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# Integration of Bicycling and Walking Facilities into the Infrastructure of Urban Communities

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***Abstract:*** ***Traffic congestion and greenhouse gas emission from vehicles have increased over the past decades as a result of people's daily driving. We want to curate Cycling & walking cities across the India safe & inviting people of all ages, cycling and walking cities mean better cities for everyone. As this research include the views on NMT (Non-motorized transportation) , GIS based cycling infrastructure, public- use bicycle, cycling and waling strategy, policies and actions, by which traffic congestion can be reduced to make smart and green mode of transport to cities. This research include study on my native place Bhagalpur city, today's condition is poor in mode of transport due to traffic congestion which is generated by linking of more numbers of village road and city road to the city. As in this research, methodology methods are done to get the data questionnaire survey door to door has done, field observation is also done to get survey report, RTI to Nagar Nigam Bhagalpur and travel behaviour change programme, data regarding survey in detailed in survey report as explained below. The main objective of this research is to find data regarding the users of cycling and walking people in city land on account of survey data, what problems' they fetch and how it can be reduced to implement bicycling and walking infrastructure to cities.100 people responded to the survey in which 37 were students including 5 phD 12 Postgraduate 15 undergraduate students and 63 general people other than students.***
***Keywords: NMT (Non-motorized transport), PUBs (Public- use bicycle, cycling, walking , cycle lanes, parkings.***

## I. INTRODUCTION

Traffic congestion and greenhouse gas emission form vehicles have alarmingly increased over the past decades as a result to people's daily driving. Building newer and larger roads to improve traffic flow and decreased emissions in no longer an option. Transportation needs to embrace higher levels of sustainability and efficiency in order to solve one of the greatest 21st century problems. Not surprisingly, engineers & researchers develop now a days many valuable & green ideas for transportation change. The entire region is facing rather serious environmental crisis threatening the quality of life. We are facing a major crisis in world today: how do we continue to live & develop our civilization without further destruction of our environment. A legacy of designing our town & cities around cars rather than people has left us less healthy, our roads move congested & our cities less well-off. We have a different vision for our cities. We want to create cycling & walking cities across the India-safe & inviting to people of all ages, where every child can walk safely to school, and communities have quality spaces to thrive, walking cities mean better cities for everyone. They cause virtually no noise, no air pollution and consuming non-renewal resources is zero than any motorized mode of transport. Non-motorized transportation (NMT) IN to increases mobility accessibility to servicer and promote sustainable economic and social development that will improve quality of life and reduce traffic congestion. This research seeks to improve those tools available to planners by evaluating the feasibility to multiple GIS-based methods to categorize and evaluate road infrastructure based on its suitability for cycling. Ideally , these methods would provide a relative quick and reasonably accurate way to evaluate a city's existing cycling network, identifying both existing areas where cycling should be comfortable and safe as well as areas that need improvement. To take full advantage of a multi modal, sustainable model of mobility, cities confront obstacles to increased bicycle use. Public use bicycle (PUB) programs present a highly successful and exciting option.Alsofounded on the claim that a bicycle can become an influential addition to public transport and provide public-individual transit options.

## II. MATERIAL AND METHODOLOGY

### *A. Questionnaire Survey And Travel Behavior Change Program*

The web based questionnaire to gain input on the plan from the public was available from June to July, 2018 through survey,some of the questions are included in it.In this method the concept of smart mobility and the smart city have recently emerged to try limit the problems incurred by the growth of the urban population and to find innovative solutions to meet this challenge. Moving smartly depends on an efficient public transport and a network of safe and continuous cycle lane, Footpath and interchange parking that avoids the city congestion. Some of the points are as under:

1) A questionnaire survey in the city regarding hospitals, sports complex meets the demand about a person arising use of max cycling and walking behaviour in them.
2) Participation in city cycle race campaign by the Bhagalpur administration.
3) A talk with different clubs and brotherhood clubs and suggests them to give opinion to people to use cycling and walking more and more in city, firstly they were concentrated only on suggestion to wear helmets to citizens.
4) During survey in Jai PrakashUdyan, I suggest people who came to exercise and walk in.

### *B. Field Observation*

Data is collected and analysed with the help of questionnaire survey and survey report is given under, in which observation is done on the citizen of Bhagalpur city. In summer 2018, a survey of city staff and students was conducted to understand their views on cycling and walking. Data is based on the record given by the facilities using person in the city, in which specific parks, roads, department offices, hospitals, medical colleges, engineering college is as within it.

