

Mode Choice Model- A Case Study On Namma Metro

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Abstract

Namma Metro, otherwise called Bengaluru Metro is a metro framework serving the city of Bengaluru, India. The undertaking plans to ponder general society transport mode decision conduct of suburbanites in Bengaluru so suitable methodologies to boost the utilization of open transport can be produced. The undertaking additionally investigates the purposes behind this move from private engine vehicles (PMVs), Public travel (Busses) and Auto/Taxi. Information is gathered through Revealed inclination overview at different metro. A binomial regression model is demonstrated using SPSS tool.

Keywords: binomial regression model, mode decision, namma metro, spss tool, transport utilization.

Introduction

Bangalore is a city with a population of 12,339,447, making it a megacity. Bangalore is here and there alluded to as the "Silicon Valley of India" (or "IT capital of India"). Since the mid 1990s, worldwide innovation firms started opening workplaces here and countless ventures have developed around it, carrying with them a gigantic convergence of individuals from all finished India. The populace developed from 5.6 million out of 2001 to 8.7 million out of 2011. Today, it's assessed to have achieved 11.5 million. Bangalore has 1,940 km of blood vessel and sub-blood vessel streets. Bangalore significantly comprises of four methods of transportation, which are Private Motor Vehicle, BMTC Bus Service, Auto/Taxi, Namma Metro. The total number of vehicle in Bengaluru is 67.22 lakh. Without an effective open transport framework, private vehicles rule the city's scene. There is a need to decide if the move to metro occurred from PMVs or existing open transport.

Details Of Survey

Study Area

For the study the zone covers eight stations of the Namma Metro namely Mahatma Gandhi Road, NadaprabhuKempgowda Station Majestic, Indiranagar, Sandal Soap Factory, Mantri Square Sampige Road, Mysuru Road, Rajajinagar and Nagasandra. The Sandal Soap Factory Metro Station is selected for a pilot survey. The Metro stations are selected based on high revenues, maximum crowd and terminal stations. The top busiest metro stations of Namma metro are M G Road, Indiranagar, Sandal Soap Factory, Rajajinagar, Mantri Square Sampige Road, Majestic and Rajajinagar. The busiest stations of all are Majestic in Purple Line and Mantri Square in the Green Line. The highest revenue stations are Majestic and Mantri Square Sampige Road.

Data Collection

In order to obtain the objectives of the project data collection is to be done in the metro stations listed above. The data collected should be such that it covers all kind of categories required for the analysis. A questionnaire is prepared after doing the pilot survey which focuses on the gender, age, income, occupation, vehicle ownership of the person and the mode of transportation used before metro. These information are collected to find the various outcomes and possibilities which can interconnect and can be the reason for the shift. The Questionnaire also includes the possible and probable reasons the people found which made them shift from their mode of transportation to the metro rail transportation.

A data collection training is held in the college premises with the help of the department faculties. Later on the data collection is carried out in the various metro stations which are selected for the work. A total of 250 data's are collected for the case study from these 8 metro stations.

Table 1: Number of metro users in each category

Gender	Male	180
	Female	70
AGE GROUP	<25	22
	25-40	115
	41-55	87
	>55	26
INCOME	<10,000	7
	10000-30000	51
	30000-50000	112
	>50000	80
Occupation	Govt	27
	Pvt	136
	Business	54
	student	33
Vehicle ownership	Car	130
	Motorcycle	216
	Bicycle	3
	Others/None	32
Mode before metro	PMV	36
	Bus	174
	Auto/Taxi	81

Reason For Shift From:

Private Motor Vehicle To Metro

Following reasons were focussed and the same is graphically represented below

1. Economic to travel in metro.
- 2- Travelling time is less in metro.
3. Peak hour traffic congestion on road.
4. Reduction in pollution due to own vehicles.
5. No stress of driving.
6. Eco-Friendly.
7. Can rest while travelling in metro.
8. Less accidents in metro.
9. Comfortable to travel in metro

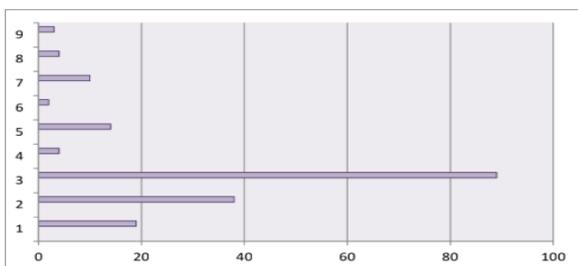


Figure 1: Column chart of reason for shift from PMV

Bus To Metro

Following reasons were focussed and the same is graphically represented below

1. Takes more time to travel.
2. No direct bus service available.
3. Eco-friendly.
4. Peak hour traffic congestion on road.
5. Less accidents
6. Buses not punctual.
7. Buses are very crowded.

