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Analysing the Relationship between Travel Time and Commuters' Transportation Mode Choice

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Abstract: *Understanding commuters' road transport mode choice is of critical importance to transport planners and policymakers in order to optimize transport systems. The purpose of this study is to analyze the relationships between cost, travel time, and travel mode choice of commuters, as these factors have significant influences on transport decisions.*

This research adopts a quantitative approach, using surveys to collect data on commuters' preferences and transport mode choices. Participants were asked to rate how much cost and travel time mattered to their decision process when choosing a transport mode.

The findings of this study provide important information on the relative importance of cost and travel time in commuters' transport mode choice. Also, the analysis identifies potential trade-offs between these factors, highlighting situations where commuters prioritize one factor over another.

By understanding the relationships between cost, travel time, and transport mode choice, transport planners and policy makers can develop strategies to develop more efficient transport systems, increase commuter satisfaction, and promote sustainable transport modes. Ultimately, this research contributes to the development of more efficient and user-centred transport systems tailored to passengers' needs..

Keywords: passengers, preferences, road transport, road transport services, travel time/speed and cost

I. INTRODUCTION

With modern urbanization and increasing population, the demand for transportation systems is constantly increasing. The choice of transport mode by commuters depends on several factors, including cost, travel time, convenience, and safety. Among these, travel time and cost are the two most important determinants that influence commuters' decisions. This study analyzes the relationship between these two factors and their impact to improve transport planning and policy making.

In urban and semi-urban areas, various transport options—such as private vehicles, public buses, metros, auto-rickshaws, and shared ride services—are available. Each mode has its own cost, speed, and features, which influence commuters' choices. For example, some commuters prefer low-cost options, while others choose modes with faster travel time. In addition, factors such as income level, purpose of travel, and socio-economic background also play a role in these decisions.

The aim of this research is to understand under what circumstances commuters prioritize cost and when travel time becomes more important. For this, a survey-based study has been conducted, in which data has been collected from passengers from different socio-economic backgrounds on their preferences. The findings of the study will help transport policymakers to develop more efficient, affordable and passenger-friendly transport services.

II. SIGNIFICANCE OF THE STUDY

The research, titled “Analysis of the relationship between travel time and mode of transport choice of commuters”, makes significant contributions in the following areas:

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- **Understanding travel behaviour -** The study helps in understanding the role of travel time in mode of transport choice by commuters, which provides basic information for transport planning.
- **Data for transport planning -** The findings of the research will help urban planners in making traffic management decisions, such as determining the frequency and routes of public transport.
- **Identification of time sensitive commuters -** The study identifies passenger groups who prefer travel time, so that transport services can be developed to suit their needs.
- **Optimisation of transport systems -** Understanding the relationship between travel time and mode choice can make transport systems more efficient, which will benefit commuters.
- **Promoting sustainable transport -** The findings of the research will help in reducing the use of private vehicles by promoting fast and reliable public transport options.
- **Contribution to urban development -** The information obtained by the study will help in planning future urban development and infrastructure, especially in terms of traffic flow management.
- **Economic efficiency -** Reduction in travel time leads to increased labor productivity, which contributes to overall economic growth.

III. REVIEW OF THE LITERATURE

Roy, P., Srinivasan, K. K., & Ramakrishnan, G. A. (2024) analysed why more commuters do not choose buses to reach their workplace. The researchers used a geographically weighted segmented logistic regression modelling method. They found that the major reasons behind commuters not adopting bus service were service irregularity, low frequency, and lack of last-mile connectivity. The study highlighted regional variations in transport choices based on different locations. The research suggested that if the quality, frequency, and accessibility of bus services are improved, more commuters may prefer public transport.

Iamtrakul, P., Klaylee, J., & Raungratanaamporn, I. (2024) evaluated travel mode choices and travel patterns of commuters in Pathum Thani Province, Thailand. The researchers studied the travel habits of different socio-economic groups through statistical analysis and field surveys. The study found that age, income, education level, and purpose of travel were the major factors influencing travel mode selection. In addition, the increasing trend of private vehicles led to limited use of public transport. The study suggested to policymakers that better transport plans and accessible public transport services could influence travellers' choices.

