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# A Case Study on the Parking Systems in VIT University, Vellore Campus

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***Abstract:*** ***By means of this paper, we are taking VIT University, Vellore as our case study for attempting to solve parking lot availability problem. A survey had been conducted to bring out the main causes of these problems. The primary focus of this paper lies in bringing out the problems and its causes with some possible solutions given by the users of parking facility at VIT University, Vellore.***
***Keywords***: ***Vehicle Parking Survey, VIT University, Parking Problems, Suggestions, Parking Area Demand Supply***

## I. INTRODUCTION

Nowadays, the parking problems have been one of the biggest problems in our day to day life. In many universities, the parking problems are becoming increasingly important. Rapid increase in number of vehicles used by the employees and the students, the imbalance between parking supply and parking demand has been considered as the main reason for parking problems. During peak hours most of the parking area gets full and this leaves the users to search for their parking among another parking area. To overcome this problem there is definitely a need for such studies. The main objective of this paper is to bring out the causes of the parking lot availability problem in VIT University, Vellore campus. Due to the incessant increase in number of vehicles used by the users of VIT University, we found that there is an imbalance between parking supply and parking demand that is, the demand is twice the supply for the parking lot availability.

## II. LITERATURE REVIEW

The Smart parking system based on Slot booking is implemented by Renuka and Dhanalakshmi [1], using the Android application. Although across the world, for example in cities like Pasadena, USA, some of the studies conducted by the Department of Transportation [2], brings out the causes of parking lot availability problems and its solutions like common parking lots for two adjoining areas, shuttle services and carpooling services. Zhenyu Mei and Ye Tian [3] tried to formulate a mathematical model and solve the parking lot availability issue by using artificial intelligence and generic algorithm techniques for Deqing Town and Xiuning City. A similar study had been done but with respect to transportation problems faced by the students of Universiti Malaysia Pahang. They had conducted a survey and the survey results were used to formulate a solution for the transportation problem faced by the students [4]. Bothra et.al [5] used Internet of Things and Cloud Technology for the development of a smart parking system.The parking demand and the reasons for parking problems had been investigated by Yuejun Liu et.al [6] in Beijing, China. The authors used Geographic Information System (GIS) technology to solve urban parking planning and policy-making issues in Beijing, China. David W Burr [7], in one of his articles, mentions parking as one of the greatest problems in colleges and universities in the United States. He throws light onto some of the causes of these problems and factors that need to be kept in mind while providing the solution like traffic constraints, parking supply inventories provided by student, faculty and class schedules. Audrey K Bowerman [8] carried a detailed case study on the parking lot availability problems in University of North Carolina and came up with causes and solutions for better utilisation of existing parking lot facilities. Barata [9] talks about the importance of adopting integrated parking management policies in the University of Coimbra. Wang Yan-ling [10] analyses the current situation and problems of parking in Beijing and came up with the causes, ways to ease out the problem are suggested. Yacine Atif et.al [11] used internet of things approach to cloud-based technique for smart car parking availability problem. From the literature review, we found many researches being conducted with regard to the parking availability problem all across the globe, especially in colleges and universities. This motivates us to work on parking lot availability problem in VIT University, Vellore.

## III.LIMITATIONS

The survey had been carried out only on the working days of the week. A detailed study over a longer duration would have provided with more accurate results.

## IV.DATA COLLECTION

We conducted a survey to understand the issues faced by the users generally while parking their vehicles. We also tried to find out where and what time they face the issues the most. Then we tried to know some possible solutions from them. We prepared a survey questionnaire by means of google form which contained 15 questions with a combination of objective and descriptive type and got it filled by the users. The sample population varied from male to female, student to faculty and staff from various departments. The age group of the respondents are between 17 years to 55 years and above. We also asked the users for their suggestions on the current parking system.

## V. OBSERVATIONS AND INFERENCES

The result of the survey has been analysed to bring out the causes of parking lot availability problems.

