



# IJEAST

INTERNATIONAL JOURNAL  
OF ENGINEERING APPLIED SCIENCE  
AND TECHNOLOGY



VOLUME : 7    ISSUE : 01    Print / Issue Publication Date: 07-Jul-2022



ISSN : 2455-2143



DOI : 10.33564/IJEAST.2022.v07i01.024

Indexed In



[WWW.IJEAST.COM](http://WWW.IJEAST.COM)

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# TRIP ATTRACTION RATES OF SHOPPING CENTRES IN BENGALURU CITY

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**Abstract—** The transportation planning process is critical in meeting people's current and future transportation needs. Trip generation must be done correctly and accurately to obtain accurate travel demand predictions. In any city or country, shopping trips are usually the second most popular after work trips. Shopping malls are places where a large number of people congregate. The number of shopping centers in Bengaluru is growing all the time. This could lead to a shift in travel patterns. A study was conducted to determine the trip attraction rate of shopping centers and the elements that influence it. Overall 5 number of shopping centers has been selected for the study. Required data needed for the analysis will be collected i.e. physical features, number of trips and socio-economic factors. Analysis will be done to know the trip attraction rates and relations among trips and factors affecting the trips. Different Trip attraction rates will be calculated with the physical features of Shopping centers which affect the trip attraction. And different rates will be defined and compared. Some of the socio-economic and other factors related to the people will be considered. Factors affecting the trip attraction along with the timings of peak volumes of trips will be identified.

**Keywords—** Trip attraction rate, Shopping Centre, Regression analysis.

## I. INTRODUCTION

After independence, India's urbanization began to accelerate due to the country's adoption of a mixed economy, which resulted in strong private sector growth. In comparison to rural areas, urbanization refers to a rise in the proportion of people living in cities. The population of people living in cities tends to grow as a country becomes more industrialized. Industrialization, job opportunities, education, infrastructure, transportation, and other variables are some of the reasons that contribute to urbanization. The key problem is the rate of growth of buildings and infrastructure, which must be examined and analysed in depth to determine their impact on the environment. This rate causes an increase in the transportation rate. Zoning is the process of dividing the total land area of a city into zones based on the land use or purpose of the land use. As a result, zoning is a land-use planning strategy that may be efficiently used by government authorities as a tool for urban planning. Residential,

commercial, industrial, public and semi-public, traffic and transportation are the most common land uses in urban areas. Unclassified, Public utilities, Park and open space, and Agriculture land Commercial land use refers to property that is utilized for commercial reasons such as the construction of offices, restaurants, shopping malls, resorts, and other similar structures. This is in opposition to the construction of residential structures. Airports, business parks, office buildings, stadiums, retail parks, shopping malls/centres, and shopping streets are just a few of the major commercial locations. These are the destinations that draw the most amount of visitors.

People nowadays have a lot of options at shopping centres. Shops specializing in fashion, electric household appliances, or gifts to huge department stores with multipurpose stores, movies, or restaurants. This combination of merchandise, offerings, fun, and services is well-known to customers. A complex is a collection of retail stores and commercial establishments. As a single property, it is designed, established, developed, and maintained. On-site parking is usually available for both two-wheelers and cars. A shopping mall takes up a lot of space. The shopping centre houses a variety of retail stores, a theatre, food courts, gaming zones, a children's section, and other businesses. Here are the some of the reasons why shopping centers attract people

- reasons why shopping centers attract people:
- All businesses, such as clothing, grocery, food court, theatres, and other stores, are placed in a unique complex, which attracts buyers to the Shopping Centre
- The main benefit of visiting or shopping in a shopping centre is the availability of parking.
- Accessibility, which includes the installation of lifts and escalators to facilitate people's movement.
- One of the best sites for individuals of all ages to have fun.

Weekends in particular Because of holidays and leisure, shopping centers are overcrowded or more crowded than on weekdays. These are some of the primary benefits that attract more people to it. As a result, customers will prefer shopping centers for their shopping visits, resulting in an increase in the number of trips. According to transportation planners, this will have a significant impact on the road network, particularly on highways near shopping centers. To determine how much of an impact Shopping Centers have, an impact analysis must be conducted that takes into account all of the factors that



influence the trip attraction and analyses them, a process known as "traffic impact analysis."

