

**AN INVESTIGATION INTO PASSENGER SATISFACTION
AND ITS ROLE IN COMMUNITY AND ECONOMIC
GROWTH: A STUDY ON WEST-ZONE RAIL SERVICES
IN BANGLADESH**

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Daffodil International University

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A Thesis Submitted to Daffodil International University's Department of Civil Engineering, Partially Satisfying the Requirements for the Award of a degree of **Bachelor of Science in Civil Engineering.**

Under the supervision of

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04 January 2025

CERTIFICATION

This demonstrates that, under my direct supervision, the following students accomplished the project and thesis, **AN INVESTIGATION INTO PASSENGER SATISFACTION AND ITS ROLE IN COMMUNITY AND ECONOMIC GROWTH: A STUDY ON WEST-ZONE RAIL SERVICES IN BANGLADESH** in the laboratories of the Department of Civil Engineering within the Faculty of Engineering at Daffodil International University this work partially satisfies the requirements for the Bachelor of Science in Civil Engineering degree. The presentation work will held on 4 January 2025.

Signature of the Candidates



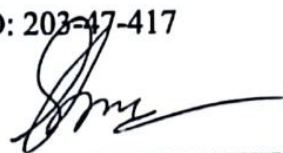
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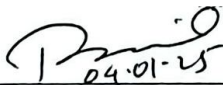
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ABSTRACT

Attraction and dependency between various linking regions have increased along with the rate of urbanization and economic growth. Since the beginning, transportation has played a vital role in advancing the development and economic benefits of connecting communities. The railway industry has demonstrated its ability to generate economic and developmental advantages for several nations. But compared to road transportation, less focus has been placed on improving the railway industry, primarily in Bangladesh, which has prevented the sector from reaping the full economic benefit. This study investigates passenger satisfaction with Bangladesh Railways, focusing on key factors such as journey time, punctuality and service quality. The objective is to identify the main barriers to passenger satisfaction and evaluate how addressing these issues can contribute to economic and community development. At Kamalapur and Parbatipur Railway Station, survey questionnaires were utilized to assess passenger satisfaction with various services. Passenger and locomotive master surveys were conducted to gain a comprehensive understanding of operational and service delivery challenges. The study employs factor analysis to identify the primary elements that influence passenger satisfaction. Surveys were conducted with both travelers and locomotive masters to gather insights. The results were based on their responses to questions designed to measure satisfaction across Nineteen key areas. The findings indicate that journey duration, punctuality, food quality and cost, ticket services, restroom cleanliness, staff behavior and scheduling sanitation are significant factors that explain 84.527% of the variance in passenger satisfaction with railway services. This research provides actionable recommendations for policymakers and railway authorities to prioritize passenger-centric strategies, ultimately fostering a more efficient and inclusive transportation system.

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CHAPTER 1

INTRODUCTION

1.1 Background

Every nation's development depends heavily on its transportation infrastructure and in Bangladesh, the railway network is essential for linking people, products and markets throughout the country. With millions of passengers served annually, the Bangladesh Railway (BR) is a vital form of transportation. However, despite its significance, passenger satisfaction is still a major worry because many intercity have issues with journey time, timeliness service quality. In addition to having an impact on passengers' everyday lives, these problems also reduce the railway system's overall efficacy and its capacity to promote community and economic development. The goal of this study, "AN INVESTIGATION INTO PASSENGER SATISFACTION AND ITS ROLE IN COMMUNITY AND ECONOMIC GROWTH: A STUDY ON WEST-ZONE RAIL SERVICES IN BANGLADESH," is to assess the key variables that affect how satisfied passengers are with the services provided by Bangladesh Railway. The study focuses on important topics like service quality, train punctuality and how intercity passengers' entire experience is affected by trip duration. The study also seeks to pinpoint the precise obstacles that impede passenger happiness, such as inadequate upkeep, crowded conditions and antiquated infrastructure, all of which hurt the dependability of the service.

Key Points to Address:

Service Quality: Aspects including cleanliness, comfort, employee conduct and the general infrastructure of train stations and trains will all be evaluated in this study. Inadequate amenities and poor upkeep are frequently mentioned as the main causes of the declining passenger experience.

Punctuality: One of the main causes of commuters' discontent is delays, which makes passengers extremely concerned about train timeliness. The study will examine the effects of delays on passengers' perceptions and how increasing timeliness can increase satisfaction.

Travel Time: A key component of travelers' total pleasure is the effectiveness of the trip, including how long it takes them to get there. In addition to frustrating travelers, lengthy wait times and delays interfere with their everyday lives by making it difficult for them to organize other activities.

Maintenance Issues: The study emphasizes how urgently the infrastructure has to be updated and maintained to guarantee dependable and seamless services. Poorly maintained trains and stations mostly cause passengers to have negative experiences.

Impact on Community and Economic Growth: The term "community promote" refers to fostering development, engagement, and support within a community by creating opportunities, addressing needs, and improving quality of life. It involves initiatives that enhance the community's well-being, build trust, and encourage active participation in activities or programs that benefit both individuals and the collective. A strong and dependable railway network may enhance community well-being by enhancing connection and mobility. Easing commerce, lowering transportation costs and improving access to markets and job opportunities may help promote economic growth.

The study's conclusions will throw the spotlight on the primary obstacles to passenger happiness at Bangladesh Railways and provide practical suggestions for raising the standard of service. Bangladesh Railway can enhance the entire travel experience, increase customer happiness and favorably impact community and economic growth by resolving these problems. In conclusion, this study will not only identify the existing issues with the railway system but also highlight how crucial it is to improve travel time, punctuality and service quality to support Bangladesh Railway's long-term expansion and viability.

1.2 Study Area

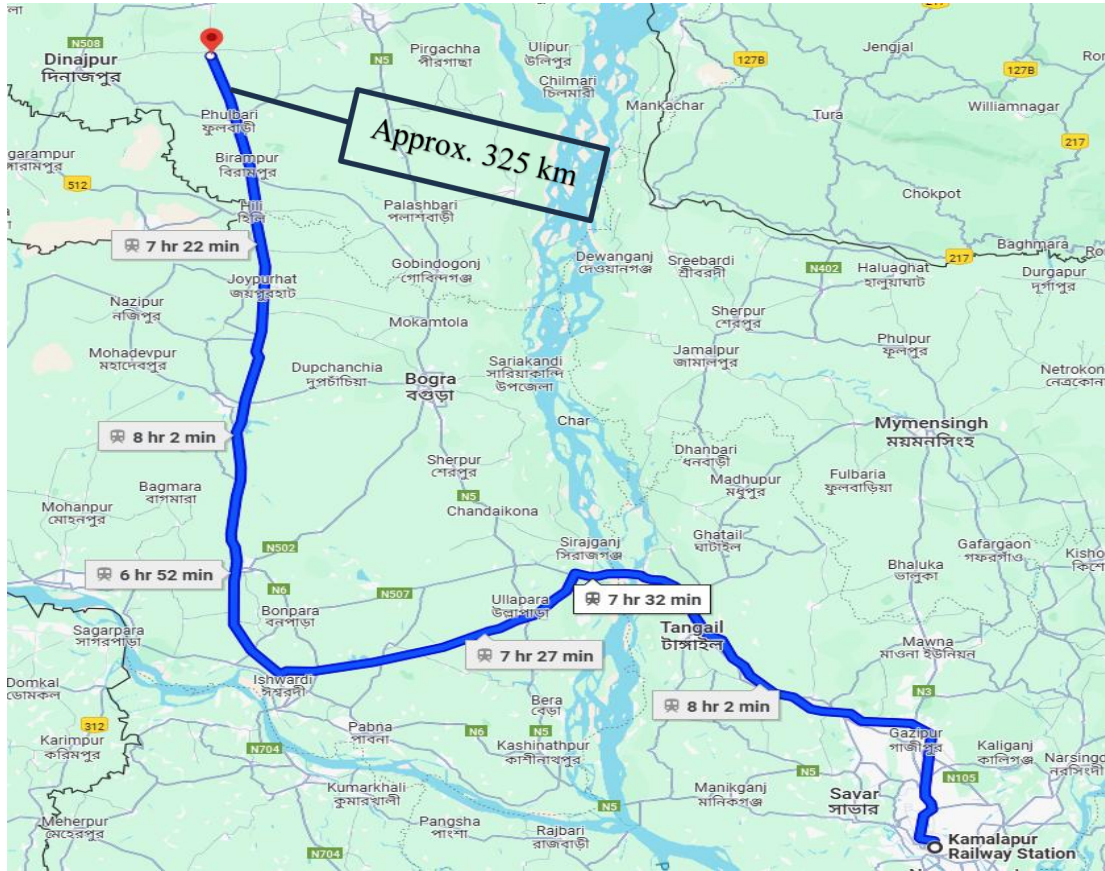


Figure 1: Study area (Dhaka - Parbatipur Railway Route)

Here's the station list for a train journey from Dhaka to Parbatipur

Dhaka (Kamalapur Railway Station) ⇔ Dhaka Airport Station ⇔ Joydebpur ⇔ Mirzapur ⇔ Tangail ⇔ Bangabandhu Bridge East ⇔ Bangabandhu Bridge West ⇔ Jamtoil ⇔ Sirajganj ⇔ Ullapara ⇔ Boral Bridge ⇔ Chatmohar ⇔ Ishwardi Bypass ⇔ Natore ⇔ Ahsanganj ⇔ Santahar ⇔ Akkelpur ⇔ Joypurhat ⇔ Panchbibi ⇔ Birampur ⇔ Phulbari ⇔ Parbatipur

1.3 Objectives

1. To analyze the major factors that hinder passenger satisfaction in Bangladesh.
2. To Promote community & economic growth.

CHAPTER 2

LITERATURE REVIEW

2.1 General

A literature review does not provide anything new to the field actually, it evaluates and summarizes the most recent findings. Because of their foundation on previous knowledge, they help scholars in even initiating the research topic. The review of the literature suggests potential directions for future research to achieve success. In a scientific publication, the importance of a literature review could be distilled into an analytical feature to enable its diverse use. The trustworthiness of the research is improved in several ways.

The significance of "user perceptions" is highlighted in a large amount of research. "Satisfaction ratings," which ask respondents to rank several factors that characterize the service, are typically used to convey user perceptions. Customer loyalty to a service is based on user impressions (Keaveney, 1995) are usually employed to communicate user opinions. User impressions determine a customer's loyalty to a service. Therefore, understanding the significance of these qualities is essential for transportation operators and aids in developing customer-focused methods that could draw in and keep more passengers (Shen Wang, 2016).

According to the literature, several important factors influence how satisfied passengers are with public transportation services. Reliability, or the percentage of services that run punctuality or the percentage of trains that run on time, are frequently mentioned as possible (Soltanpour et.al. 2020).

2.2 Defining Service Factors

The study focuses on the influences on passenger satisfaction with rail transport using a literature review and the Delphi approach. The study employs the Delphi method and a literature analysis to examine the factors that affect rail passenger happiness. Accessibility, ticket or pass availability, comfort, time, information, customer service, safety and image were among the themes that were found. The Delphi technique was

used to identify 34 sub-themes, determining their relative relevance. Following the Delphi process, 14 themes and 29 sub-themes were identified and a poll was created to gauge expert opinions on the themes and sub-themes. Because the mean score for five sub-themes was less than three out of five, they were eliminated: ticket-selling network, staff dedication, ergonomics, physical help and customer interface. (Md Yusoff Ismail, 2020).

2.3 Service Factors that influence Rail-based user Satisfactions

The importance of elements including availability, accessibility, ticket or pass, information, journey time, customer service, comfort, safety and image are emphasized in this paper's investigation of service aspects influencing user satisfaction with public rail transportation. Significant factors in the study are indicated with a checkmark, whereas non-significant factors are indicated by the absence of a checkmark. The conversation goes beyond the chosen papers and cites other works for additional discussion and support. (Md Yusoff Ismail, 2020).

2.4 Availability of service

Several variables, including service availability, frequency, network coverage and parking facilities, affect public rail service availability. Passengers' satisfaction and uptake of public transportation are significantly impacted by frequency. Efficiency, predictability and perceived time are all enhanced by high frequency. Congestion, long wait times, overloading and overcrowding are all consequences of low frequency that can cause discontent and lower adoption. Due to improved frequency, public rail transportation is more popular in industrialized nations including the US, Japan, South Korea and the UK. Network coverage and operating hours can affect customer satisfaction. An examination of the literature demonstrates that any modifications to the frequency of service may result in fewer riders. (Md Yusoff Ismail, 2020).

2.5 Accessibility of service

Accessibility is a critical component of public satisfaction for both captive and choice rail transit users. Research has indicated that a major determinant of overall service satisfaction is the ease with which passengers may reach the station that is closest to them.

Transfer comfort, such as seamless car-to-car transfers and the availability of serviced elevators and escalators, also affects customer happiness. Overall satisfaction is also impacted by the distance of transfer; research has shown that overall satisfaction and ease of transfer are correlated. (Md Yusoff Ismail, 2020).

2.6 Ticket or pass

This study predicts the choices of high-speed rail (HSR) passengers about the timings of ticket purchases, train types and travel classes using support vector regression (SVR) and artificial neural networks (ANN). An actual case study of the Shanghai-Beijing HSR market in China is used in the study and train service characteristics are identified as input variables. According to the results, SVR and ANN both surpass linear regression in their ability to accurately predict train decision behavior. Reforming the price of rail is one such use. (Sun Jiang et.al. 2018).

2.7 Travel time

The possibility of producing impractical situations and lengthy time additions in models has hindered research on automatically creating schedules. To solve these problems, the authors speed up solver times and minimize the objective function of the overall passenger trip time, which is what is typically expected in practice. The timetable of all 196 hourly passenger trains in Belgium was optimized in just two hours, demonstrating the practicality of this approach for timetabling. The objective function of predicted passenger time in practice and a reduction in calculation time with carefully selected restrictions are the two missing stages that the authors contributed to making cyclic timetabling for passengers feasible. (Vansteenwegen et.al. 2016).

The significance of the "access-to-the-station" portion of a train trip for passenger pleasure and look at how service attributes, accessibility and population served are balanced when deciding rail use in various rail network locations. Regression analysis and the Dutch Railways customer satisfaction survey are used in the analysis, which is conducted in the Netherlands. According to the study, one significant aspect of the rail trip that affects overall satisfaction and explains rail utilization is satisfaction with the

degree and caliber of access to the station. It may be more economical to increase rail use by upgrading and growing access services to the train station. (Brons Givoni et.al. 2009)

2.8 Comfort

With 25% of fixed assets in poor or extremely poor condition, the US transit system is in bad shape. To preserve convenience, safety, comfort and dependability in urban settings, this research attempts to create a comprehensive model for managing urban trains, such as the metro. Understanding passenger convenience, creating a decision-making model that simulates the functioning of a transit system and creating an optimization model to examine investment alternatives for modernizing and growing the railway network while preserving acceptable service levels are the tasks that are suggested. Public transportation systems could utilize these models to inform planning for growth and maintenance upgrades to boost ridership and enhance convenience. (Mohammadi, 2019).

2.9 Customer service

The National Dutch Railways study uses a variety of data sources to determine the factors that influence customer satisfaction. Station amenities, Wi-Fi accessibility, seats and train timeliness are all important considerations. Initiatives to improve customer satisfaction are suggested by the study, such as a tool to identify crucial variables, a marketing dashboard that reflects consumer contentment and an app for passenger seating availability. (Verhoef et.al. 2017).

2.10 Safety

This study suggests a unique paradigm for managing risk in railway systems that makes use of pattern recognition and computer vision. To detect hazards, the model records fall, slip and trip incidents in high-risk stations using a convolutional neural network. Incidents continue to happen despite efforts to lower accidents and injuries. The suggested approach can be applied to different threats and places. (Alawad et.al. 2020).

2.11 Maintenance

An initial feasibility analysis of urban rail infrastructure projects in Zadar, Croatia, is presented in this document. To promote intermodal passenger and freight mobility, relocate freight rail traffic, increase accessibility and safety and cut down on operating costs and travel time, the study sought to assess six different alignment options for rail infrastructure. To choose the best option, a partial cost-benefit analysis and a multi-criteria analysis were performed. (Ahac et.al. 2024). Investigations into high-speed trains have indicated that an increase in speed does not always result in an increase in the deformation and stresses in track components, necessitating the adoption of a stronger track structure. The loads, deformations, and strains in the track components were discovered to be amplified as a result of the discordant movement of cars on the track, such as pitching, rolling, bouncing, and so on, which occurs when the track is not properly maintained. It is possible to operate vehicles at higher speeds on a given track structure without imposing additional loads and stresses. However, this requires improved maintenance standards for both the track and the vehicles to control any inhibiting movements during higher speeds. The Rajdhani route's track construction can support speeds up to 120-140 km/h. rigorous speeds of 160 to 200 km/h require rigorous maintenance standards to ensure near track tolerances. Maintaining the existing tracks within such tolerance limits may be to maintain closer tolerance limits at a lower cost, adopting an enhanced track structure may be more cost-effective. Modern track structures, such as long welded rails with concrete sleepers, elastic fasteners, and ballastless tracks, may meet this need. Despite its high cost, this new track has minimal maintenance costs (Chandra, 2007).

2.12 Impact on Community and Economic Growth

This study examines how transportation infrastructure affects sustainable economic growth, with a particular emphasis on passenger travel. Using private tourism to promote sustainable economic growth, builds a growth model that reveals how traffic infrastructure impacts both output and consumption. This hypothesis is confirmed by the study, which finds that investments in railway infrastructure can both directly and

indirectly spur economic growth using panel data from China from 2008 to 2018. (Zhang, 2021)).

According to economic theory, the multiplier effect—which states that government investment depends on amplifying an investment multiplier that promotes the growth of related industries and subsequently speeds up economic development—is typically responsible for the relationship between infrastructure construction and economic development. Of course, infrastructure investments may be counterproductive to long-term economic growth when crowding-out effects are considered. Nonetheless, several writers have asserted that the crowding-out effect theory and investment multipliers by themselves are insufficient to fully explain the function of infrastructure. The idea of the "crowding-in effect" was proposed following several theoretical and empirical investigations. It is generally accepted in the literature that the development of transportation infrastructure influences economic development by influencing production behavior; in other words, the existing research solely concentrates on the production field. (Zhang, 2021). The emergence of the railway has improved travel duration by offering reliable and consistent schedules that could be included in the planning of economic activities, such as production and distribution, which facilitates trade and distribution of goods and people's movement. It has a strong economic rationale which makes it competitive for the mobility of people and freight. The freight movement and passenger transport benefit the nation's economy and lead towards commodity production, trade boost, and people's development. The accessibility provided by railway transport is one of the significant factors for households and firms (Wenner et. al. 2020), as the railway development brought tremendous changes to transport, economy, and society (Michniak, 2016). Railways strongly influenced economic and urban development that increased the range of reach for people and goods, as transport and mobility enable a conducive environment for trade to occur, establish civilization, give the country a growth opportunity, generate jobs, and promote economic scale realization. The railway has resulted in positive multiplier effects and is considered a link to all aspects of life and growth.

Upgradation

The final alterations to the GT46PAC came in the form of the WDP-4D. The locomotive is the most distinctively identifiable of the three thanks to the addition of a second cab at the long hood end of the locomotive. Due to the heat generated from the radiator at the second cab end of the locomotive, DLW had to install air conditioning to protect both the electrical components and the loco-pilot from high temperatures. The existing features from WDP-4B have been carried forward to this class and it exclusively features the widened cab profile. Since it is a Dual Cab now, it is called as "JT46PACe". The loco features a completely different desk control stand, provided by Medha with digital display screens allowing for remote fault diagnostics. Many locos also have GSM-R-based transmission antennae to transmit critical loco info for use by maintenance and signaling staff. It features electro-pneumatic microprocessor-based control adapted from the WDP-4B and brake system equipment of KNORR/NYAB CCB type.