8. Buses are not safe and secure.
9. Bus stop is more than 400 meters away.

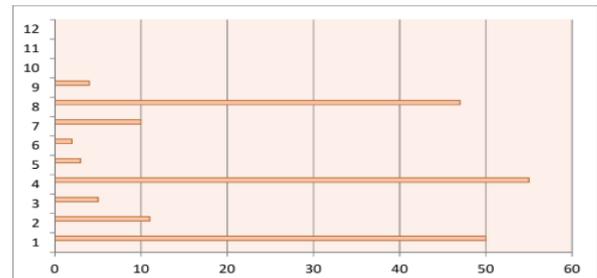


Figure 2: Column chart of reason for shift from bus

Auto/taxi to Metro

Following reasons were focussed and the same is graphically represented below

1. Fare of auto/taxi is more.
2. Peak hour congestion on road.
3. Accident rate is less.
4. Comfortable to travel in metro than in auto/taxi.
5. Large number of people can travel compared to auto/taxi.
6. Increase in pollution.
7. Waiting time is more in auto/taxi.
8. Travelling time is less in metro.
9. Not easily available when most required.

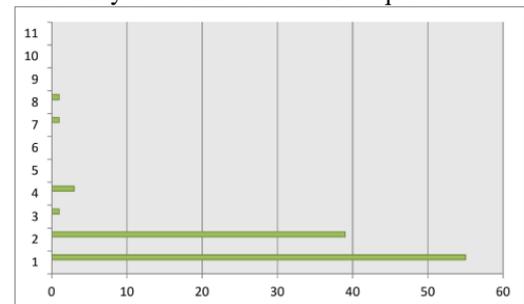


Figure 3: Column chart of reason for shift from auto/taxi

Binary Logistic Regression Model

In this segment, a double strategic relapse investigation is connected to anticipate the, mode a given metro user has moved from. Regression model is formulated in the following form and analysed using the tool SPSS. The variables are given in the table below. The significant coefficient are in bold in the table.

$$L = B_0 + B_1 * GENDER + B_2 * AGE + B_3 * OCCUPATION + B_4 * INCOME + B_5 * VEHICLE OWNERSHIP \quad \text{---(1)}$$

	B	S.E.	Wald	Df	Sig.	Exp(B)
Vehicle (0)	1.405	.273	26.566	1	.000	4.076
Access	.008	.035	.058	1	.810	1.008
Age	-.008	.010	.640	1	.424	.992
Income	-.023	.007	9.671	1	.002	.977
Gender (1)	.617	.320	3.721	1	.054	1.864
Constant	1.150	.397	8.378	1	.004	3.159

Regression equation for each station is given as:

$$L = 1.150 + 0.617 * GENDER - 0.08 * AGE + 0.008 * ACCESS - 0.023 * INCOME + 1.405 * VEHICLE OWNERSHIP$$

$$L = 0.477 - 0.221 * GENDER + 1.040 * VEHICLE OWNERSHIP + 0.175 * ACCESS - 0.012 * AGE - 0.002 * INCOME$$

$$L = 3.069 + 1.840 * GENDER + 1.769 * VEHICLE OWNERSHIP + 0.038 * ACCESS - 0.026 * AGE - 0.056 * INCOME$$

$$L = 1.408 + 2.998 * GENDER + 1.778 * VEHICLE OWNERSHIP - 0.031 * ACCESS - 0.026 * AGE - 0.020 * INCOME$$

$$L = 0.819 + 1.780 * GENDER + 1.948 * VEHICLE OWNERSHIP + 0.023 * ACCESS - 0.012 * AGE - 0.0269 * INCOME$$

$$L = 2.026 + 0.432 * GENDER + 0.610 * VEHICLE OWNERSHIP + 0.028 * ACCESS - 0.016 * AGE - 0.013 * INCOME$$

Conclusion

The principle discoveries of this investigation are;

- i) Females are for the most part more prone to have moved from transports to metro than the male partners. The same is unequivocally apparent from the examination MG, KG, MY, SS and MQ individually.
- ii) Commuters who don't have a private vehicle tend to take metro more often.

Future Scope

This examination alone isn't adequate to plan point by point rules for transportation in Bangalore. The restriction of this investigation incorporate reaction just from metro clients and absence of a point by point examination of the impression of driving by metro. To defeat these constraints and acquire experiences, such an examination can be completed on transports too. The examination ought to incorporate a point by point discernment investigation of existing and potential transport suburbanites..

