ISSN 0974-763X
UGC-CARE Listed Journal

SOUTH ASIAN JOURNAL OF MANAGEMENT RESEARCH (SAJMR)

Volume 15, Issue No.1 January, 2025

CHHATRAPATI SHAHU INSTITUTE OF BUSINESS EDUCATION AND RESEARCH (CSIBER), KOLHAPUR, MAHARASHTRA, INDIA

(An Autonomous Institute)
University Road, Kolhapur - 416004, Maharashtra State, India.

website : www.siberindia.edu.in
E-mail : editorsajmr@siberindia.edu.in

Chhatrapati Shahu Institute of Business Education and Research (CSIBER)

South Asian Journal of Management Research (SAJMR)

Volume 15, Issue No. 1, January, 2025

Editor: Dr. Pooja M. Patil

Publisher

CSIBER Press

Central Library

Chhatrapati Shahu Institute of
Business Education & Research (CSIBER)
University Road, Kolhapur – 416004, Maharashtra, India.
Phone: 91-231-2535706/07, Fax: 91-231-2535708,
Website: www.siberindia.edu.in
Email: csiberpress@siberindia.edu.in
Editor Email: editorsajmr@siberindia.edu.in

Address:
CSIBER Press
Central Library Building
Chhatrapati Shahu Institute of Business Education and Research (CSIBER),
University Road Kolhapur, Maharashtra - 416004, India.

ISSN: 0974-763X

Price: INR ₹ 1,200/-

Editor: Dr. Pooja M. Patil

Distributed By

CSIBER Press

Central Library

Chhatrapati Shahu Institute of
Business Education & Research (CSIBER)
University Road, Kolhapur – 416004, Maharashtra, India.
Phone: 91-231-2535706/07, Fax: 91-231-2535708,
Website: www.siberindia.edu.in
Email: csiberpress@siberindia.edu.in

Service Quality Gap Analysis Based on Servqual Model With A Case Study In Commuters Of The Metro Rail Transportation System In Kochi.

Linchu Rajan
Research Scholar, St. Berchmans College
Changanacherry, Kerala, India

Dr. Sheena Sasidharan.V
Assistant Professor & Research Guide, M.M.N.S.S
College, Kottiyam, Kollam, Kerala, India

Abstract
Even though service quality is a crucial component of public transportation, very little research has been conducted on the subject. Therefore, this study aims to analyse the service quality gap in the transportation service provided by Kochi metro rail transportation system by using SERVQUAL model. This research study also aims to study the influence of age on passengers' expectation and perception regarding service quality of Kochi Metro Rail. based on secondary and primary data. Data from 384 samples were collected by using purposive sampling method. We analysed the data collected from respondents with IBM SPSS software. Descriptive statistics, Gap Analysis, Paired sample t-test, Tukey HSD test, Pillai's Trace test, Wilks' Lambda test etc. were used to test the hypotheses. The study result found that the majority of the regular passengers having higher expectation regarding the service quality of the Kochi metro, but unfortunately perceived service quality was not much satisfactory based on passengers' opinion when compared to their expectation level. The results of the study show that, among the five dimensions of service quality, empathy shows the highest gap score. It has been found that age of the commuters significantly influences their service quality perceptions.

Keywords: Service Quality, Service Quality Gap, SERVQUAL, Perceived Service Quality

Introduction

The majority of corporate activity in the global economy is concentrated in the service sector. Several services, including lodging, medical care, and transportation, are the main sources of income for the companies. Service companies concentrate on gaining the trust and happiness of their customers by providing them with excellent value and high-quality services. Offering quality services at fair prices is a crucial factor in determining customer satisfaction. Customer satisfaction not only contributes revenue to the business but also growth and corporate success. Increased market share, profitability, positive word-of-mouth, and customer intention are all correlated with higher levels of customer satisfaction. The ability of a business to meet consumer expectations and maintain its competitiveness can be directly impacted by service quality, regardless of the industry. Parasuraman, Zeithaml, and Berry (1985) focused on customer expectations and perceptions in evaluating service quality. According to the researchers, service quality is "the degree and direction of discrepancy between customer perceptions and expectations. Lewis and Booms (1983) highlight the alignment between service delivery and customer expectations as a key determinant of service quality. According to the researchers, service quality is "a measure of how well the service level delivered matches customer expectations. Zeithaml et al. (1990) propose a comprehensive framework for understanding service quality, which consists of five dimensions like, tangibles, reliability, responsiveness, assurance, and empathy.

One of the most significant service industries that improves both the general standard of living and the economy is transportation. There have been so many incredible developments in the transportation industry. Mass rapid transit systems, including metro trains, monorails, bus rapid transit systems, etc., were developed in our nation to give citizens a higher quality and better mobility experience. They are renowned for making travelling easier, faster, and safer for people to move around. The introduction of metro rail has shown to be beneficial for society during rapid population growth. Due to the rapid urbanization of Indian cities, mass rapid transit systems are urgently needed. However, the fact is that, despite mass rapid transit's benefits, people's attitudes toward it haven't exactly improved. For a variety of reasons, fewer people are using metro rail for their transportation needs. This research study tries to analyze service quality gap in Kochi Metro Rail Transportation System by using SERVQUAL model. This research study also aims to study the influence of age on expectation and perception of passengers regarding service quality of Kochi Metro Rail.