### *C. RTI*

In this method RTI is done by me to the Bhagalpur Smart city limited (BSCL) Nagar Nigam Bhagalpur (BMC). In which i had taken help from advocate surendraNathPandey (Adv Civil Court Bhagalpur), he suggests me how to file a RTI, what should be the questions should be arise regarding the project which will help me in completion of this research report. The description under RTI which wasraised by me to the Bhagalpur smart city limited (BSCL) on date 07/08/2018 is:-

“Bhagalpur Smart city limited (BSCL) Nagar Nigam Bhagalpur about bid identification No- BSCL/PDMC/ROAD/2018-19-3 about the (document for Smart Road including Footpaths, bicycle track, signage posts, road side parking), which is to be make under smart city Mission, the answer about design, development and completion of road (Road name- TilkamanjhiChowk to Zero Mile Chowk) for my thesis report data in completion of M.Tech degree.

### *D. Talk With Cycle Vendors*

In this method, I met with two cycle vendor’s in my city and talk to them, about how many numbers of cycles are purchased from their shop and the feedback from the cycle user’s and he suggests me some opinion for my report, that u should send a letter to cycle manufacture company.

## III. RESULTS AND DISCUSSIONS

In 2018, city survey was conducted to understand commuting habits and showed that at least 40% of journeys made by students and general people were made on foot or by bicycle. The survey responses suggested that more could be done to improve cycling facilities and safety in the city and in neighboring areas. In survey, general people and students were asked to share their views on cycling and walking in and around the city. The survey aimed to help improved local cycling infrastructure facilities by collecting data on cycling routes and travel patterns.100 people responded to the survey in which 37 were students including 5 phD 12 Postgraduate 15 undergraduate students and 63 general people other than students.

### *A. Survey Respondent Profile*

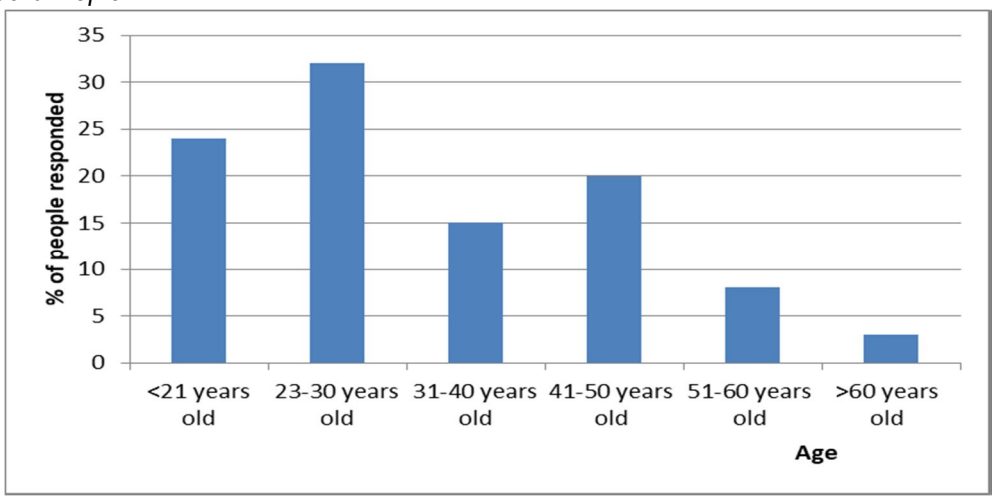


Fig No 1: Survey respondent profile

Table no 1 Percentage of Responded people

| S. No. | Age of people | % of responded people |
|---|---|---|
| 1 | <21 years old | 24 |
| 2 | 21-30 years old | 32 |
| 3 | 31-40 years old | 15 |
| 4 | 41-50 years old | 20 |
| 5 | 51-60 years old | 08 |
| 6 | >60 years old | 03 |