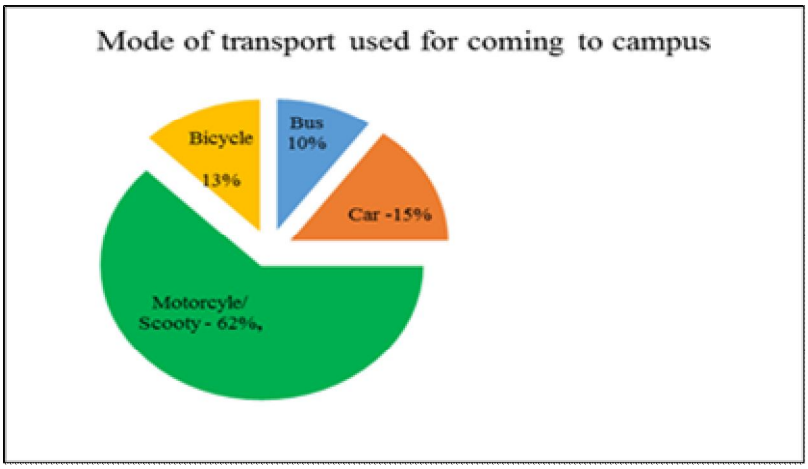


Fig. 1 Pie Chart depicting Percentage share of each mode of transport used for coming to the campus

The pie chart (Fig 1) describes the mode of transport used by the students, staff and faculty at VIT University, Vellore. The survey reveals that more than half of the respondents (62%) use motorcycle/scooty for reaching the campus. The second most preferable mode of transport is the car (15%), followed by a bicycle (13%). Least preferable mode of transport is the bus (10%).

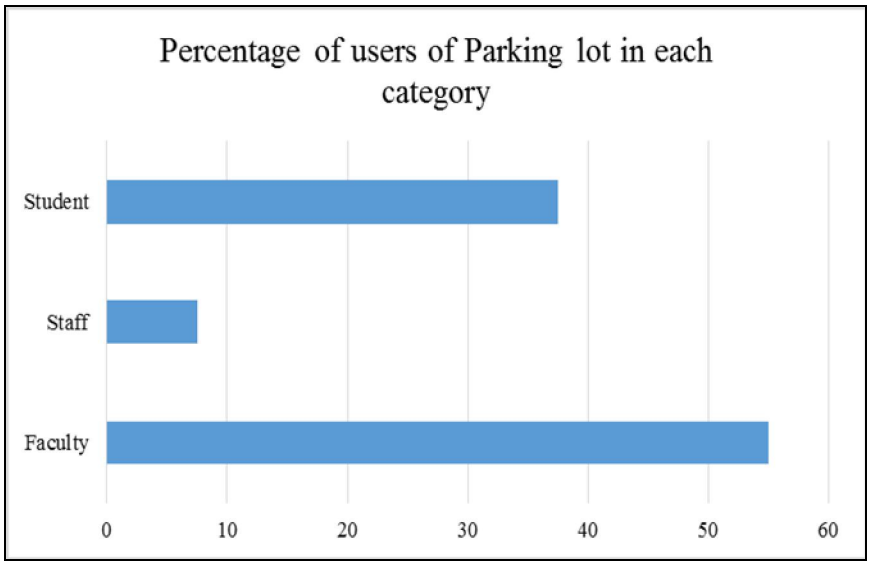


Fig. 2 Bar Graph depicting Percentage share of each category of user of the parking lot facility

The bar graph (Fig 2) shown above depicts the categories of users of parking lot. Due to the state of art hostel facilities, most of students prefer to stay in hostel. Hostels are located inside the main campus, thus students mostly don't require any mode of transport except bicycles. Thus, as we see in the bar graph, faculties are the most common users of parking lots. As mentioned earlier, some students and day boarders use bicycle or other modes such as car, motorcycle/scooty are the second highest users of parking lots.

If we come to each category of users, we see that more problems are faced by employees than students while parking vehicles inside campus. Majority of the users reported unavailability of space and lack of specific parking lots for two wheelers and four wheelers in some areas of the campus. The following graph (Figure 3) depicts the views of the users.