Review of Literature

Service Quality

Service quality is a multidimensional concept that refers to the overall level of excellence or satisfaction experienced by customers to the services provided by an organization. The service-profit chain of Heskett et al. (1994**)** emphasizes the link between service quality, customer satisfaction, loyalty, and financial performance. A study conducted by Robert Jonson (1995) identified some satisfiers and dissatisfiers in service quality. According to the researcher, the predominantly satisfying determinants are attentiveness, responsiveness, care and friendliness and the dissatisfiers are integrity, reliability, responsiveness, availability and functionality. Lee

et al. (2000), studied the relationship of perceived service quality and customer satisfaction. The result shows that perceived service quality is an antecedent of satisfaction, rather than vice versa. Researchers have reported a consistent association between service quality and customer satisfaction (Woodside et al.,1989, O Mahamad, & T Ramayah,2010, MV Ngo & HH Nguyen, 2016, E Sivadas, & JL Baker-Prewitt, 2000, H Oh, 1999, P Arora & S Narula, 2018,)

Service Quality in Public Transportation

Public transport plays a pivotal role in modern urban transportation systems, providing mobility options to millions of people worldwide. Service quality is a crucial aspect of public transport systems, influencing passenger satisfaction, mode choice decisions, and overall system performance. Hensher and Stanley (2020) conducted a comprehensive review of public transport passenger satisfaction and service quality measurement. The study analyzed various dimensions of service quality, including reliability, accessibility, comfort, safety, and customer service. It highlighted the importance of understanding passenger perceptions and expectations in evaluating service quality. Teixeira et al. (2019) developed and validated the Public Transport Service Quality Scale (PTSQS), a tool specifically designed for assessing service quality in public transport contexts. The study identified dimensions such as accessibility, reliability, comfort, safety, and tangibles as crucial factors influencing passenger perceptions of service quality. Kamruzzaman et al. (2018) investigated the relationship between service quality, service frequency, and car ownership in the context of a public transport priority policy in Brisbane, Australia. The study found that improvements in service quality, particularly reliability and accessibility, were associated with increased public transport usage and reduced car ownership**.** Loo et al. (2017) investigated the influence of safety and security in passenger satisfaction and loyalty in the air travel sector. Hensher and Stanley (2020) suggested that high service quality in public transport is positively associated with increased passenger satisfaction and loyalty. Li et al. (2021) explored the impact of service quality and customer satisfaction on passenger loyalty in public transport systems, focusing on the case of Chongqing, China. The results of the study show that reliability, comfort, safety, and customer service are the significant predictors of passenger loyalty. Dragana Grujičić et al. (2013) used Importance-Performance Analysis (IPA) with the aim of identifying the key elements of service quality that require improvement in public transportation. The results of the study show that, elements that are the most important from user and non-users' point of view are elements that belong to the set of tangibles. The study concludes that, cleanliness in the vehicle and ventilation in the vehicle will increase the level of users' satisfaction and impression of the improvement of the public transport system quality. Randheer K. et al. (2011) used SERVQUAL in Public Transportation to investigate commuters' perceptions of service quality. The preexisting component was expanded to include culture. The study's findings demonstrated the significance of culture in gauging the context of service excellence. According to a comparison of the means of the SERVQUAL components, commuters are most influenced by responsiveness, assurance, reliability, culture, and empathy. Laura Eboli and Gabriella Mazzulla (2008), used a stated preference experiment to investigate the quality of service in public transportation. The study's findings indicate that the most crucial factor that passengers take into account when choosing public transportation is service frequency. Another crucial component of service excellence is fare. Yaya et al. (2015) investigated the demographic parameters that may affect customers' perceptions of service quality and created a scale to assess customers' perceptions of service quality in public transportation. When evaluating customer perceived quality in a public transportation scenario, the three categories of functional, convenience, and physical environment quality were validated as underlying determinants. The study's findings indicate that while education was inversely correlated with perceived quality, age and having a driver's license are directly and favorably correlated with service quality. Aniebiet et al. (2021) studied public transportation firms' customer loyalty and service quality. The study's goal was to ascertain how public transportation firms' customers' loyalty was impacted by factors such as journey duration, driver skill, passenger comfort, safety, and cleanliness of vehicle. The study's conclusions showed that while travel time had no discernible impact on passengers' loyalty to public transportation companies, passenger safety, comfort, driver skill, and vehicle cleanliness all significantly increased customer loyalty.

Service Quality in Metro Rail Transportation

According to a study by ANH Ibrahim et al. (2022) user perceptions of satisfaction with the service provided by Malaysia's urban rail transport system were primarily influenced by three service quality factors namely facilities, information signs, and information availability. According to this study, one of the key elements influencing users' perceived satisfaction with the Klang Valley's LRT services was employee performance. Yuning Wang et al. (2020) evaluated the significant effects of customer satisfaction and service quality on the desire of Chinese rail transport users to reuse. The empirical study's findings supported the notion that there are several ways to define service quality, including functional, technical, comfort, cleanliness, planning, and dependability. Additionally, it increases customer happiness, which in turn influences passengers' intention to buy. This has a beneficial impact on reuse intention. Saw Y Q et al. (2020) looked into how satisfied London's Tyne and Wear Metro passengers were. The study's findings indicate that the key service quality characteristics

that have a major impact on customer satisfaction are infrastructure quality, ticket buying facilities, security, safety, and comfort. Juan de Oña et al. (2020) points out that, service quality has a direct and an indirect effect on behavioural intentions (through satisfaction), in the case of LRT systems. According to the researchers, service quality is an important predictor of behavioural intentions. De Oña et al. (2015) studied the relationship between perceived service quality, customer satisfaction and behavioral intentions for the Metro of Seville in Spain. Users' perceptions of service quality were measured along eight dimensions such as tangible service equipment, accessibility, service availability, information, security, customer service, personal space, and environmental pollution. Priyanka et al. (2023) studied service quality of Chennai Metro. The findings indicate that atmosphere, coach conditioning, cleanliness, station access, hospitality, administration service, and station facilities etc. have significant impact on customer satisfaction. Yogendra Pal Bharadwaj and Mukesh Singh (2020) studied the effect of service quality on commuters' satisfaction towards the adoption of Metro Services in Delhi. The findings showed that commuter friendliness is the primary element influencing commuter satisfaction, followed by assurance, dependability, safety and security considerations. Anjali Sharma (2013) added security as a new dimension in the existing dimensions of SERVQUAL model and it has been found that, security significantly influences customer satisfaction