*B. Daily Commuting*

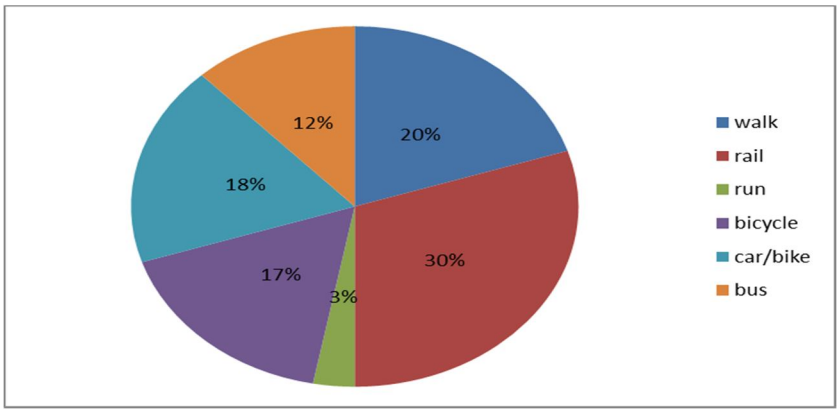


Fig No 2: Daily commuting

Note: please note that respondents could choose more than one answer if using a combination of transport modes in their daily trips. This chart corresponds to the percentage of each mode within all modes selection.

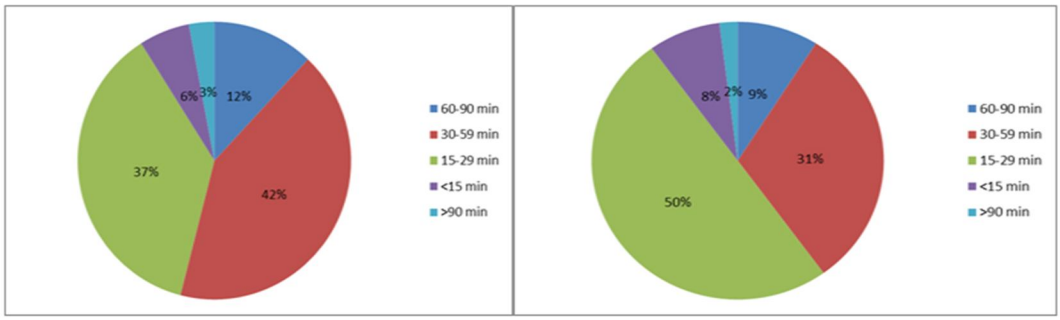


Fig No 3: All mode and cyclist travel time

*C. Cycling Activity*

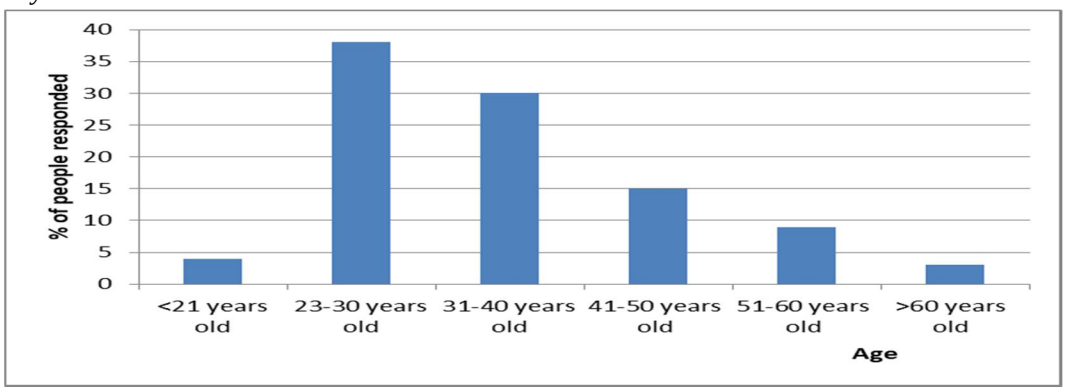


Fig No 4: Cycling Activity

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Most cyclists were commuting to city frequently (3-7 days week). Small Proportion were seasonal cyclists, riding during the colder months.