This loco again with Dual-Cab, but with More Power and Better Fuel Consumption and State-of-the-Art features compared to ALCo DL560C, along with an Air Conditioned Hood Cab, became a very efficient replacement for WDP-3A (ALCO DL560C) alias "Toaster". (Chandra, 2007)

Table 1: Performance figures

Train	Max. speed	Power output (hp)	Tractive effort (kN)
WDP-4	Service: 160 km/hr Testing: 180 km/hr	4000	270.2
WDP-4B	130 km/hr	4500	399.87
WDP-4D	135 km/hr	4500	429.41

Details of the high-speed rail system:

<i>Speed range (km/h)</i>	<i>Details</i>
200–250	<ul style="list-style-type: none"> ▶ Diesel electric trains (including the British HST) ▶ Electrified tilt-body trains (including the Swedish X2000, the Italian Pendolino, the Spanish Talgo) ▶ Electrified non-tilting the rains (including the US Metroliner)
250–350	<ul style="list-style-type: none"> ▶ Electrified non-tilting trains (including the Japanese Shinkansen, the French TGV, the German ICE)
Above 350	<ul style="list-style-type: none"> ▶ Maglev systems developed in Japan and Germany. These are a combination of superconducting magnets and linear motor technology and have a non-adhesive drive system that is independent of wheel and rail frictional forces

Development of the high-speed rail system:

<i>Year</i>	<i>Country</i>	<i>Details</i>
1964	Japan	Tokyo-Osaka, covers 515 km in 3 hrs 10 m (Shinkansen network expansion)
1981–83	France	Paris-Lyon, covers 410 km in 2 hrs (TGV network)
1991	Germany	ICE trains in Germany (Hanover-Wurzberg, covers 327 km in 2 hrs.)
1992	Spain	Madrid-Seville, covers 471 km in 2 hrs 15 m (AVE and Talgo trains)
1994	Eurostar in the UK, France, and Belgium	
1995–2003	Finland, Italy, Sweden, USA, Australia, China, Switzerland, South Korea, and other countries	

In the year 2000–01, HSGT operations stretched over a distance of around 4900 km across the world and work on another 680 km was in progress or in the planning stages in various countries.

CHAPTER 3

METHODOLOGY OF THE STUDY

3.1 Introduction

To fulfill its stated objectives, this study uses a case study system and is individual. The literature review indicates that passenger pleasure and multiple characteristics are crucial for various services. Bangladeshi experimenters have also neglected to research the level of customer satisfaction with road station services and their service quality. Therefore, an effort is made to investigate how customers evaluate the quality of services on road platforms. With the help of the results of a quick check, a case study system is employed to determine the elements that contribute to customer satisfaction with this highly significant public mileage in the particular context of Bangladesh.

3.2 Survey and Sampling

The macrocosm of the study comprised respondents from other nations as well as the whole Bangladeshi population. The study mostly relied on primary data collected via carefully developed questionnaires, which included a six-point Likert scale for evaluating customer satisfaction with certain criteria, ranging from "least satisfied" to "most satisfied." Because it enabled them to measure opinion-based details and because a scale with balanced keying—that is, an equal number of positive and negative statements could eliminate the issue of compliance bias, the researchers used a Likert scale. To evaluate factors that affect customer satisfaction on the railway platform, the survey has 18 categories. Kamalapur Railway and Parbatipur Railway Station were the two sizable train stations that were chosen as a sample in the study. Bangladesh's primary and biggest railway station is Kamalapur. It's a significant hub. Motijheel Thana, the capital of Dhaka, is where it is geographically located. Officially, it is called Dhaka Railway Station. Seven tracks and eight platforms make it up. The multimodal transportation hub that is being built around the station is expected to be completed by 2034.

The Parbatipur railway platform is located in the district of Dinajpur. All railway connections to North Bengal and Assam during the British century passed through

Bengal's eastern region. Beginning in 1878, the railway line connected Siliguri and Kolkata, which was then known as Calcutta, in two laps. From Calcutta Station (later renamed Sealdah) to Damookdeah Ghat on the southern bank of the Padma River, a 336 km meter gauge line of the North Bengal Railway connected Saraghat on the northern bank of the Padma to Siliguri. The first lap of the trip was a 185 km trip along the Eastern Bengal State Railway. In 1912, the 1.8-kilometer Hardinge Bridge was built across the Padma. The Calcutta to Siliguri route was made a broad gauge in 1926 after the meter-gauge portion north of the bridge was changed to a broad gauge. The station Parbatipur appeared on the Calcutta-Siliguri route. Following its establishment as a railway station on the Parbatipur-Parbatipur-Santahar-Darshana Line in 1876, Parbatipur quickly became the hub of additional railway development. Two developments occurred, one moving westward and the other eastward. In 1879, the North Bengal State Railway launched a meter gauge line to Kaunia. From Kaunia to the Dharla River, the Eastern Bengal Railway constructed two small gauge lines. In 1901, a meter gauge was introduced on the Kaunia Dharla railway lines. Amingaon was added to the Kaunia-Dharla line in 1908. By 1889, Parbatipur was connected to Katihar in Bihar by the Assam Behar State Railway, which had begun construction westward in 1884. Although there were no longer any railway connections outside of Bangladesh when India was divided, Parbatipur remained a crucial railway intersection.

A Google map below illustrates the distance between the Kamalapur Railway station platforms and the Parbatipur station platforms that we looked at for our study.

A total of 300 samples were surveyed, 150 of which came from the railway stations at Parbatipur and 150 Kamalapur platforms from November 05, 2024, to December 01, 2024.

Table 2: An overview of the data collection process

Locations	Survey Date	Distributed Number of Questionnaires	Number of Returned Questionnaires	Response Rate (%)
Kamalapur Railway Station	05/11/2024-01/12/2024	150	150	100
Parbatipur Railway Station		150	150	

Principal Axis Factoring (PAF) is a statistical technique used to identify underlying variables, or factors, that explain the patterns of correlations within a set of observed variables. In this research, PAF was employed to extract latent variables influencing passenger satisfaction. Using SPSS software, this method focuses on shared variance, identifying underlying structures by analyzing the correlation matrix. The initial solution was refined through Varimax rotation, which enhanced the interpretability of factors. Each factor's significance was evaluated by its eigenvalue and factor loading, with a cutoff set to ensure only meaningful contributions were retained. This process allowed the identification of key elements like service quality, ticketing accessibility, and safety perception, explaining 84.527% of the variance in passenger satisfaction.

To assess passenger satisfaction with service more precisely, the study used secondary data from pertinent research monographs and publications literature. To draw important conclusions, the collected data was assembled utilizing trustworthy statistical methods. These were examined and used in this investigation

3.3 Methodology

It was found that none of the available questionnaires should be used because the investigation revealed that factors changed according to service. It was arduous work, but it was required to meet the research objectives. An instrument was created using existing

literature, discoveries, research and professional opinion. Evaluations and exploratory investigations were used to develop factors connected to Bangladesh Railways' service quality, such as passenger satisfaction and perception. Interviews with frequent passengers were performed to determine the factors that influence their pleasure. The findings from these early surveys and evaluations were used to construct broad passenger satisfaction metrics for railroad stations. The literature review helped to verify these criteria. These were then modified to produce a question. Table 2 highlights the passenger survey, with each question represented as a variable to analyze using SPSS.

Table 3: Finding the Variables Affecting Passenger Satisfaction with Dhaka to Parbatipur Railway Service Quality in Bangladesh.

Code	Variables
V1	Income group
V2	Frequency of travel
V3	Distance traveled
V4	Travel Purpose
V5	Ticket booking method
V6	Availability of Tickets
V7	Railway safety rating
V8	Staff Behavior and Helpfulness
V9	Cleanliness of Stations and Trains
V10	Seating Comfort
V11	Lighting in platform waiting rooms
V12	Seating facilities in a platform waiting room
V13	Consistency of fans on the train
V14	The light inside train compartments
V15	Train Punctuality
V16	Willingness to Recommend Railways
V17	Satisfaction with Travel Time
V18	Satisfaction with Ticket Prices
V19	Overall Satisfaction with Railways

3.3.1 The definition of variables

Income Group

Income levels play a major role in determining travel class and frequency. People earning below ₳10,000 tend to opt for budget-friendly travel options like general or second-class tickets. As income increases, passengers are more likely to choose air-conditioned or premium services for added comfort. Those earning above ₳100,000 may prefer first-class services or even alternatives like private transportation, using railways primarily for convenience.

Frequency of Travel

The frequency of railway usage varies with occupation and lifestyle. Daily commuters include office workers and students who rely on the railway for affordability and timeliness. Weekly or monthly travelers might include business professionals or individuals visiting family. Occasional or rare travelers often use trains for leisure or long-distance trips, where overall experience and amenities become more important.

Distance Traveled

Travel distance influences passenger needs and expectations. For short trips under 50 km, efficiency and quick boarding are essential. Medium distances (50–200 km) require seating comfort and cleanliness, while long journeys over 300 km emphasize the importance of sleeping arrangements, food availability entertainment options. Bangladesh Railways caters to all these needs with its diverse range of services.

Travel Purpose

The purpose of travel shapes passenger expectations. Business travelers prioritize punctuality and comfort, while leisure travelers seek scenic routes and relaxation. Family visits focus on affordability and accessibility and medical travelers may need additional

support and easy access. Each travel purpose influences what passengers value most, from speed to comfort and reliability.

Ticket booking method

Ticket Booking Method in Railways refers to the different ways in which customers can purchase train tickets for domestic travel in Bangladesh. The process usually entails choosing a train, a trip date and paying for the ticket. In Bangladesh, railway tickets can be booked using the following methods:

- 1 Online booking method
- 2 Ticket Counters at Railway Stations
- 3 Travel Agents

Availability of Tickets

In the context of the Bangladesh Railway system, the "availability of tickets" refers to the number of seats or spaces available for reservation on a specific train, route, class and date. It informs whether people can reserve a seat or ticket for a given train travel, taking into account train capacity, demand and booking status.

Railway Safety Rating

In the context of Bangladesh Railway (BR), the "Railway Safety Rating" refers to an examination or review of safety measures, operating procedures and infrastructure quality that influence train safety, ensuring the well-being of passengers and the smooth functioning of rail services. This rating helps identify areas for improvement and ensures that necessary precautions are in place to prevent accidents and delays.

Cleanliness of Stations and Trains

The term "Cleanliness of Stations and Trains" refers to the overall hygiene, tidiness and hygienic conditions of railway stations and train coaches in the Bangladesh Railway System (or any railway system). Maintaining a high level of cleanliness has a direct impact on passenger comfort, health and safety. This covers the cleanliness of the facilities, platforms, waiting areas, train interiors, restrooms and public areas.

Seating Comfort

Seating Comfort refers to the physical comfort and usability of train carriage seats. It includes several variables that influence a passenger's entire travel experience, including the design, material quality, space, adjustability and overall layout of the seating arrangements. Seating comfort is an important aspect of customer satisfaction in rail travel since it directly impacts how comfortable passengers feel during the journey, particularly on long-distance or overnight trips.

Staff Behavior and Helpfulness

Staff Behavior and Helpfulness in the context of railway services refers to the professionalism, attitude willingness of railway personnel (such as conductors, station staff, ticket agents, security personnel and customer service representatives) to assist passengers and ensure a smooth, pleasant travel experience. It includes how personnel interact with passengers, their response, friendliness, and efficiency capacity to address passenger requirements or problems.

Train Punctuality

Train punctuality is the timeliness with which a train arrives and departs at the planned periods. It is a critical performance statistic in the railway system, reflecting how frequently and reliably trains adhere to their scheduled schedules, making it an important component in customer satisfaction and operating efficiency. Punctuality is often evaluated as the percentage of trains that arrive at their destinations on time or within a set acceptable timeframe.

Satisfaction with Travel Time

Satisfaction with Travel Time in the context of Bangladesh Railway (BR) refers to passengers' overall satisfaction or dissatisfaction with the length of their travel on a train service, from departure to arrival. It is a fundamental indicator of the railway system's

efficiency and effectiveness, showing how effectively journey time meets passengers' expectations and demands.

Overall Satisfaction with Railways

Overall Satisfaction with Railways in the context of Bangladesh Railway (BD Railway) refers to a thorough evaluation of passengers' experiences with the entire railway service, including service quality, comfort, reliability, affordability overall voyage experience. It measures how well the railway meets or surpasses passenger expectations in areas such as punctuality, customer service, train facilities cleanliness. Overall satisfaction is a comprehensive view of a passenger's journey, beginning with the planning of the trip and ending with the arrival at the destination and can include factors such as ticketing experience, staff behavior, seating comfort, train punctuality, travel time and train and station condition.

Willingness to Recommend Railways

In the context of Bangladesh Railway (BD Railway), "willingness to recommend" refers to passengers' likelihood or inclination to recommend railway services to others based on their overall experience with the service. This metric is an important indicator of customer satisfaction and loyalty, representing how satisfied passengers are with their journey and if they would recommend the railway for their travel needs. When passengers are willing to promote a service, it usually reflects a positive experience in several areas, including service quality, comfort, punctuality, customer service and overall contentment. This metric is often measured using passenger surveys or feedback methods, in which travelers are asked if they would recommend Bangladesh Railway to others.

Satisfaction with Ticket Prices

Satisfaction with Ticket Prices in the context of Bangladesh Railway (BD Railway) relates to passengers' perceptions of the value they obtain for the money they spend on train tickets. It measures how effectively the ticket pricing structure meets the expectations of passengers, their financial capacity the overall level of service delivered.

Essentially, it assesses whether passengers believe the cost of their journey is fair and reasonable in light of criteria such as comfort, convenience, timeliness service quality. This measure is crucial since ticket pricing influences passenger happiness and loyalty. If passengers believe that the price is justified by the level of service and amenities, they are more likely to be satisfied with their travel experience and continue to use the railway service. In contrast, if ticket costs are perceived as being too costly for the service provided, satisfaction levels may fall, resulting in dissatisfaction, complaints, or passengers selecting alternate forms of transportation.

Preferred Improvements

Preferred Improvements in the context of Bangladesh Railway (BD Railway) refer to specific adjustments, upgrades, or additions that passengers would want to see in railway services, infrastructure and overall experience. These enhancements are often identified through passenger feedback, surveys, or consumer proposals and they reflect areas in which passengers believe the service is inadequate or should be improved. The concept of preferred improvements is important because it assists railway authorities in understanding passenger needs and expectations, guiding them to prioritize initiatives that will increase customer satisfaction, attract more passengers improve overall railway system efficiency.

CHAPTER 4

ANALYSIS & RESULT

4.1 Introduction

The components of retail service excellence were identified through factor analysis. The same technologies were utilized by (Agarwal, 2017) to identify factors that influence customer satisfaction when making online purchases. (Rahaman, 2009) have ascertained the elements that affect train passengers' satisfaction. (Hossain, 2016) identify the elements that influence how satisfied passengers are with the level of service provided by Bangladesh Railway on the Dhaka-Chittagong route. The same methodology was applied in this study to identify the variables affecting passenger satisfaction. Finding the elements that affect railway passenger satisfaction and testing the hypothesis that these factors do so were the objectives of factor analysis. SPSS 26 was used to analyze the data.

Since statistical data was used to build the model, it has been validated. It might be developed and applied to future research of a similar nature.

The charts below illustrate the comments of railway passengers gathered to evaluate various aspects of railway services. This survey was designed to identify major areas for improvement and increase public satisfaction with the railway system.

Passenger responses:

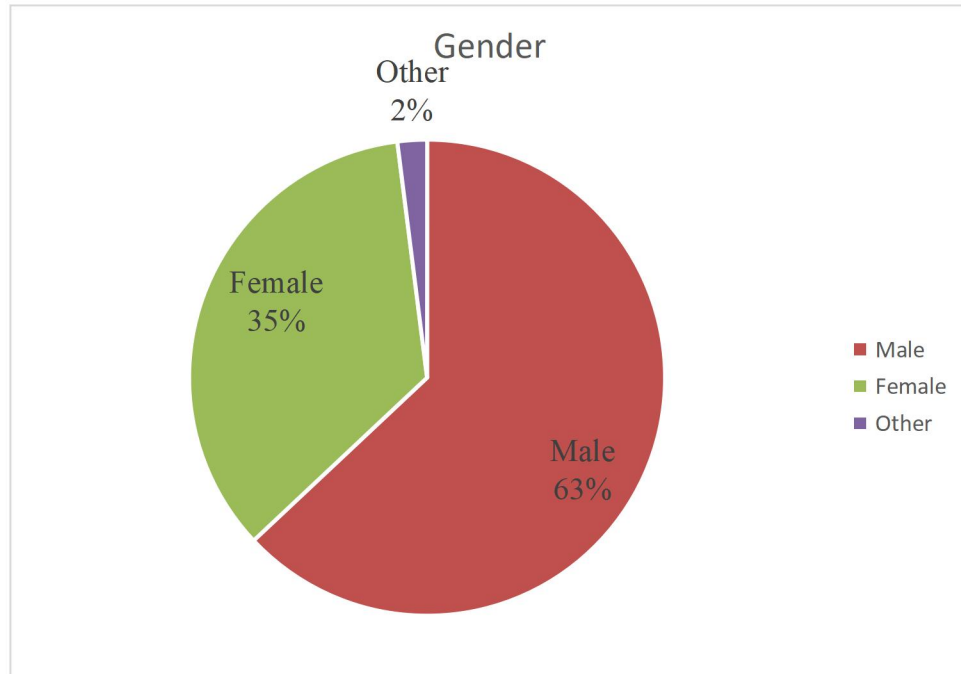


Figure 2: Gender

Figure 2: Gender: This graph shows that most survey participants were male (63%), followed by females (35%). A small percentage, 2%, identified as other.

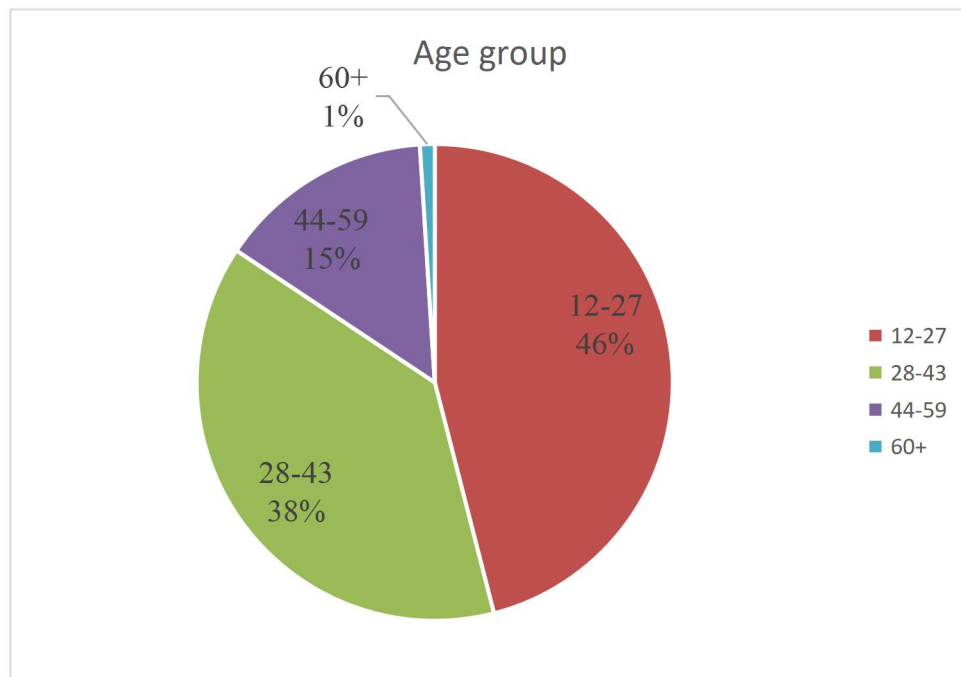


Figure 3: Age Group

Figure 3: Age Group: Most participants were aged 12–27 (46%) and 28–43 (38%). Only 15% were 44–59 and 1% were 60 or older.