Statement of the Problem

The SERVQUAL model is a sufficient tool to measure service quality from customers' perspective (Mikhaylov et al., 2015). Service quality gap analysis studies are crucial for businesses aiming to understand and improve the quality of their services. These studies typically involve comparing customer expectations with their actual perceptions of the service received, identifying any gaps that may exist between the two. Therefore, research aimed at measuring the perception of commuters regarding service quality rendered by the public transport services will be beneficial to consumers and service producers. But there aren't any research studies which discusses service quality gap based on SERVQUAL model in Metro Rail Transportation from Indian context. Hence the present research study focused on the following objective, to measure and assess the level and significance of service quality perception of the commuters on SERVQUAL scale given by Parasuraman et al. (1988). This research study also aims to study the influence of age on expectation and perception of passengers regarding service quality of Kochi Metro Rail.

Objectives of the Study

1. To identify the important factors determining service quality of Kochi Metro rail transportation system that leads to customer satisfaction.
2. To find out the gap between expected service quality and perceived service quality of commuters by using SERVQUAL instrument.
3. To study the influence of age on expectation and perception of passengers regarding service quality of Kochi Metro Rail.

Research Questions

1. What is the service quality of Kochi Metro according to the expectation and perception of Passengers?
2. What is the influence of age of passengers on Service Quality Dimensions of Kochi Metro Rail?

Hypotheses

H_01: There is no significant difference between passengers' expectation and perception on service quality offered by Kochi metro rail.

H_02: There is no significant difference in passengers' expectations on the tangibility and assurance service quality dimensions across different age groups.

H_03: There is no significant difference in passengers' expectations on the reliability, responsiveness, and empathy service quality dimensions across different age groups.

H_04: Passengers perceived service quality is not significantly different across the different age groups regarding five service quality dimensions.

Methodology

Participants and Procedure

This research study was designed as descriptive and analytical in nature based on secondary and primary data. Secondary data were collected from previous research studies, books, articles and from Kochi Metro Rail websites. Primary data were collected from the regular passengers of Kochi Metro and occasional passengers and tourists were excluded from the population. Here, on an average, more than fifty thousand passengers are

using Kochi Metro daily, and no population list was available, hence purposive sampling method was used to select the sample respondents. Researchers can ensure that the data acquired is rich and in line with the study's aim by using purposive sampling to target passengers who have experience with specific aspects of the service (Patton, 2015). Data from 384 samples were collected. The researcher travelled along with the passengers and collected data directly from the respondents.

Measurement of Variables

This study aimed to assess the potential discrepancy between passengers' expectations and the actual level of service provided by Kochi's metro train system. Service quality was determined using the SERVQUAL methodology, which applies the five aspects of service quality—tangibility, reliability, responsiveness, assurance, and empathy. There were 22 statements in the research tool. There were three parts to the structured interview schedule. Information about the respondents' age, gender, occupation, employment status, and income were requested in the first part. The respondents' expectations for service quality in relation to the various commuter services were evaluated in the second section, and their opinions of the service quality that the service operator really offered were gauged in the third. Using a five-point Likert-type scale with strongly disagree (1) and strongly agree (5) as anchors, the respondents' degree of agreement with the expectations and perceptions statements was measured.

Data Analysis

We analysed the data collected from respondents with IBM SPSS 20. version software. Descriptive statistics, Gap Analysis, Paired sample t test, Tukey HSD test, Pillai's Trace test, Wilks' Lambda test etc. were used to test the given hypothesis. Cochran's Sampling calculation formula was used to decide the appropriate sample size for unknown population.

$n_o = z^2pq/e^2$

p = 0.5 and hence q =1-0.5 = 0.5; e = 0.05; z =1.96

$= ((1.96)^2 (0.5(1-0.5))/ (0.05)^2 = 384.$

Table:1-Demographic Profile of Respondents

Categories	Frequency	Percentage
Gender		
Male	213	55.5
Female	171	44.5
Age		
Below 20 years	39	10.
20-40 years	130	34
40-60 years	150	39
Above 60 years	65	17
Education		
Professionals	81	21.
Post -graduation	100	25.7
Graduation	139	36.3
12th and Below	64	16.7
Occupation		
Government Employee	84	21.9
Private Employee	133	34.6
Business/ Profession	44	11.5
Categories	**Frequency**	**Percentage**
Self Employed	59	15.5
Others	64	16.7
Income		
Up to 100000	67	17.4
100001-200000	54	14.1
200001-300000	90	23.4
300001-400000	81	21.1
Above 400000	92	24.0

Source: Primary data.