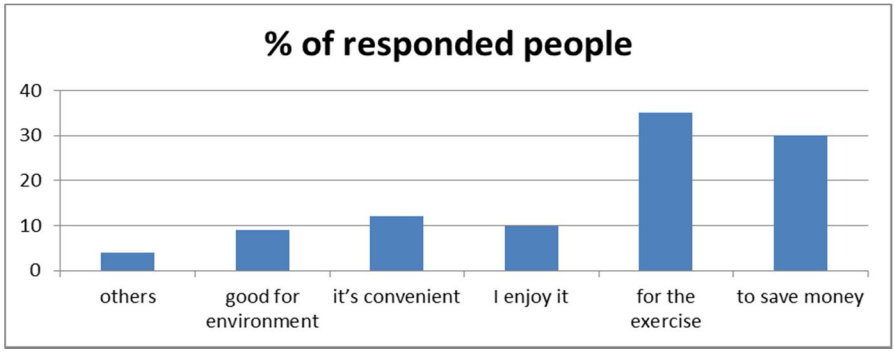


Fig No 5: Reason for cycling

*D. Safety Perception*

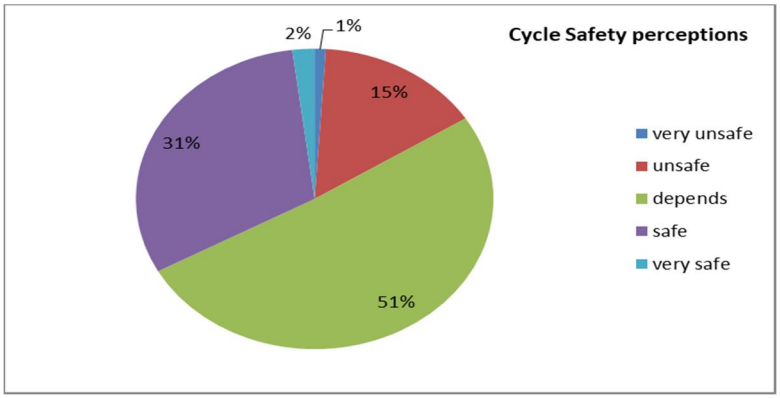


Fig No 6: Safety perceptions

Many non- cyclists expressed concerns about cycling safety and the number ofaccidents on the streets, and even said they would consider cycling to city if they felt the road was safer. The most concerning areas around JLNMCH Area for respondents are Sudha dairy and D.M Kothi. Additionally, many commented on the dangerous roundabouts around Zero mile . Many of the comments on this question repeatedly pointed out street with heavy traffic and dangerous junctions. Tilkamanjhi roundabout was also mentioned as a critical area.

*E. Cycling Infrastructure Satisfaction*

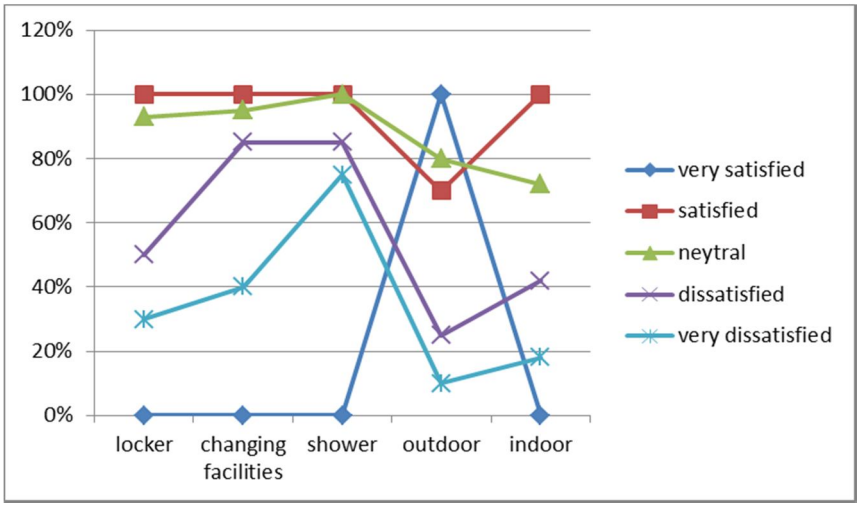


Fig No 7: Cycling infrastructure satisfaction

Table no 2 Percentage of Responded people

| S.No | Cycling Infrastructure | Category with % of responded people | | | | |
|---|---|---|---|---|---|---|
| | | very dissatisfied | dissatisfied | neutral | satisfied | very satisfied |
| 1 | lockers | 01-30% | 31-50 % | 51-92% | 93-100% | - |
| 2 | changing facilities | 01-40% | 41-85% | 86-94% | 95-100% | - |
| 3 | shower facilities | 01-79% | 80-94% | 95-100% | - | - |
| 4 | outdoor parking | 01-09% | 10-24% | 25-49% | 50-70% | 71-100% |
| 5 | indoor parking | 01-17% | 18-41% | 42-71% | 72-100% | - |

56% of respondents were very satisfied or satisfied with outdoor parking facilities. The greatest dissatisfaction was expressed in regards to lockers, where 52% of respondents said that they were dissatisfied very dissatisfied.