## II. METHODOLOGY

Methodology adopted for the present study is by a below given in figure 3.1.

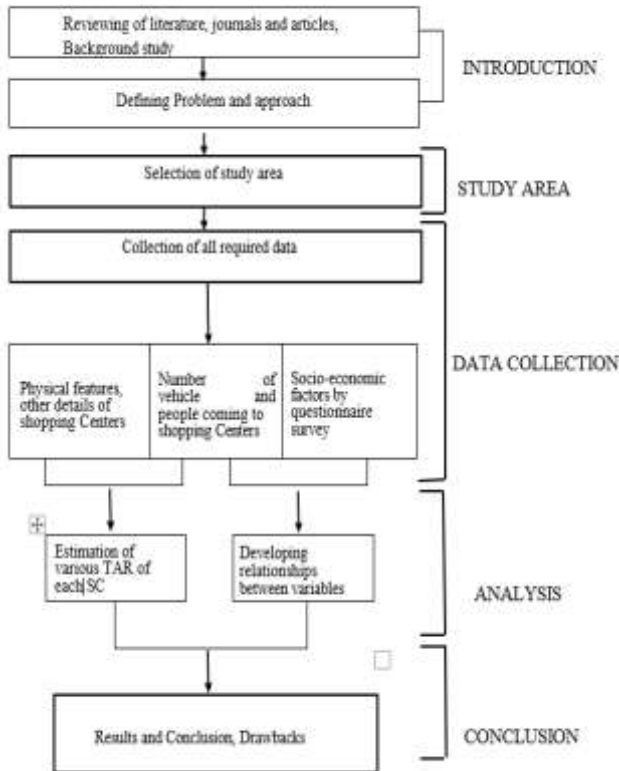


Figure 3.1: Flow diagram of methodology of Project study

## III. EXPERIMENT AND RESULT

TAR of each Shopping Center is found using the number of trips and physical features of Shopping Center. Number of trips has been collected for 2 weekdays and 2 weekends. They are converted to one day trips. Only for peak hours data has been collected i.e. 5 pm – 8pm, these 3 hour trips are converted to 1 hour trip, which is known as "Average peak hour trip". Physical features of Shopping Centers are converted to require units like Gross floor area and Total parking area are converted to 100 Sqmt for simple analysis. Totally 4 kinds of Trip attraction rates are calculated for all 5 Shopping Centers. Trip attraction rates of each Shopping Center are mentioned and specified in tables. All collected data from each shopping Center which consists of Physical features of shopping Center, volume count of vehicle and People, Data from questionnaire survey are transferred to the Microsoft excel sheets properly. Gross area found out by multiplying the floor area of each floor and number of floors in shopping Centers. Parking area found out converting number of Bays into Area (Sqmt). All

parameters converted to the required units for e.g. Sqft to Sqmt.

Estimating various TARs of each shopping Centers

No of trips per gross area: (Average number of Trips) / (Gross floor area)

No of trips per total number of shop: (Average number of Trips) / (number of shops)

No of trips per total number of Employees: (Average number of Trip) / (number of Employees)

No of trips per total Parking area: (Average number of Trips) / (total parking)

Various Trip attraction rates of all 5 Shopping Centers are found out for both weekdays and weekends. All 5 Shopping Centers are having different physical features, opened in different years and different popularity. VR is having highest popularity among all Shopping Centers. Trip attraction rates of ETA and GT world are very less compared to other Shopping Centers. They attract less people as they are less popular and they are lack in some of the facilities.