The demographic profile of the study sample, consisting of 384 Kochi Metro rail passengers, is summarized in Table 1. 55.5% of the respondents identifying as male and 44.5% as female. In terms of age, the majority of respondents fall within the 40-60 years category (39%), followed by those aged 20-40 years (34%), and a smaller proportion of respondents are either below 20 years (10%) or above 60 years (17%). Regarding education, 36.3% of respondents have completed graduate studies, 25.7% hold a post-graduate degree, 21% are professionals, and 16.7% have completed higher secondary school education or lower. In terms of occupation, the sample includes 34.6% private employees, 16.7% others, 21.9% government employees, and smaller proportions from business, self-employment etc. The income distribution indicates that 23.4% of respondents earn between ₹200,001-₹300,000 and 21.1% earn between₹300,001-₹400,000 annually, with a significant portion (24%) earning above ₹400,000. Overall, the data provides a comprehensive demographic representation of passengers of Kochi Metro.

Table: 2- Service Quality Gap Score of Kochi Metro Services

D	S.C	Statements Related to Expectation and Perception	E	P	G (P-E)
Tangibility	T1	Modern looking trams and stations	4.77	3.91	-0.86
	T2	Physical facilities should be visually appealing	4.73	3.90	-0.83
	T3	Tickets, instruction boards etc. (Materials) must be clear and visually appealing	4.76	3.54	-1.22
	T4	Employees should be smart in their appearance	4.67	3.77	-0.9
Reliability	R1	Services should be on time	4.87	3.97	-0.9
	R2	Must show a sincere interest in solving passengers' problems	4.83	3.53	-1.3
	R3	Should provide the timely services	4.80	3.63	-1.17
	R4	Maintain an error free record	4.79	3.51	-1.28
	R5	Should follow the promise to do some services by a certain time,	4.81	3.60	-1.21
Responsiveness	Re1	Employees prompt response when the services performed	4.83	3.61	-1.22
	Re2	Employees in Kochi metro should provide prompt service	4.79	3.57	-1.22
	Re3	Employees should always willing to help you	4.79	3.50	-1.29
	Re4	Employees in Kochi metro must never too busy to respond to your request	4.81	3.24	-1.57
Assurance	A1	The behaviour of employees is creating confidence in you	4.77	3.28	-1.49
	A2	Feel safe in your transactions with Kochi metro	4.81	3.87	-0.94
	A3	Employees are consistently courteous with you	4.80	3.57	-1.23
	A4	Employees having much knowledge to answer the questions	4.81	3.22	-1.59
Empathy	E1	Giving special attention to women, children and handicapped	4.84	3.74	-1.1
	E2	Operating hours are convenient to all its customers	4.81	2.80	-2.01
	E3	Employees are giving personal attention	4.70	2.89	-1.81
	E4	Having best interest at heart	4.77	3.70	-1.07
	E5	The employees are understanding the customer's specific needs	4.75	3.47	-1.28

Source: Primary Data

Table .2 is explaining the regular passenger's expectation and perception of Kochi metro rail services. The expectation and perception score denote the mean opinion of passengers and the expectation score indicates that majority of the passengers having higher expectation regarding the services of Kochi Metro rail. While looking into the opinion of passengers regarding the perceived service quality, it could be seen that their perception has not been attain the range of their expectation. While looking into each dimension of SERVQUAL model, it could be seen that, highest gap score (-1.22) identified in related to clear and visually appealing of tickets, instruction board like material aspects of Kochi metro rail, because of passengers having higher expectation level regarding the same. Regarding the reliability factors, passengers having higher expectations about sincere interest of Kochi Metro rail in solving their problems (-1.3), error free record maintenance (1.28) and following the promises made by the metro in related to certain services at specified time (-1.21). The gap score related to third dimension, it could be seen that passengers having higher perception regarding prompt response (-1.22), providing prompt services (-1.22), employees willingness to help (-1.29), and prompt response about the passenger's request without any delay or busy (-1.57). Regarding assurance, it was found that passengers having

higher expectation regarding the behaviour of employees (-1.49), employees courteous (-1.23), and employees' knowledge regarding the questions raised by passengers (-1.59). Regarding the last dimension, it was found that passengers having higher expectation about convenient operating hours of metro rail (-2.01), employees' capability of understanding passengers' specific needs (-1.28) and employees special attention attitude towards the passengers (-1.81). While in the case of total gap score and average gap score of five dimensions, it could be seen that Empathy having higher gap score and average.

Table: 3. Average SERVQUAL Score of all Five Service Quality Dimensions

Sl. No	Dimensions	Total Score	Average Score
1	Tangibility	-3.81	-0.9525
2	Reliability	-5.86	-1.172
3	Responsiveness	-5.3	-1.325
4	Assurance	-5.25	-1.3125
5	Empathy	-7.27	-1.454
Total			-6.216
Average SERVQUAL Score			-1.2432
Source: Primary Data			

Table 3. shows the average gap score. The gap score itself explained that majority of the regular passengers having higher expectation regarding empathy and secondly the higher gap score goes to reliability and then responsiveness and assurance. This research article was further analyzed the statistically significant difference between passengers' expectations and their actual perception based on their experience. Paired sample t-test was is providing a valuable output regarding the significant difference.

