

Insights into Passenger Transport Choices: A Mumbai Case Study

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Abstract: *Understanding and studying passenger preferences in passenger transportation systems is important to optimise transportation infrastructure and increase passenger satisfaction. This paper presents a comprehensive case study conducted in Mumbai, India, which aims to understand the diverse preferences of commuters using different modes of transport within the city.*

Adopting a mixed-methods approach, data were accumulated by means of surveys, interviews, and observational studies conducted across different demographic sectors and geographical locations of Mumbai. The study analysed factors influencing commuters' mode choice, including cost, comfort, convenience, travel time, safety, and environmental concerns.

The findings revealed significant differences in the preferences of commuters, impacted by factors like socioeconomic status, occupation, travel distance, and access to infrastructure. While public transportation emerged as the dominant mode for daily commuting, preferences were nuanced, some demographics prefer private modes like cars and motorcycles.

Additionally, the study identifies areas of improvement in the existing transport infrastructure and suggests measures to enhance the reliability, frequency, safety, and connectivity of public transport services.

The knowledge gleaned from this research provides valuable guidance for policymakers, urban planners, and transportation authorities in Mumbai, offering opportunities to tailor transportation solutions that align with commuters' preferences, thereby promoting sustainable and efficient passenger transport systems in the city.

Keywords: Commuters, Preferences, Passenger Transport, Mumbai, Urban Transportation, Survey, Mixed-Methods, Policy Recommendations

I. INTRODUCTION

Mumbai, often called the financial capital of India, is one of the most populous cities globally, with millions of commuters relying on various modes of transportation every day. The study, titled "Insights into Passenger Transport Choice: A Mumbai Case Study", looks at how people in Mumbai decide how to get around. Mumbai is a big city with a lot of people and different types of transportation like trains, buses, taxis and cars. This study seeks to understand why people choose one type of transportation over another.

Researchers asked people questions and looked at data to find out what influenced their choices. They wanted to know whether things like cost, convenience, comfort, or the environment affect the way people travel. By studying these factors, they hope to help improve transportation in Mumbai.

This research could help city planners and policymakers figure out how to improve transportation options for everyone. They might find ways to make travel easier, cheaper, or more eco-friendly. Understanding what people want and need in transportation can lead to making Mumbai's transportation system work better for everyone who lives there.

II. LITERATURE REVIEW

Patel and Desai (2020) provide valuable insights into commuters' mode choices in Mumbai in their paper titled "Commuters' Mode Preferences in Mumbai: A Survey Analysis." Through comprehensive survey analysis, the authors

illuminate commuters' preferences, revealing the range of transportation modes used in the city. The research enhances understanding of commuter behavior and decision-making processes regarding transport modes. By identifying key factors influencing mode preferences, such as convenience, cost, and accessibility, the study offers practical implications for urban transportation planning and policy development in Mumbai. However, further exploration of specific demographic factors and their influence on mode preferences could enrich future research.

Sharma and Gupta (2019) conducted a study on commuters' satisfaction with public transport services in Mumbai, published in the Journal of Urban Transportation. Employing a quantitative approach, the research aims to understand the factors influencing commuters' satisfaction, utilizing survey data from a commuter sample. Findings indicate that service reliability, comfort, safety, and affordability significantly impact commuters' satisfaction levels. The authors emphasize the importance of enhancing these aspects to improve overall satisfaction with public transport services in Mumbai. However, the review lacks detailed information on methodologies employed and study limitations, necessitating further critical analysis..

Khan and Mehta (2018) investigate the influence of socio-economic factors on commuters' mode choice in the Mumbai Metropolitan Region. Utilizing rigorous empirical analysis, the study emphasizes the significant impact of variables such as income, education, occupation, and household size on transportation decisions. The findings highlight the intricate relationship between socioeconomic factors and commuting preferences, offering valuable insights for transportation planners and policymakers. However, additional research could explore additional contextual factors and potential policy interventions to address commuting challenges in rapidly growing urban areas like Mumbai.

Joshi and Shah's (2017) study investigates the influence of accessibility on commuters' preferences within Mumbai's suburban rail network. The authors explore how factors such as station facilities, connectivity, and travel time affect commuter choices. Through a comprehensive analysis, they highlight the significance of accessibility in shaping commuters' preferences. This research provides valuable insights for urban planners and policymakers in improving transportation infrastructure to meet the needs of commuters efficiently. Overall, Joshi and Shah offer a pertinent examination of the role of accessibility in shaping commuter behaviour.

