



Parking Study for Multiplexes and Commercial Buildings in Vadodara City

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ABSTRACT

In this paper, the various aspects of parking have been described. Various types of parking have been described. Parking is a derived demand. People will tend to park for availing of facilities near the parking zone. Linear regression models have been developed for parking turnover with various independent variables influencing the parking turnover.

KEYWORDS : Parking; parking turnover; on-street parking; off-street parking; linear regression method.

INTRODUCTION

This paper studies the various aspects of parking. The various terminologies regarding parking have been described. Parking is a derived demand. People will be attracted towards a parking area by the facilities which are provided near the parking area. Linear regression models have been developed between parking turnover and the various independent variables which are influencing parking.

GENERAL

Parking is the act of stopping and disengaging a vehicle and leaving it unoccupied. Parking on one or both sides of a road is often permitted, though sometimes with restrictions (Wikipedia). Parking facilities are constructed in combination with some buildings, to facilitate the coming and going of the buildings' users. In congested urban areas parking of motor vehicles is time-consuming and sometimes expensive. Urban planners must consider whether and how to accommodate potentially large numbers of motor vehicles in small geographic areas. Usually the authorities set minimum, or more rarely maximum, numbers of motor vehicle parking spaces for new housing and commercial developments, and may also plan its location and distribution to influence its convenience and accessibility. Parking control is primarily an issue in relatively densely populated and relatively advanced countries where the demand/supply situation for parking spaces makes parking facilities dear and difficult. In urban locations parking control with corresponding professionals and firms specializing in this is a developing subject. Parking restrictions take the form of: A. Public parking control B. Private parking control.

PARKING STUDY

Studies must be conducted to collect the required information about the capacity and use of existing parking facilities. In addition, information about the demand for parking is needed. Parking studies may be restricted to a particular traffic producer or attractor, such as a store, or they may encompass an entire region, such as a central business district. Before parking studies can be initiated, the study area must be defined. A cordon line is drawn to delineate the study area. It should include traffic generators and a periphery, including all points within an appropriate walking distance. The survey area should also include any area that might be impacted by the parking modifications. The boundary should be drawn to facilitate cordon counts by minimizing the number of entrance and exit points. Once the study area has been defined, there are several different types of parking studies that may be required.

TYPES OF PARKING STUDIES

Inventory Of Parking Facilities

Information is collected on the current condition of parking facilities. This includes; (1) the location, condition, type, and number of parking spaces. (2) parking rates if appropriate. These are often related to trip generation or other land use considerations. (3) time limits, hours of availability and any other restrictions. (4) layout of spaces: geometry

and other features such as crosswalks and city services. (5) ownership of the off-street facilities ([www.webpages.uidaho.edu/parking studies](http://www.webpages.uidaho.edu/parking_studies)).

Accumulation Counts

These are conducted to obtain data on the number of vehicles parked in a study area during a specific period of time. First, the number of vehicles already in that area are counted or estimated. Then the number of vehicles entering and exiting during that specified period are noted, and added or subtracted from the accumulated number of vehicles. Accumulation data are normally summarized by time period for the entire study area. The occupancy can be calculated by taking accumulation/total spaces. Peaking characteristics can be determined by graphing the accumulation data by time of day.

Duration and Turnover Surveys

The accumulation study does not provide information on parking duration, turnover or parking violations. This information requires a license plate survey, which is often very expensive. Instead, modifications are often made to the field data collection protocols. Note that there is usually a tradeoff between data collection costs and study accuracy. Spending more time and money may increase accuracy, but at what point does the incremental change in accuracy become too expensive?

In planning a license plate survey, assume that each patrolling observer can check about four spaces per minute. The first observer will be slower, because all the license plate numbers will have to be recorded, but subsequent observers will be able to work much faster.

Parking turnover is the rate of use of a facility. It is determined by dividing the number of available parking spaces into the number of vehicles parked in those spaces in a stated time period.