Table: 4. Mean Significant difference between expectation and perception of passengers Service Quality Provided by Kochi Metro Rail

Dimension		Paired Differences					T	P-Value
		Mean	SD	SEM	95% Confidence Interval			
					Lower	Upper		
Tangibility	Pair 1	.864	1.055	.054	.758	.970	16.036	.000
	Pair 2	.830	.929	.047	.737	.924	17.483	.000
	Pair 3	1.214	1.220	.062	1.092	1.337	19.478	.000
	Pair 4	.901	.998	.051	.801	1.001	17.670	.000
Reliability	Pair 5	.898	.911	.047	.807	.990	19.295	.000
	Pair 6	1.292	.934	.048	1.199	1.386	27.080	.000
	Pair 7	1.167	.975	.050	1.069	1.265	23.421	.000
	Pair 8	1.277	1.037	.053	1.173	1.381	24.099	.000
	Pair 9	1.209	.931	.048	1.115	1.302	25.404	.000
Responsiveness	Pair 10	1.211	.918	.047	1.119	1.304	25.829	.000
	Pair 11	1.217	.939	.048	1.122	1.311	25.351	.000
	Pair 12	1.292	1.168	.060	1.175	1.410	21.653	.000
	Pair 13	1.567	1.224	.063	1.444	1.690	25.053	.000
Assurance	Pair 14	1.511	1.399	.072	1.369	1.653	20.938	.000
	Pair 15	.932	.878	.045	.844	1.020	20.785	.000
	Pair 16	1.230	.992	.051	1.130	1.329	24.265	.000
	Pair 17	1.592	1.451	.074	1.446	1.738	21.437	.000
Empathy	Pair 18	1.097	1.053	.054	.991	1.202	20.384	.000
	Pair 19	2.010	1.585	.081	1.851	2.170	24.820	.000
	Pair 20	1.815	1.688	.086	1.645	1.984	21.044	.000
	Pair 21	1.063	1.006	.051	.962	1.164	20.675	.000
	Pair 22	1.280	1.131	.058	1.166	1.394	22.129	.000
Source: Primary Data								

Table 4. shows that, in the case of all pairs under 5 dimensions, indicates that all passenger's expectation is significantly different from their actual perception about the services provided by the Kochi Metro rails, because of all the pairs having p-value is lesser at 5 per cent significant level. Hence, it can be inferred that there is a significant difference existing between passengers' expectation and perceived quality of services provide by Kochi Metro. Further, the study was processed the Multivariate test to find out the age wise difference in passengers' expectation and their perception regarding the services provided by Kochi Metro rail.

Table 5: Influence of Age on Passengers Expectation on Service Quality of Kochi Metro Rail

G	Dimensions	Effect	Value	F	Hypothesis df	Error df	Sig.
Age	Tangibility	Pillai's Trace	.129	4.250	12.000	1134.000	.000
	Reliability	Wilks' Lambda	.977	.572	15.000	1035.611	.898
	Responsiveness	Wilks' Lambda	.957	1.400	12.000	995.094	.159
	Assurance	Pillai's Trace	.066	2.111	12.000	1122.000	.014
	Empathy	Pillai's Trace	.065	.671	15.000	1131.000	.061
	Tangibility	Box's M=464.489, $F_{(10,\ 108772.752)}$ = 45.586, p=.000<0.05,					
	Reliability	Box's M=28.497, $F_{(20,\ 87634.764)}$ =.671, p=.075<0.05					
	Responsiveness	Box's M=45.643, $F_{(20,\ 88219.154)}$ =.528, p=.673<0.05					
	Assurance-Empathy	Box's M=663.458, $F_{(10,\ 10929.310)}$ = 65.112, p=.000<0.05					
		Box's M=275.885, $F_{(15,\ 95785.787)}$ =17.968, p=.000<0.05					
	Error variance of the dependent variable is not equal across groups G=Group, Design: Intercept + Age						

Table 5. shows the influence of age on passengers' expectation on service quality. Regarding the covariance metrics of groups, it could be seen that covariance metrices of the depended variables are not equal across the different age group (Box's M plot test) in related to tangibility and assurance, hence Pillai's Trace test was used to interpret the result of multivariate analysis for ensuring the power of result, while in the case of reliability, responsiveness and empathy, it could be seen that covariance metrices of the depended variables are equal across the different age groups, hence Wilks' Lambda (∧) test was used to interpret the test result. The result indicates that passenger's expectation regarding the service quality of Kochi Metro rail is significantly different across the different age groups regarding tangibility dimension and assurance dimensions, while in the case of other three dimensions, the result was proven that all the age groups have same expectation level regarding reliability, responsiveness, and empathy dimensions. Hence, further test between subject effect and Tucky HSD test was processed with tangibility and assurance to find out which of the statements having statistical significance and which of the group is significantly different from each other regarding the statements.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Tangibility	Employees should be smart in their appearance	4.918	3	1.639	3.571	.014
		(I) Age	(J) Age	MD (I-J)	Std. Error	Sig.
		20-40 years	40- 60 years	.23*	.084	.034
Assurance	The behaviour of employees in Kochi metro should instill confidence in you	4.349	3	.116	.269	.047
		(I) Age	(J) Age	MD (I-J)	Std. Error	Sig.
		below 20 years	above 60 years	.45	.023	.000

Result indicates that passenger's expectation was significantly different across the different age groups regarding employee's smartness in their appearance (Tangibility) and behaviour of employees (Assurance). In the case of employee's smartness, 20-40 years age passengers' expectation was significantly different from 40-60 years age groups and 20-40 years age groups having higher expectation than the other group (.23). In the case of employee's behaviour below 20 years age group passengers' expectation was significantly higher than the above 60 years age group passengers.

