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Review Paper on Case Study of Radisson Square, Indore

(Replacement of Traffic Signals by a New Variety of Roadway Intersections)

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Abstract: ***Indore is the most populous and the largest city in the Indian state of Madhya Pradesh. It serves as the headquarters of both Indore District and Indore Division. It is also considered as an education hub of the state and has campuses of both the Indian Institute of Technology and the Indian Institute of Management. Located on the southern edge of Malwa Plateau, The city is 190 km (120 mi) west of the state capital of Bhopal. Indore had a census-estimated 2011 population of 1,994,397 (municipal corporation) and 2,170,295 (urban agglomeration). The city is distributed over a land area of just 530 square kilometres (200 sq mi), making Indore the most densely populated major city in the central province. It comes under Tier 2 cities in India. Indore's financial district, based in central Indore, functions as the financial capital of Madhya Pradesh and is home to the Madhya Pradesh Stock Exchange. The city, which is called the heart of Madhya Pradesh, is full of all the things written above. Therefore, keeping in mind the increasing traffic in future, this city is in dire need of better and better traffic management in a planned manner at least cost. Keeping this traffic management in mind, I am introducing a new type of intersection by removing traffic signals at Radisson square, called busy intersection of Indore city. Through this paper, we will see what benefits this new imagination can bring us in traffic management at Radisson Crossroads.***

Keywords: Radisson Square, Indore, Traffic Signal, Roadways

1. Introduction

For a given set of goals and policies, it is possible to formulate a number of alternative transport plans. The cost of these plans may vary, and also the benefits that are likely to accrue from them. Economic analysis has found a ready application in problem concerned with the evaluation of transport plans.

Figure: A new type of intersection

For any country, it is clear that the resources available are limited and is insufficient to meet all the demands, for a developing country, the need is greatest to husband the scarce resources & select the optimum plan from amongst those competing for the allocation of these scarce resources. Economic analysis is convenient procedure to select only those schemes that result in the greatest benefit from the resources available.

The construction of road brings about a variety of benefits that are enjoyed practically by all sectors of the economy. Scarcity of resources & competing demands from various sectors are the dominating features of a developing economy. Therefore it becomes extremely necessary to allocate the required resources in the most benefitted manner among various different sectors and within a sector, among various types of schemes. In the absence of adequate data base, highway planner in India have been selecting schemes of tentative basis.

Highway economic analysis, also known as highway project appraisal, is a technique whereby the costs of & benefits from a scheme are quantified over a selected time horizon & evaluated by common yardstick.

Once a transportation arrange has been finalized & the demand on every of its route links has been established, a process must be put in place that helps identify the best resolution for every individual proposal at intervals the route network. Each project must therefore be subjected to an appraisal.

The aim of the highway appraisal process is therefore to determine the economic, societal & environmental feasibility of the project or group of projects under examination. The process enables highway planners to decide whether a project is desirable in absolute term & also provides a means of choosing between different competing project options, all of which have the ability to meet the state goals & objectives of the project sponsors.

The subject of highway economic analysis has developed during the past five decades through the contribution of analysis belonging to various disciplines & notably highway engg. & Economic evaluation of Radisson square economist.

There were many issues on which conflicting viewpoints prevailed in the early stages of the subject, but with the

passage of time there is now a general agreement on many important concepts. The analyst now has the advantage of the collective wisdom of the earlier practitioners of the art.

Objective of the project

- Economic evaluation of Radisson square & design of new type of intersection.
- Determination of volume/capacity ratio.
- Determination of benefits obtained by proposed intersection.

2. Literature Review

H. S. Goliya & Nitin Kumar Jain (2012)

In this paper an attempt has been made to study the various intersections, so as to minimize the delays at these intersections and consequently improve the level service. Traffic signal can be synchronized so that a vehicle starting at one end of the Street and traveling at Pre assigned speed can go to other end without stopping for red light. At every intersection the prevailing traffic has been calculable and so signal designed. Improve the amount of service at intersections and to reduce delay, optimized signal has been synchronize and estimated the benefits.

