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Infrastructure Condition Model as a Measure of Property Investment Performance in Ilorin; The Contemporary Approach

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Abstract: Infrastructure stands out as one of the indicators of an ideal urban economic development and its role creates attraction for all forms of investments including real estate investment. This study examined the infrastructure condition model; which serves as a measure of property investment returns in Ilorin; the Kwara State capital. The study employed an exploratory research design. The sample frame was 1,228 and a model was used given 984 as sample size, and these questionnaires were administered through stratified sampling technique and only 664 questionnaires were completed and returned, representing 67% of the total sample size. The study utilised both descriptive and inferential statistical methods of data analysis. The result of descriptive analysis of the performance of property investment revealed that a comparable average return across the study areas in Ilorin differed; ranging from 10% to 25%. The result of the infrastructure condition index developed through the scoring analysis based on descriptive modelling revealed a relative condition index of between 60% and 61% in Ilorin. The result of an inferential method using correlation to establish the relationship between infrastructure condition index and property investment return revealed that 7(seven) infrastructure maintained perfect significant correlation with property investment performance at p-value less than 0.05 level of significance. The result of regression modelling revealed that 60.4% variation in property performance is explained by seven infrastructures. Therefore, the study concluded that the performance of property investment is impressive in the areas where there is a frequent market transaction with better infrastructure conditions which is strongly influenced by constant potable water with a correct system of road networks, security, drainage system and streetlight. The study recommends that real estate investors wishing to embark on real estate investment projects should make it a point of duty to be conversant with the functionality of infrastructure in human sustainability and real estate investment growth.

Keywords: Infrastructure, Investment performance, Neighbourhood, Property investment, Property Market, Returns.

I. Introduction

Neighbourhood infrastructure is one among the markers of urban economic performance and acts as the basis for profit or returns on real estate investment. It is essential for maintaining a conducive climate for economic development and its lack is a significant impediment in any sustainable urban and real estate development [1]. The urban neighbourhood is typically characterised by technical structures such as roads, bridges, water supply, sewers, drainages, electrical grids and system communications [2]. All these are broader categorisation of infrastructure which will also comprise physical components of interconnected networks that

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provide commodities and services necessary for society's survival [3], [4].

According to [5] as supported by [6], infrastructure is a catch-all phrase for a variety of activities known as social overhead capital. It includes two types of services: social infrastructure and economic infrastructure. Infrastructure therefore can be defined as basic frameworks, facilities and installations that help the government or community to run their affairs effectively and create a conducive atmosphere for people to operate. In some locations, some infrastructure such as good road network, electricity, water supply, drainage system, waste management and recreational facilities have been identified to have a huge effect on rental values [7, 8, 9].

According to [10] property markets supported by adequate infrastructure provision indicate an important interface with economic activity and strength of the financial markets of the country. Around the world, majority of the financial institutions depend on property assets for up to 45% of their operations, therefore, crucial adjustment in the property markets can have a great impact on property market performance which can in turn have effect on the economy.

From the above, it has become apparent that the relationship between infrastructure and property investment can be measured from the dimensions of availability and condition. These dimensions underscore most studies relating to infrastructure and property investment market; thus some found the relationship negative [9], while others positive [11, 12, 13]. The measurement of these two variables (infrastructure and property investment) can also be selective based on the indices available that can be measured, for instance, infrastructure and performance (returns) on property investment [12] and [14]. Thus, the problem statement of the study is that there are presently no available developed infrastructure condition indices upon which the performance of residential property investment return can be measured or estimated. Therefore, property investment returns cannot be regarded as being sustainable as long as there is this inherent problem [7], [15]. However, it is on this note that this study develops infrastructure conditions indices (ICI) upon which valid performance of property investment returns option can be considerably measured or estimated.

