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A STUDY OF DELHI METRO'S MAGENTA LINE TO ASSESS COMMUTER SATISFACTION POST COVID-19

Abstract. This study looks how satisfied people are with the Delhi metro, which is crucial for sustainable transportation. The study focuses on security, comfort, travel time components. The research shows how important the quality of service is in public transportation and how it affects what people think and if they would recommend it to others. In the research, 430 passengers surveyed and used statistical analysis to understand what factors influence people's opinions. The study reveals that age, gender, comfort and security are important factors. The study also investigates the alternate PT modes and found that metro fare, seating/standing facilities are important aspects especially for different genders. It's important for the DM to think about how people feel about the cost of using it, the seating, and the different preferences of men and women. Making changes like lowering fares and making the metro more comfortable could make it a better option for everyone in Delhi.

Keywords: Delhi metro, User Approbation Indicators, Magenta line, Evaluation, Decision tree model.

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Introduction

The DM is a symbol of urban progress and ease in the heart of India's capital. It passes through the city, easing millions of people's lives. But, what frequently goes unnoticed is the crucial decision each passenger makes while choosing this environmentally responsible public transportation (PT) over private transportation (Khursheed, Kidwai, 2022). In order to better understand how the DM improves urban life, environmental responsibility, and general well-being in our ever-evolving cities we evaluate with the user approbation indicators.

Approbation indicators are the level of approval or appreciation by passengers/commuters, encompassing various aspects of metro systems. These indicators play a major role in assessing the quality of services and overall experience of users/commuters (Khursheed, Kidwai, 2023) . Organizations are shifting their priorities from profit maximization to achieving higher profits by maximizing customer satisfaction (Seth et al, 2005). In today's world, factors like tough competition, technological progress, changing social trends, and a dynamic economy are bringing about major shifts in public transportation companies (Khattar, 2023). Because customer preferences have a big impact on the company, they require special attention and care. Recently DM conducted a periodical user's satisfaction surveys to improve the quality of services including Availability, Accessibility, Ease of Use, Information Prior to Travel, Information during Travel, Reliability, Customer Care, Comfort, Crowding, Security and Overall Satisfaction.

DM consists of 10 coloured lines, is the largest and busiest metro rail system in India with 256 stations and 350.42 kms started operating in 2002. The Magenta Line, often referred to as the "Knowledge Corridor," for its strategic route through various national institutions and educational facilities (Balasubramanian, 2023) is a significant metro line. It stretches from Janakpuri West to Botanical Garden, covering a total of 25 stations. Among these stations, you'll find important interchange hubs such as Hauz Khas (Yellow Line) and Kalkaji Mandir (Violet Line).

1. Literature review

Transit officials worldwide continuously learn from passenger perception surveys to improve Service Quality (SQ) and enhance transit ridership (Mandhani et al, 2023). Continuous monitoring of infrastructure performance and assessment of its effectiveness are required to continually improve SQ (Swami, Parida, 2015). SQ is important because it affects how customers perceive and value your service, and how likely they are to recommend it to others. SQ can also affect reputation, competitive advantage, and

profitability. One of the most widely used frameworks is the SERVQUAL model, which identifies five dimensions of SQ: reliability, assurance, tangibles, empathy, and responsiveness. You can use these dimensions to evaluate how well your service meets the expectations of your customers.

The COVID-19 pandemic has substantially influenced travel patterns, emphasizing the crucial need to evaluate the post-pandemic performance of public transportation systems like Delhi Metro's Blue Line. This assessment, considering travel time components and performance indicators, is essential for enhancing user experiences (Khursheed, Kidwai, 2022).

n a research project, Author took a sample of 1200 respondents and was selected by dividing NCR into routes of DM. The questionnaire for this study was developed based on the five SERVQUAL dimensions. The questionnaire was structured into three parts: the first collected demographic information (gender and age), the second assessed respondents' expectations of SQ, and the third evaluated their perceptions of the actual SQ provided by DMRC (Randheer et al, 2023). A five-point Likert scale was used, ranging from "strongly disagree" to "strongly agree". By comparing the differences between each respondent's expectations and perceptions, the researchers determined the level of SQ. When perception values exceeded expectation values, it indicated satisfactory or ideal service quality (Randheer et al, 2023).