Table 6: Influence of Age on Passengers Perception on Service Quality of Kochi Metro Rail							
G	Dimensions	Effect	Value	F	Hypothesis df	Error df	Sig.
Age	Tangibility	Pillai's Trace	.092	2.974	12.000	1134.000	.000
	Reliability	Pillai's Trace	.115	2.993	15.000	1131.000	.000
	Responsiveness	Pillai's Trace	.098	3.194	12.000	1134.000	.000
	Assurance	Pillai's Trace	.127	4.118	12.000	1122.000	.000
	Empathy	Pillai's Trace	.180	4.811	15.000	1128.000	.000
	Tangibility	Box's M=130.350, $F_{(30, 8336.546)}$ =6.183, p=.000<0.05					
	Reliability	Box's M=138.280, $F_{(20, 9012.956)}$ =4.312, p=.000<0.05					
	Responsiveness	Box's M=102.702, $F_{(20, 9012.956)}$ =4.871, p=.000<0.05					
	Assurance-Empathy	Box's M= 50.384, $F_{(20, 9033.758)}$ = 2.390, p=.000<0.05					
		Box's M=158.892, $F_{(30, 8337.702)}$ =4.954, p=.000<0.05					
	Error variance of the dependent variable is not equal across groups G=Group, Design: Intercept + Age						

Table 6. is explaining the passenger's perception regarding the quality of services provided by Kochi Metro rail. The covariance metrices of the depended variables are not equal across the different age group (Box's M plot test) in related to all the dimensions, hence here again Pillai's Trace test was used to interpret the test result. The Multivariate test result indicates that passenger's perception is significantly different across the different age groups, hence test between subject effect and Tucky HSD test was processed.

Regarding further test result, it could be seen that one statements from each dimension were showing statistical significance regarding the passenger's perception on different age groups.

Tests of Between-Subjects Effects						
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Tangibility	Tickets, instruction boards etc. (Materials) must be clear and visually appealing	10.813	3	3.604	3.670	.012
		(I) Age	(J) Age	MD (I-J)	Std. Error	Sig.
		Below 20 years	40- 60 years	.71*	.252	.025
Reliability	Should follow the promise to do some services by a certain time	14.700	3	4.900	7.771	.000
		(I) Age	(J) Age	MD (I-J)	Std. Error	Sig.
		20-40 years	40- 60 years	.29*	.099	.022
Responsiveness	Employees in Kochi metro should provide prompt service	12.631	3	4.210	6.457	.000
		(I) Age	(J) Age	MD (I-J)	Std. Error	Sig.
		Below 20 years	40- 60 years	.77*	.205	.001
Assurance	The behaviour of employees is creating confidence in you	38.372	3	12.791	8.610	.000
		(I) Age	(J) Age	MD (I-J)	Std. Error	Sig.
		20-40 years	40- 60 years	.61*	.153	.000
Empathy	Giving special attention to women, children and handicapped	18.942	3	6.314	7.180	.000
		(I) Age	(J) Age	MD (I-J)	Std. Error	Sig.
		Below 20 years	Above 60 years	1.86*	.516	.002

Test result indicates that below 20 years age groups having significantly higher perception (.71) than the 40-60 years age groups passengers regarding clear and visual appearance of tickets, instruction board. Regarding the reliability, 20-40 years age groups having significantly higher perception (.29) than 40-60 years age groups. While in the case of responsiveness, below 20 years age groups having significantly higher perception (.77) than 40-60 years age groups. In the case of assurance, 20-40 years age group respondents' perception (.23) is significantly higher than 40-60 years age groups and finally the dimension empathy, it was found that below 20 years age groups perception (1.86) is significantly higher than above 60 years age groups.

Result of Hypotheses

The first research question was raised at the study initial stage was whether the passengers' expectations and perceptions are different regarding the services quality of Kochi metro or not. Based on this, study has formulated the first hypothesis that

$H_0$1: There is no significant difference between passengers' expectation and perception on service quality offered by Kochi metro rail project.

Based on the paired sample t-test, it was found that the null hypothesis ($H_0$1) stands rejected and found that all passenger's expectation is significantly different from their actual perception about the services provided by the Kochi Metro rails, because of all the pairs having p-value is lesser at 5 per cent significant level. The results show that, passenger's expectation is significantly higher than the actual perceived service quality of Kochi Metro Rail project with all five dimensions.

Secondly, study was gone for finding what are the expectations and perceptions of different age group passengers regarding the service quality of Kochi metro rail. While go through the review of prior studies, it was found that many authors were explained that age is an important factor which decide the perception of people and their expectation. Age is one of the determinants, that allow marketer to determine the changes in service quality and product quality, because of age is significantly influencing the service quality (Thompson and Kaminski, 1993). Some of the studies were found an irrational relationship between age and service used (Hansman and Schutjens, 1993). Age of people, their morality, perceptions, thinking process, etc., are very different, hence age is considered as an important element which drive different expectation and perception (Webster, 1989). Based on these observations, study has been formulated age related hypotheses i.e.,

$H_0$2: There is no significant difference in passengers' expectations on the tangibility and assurance service quality dimensions across different age groups.

$H_0$3: There is no significant difference in passengers' expectations on the reliability, responsiveness, and empathy service quality dimensions across different age groups.

$H_0$4: Passengers perceived service quality is not significantly different across the different age groups regarding five service quality dimensions.

The result of hypotheses explains that passenger's expectation on service quality of Kochi metro rail is significantly different across the age groups regarding tangibility and assurance service quality dimension ($p < 0.05$). Hence null hypothesis ($H_0$2) is rejected. While no significant difference found on reliability, responsiveness and empathy service quality dimensions ($p > 0.05$). Hence null hypothesis ($H_0$3) is not rejected. Which means that, age influences expectations about Tangibility and Assurance, but not about Reliability, Responsiveness, or Empathy for Kochi Metro Rail passengers. On the other hand, it was found that passenger's perception on service quality of Kochi Metro is significantly different across the age groups in related to all five-service quality dimension with a p-value of 0.000 for each ($p<0.05$). Hence null hypothesis ($H_0$4) is rejected. Which means that, age significantly affects passengers' perceptions of service quality in terms of Tangibility, Reliability, Responsiveness, Assurance, and Empathy for Kochi Metro Rail Transportation System.