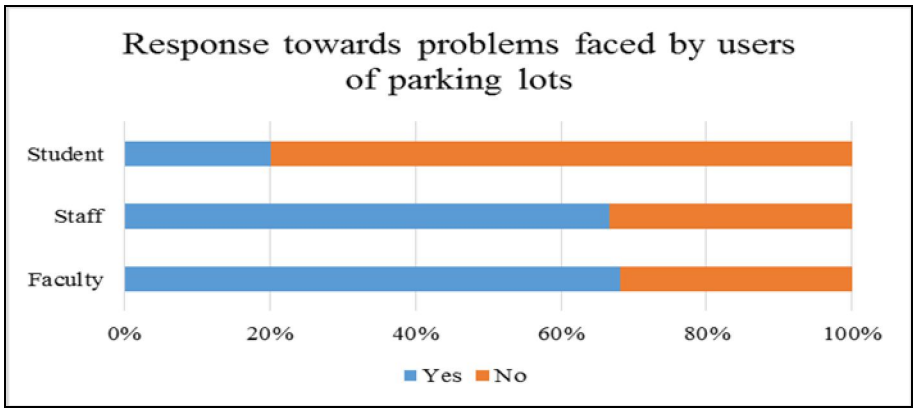


Fig. 3 Bar Graph depicting percentage of users facing problems in parking vehicles inside campu

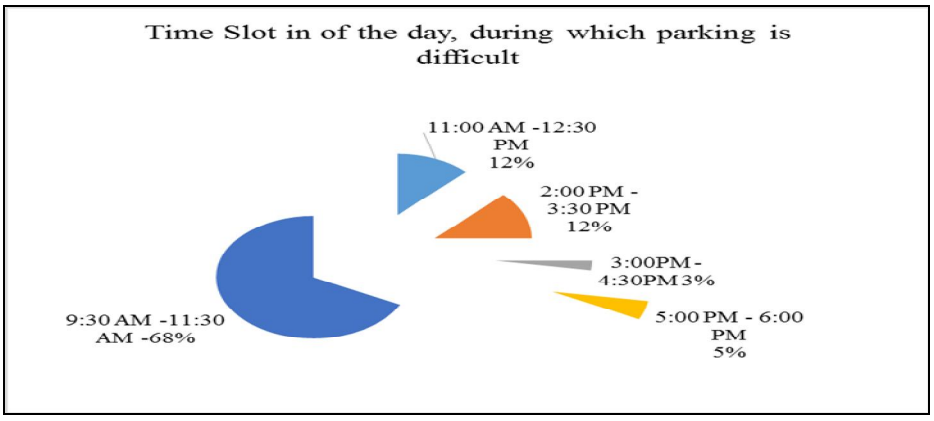


Fig. 4 Pie Graph depicting time slot of the day, during which parking is difficult

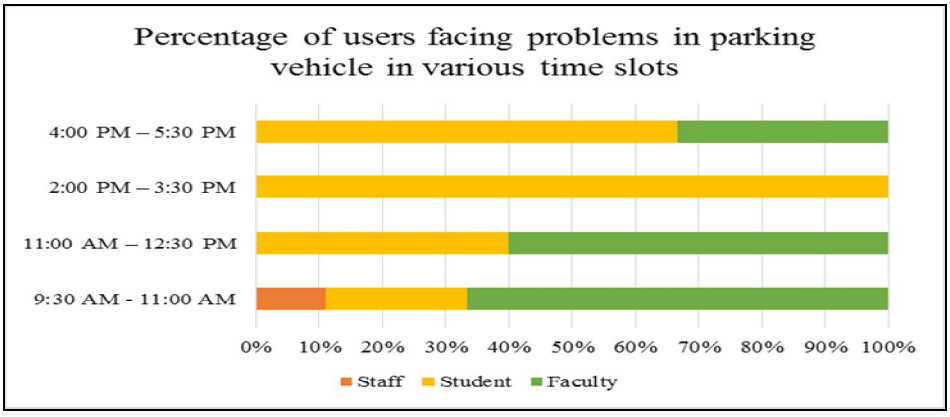


Fig. 5 Bar Graph depicting time slot distribution showing Percentage of users facing problems in parking vehicle in various time slots

From the above time slot pie graph (Fig. 4), 68% of the total respondents reported parking their vehicles to be most difficult during the time slot 9:30 AM to 11:00 AM followed by the time period 11:00 AM to 3:30 PM. From the time distribution bar graph (Fig. 5), we can conclude that faculties face more difficulty in parking in the morning hours, while students face difficulty in parking vehicles for latter part of the day.