A study talks on prioritizing attributes impacting metro rail service, infrastructure, and facilities based on user perception. It underscores the significance of attributes like Metro fare, Connection to metro, and Metro frequency, signaling their importance despite perceived underperformance. The research recommends focusing on strategies such as rational fare adjustments, improved feeder systems, and reduced headway to boost user satisfaction (Majumdar et al, 2020). Furthermore, socio-demographic characteristics, including gender, age, and trip frequency, were found to have minimal influence on user perception, offering consistent results across sub-groups.

The study emphasizes the need for DM to consider an additional dimension in delivering its services, namely "Security." Security, in this context, means that the metro system should not only provide a safe environment but also possess the expertise and knowledge to deliver a service effectively, ensuring maximum customer satisfaction.

Service quality (SQ) is a combination of several indicators/attributes such as service frequency, network coverage, waiting time, level of comfort etc,. The study found that the ‘comfort and convenience’ factor influences the 'transport service’ factor and has an indirect effect on users’ satisfaction through ‘transport service’ factor. So far, researchers employed different approaches such as Decision Tree, Multinomial Logit (MNL) model, Structural Equation Modeling (SEM), Importance-Performance Analysis (IPA), Index Number approach, Cluster Analysis technique, Bayesian Networks (BN) - SEM approach etc., in the SQ literature (Mandhani et al, 2020).

A study uses Bayesian Network and PLS-SEM to explore gender-based service quality in Delhi's MRT system. It reveals significant differences in perceptions between male and female passengers, highlighting distinct preferences and priorities. The findings emphasize the need for gender-specific policy measures and cost-effective plans to improve operational efficiency and ridership (Mandhani et al, 2020).

The literature review discusses the critical importance of SQ in the transit industry, highlighting its profound impact on customer perception, recommendation, reputation, competitive advantage, and profitability. The SERVQUAL model's five dimensions—reliability, assurance, tangibles, empathy, and responsiveness—provide a robust framework for evaluating SQ and understanding how well a service meets customer expectations.

2. Research Methodology

In this research, we aimed to understand the satisfaction indicators of DM (magenta line). To achieve this, a robust and detailed dataset pertaining to commuter travel is essential. A physical on-board survey was conducted to gather the required data, which included the following components:

Personal information of passengers: This encompassed details such as age, gender, and vehicle ownership.

Functional services offered by DM: This category gathers information related to parking preferences, fare collection systems, travel frequency, number of station interchanges, changes in travel time compared to other public transportation modes, in-vehicle and out-vehicle travel times, and main haul distance.

Comfort parameters: This section focused on aspects such as standing and seating space in metro coaches and concourse, alternative transportation preferences, security arrangements, information signage, and metro fare/trip.

The survey covered a total of 430 random passengers, comprising 240 male and 190 female respondents. The

collected data was organized and tabulated in a statistically standard format and then logically scrutinized. The analysis of the survey data involved the use of various statistical methods, including descriptive statistics and cross-tabulation. Additionally, a tree decision model technique was applied to understand the interrelationships among various factors relevant to the approval indicators of the users.

In this study, several interrelationships among user characteristics and approval factors were identified. These included age, gender, alternative public transportation preferences, travel frequency in the metro, vehicle ownership, and factors related to comfort and security. The results of the analysis are presented in the subsequent sections.

Overall, the research focuses on exploring the complex interplay of factors that influence the approval indicators of DM users and aims to provide valuable insights into the dynamics of commuter travel satisfaction.

3. Data Analysis

Figure 1 illustrates the correlation between the number of respondents and different age groups. The data shows that the highest percentage of users, 53.2%, falls within the 21-30 age group, while the above 61 group represents the smallest proportion at 0.9%.

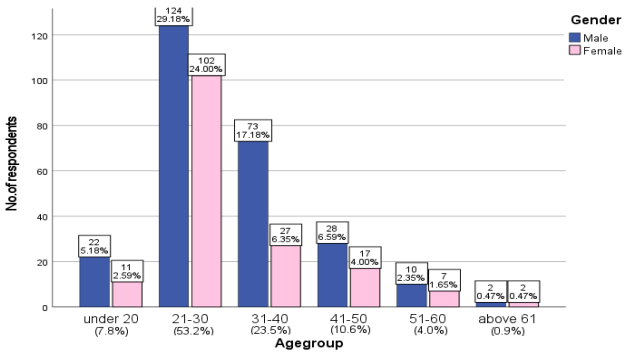


Fig. 1. Number of respondents versus age group.

