“HOW USERS PERCEIVED THE SAME FACILITY AT DIFFERENT TIMES OF DAY? CASE STUDY OF PUNE METRO ”

Paper No. 9753

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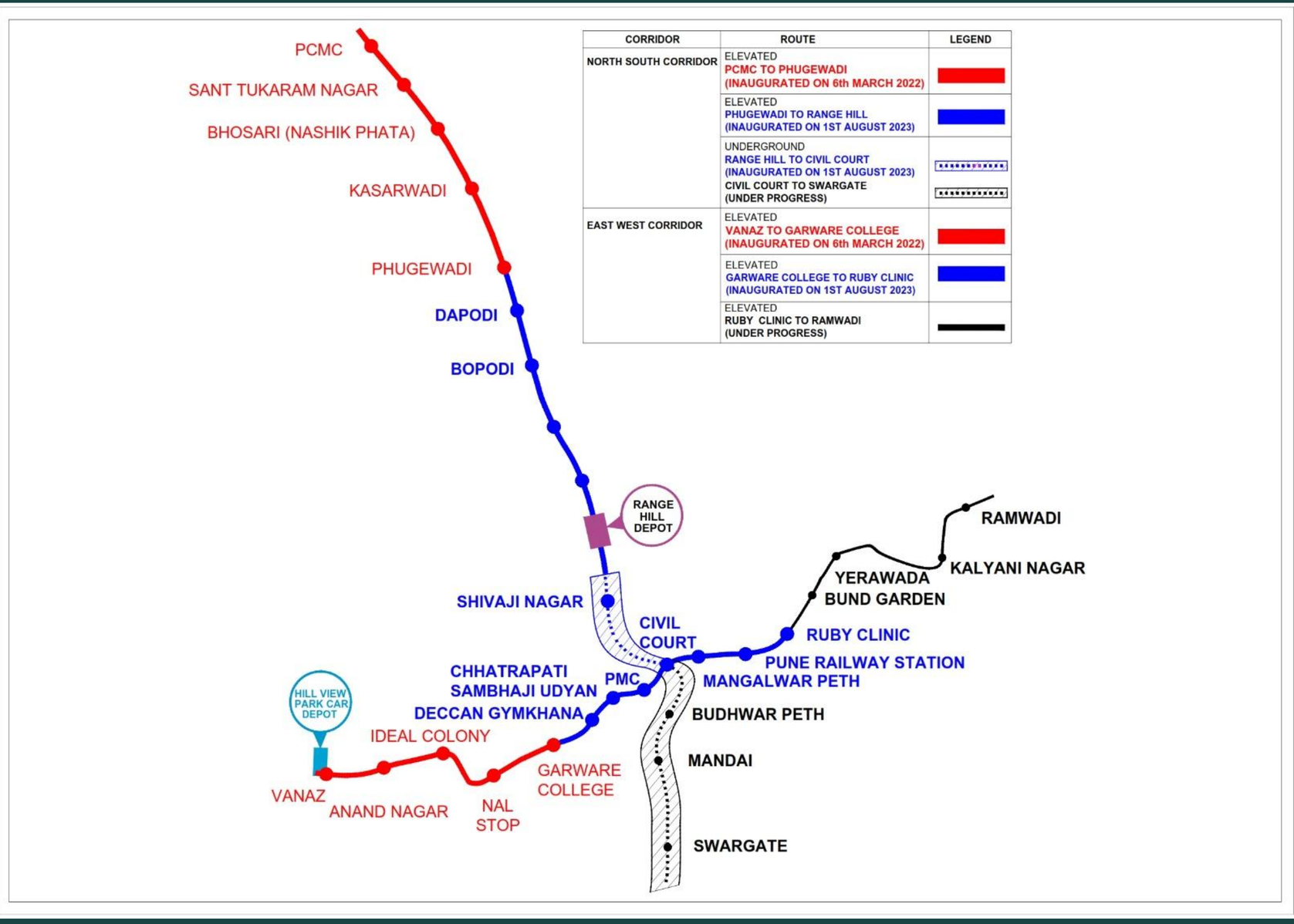
AGENDA

1	Overview
2	Data Collection
3	Statistical Representation
4	Analysis and Discussion
5	Conclusions
6	References

INTRODUCTION



Public Transport Scenario Before Metro

PMPML Buses

Need and Situation to Bring Metro in Pune

Tier I cities
>2 million (National Urban Transport Policy)

Foreground Situation of Metro in Pune

- **2 routes in operation**
- **33.2 km in working condition**
- **5% ridership (Potential: 25 – 35%)**

LITERATURE REVIEW

A Comprehensive Summary and Analysis of the existing research and literature.

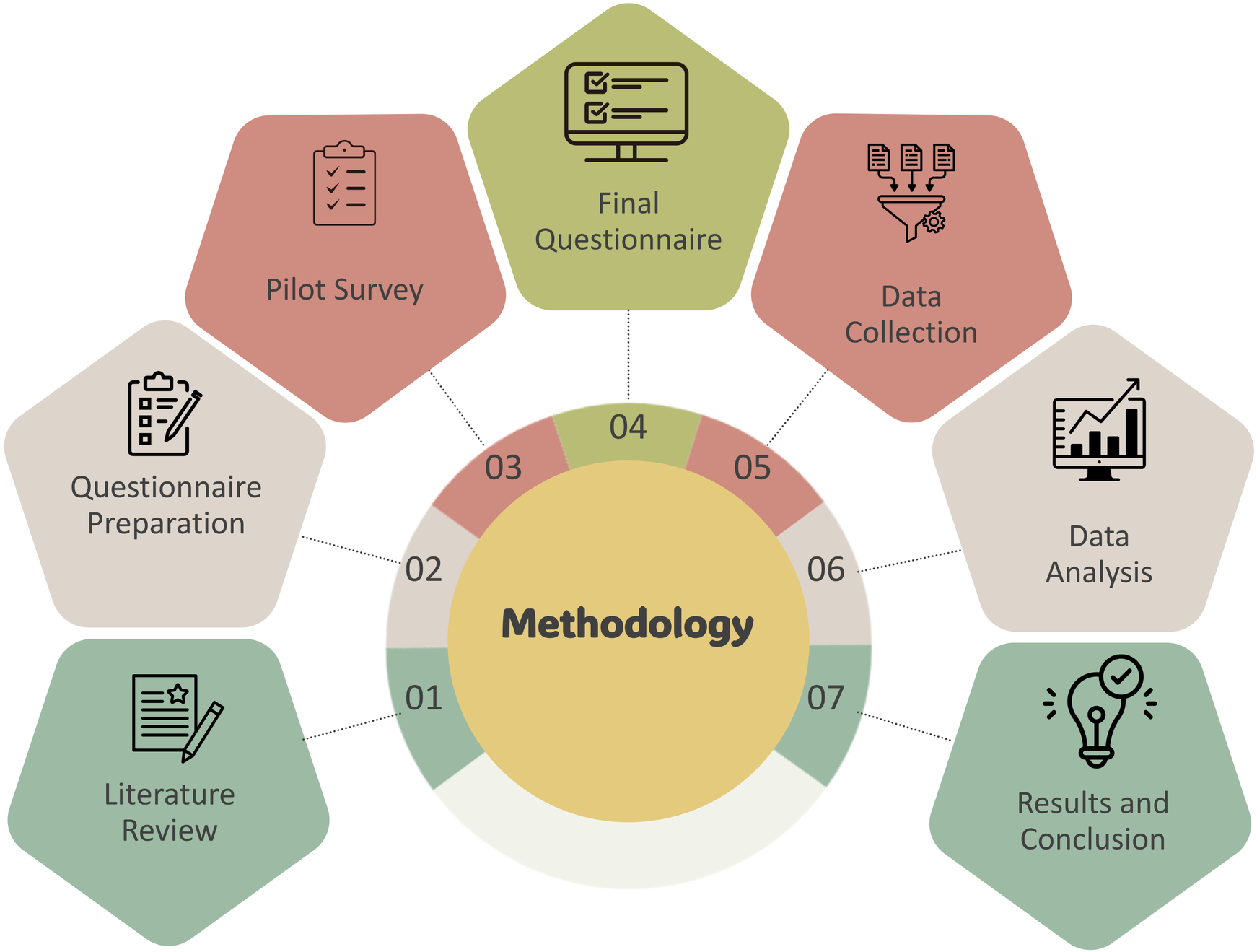
Author & Year	Sample Size	Title	Parameters	Findings
Echaniz et al. (2022)	808	Spatial and temporal variation of user satisfaction in public transport systems	Use of hybrid buses, Access time to the bus stop, Egress time from stop too final destination, Vehicle cleanliness, Ease of transfer, Information at stops, On-board information, Bus comfort, Reliability, Driver friendliness, Quality of stops, Information on the mobile phone application, Heating/air conditioning, Noise	The results show that overall user satisfaction with the service decreases at peak times of the day, experiences more variations in lines with lower frequencies and can depend on the direction and location of the trip.
Chowdhury et al. (2017)	154	Public Transport users and policy makers perceptions of integrated Public Transport Systems	Network Integration Information Integration Route Optimization and Synchronization Frequency of use	A recommendation to policy makers is to consider making transfer waiting times a key focus in planning.
Nadeem et al. (2021)	420	Does Bus Rapid Transit System (BRTS) Meet the Citizens' Mobility Needs? Evaluating Performance for the Case of Multan, Pakistan	BRT Basics Service Planning, Infrastructure stations, Communications, Access and Integration	This research concluded that around 54% of passengers are highly satisfied and opted for BRT due to comfort.
Ali et al. (2015)	200	Importance-performance Analysis and Customer Satisfaction Index for Express Bus Services	Comfort, security, punctuality, drivers, ticket price, services, and staffs at the counter.	Improving facilities from time to time will make the customer satisfied with the service provided by the organization, every change made should be aimed to give satisfaction to customers.