Deng, Y., Bai, Y., Cui, L., & He, R. (2023) in their study analysed travel mode selection trend of passengers for high-speed railway stations through multi-source data. They tried to understand passenger preferences by combining mobile GPS, survey and station data. The analysis found that factors such as access time, travel cost, and station accessibility majorly influence choices. They suggested that the actual preferences of passengers can be better understood by using integrated data sources.

Kumar, N., & Singh, R. (2023) conducted a study to understand the role of travel time in Indian urban centres. They analysed the change in travel mode choice of passengers according to different age groups, work statuses and commuting distances. The results clearly showed that longer travel time reflects a shift from public transport to private vehicles. The research suggested that improvements in time reliability and service frequency can attract passengers to public transport.

Sridhar, K. S., & Nayka, S. (2022) analysed the factors that determine travel time in an Indian city. They used household census and travel survey data to understand how elements such as residential location, road network, and population density impact travel time. The study found that distance from the centre and availability of employment opportunities were key determinants. The research emphasised the need for policymakers to incorporate inclusive transport strategies in city planning.

Jain, A., & Gupta, S. (2022) studied travel time perceptions of commuters in metro cities and its impact on public transport use. The research concluded that travellers' perceptions proved to be more influential than actual travel times. If service appeared slow to commuters, they sought alternative modes. The research suggested that service reliability, transparency of information, and accurate scheduling could positively influence traveller satisfaction and choice.

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IV. OBJECTIVES OF STUDY

- To analyze the relationship between travel time and passengers' transport mode choice
- To understand the role of travel time in commuters' decision-making for transportation modes
- To investigate how variations in travel time/speed influence commuters' preferences for different transportation modes
- To study the travel time preferences of passengers across different age and income groups

Hypotheses

1 Null Hypothesis (H_0):

There is no significant relationship between travel time/speed and commuters' choice of transportation mode.

Hypothesis 1 (H_1):

There is a significant relationship between travel time/speed and commuters' choice of transportation mode.

2 **Null Hypothesis (H_0):**

Commuters' income levels do not significantly influence their preferred mode of transport.

Hypothesis 2 (H_1):

Commuters' income levels significantly influence their preferred mode of transport.

Scope of Study :

The study investigates how cost and travel time impact commuters' choice of transportation modes within the Kalyan-Dombivali Municipal Corporation (KDMC). It specifically examines passenger road transport options including KDMT bus services, auto rickshaws, black-and-yellow taxis, and other modes. The goal is to understand the preferences and factors influencing mode choice among commuters in this area.

V. RESEARCH METHODOLOGY-

1. Research Design

- This study is based on a descriptive-analytical research design that:
- Used quantitative research methodology
- Focused on primary data collection
- Analysis of causal relationships

2. Data Collection Methods

Primary Data Collection:

Through structured questionnaire (from 100 respondents)

Survey Area: Kalyan-Dombivli Municipal Corporation (KDMC) area

Sampling Method: Convenience Sampling

Secondary Data Sources:

- Transport Department Data
- Previous Research Studies
- Municipal Corporation Reports

3. Sampling Technique

Target Group: Commuters of KDMC area

Sample Size: 100 Respondents

Selection Criteria:

- Different age groups (16-30, 31-45, 46-60, 61+ years)
- Various income levels (<20K, 20-40K, 40-60K, 60-80K, 80K+ per month)
- Gender based inclusion (55% females, 45% males)

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4. Data Collection Instrument

- Structured questionnaire which included:
- Travel time preferences
- Factors for transport mode selection
- Socio-economic details
- Travel purpose

5. Data Analysis Methods

Descriptive Statistics:

- Frequency distribution
- Percentage analysis

Inferential Statistics:

- Cross-tabulation
- Categorical analysis:
- Comparison of travel time preferences according to age and income groups
- Evaluating the effect of travel time on transport mode selection

6. Variables Definition

- Independent Variables:
- Travel time
- Travel speed
- Age of passenger
- Monthly income

Dependent Variables:

- Transport mode selection (KDMT bus, auto, taxi, others)

7. Ethical Considerations

- Respondents consent obtained
- Confidentiality maintained
- Unbiased data collection ensured