Conclusion: Based on analysis of data collated from Eastern ring road, conclusions are signal design and synchronization has been done for nine intersections of eastern ring road to minimize delay. Journey time 241Sec. N to S and 151sec. S to

N are reduced by synchronization. 241 kl gas-o-line and 340 kl diesel once a year are saved. The loss occurred of Rs.1.20million/annum, 30.15 million/annum and 13.42 million/annum due to vehicle delay, low running speed of vehicle and loss of people's time of respectively. CO2 emission is estimated to reduce by 1.50 million Kg. per annum.

Zhi Liu (January 2000)

Rural basic road comes area unit expected to yield substantial social edges, that cannot be properly, evaluated victimization standard analysis methodology. This note describes the appliance of value effectiveness analysis to supplement analysis within the analysis and choice of road works for finance underneath a Bank rural road project in the State of Andhra Pradesh, India.

Conclusion: The economic analysis described here requires systematic data collection. This specific expertise might not be transferable to alternative rural road comes. However, one important lesson learned from this experience is that data collection at low cost can be possible with the active participation of the client in the preparation of the project.

Vikram Singh Patel (2013)

They have selected eastern ring road corridor for our case study of transit scheduling now a day's eastern area of Indore is developing rapidly. To provide quicker and effective transit services, I make schedule for transit units going to be run on that route. The schedule is formed for fourteen hours during a day (7:00 AM To 09 PM). For finding out schedule of transit units, traffic information ar collected at totally different road sections on the route. The traffic knowledge is then analyzed and traffic flow and traveler flow on the route is taken out. Transit units square measure provided on the idea of traveler flow at completely different sections and at different time at intervals on a daily basis.

Conclusion: The route is analyzed and transit units are provided on the basis of passenger traffic flow along sections on the route. Schedule is developed on the bases of their departure time. 16 transit units are required to run along the route, continuously throughout the day. Additional 34 transit units are required to accommodate the peak hour traffic at some specified sections of the route. 60 % of passenger traffic is travelling through the BRTS. Traffic congestion is reduced on the route, as two wheeler and four wheeler traffic is getting shifted on BRTS. Well managed traffic system has been designed along the route. Public transport get popularize and reduce the dependability over private vehicles.

3. Various Methods of Economic Evaluation

3.1 Economic evaluations

Economic analysis could be a convenient procedure to pick out solely those schemes that end in the best edges from the resource obtainable and is that the solely suggests that to persuade the general public concerning the requirement of sure investment. The essential principle behind any technique of economic evolution is to live the value of the project decisive the advantages that area unit probably to accrue and compare the two.

a) Costs

The cost may be thought-about generally underneath the subsequent categories:

1) Capital price
2) Maintenance price

The opportunity cost of providing transport facility ought to be calculable accurately, and will embody land price. Prices of control and lighting installation and administration ought to even be as well as.

The maintenance price is of a repeated nature and represent the expenditure to stay the assets during a tolerably shape within the future years. The impact of the new theme on the present transport network ought to be evaluated in decisive the upkeep prices.

b) Benefits

Transportation plans area unit meant to bring edges to the road users by providing cheaper, a lot of economical, faster and safer travel. Associate analysis of the profit is, therefore, of prime concern in any economic analysis. profit sometimes represents the distinction between the value of in operation on a replacement transport facility and value of in operation and existing facility.

Benefits may be classified underneath the subsequent heads:

1) Edges to the generated traffic.
2) Edges to traffic pleased from different routes.

3) Edges to the traffic in operation of different roads wherever reduction in traffic has been caused by the gap from the new facility.

3.2 Methods of economic analysis

A number of ways are adopted and these area units the vital ways of economic evaluation:

Rate of come technique
3.2.1 Benefit-cost (B/C) quantitative relation technique
3.2.2 First year rate of come technique

Discounting income technique
3.2.3 Net gift price (NPV) technique
3.2.4 Internal rate of come technique

3.2.1 Benefit-cost (B/C) quantitative relation technique
The profit price quantitative relation technique is one among the wide used once for analysis of road comes. During this technique, the quantitative relation of internet annual profit to internet annual price is set. The advantages area unit evaluated for one reference year, that for the convenience may be the primary year of operation when construction.