*F. Cycling Improvement Priorities*

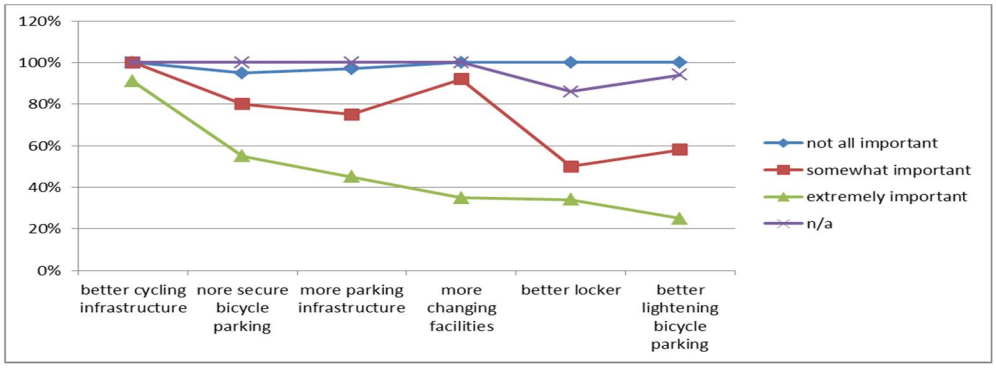


Fig No 8: Improvement priorities

Table no 3 Percentage of Responded people

| S.No. | Facilities & Infrastructure | Category with % of responded people | | | |
|---|---|---|---|---|---|
| | | not all important | somewhat important | extremely important | n/a |
| 1 | better cycling infrastructure | 100% | 100% | 91% | 100% |
| 2 | more secure bicycle parking | 95% | 80% | 55% | 100% |
| 3 | more parking infrastructure | 97% | 75% | 45% | 100% |
| 4 | more changing facilities | 100% | 92% | 35 | 100% |
| 5 | better lockers | 100% | 50% | 34% | 86% |
| 6 | better lightening bicycle parking | 100% | 58% | 25% | 94% |

## IV. CONCLUSIONS

It is essential to understand that mobility is a derived demand that is derived from the need for people to meet their necessary social or economic interactions. Private vehicle, public transport or NMT are simply means to achieve it. Bhagalpur not only demand activity centre closer to each other, but also want safe and efficient pedestrian and cycling corridors with high quality public transport options.

In this work, we present the cycling and walking infrastructure in various ways which is illustrated in this report, in which a survey is done in Bhagalpur city in summer 2018 to understand their views on cycling and walking in and around the city.

*1)* In survey of 100 people, 57% of them were cyclists in which 40% of journey made by citizen were made on foot or by bicycle. 37% of them were student and 63% of them were general people among them 73% are male and 27% are female. Most cyclist were commuting to city frequently (3-7 days a week), a small portion were seasonal cyclists. 68% of cyclists were between 21 and 40 years, in which 35% of citizen using cycling for the exercise, 30% to save money , 12% for convenience 9% of them were good for the environment. 51% of user's think it is safe and 15% of user's think it is unsafe. 55% of respondents were 'very satisfied' or 'satisfied' with outdoor parking, but 45% were think about more parking infrastructure, 52% of respondents were dissatisfied regarding to lockers and other facilities. 20 additional comments regarding other facilities they think about the infrastructure of cycling and walking are to be done which is illustrated in survey report.

*2)* As above data shows that cycling and walking is benefited as personal concern and about the smartness and greenery of the city, which will help to reduce traffic jams and also concerning about the today's environment. Bhagalpur is on the verge of something new, fantastic and exciting under Smart City Mission; the city has the chance of sustainable transportation. As above data shows that cycling and walking is benefited as personal concern and about the smartness and greenery of the city, which will help to reduce traffic jams and also concerning about the today's environment.

*3)* Bhagalpur is on the verge of something new, fantastic and exciting under Smart City Mission; the city has the chance of sustainable transportation. . Empowering citizens to travel independently through the city, on vehicles that are emission free, good for the health, efficient and personal, this may drastically and positively alter the environment of city. While there is the future of public-use bicycle in Bhagalpur, one can conclude that the city and citizens deserves such a program.

*4)* Thus there is an increase in percentage of cyclist to 67% within a year when illustrated literature part should be implemented. All this can only be possible by strong political will and sustained public pressure for change.

