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RESEARCH ARTICLE

SERVICE QUALITY ATTRIBUTES AFFECTING THE METRO PASSENGERS OF KOLKATA, WEST BENGAL, INDIA

***Dr. Suman Paul**

Department of Geography, Sidho Kanho Birsha University, Purulia, West Bengal, India

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ABSTRACT

With increased pace of urbanization and economic growth, attraction and dependency between different linking regions has also increased. Transportation have performed very crucial roles from very early, accelerating the sharing of economic and development benefit of connecting spatial regions. Railway has been proved as a potential sector for drawing economic and development benefits for various countries. But less emphasis has been given in improvement of railway sector mainly in railway service in Kolkata compared with road and which cause failed to draw proper economic benefit from the sector. This study has aimed to focus on the railway transportation sector and to develop a model defining the relationship between overall satisfaction and service quality attributes in a selective route from DumDum to New Garia in south-eastern zone of Kolkata so that it can reinforce further improvement process. Findings show that, overall service satisfaction depend on eight distinct service quality attributes. It implies the service with worst situation, overall satisfaction of service and need for priority improvement to support the further orientation, addition and betterment of service to draw maximum economic and development benefit for those linking regions.

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INTRODUCTION

With increased pace of urbanization and economic growth, attraction and dependency between different linking regions has also enhanced. Transportation have performed very crucial roles from very early, accelerating the sharing of economic and development benefit of connecting spatial regions. Railway has been proved as a potential sector for drawing economic and development benefits for various countries. But less emphasis has been given in improvement of railway sector mainly in railway service in Kolkata compared with road and which cause failed to draw proper economic benefit from the sector.

This study has aimed to focus on the Metro railway transportation sector and to develop a model defining the relationship between overall satisfaction and service quality attributes in a selective route from DumDum to New Garia in south-eastern zone of Kolkata so that further improvement process can be reinforced. Findings show that, overall service satisfaction depends on eight distinct service quality attributes. It implies the service with worst situation, overall satisfaction of service and need for priority improvement to support further orientation, addition and betterment of service to draw maximum economic and development benefit for those linking regions. The quality of those service attributes dominate the satisfaction of overall service of Metro rail passengers and this relationship can be depicted through a linear model stating overall satisfaction as dependent and others service attributes as independent variable. The regression model is found as most familiar option to draw the relationship between overall satisfaction and service attributes of railway.

Corresponding author:* **Dr. Suman Paul,
Department of Geography, Sidho Kanho Birsha University, Purulia, West Bengal, India.

Review of Literature

Customer satisfaction represents a measure of company performance according to customer needs (Hill et al. 2003); therefore, the measure of customer satisfaction provides a service quality measure. Customers express their points of view about the services by providing judgments on some service aspects by means of ad hoc experimental sample surveys, known in the literature as "customer satisfaction surveys." In the literature, there are many studies about transit service quality. Examples of the most recent research are reported in TRB (2003a, 2003b), Eboli and Mazzulla (2007), Tyrinopoulos and Antoniou (2008), Iseki and Taylor (2008), and Joewono and Kubota (2007). In these studies, different attributes determining transit service quality are discussed; the main service aspects characterizing a transit service include service scheduling and reliability, service coverage, information, comfort, cleanliness, and safety and security.

Service scheduling can be defined by service frequency (number of runs per hour or per day) and service time (time during which the service is available). Service reliability concerns the regularity of runs that are on schedule and on time; an unreliable service does not permit user travel times to be optimized. Service coverage concerns service availability in the space and is expressed through line path characteristics, number of stops, distance between stops, and accessibility of stops. Information consists of indications about departure and arrival scheduled times of the runs, boarding/alighting stop location, ticket costs, and so on. Comfort refers to passenger personal comfort while transit is used, including climate control, seat comfort, ride comfort including the severity of acceleration and braking, odors, and vehicle noise. Cleanliness refers to the internal and external cleanliness of vehicles and cleanliness of terminals and stops. Safety concerns the possibility that users can be involved in an accident, and security concerns personal security against crimes. Other service aspects characterizing transit services concern fares, personnel appearance and helpfulness, environmental protection, and customer services such ease of purchasing tickets and administration of complaints.

technique, factor analysis, regression and analysis of variance were used to estimate the interrelated dependency of the attributes. In the current study basically factor analysis and regression analysis have been used to find out the relationship between the satisfaction of service and service quality attributes of rail passengers.