The profit price quantitative relation for a selected project would be:
B/C = edges within the reference year / Annual price

The dividend of the B/C quantitative relation represents the advantages, that area unit extremely reduction in user prices. The divisor represents the distinction in annual road price between the new facility and also the existing facility. A quantitative relation bigger than one.0 indicates that the additional price concerned within the improvement is a smaller amount than the advantages that area unit probably to accrue and also the project is economically even.

3.2.2 Initial Year Rate of come technique
The primary year rate of rate of come technique could be a straightforward technique, the advantages occurring within the initial year of the schemes operation alone area unit compared with the opportunity cost of the development. The result expressing the advantages occurring within the initial year as share of the prices is termed the primary year rate of come.

First Year Rate of come = edges occurring within the initial year / opportunity cost.

The first year rate of come of a doable theme offers a sign of its priority when put next with different schemes, and so assists the choice of the foremost advantageous theme. The priority for various theme can even be selected the premise of the primary year rate of come.

3.2.3 Internet gift price technique
Net gift price (present worth) technique is predicated on the discounted income (DCF) techniques. Within the technique, the stream of the cost/ edges related to the project over associate extended amount of your time is calculated and is discounted at a specific discount rate to allow this value. edges area unit treated as positive and cost as negative and also the internet gift value is found. Any project with a positive internet gift price is treated as acceptable.

The net gift price is algebraically expressed as:
NPV0= (Bo– C0) + B1-C1/(1+i) C2/(1+i)2 …….Cn/(1+i)n

Where,
NPVo = internet gift price within the year zero
B1 = price of the advantages that occur within the Year t
C1 = prices that happens within the year t i = Discount rate every year
n = the quantity of year that the come is to be Calculated.

3.2.4 Internal Rate of come technique
The internal rate of come technique is that the discounted rate that makes the discounted future edges area unit adequate to the initial outlay. In different words, it's the discount rate that makes the stream of money flows to zero.
If Bo=0:

$$C0=-B1-C1/ (1+i) + B2-C2/(1+i)\ldots\ldots\ldots Cn/(1+i)n$$

Where C0= opportunity cost of the investment within the year Zero
B1 =Value of the advantages that occur within the year t
C1 =Costs that occur within the year t
i = Internal rate of come
n= range of years that the analysis is completed.

The solution of the higher than equation is very tedious and is feasible solely by trial and error. With the pc programmed the work is rendered terribly straightforward.

3.3 Comparison of the various methods of Economic Evaluation

The four methods of economic evaluation described earlier have their own advantages and disadvantages. Each one of them may be more appropriate than the other for a given situation.

The benefit-cost method is widely used by highway engineers, suffers from the following drawbacks:

It requires an assumption of the rate of interest, which should be somewhat related to the opportunity cost of capital. Unfortunately, the opportunity cost of capital is very often not known, or can be estimated only approximately.

The significance of B/C ratio is ambiguous and its relative value is difficult to understand and interpret. For example, if there are two proposals, one with a B/C ratio 1.05 and the other with a ratio of 1.10, the difference is very difficult to appreciate.

It is at times difficult to decide which item should be treated as costs and placed in the denominator and which as negative benefits and placed in the numerator.

The Net Present Value method also suffers from the disadvantage that a discount rate has to be assumed initially.

It is much simpler computationally when compared to the internal rate of return method.

The internal rate of return method avoids the necessity for selecting a discount rate initially. The rate which is derived as a result of the computations can be easily compared with the market rate of interest, with which economist and financial experts are familiar. Thus the method is considered to be more meaningful than the others. Its disadvantages are that the calculations are tedious and a solution can only be found by trial and error, and it may sometimes be misleading in comparing projects having different lives and different streams of benefits.

The first year rate of return method is quick to use, but has obvious shortcoming. More importantly, many projects may have attractive benefits initially but whose benefits taper off abruptly thereafter and this factor will be lost sight of in the method.