RESEARCH QUESTIONS

1. What the user's perceived about Pune Metro?
2. Did the user's perception vary spatially and temporarily?
3. What is the importance satisfaction matrix for the users?
4. How to increase the ridership of Pune Metro?

OBJECTIVES

Objective I	Objective II	Objective III	Objective IV
To assess Spatial Variation in Metro users Perception of Pune.	To Evaluate the Temporal Variation in Metro users Perception of Pune.	To investigate important satisfaction factors among users and analyze gender- and age-wise perceptions of Pune Metro using selected variables.	To propose policy recommendations for improvement in the Metro’s usage


Methodology
01
Literature Review
02
Questionnaire Preparation
03
Pilot Survey
04
Final Questionnaire
05
Data Collection
06
Data Analysis
07
Results and Conclusion

NUMBER OF SAMPLES

$$n = \frac{p(1-p)}{(\frac{e}{z})^2 + \frac{p(1-p)}{N}}$$

where p = proportion or incidence of cases, e = margin of error in result, z = standardised score for level of confidence, and N = population size.

(Source: Saw et al. 2020)

Approximate Sample Size: 400


GPS Map Camera
Pune, Maharashtra, India
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Lat 18.515907°
Long 73.843796°
09/03/24 07:15 PM GMT +05:30
Google


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10 Mar 2024 04:03 pm


Pune, Maharashtra, India
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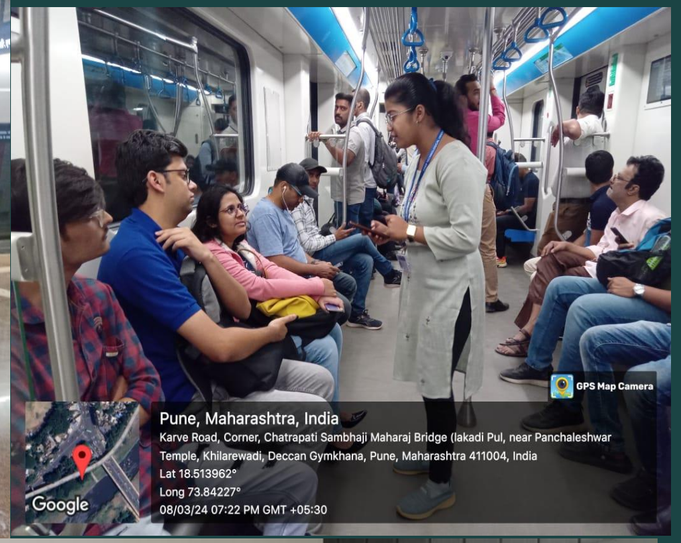
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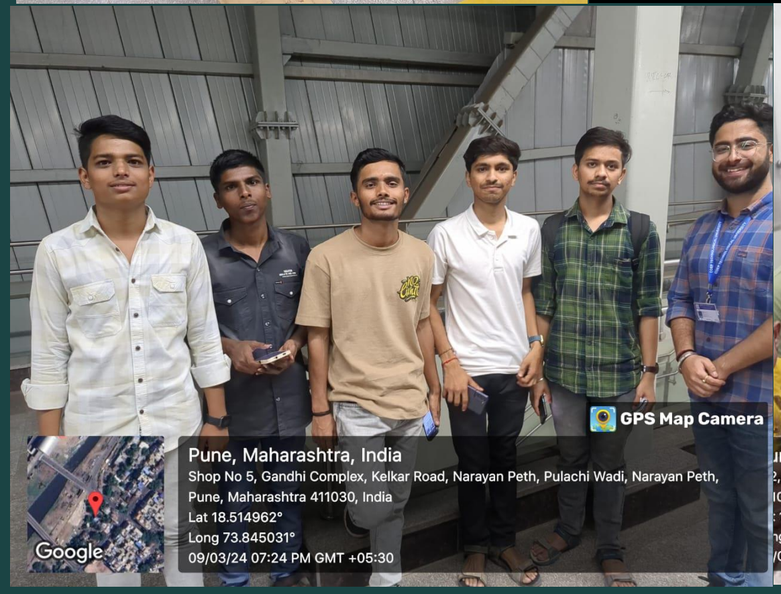
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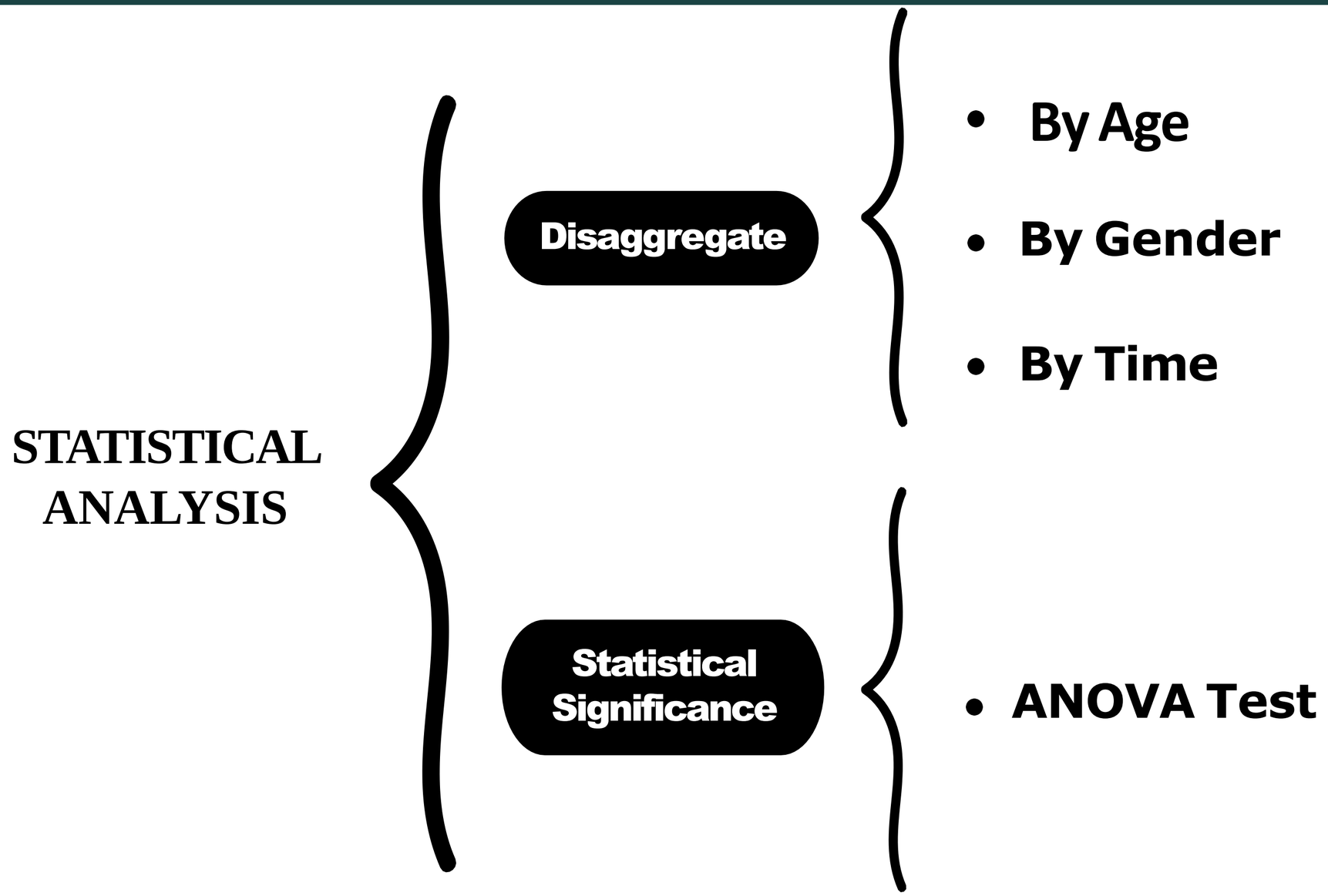
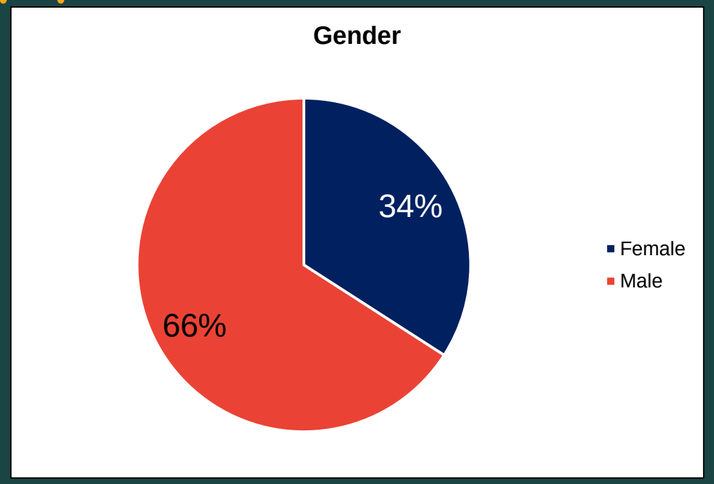
ANALYSIS