*5)* Overall, the survey showed clearly that there is great interest and demand for cycling infrastructure, many respondents took the time to provide detail comments and suggestions. Many students and general people felt that although city has adequate infrastructure provision, there is still room for improvement to meet the needs of current cyclist and attract new cyclists. 50 respondents provided their phone numbers to be included in a Bhagalpur Bicycle User Group (BBUG). A BBUG could provide a forum for students and general cyclist to come together and discuss how to campaign for greater local road safety and improve infrastructure for cyclists, while improving cycling facilities in and around the school, college, offices, hospitals, parks etc.

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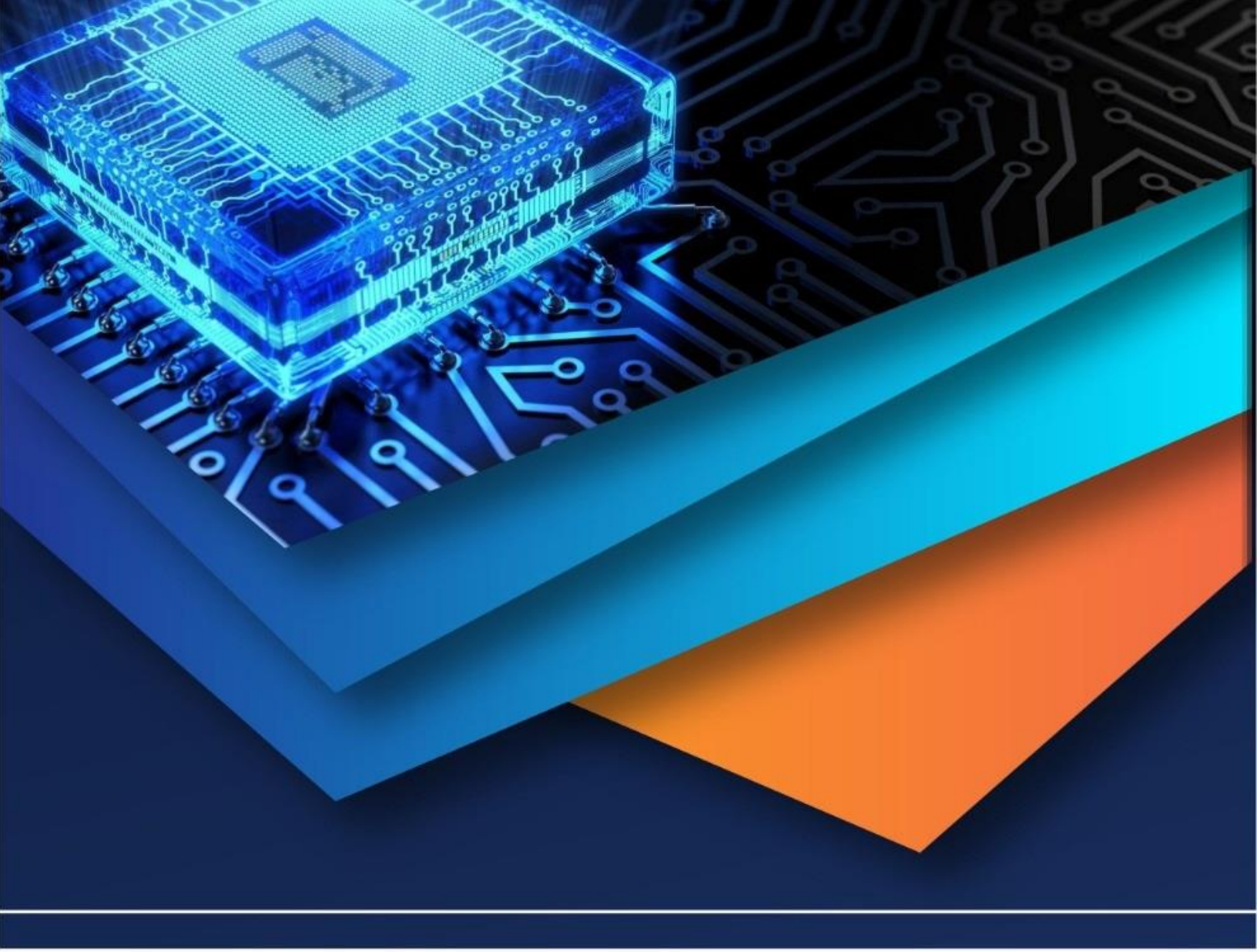

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