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To Study the Seating Arrangement in Bus Stops of Pune

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Abstract: ***The first point of contact between the passenger and the transit system is the bus stand. Many factors influence the design and placement of the bus stand. The design of bus stand waiting areas and provision of seating arrangement that enhance security and comfort plays a significant role in a person's decision to use transit. Passengers need space where they can sit, relax, or hault for their next connected bus. The question arises, whether the seating arrangement provided in waiting areas are used or not. The aim of this research is to study the seating arrangement of bus stands of city of Pune . From the combination of interviews, observation, mapping and questionnaire survey this research tells about the activity and need of seating arrangement in bus stands of Pune city. Pattern***
Keywords: Transit system, waiting area, seating arrangement, bus stand.

I. INTRODUCTION

Transportation is an integral part of functioning of society. The transport system improves the social, economic, industrial, commercial progress and transfers the society into an organised one. Public transport systems come into place for the majority of the public that cannot be able to spend on such luxuries but, just like the ones who own private transportation, also have jobs and different destinations they need to be. Pune is the second largest city in the Indian state of Maharashtra, after Mumbai. It is the ninth most populous city in the country with an estimated population of 3.13 million. The city , now accommodating a heavy population is facing increasingly acute traffic congestion. Due to raipd increasing pollution problems , we need to promote the public to use public transport system which can be done by building efficient infrastructure of bus stands. A bus stand is a designated place where buses stop for passengers to board or alight from a bus. They are usually seen at different busy spots like around schools, colleges, medical centers, offices or at the junction of two roads. The design of bus stand waiting areas and provision of seating arrangement that enhance security and comfort plays a significant role in a person's decision to use this mode of transport. According to research, Buses account for 55% of public transport in Europe, over 45% of all passenger transport in Turkey, and 751 million passenger trips annually in the USA. The bus transport industry employs around 8 million people in Europe. Each job created in the USA's bus industry creates at least three additional jobs in partner industries. More than 21 million people work directly in China's bus industry. Transportation infrastructure cannot operate without transportation and transportation cannot run without transportation infrastructure. Different transportations have their own infrastructure to support each other. Infrastructure for land transportation such as public bus will be the bus stand. In each of these countries, main reason for the use of bus transport was quality infrastructure. Hence it is essential to lay stress on infrastructure of bus stands that would promote its use.

II. LITERATURE REVIEW

A. Road Service Bus Stop Design Guide

In this research paper the author coveys that every boarding stop should be provided with a seat with a backrest and arms. People need to feel comfortable waiting for a bus. Many people, particularly the elderly cannot comfortably wait for a bus without sitting down. Seating at bus stops should be located as close as possible to the front door of the bus when it pulls into the stop, providing that the required clear areas and minimum continuous accessible path of travel is maintained.Seating and shelters should be positioned so that sightlines between approaching buses and waiting passengers are maintained. They should also provide good visibility for surveying the surrounding environment. Maintaining sightlines is particularly important when planting trees in the bus stop surroundings.

B. Bus Stop Design Guide And Placement Security Considerations

This research paper tells us that benches are installed inside all standard shelters. Benches may also be installed independently at bus stops that do not have shelters. The design factors for benches should include the following

1) Benches should be placed facing the street.
2) The structure and materials should be chosen for strength and durability.
3) Materials and paint treatments should be resistant to weather conditions, graffiti, cutting, fire and other forms of vandalism.
4) The design should be appropriate to the neighborhood.

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C. Bus Stop Guidelines

In this research paper the author coveys that unless services are very frequent or stops very rarely used, seats should be provided in all bus stops. Many passengers such as the elderly or those with mobility impairments may be able to walk to or from their nearest bus stop, but find it impossible or very painful to stand waiting. Typically, seats should be provided as a bench or horizontal rail to provide waiting passengers with something to sit on, rest against, or 'perch' on.Whenever possible, sharp edges and corners should be avoided.