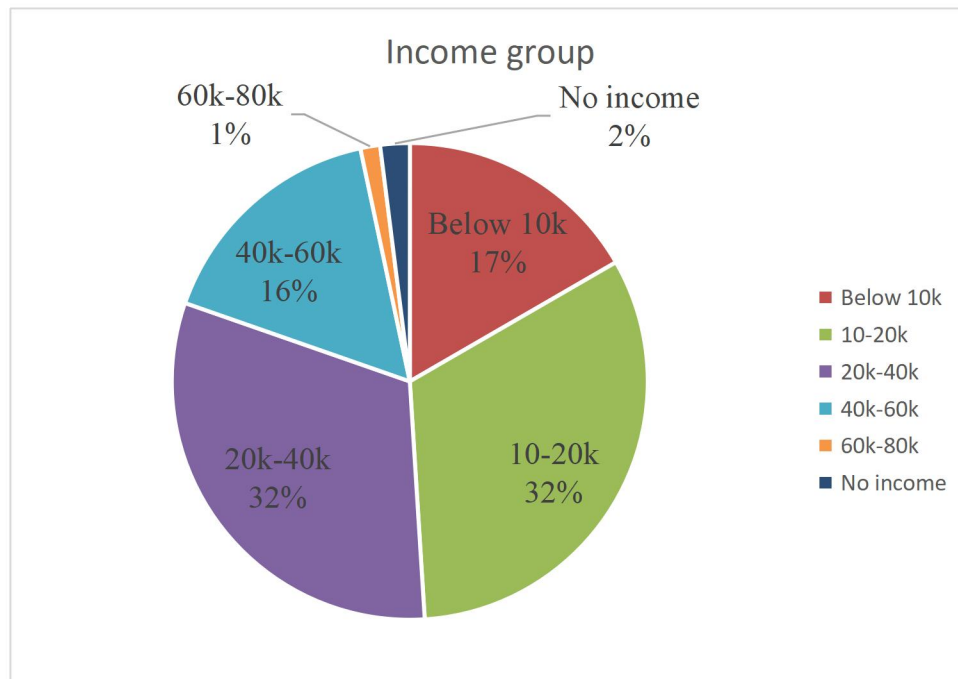


Figure 4: Income Group

Figure 4: Income Group: Most participants had an income of ₹10k–20k (32%) or ₹20k–40k (32%). Smaller groups earned below ₹10k (17%), ₹40k–60k (16%), or more, with 2% having no income.

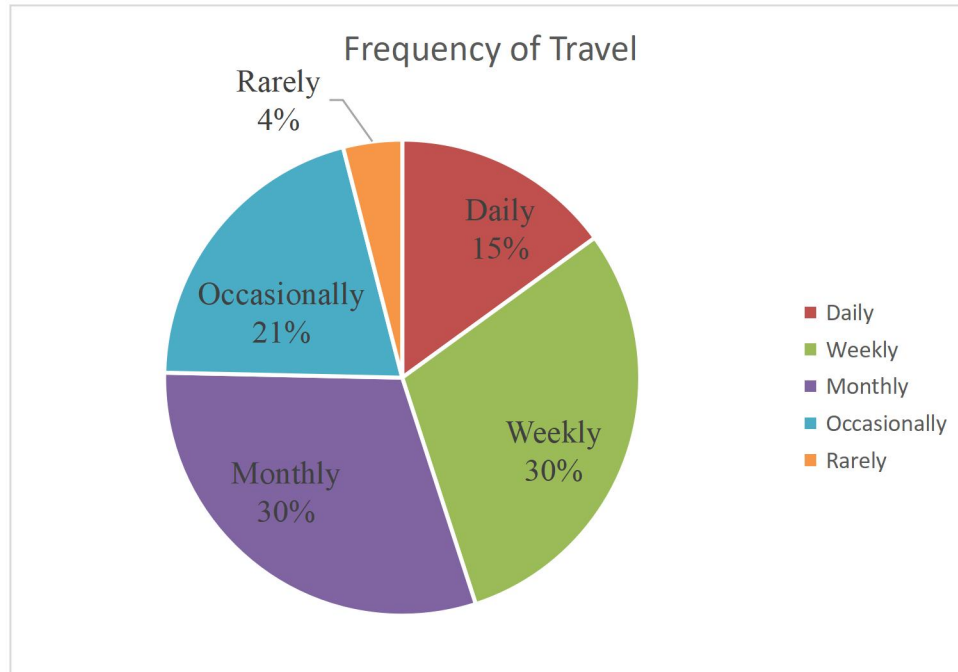


Figure 5: Frequency of Travel

Figure 5: Frequency of Travel: The majority of participants traveled weekly (30%) or monthly (30%), with 21% traveling occasionally. Only 15% traveled daily and 4% rarely traveled.

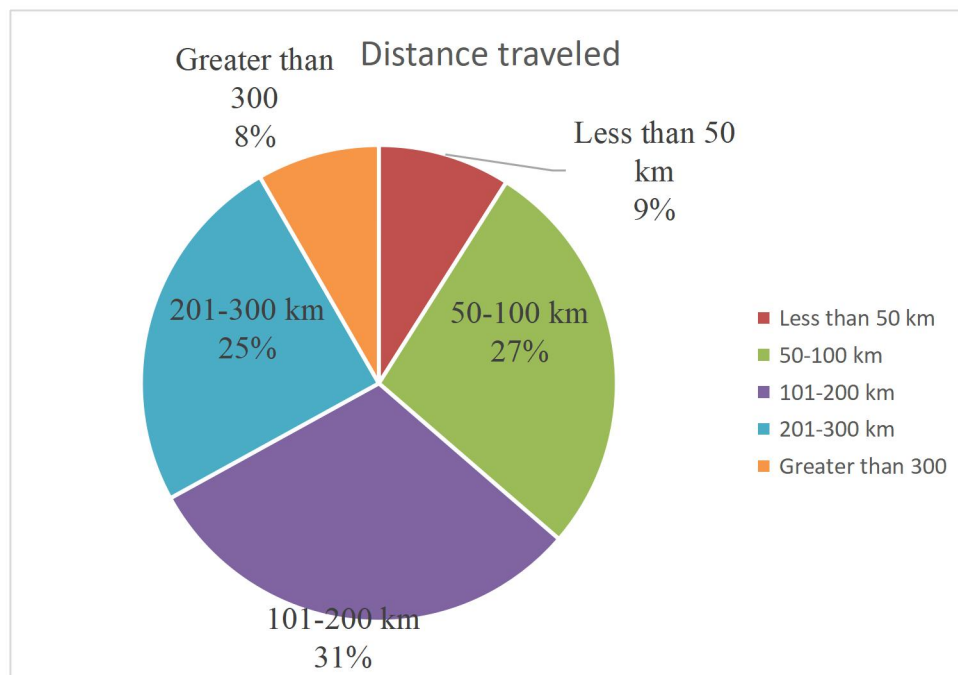


Figure 6: Distance Traveled

Figure 6: Distance Traveled: Most participants traveled distances of 101–200 km (31%) or 50–100 km (27%). Smaller groups traveled 201–300 km (25%), less than 50 km (9%), or over 300 km (8%).

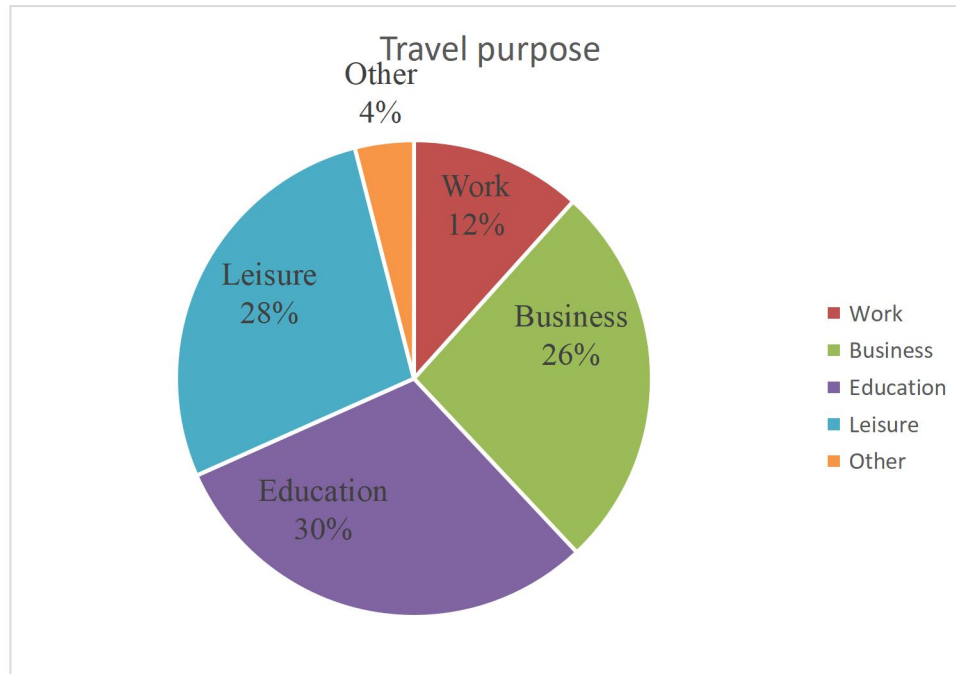


Figure 7: Travel Purpose

Figure 7: Travel Purpose: Education was the most significant travel purpose, accounting for 30%, highlighting its importance among participants. Leisure (28%) and business (26%) followed, with work (12%) and other reasons (4%) being less frequent

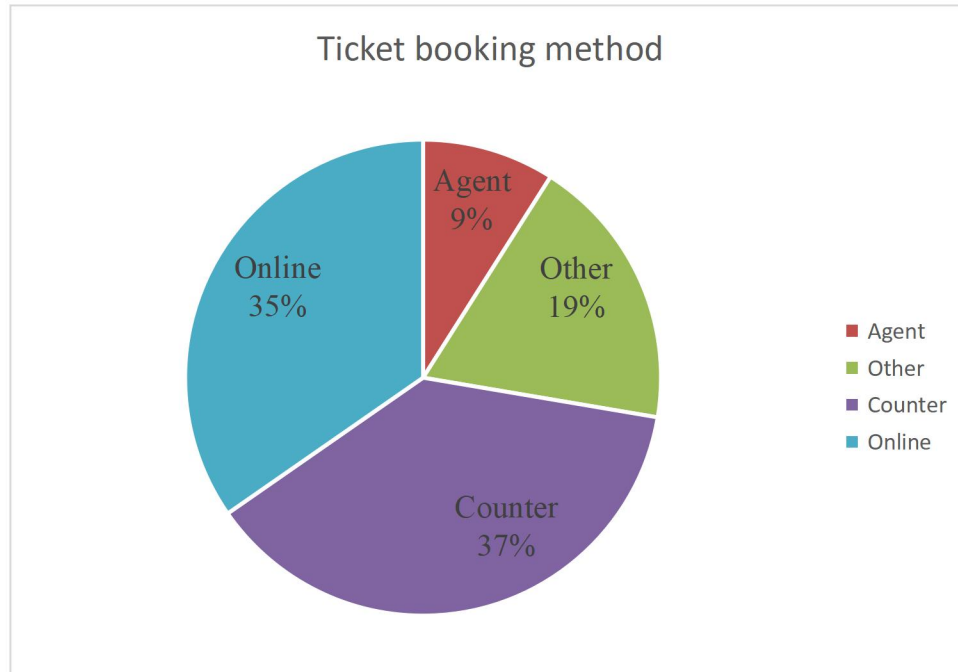


Figure 8: Ticket Booking Method

Figure 8: Ticket Booking Method: Counter bookings were the most common method (37%), closely followed by online bookings (35%). Agent bookings (9%) and other methods (19%) were less preferred.

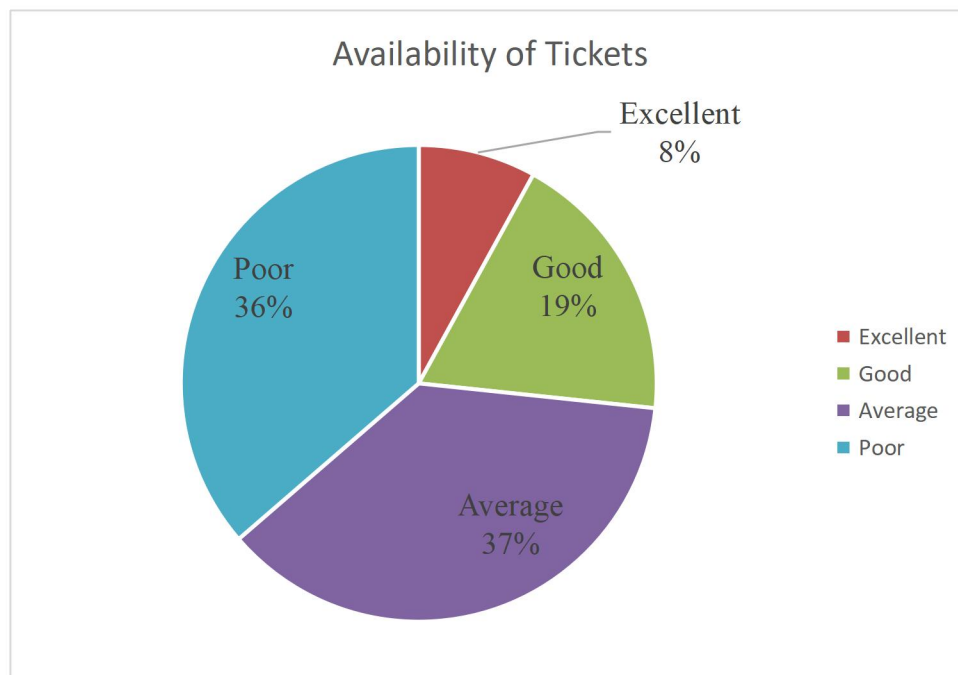


Figure 9: Availability of Tickets

Figure 9: Availability of Tickets: Most participants rated ticket availability as either average (37%) or poor (36%), while fewer found it good (19%) or excellent (8%).

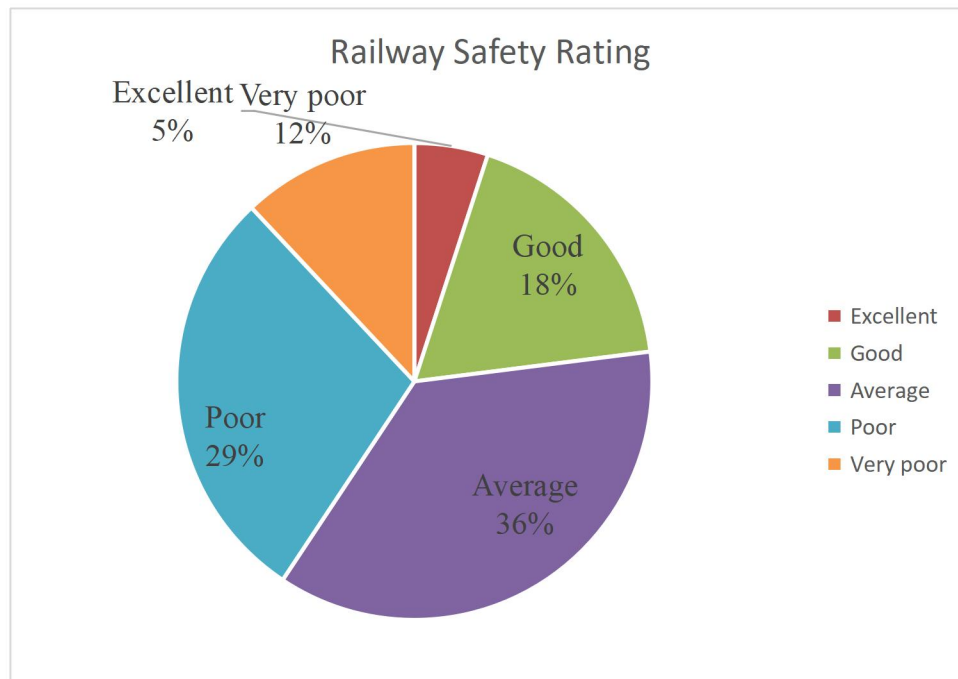


Figure 10: Railway Safety Rating

Figure 10: Railway Safety Rating: Most participants rated railway safety as average (36%) or poor (29%). A smaller percentage considered safety to be good (18%), very poor (12%), or excellent (5%).



Figure 11: Staff Behavior and Helpfulness

Figure 11: Staff Behavior and Helpfulness: Most participants rated staff behavior and helpfulness as average (37%) or poor (29%), with fewer rating it as good (17%) or excellent (6%) and 11% found it very poor.

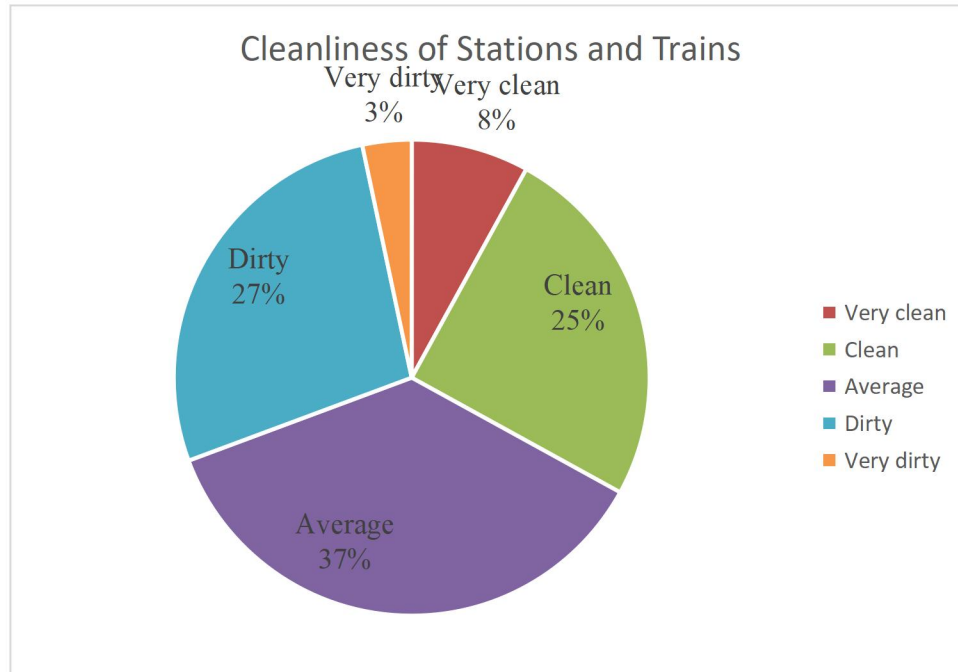


Figure 12: Cleanliness of Station and Trains

Figure 12: Cleanliness of Station and Trains: Cleanliness of Stations and Trains Most participants rated cleanliness as average (37%) or dirty (27%), with fewer considering it clean (25%) or very clean (8%). A small portion found it very dirty (3%)

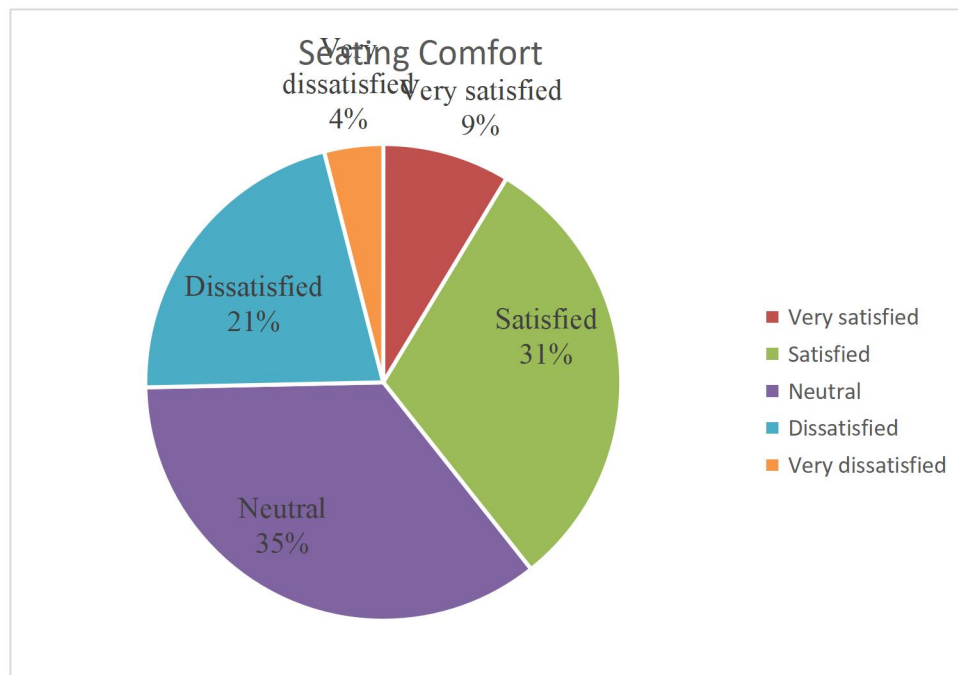


Figure 13: Seating Comfort

Figure 13: Seating Comfort: Most participants felt neutral (35%) about seating comfort, followed by those who were satisfied (31%). Some expressed dissatisfaction (21%) or were very dissatisfied (4%), while 9% were very satisfied.