STATISTICAL ANALYSIS
Disaggregate
By Age
By Gender
By Time
Statistical Significance
ANOVA Test

Variables	Description
Gender	0=Female, 1= Male
Age	0= <=20, 1= 21-30, 2= 31-40, 3=41-50, 4= 51-60
Occupation	0= Government Job, 1=Housewife, 2=Own a Business, 3= Private Job,4= Retired, 5= Student, 6= Unemployed
Monthly Income	1= <10,000, 2= 10,000-20,000, 3=20,000-40,000,4= 40,000-60,000, 5=60,000-80,000, 6=80,000-1L, 7= 1L-1.25L, 8= >1.25L
Frequency of Travel (Mode of Choice)	0= 1-2 Times, 1= 4-5 Times, 2= Daily, 3= Once a Month
Frequency of Travel (Metro)	0= 1-2 Times, 1= 4-5 Times, 2= Daily, 3= First Time, 4= Rarely
Have a Metro Smartcard	0= No, 1=Yes
Time Started Using Metro	0= Aug’23-Sept’23, 1= Oct’23-Dec’23, 2= Jan’24-Feb’24
Time of Travel	1=Afternoon Offpeak, 2-Morning Peak, 3=Evening Peak
Trip Purpose	1= Business, 2= Educational, 3= Leisure, 4= Shopping and recreational, 5= Work
Stations	0= PCMC, 1=Sant Tukaram Nagar, 2=Bhosari , 3= Kasarwadi, 4= Phugewadi, 5= Dapodi, 6=Bopodi, 7= Shivajinagar, 8= Civil Court, 9= Vanaz ,10= Anand Nagar, 11= Ideal Colony, 12=Nal Stop, 13= Garware College, 14= Deccan Gymkhana, 15= Chattrapati Sambhaji Garden, 16= PMC, 17= Pune Railway Station, 18= Ruby Hall Clinic, 19= Bund Garden, 20= Kalyani Nagar, 21= Mangalwar Peth, 22= Ramwadi
Trip Distance (in kms)	0= 0-5, 1=5-7, 2=7-10, 3= 10-15, 4= 15-20, 5=20-25, 6= Above 25
Importance Scale	-2= Not Important -1= Slightly Important 0= Moderately Important 1= Very Important 2= Extremely Important
Satisfaction Scale	-2= Very Dissatisfied -1= Dissatisfied 0= Neutral 1= Satisfied 2= Very Satisfied

Variables	Description
Pune Metro	PM
Information availability	IA
Accessibility to Senior Citizens and Physically Challenged	ASCPC
Travel Cost	TC
Comfort	C
Travel Time	TT
Overall Safety	OS
Refreshment Facilities	RF
Availability of Amenities	AA
Staff Attitude	SA
Efficiency in Ticketing Process	ETP
Platforms and Terminals	PT
Washroom Toilet Facilities	WTF
Cleanliness	CL
Overall Environment	OE
Overall Importance	OI
Overall Satisfaction	OS

Socioeconomic and Demographic



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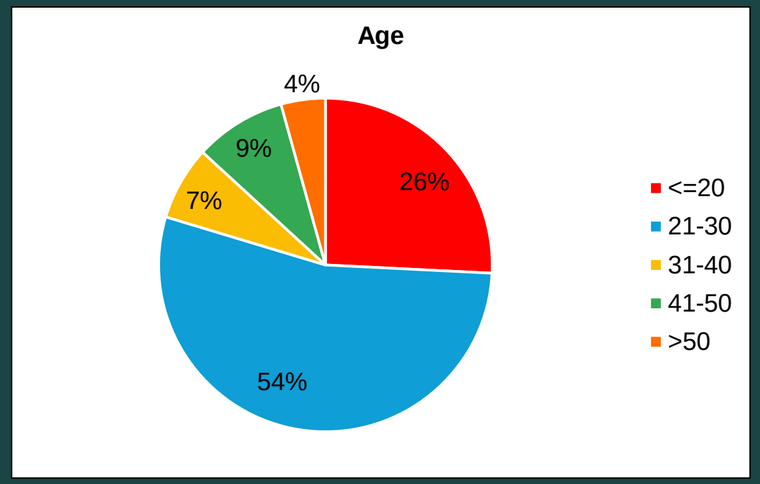

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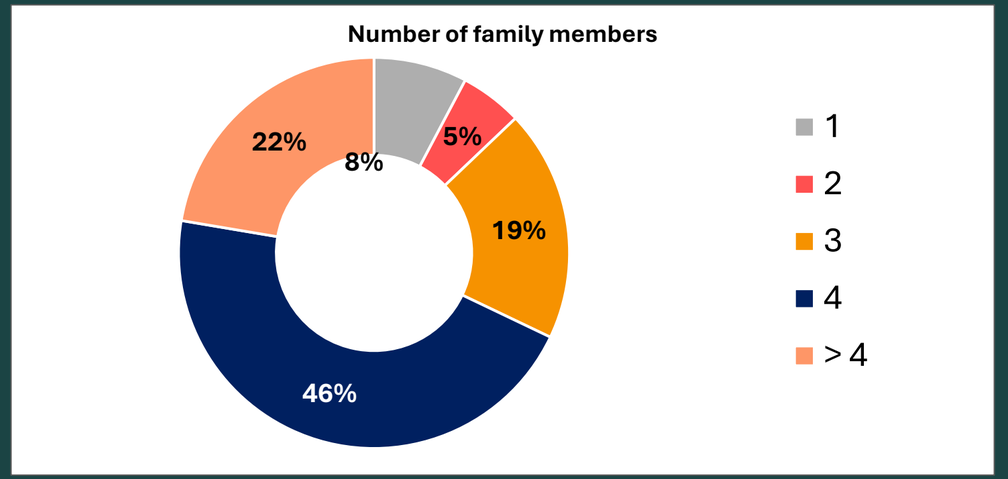

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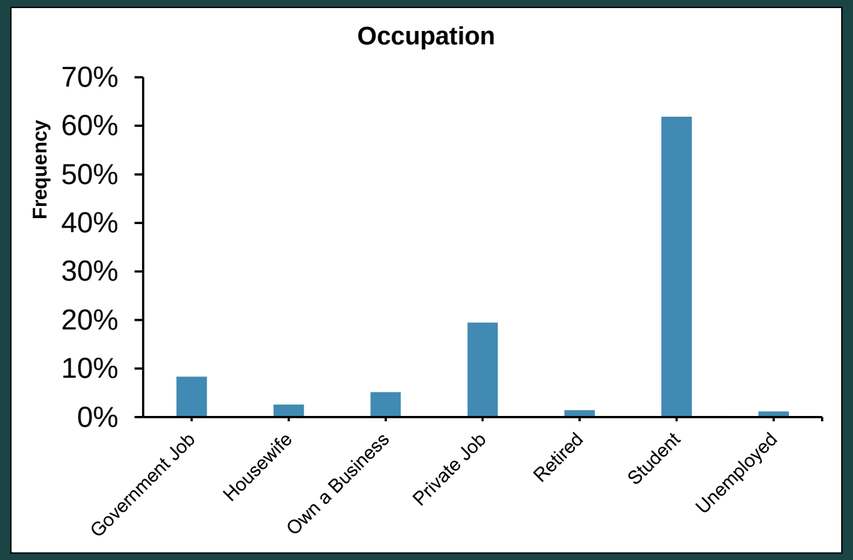