Further observation reveals 7.8% of commuters are of the under 20 age group, in which 2.59% are female. In the age group of 31-40, male commuters are higher at 17.18% of the whole 23.5%. The age group of 51-60 shows a slight variation in male to female ratio of 0.7% of the whole 4.0%. This reveals that most passengers are employees and students.

Table 1 represents the inter-relationship between gender classification and the choice of the second-best alternative of PT after DM. The data analysis, conducted using the cross-tabulation method, The data is divided into male and female respondents. The total number of males is 259, while the total number of females is 166.

Table 1.

Gender versus Second best alternative of public transportation after Delhi Metro

			Second best alternative of public transportation after Delhi Metro					
			DTC Bus	Cabs	Auto-Rickshaw	E-Rickshaw	Feeder Bus	Total
Gender	Male	No.of respondents	64	115	68	8	3	259
		% within Gender	24.7%	44.4%	26.3%	3.1%	1.2%	100.0%
		% within Second best alternative of public transportation after Delhi Metro	60.4%	58.4%	68.7%	44.4%	75.0%	60.9%
	Female	No.of respondents	42	82	31	10	1	166
		% within Gender	25.3%	49.4%	18.7%	6.0%	0.6%	100.0%
		% within Second best alternative of public transportation after Delhi Metro	39.6%	41.6%	31.3%	55.6%	25.0%	39.1%
Total		No.of respondents	106	197	99	18	4	425
		% within Gender	24.9%	46.4%	23.3%	4.2%	0.9%	100.0%
		% within Second best alternative of public transportation after Delhi Metro	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The most preferred second-best alternative for males is Cabs 44.4%, followed by Auto-Rickshaws 26.3%. Cabs are the most preferred alternative for females 49.4%, followed by Auto-Rickshaws 18.7% and E-Rickshaws 6%. Auto-Rickshaws are the second most preferred option for both genders, but the percentage is higher among males 44.4% compared to females 18.7%. E-Rickshaws are more preferred by males 3.1% than females 6%.DTC Buses are more popular among males 24.7% compared to females 25.3%. There are differences in preferences between genders, Cabs and Auto-Rickshaws emerge as the top choices for both genders.

Table 2 Crosstabulation provides insights into the relationship between age groups and the frequency of traveling in Delhi Metro. The age groups are categorized as under 20, 21-30, 31-40, 41-50, 51-60, and above 61, while the frequency of traveling in Delhi Metro is divided into occasional, 1-2 times in a month, 4-5 times in a month, 2-3 times in a week, and daily. The findings of another research **(**Khursheed, Kidwai, 2023**)** confirms the above observations.

Table 2.

Age group versus Frequency of travelling in Delhi Metro

			Frequency of travelling in Delhi Metro					
			Occasional	1-2 times in a month	4-5 times in a month	2-3 times in a week	Daily	Total
Agegroup	under 20	No. of respondents	4	2	5	8	14	33
		% within Agegroup	12.1%	6.1%	15.2%	24.2%	42.4%	100.0%
		% within Frequency of travelling in Delhi Metro	5.9%	8.3%	10.0%	9.0%	7.2%	7.8%
		% of Total	0.9%	0.5%	1.2%	1.9%	3.3%	7.8%
	21-30	No. of respondents	32	14	31	42	107	226
		% within Agegroup	14.2%	6.2%	13.7%	18.6%	47.3%	100.0%
		% within Frequency of travelling in Delhi Metro	47.1%	58.3%	62.0%	47.2%	55.2%	53.2%
		% of Total	7.5%	3.3%	7.3%	9.9%	25.2%	53.2%
	31-40	No. of respondents	20	4	7	21	48	100
		% within Agegroup	20.0%	4.0%	7.0%	21.0%	48.0%	100.0%
		% within Frequency of travelling in Delhi Metro	29.4%	16.7%	14.0%	23.6%	24.7%	23.5%
		% of Total	4.7%	0.9%	1.6%	4.9%	11.3%	23.5%
	41-50	No. of respondents	6	4	5	13	17	45
		% within Agegroup	13.3%	8.9%	11.1%	28.9%	37.8%	100.0%
		% within Frequency of travelling in Delhi Metro	8.8%	16.7%	10.0%	14.6%	8.8%	10.6%
		% of Total	1.4%	0.9%	1.2%	3.1%	4.0%	10.6%
	51-60	No. of respondents	5	0	2	5	5	17
		% within Agegroup	29.4%	0.0%	11.8%	29.4%	29.4%	100.0%
		% within Frequency of travelling in Delhi Metro	7.4%	0.0%	4.0%	5.6%	2.6%	4.0%
		% of Total	1.2%	0.0%	0.5%	1.2%	1.2%	4.0%
	above 61	No. of respondents	1	0	0	0	3	4
		% within Agegroup	25.0%	0.0%	0.0%	0.0%	75.0%	100.0%
		% within Frequency of travelling in Delhi Metro	1.5%	0.0%	0.0%	0.0%	1.5%	0.9%
		% of Total	0.2%	0.0%	0.0%	0.0%	0.7%	0.9%
Total		No. of respondents	68	24	50	89	194	425
		% within Agegroup	16.0%	5.6%	11.8%	20.9%	45.6%	100.0%
		% within Frequency of travelling in Delhi Metro	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	16.0%	5.6%	11.8%	20.9%	45.6%	100.0%

