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Housing Affordability Index (HAI) Approach in Assessment of the Affordable Housing Projects in Dar Es Salaam, Tanzania

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Abstract: Housing affordability is the relationship between households' income and housing expenditure. Affordable projects developed in Tanzania are sold at exorbitant prices that are above reach of the majority of citizens Houses are considered to be unaffordable if the household pays more than 30% of their income towards owning or renting the house. URT (2013) that Dar es Salaam has an annual growth rate of 5.6% from 4.3% in span of the year 1998-2002 above the national growth of 2.7%. The main objective of this paper is assesses the Housing Affordability index taking National Housing Corporation affordable projects as case study. Housing Affordability index (HAI) was used in order to determine the housing affordability index in Tanzania. The study revealed that neither the 2 nor 3 bedroom house is affordable to the low income group as intended. HAI method revealed that 2bedroom house selling at median price of Tsh 42,442,299.00 is affordable to household with an income of above Tsh 2,035,000.00, while 3 bedroom selling at median selling price of Ths 50,515,941.60 is affordable to household income of above Tsh 2,470,000.00.

Keyword: Housing affordability index (HAI), Household income, National Housing Corporation

I. INTRODUCTION

A. Background of the Study

States that everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, and housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control [9].

It's therefore every ones right to stay in a respectable habitable dwelling. Even though, housing is the primary necessity of humans in lots of parts of the word, its affordability still remains a challenge to city dwellers [7]. He observed that the problem exists in both developed and developing countries but the problem is most mentioned in the urban cities of the developing countries. While housing investment have generally increased overtime access to housing remains key challenge especially in developing countries where relative to developed world investment has generally been low resulting in inadequate housing delivery and consumption [8].

Tanzania still faces the same housing problems. The sector is mainly dominated by pension funds, government owned institutions such as National Housing Corporation (NHC) and Tanzania Building Agency (TBA), private local investors/developers and few foreign investors/developers. The real estate sectors have not been able to meet the ever growing urban housing demand. Dar es salaam have experienced growth of 5.6% (4,364,541) in the span of the year 2002 -2012 from 4.3% in the span of the year 1998-2002 [10]. This shows that the driver that enables this sector to thrive and produce more housing supply should be addressed.

B. Statement of the Problem

In order to house the ever growing population in urban areas especially in dare s salaam, Pensions funds and government owned institutions such as NHC have constructed the affordable housing in bit to supply the housing units that are in deficit of 3million units with annual growth of 200,000units [11].These developed houses are expensive beyond the affordability of even the middle income citizens. This has risen concerned with government leaders who sees actually something should be done. An example is noted when president Dr. John Magufuli gave directive to National Housing Corporation to implement affordable housing projects only to Municipal councils and services providers will be responsible to build roads and services(water, electricity) respectively up to project site. This move is intended to low the cost of the houses as higher amount of project money is spent on the infrastructure development that eventually is recovered from the final owner. Due to small number of houses produced and sold at higher prices it locks out majority of citizens who have to explore other option to accommodate them.

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Those who can't afford to build either onetime or progressively usually opt to rent available houses. Due to limited number of houses landlords/landladies greatly exploit the tenants with high rents with option to tenants to pay annually their rents which increasing annually. The house search process greatly costs time and money before one can get a satisfactory house within his location option and his budget with help of house brokers (*Madalali*).

Due to these high rent rates a number of people can't afford, therefore they have resulted to establish their own houses on reserved land (encroachment) resulting to development of squatters and unplanned settlement such as in Jangwani basin, - Dar es salaam. These squatters and unplanned settlement are characterized with overcrowding due to high population density, sanitation problems, and insecurity of tenure. Crime rate is usually high as most of people are jobless. There is poor infrastructure such as there is no storm drainage. They experience unhealthy living condition such as sewage is made to drained to trenches adjacent to living houses posing a danger to the outbreak of diseases. Garbage dump sites are next to living homes.

II. LITERATURE REVIEW

A. *Introductions*

Over the decades, housing affordability has become a major policy concern across countries in the various regions of the world. This concern about housing affordability is mainly driven as a result of households cost burdens in meeting other basic requirements especially the low-income to access homeownership. Research by the Australian Housing and Urban Research Institute (AHURI) in [4] cited Maclennan and Williams (1990: 9) definition of affordability as concerned with securing some given standard of housing (or different standards) at a price or rent which does not impose in the eyes of third party (usually government) an unreasonable burden on household incomes.