Selection of the Study Area

Since commencement of the construction, the project faced several hurdles and actual construction of line 1 started only in 1978. The first section opened between Esplanade & Bhowanipore (Now called Netaji Bhawan) by Sanjay Seal and Tapan Kumar Nath. There were no connections of this stretch with the two depots at DumDum & Tollygunge (now called Mahanayak Uttam Kumar), and the metro operated on only a single line. Two years later, the line 1 extended up to Tollygunge at the southern end and double line Services from DumDum to Tollygunge started finally in 1995 and full services from DumDum to New Garia commenced on October 7, 2010 (see Figure no.1).

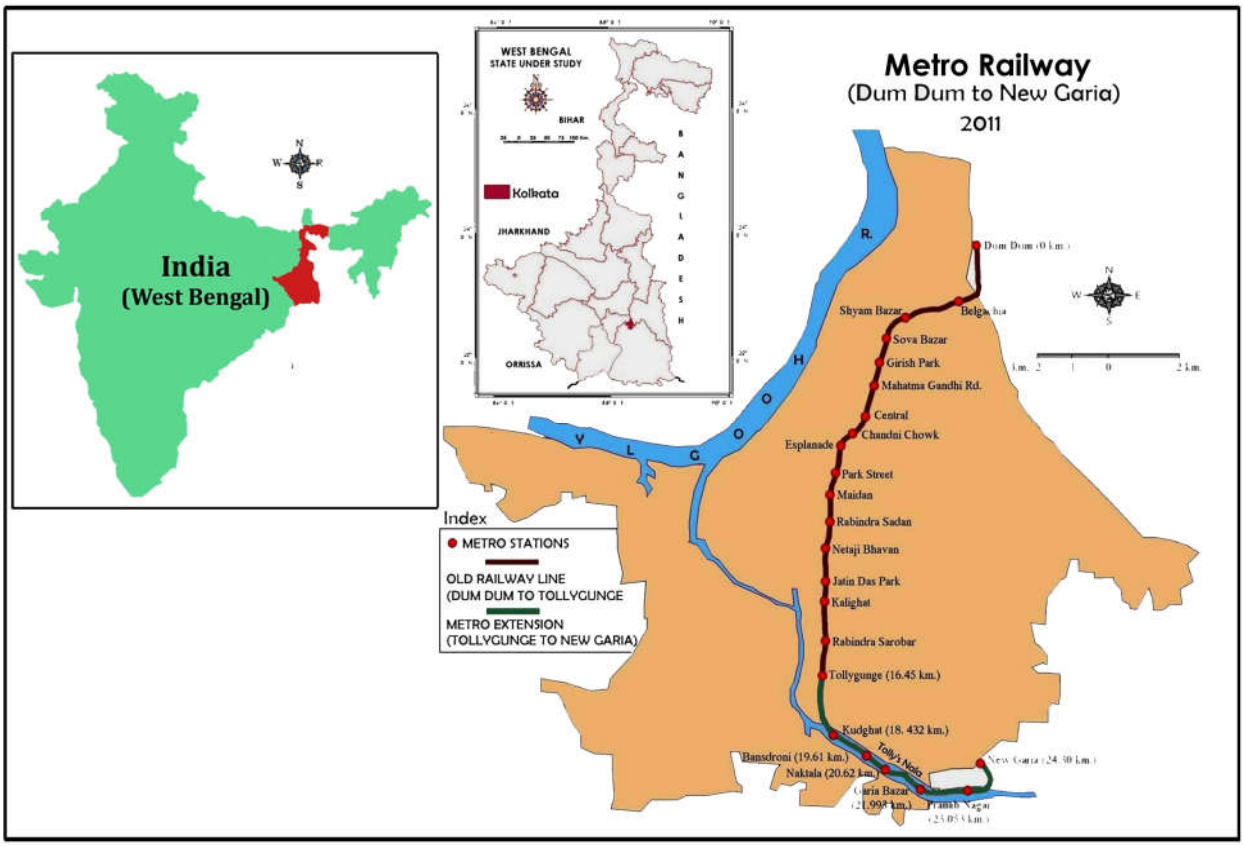


Fig.1. The Location of the Study Area

A study named service quality attributes affecting customer satisfaction for bus transit for measuring the relationship between global customer satisfaction and service attributes of public transport especially of bus transit for University of Calabria student to reach the campus from the urban area of Cossenza of southern Italy. A model proposed in this study which may useful to analyze the correlation between service quality attributes and identify the more convenient attributes for improving the supplies service (Fu and Xin, 2007). This study provides the methodological assistance to conduct current study to determine the relationship between rail passenger satisfaction and service attributes. Multivariate