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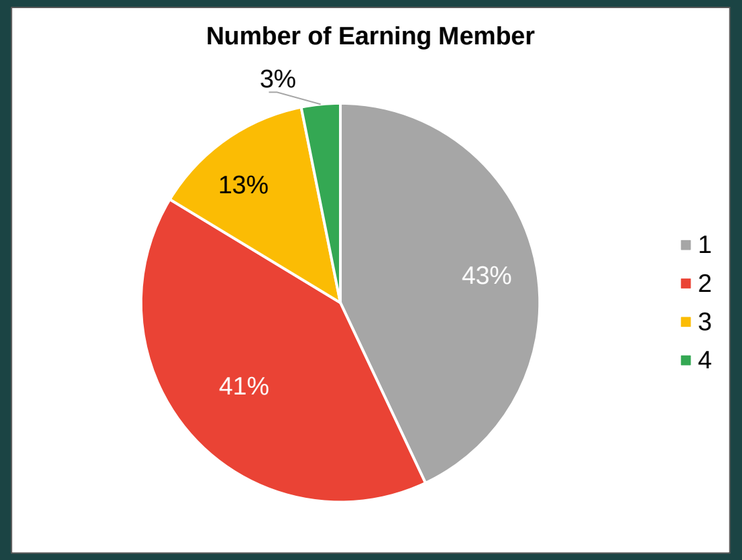

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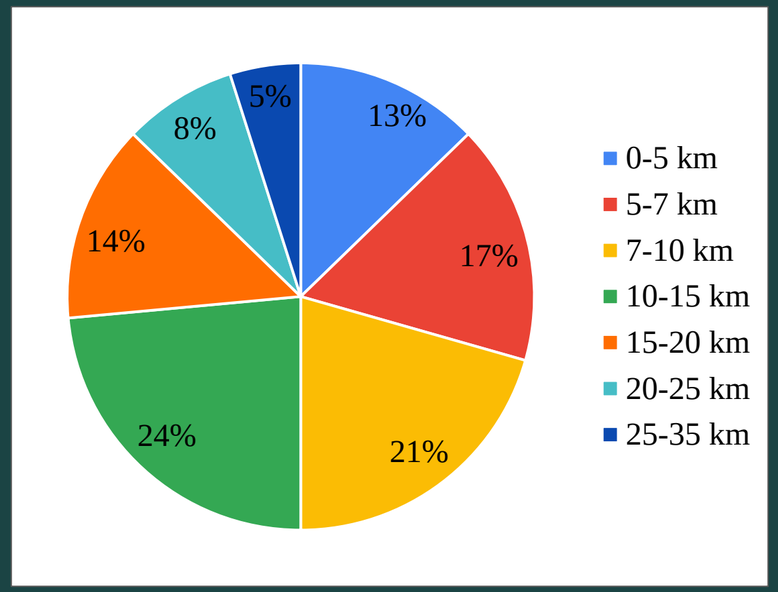
Trip Characteristics



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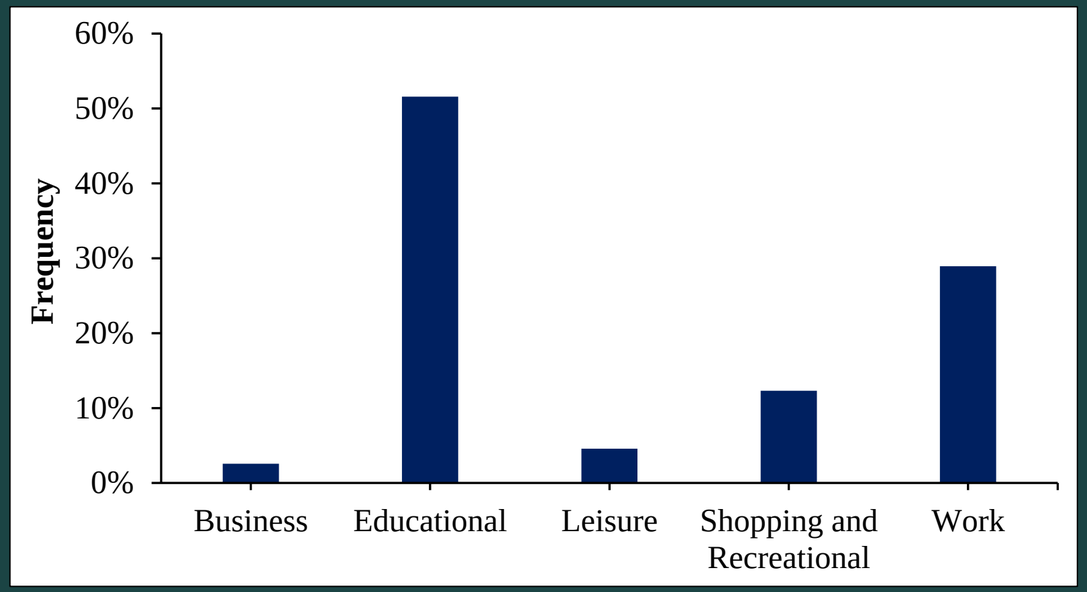

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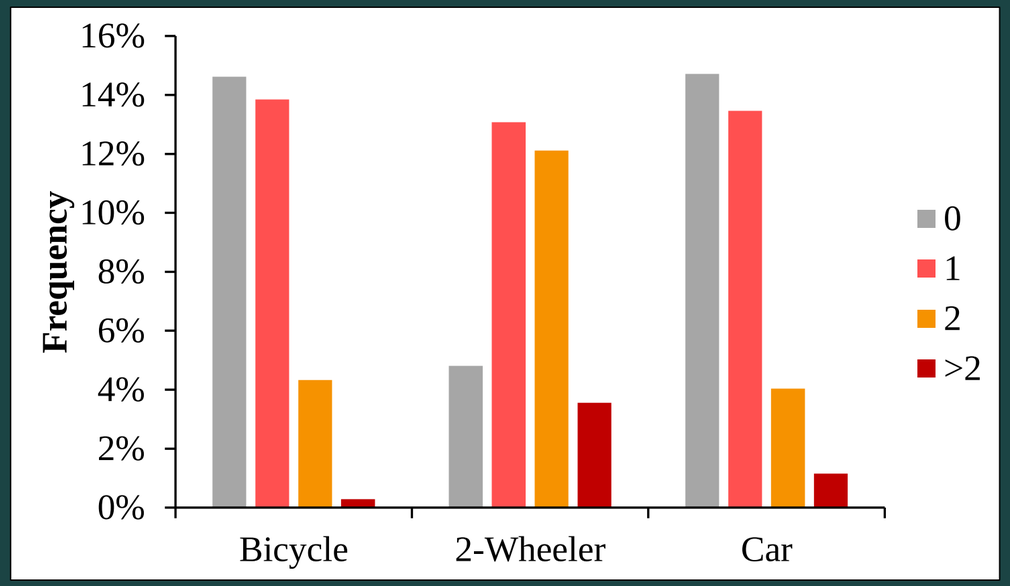

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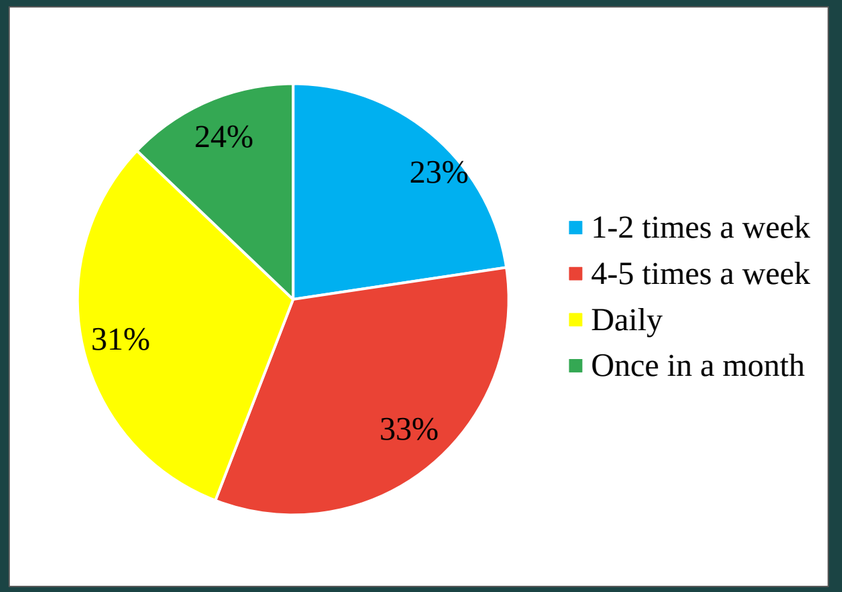