A concept closely related to housing affordability is 'housing stress' [3] AHURI research has written that housing stress: encompasses a range of financial circumstances including a short-term or one-off issue of paying a mortgage deposit or rental bond, an ongoing problem for households whose income is insufficient to meet housing costs (e.g. households who have over-extended themselves and pay too much in rental or mortgage costs), and an episodic problem due to unforeseen circumstances such as redundancy or a rent rise. It can also refer to factors such as over-crowding, insecurity of tenure, and inappropriate facilities within the home.

Affordability of an item as amount of financial stress that the purchaser would pay [5] this stress is in two ways; first how much of our income is going to purchase? Secondly, how much income will be left over for other goods? In this view then we can view affordability as relationship between income and relative prices. At one end it is easily affordable and at the other end it is not affordable. The idea of affordable housing recognizes the needs of households whose incomes are not sufficient to allow them to access appropriate housing in the market without assistance Thus, the term 'affordable housing' describes housing that assists lower income households in obtaining and paying for appropriate housing without experiencing undue financial hardship.

United States Department of Housing and Urban Development in [12] identifies the families who need affordable housing as follows; Families who pay more than 30 percent of their income to housing is considered a cost burdened to them as they may have difficulty affording basic necessities (such as food, clothes, transport and medical care). An estimated 12 million renter and households now pay more than 50 percent of their annual incomes for housing [12]. A family with one full-time worker earning homeowner the minimum wage cannot afford the local fair-market rent for a two-bedroom apartment anywhere in the United States [12].

B. *Measure of Housing Affordability*

This paper focuses on the use of Housing Affordability Index (HAI) as a tool to measure housing affordability. [6] the Approach is important to measure income affordability of a person to pay for monthly housing payment. Housing affordability measure is used to explain the type of household expenditure; to analyze the trend with comparison on type of different household; to determine who are qualifies to get a housing subsidies; to define housing necessity for public policy; to predict household applicable to pay for a rent or housing loan and to choose housing unit before deciding to buy or rent the house.

C. *Housing Affordability Index (HAI)*

American largest trade association which engages in real estate know as National Association of Realtors (NAR) has defined affordability index with main aim being to measure whether a typical family can qualify for a mortgage loan on a typical home. NAR define a typical home as a national median-priced existing single family home. The typical family is defined as one earning

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the median family income as reported by the U.S. Bureau of the Census. The prevailing mortgage interest rate is the effective rate on loans closed on existing homes from the Federal Housing Finance Board. These components are used to determine if the median income family can qualify for a mortgage on a typical home. The indices are interpreted as follows by National Association of Realtors;

Indices	Interpretation
Exactly 100	Family with the median income has exactly enough income to qualify for a mortgage on a median-priced home.
Above 100	Signifies that family earning the median income has more than enough income to qualify for a mortgage loan on a median-priced home
Below 100	Signifies that family earning the median income has less income to qualify for a mortgage loan on a median-priced home

Formula used to calculate as adopted by the National Association of Realtors (NAR)

$$\text{Housing Affordability index (HAI)} = \frac{\text{Median family Income}}{\text{Qualifying Income}} \times 100$$

$$\text{Qualifying Income} = \frac{\text{Mortgage Repayments}}{30\%}$$

(Minimum as set by NAR and HUD.GOV (2015)

$$\text{Monthly Payment of mortgage} = P\,\frac{r(1+r)^n}{(1+r)^n-1}$$

Where;
M=Monthly payment
P=Principal Amount
r=Monthly interest rate
n=Number of months to pay mortgage

III. METHODOLOGY

This study involved intensive literature review of the existing data on median selling house price, household income and mortgage interest rate. National housing Corporation (NHC) and Watumishi Housing Company (WHC) affordable housing projects. Housing affordability index (HAI) method was used to measure housing affordability. Microsoft excel software was used as analytical tool in the computation of the data. Regression analysis was done to find out the relation between the median income and the index.

IV. RESULTS AND DISCUSSIONS

The three input data that is median selling house price, Income and Mortgage interest rate were established as follows.