Among individuals under 20, the majority 42.4% travel in Delhi Metro daily. Age groups 21-30 show a more distributed pattern, with 47.3% traveling daily and 18.6% traveling 2-3 times in a week. This age group exhibits the highest overall frequency of traveling in Delhi Metro, with 53.2% traveling daily.

The 31-40 age group indicates a relatively balanced distribution across different frequencies, with 29.4% traveling 2-3 times in a week and 23.6% traveling daily

In the 41-50 age group, a significant portion (28.9%) travels 2-3 times in a week, while 37.8% travel daily. The 51-60 age group and above 61 show lower frequencies of traveling, with daily travel percentages of 29.4% and 75%, respectively. The data suggests that daily travel becomes less common as age increases. It helps in understanding the varying preferences and behaviors of different age groups regarding Delhi Metro usage.

Table 3 provides insights into the relationship between different age groups and their preferences for the parking facilities offered by DM. The parking options are categorized as "Don't need parking facility," "Less and Costly," "Less but cheap," "Enough but Costly," and "Enough and Cheap."

Table 3.

Agegroup versus Parking facility offered by DMRC

			Parking facility offered by DMRC					
			Dont need parking facility	Less and Costly	Less but cheap	Enough but Costly	Enough and Cheap	Total
Agegroup	under 20	No .of respondents	23	2	2	4	2	33
		% within Parking facility offered by DMRC	8.7%	5.6%	6.1%	14.8%	3.1%	7.8%
		% of Total	5.4%	0.5%	0.5%	0.9%	0.5%	7.8%
	21-30	No .of respondents	148	18	13	12	35	226
		% within Parking facility offered by DMRC	55.8%	50.0%	39.4%	44.4%	54.7%	53.2%
		% of Total	34.8%	4.2%	3.1%	2.8%	8.2%	53.2%
	31-40	No .of respondents	57	9	11	6	17	100
		% within Parking facility offered by DMRC	21.5%	25.0%	33.3%	22.2%	26.6%	23.5%
		% of Total	13.4%	2.1%	2.6%	1.4%	4.0%	23.5%
	41-50	No .of respondents	24	7	4	5	5	45
		% within Parking facility offered by DMRC	9.1%	19.4%	12.1%	18.5%	7.8%	10.6%
		% of Total	5.6%	1.6%	0.9%	1.2%	1.2%	10.6%
	51-60	No .of respondents	11	0	3	0	3	17
		% within Parking facility offered by DMRC	4.2%	0.0%	9.1%	0.0%	4.7%	4.0%
		% of Total	2.6%	0.0%	0.7%	0.0%	0.7%	4.0%
	above 61	No .of respondents	2	0	0	0	2	4
		% within Parking facility offered by DMRC	0.8%	0.0%	0.0%	0.0%	3.1%	0.9%
		% of Total	0.5%	0.0%	0.0%	0.0%	0.5%	0.9%
Total		No .of respondents	265	36	33	27	64	425
		% within Parking facility offered by DMRC	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	62.4%	8.5%	7.8%	6.4%	15.1%	100.0%

Under 20, a significant proportion 55.8% indicates that they don't need a parking facility.The 31-40 age group displays a more varied pattern, with significant percentages across different parking facility options. However, the highest percentage 26.6% chooses "Enough but Costly," indicating a willingness to pay more for sufficient parking space.In the 41-50 age group, a notable proportion 19.4% prefers "Less and Costly" parking facilities, suggesting a

desire for cost-effective options. The choices in this age group are more evenly distributed across different parking categories.