8. Limitations

- Limited to KDMC area only
- Small sample size (100 respondents)
- Limitations of convenience sampling

VI. DISCUSSION AND RESULTS

Table No. 1 – Frequency Table of Gender (Out of 100 Respondents)

Gender	Frequency	Percent
Female	55	55.00%
Male	45	45.00%
Total	100	100.00%

Source: Compiled from SPSS output

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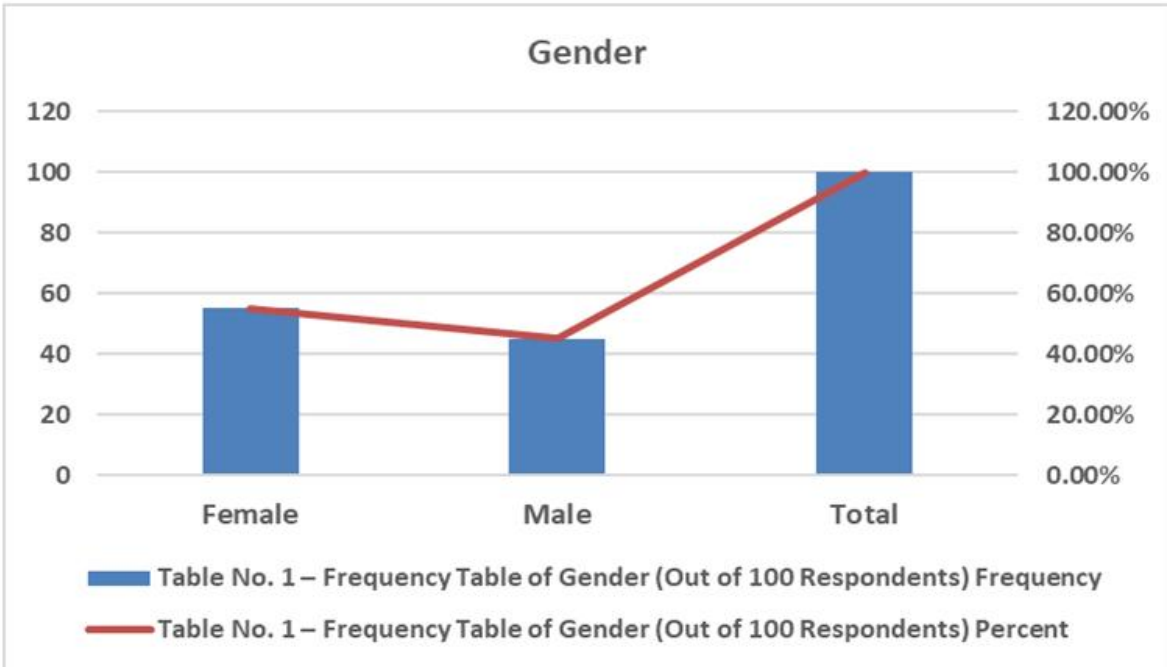

Table No. 1 – Distribution of Respondents by Gender (Based on 100 Respondents)

It is evident from the above table that out of the total 100 respondents who participated in the survey, 55% were females and 45% were males. This shows that the participation of females in this study was higher than that of males. This gender-based distribution helps in making the research findings more balanced and inclusive from a social perspective. Also, it indicates that women's participation in public transport services like KDMT is important, hence policies should be made keeping in mind their choice and satisfaction.

Table No. 2 – Frequency Table of Monthly Income (Out of 100 Respondents)		
Monthly Income	**Frequency**	**Percent**
Below ₹20,000	39	39.00%
₹20,001 to ₹40,000	24	24.00%
₹40,001 to ₹60,000	18	18.00%
₹60,001 to ₹80,000	13	13.00%
₹80,001 and above	5	5.00%
Total	**100**	**100.00%**