D. Transit Capacity And Quality Of Service Manual

This chapter contains procedures for estimating the capacities of various elements of transit terminals. For bus stops, procedures are provided for sizing passenger waiting areas at stops, and the provision of passenger amenities within these areas. The recommended procedures for computing the size of passenger waiting areas at bus stops is based on maintaining a desirable level of service. The primary measure of effectiveness for defining pedestrian level of service is the average space available to each pedestrian. The level of service for a pedestrian waiting area is based not only on space but also the degree of mobility allowed. In dense standing crowds, there is little room to move, but limited circulation is possible as the average space per pedestrian increases.

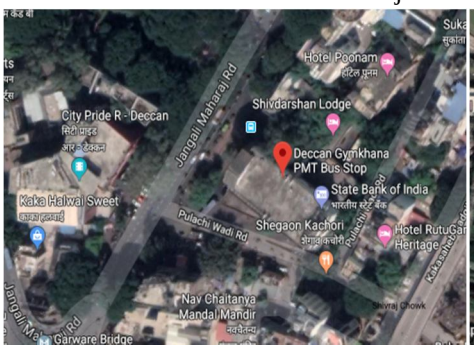
SR.NO	TITLE	AUTHOR	PUBLISHER OR DATE OF PUBLISH	TYPES OF RESEARCH	AIM	INFERENCE
1	Road service Bus stop design guide	Regional transport strategy	October 2005	Qualitative	To analyse the design and planning principles of bus terminal waiting area.	Paper details out the anthropometry of furniture used and its proper zoning.
2	Bus stop design and placement security considerations	Sean ryan, Bill pitard	June,2010	Qualitative	To understand the boundaries of waiting area in bus terminal design.	Waiting areas should be designed keeping handicapped people and their movement patterns.
3	Bus stop guidelines	Bron Healey	April 2010	Qualitative	To understand principles and guidelines while desiging bus stop waiting area.	Maintaining sight line is important and materials udes should have weather resistant.
4	Transit capacity and quality of service manual	Pace organisation		Quantitative.	To understand procedure for computing size of passenger waiting area.	Level of service at bus terminal decides area for passenger waiting area.

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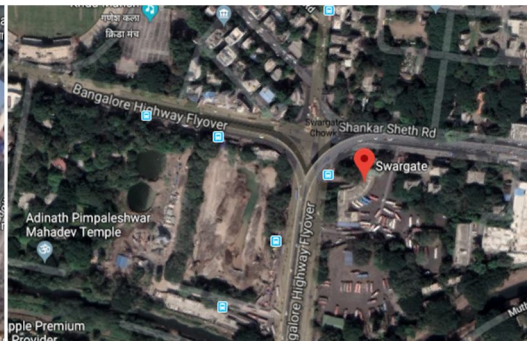
III. METHODOLOGY

1) The major bus stands of the Pune city are identified.
2) The primary data is collected by visiting and observing the selected bus stands of the city.
3) All the activities happening in sitting area are observed and mapped.
4) Questionnaire is prepared and circulated among the people.