Gupta and Singh (2016) examine the impact of service quality on commuters' mode choice within Mumbai's Bus Rapid Transit System. Through their study published in the Journal of Public Transportation, they delve into the critical role of service quality in influencing commuters' decisions. The authors' research sheds light on the significance of factors such as reliability, convenience, and comfort in shaping commuters' preferences for utilising public transportation. Their findings offer valuable insights for enhancing the effectiveness and attractiveness of urban transit systems.

Patel and Shah (2015) investigate Mumbai's passenger transport system, focusing on commuters' perceptions of safety and security. Published in the Journal of Transportation Security, their study discusses factors influencing perceptions and offers insights into the complex dynamics of safety and security within urban transportation systems. The research underscores the significance of understanding commuter perspectives for enhancing safety measures in public transport networks, shedding light on crucial aspects impacting commuters' experiences.

Mehta and Sharma (2014) investigate the influence of fare structures on commuters' mode choice within Mumbai's Metro System. Employing a case study approach, they assess various factors affecting commuters' decisions. The study underscores the significance of fare structure in shaping mode preferences and suggests implications for policy and planning. However, the limited scope of the case study may constrain the generalizability of findings beyond the Mumbai context.

Objectives of the study:

Investigate the factors influencing commuters' preferences in passenger transport within the Mumbai region.
Analyze the significance of various transport modes (e.g., buses, trains, taxis) in meeting commuters' needs in Mumbai.
Study the challenges commuters face in accessing and utilising different modes of passenger transport in Mumbai.
Suggest the potential strategies and interventions to improve commuter satisfaction and efficiency in Mumbai's passenger transport system.

Need and significance of various transport modes

1. Local Trains (Suburban Rail Network):

Significance:

- Mumbai's local train network is considered the lifeline of the city.
- It serves millions of commuters daily.
- The network offers a cost-effective transportation option.
- It is particularly efficient for those traveling long distances within the city and its suburbs.
- The trains provide relatively fast transit compared to other modes of transport.
- The local train system plays a vital role in Mumbai's transportation infrastructure.

Meeting Commuters' Needs:

- Local trains efficiently serve densely populated areas.
- They play a crucial role in alleviating road congestion.
- Commuters rely on them for daily commuting to work, education, and other activities.
- The trains are particularly important for facilitating smooth transportation in Mumbai.

2. Buses:

Significance:

- Buses play a vital role in providing connectivity to areas not served by trains.
- They offer flexibility in routes, reaching areas inaccessible by train.
- Buses cater to a diverse range of commuters, including those who cannot access or afford other modes of transport.
- They contribute significantly to the overall transportation network's accessibility and inclusivity.

Meeting Commuters' Needs:

- Buses are essential for short to medium-distance travel within the city.
- They connect residential areas, commercial hubs, and other key locations.
- Buses serve as feeder services to railway stations and metro stations, enhancing overall accessibility.
- Their role in providing last-mile connectivity is crucial for commuters' convenience and efficiency.

3. Taxis and Auto-rickshaws:

Significance:

- Taxis and auto-rickshaws offer door-to-door transport services.
- They provide convenience and flexibility to commuters.
- Especially useful for travel to destinations not easily accessible by public transport.
- These modes of transportation cater to individual needs, offering personalised travel options within the city.

Meeting Commuters' Needs:

- Taxis and auto-rickshaws are preferred for their point-to-point service.
- They cater to commuters with specific time constraints or those traveling to areas with limited public transport options.
- These modes of transport offer a more comfortable and private alternative.
- While fares may be higher, they provide convenience and personalised service to passengers.

4. Metro Rail:

Significance:

- Mumbai's metro rail system is a relatively recent addition to the city's transport network.

- It aims to provide faster and more efficient travel options.
- Particularly beneficial along congested corridors.
- The metro system enhances connectivity and reduces travel time for commuters.

Meeting Commuters' Needs:

- The metro serves as a rapid transit option, providing comfortable and reliable transport.
- It is particularly beneficial for longer distances and areas with heavy traffic congestion.
- The metro attracts commuters seeking a balance between speed, comfort, and reliability.
- Its presence enhances the overall transportation infrastructure of Mumbai, offering an efficient alternative to alleviate congestion on roads and other modes of transport.