On the general note, there is a link between real estate investment and neighbourhood infrastructure according to several studies carried by different authors. [16] maintained that infrastructure is critical for individuals to achieve adequate housing and good quality of life, particularly in the construction of low-cost housing and thus, urban infrastructure should be divided into basic infrastructure components (BIC) and supportive infrastructure components (SIC). Basic infrastructure components are critical infrastructure components that are regarded as a necessity for people's basic survival, health, safety, and security. Supportive infrastructure refers to all services that are regarded as beneficial to people's lives but are not required for their basic well-being. One or more of the following service facilities make up supportive infrastructure: parks and green areas, schools, health centres, worship areas, public markets, and public service buildings [5].

Between 2003 and 2011, [7] investigated the impact of infrastructure on property returns in Lagos' Unity Estate. The study used a descriptive analytical method to identify water supply, power, and a road as essential

infrastructure for the estate. The effect of infrastructure facilities on property investment in Akure was studied by [14] in which data was gathered from 189 residential properties and then put through multiple regression analysis. The results revealed that infrastructure amenities such as water, power, drainage, access road, burglary proof, wall-fence, street light, and security were considerably improved by installing burglary proof, wall-fence, street light, and security contributed to about 30.5% variation in property investment returns.

In Meru County Council in Kenya, [13] investigated the impact of infrastructure development on real estate investment returns. The results of regression analysis on data collected from 955 real estate properties demonstrated that transportation and communication elements, social amenities, industrial development, educational institutions, and commercial development account for 89.3% variation in property investment. The study indicates that, among other things, infrastructure development has a significant impact on real estate investment returns. As a result, infrastructure developments will increase demand for real estate residential property which will have effect returns on the real estate property.

Without any iota of doubt, it is clear as a result of the reviewed studies that, there is a palpable link, between neighbourhood infrastructure and property investment performance. The actual missing link in several studies is that the property investment indices were not considerably captured the infrastructure condition index upon which property investment option can be measured or estimated, this is substantiated on the basis of not looking at the dimension of depreciation of infrastructure on time series assumption.

II. Materials and Methods

The study was carried out in Ilorin the capital of Kwara State. Ilorin lies on Latitude $8^0$28'N and Longitude $4^0$33'E in the central region of Nigeria. The property market of Ilorin the study area is said to be growing, encouraging and attractive in the last one and half decades, hence the justification for its selection for the study. The four selected neighbourhoods Adewole Housing Estate, Government Reservation Area (GRA), Fate-Tanke and Sabo-Oke are residential and three of them are characterised as low density, medium density and high-density areas while the fourth one shares the characteristics of medium and high density as depicted in Figure 1 below.

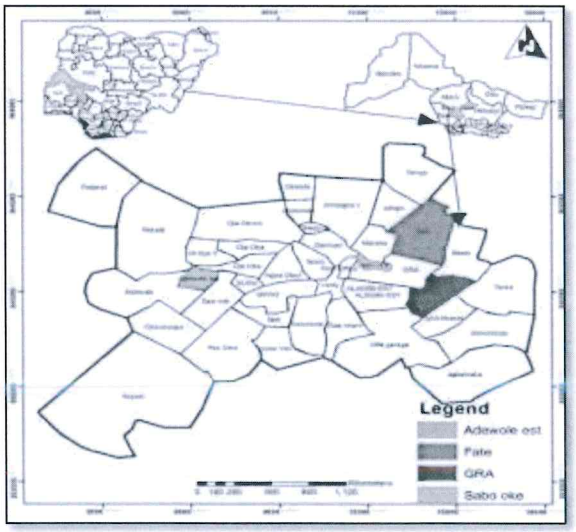


Figure 1: Selected Areas within Ilorin metropolis
Source: Kwara State Town Planning and Development Authority

The exploratory research design was adopted especially on income generating investment properties which represent the sampled population in selected neighbourhoods of Ilorin metropolis. The total number of rental investment properties (RIPs) was generated through the household residents of the

neighbourhoods and this was professionally supported and backed up by the available records of neighbourhood rental evidences (NREs) of the property under the management portfolio of the practising Estate Surveyors and Valuers firms within the selected areas of Adewole Housing Estate, GRA, Fate and Sabo-Oke.