References

- [1] Census-India, Census of India 2011 primary census abstract: NCT of Delhi, 2011.
- [2] ESD, "Transport", In: Delhi: Economic Survey of Delhi (2012-2013)., Govt: NCT Delhi, 2012, pp. 163-177.
- [3] ESD, "Transport", In: Delhi: Economic Survey of Delhi (2014-2015)., Govt: NCT Delhi, 2014, pp. 2011-2014.
- [4] DES, Statistical Abstract of Delhi, Directorate of Economics and Statistics., Govt: NCT Delhi, 2014.
- [5] M.G. Badami, and M. Haider, "An analysis of public bus transit performance in Indian cities", *Transp. Res. Part A Policy Pract.*, vol. 41, no. 10, pp. 961-981, 2007. [<http://dx.doi.org/10.1016/j.tra.2007.06.002>]
- [6] M.G. Badami, "The urban transport challenge in India: Considerations, implications and strategies", *Int. Dev. Plan. Rev.*, vol. 27, no. 2, pp. 169-194, 2005. [<http://dx.doi.org/10.3828/idpr.27.2.2>]
- [7] B. Sudhakara Reddy, and P. Balachandra, "Urban mobility: A comparative analysis of megacities of India", *Transp. Policy*, vol. 21, pp. 152-164, 2012. [<http://dx.doi.org/10.1016/j.tranpol.2012.02.002>]
- [8] R. Goel, and G. Tiwari, "Promoting low carbon transport in India: Case study of metro rails in indian cities", *IIT Delhi*, vol. 1, p. 88, 2014.
- [9] E. Sreedharan, "Delhi metro - The changing face of urban public transport in India", *Indian J. Transp. Manag.*, vol. 32, no. 1, pp. 57-61, 2008.
- [10] C.P. Chen, and G.A. Naylor, "Development of a mode choice model for bus rapid transit in santa clara county california", *J. Public Transp.*, vol. 14, no. 3, pp. 41-62, 2011. [<http://dx.doi.org/10.5038/2375-0901.14.3.3>]
- [11] M. Gebeyehu, and S. Takano, "Diagnostic evaluation of public transportation mode choice in addis ababa", *J. Public Transp.*, vol. 10, no. 4, pp. 27-50, 2007. [<http://dx.doi.org/10.5038/2375-0901.10.4.2>]
- [12] E. Molin, "Context-dependent stated choice experiments", *J. choice Model*, vol. 3, no. 3, pp. 39-56, 2010.
- [13] D. Pavlyuk, and V. Gromule, "A discrete choice model for a preferred transportation mode ", *Reliab. Stat. Transp. Commun.*, vol. 2, p. 22, 2010.
- [14] M.A. Abuhamoud, R.A. Rahmat, and A. Ismail, "Modeling of transport mode in Libya: A binary Logit model for government transportation encouragement", *Aust. J. Basic Appl. Sci.*, vol. 5, no. 5, pp. 1291-1296, 2011.
- [15] D. Muley, J. Bunker, and L. Ferreira, "Investigation into travel modes of TOD users: Impacts of personal and transit characteristics", *Queensl. Univ. Technol. Brisbane Aust.*, vol. 7, no. 1, pp. 3-13, 2009.
- [16] O.A. Khan, "Modelling passenger mode choice behaviour using computer aided stated preference data", *School of Urban Development, Queensland University of Technology. PhD Thesis*, 2007, pp. 1-324.
- [17] O.A. Khan, L. Ferreira, and J.M. Bunker, "Modelling multimodal passenger choices with stated preference", In: *Proceedings 26th Conference of the Australian Institutes of Transport Research*, Melbourne, Australia, 2004, pp. 1-9.
- [18] C. J. Peng, K. L. Lee, and G. M. Ingersoll, "An introduction to logistic regression analysis and reporting", *J. Educ. Res.*, vol. 96, no. 1, pp. 3-14, 2002. [<http://dx.doi.org/10.1080/00220670209598786>]
- [19] H.A. Park, "An introduction to logistic regression: from basic concepts to interpretation with particular attention to nursing domain", *J. Korean Acad. Nurs.*, vol. 43, no. 2, pp. 154- 164, 2013. [<http://dx.doi.org/10.4040/jkan.2013.43.2.154>] [PMID: 23703593]
- [20] S. Ahmad, O. Balaban, C.N. Doll, and M. Dreyfus, "Delhi revisited", *Cities*, vol. 31, pp. 641-653, 2013. [<http://dx.doi.org/10.1016/j.cities.2012.12.006>]
- [21] etes educator of nurses in korea. *Diabetes Research and Clinical Practice* 77, 199-204.
- [22] McMahan GT, Gomes HE, Hohne SH, Hu TM, Levine BA & Conlin PR (2005), Web-based care management in patients with poorly controlled diabetes. *Diabetes Care* 28, 1624-1629.

- [23]Thakurdesai PA, Kole PL & Pareek RP (2004),
Evaluation of the quality and contents of diabetes
mellitus patient education on Internet. Patient
Education and Counseling 53, 309–313.