Objectives

The present study has following objectives:

- To understand the zone of influence of various Metro stations due to the expansion from Tollygunge to New Garia,
- To attempt a comparative assessment of the composition of Metro passengers, distance travelled by them and purpose of their journey in the light of pre and post expansion of Metro railway,

- To calculate the satisfaction index among different income groups (gender wise) related to various service quality attributes of Metro railway in the light of pre and post expansion,
- To find out the level of satisfaction of two major group of Metro passengers (students and working population) for the service quality attributes of Metro railway in the light of pre and post expansion and
- Lastly, to determine the service criterion which need further improvement in order to cope up with the increased passenger load due to the expansion of Metro from Tollygunge to New Garia.

METHODOLOGY

The sample survey was addressed to the rail passenger considering the DumDum – Tollygunge – New Garia stretch which is located north to south-eastern part of Kolkata. This selected route is very important in respect of commuters those who try to reach their destination. This survey was conducted in March 2017 and total samples of 460 Metro Rail passengers have been interviewed taking 20 passengers each from 23 Metro Stations. The samples were collected randomly. They were asked about their socioeconomic characteristics considering their origin, destination and purpose of journey and level of overall satisfaction for the present type of service quality attributes. Determination of the level of satisfaction of the sample respondent was based on 3 points scale (satisfied, acceptable and unsatisfied). To determine the level of satisfaction as perceived by the sample respondents, a satisfaction index was adopted following the index developed by Rahaman et al. (2009) was selected. The highest value of the index is + 1 and the lowest value is – 1. Satisfaction Index (Is) has been expressed mathematically in following manner:

$$Is = \frac{fs - fd}{N}$$

As per formula, Is = Satisfaction Index, fs = Number of Satisfied Respondents, fd = Number of Dissatisfied Respondents and N = Total Number of Respondents. The highest value of this index is +1 and the lowest value is -1. To evaluate the Metro rail service quality (for detailed list of Service Quality Attributes, find the Table 1 in Annexure), the passengers were asked to give their opinion about the quality of 24 service attributes selected primarily through literature review and on the basis of information provided by the Metro Railway Authority. The satisfaction level has been measured by Likert scale where the passengers are requested to grade their satisfaction by mentioning the value 1 (very poor) to 5 (very good).

FINDINGS AND ANALYSIS

Extent of Influence of Metro Stations due to the Expansion from Tollygunge to New Garia

Another study has also been made to understand Zone of Influence by which one can easily depict the area of Thresh Hold Population of Kolkata Metro railway. From the Metro users it has been mapped to analyse the scenario of such situation. 5 km. and above zones are lying in extreme north and south stations (Fig. 2), where Central and Kalighat are the exceptions. Most of the middle stations having a thresh hold of 3 km. – 5 km. range and only Naktala and Sovabazar have 2 km. of pull. The overall Metro Railway Service is interdependent on the service attributes. Recently expansion of Metro Railway from Tollygunge to New Garia has increased