Major bus stands of Pune



Deccan Gymkhana PMT bus stop



Swargate bus depot



Chhatrapati sambhaji maharaj bus stand



Sangamwadi bus depot

A. *Case Study 1- Swargate Bus Depot*

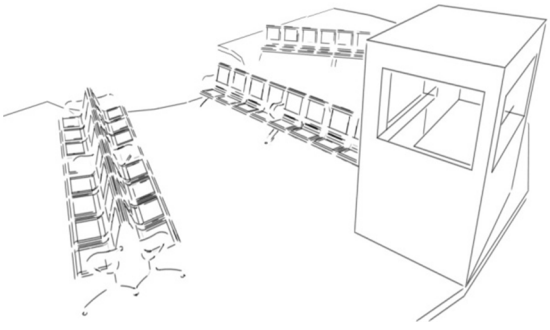


Fig1- View Of Bus Stand

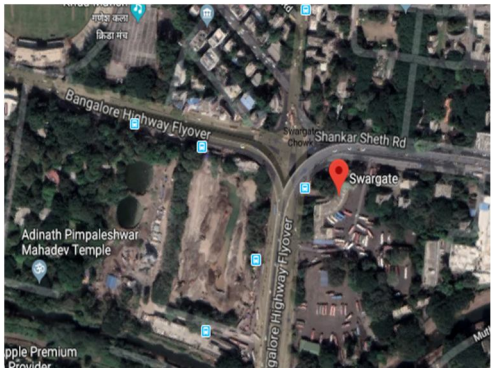
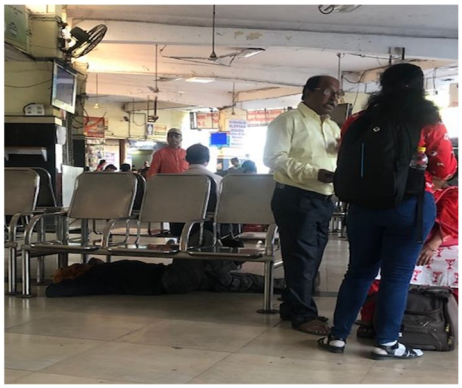


Fig 2- Satellite Image

Swargate bus stand has a capacity of 120 -150 seats. Approximately 1800 buses are estimated to arrive and depart from the terminus. It is main bus station of the city as the buses from this station connects pune to other cities in Maharashtra as well as cities of other states. The bus station has radial seating arrangement allowing the passengers to have a clear view of arrival and departure of buses.People of all age groups were observed to use the bus station.

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People have adequate space to sit , relax, keep their luggage. The station is more crowded on weekends as compared to other week days. After conducting survey it was found that seats provided were adequate but during the rush season(vacation) or at any festival when students travel home, seating provided is not adequate.

The no of static seating provided were around 160. Material of the seats was stainless steel and were mounted to floor. Height of the seating from floor is 600 mm. The seating type had arm rest which were not seen in other bus terminal seats.During evening hours the bus stand was well illuminated by lighting
arrangements. Bus stand also had mechanical ventilation facility making the waiting area comfortable for passengers.

While activity mapping it was observed that space was used by passengers waiting for bus, by the conductor for distributing tickets, separate ticket counter ,help desk for providing information of bus routes etc. Vendors were also seen providing supplying food and other eatables to the people sitting in waiting area. A man who had to wait long for his next bus was observed to sleep under the seats.