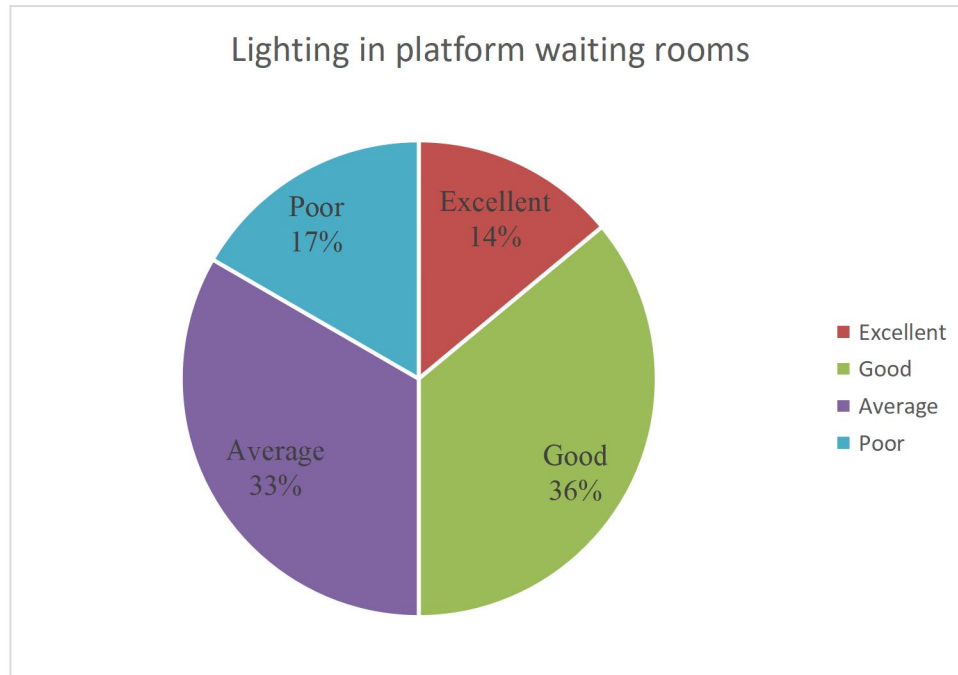


Figure 14: Lighting in Platform Waiting Rooms

Figure 14: Lighting in Platform Waiting Rooms: Lighting was rated as good by the majority (36%), while others found it average (33%) or poor (17%). Only 14% considered it excellent.

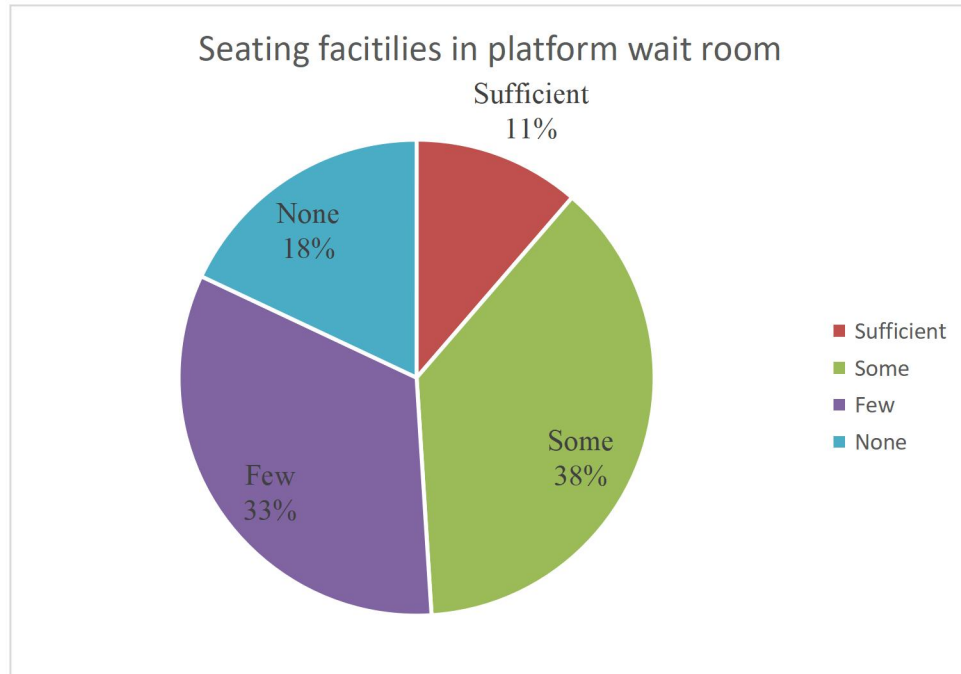


Figure 15: Seating Facilities in Platform Wait Room

Figure 15: Seating Facilities in Platform Wait Room: Seating Facilities in Platform Waiting Rooms Seating facilities were rated as some by most participants (38%), followed by few (33%). A smaller percentage found them sufficient (11%) or absent (18%).

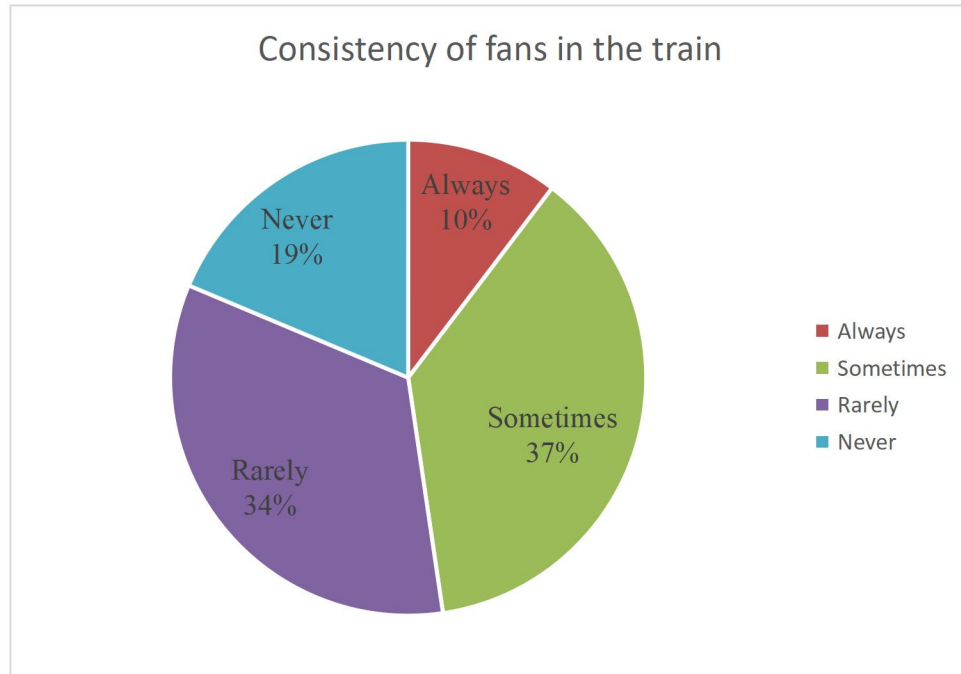


Figure 16: Consistency of fans in the train

Figure 16: Consistency of fans in the train: Most participants felt that fans in trains worked inconsistently, with "sometimes" (37%) and "rarely" (34%) being the most common responses. Only 10% said they always worked, while 19% said they never worked.

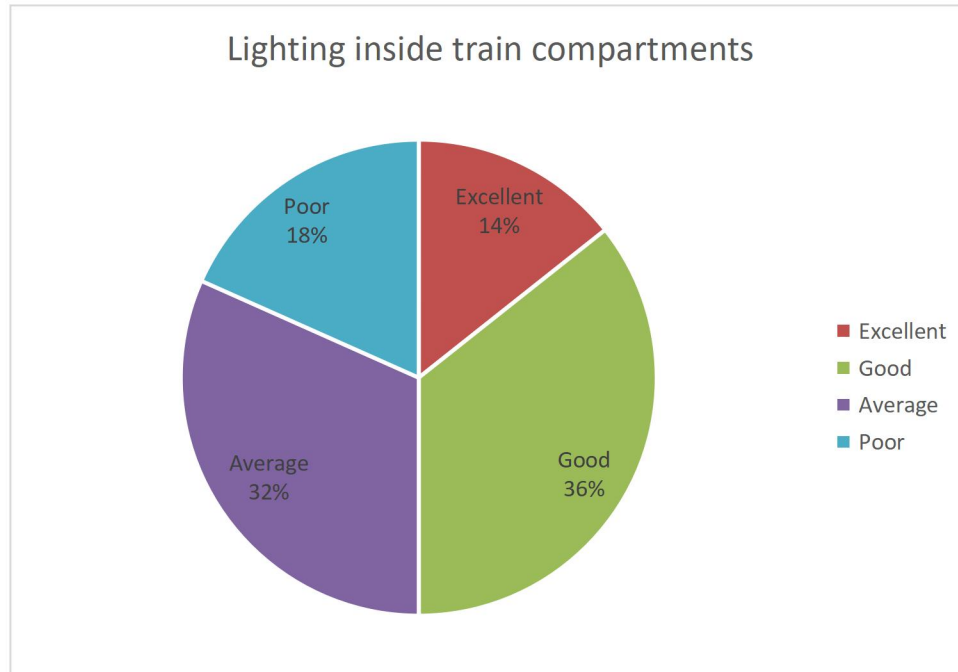


Figure 17: Lighting inside Train Compartments

Figure 17: Lighting inside Train Compartments: Lighting inside train compartments was mostly rated as good (36%) or average (32%), while fewer participants found it poor (18%) or excellent (14%).

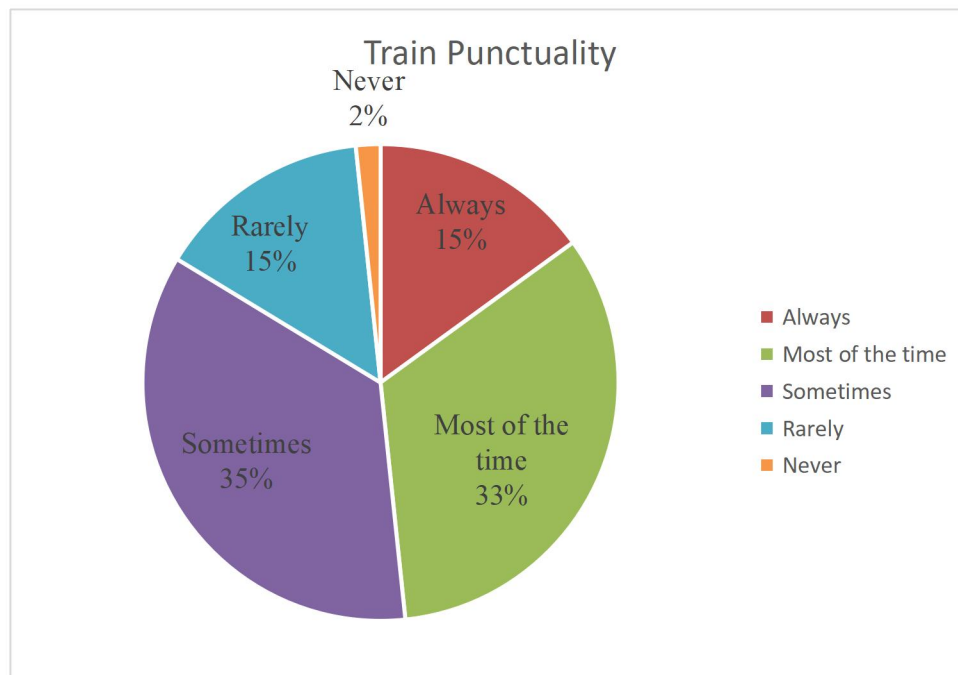


Figure 18: Train Punctuality

Figure 18: Train Punctuality: Train punctuality was mostly rated as sometimes (35%) or most of the time (33%). A smaller percentage of people felt it was always (15%) or rarely (15%) punctual, while only 2% rated it has never been punctual.

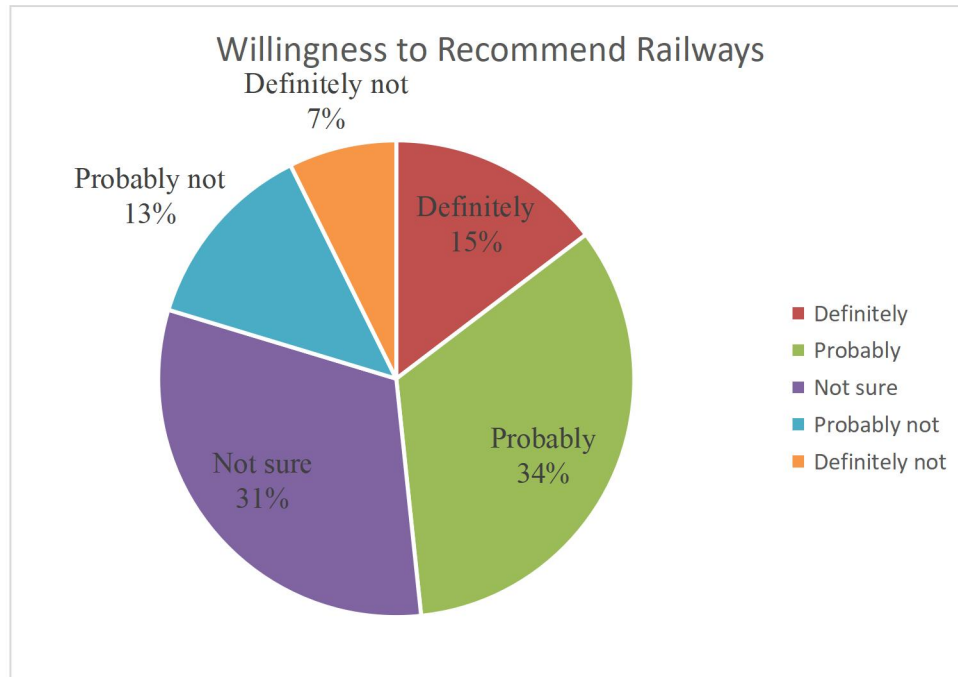


Figure 19: Willingness to Recommend Railways

Figure 19: Willingness to Recommend Railways: Willingness to recommend railways was mostly rated as probably (34%) or not sure (31%). A smaller percentage of people felt they would definitely (15%) or probably not (13%) recommend it, while 7% stated they would definitely not recommend it.

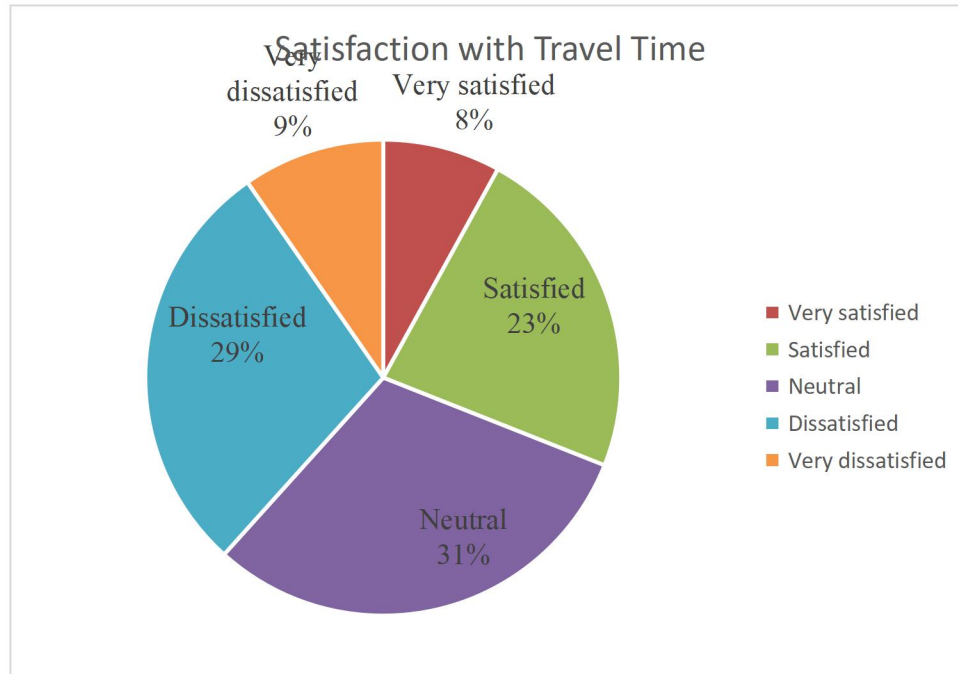


Figure 20: Satisfaction with Travel Time

Figure 20: Satisfaction with Travel Time: Satisfaction with travel time was mostly rated as dissatisfied (29%) or neutral (30%). A smaller percentage of people were satisfied (23%) or very satisfied (10%), while 10% were very dissatisfied. Most of them who were satisfied were traveling in first class compartment.