3.4 Traffic Studies

Traffic studies or surveys area unit administered to investigate the traffic characteristics. These studies facilitate to decide the geometric style feature and control for safe and economical traffic movements. The traffic surveys for assembling traffic knowledge are known as traffic census. The various traffic studies generally carried out are:

1) Traffic volume study
2) Speed studies
   a) Spot speed study
   b) Speed and delay study
3) Origin and destination (O & D) study
4) Traffic flow characteristics
5) Traffic capacity study
6) Parking study
7) Accident studies or the traffic flop

3.4.1 Traffic volume study

Traffic volume is that the variety of vehicles crossing a region of road per unit time at any elect amount. Traffic volume is employed as a amount live of flow; the ordinarily used units area unit vehicles per day and vehicles per hour. A complete traffic volume study might embody the classified volume study by recording the quantity of varied sorts and categories of traffic, the distribution by direction and turning movements and the distribution on different lanes per unit time.

3.4.2 Counting of traffic volume

A traffic volume count is also done by mechanical counters or manually.

3.4.3 Mechanical counters

These are also either mounted (permanent) sort or moveable sort. The mechanical counter will mechanically record the overall variety of vehicles crossing a region of the road in a much desired amount. The working may be by the effect of impulses or stimuli caused by traffic movements on a pneumatic hose placed across the roadway or by using any other type of sensor. Traffic count is recorded by electrically operated counters and recorders capable of recording the impulses. The impulses caused by vehicles of light weight may not be enough in some cases to actuate the counter. Also it's out of the question to simply record foot traffic by this methodology. Other methods of working the mechanical detectors are by photo-electric cells, magnetic detector and radar detectors. The main advantage of mechanical counter is that it will work throughout the day and night for the specified amount, main drawback of the mechanical counter is that it is not doable to urge the traffic volumes of varied categories of traffic within the stream and therefore the details of turning movements.

3.4.4 Manual counts

This methodology employs a field team to record traffic volume on the prescribed record sheets. By this methodology it's doable to get knowledge that cannot be collected by mechanical counters, like vehicle classification, turning movements and counts where the loading conditions or number of occupants are required. However it's not practicable to own manual count for all the twenty four hours of the day and on all days around the year. Hence it's necessary to resort to applied mathematics sampling techniques so as to chop down the manual hours concerned in taking complete counts, first the fluctuations of traffic volume during the hours of the day and therefore the daily variations area unit determined.

Then by choosing typical short count periods, the traffic volume study is formed by manual enumeration. Then by applied mathematics analysis the height hourly traffic volumes furthermore because the average daily traffic volumes area unit calculated. This methodology is incredibly ordinarily adopted because of the particular blessings over alternative strategies.

3.4.5 Presentation of traffic volume

The data collected throughout the traffic volume studies area unit sorted out and area unit bestowed in any of the subsequent forms relying upon the wants

1) Annual average daily traffic (AADT or ADT) of the total traffic as well as classified traffic are calculated. This helps in deciding the relative importance of a route and in phasing the road development program. In order to convert the various vehicle categories to 1 category like railroad car, conversion factors known as Passenger Car Units (PCU) are used.
2) Trend charts showing volume trends over period of years are prepared. These knowledge area units helpful for designing future enlargement, design and regulation.
3) Variation charts showing hourly, daily and seasonal variations are also prepared. These facilitate to decide the facilities and regulation required throughout peak traffic periods.
4) Traffic flow maps along the routes, (the thickness of the lines representing the traffic volume to any desired scale), are drawn. These facilitate to search out the traffic volume distribution at a look.
5) Volume flow diagram at intersections either drawn to a certain scale or indicating traffic volume as shown in Fig. 5.2 are prepared, thus showing the details of crossing and turning traffic. These data are needed for intersection design.
6) Thirtieth higher hourly volume or the design of hourly volume is found from the plot between hourly volume

and the number of hours in an year that the traffic volume is exceeded. See Fig. 5.3. The 30th highest hourly volume is the hourly volume that will be exceeded only 29 times in a year and all other hourly volumes of the year will be less than this value. The highest or peak hourly volume of the year will be too high that it will not be economical to design the facilities according to this volume. The annual average hourly volume (AAVH) found from AADT will not be sufficient during considerable period of a year. The high facilities designed with capability for thirtieth highest hourly traffic volume at intervals the assumed year is found to be satisfactory from every facility and economic problems. This is as a result of the value are less in comparison to the height hourly volume and therefore affordable. There will be congestion solely throughout twenty nine hours within the year. Thus the thirtieth highest hourly volume is usually taken because the hourly volume for style. However the actual design hourly volume may be decided by drawing the diagram as shown in Fig 5.3, after carrying out traffic volume studies on the desired location of the road. The design hourly volume thus arrived at need not necessarily is the thirtieth highest hourly volume in all the cases.