Individuals aged 51-60 and above 61 show a lower inclination towards needing parking facilities, with a considerable percentage in the "Don't need parking facility" category. Those who express a preference in these age groups often opt for "Enough and Cheap" parking, emphasizing both sufficiency and affordability. Overall, the data reveals age-related patterns in parking preferences, with younger age groups showing a higher inclination towards not needing parking facilities, while older age groups demonstrate more diverse preferences, including a willingness to pay for sufficient parking. These insights can be valuable for DMRC in tailoring parking services to the varied needs of different age demographics.

4. Decision tree model

The decision tree algorithm belongs to the supervised learning machine learning method, and it is a commonly used technology in data mining. It can be used to classify the analyzed data, and it can also be used for prediction. It provides a clear indication of which fields are most important for prediction or classification (Xie, Zhao, 2010). Common algorithms are CHAID, CART, ID3, C4.5, C5.0, and so on (Yang at al. 2023).

A Random Forrest Decision Tree is created randomly from a set of potential trees, with random features at each node. Each tree in the set has an equal chance of being sampled, ensuring a uniform distribution. Random Forest, a powerful method for classification and regression in data mining, efficiently combines large sets of random trees for accurate models. It categorizes objects or instances based on attributes like age or gender. The Decision Tree begins at the root and descends to a "leaf" node, with branches extending from each internal node, representing specific characteristics and ranges of values. The algorithm involves building a specified number of trees (N), randomly selecting features in each iteration to create diverse trees and enhance model robustness (Sekhar et al, 2016).

A Decision Tree categorizes data by examining attribute values in the dataset. It is built from pre-classified data, dividing based on features that effectively separate the data. Items are split according to these features, and the process repeats recursively for each subset until all items in a subset belong to the same class. This method helps visualize and understand patterns in the data for effective decision-making (Ali et al, 2012).

The chi-squared automatic interaction detector (CHAID) algorithm is considered to be one of the most used supervised learning methods as it is adaptable to solving any kind of problem at hand.In 1980, Kass introduced the chi-squared automatic interaction detector (CHAID), a decision tree technique designed to uncover relationships between variables. CHAID utilizes an adjusted significance test to divide respondents into groups based on the relationship between the underlying and dependent variables. It further segments each group into subgroups. Typically, key indicators like usage level or purchase intention serve as dependent variables in CHAID analysis (Yang et al, 2023).

In a research paper the author conclude from the spatial-temporal analysis that substantial replacement of Cycle-rickshaws by E-rickshaws in Delhi, with E-rickshaws surpassing Auto-rickshaws as the second most preferred access-egress mode, particularly post-COVID-19. Walking emerges as the most preferred access-egress mode, potentially due to avoiding additional costs and mode changes. Vehicle ownership and travel frequency in Delhi Metro have limited impact on mode choice (S. Khursheed, F. Kidwa, 2022).

Fig 2 represents a CHAID (Chi-squared Automatic Interaction Detector) decision tree analysis for predicting the second-best alternative of public transportation after DM. The analysis is based on various independent variables, including the type of transportation mode, the number and percentage of respondents for each mode, and the predicted category for each node.