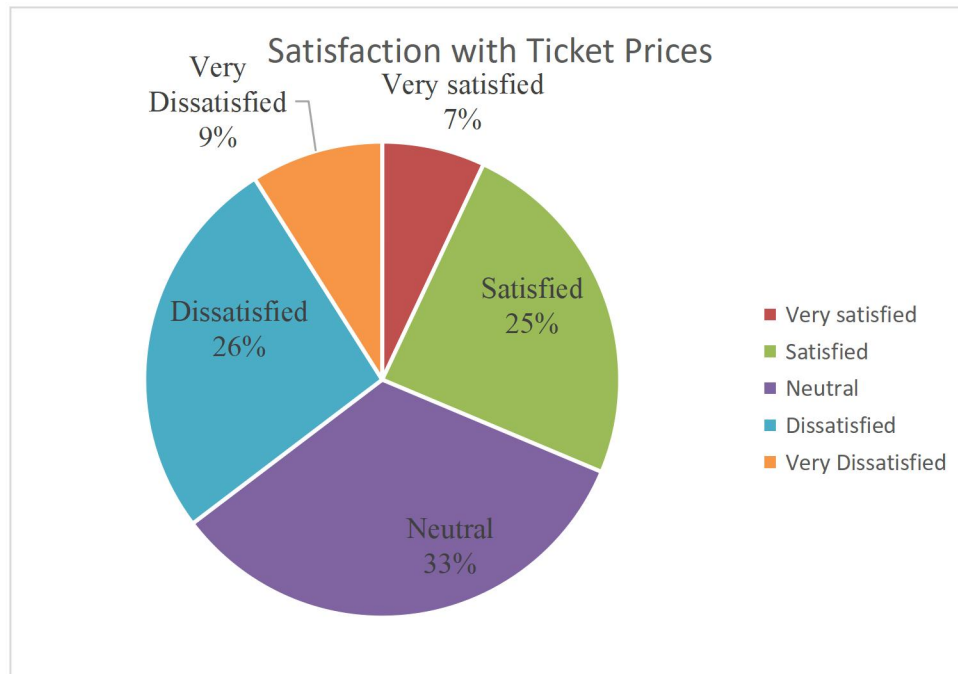


Figure 21: Satisfaction with Ticket Price

Figure 21: Satisfaction with Ticket Price: Satisfaction with ticket prices was mostly rated as neutral (33%) or dissatisfied (26%). A smaller percentage of people were satisfied (25%) or very satisfied (7%), while 7% were very dissatisfied. Most of users wants to reduce the ticket price.

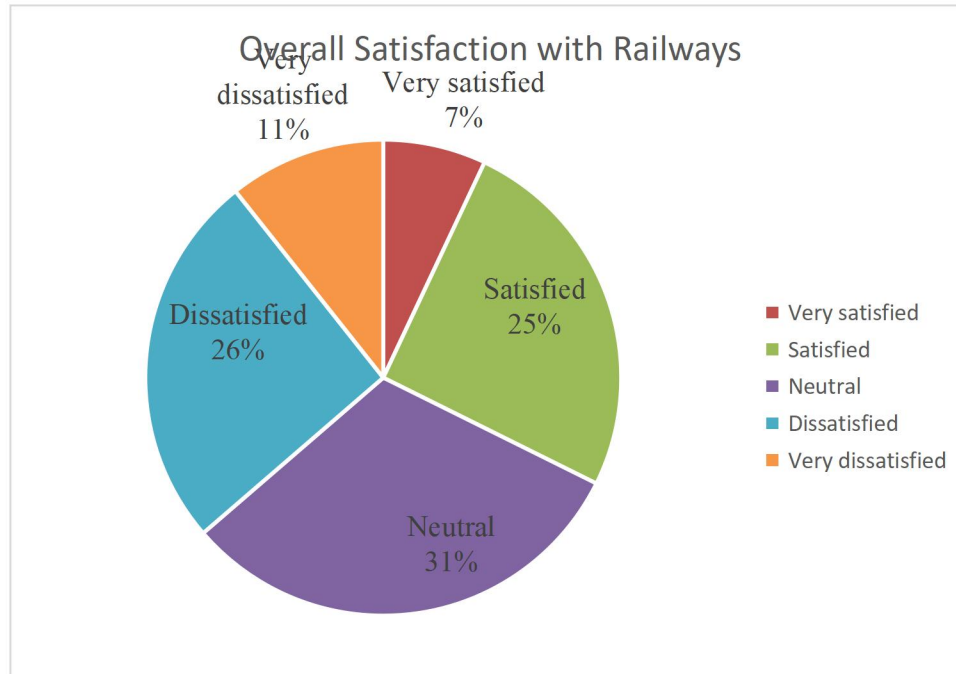


Figure 22: Overall Satisfaction with Railways

Figure 22: Overall Satisfaction with Railways: Overall satisfaction with railways was mostly rated as neutral (31%) or dissatisfied (26%). A smaller percentage of people were satisfied (25%) or very satisfied (7%), while 11% were very dissatisfied. While asking about overall satisfaction we were able to notice that the sanitary issue and travel time were affecting the overall satisfaction most.

\$Improvement Frequencies

\$Improvement ^a	Responses	Percent of Cases	
		N	Percent
Improvement in cleanliness	185	14.3%	61.7%
Improvement in punctuality	218	16.8%	72.7%
Improvement in travel time	243	18.8%	81.0%
Increase frequency	154	11.9%	51.3%
Ticket price reduction	203	15.7%	67.7%
Improvement in safety	193	14.9%	64.3%
Other improvement	98	7.6%	32.7%
Total	1294	100.0%	431.3%

a. Dichotomy group tabulated at value 1.

The charts below present insights from questions asked to Locomotive Masters. This survey aimed to identify ways to improve railway operations and tracks, ensuring more reliable and efficient services.

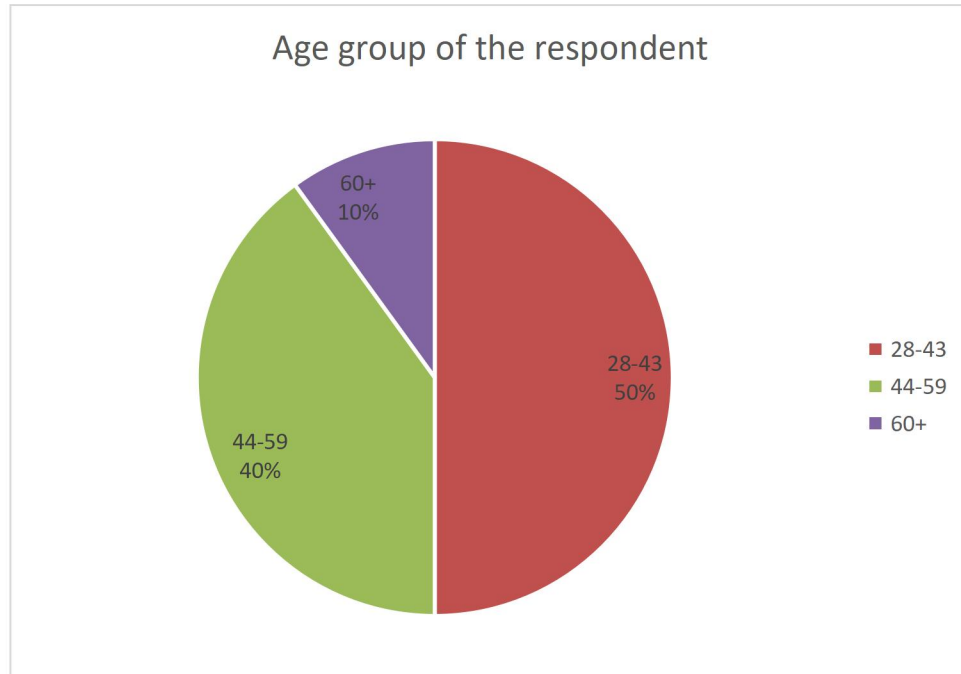


Figure 23: Age group of the respondent (LM)

Figure 23: Age group of the respondent (LM): The majority of respondents were in the 28-44 age group (50%), followed by the 44-59 age group (40%). A smaller percentage of respondents were aged 60+ (10%)

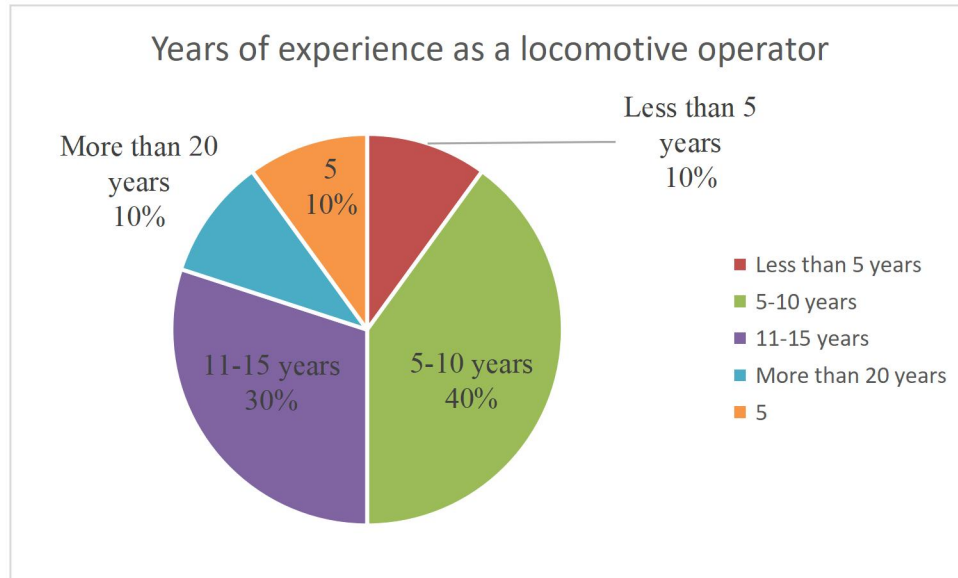


Figure 24: Years of Experience as a Locomotive Operator

Figure 24: Years of Experience as a Locomotive Operator: The majority of respondents had 5-10 years of experience (40%), followed by 11-15 years of experience (30%). A smaller percentage had less than 5 years of experience (20%), while 10% had more than 20 years of experience.

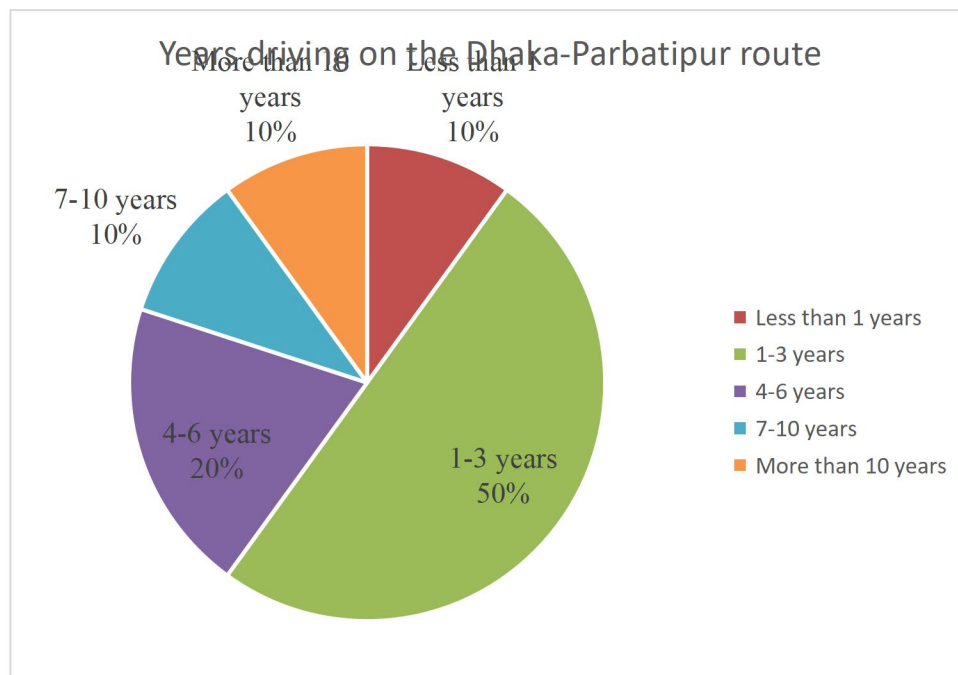


Figure 25: Years Driving on the Dhaka-Parbatipur Route

Figure 25: Years Driving on the Dhaka-Parbatipur Route: Most respondents had been driving on the Dhaka- route for 1-3 years (50%), followed by 4-6 years (20%). Smaller percentages had driven for less than one year (10%), 7-10 years (10%), or more than 10 years (10%).

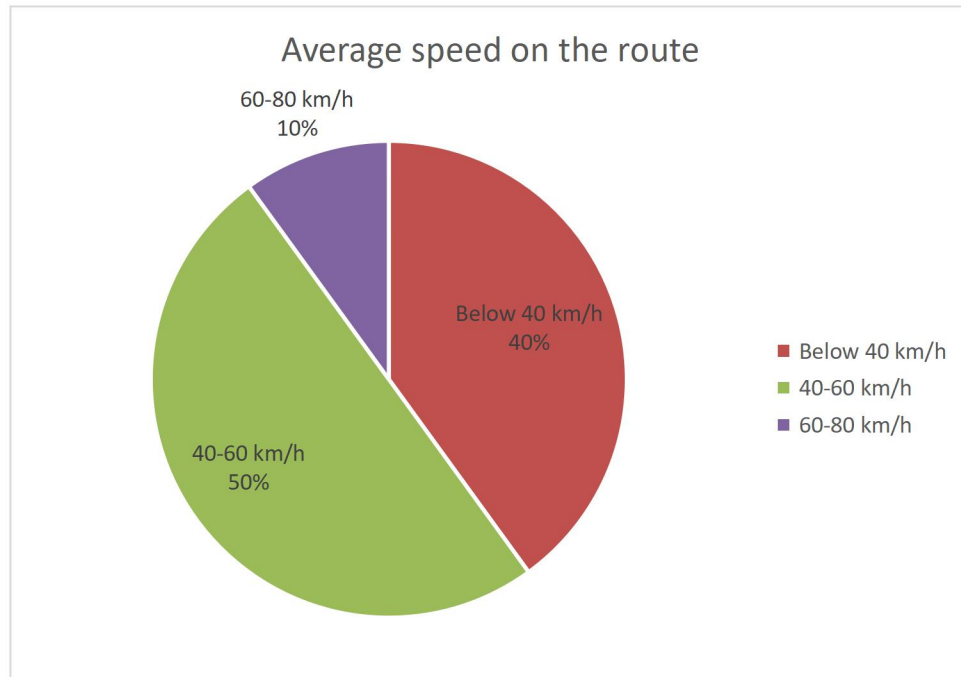


Figure 26: Average Speed on the Route

Figure 26: Average Speed on the Route: The average speed on the route was mostly reported as 40-60 km/h, followed by 60-80 km/h. A smaller percentage of respondents reported an average speed below 40 km/h.

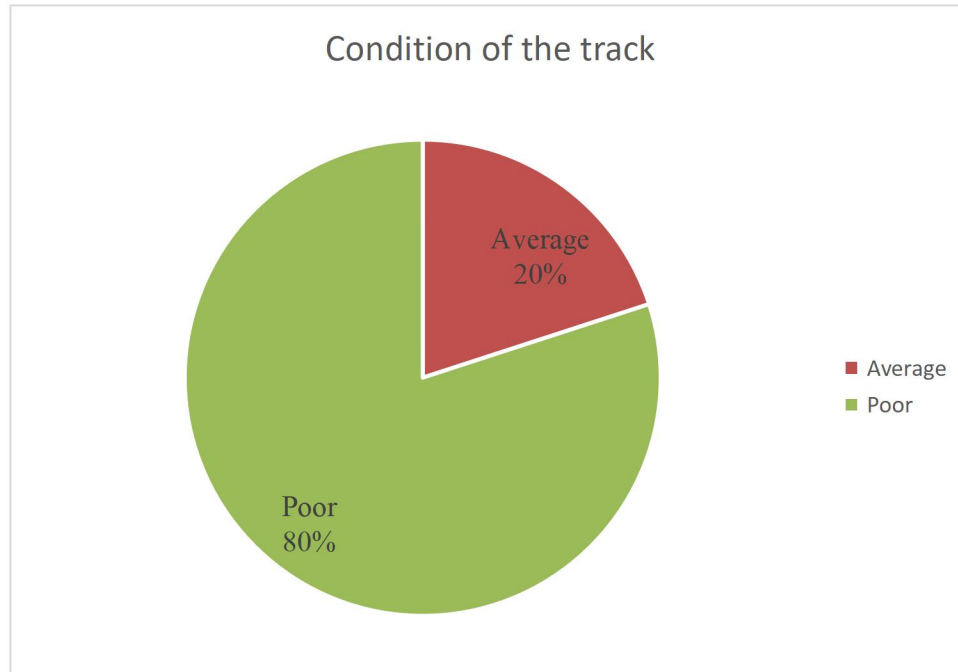


Figure 27: Condition of Track

Figure 27: Condition of Track: The condition of the track was mostly rated as poor (80%), with a smaller percentage rating it as average (20%). Need to improve the track condition including signals.

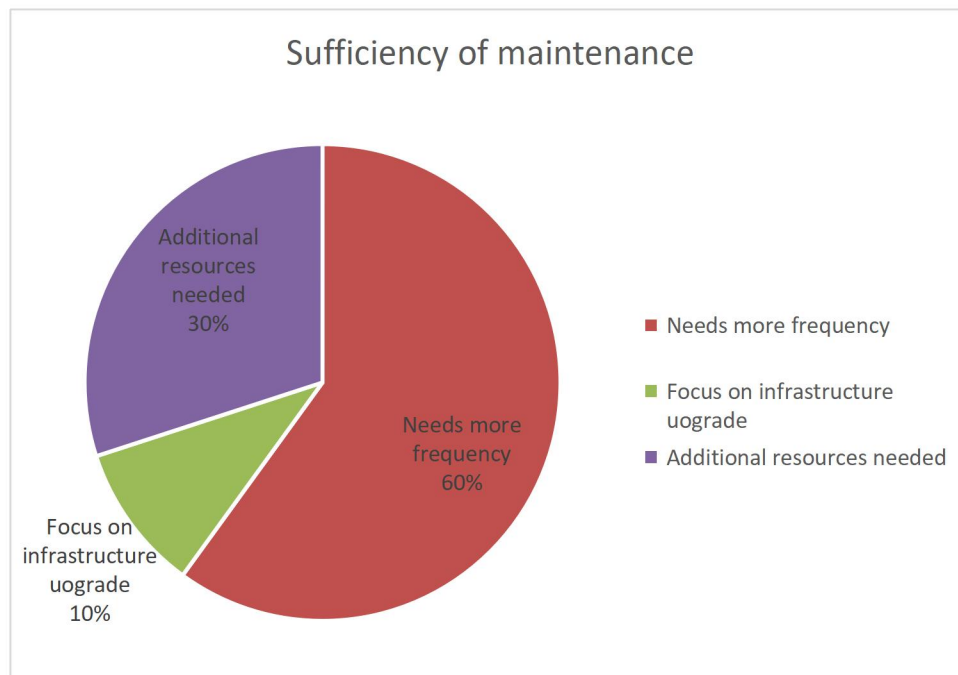


Figure 28: Sufficiency of Maintenance

Figure 28: Sufficiency of Maintenance: The majority of respondents felt that maintenance needed more frequency (60%), while 30% believed additional resources were needed. A smaller percentage (10%) felt the focus should be on infrastructure updates.