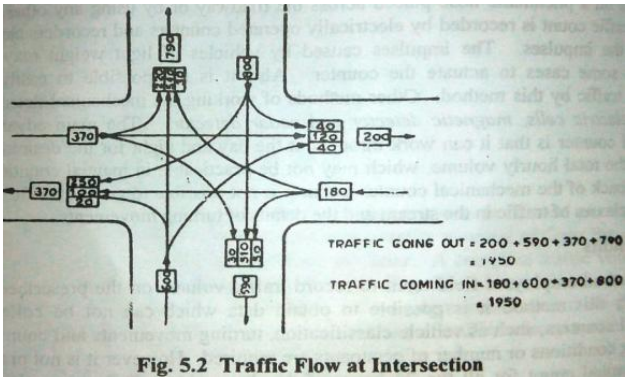

Fig. 5.2 Traffic Flow at Intersection

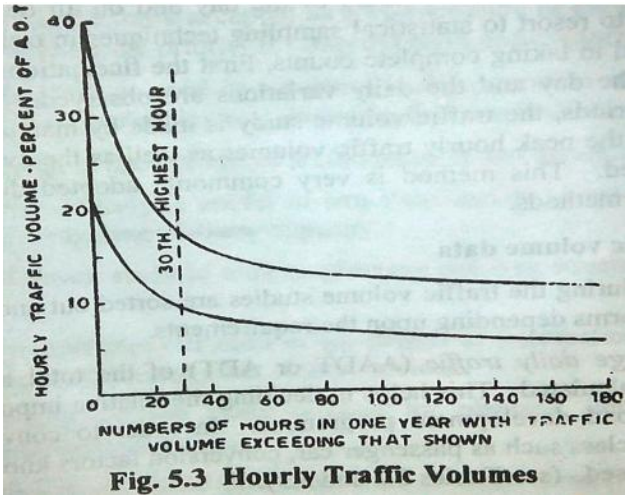

Fig. 5.3 Hourly Traffic Volumes

Proposed Methodology 4 Traffic Volume Count

Traffic Data Collection is basic requirements for transport planning. Traffic Data forms an integral part of national economics and such knowledge is essential in drawing up a rational transport policy for movement of passengers and goods by both government and the private sectors. Traffic Volume Count is counting of number of vehicles passing through a road over a period of time. It is usually expressed in terms of Passenger Car Unit (PCU) and measured to calculate Level of Service of the road and related attributes like congestion, carrying capacity, V/C Ratio, identification of peak hour or extended peak hour etc. Traffic volume count or TVC is usually done as a part of transportation surveys; TVC can be classified or unclassified.

4.1 Need of Traffic Volume Count Survey

Traffic Volume Survey is an essential part of Town Planning, especially for a town planner. It includes counting the number of vehicles passing through a survey station. The study of Classified Traffic Volume Count is to understand factors that form the basis of:

4.1.1 Checking the efficiency/saturation of the road network by comparing current traffic Volume with the calculated capacity or by identifying level of service.

4.1.2 Establishing the use of the road network by vehicles of different categories, traffic Distribution, PCU/vehicle value

4.1.3 Need of median shifting or road widening.

4.2 Purpose of Traffic Volume Count

The purpose classified traffic volume count is to draw inferences on the basis of data collected. To provide possible solutions and improvement suggestion for the problem identified. The objectives covered in it include identifying the hourly distribution of vehicles and peak hour, identify level of service and compare modal composition on different hierarchy of roads.