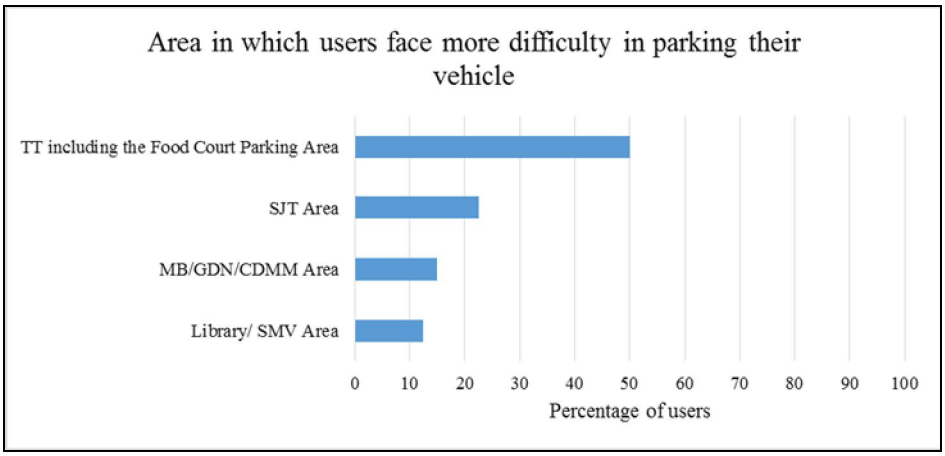


Fig. 6 Bar Graph depicting the area in which users are more likely to face problems in parking their vehicles.

From the above bar graph (Fig. 6), we can infer that the users are facing more problems in parking their vehicles in areas adjacent to Technology Tower including the Food Court area as compared to other areas in the university. The second most pointed out area by the users is adjacent to Silver Jubilee Tower. Least hassles are faced in parking vehicles by the users of VIT University is adjacent to Sir M Vishveshvaraiya Building and Library.

*A. The Primary Causes behind the Parking LOT Problems are as follows*

*1)* Increasing number of vehicles inside the campus
*2)* No proper parking regulations
*3)* Vehicles are not being parked effectively
*4)* Parking Space being utilised by small shops/ online shopping delivery agents

Thus, the main causes for the parking lot availability problem have been successfully determined.

## VI. SUGGESTIONS

A part of the questionnaire addressed to the solution of the parking lot availability problem. Some of the specific suggestions from the respondents are as follows

*A. Better Utilisation of Existing Parking Facilities*

Most of the users suggested that existing parking facilities need to be strengthened. With the help of security guards, the manner in which vehicles are parked can be improved. Thereby, ensuring better utilisation of existing parking facilities inside the campus.

*B. Availability of Facilities Like Shuttle Cabs And Buses*

Majority of the users reported the need of shuttle cabs and buses should be made available for all hostellers and day boarders. Currently, shuttle cabs are available to all. But as per users, provision for bus services should be made available to all. This can help in reducing the amount of vehicles used inside the campus as more people can be moved from one place to another, eliminating need of more vehicles inside the campus.

*C. Specific Parking Lots for Each Category of Users*

Majority of users reported that they want specific parking lots for each category so as to reduce the hassles caused during parking vehicles inside the campus.

*D. Availability of New Parking Lots Inside the Campus*

The responses were mixed. While some responded with a 'No', majority of them responded with new ideas like areas adjacent to SJT, Transport Office. While some responded them with suggestions like areas adjacent to Foodys.

## VII. CAR-POOLING

Car-pooling is one of the major solutions to the problem for increasing population and pollution. when we asked our respondents, majority of them were neutral about the concept of car-pooling in vit university, vellore. this can be explained on the fact that many day-boarders stay in different areas. thus, car-pooling may or may not be a problem. but yes, it can be implemented to reduce the congestion of vehicles inside the campus. we all know that currently natural resources are on the verge of depletion. thus, car-pooling can help conserve fossil fuels and thereby help in reducing air pollution.

Integrating the above mentioned suggestions into the current system, we can ensure that problems regarding parking lot availability can be reduced up to a certain extent.

## VIII. CONCLUSIONS

The study was conducted to bring out the problems caused by insufficient space in parking lot in VIT University, Vellore. The main components of this case study are found out to be the Parking Zones, the category of users and the time during which the vehicle is to be parked. To overcome this problem there is definitely a need for designed parking lot system with certain modification with respect to the present and thus, we need to take into the account the various constraints and solutions suggested by the user. While creating new parking spaces seems like a possible solution, but it is not a viable and permanent solution. We are looking at optimization of current facilities available to solve the problems faced by the users. Using the data obtained from survey, we will be proceeding further to formulate a mathematical model for balancing supply and demand to solve the parking lot availability problem and also bring out the attractiveness of alternate transportation modes.