A. Income

The income data used in this study was taken from the salary scales of Tanzania government employees circular 2016. The figure used was after deduction of the statutory as laid down by the law that is Pension 10%, P.A.Y.E tax based on the Tanzania Revenue Authority (TRA) guidelines and National insurance Fund 3% (NHIF).

B. Median House Price

The study evaluated the selling prices from the two real estate companies that is National Housing Corporation (NHC) and Watumishi Housing Company (WHC). Two types of the houses (2 and 3bedroomed) were being developed by these real estate developers. From table 3 the median price of the 2 and 3 bedroom houses is revealed to be Tsh 42,442,299.00 and Tsh 50,515,941.60 respectively.

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C. Interest Rate

the study revealed that mortgage loan interest ranges from 16% -20% sometimes it goes up depending on the collateral. For purpose of this study the interest rate used is 19% p.a

Table 3: Selling Prices of the Affordable prices for both NHC and WHC

National housing Corporation (NHC)			Watumishi Housing Company (WHC)		
Region	House Type	Price in Tsh (VAT Incl.)	Region	House Type	Price in Tsh (VAT Incl.)
Dar es Salaam					
Kigamboni housing estate	2Bedrm 56m²	46,983,547.43	Gezaulole Residents	1bedrm 36m^2	40,000,000
	3Bedrm 70m²	53,769,670.46		2bedrm 60m^2	60,000,000
Mwongozo Beach Housing Estate	2 Bedrm(Nyati)65 m²	52,807,950.00		3 bedrm 85m^2	91,000,000
	3Bedrm (Twiga) 85m²	69,056,550.00		3 bedrm 96m^2	96,000,000
	3Bedrm (Simba) 144m²	152,104,100.40		3 bedrm 115m^2	90,000,000
	3Bedrm (Chui) 130m²	137,300,670.00			
	3Bedrm(Tembo)100 m²	105,615,900.00	Mkundi Housing.	2bedrm 60m^2	33,000,000
Up-country regions				2 bedrm 61m^2	39,000,000
Bombambili Geita	2Bedrm(Nyati) 56m²	43,404,789.60		3 bedrm 85m^2	43,000,000
	3Bedrm(Faru) 70m²	48,805,059.60		3 bedrm 96m^2	55,700,000
	3Bedrm(Twiga) 85m²	48,998,131.20		3 bedrm 115m^2	69,800,000
Ilembo- Katavi	2Bedrm(Nyati) 56m²	36,129,240.00		3 bed 121 m^2	73,500,000
	3Bedrm(Faru) 70m²	54,341,053.20			
	3Bedrm(Twiga) 85m²	45,243,748.80	Bunju B Housing Estate	2bedrm 60m^2	68,000,000
Kongwa- Dodoma	2Bedrm(Nyati) 56m²	41,881,244.40		3 bedrm 85m^2	78,000,000
	3Bedrm(Faru) 70m²	47,006,244.00		3 bedrm 115m^2	91,000,000
	3Bedrm(Twiga) 85m²	47,396,210.40			
Mkinga-Tanga	2Bedrm(Nyati) 56m²	40,703,693.80	Magomeni Apartments	2bedrm 60m^2	88,580,000
	3Bedrm(Faru) 70m²	46,383,062.40		3 bedrm 85m^2	128,750,000
	3Bedrm(Twiga) 85m²	48,200,994.00			
Mkuzo- Ruvuma	2Bedrm (Nyati) 56m²	42,846,602.40			
	3Bedrm(Faru) 70m²	49,238,992.80	Kisesa Housing	2 bedrm 61m^2	67,000,000
	3Bedrm(Twiga)	52,381,663.20		3 bedrm 85m^2	88,000,000