4.3 Methods of doing Traffic Volume Count

Traffic Volume Count can be done by various methods depending upon various factors like manpower available, budget, technology/instrument available, magnitude of traffic data required or to be collected which will then determine quality and type of vehicle classification to be adopted. Traffic counting falls in two main categories, namely: manual count and automatic count. Traffic data collection forms the integral part of traffic volume study as it provides the raw data and includes primary survey. The various types and methods used to collect traffic data not only provide a good and valuable coverage of the required traffic information. Different methods of traffic volume count are as mentioned below –

4.3.1 Duration and Interval of Traffic Counts: In order to predict traffic flow volumes that can be expected on the road network during specific periods, knowledge of the fact is required that traffic volumes changes considerably at each point in time. There are three important cyclical variations:

4.3.2 Hourly pattern
The way traffic flow characteristic varies throughout the day and night;

4.3.3 Daily Pattern
The day-to-day variation throughout the week.

4.3.4 Monthly and yearly Pattern
The season-to-season variation throughout the year. When analyzing the traffic one must also be aware of the directional distribution of traffic and the manner in which its composition varies as it is important to deal with tidal flow.

4.4 Manual Count

The most common method of collecting traffic volume data is the manual method of traffic volume count, which involves a group of people recording number of vehicles passing, on a pre-determined location, using tally marks in inventories. Raw data from those inventories is then organized for compilation and analysis. This method of data collection can be expensive in terms of manpower, but it is nonetheless necessary in most cases where vehicles are to be classified with a number of movements recorded separately, such as at intersections also in case where automatic methods cannot be used due to lack of infrastructure, necessary authorization etc.

4.5 Automatic Count

This method is employed in cases where manual count method is not feasible. Various instruments are available for automatic count, which have their own merits and demerits. Some of the widely used instruments are pneumatic tubes, inductive loops, weigh-in-motion Sensor, micro-millimeter wave Radar detectors and video camera. Both types of count can be classified or unclassified. Classified traffic volume count gives a better understanding of the types of vehicles which uses the road and can be used for number of other purposes apart from the transportation surveys. It can also be used for calculating the modal split of vehicles on the road. Unclassified traffic volume count is done where sufficient manpower is not available or the budget for the survey is low. This type of volume count does not give good information about the road. Some of the widely used instruments are –

4.5.1 Pneumatic tubes
These are tubes placed on the top of road surfaces at locations where traffic counting is required. As vehicles pass over the tube, the resulting compression sends a burst of air to an air switch.

4.5.2 Inductive loops
Inductive loop detector consists of embedded turned wire. It includes an oscillator, and a cable, which allows signals to pass from the loop to the traffic counting device. Inductive loops are cheap, almost maintenance-free and are currently the most widely used equipment for vehicle counting and detection.

4.5.3 Weigh-in-Motion Sensor types
A variety of traffic sensors and loops are used to count, weigh and classify vehicles while in motion, and these are collectively known as Weigh In Motion (WIM) sensor systems. Some notable traffic sensors are:

Bending Plates which contains strain gauges that weight the axles of passing vehicles

Capacitive Strip is a thin and long extruded metal used to detect passing axles. Capacitive strips can be used for both statistical data and axle configuration.

Capacitive Mat functions in a similar manner as the capacitive strip but it is designed to be mobile and used on a temporary basis only.

Piezo-electric Cable is a sensing strip of a metallic cable that responds to vertical loading from vehicle wheels passing over it by producing a corresponding voltage. The cable is very good for speed measurement and axle-space registration, and is relatively cheap and maintenance.

4.5.4 Micro-millimeter wave Radar detectors
Radar detectors actively emits radioactive signals at frequencies ranging from the ultra-high frequencies (UHF) of 100 MHz, to 100 GHz, and can register vehicular presence and speed and can be used determine vehicular volumes and classifications in both traffic directions.

4.5.5 Video Camera
Video image processing system utilize machine vision technology to detect vehicles and capture details about individual vehicles when necessary. The system is useful for traffic counting and give a +/- 3% tolerance, and is not appropriate for vehicular speed and their classification.

Expected Outcomes

1) Construction of channelizing island will result in avoiding delays and congestion at the intersection.
2) Construction of channelizing island will also result in reducing the conflict points.
3) The proposed improvement will increase travel speeds and thus save travel time for all the passengers.
4) If the volume to capacity ratio will be greater than 1.0 then a solution will be required to the problem.
5) A comparative study can also be made of the cost and the benefits of making the channelized island.

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