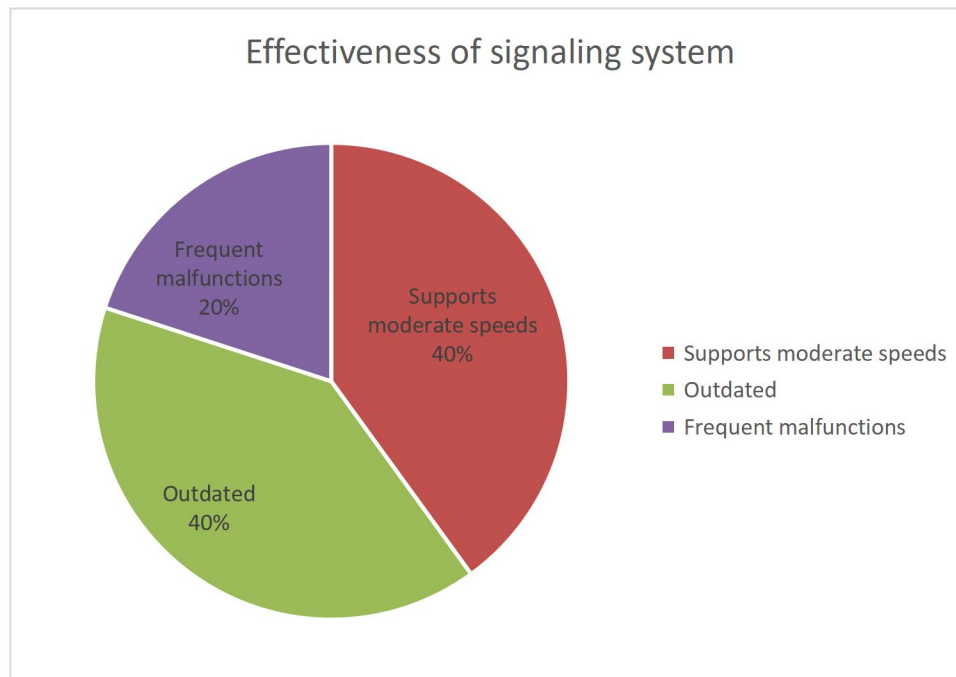


Figure 29: Effectiveness of Signaling System

Figure 29: Effectiveness of Signaling System: The signaling system is mostly seen as supporting moderate speeds (40%) or outdated (40%), with a smaller percentage mentioning frequent malfunctions (20%). Many people feel the system works okay for average speeds but isn't really built for higher speeds. It's also considered outdated, as it hasn't kept up with newer technology. On top of that, it often has problems and doesn't work properly, which can cause reliability issues.

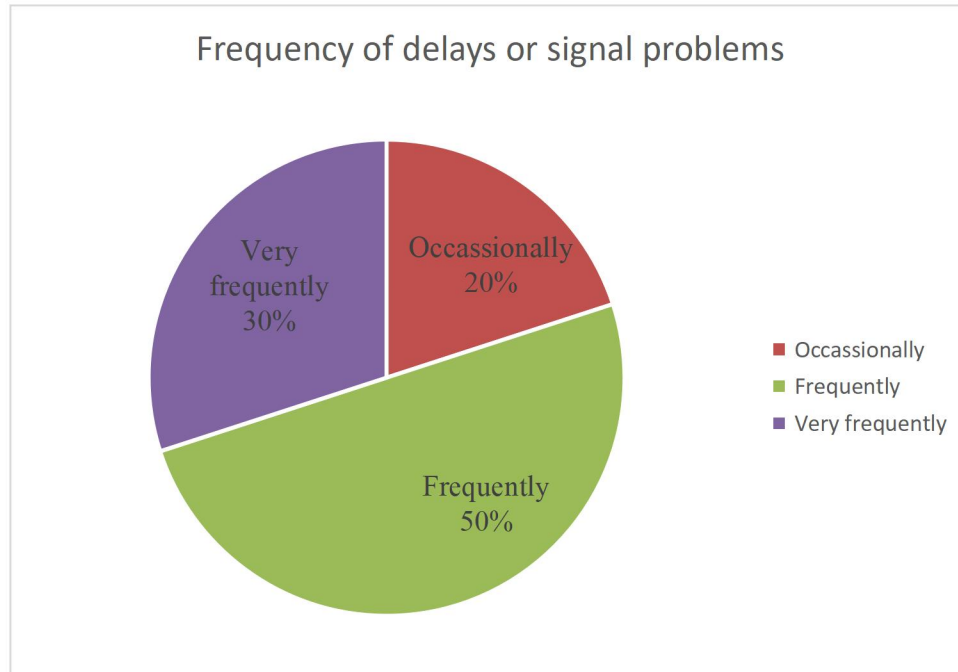


Figure 30: Frequency of Delays or Signal Problems

Figure 30: Frequency of Delays or Signal Problems: Delays due to signal problems were mostly reported as frequent (50%) or very frequent (30%). A smaller percentage of respondents said they occur occasionally (20%).

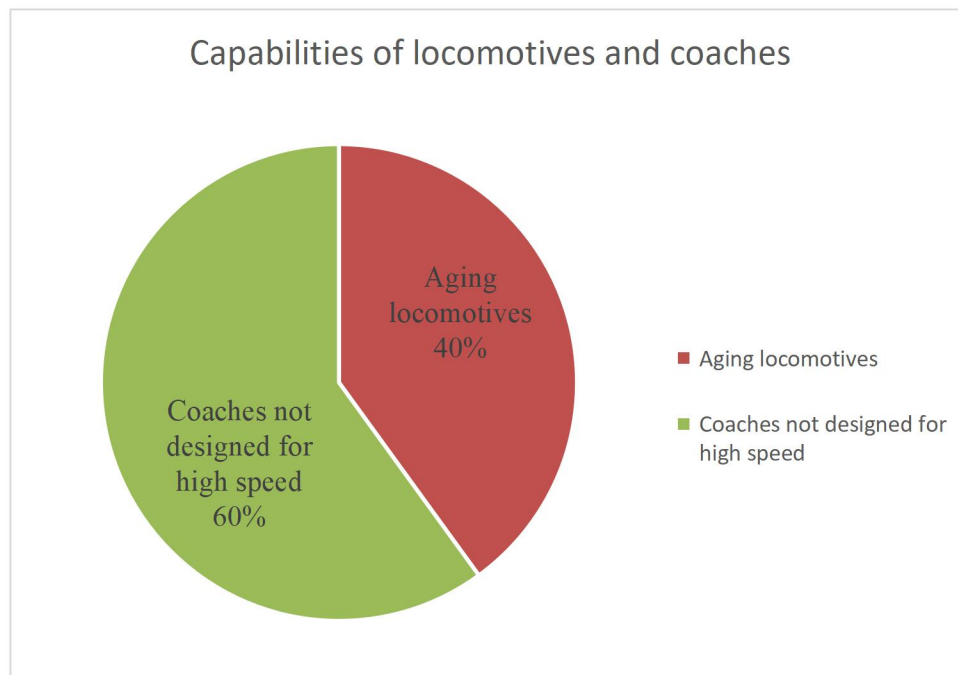


Figure 31: Capabilities of Locomotives and Coaches

Figure 31: Capabilities of Locomotives and Coaches: The locomotives were mostly described as aging (40%), while the coaches were considered not designed for high speed (60%).

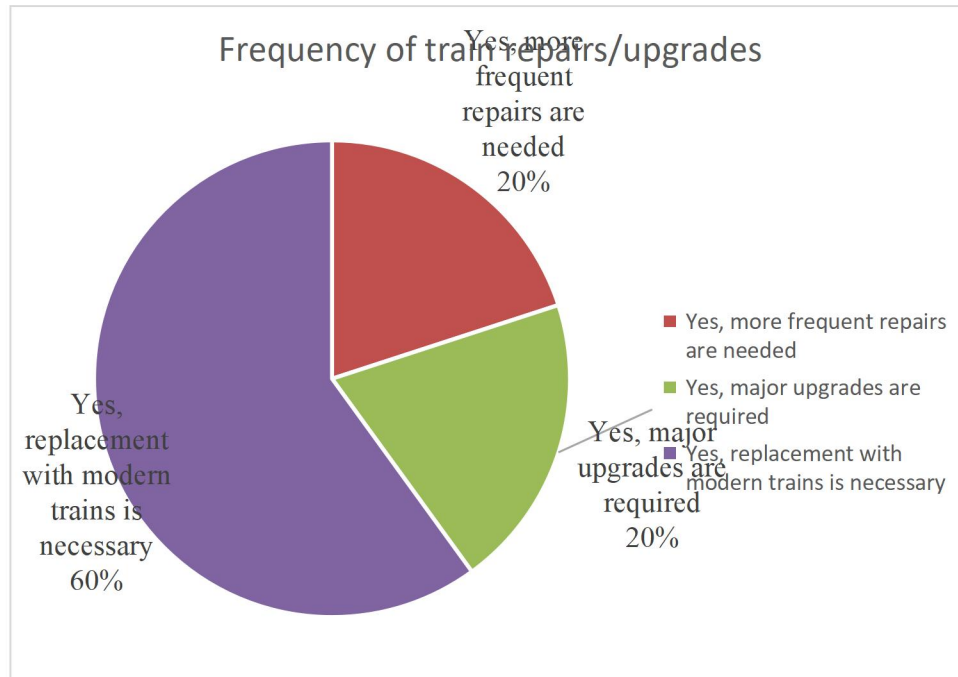


Figure 32: Frequency of Train Repairs/ Upgrades

Figure 32: Frequency of Train Repairs/ Upgrades: The majority of respondents had 5-10 years of experience (40%), followed by 11-15 years of experience (30%). A smaller percentage had less than 5 years of experience (20%), while 10% had more than 20 years of experience.

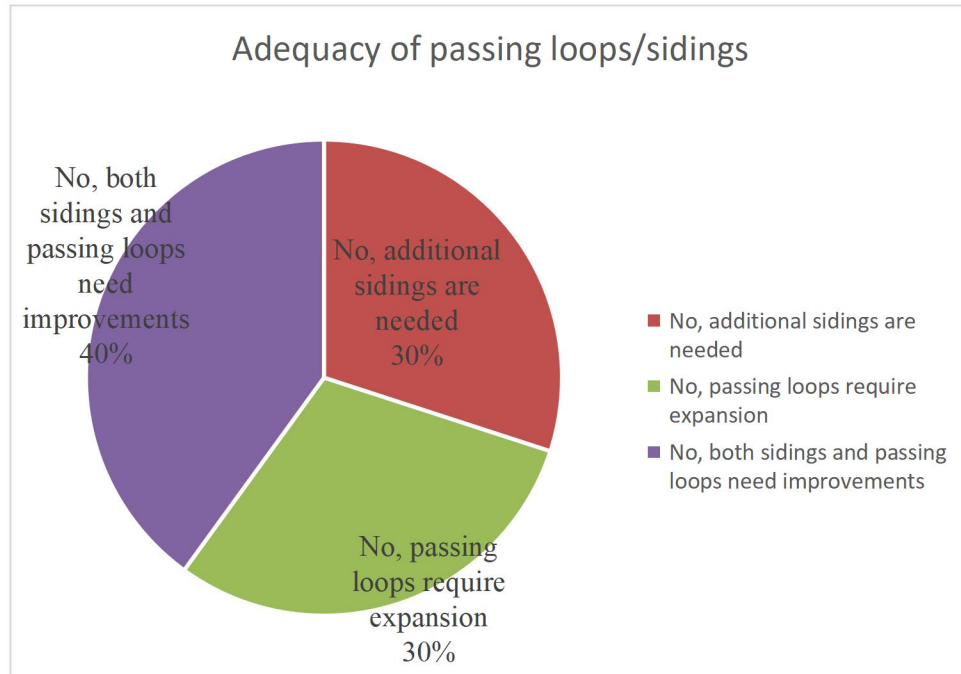


Figure 33: Adequacy of Passing Loops/ Sidings

Figure 33: Adequacy of Passing Loops/ Sidings: The majority of respondents had 5-10 years of experience (40%), followed by 11-15 years of experience (30%). A smaller percentage had less than 5 years of experience (20%), while 10% had more than 20 years of experience.

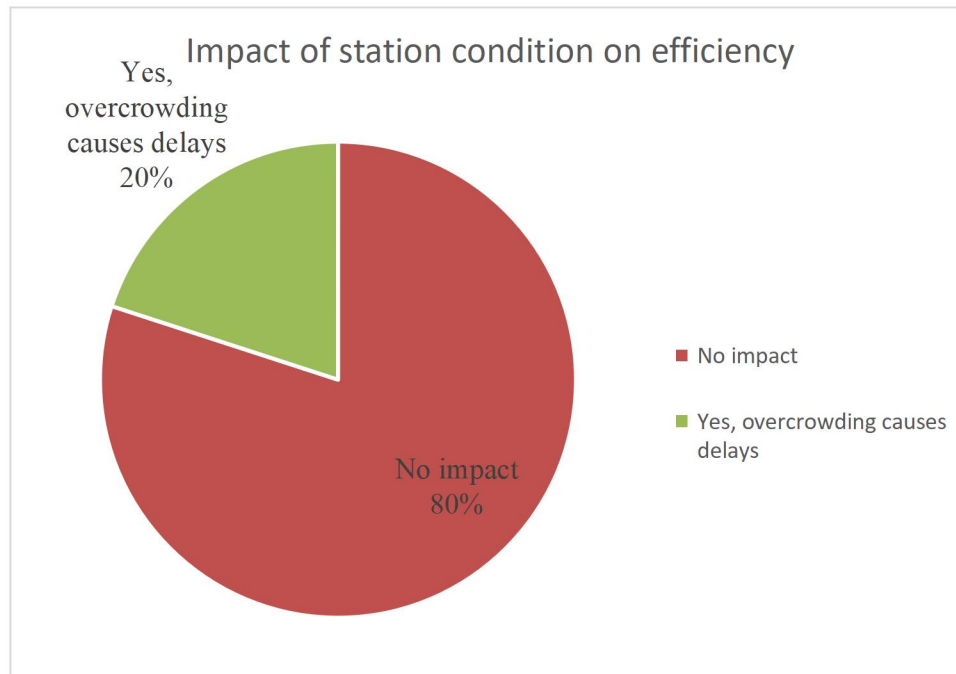


Figure 34: Impact of Station Condition on Efficiency

Figure 34: Impact of Station Condition on Efficiency: The majority of respondents (80%) felt that station conditions had no impact on efficiency, while 20% believed overcrowding causes delays.

Based on their individual experiences, the passengers and locomotive masters were asked to score each of the 19 attributes and 16 attributes on a five-point scale. The rate of passenger reaction was quite good. Positive responses were obtained from the locomotive master survey, which also identified important operating concerns. They gave information on the state of the rails, locomotives, and coaches as well as the main locations with speed limits and the reasons behind slow speeds. This information provides helpful direction for focused enhancements.

The Kaiser-Meyer-Ohlin (KMO) sample adequacy measure and Bartlett's test of sphericity were used to assess the validity of the data. The range of the KMO statistic is 0 to 1. 1 implies that factor analysis should provide different and trustworthy components, whereas a score of 0 indicates that factor analysis is unlikely to produce unique and trustworthy factors (Hadi, et.al. 2016). Values below this should cause you to reconsider which variables to include or gather additional data). Furthermore, results between 0.5

and 0.7 are considered mediocre, those between 0.7 and 0.8 are considered good and those between 0.8 and 0.9 are considered exceptional. and exceptional values are those that exceed 0.9 (Lapierre et. al. 1996). The Kaiser-Meyer-Ohlin and Bartlett's tests are displayed in Table 4

Table 4: Kaiser-Meyer-Ohlin Measure and Bartlett's Test

KMO Measure of Sampling Adequacy	0.710	
Bartlett's Test of Sphericity	Approx. Chi-Square	4116.103
	df	105
	Sig.	< .001

The data sufficiency and factor analysis validity for the current investigation are shown in the above table. This data's KMO value is 0.710. Kaiser (1974) states that this is good, thus we can be certain that factor analysis is suitable for these data.

At the <0.001 level of significance, Bartlett's Test of Sphericity yields a Chi-Square value of 4116.103 with 105 degrees of freedom. The Test of Sphericity showed that significance is perfectly valued because the significance $p < 0.05$. After determining the components' appropriateness, more research using the Principal Axis Factoring Method was recommended.

The analysis of the correlation between each variable was done using Principal Axis Factoring. The next phase in the procedure was to examine communalities, which are listed in Table 5.

Table 5: Communalities

Serial	Variables	Initial	Extraction
1	Ticket booking method	.871	.971
2	Availability of Tickets	.867	.877
3	Railway safety rating	.931	.966
4	Staff Behavior and Helpfulness	.932	.961
5	Cleanliness of Stations and Trains	.760	.563

6	Seating Comfort	.811	.701
7	Lighting in platform waiting rooms	.828	.780
8	Seating facilities in the platform waiting room	.908	.852
9	Consistency of fans on the train	.875	.858
10	The light inside train compartments	.627	.597
11	Train Punctuality	.370	.578
12	Willingness to Recommend Railways	.381	.629
13	Satisfaction with Travel Time	.649	.700
14	Satisfaction with Ticket Prices	.762	.880
15	Overall Satisfaction with Railways	.728	.782

Extraction Method: Principal Axis Factoring

4.2 Data and Analysis

Using the principal axis factoring approach, we first estimate the common variance when the communalities are less than 1. Each variable's commonality is taken to be equal to its square multiple regression coefficient about the other variables in this initial estimate. These initial estimates of the communalities are used in the principal axis factoring process to replace the correlation matrix's primary diagonal, which comprises all ones. The principal component is now applied to this improved version of the correlation matrix, as was previously described.

The above table displays the factor analysis results. Each value in the column extraction indicates the percentage of passengers who gave comparable answers to each variable. According to the ticket booking method, 97% of passengers had identical answers on this variable. In addition, we find that 88% are worried about the availability of tickets, 96% are worried about the safety rating of the railway, 96% are worried about the helpfulness and behavior of the staff, 56% are worried about the cleanliness of the station and trains, 70% are worried about the comfort of the seats, 78% are worried about the lighting in the platforms and waiting rooms, 85% are worried about the seating facilities in the platforms and waiting rooms, 85% are worried about the Consistency of fans in the train, 59% are

worried about the light inside train compartments, 57% are worried about train punctuality, 62% are worried about being willing to recommend railways, 70% are worried about the travel time, 88% are worried about the ticket prices and 78% are worried about the overall satisfaction with railways.

Choosing the number of eigenvalues greater than one was a solid general rule of thumb (according to Kaiser's criterion) when doing Principal Axis Factoring. Eigenvalue indicates how much variance (information) each factor explains. Five items could be extracted using the rule of thumb method, according to the Eigenvalues (appendix 3). Following receipt, the survey results were coded and loaded into SPSS software for statistical analysis. The data gathered for the study was assessed using the Principal Axis Factoring Rotation Method: Similar dimensions of variables from observed variables that have a better connection with observed variables and seemed unconnected but no correlation among the factors was also found by Kaiser and Varimax, the respondents' choice of normalization to identify the major components. Principal Axis Factoring with two rotational factors loading (Table 6) was used for the survey data. Loading of factors is the rotated factor matrix value. Variables having a factor loading higher than **0.60** were given a factor. Factor loading is the correlation coefficient between the factor and the variable. Factor loading shows the variance explained by the variable on that specific factor.

After factoring the first nineteen variables using varimax rotation, the major axis factoring was applied. At the factor analysis level, the link between components is explained using a statistical technique called varimax rotation. The procedure involves altering the coordinates of information obtained by looking into a primary component. The goal of the rotation or adjustment is to maximize the variance that each element shares. By optimizing the shared variance, the outcomes provide a clearer picture of the relationship between the data and each essential component. Increasing the squared correlation of items associated with one component while decreasing the correlation on any other factor is a standard procedure to optimize diversity.