Challenges commuters face in accessing and utilizing different modes of passenger transport in Mumbai

- **Congestion and Overcrowding:** Mumbai's transport infrastructure, particularly its local trains and buses, often grapple with severe congestion and overcrowding, especially during peak hours. This makes accessing and utilising these modes uncomfortable and sometimes unsafe for commuters.
- **Limited Last-Mile Connectivity:** While Mumbai's local train network is extensive, many commuters face challenges in reaching their final destinations due to limited last-mile connectivity. This lack of connectivity often necessitates additional modes of transport, such as auto-rickshaws or taxis, adding to commute times and costs.
- **Infrastructure Constraints:** The city's road infrastructure is often inadequate to handle the volume of traffic, leading to bottlenecks, delays, and increased travel times for commuters using buses, taxis, and private vehicles.
- **Safety Concerns:** Commuters, especially women, often face safety concerns while accessing and utilising certain modes of transport, particularly during late hours. Incidents of harassment and theft are not uncommon, affecting commuters' confidence in using public transport, particularly buses and trains.
- **Affordability:** While public transport options like buses and trains are relatively affordable, the cost of alternative modes such as taxis and app-based ride-hailing services can be prohibitive for many commuters, particularly those from lower-income groups.
- **Information Accessibility:** Access to real-time information about schedules, routes, and disruptions is essential for efficient use of public transport. However, many commuters face challenges in accessing timely and accurate information, leading to uncertainties and inconveniences during their journeys.
- **Lack of Accessibility for Persons with Disabilities:** Mumbai's transport infrastructure often lacks accessibility features for persons with disabilities, making it challenging for them to access and utilise different modes of transport independently.
- **Environmental Concerns:** Mumbai's reliance on motorised transport contributes to air and noise pollution, impacting the health and well-being of commuters and residents. This can deter individuals from using certain modes of transport, particularly those that rely on fossil fuels.

III. METHODOLOGY

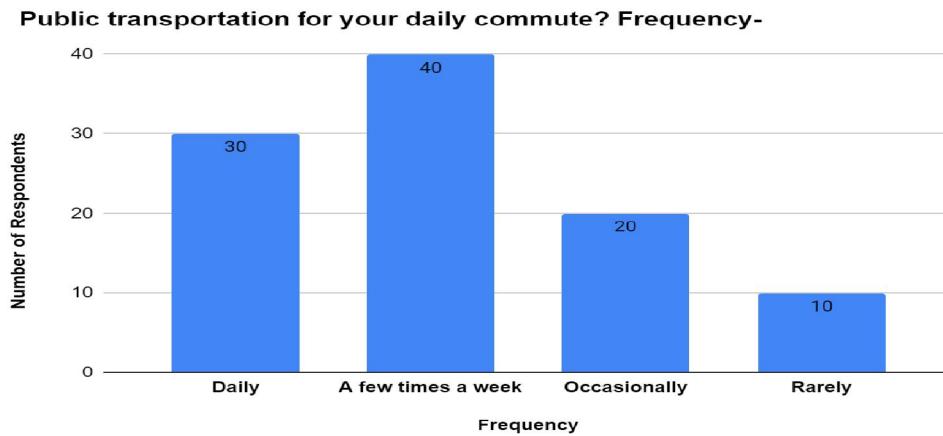
- **Sampling Method:** A stratified random sampling technique was employed to ensure the representation of different age groups across various geographical areas of Mumbai. This method ensured that each age group had a proportionate representation in the study sample.
- **Data Collection:** Surveys were conducted using a structured questionnaire distributed either face-to-face or through online platforms, considering the accessibility and convenience of the participants. The questionnaire focused on capturing information related to the participant's age, the primary mode of transport (bus, auto-rickshaw, taxi, personal vehicle), frequency of use, reasons for choice, and perceived barriers to alternative modes of transport.

IV. DISCUSSION AND RESULTS

Table: Frequency of using public transportation for their daily commut

Frequency	Number of Respondents
Daily	30
A few times a week	40
Occasionally	20
Rarely	10
Total	100

Chart: Frequency of using public transportation for their daily commute:



Results

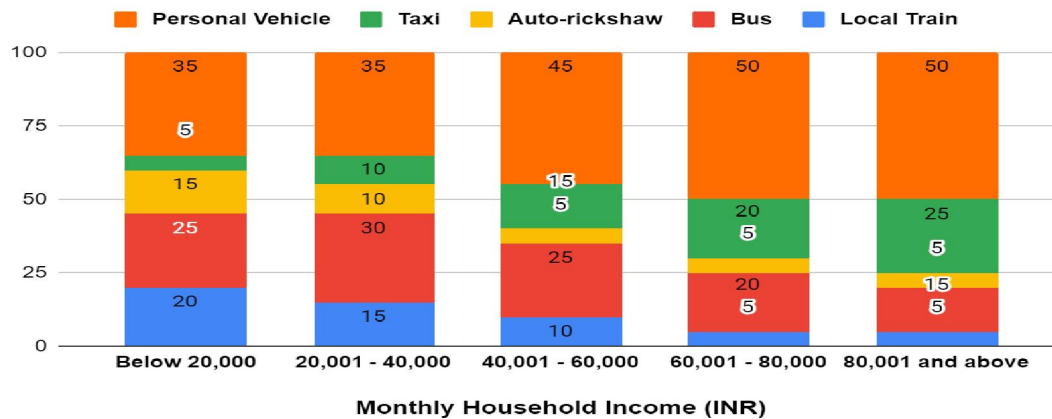
- **Daily:** 30 out of 100 respondents use public transportation daily for their commute. This indicates a significant portion of the sample relies on public transit as their primary mode of transportation.
- **A few times a week:** 40 respondents use public transportation a few times a week. This suggests that a considerable number of individuals use it regularly but not on a daily basis, possibly opting for other modes of transportation occasionally.
- **Occasionally:** 20 respondents use public transportation occasionally. This might include situations where they use it when needed, but it's not a regular part of their commute routine.
- **Rarely:** 10 respondents rarely use public transportation for their daily commute. This group likely prefers alternative modes of transportation such as personal vehicles, biking, or walking.
- Overall, it appears that a majority of the respondents utilize public transportation to some extent, with a significant portion using it either daily or a few times a week. This suggests that public transit plays a vital role in the transportation habits of the surveyed population.

1.2. Table: Preferred mode of transportation categorized by their monthly household income.

Monthly Household Income (INR)	Local Train	Bus	Auto-rickshaw	Taxi	Personal Vehicle	Grand Total
Below 20,000	20	25	15	5	35	100
20,001 - 40,000	15	30	10	10	35	100
40,001 - 60,000	10	25	5	15	45	100
60,001 - 80,000	5	20	5	20	50	100
80,001 and above	5	15	5	25	50	100

1.2 Chart: Preferred mode of transportation categorized by their monthly household income.

Local Train, Bus, Auto-rickshaw, Taxi and Personal Vehicle



Results:

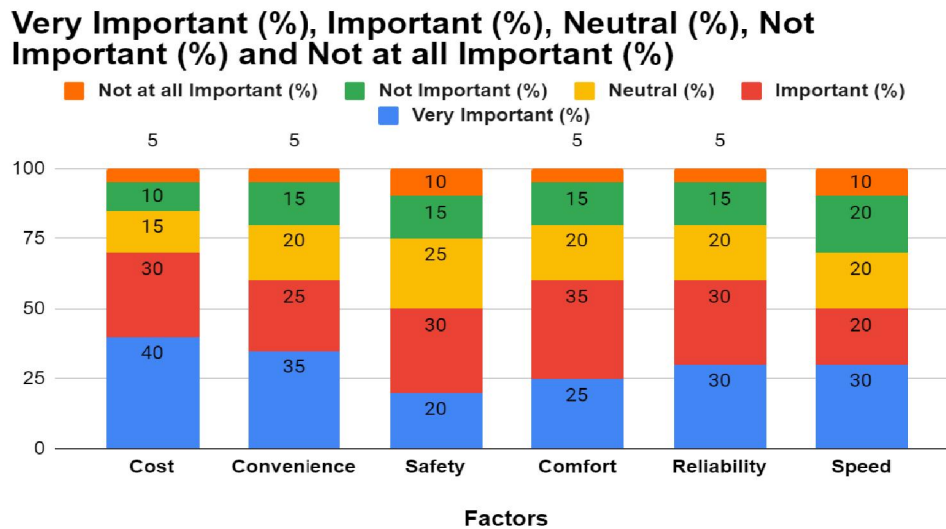
- **Below 20,000 INR:** Respondents in this income bracket show a preference for personal vehicles (35 respondents) and buses (25 respondents), likely due to the flexibility and affordability of these modes of transportation. Auto-rickshaws are also a popular choice (15 respondents), followed by local trains (20 respondents), which might be preferred for longer commutes.
- **20,001 - 40,000 INR:** Similar to the lower income bracket, respondents in this category also favor personal vehicles (35 respondents) and buses (30 respondents). However, there's a slight decrease in the preference for auto-rickshaws (10 respondents) and local trains (15 respondents), possibly due to increased affordability allowing for more reliance on private transportation.
- **40,001 - 60,000 INR:** In this income bracket, respondents show a notable increase in their preference for personal vehicles (45 respondents), indicating a stronger reliance on private transportation options. Buses (25 respondents) remain popular, while the preference for local trains decreases (10 respondents), possibly due to higher disposable income allowing for more convenient and comfortable modes of travel.
- **60,001 - 80,000 INR:** Respondents in this income range continue to favor personal vehicles (50 respondents), with a significant decrease in the preference for local trains (5 respondents). Buses (20 respondents) remain a popular choice, along with taxis (20 respondents), indicating a balance between affordability and convenience in transportation choices.
- **80,001 INR and above:** The highest income bracket shows a clear preference for personal vehicles (50 respondents) and taxis (25 respondents), likely due to the higher disposable income allowing for more comfortable and convenient travel options. Buses (15 respondents) and auto-rickshaws (5 respondents) are less preferred, while the preference for local trains remains minimal (5 respondents).