Fig 3- Vendors Selling Eatables



Fig 4- Seating Facility

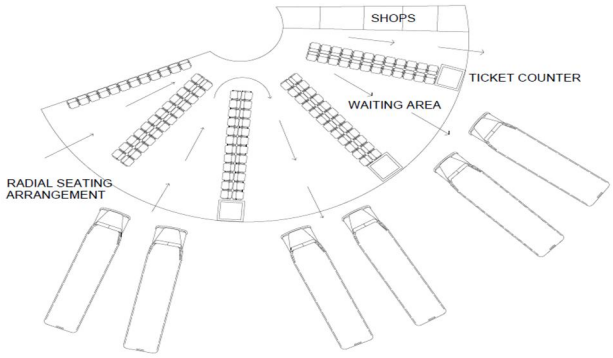


Fig 5- Layout and Circulation In Waiting Area

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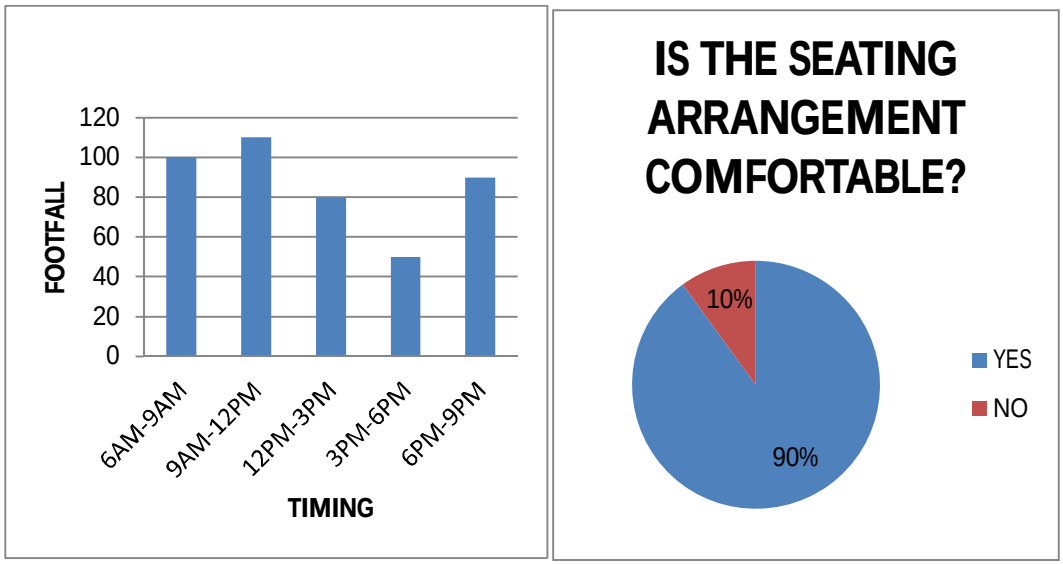


Fig 6- Footfall Table For Bus Stand

B. Case Study 2- Deccan Gymkhana Pmt Bus Stop

Deccan Gymkhana has a major bus stand of PMPML, the local bus service in Pune. Bus service to almost all parts of the city is available here. . As compared to swargate bus depot, it has less capacity of seats (around for 10-15 people). People of age above 20 were observed to use this bus stand.There is no well arrangement for seats for the passengers to sit. Also seating arrangement is distorted. Passengers who are sitting at back do not have clear visibility of buses passing by.

The no of static seating provided were around for 15 people. Material of the seats was stainless steel and were mounted to floor.Stainless steel benches were used for seating. Height of the bench from floor is 600 mm. The benches did not had any arm rest making it uncomfortable for passengers.During evening hours the bus stand was not so well illuminated.Bus stand didn't had mechanical ventilation facility making the waiting area uncomfortable for passengers.

The bus stand is crowded at all hours of the day as bus service to all parts of city is available here. No vendors were seen around . There were small shops and tea stalls near from where people could buy eatables .While activity mapping, it was observed that due to less sufficient sitting space , peple were standing on roads waiting for bus arrival. This is dangerous as it could lead to accident as vehicular traffic is more in the surrounding. Lack of infrastructure facilities and seating arrangements makes it uncomfortable for passengers to wait for a long time specially during summers. Also on conducting survey, people demanded the redevelopment of bus terminal as it is a important junction connecting to main parts of the city.



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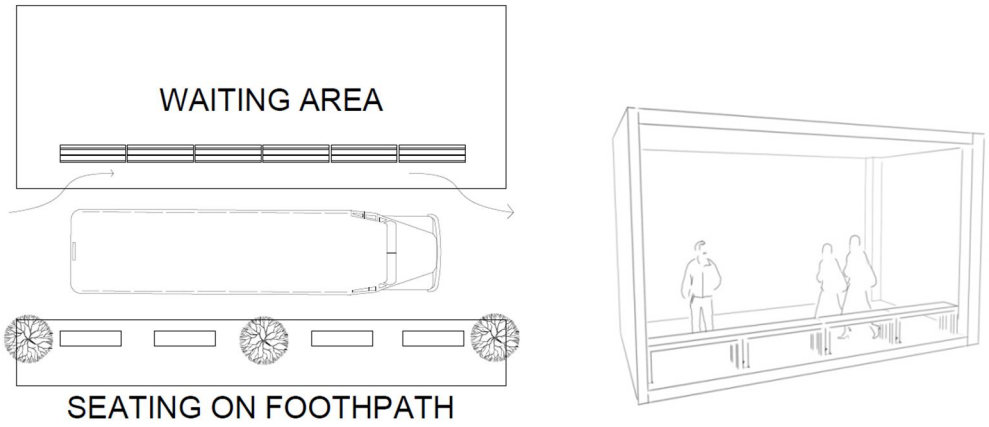