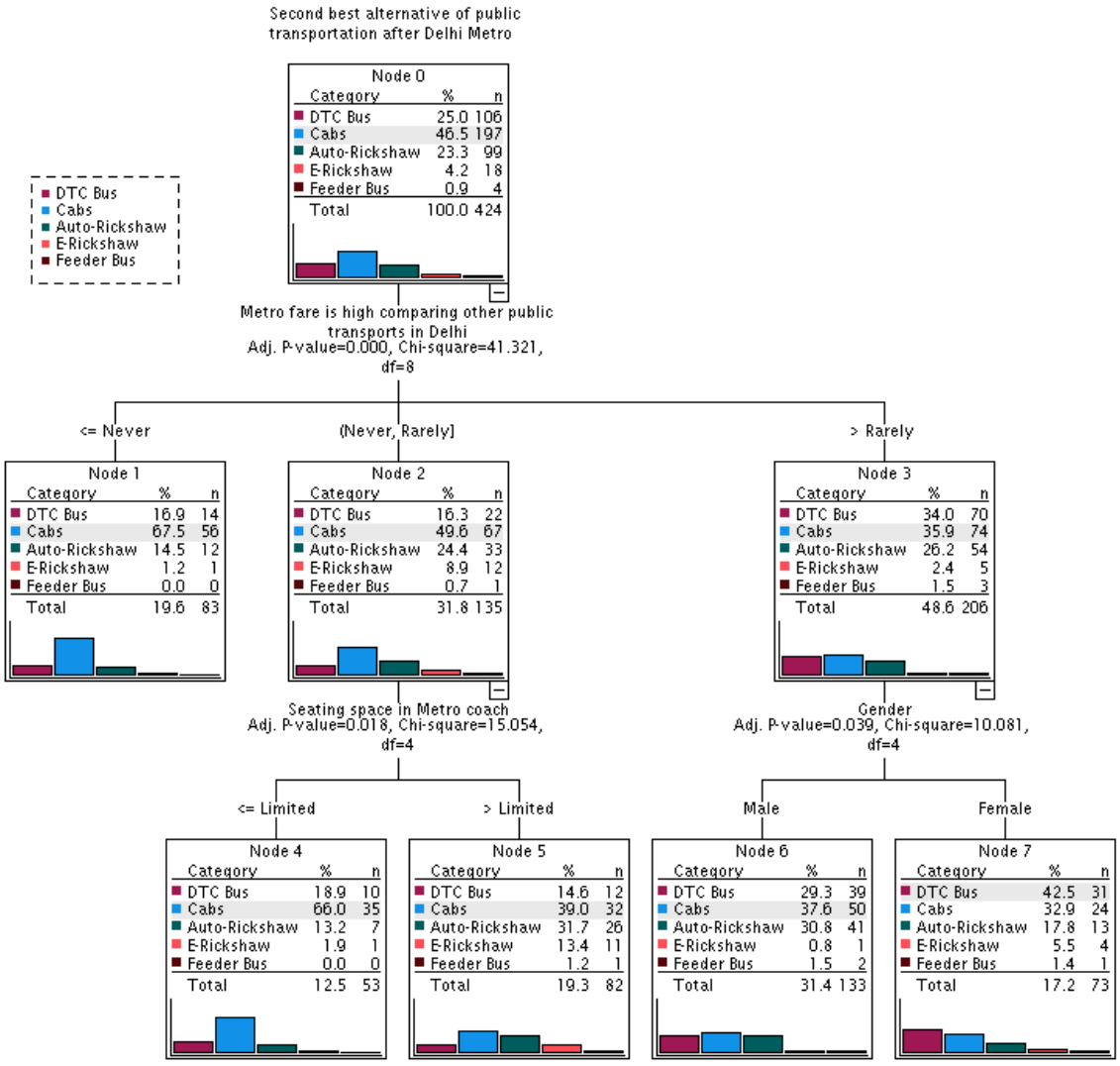


Fig. 2. Decision tree model of user approbation indicators

Table 4 gives inference that Node 0 is also called Root Node is the starting point that encompasses the entire dataset, representing the total counts and percentages for different modes of transportation. The percentages indicate the proportion of respondents who consider each transportation mode as the second-best alternative after DM. The decision tree begins with the primary independent variable used for the initial split, which is "Cabs." The decision tree algorithm examines how respondents' preferences diverge based on their consideration of Cabs as a second-best alternative.

Node 1, encompassing 19.6% of respondents, reveals a subgroup consistently avoiding Cabs as their second-best option after DM. Their decision predominantly hinges on the perception of high metro fares compared to other public transport options, indicating a notable reluctance toward choosing Cabs due to perceived costliness. Recognizing this concern is crucial for planners, necessitating strategies like fare subsidies, discounts, or communication efforts emphasizing metro travel affordability. In essence, Node 1 highlights a specific group significantly influenced by metro fare perceptions, emphasizing the need to address these concerns for a more adaptable public transportation system.