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	85m²		Project		
Mlole- Kigoma	2Bedrm(Nyati) 56m²	40,470,483.60		3 bedrm 115m²	98,000,000
	3Bedrm(Faru) 70m²	46,052,355.60			
	3Bedrm(Twiga) 85m²	45,878,400.00			
Mrara- Manyara	2Bedrm(Nyati) 56m²	42,037,995.60			
	3Bedrm(Faru) 70m²	50,515,941.60			
Mtanda- Lindi	2Bedrm(Nyati) 56m²	39,719,224.80			
	3Bedrm(Faru) 70m²	44,475,285.60			
	3Bedrm(Twiga) 85m²	47,111,382.00			
Mvomero- Morogoro	2Bedrm(Nyati) 56m²	40,655,908.80			
	3Bedrm(Faru) 70m²	46,168,963.20			
	3Bedrm(Twiga) 85m²	47,151,525.60			
Unyankumi- Singida	2Bedrm(Nyati) 56m²	49,544,848.80			
	3Bedrm(Faru) 70m²	54,987,174.00			

D. Housing Affordability Index Using HAI method

Step by Housing Affordability index calculation using HAI method.

1) *Determine the Median Price:* 2bedroom house is Tsh 42,442,299.00 and 3bedroom house is Tsh 50,515,941.60.
2) *Down Payment:* down payment of houses sales is 10% of the total sale.
3) *Interest Rate:* to be used will be 19% p.a.
4) *Time (n):* Form the survey conducted the time given by the banks to repay the mortgage is 15years (180months) or 20years (240months). For the purpose of this research 20years time will be used.
5) *Monthly Payment (M):* Monthly payment formula $$M = P\frac{r(1+r)^n}{(1+r)^n - 1}$$
6) *Qualify Income (Q):* $$Q = \frac{Monthlypayment}{30\%}$$
7) *Median Family Income:* from the government employees salary scale.
8) *Affordability Index (HAI)* $$HAI = \frac{\text{Median family income}}{Qualifyincome} X100\%$$

Table4: Monthly Payment and Qualifying income.

Room Type	Selling price (Tsh)	Downpayment (Tsh)	Principal amount (Tsh)	Monthly Payment (Tsh)	Qualify income (Tsh)
2bedroom	42,442,299.00	4,244,229.90	38,198,069.10	625,017.59	2,083,391.98
3bedroom	50,515,941.60	5,051,594.16	45,464,347.44	743,912.39	2,479,707.98

The table 4 shows the calculations done to determine down payment (10% of the total sales) Monthly payment and qualifying income.From table 5 the results of the study revealed that a 2bedrommed house valued at a median price of Tsh 42,442,299 has a HAI index value less than 100 for household with mid income belowTsh 1,962,500. This means that the household has less income to qualify for mortgage town the house. Household with mid income value of between Tsh 2,107,500 and Tsh 2,252,500 has HAI

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index value of about 100. This means that the household income within this range has exactly enough to qualify for mortgage. The household with mid income above Tsh 2,397,500 has HAI index value above 100 signifying that this household has more income to qualify for the mortgage for the 2bedroomed house.

From table 5 the results of the study revealed that a 3bedrommed house valued at a median price of Tsh 50,515,941.60 has a HAI index value less than 100 for household with mid income below

Tsh 2,397,500. This means that the household has less income to qualify for mortgage town the house. Household with mid income value of between Tsh 2,542,500 and Tsh 2,687,500 has HAI index value of about 100. This means that the household income within this range has exactly enough to qualify for mortgage. The household with mid income above Tsh 2,832,500 has HAI index value above 100 signifying that this household has more income to qualify for the mortgage for the 3bedroomed house.

Regression analysis was conducted to reveal whether there is any relationship between the Income and the affordability index. The regression model was the one below

$$Y=\beta_0 + \beta_1 X_1 + \mu$$

Where Y, the dependent variable is affordability index (HAI) and X1 is the independent variable the family median income β is the regression coefficient, β0 is the intercept the value of Y when X values are zero.

From the two tables 6 and 7 we can see there is correlation coefficient (Multiple R) is 1 which indicates that there is a strong perfect relationship between the affordability index (HAI) and the median monthly income. There is significant relationship between the affordability index (HAI) and median monthly income since p<0.0001. 2bedroom house the coefficient or parameter relating to median monthly income is 4.8 E5 this implies that an increase of median monthly income by 1 leads to increase of Affordability index (HAI) by 4.8 E5, Likewise for the between the 3bedrooms there is significant relationship and median annual income since p<0.0001. Since the coefficient or parameter relating to median monthly income is 4.0 E5 this implies that an increase of median monthly income by 1 leads to increase in affordability index (HAI) by 4.0 E5.