Overall, the analysis suggests that transportation preferences vary based on income level, with personal vehicles being the preferred mode of transportation across all income brackets, followed by buses. The preference for local trains, auto-rickshaws, and taxis varies depending on affordability, convenience, and comfort.

1.3. Table: Ranking of Factors Influencing Transport Choices

Factors	Very Important (%)	Important (%)	Neutral (%)	Not Important (%)	Not at all Important (%)	Grand Total
Cost	40	30	15	10	5	100
Convenience	35	25	20	15	5	100
Safety	20	30	25	15	10	100
Comfort	25	35	20	15	5	100
Reliability	30	30	20	15	5	100
Speed	30	20	20	20	10	100

1.3 Chart: Importance of Factors Influencing Transport Choices



Results and Analysis:

- **Cost:** 40% of respondents find cost to be very important, making it the most crucial factor. 30% also consider it important.
- **Convenience:** 35% of respondents prioritize convenience as very important, followed by 25% considering it important.
- **Safety:** Although 20% find safety very important, 30% consider it important, indicating a significant concern.
- **Comfort:** 25% of respondents find comfort very important, with 35% considering it important, suggesting a substantial portion of passengers prioritize comfort.
- **Reliability:** 30% consider reliability very important, with another 30% finding it important, indicating a high demand for consistent service.
- **Speed:** 30% prioritize speed as very important, with 20% considering it important. This suggests a substantial portion of respondents value faster modes of transport.

The analysis of survey data reveals the relative importance of different factors influencing commuters' mode choice, such as cost, comfort, safety, and reliability. Furthermore, qualitative insights from interviews shed light on commuters'

experiences, perceptions, and preferences regarding existing transport services in Mumbai. Observational studies provide valuable context by capturing real-time behaviours and decision-making processes of commuters in different settings. The synthesis of findings enables a comprehensive understanding of commuters' preferences and the underlying factors shaping their transport choices in Mumbai.

Overall, cost, convenience, and reliability emerge as the top three influential factors in passenger transport choices in Mumbai, followed closely by safety, comfort, and speed. This data can be crucial for transportation planners and policymakers to focus on these aspects to enhance the public transport system in Mumbai.

V. CONCLUSION

The study sheds light on transportation preferences across age groups in Mumbai, offering crucial insights for policymakers to enhance infrastructure and promote sustainable mobility solutions. These findings facilitate tailored interventions to address diverse needs and barriers, fostering improved transportation systems for the city's residents.

The data underscores the multifaceted nature of passenger transport choices in Mumbai. Affordability and accessibility emerge as pivotal, with cost and convenience rated highly. Safety and comfort are significant considerations, indicating a need for secure and enjoyable travel experiences. Reliability and speed are also crucial, highlighting a demand for consistent and efficient services. These findings underscore the importance of a holistic approach to transportation planning, addressing diverse needs and preferences. Policymakers should prioritize investments in infrastructure, technology, and service enhancements to create a comprehensive and effective transportation system that meets the evolving demands of commuters in Mumbai while promoting sustainability and inclusivity.

RECOMMENDATIONS

- The research paper concludes with key findings and implications for policymakers and transportation authorities in Mumbai.
- Understanding commuters' preferences and behaviours is essential for formulating targeted interventions to improve existing transport services and infrastructure.
- Recommendations may include:
 - Enhancing safety measures.
 - Improving last-mile connectivity.
 - Optimizing route planning.
 - Integrating technology for real-time information dissemination.
 - Promoting sustainable modes of transport.
- Ultimately, addressing commuters' preferences and needs is crucial for creating a more efficient, accessible, and user-centric passenger transport system in Mumbai.

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