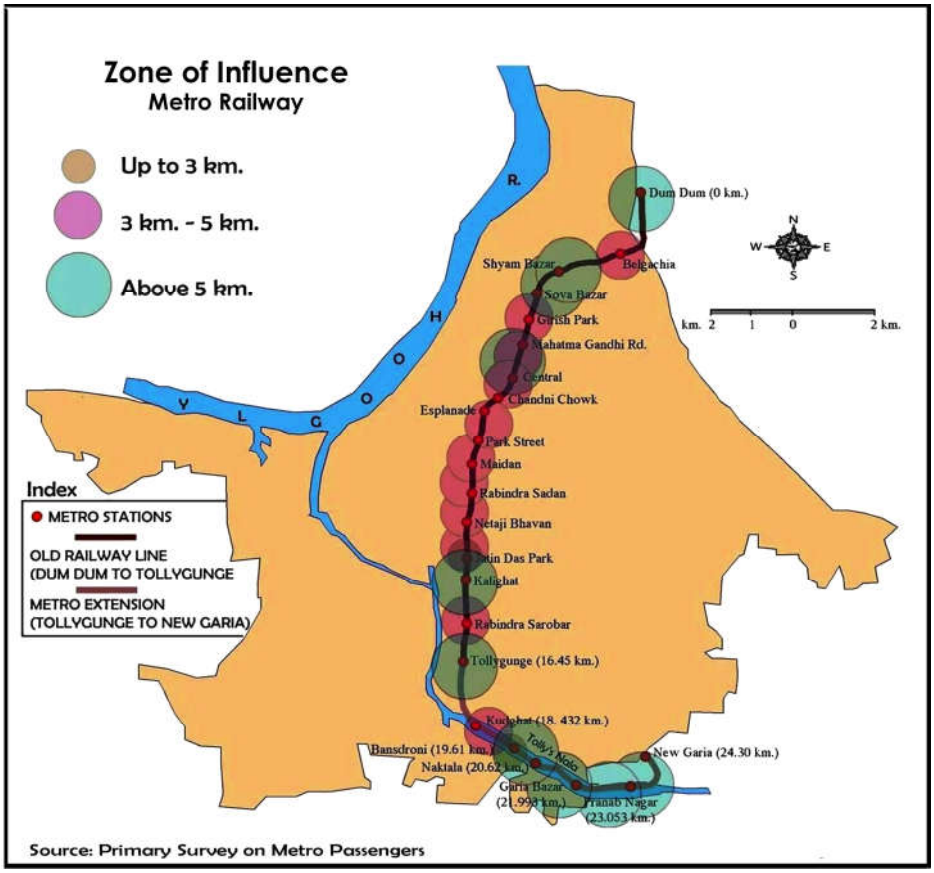


Fig.2. The Zone of Influence of Metro Railway

the volume of passenger which not only generated additional revenue for the Metro Authority but simultaneously the passengers are facing varieties of problem which have reduced their travel comfort to some extent.

Composition of Metro Passengers

Metro railway plays an important role for the development of transport network in Kolkata city with a very low travel cost. This transport network is basically made a linkage between the suburbs (north and south suburban) with city in a very short time. Some important results came out after a survey on the Metro passengers took place in March 2017. This survey was done to assess the service quality attributes affecting the satisfaction level of metro passengers after the expansion of Metro from Tollygaunge to New Garia. If the Age-Sex Composition of Metro passengers are considered (see Table 1), it was found that most of the male passengers falling in the age groups from 21 years to 50 years due to education and job purpose. On the other hand female passengers are mostly fallen under 21 years to 40 years age groups. The scenario was more or less same after the expansion of Metro railway. One important fact was the percentage of female passengers from 10 years to 50 years increased from near 30 per cent to 44 per cent.

Table 1. Age-Sex Composition of Metro Passengers in Pre and Post Expansion Scenario

Age Groups	*Figures in Percentage*			
	Pre-Expansion		Post-Expansion	
	Male	Female	Male	Female
Below 10 Years	5.2	3.3	4.2	4.9
10 to 20 Years	3.7	2.4	4.8	7.6
21 to 30 Years	17.9	12.6	11.6	16.6
30 to 40 Years	20.8	10.6	14.6	15.6
40 t0 50 Years	13.1	5.2	9.6	4.2
50 to 60 Years	3.2	0.9	3.1	0.7
Above 60 Years	0.75	0.35	1.6	0.9

Source: Survey on Metro Passengers, March 2017.

Another interesting point has been study to find the distance traveled by the passengers after expansion. It has been found from the study that, after expansion of Metro service a huge change has been took place in respect of travelling the short distance basically by female passengers. The percentage figure mounted up to 41 per cent from 20 per cent for the female passengers.

Table 2. Distance Travelled by Metro Passengers in Pre and Post Expansion Scenario

Distance in Km.	Figures in Percentage			
	Pre-Expansion		Post-Expansion	
	Male	Female	Male	Female
Below 5 km.	12	7	19	26
5 to 10 km.	27	13	12	15
10 to 15 km.	16	8	11	6
above 15 km.	11	6	8	3

Source: Survey on Metro Passengers, March 2017.

Purpose of travel by the Metro users is one of the important aspects of this study. Here one thing has been came out from the study that, percentage of female population from informal sector has been increased where as the percentage of private sector employee using Metro decreases.

Satisfaction Index of Quality Attributes

In order to collect data on the Metro passengers, satisfaction index has been calculated for three income groups.

Table 3. Purpose of Travel of Metro Passengers in Pre and Post Expansion Scenario

Purpose of Travel	Figures in Percentage			
	Pre-Expansion		Post-Expansion	
	Male	Female	Male	Female
School	4.3	3.4	4.5	3.9
College	16.8	11.2	15.8	12.8
Pvt. Office	23.8	14.4	19.8	13.2
Govt. Office	4.7	1.3	2.7	0.8
Informal Sector	1.4	2.2	2.7	6.2
Marketing	5.7	9.7	4.6	11.7
Others	0.3	0.8	0.5	0.8

Source: Survey on Metro Passengers, March 2017.