## IX. ACKNOWLEDGMENT

The authors of this study gratefully acknowledge the suggestions and advice of every employee and students of VIT University, Vellore campus for bringing out the causes and some suggestions to ease out the parking lot availability problems. Thereby, helping in achieving the primary objective of this paper

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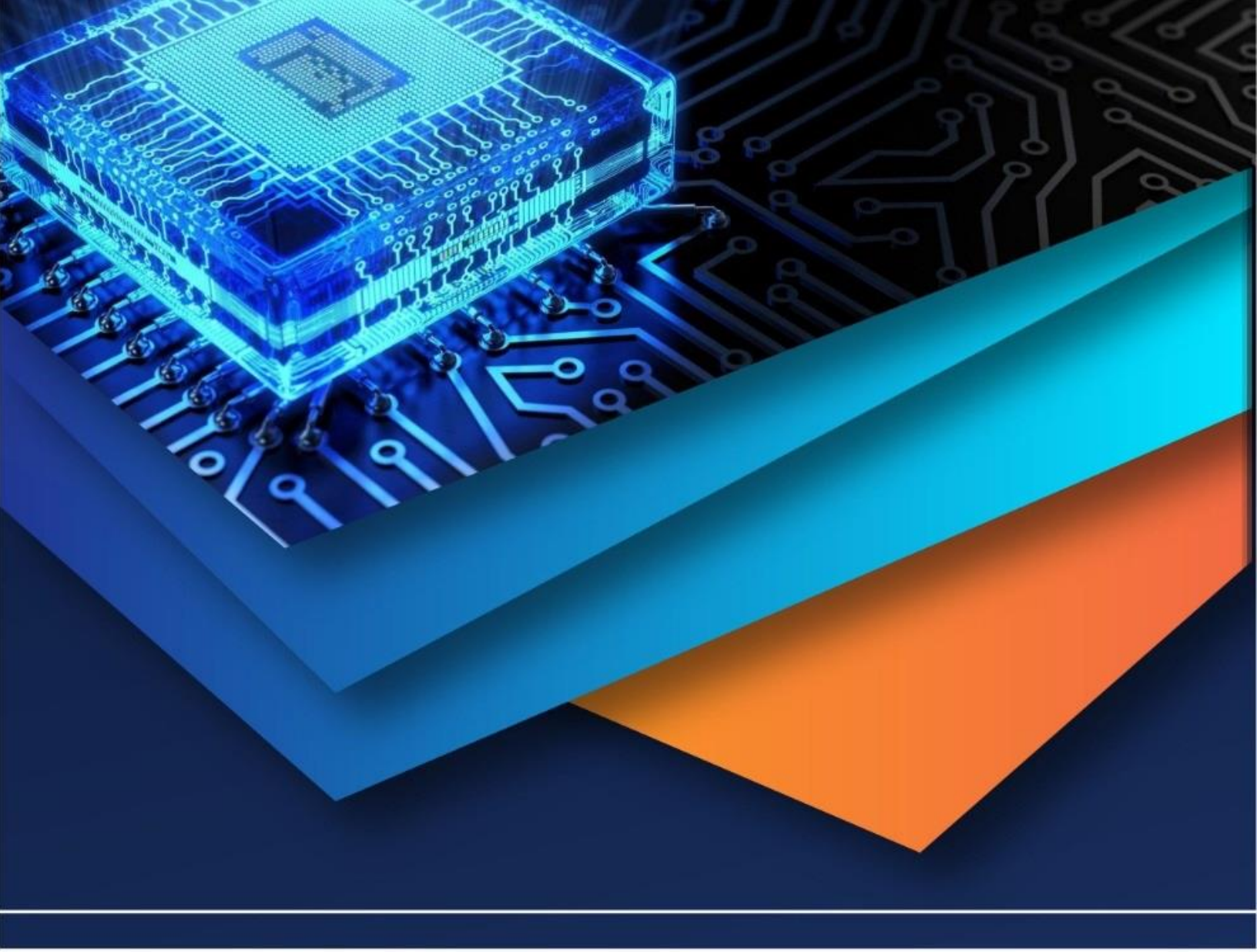

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