Table 5: Housing Affordability index (HAI) calculation

Income (Take home)	Mid Income	2bedroom HAI index	Results interpretation	3bedroom HAI index	Results interpretation
150,000-294,999	222,500	10.68	*Less Income to qualify*	8.97	*Less Income to qualify*
295,000 -439,999	367,500	17.64		14.82	
440,000 -584,999	512,500	24.60		20.67	
585,000 -729,999	657,500	31.56		26.52	
730,000 -874,999	802,500	38.52		32.36	
875,000 -1,019,999	947,500	45.48		38.21	
1,020,000 -1,164,999	1,092,500	52.44		44.06	
1,165,000 - 1,309,999	1,237,500	59.40		49.91	
1,310,000 - 1,454,999	1,382,500	66.36		55.75	
1,455,000 -1,599,999	1,527,500	73.32		61.60	
1,600,000 - 1,744,999	1,672,500	80.28		67.45	
1,745,000 - 1,889,999	1,817,500	87.24		73.29	
1,890,000 - 2,034,999	1,962,500	94.20		79.14	
2,035,000 - 2,179,999	2,107,500	101.16	*Exactly enough Income to qualify*	84.99	
2,180,000 - 2,324,999	2,252,500	108.12		90.84	
2,325,000 - 2,469,999	2,397,500	115.08	*More Income*	96.68	
2,470,000 - 2,614,999	2,542,500	122.04		102.53	*Exactly enough Income to qualify*
2,615,000 - 2,759,999	2,687,500	129.00		108.38	
2,760,000 - 2,904,999	2,832,500	135.96		114.23	*More Income*
2,905,000 - 3,049,999	2,977,500	142.92		120.07	
3,050,000 - 3,194,999	3,122,500	149.88		125.92	
3,195,000 - 3,339,999	3,267,500	156.84		131.77	
3,340,000- 3,484,999	3,412,500	163.80		137.62	
3,485,000 - 3,629,999	3,557,500	170.76		143.46	

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3,630,000 - 3,774,999	3,702,500	177.71	*to qualify*	149.31	*to qualify*
3,775,000 - 3,919,999	3,847,500	184.67		155.16	
3,920,000 - 4,064,999	3,992,500	191.63		161.01	
4,065,000 - 4,209,999	4,137,500	198.59		166.85	
4,210,000 - 4,354,999	4,282,500	205.55		172.70	

Table 6: Regression analysis results HAI of 2bedroom house

Regression Statistics	
Multiple R	1
R Square	1
Adjusted R Square	1
Standard Error	2.03E-14
Observations	30

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	108866.4	108866.4	2.6E+32	0
Residual	28	1.2E-26	4.1E-28		
Total	29	108866.4			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	5.7E-14	7.8E-15	7.3	6.4E-08	4.1E-14	7.3E-14	4.1E-14	7.3E-14
median annual income	4.8E-05	3.0E-21	1.6E+16	0	4.8E-05	4.8E-05	4.8E-05	4.8E-05

Table 7: Regression analysis results HAI 3bedroom

Regression Statistics	
Multiple R	1
R Square	1
Adjusted R Square	1
Standard Error	8.61E-15
Observations	30

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	76848.4	76848.4	1.0E+33	0
Residual	28	2.1E-27	7.4E-29		
Total	29	76848.4			

	Coefficients	*Standard*	*t Stat*	*P-value*	*Lower*	*Upper*	*Lower*	*Upper*

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		Error			*95%*	*95%*	*95.0%*	*95.0%*
Intercept	1.4E-14	3.3E-15	4.3	0.0002	7.4E-15	2.1E-14	7.4E-15	2.09E-14
median annual income	4.0E-05	1.3E-21	3.2E+16	0	4.0E-05	4.0E-05	4.0E-05	4.03E-05

V. CONCLUSIONS

The findings indicate that Housing affordability index (HAI) can be used by the developers in measuring the affordability of the houses to the intended social class. Findings indicated that 2 and 3 bedroom house with a median selling price of Tsh 42,442,299.00 and Tsh 50,515,941.60 respectively using HAI method is only affordable to household with mid income above Tsh 2,397,500 for 2 bedroom and Tsh 2,832,500 for 3bedroom.