The passengers divided into 3 income levels in the basis of monthly income. However, for the sake of present study some changes were made to these groups. The income groups were subjectively considered as follows:

Table: Level of Metro passenger income in three income groups

Income groups	Level of Income (Rupees per month)
High income Group	Above 15,000
Middle income Group	5,000 to 15,000
Lower income Group	Less than 5,000

In case of pre-expansion scenario, level of satisfaction among male-female passengers of high income group suggests that they have moderate level of satisfaction with Ticketing Service whereas the study shows middle income group having higher level of satisfaction. On the other hand low income group has a little level of satisfaction on Ticketing Service because they are not well enough money to spend for *'SMART CARD'*. Post-expansion scenario shows that drastic change in satisfaction level among high income group to middle income group (see Table No. 4). Presently, *single journey* is become a hectic in Metro Rail as tender of Ticket takes more or less *20 – 25 minutes* of time. According to all groups *Magnetic Strips Ticket* was far better than the recent one.

Table: Satisfaction Index on Ticketing Service Quality of Metro Passengers in Pre and Post Expansion Scenario

Condition	Population	Ticketing Service Quality	Income Groups		
			High	Moderate	Low
Pre - Expansion	Male		0.67	0.78	0.23
	Female		0.66	0.76	0.12
Post - Expansion	Male		-0.72	-0.67	0.21
	Female		-0.93	-0.34	0.45

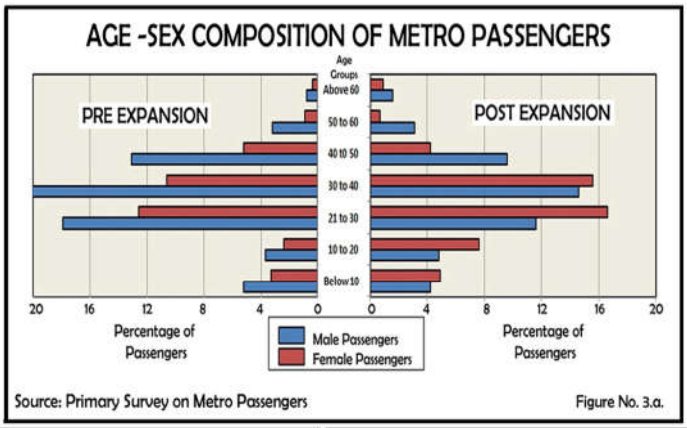
Source: Survey on Metro Passengers, March 2017.

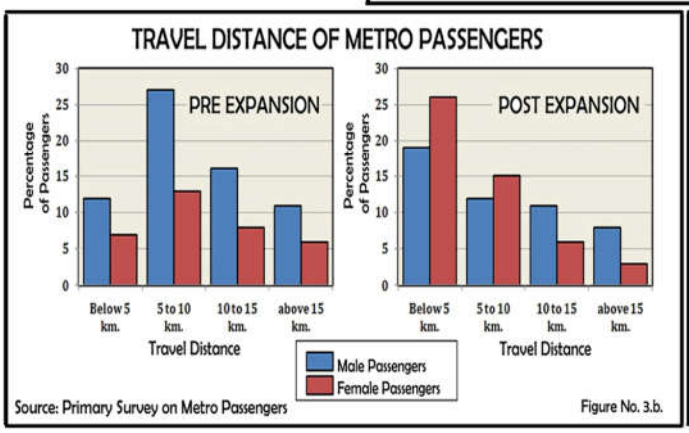
Level of Satisfaction on *Waiting Service Quality* has also been done among male-female passengers of different Income Groups. High Income Group suggests that they have low level of satisfaction with Waiting Service Quality (see Table No. 5). On the other hand Middle Income Group and Low Income Group have higher level of satisfaction.