Fig 7- Layout And Circulation In Waiting Area

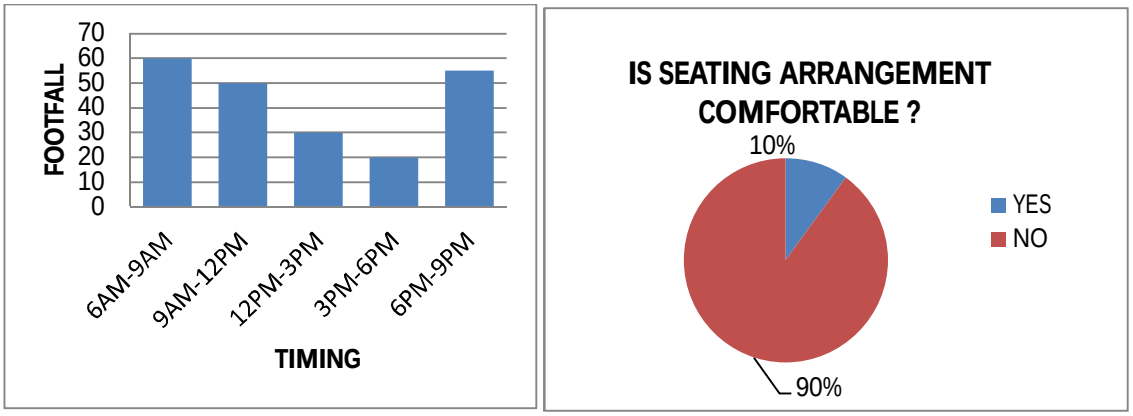


Fig 8- Footfall Table For Bus Stand

C. Case Study 3- Chhatrapati Sambhaji Maharaj Bus Stand



Fig 9- Passengers Sitting On Fig 7- Satellite Image Foothpath

The PMPML section of the bus station is named Chattrapati Shahu Maharaj bus station. It is the common stand point on the Hadapsar-Swargate and Katraj-Swargate sections of the Rainbow BRTS.

Density of passengers as compared to other 2 stations was comparatively less. No proper seating arrangement with proper sheds are installed for passengers. People of all age groups were found to use this station. Passengers preferred to sit on foothpath as compared too seats provided . When asked why, the answer was they were more comfortable sitting on foothpaths as compared to seating arrangement provided. Inspite of having proper infrastructure, due to improper seating arrangement, it was uncomfortable for passengers.

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The no of static seating provided were around for 20-25 people. Material of the seats was stainless steel and was cantilever mounted to bus shelter. Height of the bench from road is 1300 mm(800mm foothpath height +600mm seat height). The benches did not had any arm rest making it uncomfortable for passengers. Also since the seats were cantilevered people didn't prefer to use them as they were not much comfortable to the users. The bus stand during evening hours was not well illuminated as it didn't had any lighting facilty. Also the bus stand was naturally ventilated. There was no mechanical ventilation.
There is no proper maintenance of bus stand plus cleanliness of stand is not maintained.