Summary of Findings, Conclusion and Recommendation

Study result found that majority of the regular passengers having higher expectation regarding the service quality of the Kochi metro, but unfortunately perceived service quality was not much satisfactory based on passengers' opinion when compared to their expectation level. As said earlier, passenger is an important element of the successful drive of Kochi Metro, hence improving service quality as per the expectation of passenger is unavoidable. Results of the study show that, in the case of total gap score and average gap score of five dimensions, it could be seen that empathy having higher gap score (-7.27) and average (-1.454) followed by reliability (-5.86) and responsiveness (-5.3). Study also found that, majority of the passengers were not satisfied with the operating hours of Kochi Metro (-2.01) and employees' attitude regarding the special attention to the passengers (-1.81). Results of the study also show that, passenger's expectation on service quality of Kochi metro rail is significantly different across the age groups regarding tangibility and assurance service quality dimension while no significant difference found on reliability, responsiveness and empathy service quality dimensions. While age significantly affects passengers' perceptions of service quality in terms of Tangibility, Reliability, Responsiveness, Assurance, and Empathy for Kochi Metro Rail. The service quality gap analysis shows that, Kochi Metro needs to take care of following points i.e.,

1. Increase the quality of material like tickets, boards etc., and ensure the visual appearance quality.
2. Ensure ventilation systems are functioning properly in enclosed stations to improve comfort.

3. Improve the clarity of signage in stations, with better route maps, up-to-date schedules, and information about delays or disruptions. Consider multilingual signage to accommodate diverse populations.
4. Add more frequent services during peak hours to minimize crowding and reduce the impact of occasional delays.
5. Regularly review and adjust timetables based on real-time data, feedback, and seasonal changes (e.g., holidays or festivals) to ensure that the schedules are as realistic as possible.
6. During peak commuting hours, ensure that additional staff members are available to assist passengers with inquiries, directions, or issues.
7. For routine questions like ticketing or schedule information, provide self-service kiosks at stations, reducing the dependency on staff and improving response time.
8. Provide training for staff on safety protocols, including emergency procedures, conflict resolution, and customer service during stressful situations.
9. Must show more sincere interest in solving passengers' problems
10. Regularly publish performance reports regarding on-time service, maintenance, and safety records to demonstrate the system's reliability to the public.
11. Maintain an error free record.
12. Ensuring the prompt response as per the request and queries of passengers
13. Take care of employee's behaviour and periodic training to them for improvising their attitude, behaviour and performance
14. Provide better knowledge practice among employees and train them to stick on courteous to passengers
15. To fix more convenient operating hours in Kochi Metro after conducting a preliminary investigation among regular and occasional passengers
16. Provide training programmes for employees for handling the passengers in an effective way
17. Provide a chance to the Kochi Metro employees to interact with other metro employees regarding the passenger management.
18. Ensure that priority seating for the elderly, disabled, and pregnant passengers is clearly marked and actively enforced. Conduct awareness campaigns to encourage other passengers to respect priority seating areas.
19. Use mobile apps to provide personalized travel information, such as updates on the fastest routes, potential delays, or tips for avoiding crowded trains during busy times.
20. After implementing changes, it's essential to continuously monitor customer satisfaction and gap scores. This can be done through regular surveys (to track how perceptions change over time) and passenger feedback mechanisms (e.g., suggestion boxes, mobile apps)
21. Most importantly, consider the age difference while preparing development planning in Kochi Metro, because of age is significantly influencing the passenger's perception.

Limitations and Future Scope for Research

This study has certain limitations. Firstly, this is a cross-sectional study. Longitudinal studies may give more clear evidence regarding the service quality of Kochi Metro. Other demographic variables like gender, education etc. can also be taken in to consideration to check its influence on service quality gap. The study used purposive sampling method for data collection. To ensure that the data gathered is comprehensive and in line with the study's objectives, researchers can use purposive sampling to target passengers who have firsthand experience with key aspects of the service. However, because purposive sampling is not statistically representative of the overall population, it may introduce bias into the sampling process and limit the generalizability of the results.

References

Aniebiet, E., Joseph, A.A., Edim, E.J., & Rosemary, M. (2021). Service Quality and Passengers' Loyalty of Public Transportation Companies. *British Journal of Management and Marketing Studies, 4*(4)*,* 82-98.

Arora, P., & Narula, S. (2018). Linkages between service quality, customer satisfaction, and customer loyalty: A literature review. *IUP Journal of Marketing Management, 17*(4)*,* 30–45.

Bharadwaj, Y. P., & Singh, M. (2020). The Effect of Service Quality on Commuters' Satisfaction towards the Adoption of Metro Services: A Case Study of Delhi Metro Rail Corporation. *International Journal on Emerging Technologies, 11*(2)*,* 237-244.

De Ona, J., de Oña, R., Eboli, L., Forciniti, C., & Mazzulla, G. (2016). Transit passengers' behavioural intentions: the influence of service quality and customer satisfaction. *Transport metrica A: Transport Science*, *12*(5), 385-412.

De Oña, R., Machado, J. L., & De Oña, J. (2015). Perceived service quality, customer satisfaction, and behavioral intentions: structural equation model for the Metro of Seville, Spain. *Transportation Research Record*, *2538*(1), 76-85.