User Information Surveys

Individual users can provide valuable information that is not attainable with license plate surveys. The two major methods for collecting these data are parking interviews and postcard studies. For the parking interviews, drivers are interviewed right in the parking lot. The interviews can gather information about origin and destination, trip purpose, and trip frequency. The postage paid postcard surveys requests the same information as in the parking interview. Return rates average about 35%, and may include bias. The bias can take two forms. Drivers will sometimes overestimate their parking needs in order to encourage the surveyors to recommend additional parking. Or, they may file false reports that they feel are more socially acceptable.

Land Use Method of Determining Demand

Parking generation rates can be used to estimate the demand for parking. Tabulate the type and intensity of land uses throughout the study area. Based on reported parking generation rates, estimate the

number of parking spaces needed for each unit of land use. Determine the demand for parking from questionnaires. A rule of thumb is to overestimate the demand for parking by about 10 %. If the analysis suggests that the parking demand for a particular facility will be 500 spaces, then the design should be for 550 spaces

PARKING ASPECTS

In this we see the terms associated with parking (Dr. L.R. Kadiyali (2009).

Terms

Parking Accumulation: The total number of vehicles parked in an area at a specified moment.

Parking Volume: The number of vehicles parking in a particular area over a given period of time. It is usually measured in vehicles per day.

Parking Load: The area under the parking accumulation curve during a specified period.

Parking Duration: The length of time spent in a parking space.

Parking Index: Percentage of parking bays actually occupied by parked vehicles as compared to the theoretical number available.

Parking Turn-over: Rate of the usage of the available parking space.

Parking Production: The parking production is the number of sold hours for parking per place per year.

Sold Hours: The number of sold hours is calculated by dividing the total revenue by the tariff.

TYPES OF PARKING

On-Street Parking

On-street parking facilities are basically the parking spaces near the sides of the roads where vehicles are allowed to park as mentioned by Dr. L.R. Kadiyali (2009).

The methods of On-Street Parking are; (1) Parallel parking, (2) 30° angle parking, (3) 45° angle parking, (4) 60° angle parking. (5) Right angle parking.

Parallel parking makes the least use of the width of the street, and this is an important consideration in narrow streets. As the parking angle increases the width of street used also increases.

From the point of view of maneuverability, angle parking seems to be better than parallel parking which usually involves a backing motion. Delay to traffic is minimum with angle parking.

As regards safety, it has been noticed that angle parking is more hazardous than parallel parking.

Considering the above, it is recommended that in general parallel parking should be favored on streets. On exceptionally wide (wider than 20 m) and low volume streets, consideration might be given for angle parking.

Off-Street Parking

Off-street parking facilities are parking spaces away from the main thoroughfare and connected to it through a service road as mentioned by Dr. L.R. Kadiyali (2009).

Common facilities of Off-Street Parking are; (1) Surface car parks, (2) Multi-storey car parks, (3) Roof parks, (4) Mechanical car parks, (5) Underground car parks.

Surface car parks, properly located and developed on a piece of vacant land or surrounding an office complex or super market, are very popular with the motorists. Great care is needed in their design and operation. The overall aesthetics of the area should receive due attention. A stall size of 2.5 m x 5 m is probably adequate for Indian conditions predominated by small-size cars. If the surface park is to

be operated with a fee-charging system, there should be arrangement for collecting the money. This can be done either manually by stationing an attendant in a kiosk at the entrance who sells the parking tickets or by installing an automatic vending machine which can be designed to raise a barrier rail upon insertion of a coin.

Multi-storey car parks: Surface parks consume too much of the precious land in the heart of the city and are not, therefore, always feasible. One of the alternatives when land is costly is to provide multi-storey car parks. Multi-storey car parks are designed for a capacity of about 400 to 500 cars. Larger capacity tends to increase the time for unparking a car. About five floors is also the upper limit for the same reason. The car parking floors, the ramps, the entrance and the exits should be well lighted. If the garage is without external walls, as is often the case, there is no need for artificial means for ventilation. Otherwise, mechanical ventilators should be provided. The operation of the multi-storey car parks can be with customer parking or attendant parking or a combination of the two.