VI. RECOMMENDATION

From the findings the paper recommends that the real estate developers first determine the affordability index of the targeted social class of people before investing in construction of the houses. This will greatly enable the developers to develop houses that are within the reach of the targeted social class thereafter helping alleviate problems associated lack of houses; such as unplanned settlement characterized with overcrowding due to high population density, sanitation problems and insecurity of tenure.

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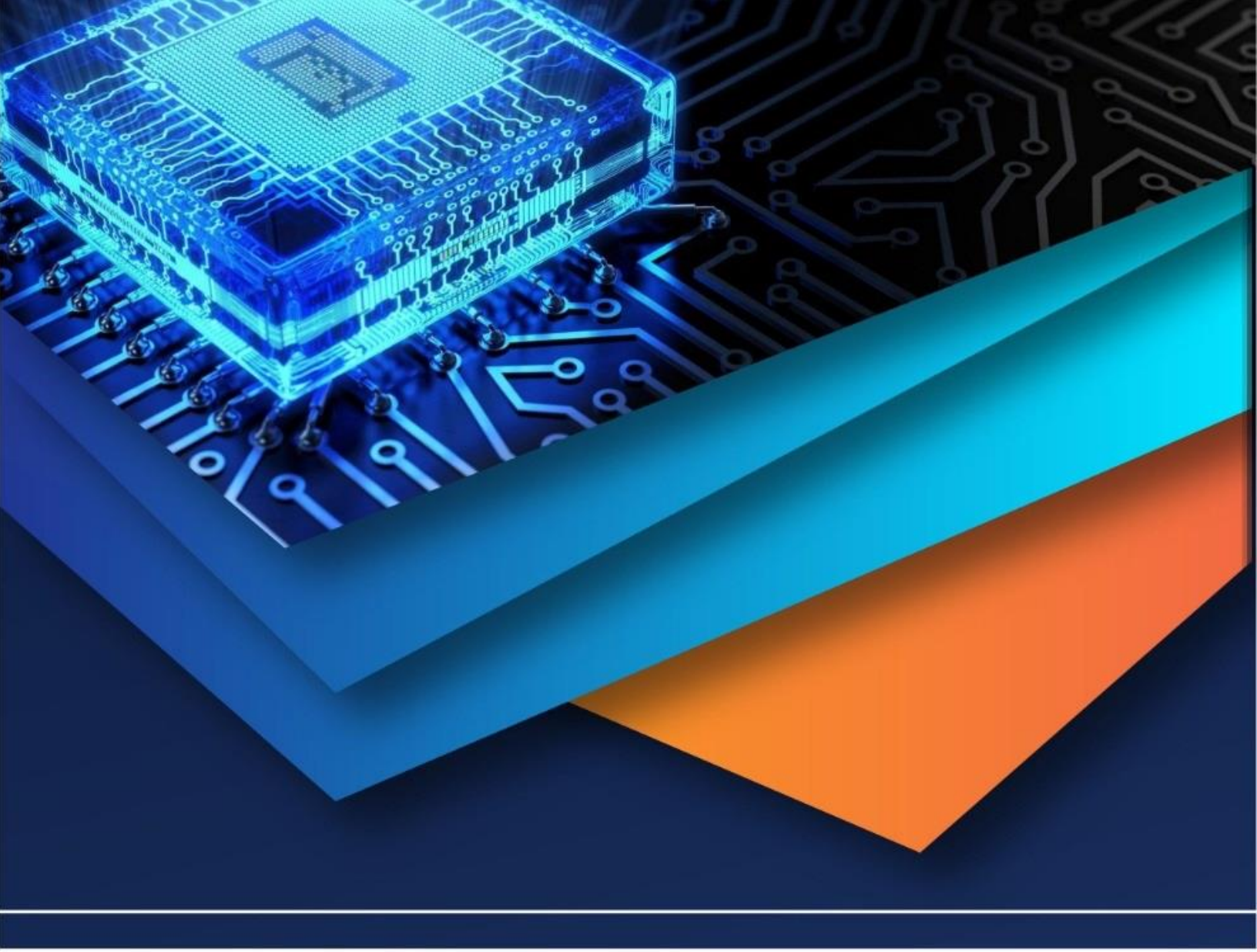

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