Eboli, L., & Mazzulla, G. (2008). A stated preference experiment for measuring service quality in public transport. *Transportation Planning and Technology, 31*(5)*,* 509–523. https://doi.org/10.1080/03081060802242606

Grujičić, D., Ivanović, I., Jović, J., & Đorić, V. (2014). Customer perception of service quality in public transport. *Transport, 29*(3), 285–295. https://doi.org/10.3846/16484142.2014.951076

Hansman, H., & Schutjens, V. (1993). Dynamics in market segmentation: A demographic perspective on age-specific consumption. *Marketing and Research Today, 21*(3), 139-139.https://doi.org/10.1362/000071093771859538.

Hensher, D. A., & Stanley, J. (2020). A review of public transport passenger satisfaction and service quality measurement. *Transport Reviews, 40*(1)*,* 75–100. https://doi.org/10.1080/01441647.2019.1619240.

Heskett, J. L., Jones, T. O., Loveman, G. W., Sasser, W. E., & Schlesinger, L. A. (1994). Putting the service-profit chain to work. *Harvard Business Review, 72*(2), 164–174.

Ibrahim, A. N. H., Borhan, M. N., Osman, M. H., Mat Yazid, M. R., & Md. Rohani, M. (2022). The influence of service quality on user's perceived satisfaction with light rail transit service in Klang Valley, Malaysia. *Mathematics*, *10*(13), 2213.

Johnston, R. (1995). The determinants of service quality: Satisfiers and dissatisfiers. *International Journal of Service Industry Management, 6*(5)*,* 53–71. https://doi.org/10.1108/09564239510100061.

Kamruzzaman, M., Hine, J., & Yoshii, T. (2018). Service quality, service frequency, and car ownership: Analysis of a public transport priority policy in Brisbane, Australia. *Transportation Research Part A: Policy and Practice, 117*, 68–84. https://doi.org/10.1016/j.tra.2018.07.006

Lee, H., Lee, Y., & Yoo, D. (2000). The determinants of perceived service quality and its relationship with satisfaction. *Journal of Services Marketing, 14*(3), 217–231. https://doi.org/10.1108/08876040010327289

Lewis, B. R., & Booms, B. H. (1983). *The marketing aspects of service quality. In Emerging perspectives on services marketing* (pp. 99-107). American Marketing Association.

Li, H., Guo, S., Ma, S., & Li, M. (2021). Exploring the impact of service quality and customer satisfaction on passenger loyalty in public transport: A case study of Chongqing, China. *Sustainability, 13*(1)*,* 247.

Mahamad, O., & Ramayah, T. (2010). Service quality, customer satisfaction and loyalty: A test of mediation. *International business research, 3*(4)*,*72-80

Mikhaylov, A. S., Gumenuk, I. S., & Mikhaylova, A. A. (2015). The SERVQUAL model in measuring service quality of public transportation: evidence from Russia. *Calitatea, 16*(144), 78-83.

Mishra, A. K. (2013). Measuring commuters' perception on service quality using SERVQUAL in Delhi metro.

Ngo, M. V., & Nguyen, H. H. (2016). The relationship between service quality, customer satisfaction and customer loyalty: An investigation in the Vietnamese retail banking sector. *Journal of Competitiveness, 8*(2)*,* 1–17.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. *Journal of Marketing, 49*(4)*,* 41-50.

Patton, M. Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice* (4th ed.). SAGE Publications

Prabhakaran, P., Anandakumar, S., Priyanka, E. B., & Thangavel, S. (2023). Development of service quality model computing ridership of metro rail system using fuzzy system. *Results in Engineering, 17*, 100946.

Randheer, K., Al-Motawa, A. A., & Vijay, P. J. (2011). Measuring commuters' perception on service quality using SERVQUAL in public transportation. *International Journal of Marketing Studies*, 3(1), 21–31. https://doi.org/10.5539/ijms.v3n1p21

Saw, Y. Q., Dissanayake, D., Ali, F., & Bentotage, T. (2020). Passenger satisfaction towards metro infrastructures, facilities and services. *Transportation Research Procedia, 48*, 3980-3995

Sivadas, E., & Baker-Prewitt, J. L. (2000). An examination of the relationship between service quality, customer satisfaction, and store loyalty. *International Journal of Retail & Distribution Management, 28*(2), 73-82.

Teixeira, J. F., Goñi, J. M., & Fábregues, S. (2019). Development and validation of the Public Transport Service Quality Scale (PTSQS). *Transportation Research Part A: Policy and Practice, 125,* 93-105.

Thompson, A. M., & Kaminski, P. F. (1993). Psychographic and lifestyle antecedents of service quality expectations: a segmentation approach. *Journal of Services Marketing, 7*(4), 53-61.

Wang, Y., Zhang, Z., Zhu, M., & Wang, H. (2020). The impact of service quality and customer satisfaction on reuse intention in urban rail transit in Tianjin, China. *Sage Open, 10*(1),1-10.

Webster, C. (1989). Can Consumers be Segmented on the Basis of their Service Quality Expectations? *Journal of Services marketing, 3*(2)*,* 35-53.

Woodside, A. G., Frey, L. L., & Daly, R. T. (1989). Linking service quality, customer satisfaction, and behaviour. *Marketing Health Services, 9*(4)*,* 5.

Yaya, L. H. P., Fortià, M. F., Canals, C. S., & Marimon, F. (2015). Service quality assessment of public transport and the implication role of demographic characteristics. *Public Transport, 7,* 409-428.

Zeithaml, V. A., Parasuraman, A., & Berry, L. L. (1990). *Delivering quality service: Balancing customer perceptions and expectations.* Simon & Schuster.

.