Roof parks: A very popular method of solving the parking problems adopted in many cities is to park the vehicles on roof tops. Access ramps or mechanical lifts provide the necessary access to the roofs. To economize, many roofs may be linked together served by a single access ramp. In addition to the ramps, extra cost is involved in designing the roof tops and the structural elements for the parking load.

Mechanical car parks: Mechanical car parks provide for lifting of the cars from floor to floor by means of a lift and transfer of cars to and from the parking stall by means of wheeling or mechanically operated transfer dollies or cradles. Since the ramps and aisles are eliminated in this system, it is more economical in space as compared to the ramped system, multi-storey garages. The disadvantages are the higher maintenance costs and the possibility of breakdown due to mechanical or power failure.

Underground car parks: The great advantage of underground car parks is the least intrusion they cause to the aesthetics of a place. These parks can be built in the basement of any multi storeyed building or below open spaces. Since the work involves large quantities of excavation, construction of retaining walls, ventilation and lighting, such car parks tend to be very costly. Underground car parks can be single-storeyed or multi-storeyed though the latter tend to be very costly.

NEED OF STUDY

Mushrooming of malls and multiplexes in the city of Vadodara has certainly brought smiles on the faces of people. But not many know that these spaces of fun, entertainment and shopping will end up adding to the traffic chaos. It has become a common sight these days to see vehicles especially cars parked outside the multiplexes and malls. This is despite the fact that malls and multiplexes offer parking space to one and all. As a result, it is a challenge for commuters to drive their vehicles or walk comfortably on the road.

STUDY AREA

- 1) Inox, Alkapuri.
- 2) Cinemarc, Akota.
- 3) Fame Seven Seas, Fatehganj.
- 4) Vadodara Central, near Genda Circle.
- 5) Inorbit, near Bhailal Amin Hospital.



Figure. 1: Inox, Alkapuri



Figure. 2: Cinemarc, Akota



Figure. 3: Fame Seven Seas, Fatehganj



Figure. 4: Vadodara Central, near Genda Circle



Figure. 5: Inorbit, near Bhailal Amin Hospital

AIM

The aim of the study is to assess the relationship between the parking turnover and the various variables affecting parking.

The following relationships are assumed and checked:

- H-1: The parking turnover is negatively related to parking tariff.
- H-2: The parking turnover is positively related with the quality of urban amenities:

The measurable urban amenities are:

- a) Number of shops.
- b) Opening duration of shops.
- c) Amount of floor space of shops.
- d) Number of seats in the screens of a multiplex.

H-2A: The parking turnover is positively related to the number of shops.

H-2B: The parking turnover is positively related to the opening duration of shops.

H-2C: The parking turnover is positively related to the amount of floor space of shops.

H-2D: The parking turnover is positively related to the number of seats in the screens of a multiplex.

CONCLUSIONS

The following relations were observed:

H-1: A negative relationship was assumed between parking turnover and parking tariff. A negative relationship was assumed because people will tend to park more at places having lower parking tariff.

There was a negative relationship existing between the two variables. The relationship was less strong.

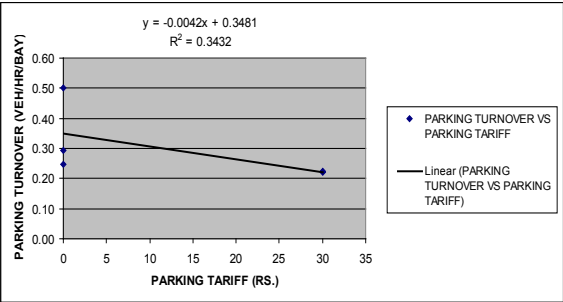


Chart 1: Parking Turnover vs Parking Tariff

H-2A: A positive relationship was assumed between parking turnover and number of shops.