Table 4. Decision tree model

Node	DTC Bus	Cabs	Auto-Rickshaw	E-Rickshaw	Feeder Bus	Total	Predicted Category	Parent Node	Primary Independent Variable				
	No.of respondents	No.of respondents	No.of respondents	No.of respondents	No.of respondents	No.of respondents			Variable	Sig.a	Chi-Square	df	Split Values
0	106 (25%)	197(46.5%)	99(23.3%)	18(4.2%)	4(0.9%)	424(100%)	Cabs						
1	14(16.9%)	56(67.5%)	12(14.5%)	1(1.2%)	0(0%)	83(19.6%)	Cabs	0	Metro fare is high comparing other public transports in Delhi	0	41.321	8	<= Never
2	22(16.3%)	67(49.6%)	33(24.4%)	12(8.9%)	1(0.7%)	135(31.8%)	Cabs	0	Metro fare is high comparing other public transports in Delhi	0	41.321	8	(Never, Rarely]
3	70(34%)	74(35.9%)	54(26.2%)	5(2.4%)	3(1.5%)	206(48.6%)	Cabs	0	Metro fare is high comparing other public transports in Delhi	0	41.321	8	> Rarely
4	10(18.9%)	35(66%)	7(13.2%)	1(1.9%)	0(0%)	53(12.5%)	Cabs	2	Seating space in Metro coach	0.018	15.054	4	<= Limited
5	12(14.6%)	32(39%)	26(31.7%)	11(13.4%)	1(1.2%)	82(19.3%)	Cabs	2	Seating space in Metro coach	0.018	15.054	4	> Limited
6	39(29.3%)	50(37.6%)	41(30.8%)	1(0.8%)	2(1.5%)	133(31.4%)	Cabs	3	Gender	0.039	10.081	4	Male
7	31(42.5%)	24(32.9%)	13(17.8%)	4(5.5%)	1(1.4%)	73(17.2%)	DTC Bus	3	Gender	0.039	10.081	4	Female

Node 2, representing 31.8% of respondents, identifies a subgroup that infrequently considers Cabs as the second-best alternative after DM. Similar to Node 1, their decision-making is notably influenced by the perception of high metro fare. This suggests that, despite not entirely dismissing Cabs, this group remains hesitant due to concerns about the costliness of metro travel.

Node 3 encompasses 48.6% of respondents who more frequently consider Cabs. Unlike Nodes 1 and 2, this group exhibits a lesser influence of the perception of high metro fare on their decision-making. Their higher propensity to consider Cabs suggests that factors beyond fare considerations play a more prominent role in shaping their preferences, indicating a more open attitude toward Cabs as a viable alternative to DM.

Node 4, representing 12.5% of respondents, identifies a subgroup that infrequently considers Cabs. Notably, these respondents exhibit a particular aversion to Cabs when faced with limited seating space in the metro coach. This suggests that concerns related to the availability of seating play a significant role in their decision-making, influencing them to avoid Cabs.

Node 5 encompasses 19.3% of respondents who more frequently consider Cabs, especially when seating space in the metro coach is not limited. This group demonstrates a greater inclination to opt for Cabs when the availability of seating is not a constraint. The preference for Cabs in this context implies that factors related to comfort and convenience, such as sufficient seating space, contribute to their decision to choose Cabs over other alternatives after DM.

Node 6, constituting 31.4% of respondents, represents a subgroup that consistently considers Cabs as a more frequent alternative. This group is unaffected by concerns about limited seating space, further stratification is based on gender. Males (Node 6) emerge as more likely to prefer Cabs, indicating a gender-based preference within this subgroup. This suggests that, when factors like seating space are not influential, males within this group lean towards choosing Cabs as their preferred mode of transportation.

Node 7 encompasses 17.2% of respondents who, despite considering Cabs more often, display a preference for DTC Bus, and this choice is notably associated with gender. Females within this subgroup are more likely to opt for DTC Bus, indicating a gender-related distinction in transportation preferences. The role of gender in influencing the choice between Cabs and DTC Bus within this specific subgroup suggests that considerations beyond seating and frequency play a role, possibly related to comfort, safety, or other gender-specific factors.

This detailed analysis provides transportation planners with valuable insights into the multifaceted factors influencing commuters' choices, enabling more targeted and effective strategies for enhancing public transportation satisfaction and adaptability.

In conclusion, addressing perceptions of high metro fares, improving seating conditions, and understanding gender-specific preferences are key strategies for transportation planners to diversify and enhance the adaptability of the public transportation system in Delhi. Initiatives such as fare subsidies, comfort improvements, and targeted communication efforts can contribute to a more inclusive and appealing transportation network that caters to the diverse preferences of commuters.

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