Google Earth Pro and ground truthing/physical enumeration were adopted to give room for accuracy and adequacy. The total sample frame generated was 1,228 using [17] model as adopted by [18], and were summed up to be 984 as sample size while only 664 was returned and used for the analysis. The sample size for each residential sub-market in Ilorin was quantitatively determined using the model for sample size determination as follows:

$$n = \frac{Z^2pqN}{e^2(N-1) + Z^2pq} \quad (1)$$

where:

n = sample size to be arrived at after applying formula

N = population size

p = 95% confidence level of the target population

q = 1- p

e = Acceptable error

Z = 1.96 (Z – Value or score at 95% confidence level)

The sample sizes are presented in Table 1.

Based on the total sample size of 1,228 shown in Table 1, a total of 984 was arrived at as sample size using fitted model, and the same number of questionnaires were administered accordingly to collect the required data/information on the availability and actual condition of the existing infrastructure in the selected neighbourhoods of Ilorin metropolis and only 664 questionnaires were correctly completed and returned for analysis. The adopted techniques for data analysis were both descriptive and inferential statistical techniques. First, descriptive statistic was used to generate the infrastructure condition index for each of the selected neighbourhoods. Secondly, inferential statistical analysis technique (multiple regression analysis) was used to develop a model suitable for predicting property investment performance in selected neighbourhoods of Ilorin. In this model, property investment total return is dependent or explained variable while infrastructure (water supply, electricity supply, drainage, roads, waste disposal system, security infrastructure, recreational facilities, street lighting, educational facilities and health facilities) are the independent variables or predictors..

Variables definition and model

The regression model for the study is described below:

$$R = \alpha + \beta WTS + \beta ELEC + \beta DRN + \beta RD + \beta WDIS + \beta SECT + \beta REC + \beta STRLG + \beta EDU + \beta HELH + e. \quad (2)$$

where:

R = Returns

WTS = Water Supply index,

ELEC = Electricity,

DRN = Drainage,

RD = Road,

WDIS = Waste disposal,

SECT = Security Infrastructure,

REC = Recreational,

STRL = Streetlight,

EDU = Education Facilities,

HELH = Health Infrastructure,

α = Intercept

ε = error term

Table 1: Determined Sample Size and Questionnaire Distribution

Location	Neighbourhood	Population	Sample Size Administered	Number Returned
Ilorin	GRA	303	240	151
	Adewole H/E	241	235	159
	Sabo-Oke	339	252	187
	Fate	345	257	167
	Total	**1,228**	**984**	**664**

Table 2: Data Description and Measurement for Model Formulation

Variables	Description	Scale
Total return Index (TRI)	Rate (%)	Ratio
Water supply	Measured based on basis regularity: ranging from no supply-0, regular supply to not regular supply. minimum score-3, maximum score-10	Ratio
Electricity supply	Measured based on number of hour. No supply-0, 1-6hrs, 1-12hrs, 1-18hrs and 12hrs, ranging from minimum score-6 to maximum score-24	Ratio
Drainage condition	Measured based on condition: range from no drainage-0, covered to uncovered. Range from Minimum score (not covered)-3 to maximum (covered)-10	Ratio
Road condition	Measured based on condition: range from un-tarred to tarred road. Range from Minimum score -3 to maximum score-10	Ratio
Waste disposal	Measured based of quality of disposal dump. Range from unapproved open dump-0, approved open dump to approved waste bin, minimum score- 3, maximum-10	Ratio
Security condition	Measured based on types of security. Ranging from No security-0, community security to Police patrol, , minimum score -5 and maximum score-10	Ratio
Recreation facility condition	Measured based on availability and functionality. Ranging from not available-0, available but not functional, to available and functional. Minimum score – 0 (not available,) available not functional-3 to maximum score -10 functional	Ratio
Streetlight condition	Measured based on availability and functionality. Ranging not available-0, available but functional, available and functional. Minimum-3 and maximum score-10	Ratio
Education facility condition	Measured based on availability and standard. Not available-0, available but no good structural and computer aided facility, good structure, aided computer facility and quality teaching and welfare. Ranging from minimum score -3 to maximum score -15	Ratio
Health infrastructure	Measured based on standard. Ranging from not available-0, available but no drugs. Drugs but no facility in theatre room, available drug, theatre and qualified personnel. Minimum score-3 maximum score 15	Ratio