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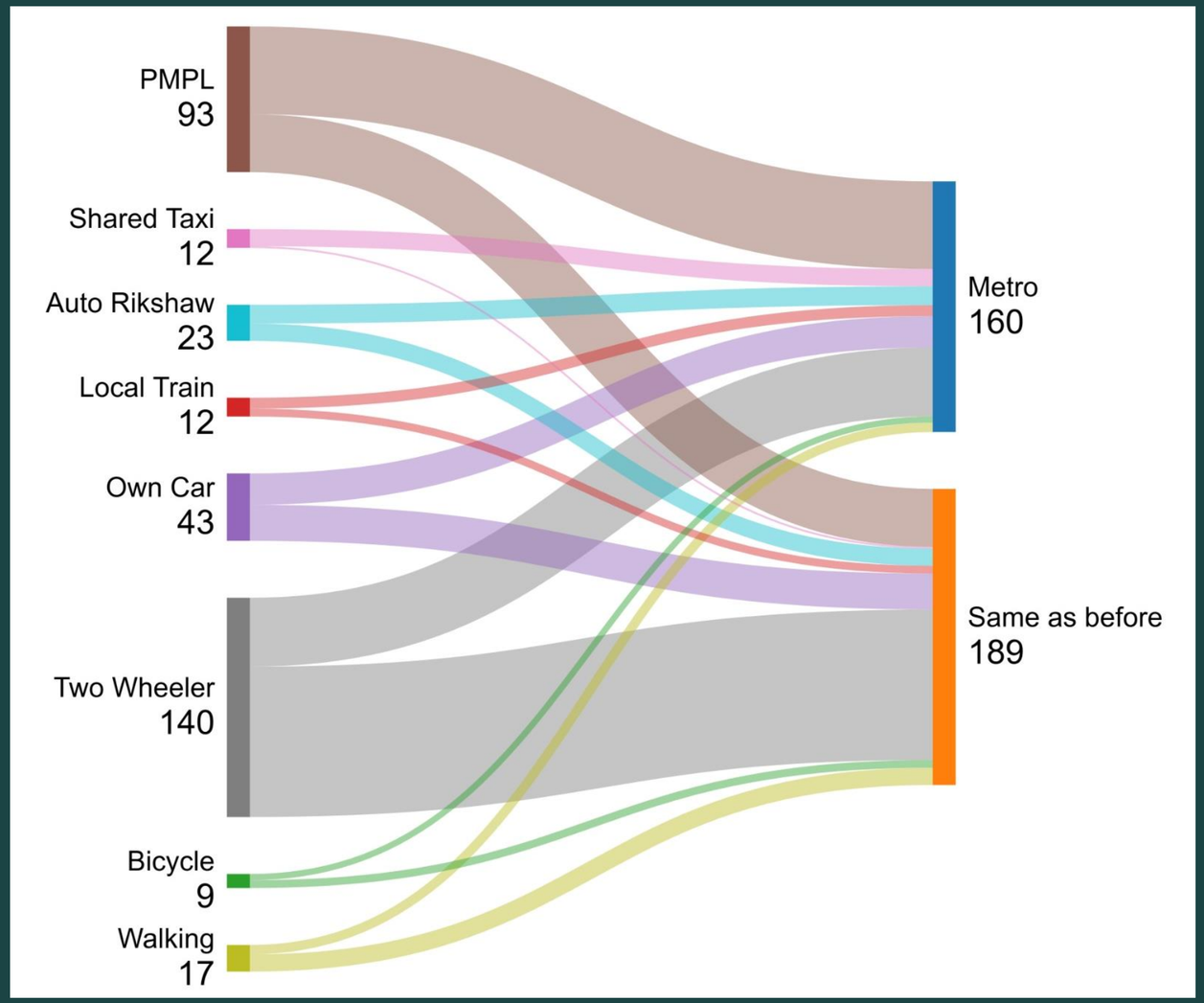
Metro Characteristics



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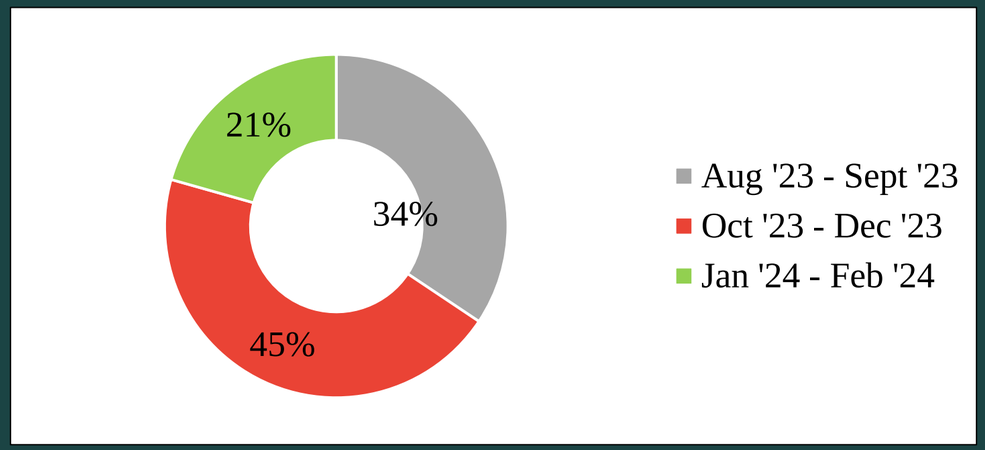

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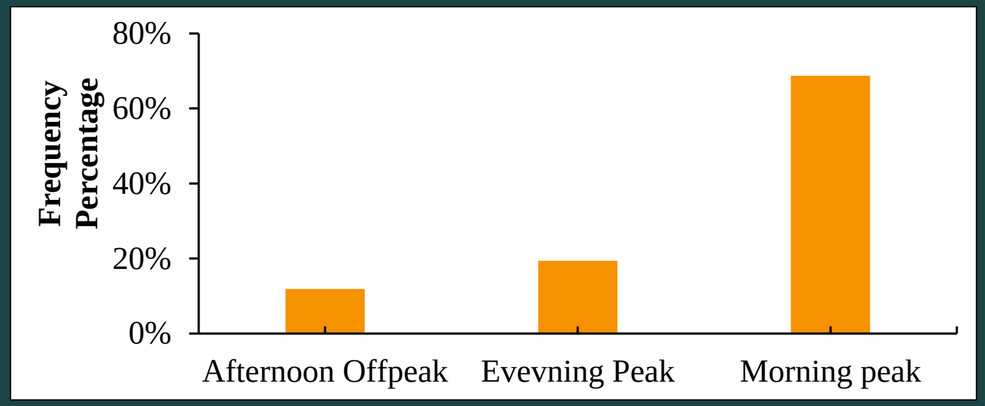

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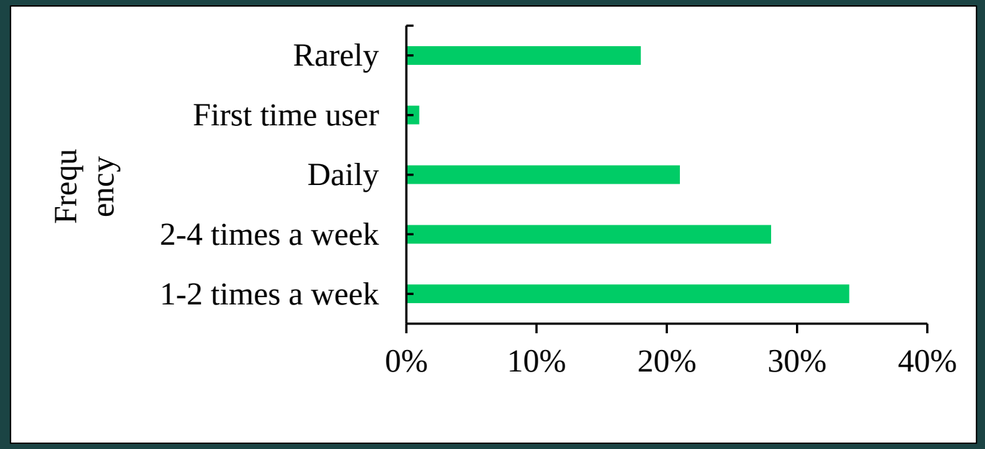