Table 6: Variable Factor Loading

Factor	Variables	The loading of factors	Eigen Value	Percent of variance explained
Comfort of Passengers and the Quality of Facilities	Consistency of fans in the trains	.920	4.636	30.907
	Seating facilities in platform wait. room,	.919		
	Lighting in the platform waiting room	.876		
	Cleanliness of Stations and Trains	.745		
	Lighting inside train compartments	.768		
	Seating comfort.	.835		
Overall, Train Service Satisfaction	Satisfaction with ticket prices	.937	2.659	17.726
	Overall satisfaction with railways	.883		
	Satisfaction with travel time	.833		
Service Quality and Safety Perception	Staff behavior and helpfulness & Railway safety rating.	.978	1.991	13.272
		.980		
Ticketing Accessibility and Convenience	Ticket booking method	.979	1.808	12.052
	Availability of Tickets	.939		
Customer Loyalty and Service Reliability	Willingness to recommend railways	.791	1.585	10.570
	Train punctuality	.759		
Total Variance			84.527%	
Source: Appendix 3,4				

The statistical information in Table 6 supports the aspects of passenger satisfaction that have been established, including the comfort of passengers and the quality of facilities, overall train service satisfaction, service quality and safety perception, ticketing accessibility and convenience, customer loyalty, and service reliability. An overview of the variables affecting railway passenger satisfaction is provided in the table below. It was found that the most important factor affecting passenger satisfaction was;

Factor 1

"Comfort of Passengers and the Quality of Facilities" is the first pertinent component, with an Eigenvalue of 4.636, meaning it explains more variability than any single variable and a stated percentage of variance explained of 30.907, respectively. This indicates that nearly one-third of the variability in the data is explained by this factor, making it a dominant component. This component includes six variables: (the cleanliness of stations and trains, the lighting in the train compartments, the seating amenities in the platform waiting area, the fans in the trains and the lighting in the platform waiting area). These factors (0.920, 0.919, 0.876, 0.745, 0.768 & 0.835) have performed well. The values show how strongly each variable correlates with the component, with higher values (0.70 or greater indicates strong loading (strongly associated with the component). 0.40 to 0.69 indicates moderate loading (fairly correlated). 0.30 to 0.39 indicates weak loading (usable in exploratory analysis but not strong). Loading values less than 0.30 are considered poor and are frequently removed from the study) indicating stronger relationships. The selected variables accounted for 30.91 percent of the factor's variation.

Factor 2

"Overall, Train Service Satisfaction" is the second most significant component, with an Eigenvalue of 2.659 and a percent of variation explained of 17.726, respectively. The percent variance by this component was 17.726 percent, according to the variables that were included. With factor loading (0.937, 0.883 & 0.833), this factor is composed of three variables: contentment with (satisfaction with ticket prices, overall satisfaction with railways satisfaction with travel time).

Factor 3

"Service Quality and Safety Perception" the third component, has an Eigenvalue of 1.991 and a 13.272 percent variance explained by variables. (staff behavior and helpfulness & railway safety rating) are the two variables that make up this component, which has a factor loading of (0.978 & 0.980); it was discovered that 13.272 percent of the variation was explained by the factors that were included.

Factor 4

"Ticketing Accessibility and Convenience" the fourth component, has an Eigenvalue of 1.808 and a matching percent of variance explained of 12.052. This component has two variables termed "ticket booking method & availability of tickets) that accounted for 12.052 percent of the variation and had a factor loading of (0.979 & 0.939).

Factor 5

"Customer Loyalty and Service Reliability" is the fifth component, with a percent of variance explained of 10.570 and an Eigenvalue of 1.585. This factor, which contained the double variable (willingness to recommend railways & train punctuality) with factor loadings of (0.791 & 0.759), had a percent variance of 10.570%.

Following a careful analysis using statistical methods, elements were ranked in order of importance among the determining factors. Table 7 displays how various factors were ranked.

Table 7: Ranking of factors

Factors	Mean	Rank
Factor 1	2.289	4
Factor 2	2.823	1
Factor 3	2.501	3
Factor 4	2.806	2
Factor 5	2.015	5

Source: Appendix 5 (descending order)

Table 7 shows the ranking of factors, ranked based on the average of factors calculated by the multiplication of individual variables factor loading and mean value. For example, the Consistency of fans in the trains is one of the variables of Factor 1 with 0.92 factor loading and 2.61 mean value. The multiplication value of mean and factor loading is 2.74, other variables of Factor 1 are calculated in the same way and the average of all variables $\{(mean*factor\ loading)/6\}$ of Factor 1 is the average factor which is 2.289 (appendix-5). The highest mean value of factor 2 (Overall, Train Service Satisfaction) should be prioritized by Bangladesh Railway. To achieve complete passenger satisfaction on Bangladesh Railway, factors 4 (Ticketing Accessibility and Convenience), factor 3 (Service Quality and Safety Perception), factor 1 (Comfort of Passengers and the Quality of Facilities) and Factor 5 (Customer Loyalty and Service Reliability) should also be prioritized.

4.3 Passenger's Satisfaction Model

Based on factor analysis, we have five important components and Figure 35 suggests a model of passenger satisfaction with railway service. There are two categories of variables. The comfort of Passengers and the Quality of Facilities, Overall Train Service Satisfaction, Service Quality and Safety Perception, Ticketing Accessibility and Convenience, Customer Loyalty and Service Reliability are the independent components in the model, while passenger satisfaction is the dependent variable.



Figure 35: Research Regression Model for Determinants of Passenger Satisfaction with Railway Services

4.4 Result and Discussion

A satisfaction model has highlighted the relationship between factors about service quality and total passenger satisfaction. This model demonstrated that five different service quality characteristics (Overall Train Service Satisfaction, Ticketing Accessibility and Convenience, Service Quality and Safety Perception, Comfort of Passengers and the Quality of Facilities, Customer Loyalty and Service Reliability) were necessary to satisfy Bangladesh railway service. These five factors could explain 84.527% of the variation in passenger satisfaction with Bangladeshi railway services. According to a statistical analysis (Factor analysis SPSS 26, Principal Axis Factoring, Varimax Rotation Scree Plot), the travel duration, ticket price and overall satisfaction with railway services can significantly affect passenger happiness. The biggest issues facing Bangladesh Railway are the lines' poor state, the lack of maintenance, and the lengthy journey times. Resolving these problems would greatly increase overall satisfaction, decrease delays, and improve passenger comfort.

The Bangladesh Railway Citizen Charter states that the railway is accountable for offering a range of passenger services on the platform and train, including Overall Train Service Satisfaction, Ticketing Accessibility and Convenience, Service Quality and Safety Perception, Comfort of Passengers and the Quality of Facilities, Customer Loyalty and Service Reliability) as well as in other designated areas where travelers require assistance to safeguard their basic rights. Nevertheless, a thorough examination of sample platforms & train and field research revealed that the situation goes beyond passenger satisfaction. Among the reasons are:

Overall Train Service Satisfaction: -

The Dhaka-Parbatipur railway line faces critical challenges affecting travel comfort and efficiency. Poor track conditions, lack of maintenance, and outdated locomotives restrict speeds to an average of 40 km/h (max 85 km/h, min 35 km/h), compared to India's diesel locomotives (WDP-4, WDP-4B, WDP-4D) capable of 160 km/h. which is refer in the literature review. Frequent stops at 15–24 stations contribute to an additional two hours of travel time, thereby extending the overall journey duration, while the single combined broad and meter gauge track causes further congestion due to train crossings. This data,

which was gathered from passenger and locomotive master surveys as well as from personal inspections highlights the urgent need for improvements that must be addressed, including upgrading tracks, modernizing rolling stock for higher speeds, and addressing congestion, ensuring faster travel and enhanced service quality.

Ticketing Accessibility and Convenience: -

Tickets for Bangladesh Railway can be purchased at counters or via the Shohoz app. During peak times, the app experiences frequent issues, while counters experience long queues. Black market ticket sales worsen affordability. Improving app reliability, counter efficiency, and enforcing strict regulations against ticket reselling are crucial for enhancing passenger experience.

Service Quality and Safety Perception

Passenger surveys reveal critical issues in Bangladesh Railway: corruption, insufficient safety, and unprofessional staff. Stone-throwing incidents on the Dhaka-Parbatipur route, staff negligence in ticket checks, and bribe-based corruption in penalties compromise safety, order, and revenue. Addressing these issues is essential for improving passenger satisfaction and ensuring sustainable railway operations.

Comfort of Passengers and the Quality of Facilities

Passenger surveys highlight discomfort in Bangladesh Railway due to unreliable fans, poorly maintained seating, insufficient lighting in trains and waiting rooms, and unclean stations and train interiors. Addressing these issues by improving ventilation, seating, lighting, and cleanliness is crucial for enhancing passenger comfort, safety, trust, and overall satisfaction with railway services.

Customer Loyalty and Service Reliability

Congestion on the Dhaka-Parbatipur route, caused by numerous manual crossings, leads to long delays, reduced train flow, and financial losses. Addressing this issue would improve punctuality, passenger satisfaction, and freight efficiency, boosting trade and economic activity. Reduced delays would lower operating costs, enhance sustainability, and strengthen national transportation connectivity.

Economic growth and community promote

According to Passenger's Locomotive master survey and journal paper, the inefficiency of railway systems, particularly prolonged journey times, stems from outdated locomotives, aging coaches, and poor track maintenance. These factors prevent trains from achieving high speeds, reducing punctuality and increasing delays. Passengers face discomfort due to overcrowded and poorly equipped coaches, further decreasing satisfaction and discouraging rail travel. The lack of reliable services also affects freight operations, disrupting supply chains, increasing costs, and slowing economic activity. Addressing these challenges is vital for improving connectivity, fostering trade, and supporting regional development. Upgrading locomotives and coaches to support high-speed operations and regular track maintenance can significantly reduce travel time and enhance passenger comfort. Modernization ensures timely and reliable services, promoting passenger trust and encouraging greater rail usage. Improved efficiency benefits both passengers and freight services, driving economic growth, reducing environmental impacts, and strengthening the railway's role as a sustainable and vital component of national transportation systems. A railway company ensures passenger satisfaction by improving safety, punctuality, and facilities. It also organizes awareness campaigns on safe railway usage, engages local vendors for station shops, and provides discounted tickets for students and senior citizens. These efforts strengthen the community's trust and promote widespread use of the railway.

CHAPTER 5

CONCLUSION & RECOMMENDATION

5.1 General

A vital component of Bangladesh's transportation network, the railway system links people and promotes business. Due to problems like delays, poor customer service, and lengthy journey times, the Dhaka-Parbatipur route one of the busiest corridors continues to struggle to guarantee passenger happiness. This study intends to show the broader impacts of an effective railway system while identifying the major factors influencing passenger experiences on this route. To promote community development and economic progress through a more dependable and passenger-focused railway network, the research aims to address these issues by improving service quality, punctuality, and trip time.

5.2 Conclusion

Because of the increase in transportation along this route, there is a considerable demand for the train service. By analyzing 19 variables we discovered certain key factors based on the data we gathered from passengers. Some variables are not included due to their lower value which is (<0.6) This is the Overall Train Service Satisfaction, according to statistical data the factor avg. is so high (2.823), that it indicates that customers desire to see improvements in this variable. Similar factors include Ticketing Accessibility and Convenience (2.806-factor avg), Service Quality and Safety Perception (2.501-factor avg), Comfort of Passengers and the Quality of Facilities (2.289-factor avg.), Customer Loyalty and Service Reliability (2.015-factor avg.). These factors are needed to improve passenger satisfaction.

According to the journal increasing the satisfaction of railroad passengers has a major positive impact on both economic growth and community development. Reliable rail services improve connectivity, giving people easier access to jobs, healthcare, and education, all of which benefit communities. Additionally, improved services attract tourists, which boosts local companies and boosts regional economies. Effective railroads encourage trade by ensuring the smooth transport of goods and reducing transportation

expenses, which boosts regional and national economies. Reducing pollution and traffic on the roads results in fewer accidents and better air quality, which improves sustainability. Loyalty among enthusiastic passengers boosts revenue and ridership, enabling infrastructure reinvestment. This promotes public satisfaction and accelerates economic development.

5.3 Recommendation for Future Study

We examined the quality of passenger service at the Dhaka-Parbatipur railway services in our thesis paper, and we have identified some of these factors. Since we only examined one Bangladesh railway route, we think that future research should look at all of the routes for a comprehensive picture. We hope that our research will yield valuable data for future large-scale studies. We have worked with 19 variables, but we are hopeful that our paper will be helpful in future research on how to work with more variables in the future. We think that in future studies, we should pay more attention to gathering data and devote enough time to it. We might suggest getting in touch with each conscious passenger and getting accurate information from them. A few more passengers will refuse to give information, but data collection requires patience. Although we worked with 300 respondents, more will be needed in the future for the research field. because precise and reliable data requires a high number of responses. The analysis of the thesis was made simple by IBM SPSS software. Additionally, we think that mastering the SPSS software is essential for analyzing research data in the future.

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Appendix- 1: Descriptive statistics

Variable	Mean	St. Deviation	Analysis N
Ticket booking method	2.98	0.947	300
Availability of Tickets	2.87	0.934	300
Railway safety rating	2.06	1.044	300
Staff Behavior and Helpfulness	3.06	1.042	300
Cleanliness of Stations and Trains	2.93	0.987	300
Seating Comfort	2.81	0.998	300
Lighting in platform waiting rooms	2.53	0.930	300
Seating facilities in platform waiting room	2.58	0.913	300
Consistency of fans in the train	2.61	0.906	300
Light inside train compartments	2.54	0.951	300
Train Punctuality	2.55	0.972	300
Willingness to Recommend Railways	2.65	1.107	300
Satisfaction with Travel Time	3.09	1.104	300
Satisfaction with Ticket Prices	3.23	1.071	300
Overall satisfaction with Railways	3.25	1.102	300

Appendix- 2 matrix of correlation

		Correlation Matrix														
		F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15
Correlation	F1	1.000	.927	.039	.042	-.066	-.089	-.136	-.145	-.153	.001	.056	.057	.111	.064	.082
	F2	.927	1.000	.044	.055	-.049	-.076	-.129	-.129	-.138	-.029	.034	.019	.063	.042	.044
	F3	.039	.044	1.000	.963	.053	.060	.110	.050	.032	.108	-.025	.032	.076	.041	.039
	F4	.042	.055	.963	1.000	.058	.057	.104	.038	.017	.099	-.007	.044	.064	.036	.055
	F5	-.066	-.049	.053	.058	1.000	.866	.590	.613	.627	.528	.005	-.047	.070	.074	.054
	F6	-.089	-.076	.060	.057	.866	1.000	.661	.695	.721	.628	-.008	-.024	.046	.032	.040
	F7	-.136	-.129	.110	.104	.590	.661	1.000	.889	.814	.717	-.016	-.043	-.024	-.079	-.010
	F8	-.145	-.129	.050	.038	.613	.695	.889	1.000	.918	.684	.017	-.013	-.009	-.056	-.027
	F9	-.153	-.138	.032	.017	.627	.721	.814	.918	1.000	.728	.010	-.039	-.038	-.079	-.047
	F10	.001	-.029	.108	.099	.528	.628	.717	.684	.728	1.000	-.013	-.060	.008	-.042	.005
	F11	.056	.034	-.025	-.007	.005	-.008	-.016	.017	.010	-.013	1.000	.600	.016	-.016	-.030
	F12	.057	.019	.032	.044	-.047	-.024	-.043	-.013	-.039	-.060	.600	1.000	.056	.015	.003
	F13	.111	.063	.076	.064	.070	.046	-.024	-.009	-.038	.008	.016	.056	1.000	.779	.742
	F14	.064	.042	.041	.036	.074	.032	-.079	-.056	-.079	-.042	-.016	.015	.779	1.00	.829
	F15	.082	.044	.039	.055	.054	.040	-.010	-.027	-.047	.005	-.030	.003	.742	.829	1.000

Appendix- 3 Explanation of the Total Variance

Total Variance Explained									
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.636	30.907	30.907	4.382	29.216	29.216	4.317	28.779	28.779
2	2.659	17.726	48.633	2.468	16.454	45.669	2.378	15.855	44.634
3	1.991	13.272	61.904	1.921	12.805	58.475	1.933	12.885	57.518
4	1.808	12.052	73.957	1.735	11.564	70.039	1.868	12.450	69.968
5	1.585	10.570	84.527	1.199	7.990	78.029	1.209	8.061	78.029
6	.675	4.498	89.025						
7	.401	2.673	91.698						
8	.359	2.390	94.088						
9	.266	1.772	95.860						
10	.192	1.277	97.137						
11	.158	1.052	98.190						
12	.115	.766	98.956						
13	.068	.452	99.408						
14	.055	.363	99.771						
15	.034	.229	100.000						

Extraction Method: Principal Axis Factoring.

Appendix- 4 Rotated Factor Matrix

Rotated Factor Matrix^a

	Factor				
	1	2	3	4	5
Consistency of fans in the train	.920				
seating facilities in platform wait room	.919				
Lighting in platform waiting rooms	.876				
Seating Comfort	.835				
Lighting inside train compartments	.768				
Cleanliness of Stations and Trains	.745				
Satisfaction with Ticket Prices		.937			
Overall Satisfaction with Railways		.883			
Satisfaction with Travel Time		.833			
Railway Safety Rating			.980		
Staff Behavior and Helpfulness			.978		
Ticket booking method				.979	
Availability of Tickets				.939	
Willingness to Recommend Railways					.791
Train Punctuality					.759

Extraction Method: Principal Axis Factoring.

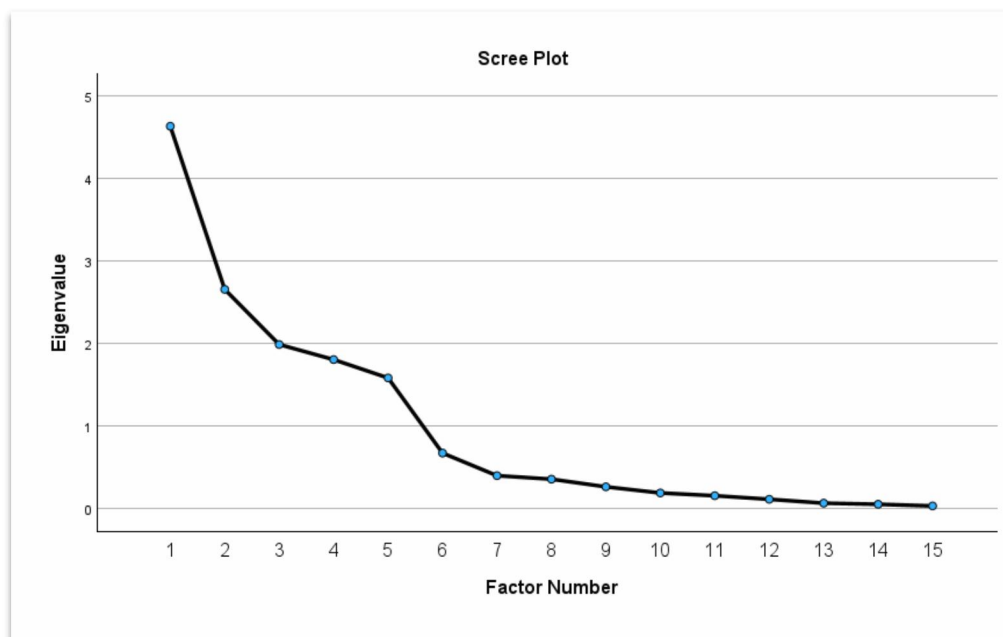
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

Appendix- 5 Average of Factors Grant

Factors	Variables	Factor Loading (1)	Mean of Factors (2)	F.L * M.F (1) * (2)	Total	Average of Factors
Comfort of Passengers and the Quality of Facilities	Consistency of fans in the trains	0.92	2.61	2.7416	13.732	2.289
	Seating facilities in platform wait. room,	0.919	2.58	2.77538		
	Lighting in platform waiting room	0.876	2.53	2.847		
	Cleanliness of Stations and Trains	0.745	2.93	2.1543		
	Lighting inside train compartments	0.768	2.54	2.25024		
	Seating comfort.	0.835	2.81	2.34635		
Overall, Train Service Satisfaction	Satisfaction with ticket prices	0.937	3.23	2.48305	8.470	2.823
	Overall satisfaction with railways	0.883	3.25	2.85209		
	Satisfaction with travel time	0.833	3.09	2.57397		
Service Quality and Safety Perception	Staff behavior and helpfulness & Railway	0.978	3.06	2.48412	5.011	2.501
	safety rating.	0.98	2.06	2.499		
Ticketing Accessibility and Convenience	Ticket booking method	0.979	2.98	2.59435	5.612	2.806
	Availability of Tickets	0.939	2.87	2.45079		
Customer Loyalty and Service Reliability	Willingness to recommend railways	0.791	2.65	2.42046	4.032	2.015
	Train punctuality	0.759	2.55	2.33772		

Appendix- 6 Scree Plot



Appendix- 7 Passenger survey question

"Assessing Passenger Satisfaction in Bangladesh Railways: A Study on Quality, Punctuality, and Travel Time"

A survey to gather insights from Passenger.