There was a positive relationship existing between the two variables. The relationship was very strong.

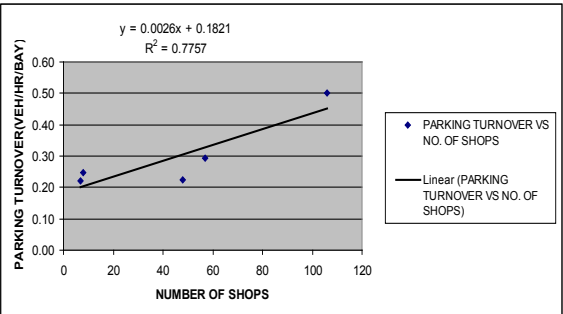


Chart 2: Parking Turnover vs Number of Shops

H-2B: A positive relationship was assumed between parking turnover and opening duration of shops.

There was a negative relationship existing between the two variables. The relationship was strong.

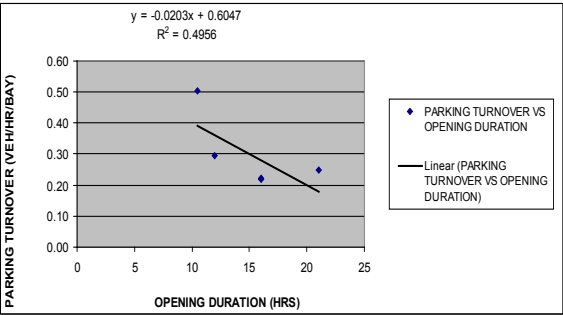


Chart 3: Parking Turnover vs Opening Duration

H-2C: A positive relationship was assumed between parking turnover and amount of floor space of shops.

There was a positive relationship existing between the two variables. The relationship was very strong.

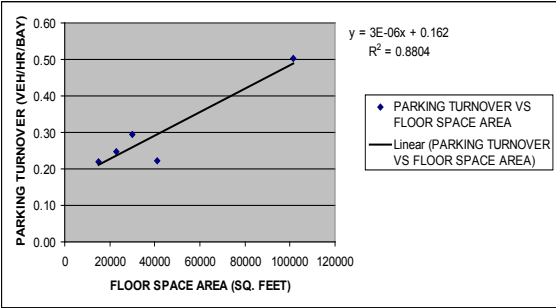


Chart 4: Parking Turnover vs Floor Space Area of Shops

H-2D: A positive relationship was assumed between parking turnover and the number of seats in a multiplex.

There was a negative relationship existing between the two variables. The relationship was strong.

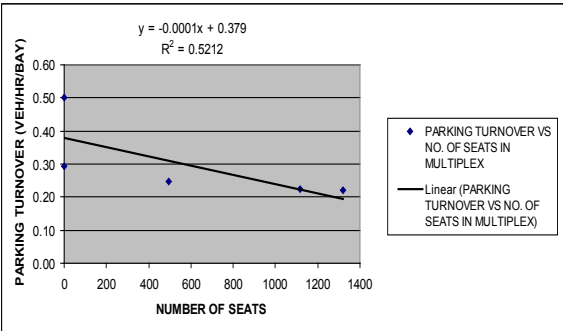


Chart 5: Parking Turnover vs Number of Seats In Multiplex

REFERENCES

[1] Kadiyali, Dr. L.R. (2009), "Traffic Engineering and Transportation Planning" Khanna Publishers, Seventh Edition | [2] Kees Van Der Garde (2009), "Performance of Parking Garages". | [3]http://www.webpages.uidaho.edu/niatt_labmanual/chapters/parkinglotdesign/theoryandconcepts/ParkingStudies.htm | [4] [En.wikipedia.org/wiki/Parking](http://en.wikipedia.org/wiki/Parking). |