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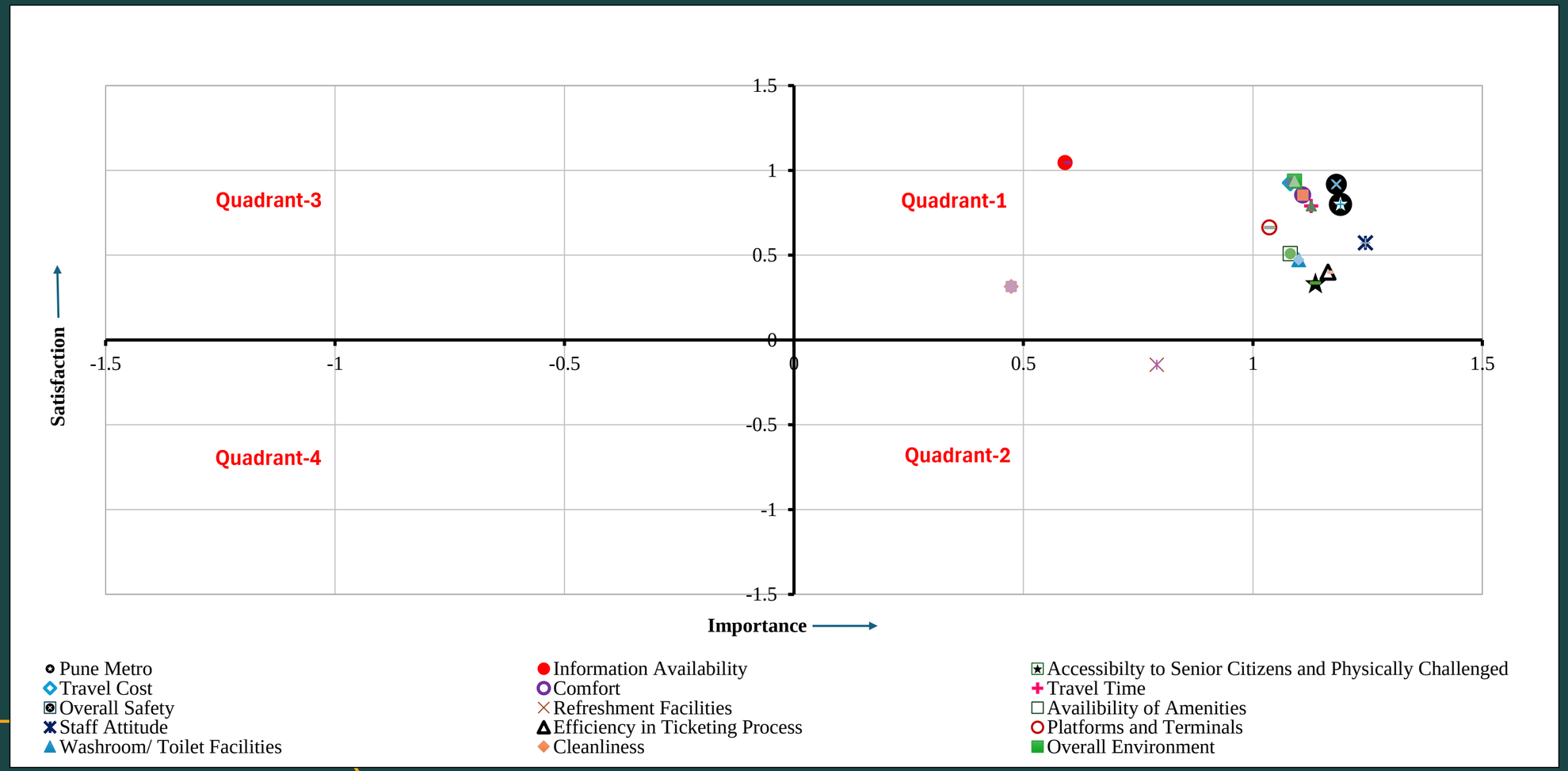
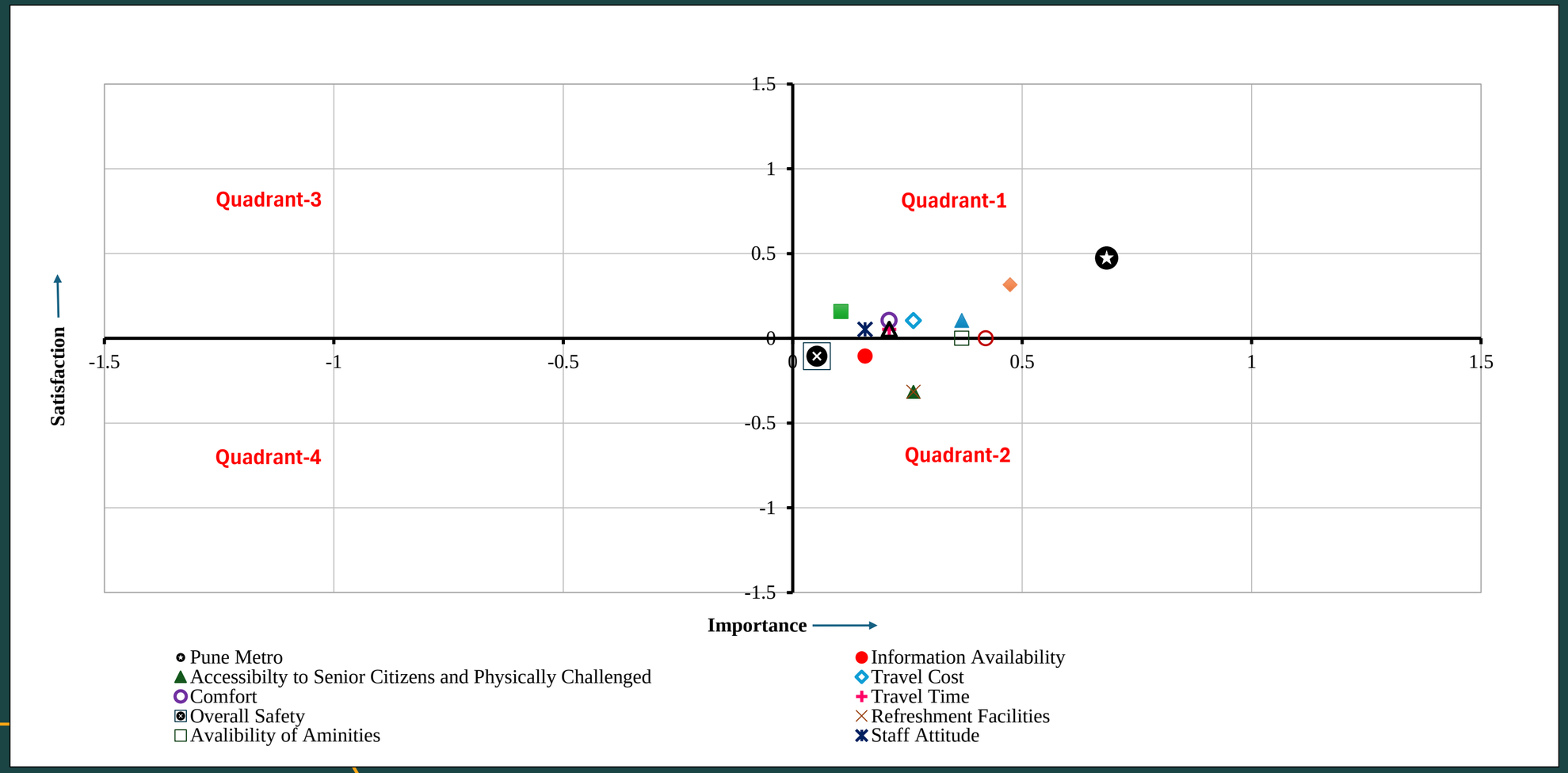
IMPORTANT SATISFACTION ANALYSIS