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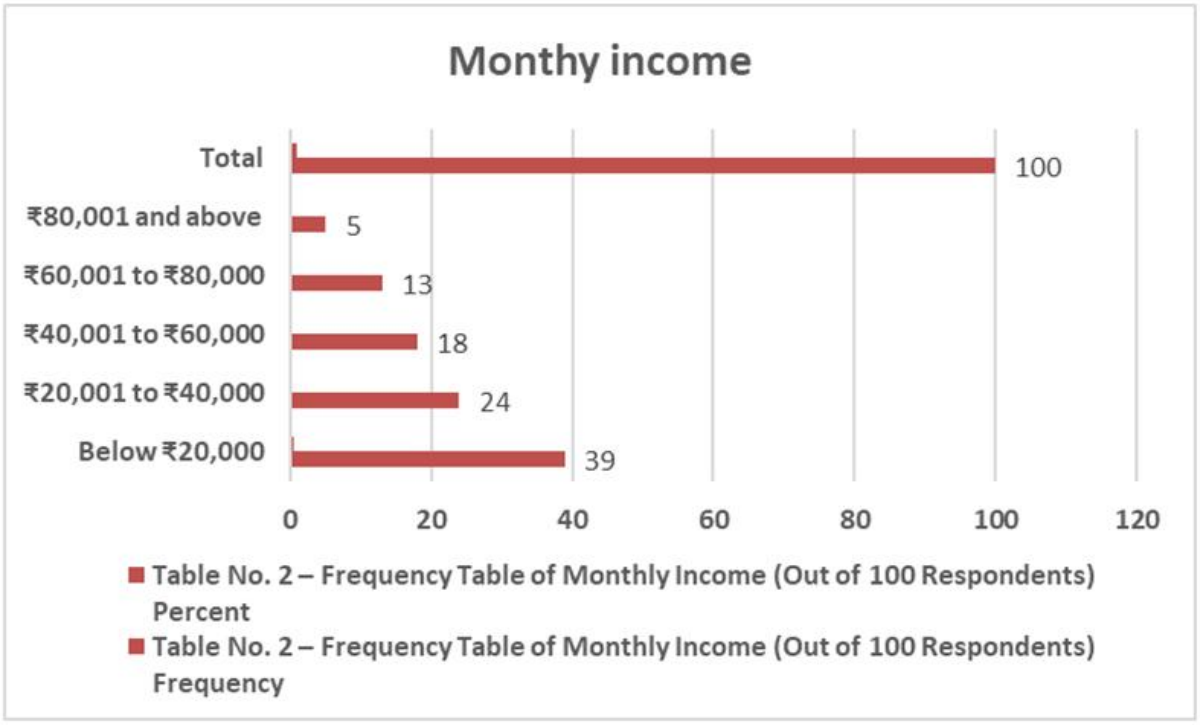

Table No. 2 – Monthly Income Distribution of Respondents (Out of 100 Respondents)

This table shows the distribution of respondents based on monthly income, which includes 100 respondents.

Respondents with income less than ₹20,000: 39% of the respondents fall in this category, which indicates that a large number of people belong to the low income group. This shows the social and economic inequalities, which are common in cities.

Respondents with income from ₹20,001 to ₹40,000: 24% of the respondents fall in this category. This income level belongs to the middle class, which is found in most urban areas of India.

Respondents with income from ₹40,001 to ₹60,000: 18% of the respondents fall in this category, which indicates that a small but significant portion belongs to the upper middle class.

Respondents with income between ₹60,001 and ₹80,000: 13% of respondents fall in this category, which is slightly better off than the lower income group.

Respondents with income between ₹80,001 and above: Only 5% of respondents fall in this category, which represents the higher income group.

Table No. 3 - Cross-tabulation of Commuter's Preferences in Mode of Transportation on the Basis of Speed/Travel with Age (Out of 100 Respondents)

Age	16-30 (Count)	31-40 (Count)	41-50 (Count)	51-60 (Count)	61 and Above (Count)	Total (Count)
KDMT bus services	23 (23%)	19 (19%)	15 (15%)	13 (13%)	2 (2%)	72 (72%)
Auto	23 (23%)	5 (5%)	7 (7%)	5 (5%)	3 (3%)	43 (43%)
Taxi (Black & Yellow)	7 (7%)	8 (8%)	3 (3%)	5 (5%)	1 (1%)	24 (24%)
Other Modes	12 (12%)	3 (3%)	3 (3%)	2 (2%)	8 (8%)	28 (28%)
Total	65 (65%)	35 (35%)	28 (28%)	25 (25%)	14 (14%)	100 (100%)

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This table shows the preferences for selection of transport based on travel time and speed according to different age groups based on 100 respondents.