- Gender: / লিঙ্গ:**
 - Male / পুরুষ
 - Female / মহিলা
 - Other / অন্যান্য
- Age Group: / বয়স গ্রুপ:**
 - 12-27 / ১২-২৭
 - 28-43 / ২৮-৪৩
 - 44-59 / ৪৪-৫৯
 - 60 and above / ৬০ এবং তার বেশি
- Income Group: / আয় গ্রুপ:**
 - Below ৳10,000 / ৳১০,০০০ এর নিচে
 - ৳10,000 - ৳20,000 / ৳১০,০০০ - ৳২০,০০০
 - ৳20,001 - ৳40,000 / ৳২০,০০১ - ৳৪০,০০০
 - ৳40,001 - ৳60,000 / ৳৪০,০০১ - ৳৬০,০০০
 - ৳60,001 - ৳80,000 / ৳৬০,০০১ - ৳৮০,০০০
 - ৳80,001 - ৳100,000 / ৳৮০,০০১ - ৳১০০,০০০
 - Above ৳100,000 / ৳১০০,০০০ এর উপরে
- How often do you travel by Bangladesh Railways? / বাংলাদেশ রেলওয়েতে আপনি কত ঘন ঘন ভ্রমণ করেন?**
 - Daily / দৈনিক
 - Weekly / সাপ্তাহিক
 - Monthly / মাসিক
 - Occasionally / মাঝে মাঝে
 - Rarely / ক্রমাচিৎ
- How far do you typically travel on this train? / আপনি সাধারণত এই ট্রেনে কতদূর ভ্রমণ করেন?**
 - Less than 50 km / ৫০ কিলোমিটারের কম
 - 50-100 km / ৫০-১০০ কিমি
 - 101-200 km / ১০১-২০০ কিমি
 - 201-300 km / ২০১-৩০০ কিমি
 - More than 300 km / ৩০০ কিলোমিটারেরও বেশি
- What is your primary purpose for using Bangladesh Railways? / বাংলাদেশ রেলওয়ে ব্যবহার করার জন্য আপনার প্রাথমিক উদ্দেশ্য কি?**
 - Commuting to work / কাজে যাতায়াত
 - Business trips / ব্যবসায়িক ভ্রমণ
 - Education / শিক্ষা
 - Leisure/Travel / অবসর/ভ্রমণ
 - Other (please specify) / অন্যান্য (অনুগ্রহ করে উল্লেখ করুন)
- How do you usually book your railway tickets? / আপনি সাধারণত কিভাবে আপনার রেলের টিকিট বুক করেন?**
 - Online (website/app) / অনলাইন (ওয়েবসাইট/আপ)
 - At the ticket counter / টিকিট কাউন্টারে
 - Through an agent / এজেন্টের মাধ্যমে
 - Other (please specify): / অন্যান্য (অনুগ্রহ করে উল্লেখ করুন) _____
- How would you rate the availability of railway tickets for your preferred travel times? / আপনার পছন্দের ভ্রমণের সময়ে ট্রেনের টিকিটের পাপাতা আপনি কীভাবে মূল্যায়ন করবেন?**
 - Excellent / চমৎকার
 - Good / ভাল
 - Average / গড়
 - Poor / খারাপ
- How would you rate the overall safety of railway travel in Bangladesh? / বাংলাদেশে রেলপথে ভ্রমণের সামগ্রিক নিরাপত্তা আপনি কীভাবে মূল্যায়ন করবেন?**
 - Excellent / চমৎকার
 - Good / ভাল
 - Average / গড়
 - Poor / খারাপ
 - Very Poor / খুব খারাপ
- How would you rate the cleanliness of railway stations and trains? / রেলওয়ে স্টেশন এবং ট্রেনের পরিচ্ছন্নতাকে আপনি কীভাবে মূল্যায়ন করবেন?**
 - Very clean / খুব পরিষ্কার
 - Clean / পরিষ্কার
 - Average / গড়
 - Dirty / নোংরা

Very dirty / খুব নোংরা

11. How satisfied are you with the seating comfort on trains? / টেনে বসার ব্যবস্থা নিয়ে আপনি কতটা সন্তুষ্ট?

- Very satisfied / খুব সন্তুষ্ট
 Satisfied / সন্তুষ্ট
 Neutral / নিরপেক্ষ
 Dissatisfied / অসন্তুষ্ট
 Very dissatisfied / খুবই অসন্তুষ্ট

12. How do you rate the behavior and helpfulness of railway staff? / রেলওয়ে কর্মীদের আচরণ এবং সহায়কতাকে আপনি কীভাবে মূল্যায়ন করেন?

- Excellent / চমৎকার
 Good / ভাল
 Average / গড়
 Poor / খারাপ
 Very poor / খুবই খারাপ

13. How often do trains run on time, according to your experience? / আপনার অভিজ্ঞতা অনুযায়ী ট্রেন কতটা সময়মতো চলে?

- Always / সর্বদা
 Most of the time / বেশির ভাগ সময়
 Sometimes / মাঝে মাঝে
 Rarely / কদাচিৎ
 Never / কখনই না

14. How satisfied are you with the travel time compared to other transport options? / অন্যান্য পরিবহন বিকল্পের তুলনায় ভ্রমণের সময় নিয়ে আপনি কতটা সন্তুষ্ট?

- Very satisfied / খুব সন্তুষ্ট
 Satisfied / সন্তুষ্ট
 Neutral / নিরপেক্ষ
 Dissatisfied / অসন্তুষ্ট
 Very dissatisfied / খুবই অসন্তুষ্ট

15. How would you rate your overall satisfaction with Bangladesh Railways? / বাংলাদেশ রেলওয়ের প্রতি আপনার সামগ্রিক সন্তুষ্টিতে আপনি কীভাবে মূল্যায়ন করবেন?

- Very satisfied / খুব সন্তুষ্ট
 Satisfied / সন্তুষ্ট
 Neutral / নিরপেক্ষ
 Dissatisfied / অসন্তুষ্ট

Very dissatisfied / খুবই অসন্তুষ্ট

16. Would you recommend Bangladesh Railways to others? / আপনি কি অন্যদের কাছে বাংলাদেশ রেলওয়ের সুপারিশ করবেন?

- Definitely / অবশ্যই
 Probably / সম্ভবত
 Not sure / নিশ্চিত নই
 Probably not / সম্ভবত না
 Definitely not / অবশ্যই না

17. Are you satisfied with the ticket prices of Bangladesh Railways? / আপনি কি বাংলাদেশ রেলওয়ের টিকিটের দাম নিয়ে সন্তুষ্ট?

- Very satisfied / খুব সন্তুষ্ট
 Satisfied / সন্তুষ্ট
 Neutral / নিরপেক্ষ
 Dissatisfied / অসন্তুষ্ট
 Very dissatisfied / খুবই অসন্তুষ্ট

18. What improvements would you like to see in Bangladesh Railways? (Select all that apply) / বাংলাদেশ রেলওয়েতে আপনি কোন উন্নতি দেখতে চান? (প্রযোজ্য সমস্ত নির্বাচন করুন)

- Better cleanliness / ভালো পরিচ্ছন্নতা
 Improved punctuality / উন্নত সময়ানুবর্তিতা
 Shorter travel time / ভ্রমণের সময় কম
 More frequent trains / আরও ঘন ঘন ট্রেন
 Reduced ticket prices / টিকিটের দাম কমেছে
 Improved safety measures / উন্নত নিরাপত্তা ব্যবস্থা
 Other (please specify) / অন্যান্য (অনগ্রহ করে উল্লেখ করুন)

Appendix- 8 L.M survey question

"Assessing Passenger Satisfaction in Bangladesh Railways: A Study on Quality, Punctuality, and Travel Time"

A survey to gather insights from locomotive masters.

- Age Group: / বয়স গ্রুপ:**
 - 12-27 / ১২-২৭
 - 28-43 / ২৮-৪৩
 - 44-59 / ৪৪-৫৯
 - 60 and above / ৬০ এবং তার বেশি
- How many years of experience do you have as a locomotive operator? / একজন লোকোমোটিভ অপারেটর হিসাবে আপনার অভিজ্ঞতা কত বছরের?**
 - Less than 5 years / ৫ বছরের কম
 - 5-10 years / ৫-১০ বছর
 - 11-15 years / ১১-১৫ বছর
 - 16-20 years / ১৬-২০ বছর
 - More than 20 years / ২০ বছরের বেশি
- How long have you been driving on the Dhaka-Chilahati route? / আপনি কতদিন ধরে ঢাকা-চিলাহাটি রুটে ট্রেন চালাচ্ছেন?**
 - Less than 1 year / ১ বছরের কম
 - 1-3 years / ১-৩ বছর
 - 4-6 years / ৪-৬ বছর
 - 7-10 years / ৭-১০ বছর
 - More than 10 years / ১০ বছরের বেশি
- What is the current average speed of trains on this route, and what factors limit this speed? / এই রুটে ট্রেনের বর্তমান গড় গতি কত, এবং কোন কোন কারণে এই গতির সীমাবদ্ধতা রয়েছে?**

<input type="checkbox"/> Below 40 km/h / ৪০ কিমি/ঘণ্টা নিচে	<input type="checkbox"/> track issues
<input type="checkbox"/> 40-60 km/h / ৪০-৬০ কিমি/ঘণ্টা	<input type="checkbox"/> aging infrastructure
<input type="checkbox"/> 60-80 km/h / ৬০-৮০ কিমি/ঘণ্টা	<input type="checkbox"/> signal delays
<input type="checkbox"/> Above 80 km/h / ৮০ কিমি/ঘণ্টা উপরে	<input type="checkbox"/> congestion or scheduling conflicts
- Are there specific sections of the track where speed restrictions are more frequent? Why? / ট্র্যাকের নির্দিষ্ট কোনো জায়গা রয়েছে যেখানে গতি সীমাবদ্ধতা বেশী হয়? কেন?**

<input type="checkbox"/> Near urban areas/ শহরাঞ্চলের কাছাকাছি	<input type="checkbox"/> high traffic
<input type="checkbox"/> Rural sections/ গ্রামীণ অংশ	<input type="checkbox"/> track alignment issues
<input type="checkbox"/> At bridges or crossings/ সেতু বা ক্রসিং এ	<input type="checkbox"/> safety concerns
<input type="checkbox"/> No specific sections/ কোনো নির্দিষ্ট বিভাগ নেই	<input type="checkbox"/> speed restrictions apply evenly
- What are the challenges you face when driving on this route? / এই রুটে ট্রেন চালানোর সময় আপনি কোন সমস্যার সম্মুখীন হন?**
 - Poor track conditions/ খারাপ ট্র্যাক অবস্থা

- Inadequate signaling systems/ অপর্থাপ্ত সিগন্যালিং সিস্টেম
 - Frequent delays due to maintenance/ রক্ষণাবেক্ষণের কারণে ঘন ঘন বিলম্ব
 - Communication or coordination issues/ যোগাযোগ বা সমন্বয় সমস্যা
7. How would you describe the condition of the tracks on the Dhaka to Chilahati route? / ঢাকা থেকে চিলাহাটি রুটের ট্র্যাকের অবস্থা আপনি কীভাবে বর্ণনা করবেন?
- Excellent (no noticeable issues)/ চমৎকার (কোন লক্ষণীয় সমস্যা নেই)
 - Good (minor repairs needed)/ ভাল (ছোট মেরামত প্রয়োজন)
 - Average (requires consistent maintenance)/ গড় (সঙ্গত রক্ষণাবেক্ষণের প্রয়োজন)
 - Poor (significant repairs required urgently)/ খারাপ (গুরুত্বপূর্ণ মেরামত জরুরিভাবে প্রয়োজন)
8. Are there particular areas where track issues (e.g., misalignment, wear, or weak joints) affect speed? / এমন কোনো নির্দিষ্ট স্থান আছে যেখানে ট্র্যাকের সমস্যা (যেমন, অ্যালাইনমেন্টের সমস্যা, পরিধান বা দুর্বল জয়েন্ট) গতি প্রভাবিত করে?
- Urban stretches/ শহুরে প্রসারিত
 - Rural areas/ গ্রামীণ এলাকা
 - Bridge approaches/ ব্রিজের শুরু অথবা শেষে
 - Entire route has such issues/ পুরো রুটেই এমন সমস্যা রয়েছে
9. Do you feel that maintenance on this route is sufficient and regular? What improvements would you suggest? / আপনি কি মনে করেন যে এই রুটে রক্ষণাবেক্ষণ যথেষ্ট এবং নিয়মিত? কি উন্নতি আপনি সুপারিশ করবেন?
- Yes, maintenance is adequate/ হ্যাঁ, রক্ষণাবেক্ষণ পর্যাপ্ত
 - No, it needs to be more frequent/ না, এটি আরও ঘন ঘন হওয়া দরকার
 - No, focus should be on upgrading infrastructure/ না, অবকাঠামো উন্নয়নে ফোকাস করা উচিত
 - No, additional resources (funds/equipment) are required/ না, অতিরিক্ত সম্পদ (তহবিল/সরঞ্জাম) প্রয়োজন
10. Do signaling systems on this route allow for higher speeds, or are there limitations? / এই রুটে কি সিগন্যালিং সিস্টেমগুলি উচ্চ গতির জন্য অনুমতি দেয়, নাকি সীমাবদ্ধতা আছে?
- Fully support higher speeds/ সম্পূর্ণরূপে উচ্চ গতি সমর্থন
 - Support moderate speeds but need upgrading/ মাঝারি গতি সমর্থন কিন্তু আপগ্রেড প্রয়োজন
 - Outdated systems limit speed significantly/ পুরানো সিস্টেম উল্লেখযোগ্যভাবে গতি সীমিত
 - Frequent malfunctions make them unreliable/ ঘন ঘন ত্রুটিগুলি তাদের অ বিশ্বস্ত করে তোলে
11. How often do you face unexpected delays or signal problems? / আপনি কত ঘন ঘন অপ্রত্যাশিত বিলম্ব বা সংকেত সমস্যার সম্মুখীন হন?
- Rarely (less than once a week)/ কদাচিৎ (সপ্তাহে একবারেরও কম)
 - Occasionally (1–2 times a week)/ মাঝে মাঝে (সপ্তাহে 1-2 বার)
 - Frequently (3–5 times a week)/ ঘন ঘন (সপ্তাহে 3-5 বার)
 - Very frequently (almost daily)/ খুব ঘন ঘন (প্রায় প্রতিদিন)
12. Are the locomotives and coaches you use on this route capable of higher speeds, or are there limitations? / আপনি এই রুটে যে লোকোমোটিভ এবং কোচগুলি ব্যবহার করেন সেগুলি কি উচ্চ গতিতে সক্ষম, নাকি সীমাবদ্ধতা আছে?
- Fully capable of higher speeds/ উচ্চ গতিতে সম্পূর্ণরূপে সক্ষম
 - Minor repairs/upgrades needed for optimal performance/ সর্বোত্তম কর্মক্ষমতার জন্য ছোটখাটো মেরামত/আপগ্রেড প্রয়োজন

- Aging locomotives limit speed/ বার্ষিক্যজনিত লোকোমোটিভ গতি সীমিত করে
 - Coaches are not designed for high-speed travel/ কোচ উচ্চ গতির ভ্রমণের জন্য ডিজাইন করা হয় না
13. **Do the trains require more frequent repairs or upgrades to achieve better performance? / ভালো পারফরম্যান্স অর্জনের জন্য ট্রেনগুলির কি ঘন ঘন মেরামত বা আপগ্রেডের প্রয়োজন হয়?**
- No, current maintenance is sufficient/ না, বর্তমান রক্ষণাবেক্ষণ যথেষ্ট
 - Yes, more frequent repairs are needed/ হ্যাঁ, আরও ঘন ঘন মেরামতের প্রয়োজন
 - Yes, major upgrades to engines and systems are required/ হ্যাঁ, ইঞ্জিন এবং সিস্টেমে বড় আপগ্রেড প্রয়োজন
 - Yes, replacement with modern trains is necessary/ হ্যাঁ, আধুনিক ট্রেনের সাথে প্রতিস্থাপন প্রয়োজন
14. **Are there enough passing loops or sidings to avoid congestion on the route? / রুটে যানজট এড়াতে পর্যাপ্ত পাসিং লুপ বা সাইডিং আছে কি?**
- Yes, sufficient infrastructure exists/ হ্যাঁ, পর্যাপ্ত পরিকাঠামো বিদ্যমান
 - No, additional sidings are needed in key sections/ না, মূল বিভাগে অতিরিক্ত সাইডিং প্রয়োজন
 - No, passing loops require expansion/ না, পাসিং লুপগুলির সম্প্রসারণ প্রয়োজন
 - No, both sidings and passing loops need improvements/ না, সাইডিং এবং পাসিং লুপ উভয়েরই উন্নতি প্রয়োজন
15. **How do station conditions affect the speed and efficiency of the journey? / স্টেশনের অবস্থা কীভাবে যাত্রার গতি এবং দক্ষতাকে প্রভাবিত করে?**
- No, stations do not impact efficiency/ না, স্টেশনগুলি কার্যক্ষমতা প্রভাবিত করে না
 - Yes, overcrowding causes delays/ হ্যাঁ, অতিরিক্ত ভিড় বিলম্বের কারণ
 - Yes, poorly maintained infrastructure slows operations/ হ্যাঁ, খারাপভাবে রক্ষণাবেক্ষণ করা অবকাঠামো কার্যক্রমকে ধীর করে দেয়
 - Yes, insufficient platforms and tracks create bottlenecks/ হ্যাঁ, অপূর্ণ প্ল্যাটফর্ম এবং ট্র্যাক বাধা সৃষ্টি করে
16. **If resources were available, what would be your top priority for improvement on this route? /যদি সম্পদ পাওয়া যায়, তাহলে এই রুটে উন্নতির জন্য আপনার সর্বোচ্চ অগ্রাধিকার কি হবে?**
- Upgrading tracks for higher speed limits/ উচ্চ গতির সীমার জন্য ট্র্যাক আপগ্রেড করা হচ্ছে
 - Modernizing signaling systems/ সিগন্যালিং সিস্টেমের আধুনিকীকরণ
 - Increasing frequency of maintenance/ রক্ষণাবেক্ষণের ফ্রিকোয়েন্সি বাড়ছে
 - Replacing or upgrading locomotives and coaches/ লোকোমোটিভ এবং কোচ প্রতিস্থাপন বা আপগ্রেড করা

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