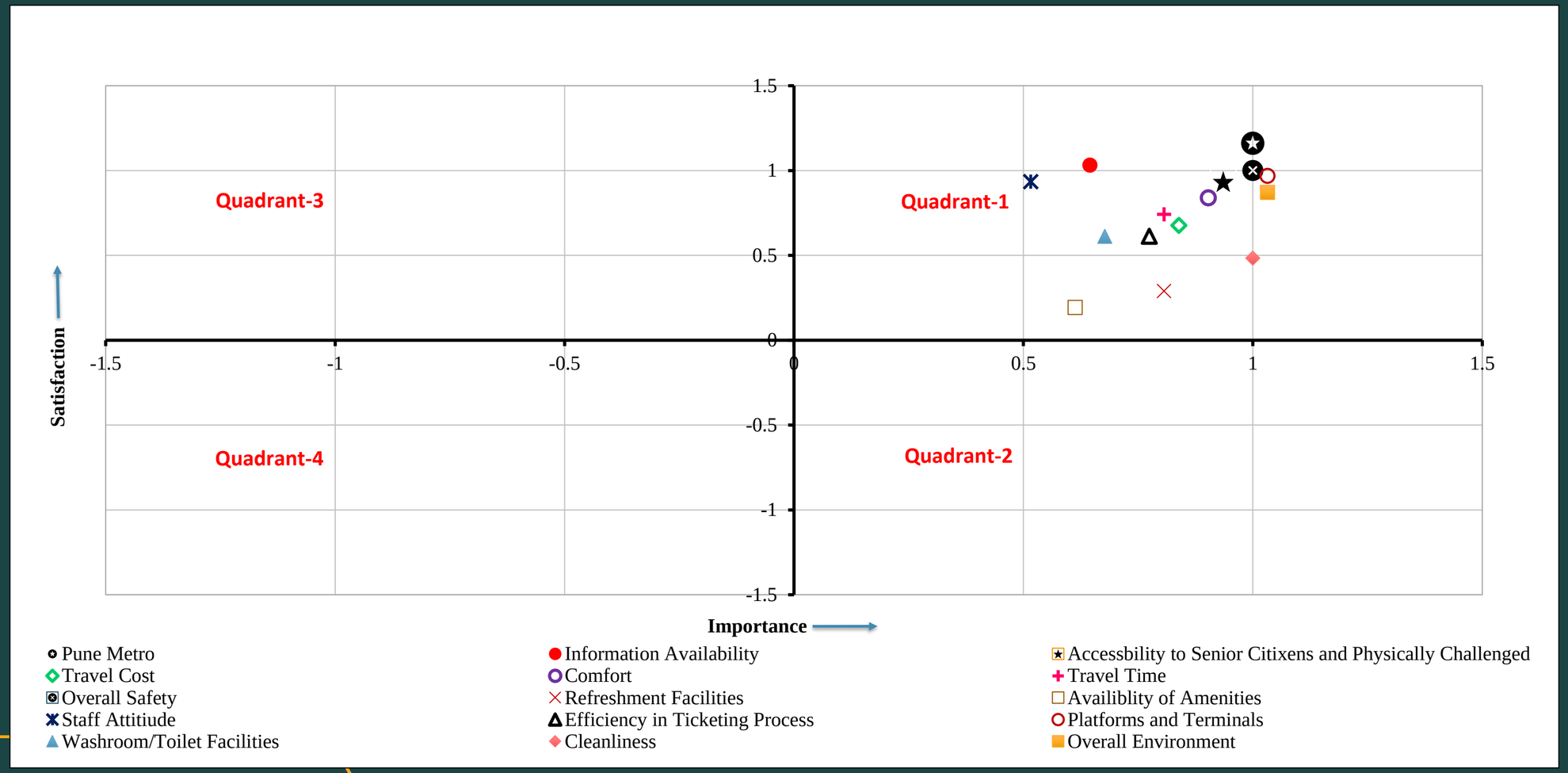
MORNING PEAK



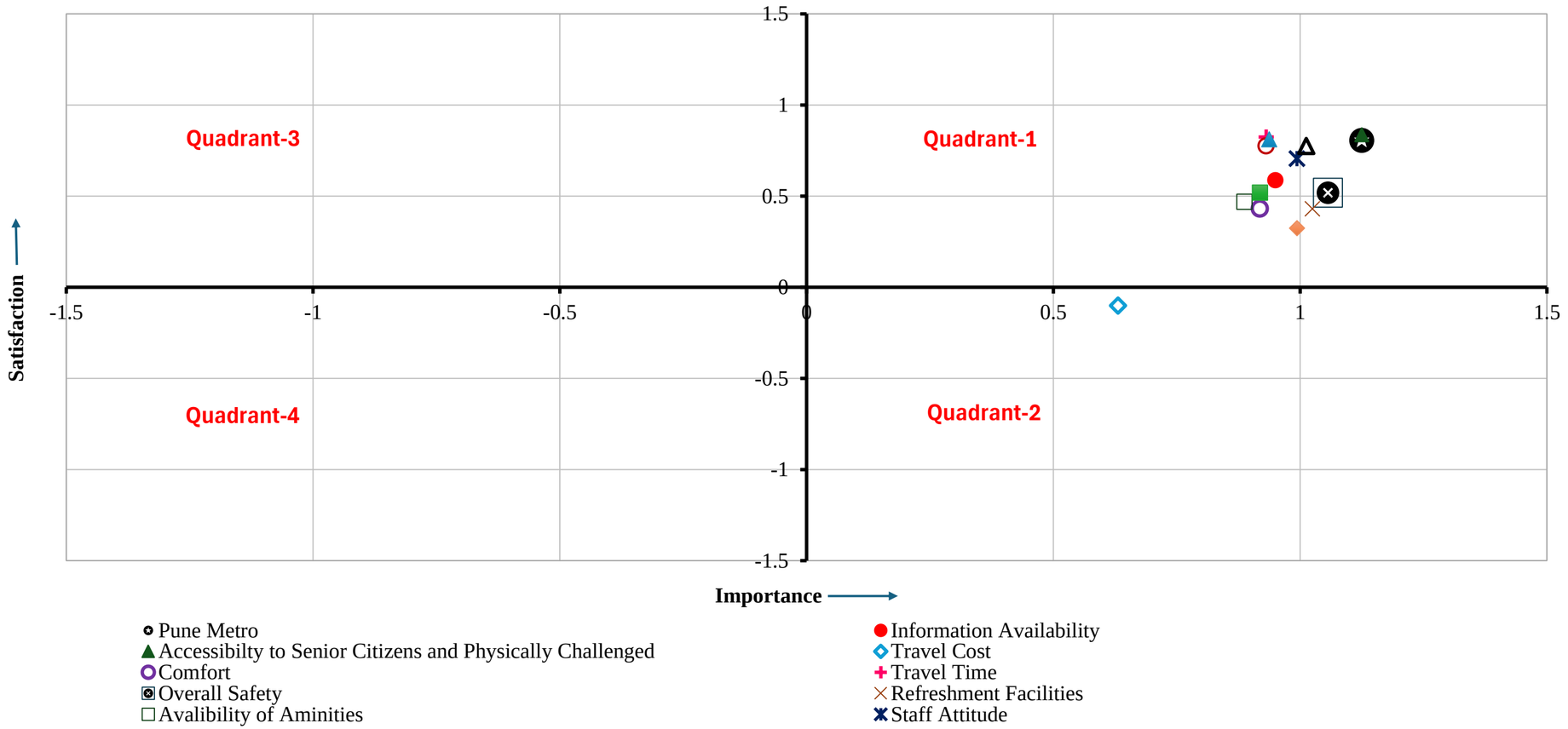
AFTERNOON PEAK



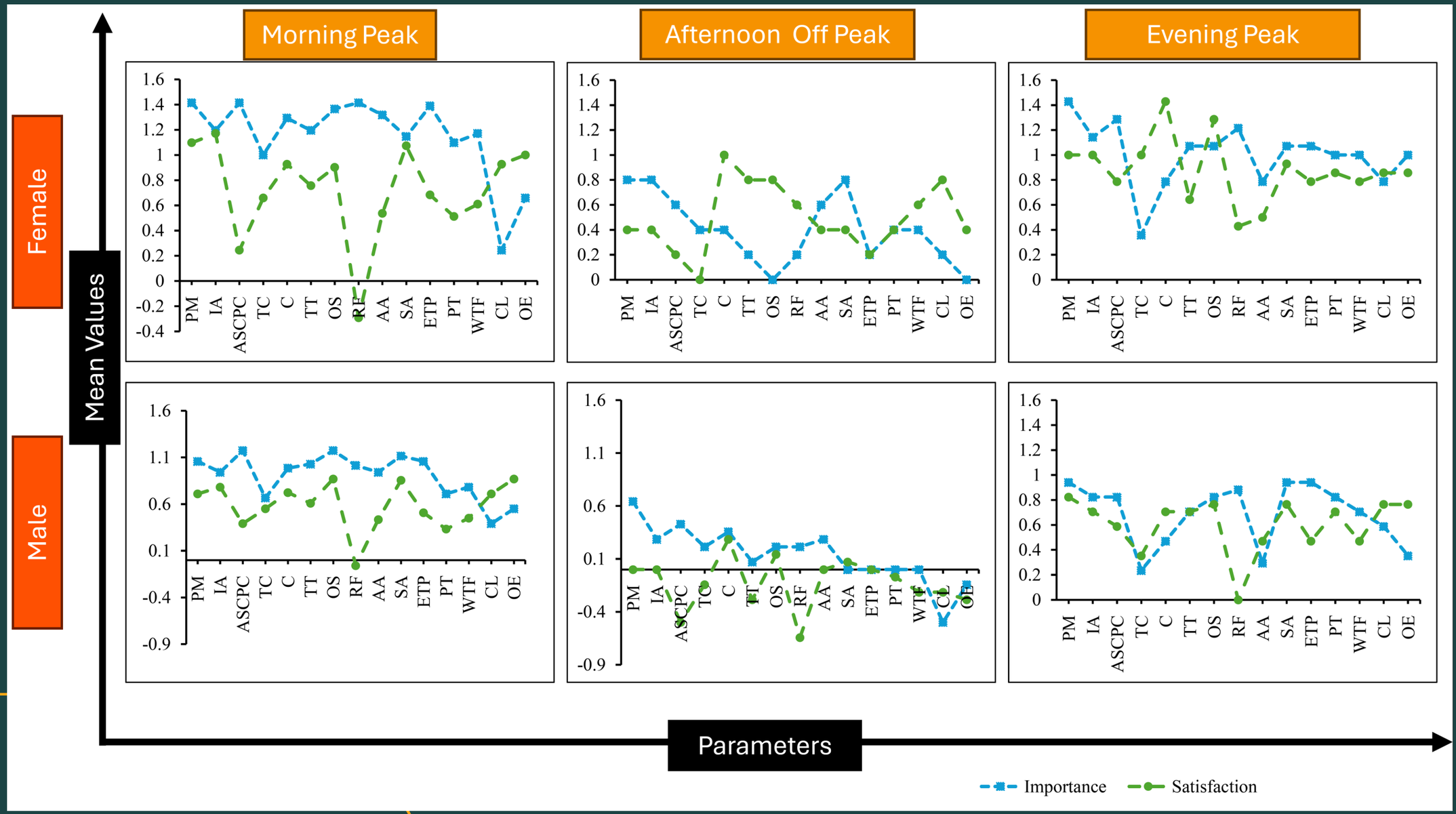
EVENING PEAK



OVERALL

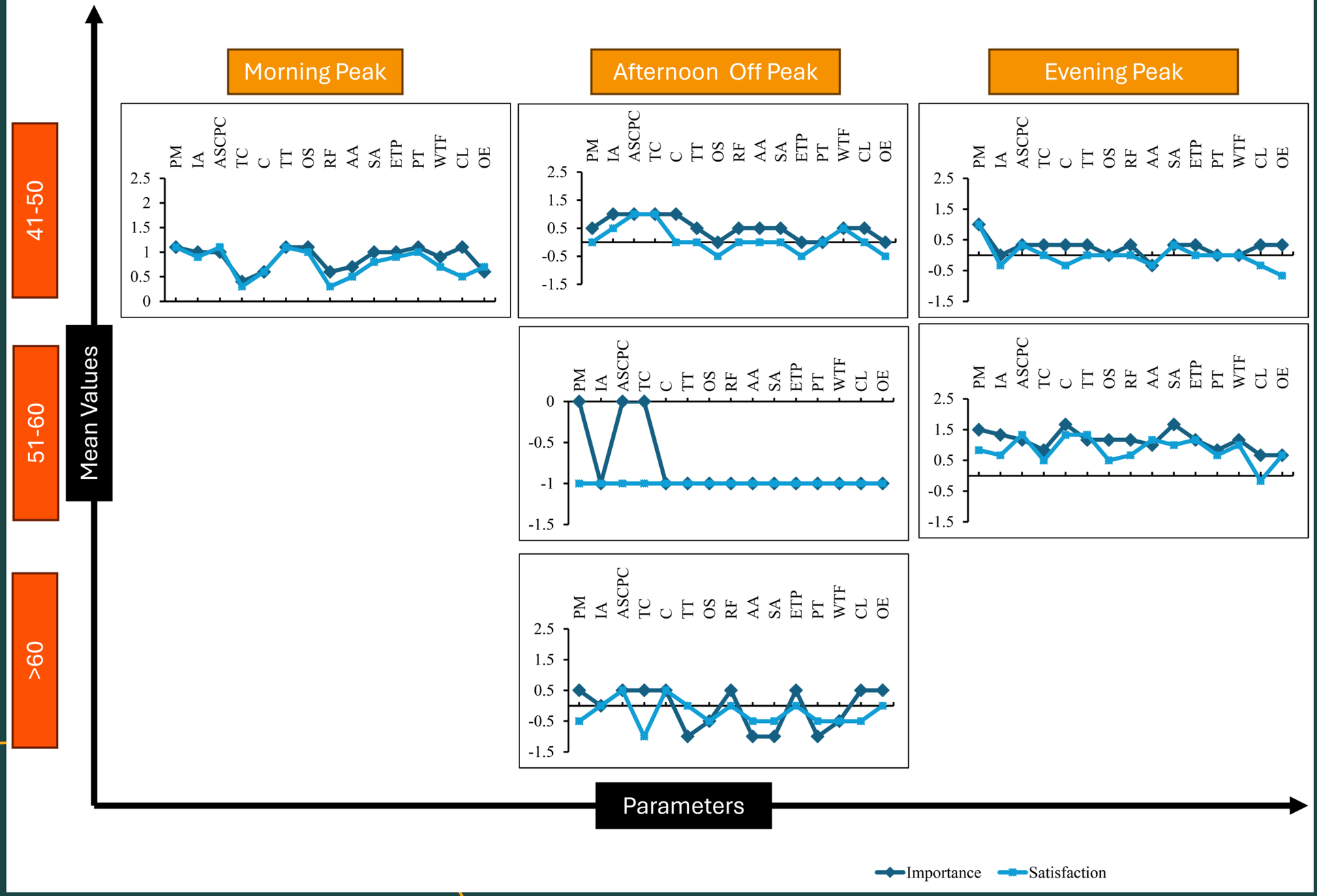

Quadrant-3
Quadrant-1
Quadrant-4
Quadrant-2
1.5
1
0.5
0
-0.5
-1
-1.5
-1.5
-1
-0.5
0
0.5
1
1.5
Satisfaction
Importance
Pune Metro
Accessibilty to Senior Citizens and Physically Challenged
Comfort
Overall Safety
Avalibility of Aminities
Information Availability
Travel Cost
Travel Time
Refreshment Facilities
Staff Attitude

Gender Analysis



Age-wise Analysis

Age-wise Analysis



Statistical Analysis

	Age		Gender		Time	
	F Value	P Value	F Value	P Value	F Value	P Value
PM_I	7.150	0.008	2.638	0.075	0.957	0.446
PM_S	6.118	0.014	1.940	0.147	1.356	0.244
IA_I	4.824	0.303	3.908	0.022	1.626	0.156
IA_S	2.229	0.137	4.195	0.017	0.491	0.783
ASCPC_I	4.098	0.045	6.351	0.002	1.349	0.247
ASCPC_S	2.071	0.152	3.214	0.043	2.279	0.049
TC_I	2.393	0.124	4.046	0.019	0.359	0.876
TC_S	0.246	0.621	1.972	0.143	1.306	0.264
C_I	2.851	0.093	5.813	0.004	0.944	0.454
C_S	0.634	0.427	1.041	0.355	0.663	0.652
TT_I	2.278	0.133	8.881	0.000	3.327	0.007
TT_S	2.254	0.135	4.783	0.010	0.896	0.485
OS_I	1.541	0.216	10.999	0.000	3.049	0.012
OS_S	2.026	0.157	2.300	0.104	0.990	0.426
RF_I	5.894	0.016	8.185	0.000	2.316	0.046
RF_S	2.323	0.129	3.464	0.034	1.766	0.123
AA_I	5.023	0.024	6.315	0.002	2.414	0.039
AA_S	3.140	0.078	2.501	0.085	1.240	0.293
SA_I	1.032	0.311	6.970	0.001	2.541	0.031
SA_S	3.101	0.080	4.065	0.019	0.569	0.724
ETP_I	3.677	0.057	10.444	0.000	1.470	0.203
ETP_S	1.812	0.180	8.733	0.000	1.225	0.300
PT_I	2.328	0.129	6.531	0.002	2.139	0.064
PT_S	5.142	0.025	4.541	0.012	1.813	0.113
WTF_I	3.115	0.079	5.953	0.003	2.222	0.055
WTF_S	6.042	0.015	5.473	0.005	2.375	0.041
CL_I	5.824	0.017	6.877	0.001	1.173	0.325
CL_S	0.162	0.688	6.047	0.003	2.886	0.016
OE_I	0.621	0.014	7.004	0.001	1.775	0.121