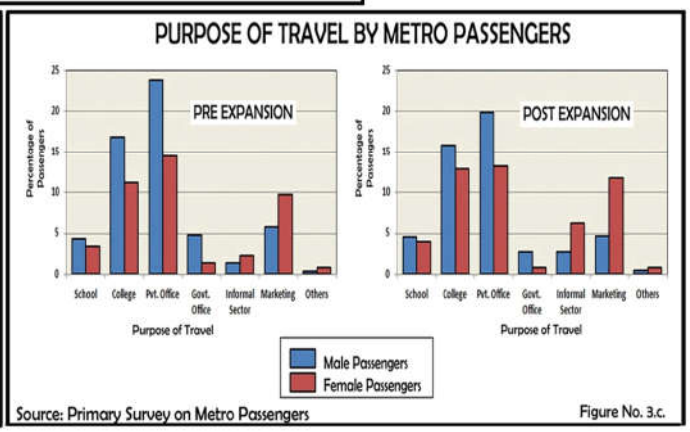
Table: Satisfaction Index on Waiting Service Quality of Metro Passengers in Pre and Post Expansion Scenario

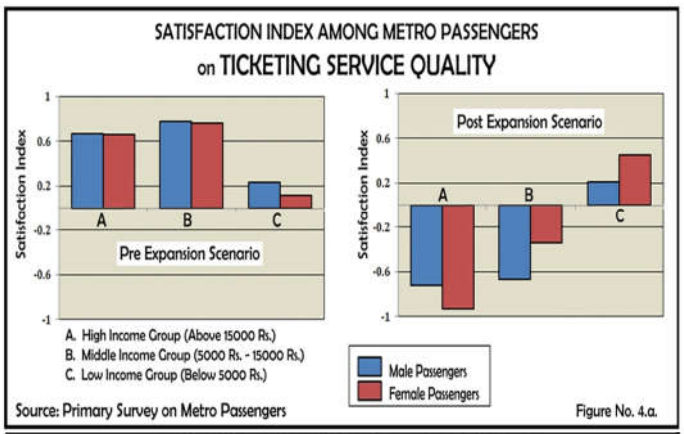
Condition	Population	Waiting Service Quality	Income Groups		
			High	Moderate	Low
Pre - Expansion	Male		0. 45	0.64	0.77
	Female		0.55	0.45	0.62
Post - Expansion	Male		-0.34	0.12	0.56
	Female		-0.23	0.23	0.76

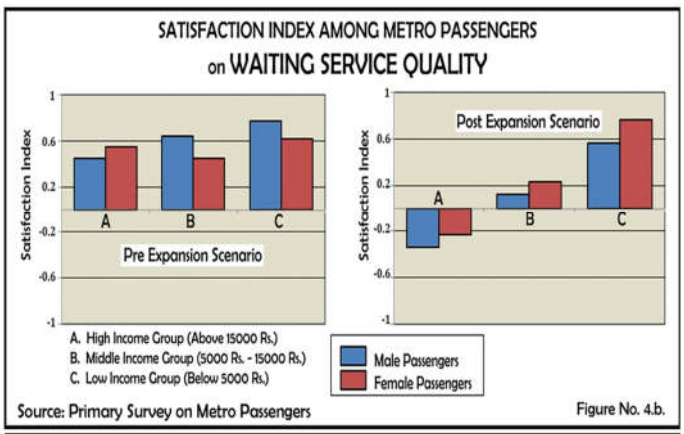
Source: Survey on Metro Passengers, March 2017.