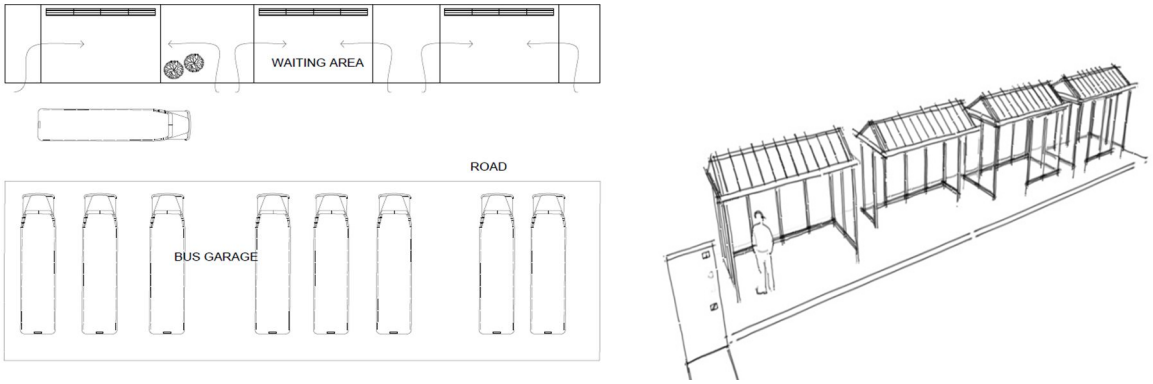


Fig9- Layout And Circulation In Waiting Area

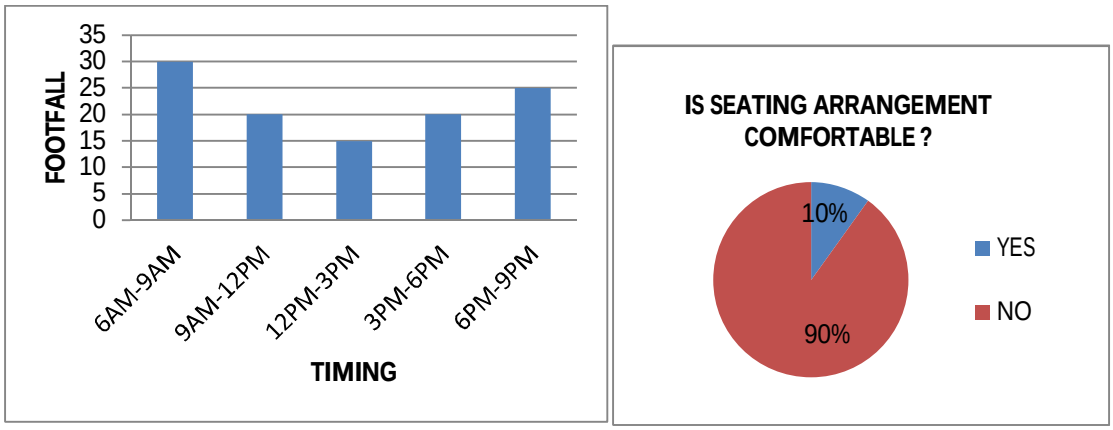


Fig 10- Footfall Table For Bus Stand

D. Case Study 4- Sangamwadi Bus Stand



Fig 10-Bus Stand Ground Sangamwadi



Fig 10- Satellite Image

Approximately 400 buses are estimated to arrive and depart from the terminus. It is main bus station of the city as the buses from this station connects pune to other cities in Maharashtra as well as cities of other states. The bus station has no proper seating arrangement for travelling passengers. People find it very inconvenient during summers and rainy season as there are no proper sheds or infrastructure.

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Passengers have to sit on benches of shops and wait for the arrival of buses. There's no static seating arrangement. passengers have to use wooden benches provided outside tea stalls or benches provided outside booking stalls. Material of the benches were poor quality wooden planks and were not miunted to anything. Height of the bench from floor is 650 mm.. During evening hours the waiting area was not so well illuminated. Bus stand didn't had mechanical ventilation facility making the waiting area uncomfortable for passengers.

The station is more crowded almost all days of week as it is major bus stand connecting different cities to pune. After conducting survey it was found that seats provided were inadequate and inconvenient for passengers.

Vendors were also seen providing supplying food and other eatables to the people sitting in waiting area. People had to wait under sheds or at benches provided near tea stalls due to lack of proper infrastructure.