OE_S	2.485	0.117	4.168	0.017	1.551	0.117
OI	5.010	0.027	8.648	0.000	1.926	0.093
OS	3.952	0.049	5.731	0.004	1.520	0.187

CONCLUSIONS

1. Speed up ticketing, manage crowds, and improve accessibility during peak hours.
2. Enhance comfort, staff friendliness, and environment during quieter afternoons.
3. Focus on cleanliness, restrooms, and clear travel information in evenings.
4. Address age and gender-specific needs for better amenities and accessibility.

REFERENECES

- Ali, Z. M., Ismail, M., Suradi, N. R. M., and Ismail, A. S. (2009). “Importance-performance analysis and Customer Satisfaction Index for express bus services.” World Congress on Nature and Biologically Inspired Computing, NABIC, IEEE, 590–595.
- Chowdhury, S., Hadas, Y., Gonzalez, V. A., and Schot, B. (2018). “Public transport users’ and policy makers’ perceptions of integrated public transport systems.” Transport Policy, Elsevier Ltd, 61(October 2017), 75–83.
- Echaniz, E., Cordera, R., Rodriguez, A., Nogués, S., Coppola, P., and dell’Olio, L. (2022). “Spatial and temporal variation of user satisfaction in public transport systems.” Transport Policy, 117, 88–97.
- https://timesofindia.indiatimes.com/city/pune/each-commuters-wait-128-hours-on-average-in-traffic/articleshow/107413228.cms
- https://www.pmc.gov.in/en/pune-metro-rail-project
- Rankavat, S., Gurram, A. R., Pawar, D. S., and Kushwaha, V. (2023). “Study of COVID-19 impact on users’ perception for transport modes choice in India.” IATSS Research, International Association of Traffic and Safety Sciences, 47(1), 73–83.
- Saw, Y. Q., Dissanayake, D., Ali, F., and Bentotage, T. (2020). “Passenger satisfaction towards metro infrastructures, facilities and services.” Transportation Research Procedia, Elsevier B.V., 48, 3980–3995.
- Tiwari, G., & Jain, D. : Journal- "A Framework for Selecting an Appropriate Urban Public Transport System in Indian Cities" (Delhi, 2023).

THANK YOU