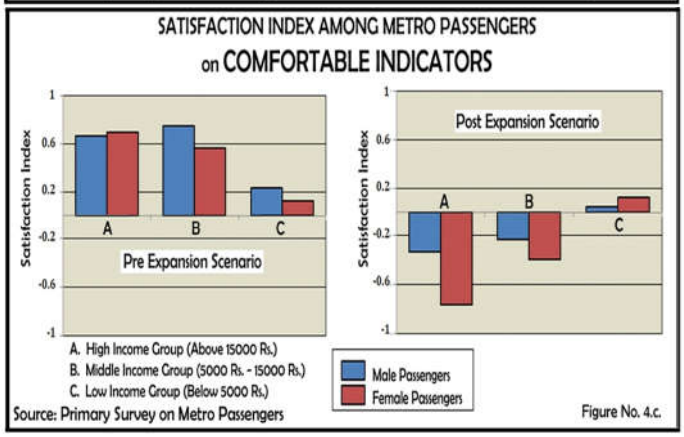


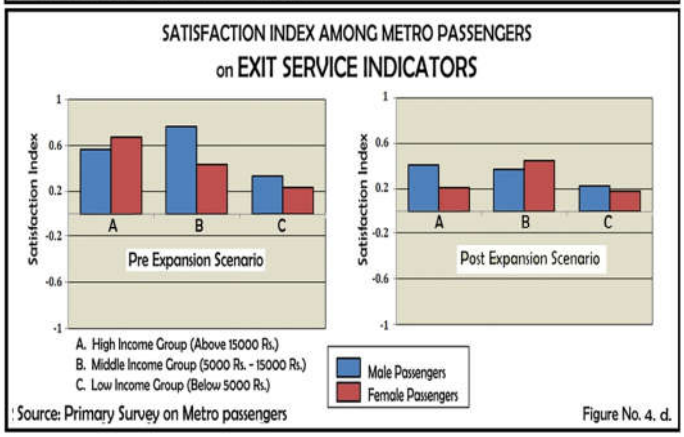












Post-expansion scenario shows that drastic change in Satisfaction Level among High Income group due to waiting for tender the ticket as well as Smart Card. Among Middle Income Group the result lower down where as among Low Income Group have same kind of Satisfaction Level.

Level of Satisfaction on Comfortable Indicators has been analysed to measure about the fall of service in comfortability among male-female passengers. From the table 5 it is evident that, High Income Group and Middle Income Group suggest that they have moderate to high level of satisfaction with Comfortable Indicators *(see Table No. 6)*.

Table 6. Satisfaction Index on Comfortable Indicator of Metro Passengers in Pre and Post Expansion Scenario

Condition	Population		Income Groups		
			High	Moderate	Low
Pre - Expansion	Male	Comfortable Indicator	0.76	0.44	0.53
	Female		0.59	0.46	0.42
Post - Expansion	Male		0.23	0.23	0.25
	Female		0.52	0.48	0.32

Source: Survey on Metro Passengers, March 2017.

Table 7. Satisfaction Index on Security Indicator of Metro Passengers in Pre and Post Expansion Scenario

Condition	Population		Income Groups		
			High	Moderate	Low
Pre - Expansion	Male	Security Indicator	0.76	0.44	0.53
	Female		0.59	0.46	0.42
Post - Expansion	Male		0.23	0.23	0.25
	Female		0.52	0.48	0.32

Source: Survey on Metro Passengers, March 2017.

On the other hand Low Income Group has low level of satisfaction. After expansion of Metro railway the scenario has changed a lot. Drastically the Comfortable services fallen down at high level. Almost every passenger is very much annoyed with Comfortable indicators, e.g. space within the train, nature of escalator, toilet facility, sitting within the station etc. Basically among the Low Income Group also the satisfaction is also portraying the low value. Another indicator to analyse the nature of Metro service is Security Indicator services provides by the authority. Pre and post expansion has been changed drastically. In the Pre-expansion time, the High Income Group perceived the service as good one and it is more or less for all groups (see Table No. 7). But after expansion the scenario has changed. Among all the Income Groups it has been observed that all the parameters have been fall. Basically in rush hour (office hour), specially at Puja time gates are creating problem a lot. Objectionable behavior by co passenger on women has also increased. To evaluate the rail service quality among the Students and Service holder passenger was asked about 24 service attributes. On a scale from 1 to 5 denote the satisfaction level form very poor to very good, passenger asked to give satisfaction level regarding their perception of existing service condition. The specific cause underlying their choice also requested to describe.

Satisfaction Index among the students depicts a good example of service deterioration. According to Male students According to Male Student the Service attributes drastically fallen in the following categories:

- Ticketing Service Quality
- Exit Service Situation
- Comfortable Indicators (e.g. crowded condition within the train, working nature of escalator, space for moving within the train etc.)

On the other hand female students, mainly college and university students faced a lot of problems presently. The service deterioration under below listed services:

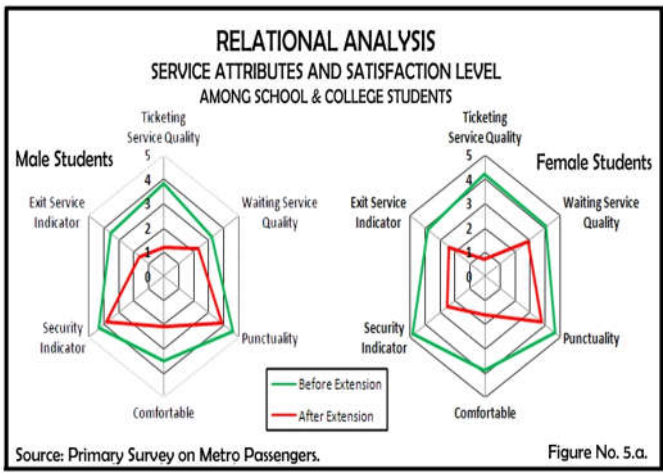
- Ticketing Service Quality
- Exit Service Indicators.
- Comfortable Indicators (e.g. crowded condition within the train, working nature of escalator, space for moving within the train etc.).