KDMT bus services get the highest preference in the 16-30 age group, where 23% of the respondents chose it. As the age increases, the preference for this service decreases, and only 2% chose it in the 61 years and above age group.

Auto is equally popular in the 16-30 age group (23%) but it is limited to 3% in the age group above 61 years.

Taxi (Black & Yellow) gets a preference of 7% in the 16-30 age group, while it is reduced in other groups, with only 1% choosing it in the 61 years and above age group.

The preference for other modes was 12% in the 16-30 age group, while it reached 8% in the 61 years and above age group.

This data shows variations in transport mode preferences across age groups, which may depend on factors such as travel time, convenience, and cost. Thus, this study suggests that travel time and cost preferences change with age, which impacts transport decisions.

Table No. 4 - Cross-tabulation of Commuter's Preferences in Mode of Transport Based on Speed/Travel Time with Monthly Income (Out of 100 Respondents)

Particular	**Below ₹20,000 (Count)**	**₹20,001 - ₹40,000 (Count)**	**₹40,001 - ₹60,000 (Count)**	**₹60,001 - ₹80,000 (Count)**	**₹80,001 and above (Count)**	**Total (Count)**
KDMT bus services	14 (14.0%)	15 (15.0%)	10 (10.0%)	5 (5.0%)	1 (1.0%)	45 (45.8%)
Auto	12 (12.0%)	5 (5.0%)	4 (4.0%)	2 (2.0%)	1 (1.0%)	26 (26.2%)
Taxi (Black & Yellow)	4 (4.0%)	2 (2.0%)	2 (2.0%)	5 (5.0%)	0 (0.0%)	13 (13.2%)
Other Modes	7 (7.0%)	1 (1.0%)	2 (2.0%)	1 (1.0%)	3 (3.0%)	15 (14.8%)
Total	37 (37.0%)	23 (23.0%)	18 (18.0%)	13 (13.0%)	5 (5.0%)	100 (100%)

This table shows the choice of transport mode based on monthly income. Based on 100 respondents, this table shows how the preference of commuters varies across different income groups.

KDMT bus services were the most preferred transport mode across all income groups. This mode was preferred by the less than ₹20,000 income group (14%), while the preference was very low in the ₹80,001 and above income group (1%).

Autos were selected more by the less than ₹20,000 income group (12%), but the percentage was significantly lower in other groups.

The choice of taxis (black and yellow) was also limited, especially in the ₹60,001 to ₹80,000 income group (5%).

The preference for other modes was higher in the ₹80,001 and above income group (3%), while the percentage was lower in other income groups.

This table shows significant differences between income and travel mode preference, which suggests that different types of transport modes are more accessible and attractive to travellers of different income levels. According to this data, public transport was relatively less preferred among higher income groups, while public transport was more prominent among lower income groups. This finding highlights the importance of accessibility and prices of transport services in cities.

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VII. CONCLUSION

The primary objective of this research study was to analyze the relationship between travel time and transport mode choice in the Kalyan-Dombivli Municipal Corporation (KDMC) area. The findings of the study clearly show that travel time emerges as a deciding factor in transport mode choice, especially for commuters in the younger age group (16-30 years). A clear correlation was observed between income level and choice of transport options, where commuters from lower income groups preferred public transport services (KDMT bus). The 55% participation of female commuters in the study highlights their specific needs in the public transport system. Based on the findings, there is a need to improve the frequency and reliability of public transport, strengthen last-mile connectivity, and develop transport services keeping in mind the specific needs of different age and income groups. This study provides important insights for transport planners and policymakers, which will be helpful in developing more efficient, inclusive, and sustainable transport systems. However, some of the limitations of the study, such as the limited sample size of 100 respondents and the scope limited to only one municipal area, deserve attention in future research. Future research may yield more comprehensive findings by including larger sample sizes, comparative studies across different urban areas, and qualitative research methods.

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