality service means cleanliness. Around 26% of passenger thinks that punctuality in services means quality services. 27% of passenger it is related to first aid services provided. And for 14% of passenger devotees, quality services to the level of comfort.

Sample characteristics for sample size of 250	AGREE	DISAGREE
15-22	29	33
23-45	41	53
46-60	31	40
60+	13	10
MALE	93	43
FEMALE	47	67

Table no.04)customer satisfaction and sample characteristics

The above table represents customer satisfaction and sample characteristics for MSRTC. It could be seen from the table, as for the agreement to customer satisfaction majority of the passenger from age group of 23-45 are satisfied more than any other age group. Also, it can be observed that the male passenger is much more agreed with the customer satisfaction from MSRTC.

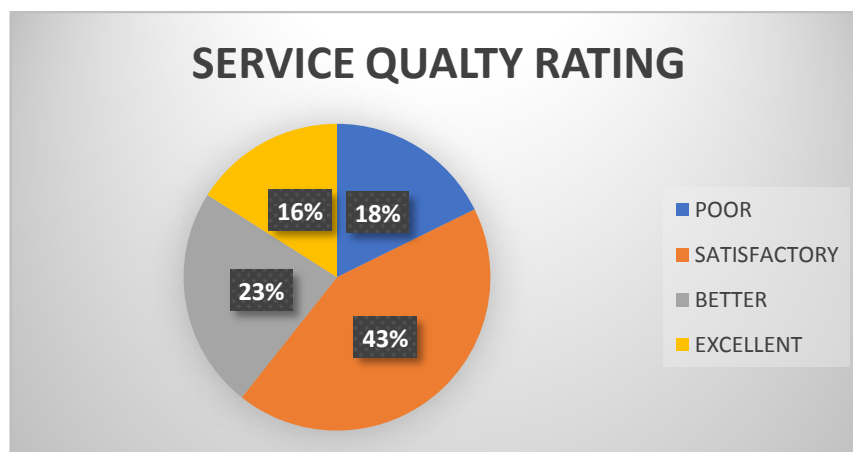


Chart No. 31 Service quality rating for MSRTC

The above chart represents the overall rating given by the passenger for various services and its quality. It can be seeing that over 43% of passenger are rated the service quality as satisfactory. Over 23% of passenger rated the quality as better i.e. average quality. For 16% of passenger the service quality was of excellent level. And for 18% of passenger the service quality was of poor level.

4.5) Research hypothesis: -

The research hypothesis is categorized into three groups:

a) Relationship between customer satisfaction and service quality dimensions

b) Relationship between service quality and service quality dimensions

c) Relationship between service quality and customer satisfaction.

a) Relationship between customer satisfaction and service quality dimensions: -

- Null hypothesis = H_0 : There is no significant relationship between customer satisfaction and service quality dimensions.
- Alternative hypothesis = H_a : There is a significant relationship between customer satisfaction and service quality dimensions.

	Service quality dimension	P value
Customer satisfaction	Cleanliness	0.000
	Level of comfort	0.199
	Fares charged	0.957

From the above data it is observed that two of the three-dimension p value > 0.05 (level of significance) thus the H_0 is accepted and hence there is no significance relationship between customer satisfaction and these dimensions. Those dimensions were level of comfort and fares charged. Also, one dimension i.e. cleanliness p value is less than 0.05, hence H_0 is rejected. This means that there is a significant relationship between customer satisfaction and the dimension.

b) Relationship between service quality and service quality dimensions: -

	Service quality dimensions	P-Value
Service quality	Internet facility	0.010
	Services by employees	0.000
	Punctuality	0.013
	First aid	0.014

From the above data it is observed that all the service quality dimension has the value of $p < 0.05$. therefore, H_0 is rejected this means that there is a significant relationship between service quality and those dimensions.

c) Relationship between service quality and customer satisfaction: -

Customer Satisfaction	Service quality	P-Value=0.901
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From the above data it can be observed that the relationship between customer satisfaction and quality services is found. The p value (0.901) $>$ level of significance (0.05) hence H_0 is accepted and H_a is rejected. And hence we can say that there is no significant relationship between customer satisfaction and quality services from the sample size we have selected.

4. Conclusion:

The presented work aims to examine the relationship between customer satisfaction and service quality concerning service quality dimensions. The unique design of this research gave strange but exciting results because of the grouped and ungrouped presentation of the data. The summary of the results shows that the research questions were answered either distinctively by the individual service sectors or jointly in a group and

analysis of the standard variables.

The grouped analysis showed a different view of the outcome. There were significant relationships between service quality and service quality dimensions; the organizations' standard SERVQUAL dimensions (reliability, empathy, assurance, tangibles, and responsiveness) had a significant relationship with service quality. There could be relationships among service quality dimensions, customer satisfaction, and service quality, but customers of service sectors might be satisfied because of reasons other than service equality.

This study shows the application of A—Parasuraman's quality tool and the response surface tool, i.e., SERVQUAL model, in the MSRTC transport. The SERVQUAL model is ascertained to be a suitable and appropriate tool in analyzing the importance of quality of service features for users of the public passenger transport system in the Amravati district.

The following points are concluded from our study: -

All parameters were rated positively in the age group 15-22. The services like punctuality, internet facility, clean and healthy premises, etc., were effectively facilitated to this age group. The only parameter which shows lacking was the availability of water dispenser.

In the age group 23-45, the service of dustbin facilities and the internet was seen as lacking, as most passengers in this age group rated negatively for these two services.

In the age group 45-60, facilities of dustbins, availability of water dispenser, and most importantly, level of comfort in their journey was observed as unfulfilled.

In the age group of 60+, it was surprising to observe that the age group had no negative response to the services provided by MSRTC. This age group rated all the services provided tremendously. This shows that senior citizens, or those 60+, rely on and trust the MSRTC bus services.

The male respondents show a heavy negative rating on the services provided by MSRTC. Almost all the services provided by MSRTC failed to satisfy the male passenger to some extent.

The female respondents also show a negative performance for the services provided by the MSRTC.

Compliance with Ethical Standards:

The manuscript is not submitted to more than one publication for simultaneous consideration. The submitted work should be original and should not have been published elsewhere in any form or language (partially or in full). Upon request authors will send relevant documentation or data in order to verify the validity of the results presented. Authors declare that there is no conflict of interest regarding the publication of this paper.

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