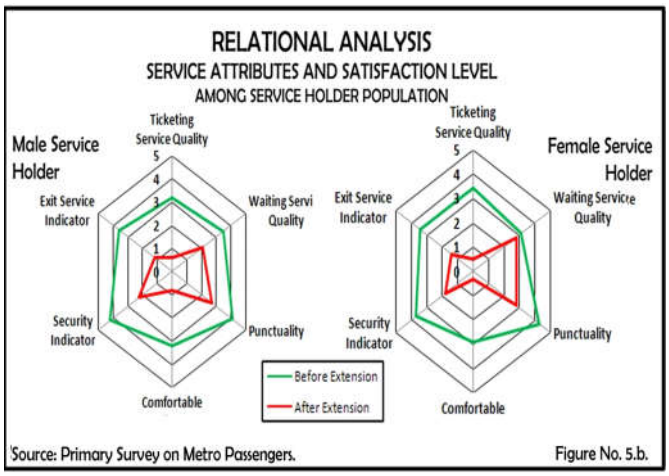
Satisfaction Index among the Service Holders gives also a clear idea about the changing service attributes. According to Male Service Holder the Service Attributes drastically fallen in:

Table 8. Student's and Service Holder's Response on Service Provisions in Pre and Post Metro Expansion Scenario

Service Provisions	Student's Response				Service Holder's Response			
	Pre-Expansion		Post-Expansion		Pre-Expansion		Post-Expansion	
	Male	Female	Male	Female	Male	Female	Male	Female
Ticketing Service Quality	3.8	1.2	4.2	0.7	3.2	3.4	0.6	0.5
Waiting Service Quality	3.2	2.3	4.1	2.9	3.5	3.1	2.1	2.8
Punctuality	4.6	3.9	4.7	3.8	4.1	4.3	2.7	2.8
Comfortable Indicator	3.5	2.1	3.9	1.6	3.2	2.9	0.8	0.3
Security Indicator	4.3	3.8	4.8	2.5	4.2	3.7	2.25	1.8
Exit Service Indicator	3.5	1.6	3.8	2.4	3.6	3.4	1.2	1.4

Source: Survey on Metro Passengers, March 2017.





- Ticketing Service,
- Punctuality and Heavy Rush in Trains,
- Comfortable atmosphere within the trains,
- Exit Service Indicators.

On the other hand Female Service Holder, their perception on the service attributes drastically fallen in:

- Comfortable atmosphere within the trains,
- Security Servicer offered by Metro Railway,
- Ticketing Service,
- Punctuality and Heavy Rush in Trains,
- Exit Service Indicators.

Conclusion

The relation between overall satisfaction and service quality attributes stated earlier through a satisfaction model. From this model it has observed that the satisfaction of railway service is depending on eight distinct service quality attributes.

- Security inside the train is the worst among those because the coefficient of the security inside the train gets high value which implies the service satisfaction is mostly dominated by the quality of this service attribute for the selected route.
- Also waiting arrangement and train environment found very near condition as like as train security, because both services get almost similar coefficient value like train security.
- Spacing for moving on train and station security found with the worst situation after these three services attributes. Behavior of the staffs and waiting time found with low coefficient value than others which implies that these two have less domination in overall service satisfaction.
- The passenger give more importance in security inside the train because it is most common of hijacking and lost of luggage or baggage when train stopped in different station and there is very low security patrol found inside the train, also in case of long journey majority of passenger sleeping on train.
- Station information that is availability of information about train schedule, arrival and departure time, other information are not well managed.
- It have seen that there is no assigned stuff or help point to provide information and staffs on ticketing room are not talking much except selling tickets.
- However in few stations it have found display board also display screen in some ticketing center but that can provide limited information only about fare and train schedule.
- Station waiting arrangement that is waiting room or shelter, it has observed in field that the seat capacity is very low and is not well arranged.
- It has seen that at evening some drug addicted persons are moving on the station without any restriction. However there have some places in station which are not noticeable from the platform and also no restriction, checking for entry or moving on the station.
- Waiting time is found as important service to define the overall satisfaction of service because most of the passenger want to get their destination in lest time.
- Although it found as crucial service issue to determine the overall service satisfaction it is not much problematic one because the waiting time not varied much without any worst case. Another important service issue that dominates the overall satisfaction level of passenger is environment inside the train.

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