Main factors which affect the Trip Attraction Rate of shopping Centers are considered for the study they are listed below

- ☐ Age and Gender
- ☐ Purpose
- ☐ Location and distance.
- ☐ Occupation and Income
- ☐ Mode of Travel
- ☐ Frequency
- ☐ Preferred day and time for coming to shopping Centers
- ☐ Availability of parking

| WEEKDAY                                 |                         |      |          |             |      |
|-----------------------------------------|-------------------------|------|----------|-------------|------|
| PHYSICAL FEATURES                       | Name of Shopping Centre |      |          |             |      |
|                                         | ARCADE                  | ETA  | GT WORLD | INNOV-ATION | VR   |
| Trips per 100sqmt of gross floor area   | 5.4                     | 1.8  | 1.5      | 4.5         | 3.4  |
| Trips per no of shops                   | 12.0                    | 58.4 | 9.4      | 10.9        | 17.2 |
| Trips per number of employees           | 1.6                     | 2.7  | 1.4      | 1.3         | 1.3  |
| Trips per 100sqmt of total parking area | 2 W                     | 13.8 | 4.2      | 3.9         | 26.1 |
|                                         | CAR                     | 3.5  | 0.8      | 0.4         | 2.5  |
| WEEKEND                                 |                         |      |          |             |      |
| Trips per 100sqmt of gross floor area   | 8.2                     | 2.3  | 2.4      | 8.5         | 5.8  |
| Trips per no of shops                   | 18.2                    | 75.7 | 15.3     | 20.7        | 28.8 |
| Trips per number of employees           | 2.4                     | 3.4  | 2.2      | 2.5         | 2.2  |
| Trips per 100sqmt of total parking area | 2 W                     | 24.9 | 7.4      | 5.6         | 43.7 |
|                                         | CAR                     | 6.0  | 1.5      | 0.7         | 4.9  |



I. VR is having the highest Gross floor area i.e. nearly 45000 Sqmt, it is also one most popular Shopping Center in Bengaluru, Trip attraction rates are 3.4 and 5.8 for weekday and weekend, these are not very high because of more number of trips for large area. ARCADE and INNOVATION are relatively similar in all physical features and even in popularity. Trip attraction rates of this Shopping Centers are high as more number of people attracted to this Shopping Centers but Gross floor area is not very much. ETA is having gross floor area about 16300Sqmt and has only few shops and theatres. Trip attraction rate of ETA are 1.8 and 2.3 less compared to others. GT WORLD is having nearly 38000Sqmt of total floor area, but it attracts less people as it newly opened and less popular. So GT WORLD is having Trip attraction rates 1.5 and 2.4 which are least among all 5 Shopping Centers.

II. ETA is having least number of shops i.e. so Trip attraction rates are very high i.e. 58.4 and 75.7. One shop of ETA attracting about 58 people in one hour in weekday and 76 in weekends. Apart from that VR has highest Trip attraction rates with 17.2 and 28.8 as the more number of people are attracted to this Shopping center. ALL other 3 Shopping centers are having nearly similar Trip attraction rates.

III. Trip attraction rate (trips per number of employees) of all Shopping centers is almost similar, even similarity exists in weekends. ETA is having highest TARs with 2.7 and 3.4.

IV. Parking facility for vehicles is essential. VR, GT world and ETA are providing largest parking areas. GT World is having lowest Trip attraction rates i.e. 0.4 and 0.7 for car, 3.9 and 5.6 for 2 wheeler. Trip attraction rates of Gopalan Innovation are very high as parking demand in this Shopping center is very high but parking area is very less for the demand, especially for 2 wheelers Trip attraction rates are 26.1 and 43.7 are very high compared others. Gopalan arcade is also has high Trip attraction rates after Gopalan Innovation.

#### IV.CONCLUSION

- The variables like Gross floor area, parking area strongly correlated to the trip attraction rates. Higher the area, more visitors and more vehicles
- There is moderate relationship between the number of employees and number of shops as indicated by the analysis.
- Trip attraction will be more in weekends, Also more in evening time.
- The variables like Distance, income are strongly involved in the generation of trips. They are highly correlated with Trip attraction rates

An accurate calculation of trip attraction rates is required to effectively plan the need for city transportation systems and

infrastructures. Furthermore, journey rates differ from location to location and city to city. To improve the accuracy of trip forecasts, the trip model's accuracy must be improved. By knowing the explanatory variables in a specific future situation, the demand for trips in that scenario may be properly estimated.

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2455-2143