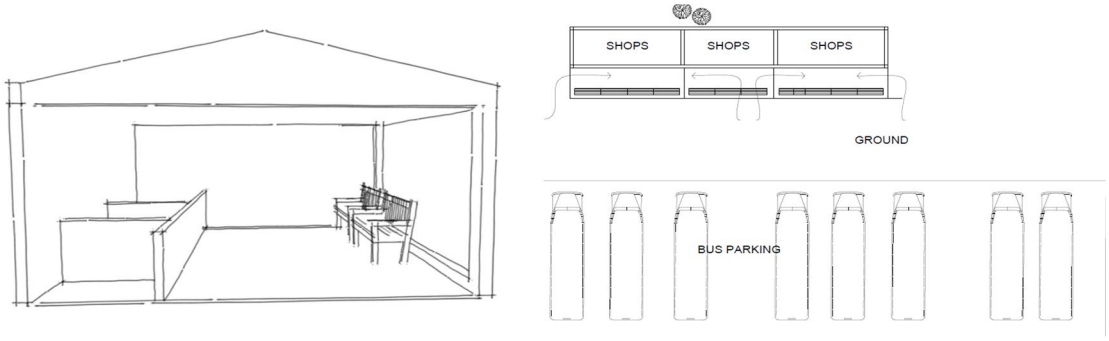


Fig 11- Layout And Circulation Of Bus Stand

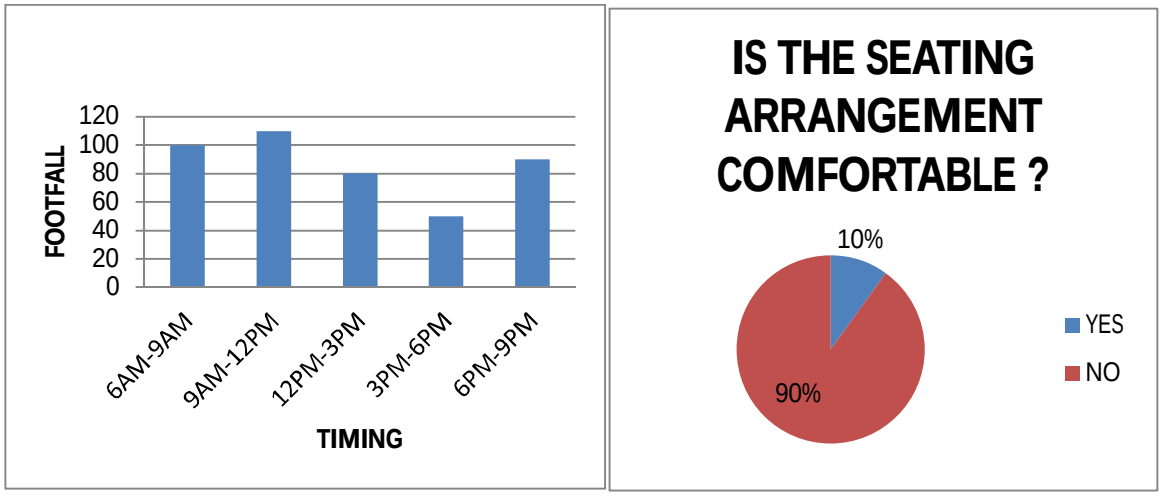


Fig 12- Footfall Table For Bus Stand

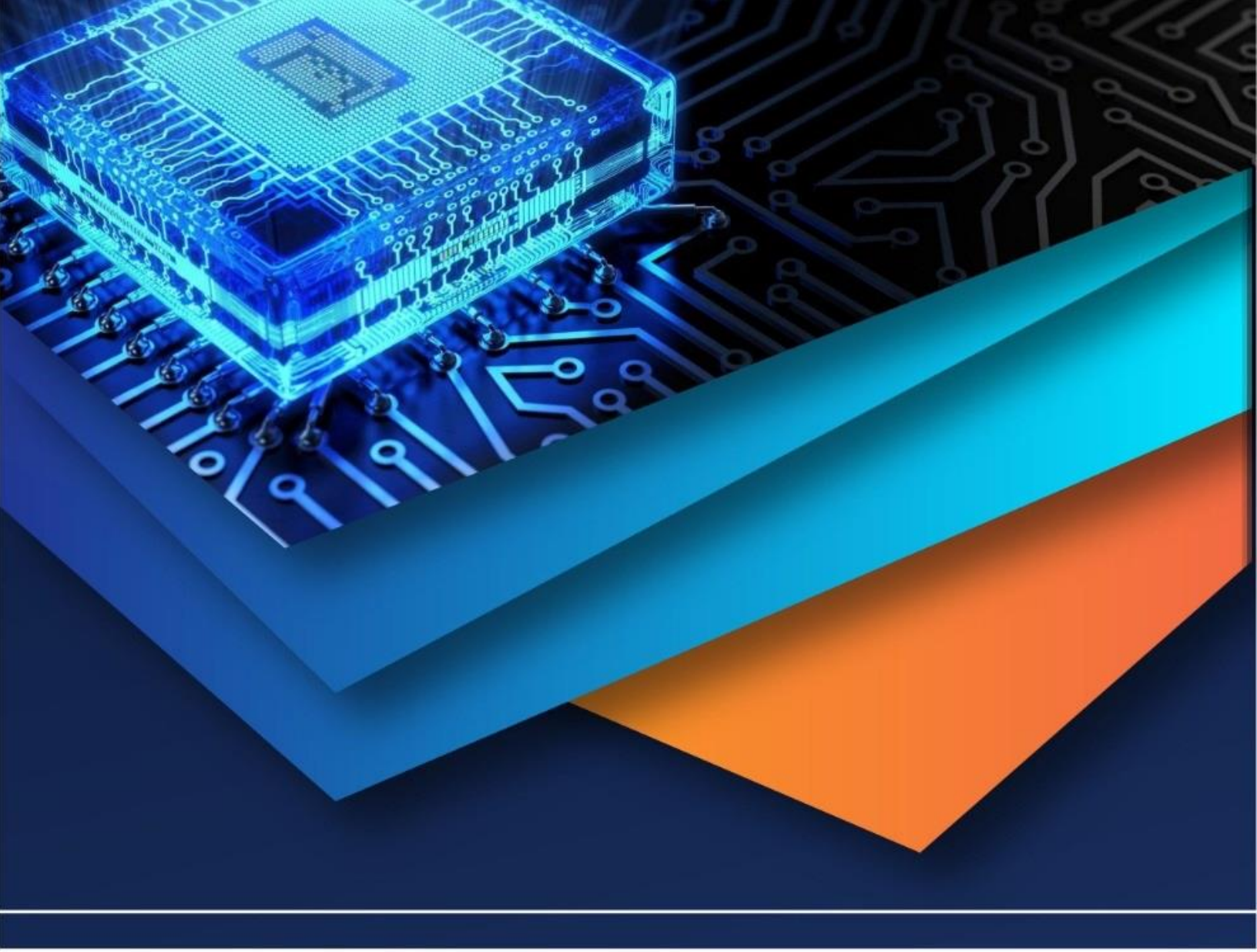
IV. CONCLUSION

From the comparative analysis we conclude that seating arrangement in bus stands play an important role in a person's decision to use transit This research is able to let the government and private sector to make improvement on the bus stands in order to let them become truly efficient. From the questionnaires which were distributed and collected, tells us the satisfaction level and expectation of locals and passengers towards the bus terminals. From their expectation, the improvement can be made. Besides, clean the bus terminals daily so that locals and tourists will feel comfortable and assign more security to secure the bus terminals. When the improvements have made, the locals and tourists will have the chance to use better bus terminals. All these will make the business of the bus increase too.

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