Source: Authors' construct, 2021

III. Results and Discussion

In the context of trends in performance (returns) on property investment for this study, only 2-bedroom and 3-bedroom properties were considered in terms of rent and sales

The result of trends analysis of 2-bedroom and 3-bedroom property returns presented in Table 3 revealed that GRA maintained double digit over certain period indicating a better performance on the basis of average. But on the analysis of risk content using standard deviation

and coefficient of variation, GRA property market appeared more risky than other market locations, Adewole Housing Estate is considered better property market, because investor is taking a slightest risk at comparable average return, while Sabo-Oke and Fate are said to be considerable property market for 2-bedroom more than 3-bedroom.

A. Infrastructure Condition Index (Ici) Consruct

In analysing infrastructure conditions, collected data were measured on a 5-point Likert Scale, also reliability assessment was conducted in order to ascertain the extent of dependability of the data amount items by the use of Cronbach Alpha (α) technique. The result showed a minimum acceptable coefficient of .075 (75%) and all the items in the study area maintained internal consistency at reliable percentage in Adewole Housing Estate, GRA, Fate and Sabo-Oke respectively. In determining the Benchmark for the development of ICI, a hypothesis mean was estimated as (5 + 4 + 3 + 2 + 1)/5 = 3.00. This is in line with [19]. For easy interpretation of ICI, 3.00 was further converted to a percentage by dividing the highest number on the scale as thus; 3/5 0.6 (60%). This means that, ICI above 60% indicates a better infrastructure condition while anyone below the benchmark indicates poor condition.

In line with Table 4, the average mean condition index (benchmark) at 0.6 (3/5) for five-point Likert Scale is used to determine the infrastructure condition index. In GRA, it ranges between 0.77 – 0.88, in Sabo-Oke 0.59 – 0.64, in Fate ICI ranges between 0.63 – 81 and in Adewole Housing Estate ICI ranges between 0.67 – 0,82. The implication of this is that, the infrastructure condition of GRA and Adewole Housing Estate are better than Fate and Fate is better than Sabo-Oke.

B. Link Between Infrastructure Condition Index (Ici) and Property Investment Performance (Pip)

The result of the strength of the relationship between infrastructure condition index and property performance index is presented in Table 5. There is a strong positive significant relationship between water, access road and neighbourhood security and property returns across the study areas in Ilorin. Electricity is positively and strongly correlated with property returns in GRA and Adewole Housing Estate. The drainage system maintained a strong correlation with property return in Adewole Housing Estate, Sabo-Oke and Fate.

Waste disposal is strongly correlated with property return in Adewole Housing Estate. Recreational facilities only maintained strong correlation with property return, while education and health facilities failed to maintain a significant relationships with property returns across the study areas. Street light maintained a strong correlation with property return in GRA. This indicates that these aforementioned infrastructure variables are likely to cause positive significant change in return on property investment cross the selected neighbourhoods, they are therefore positively and strongly correlated with property investment performance in the study areas of Ilorin

Following the outcome of the analysis presented in Table 6, Ilorin presents ICI aggregate, ranging from 0.59 to 0.67 condition indices. Further, extracts were made from the ICI in Table 2. The output in Table 7 revealed fairly-better infrastructure conditions for Ilorin, comparatively, some of the 10 infrastructure items assessed across selected neighbourhoods

turn out to be in fair, good and very good condition

Table 3: Combined Average Rate of Returns of 2-Bedroom and 3-Bedroom Property Investment in Ilorin

Year	GRA	Adewole Housing Estate	Sabo-Oke	Fate
2009	13.04	6.80	7.98	6.67
2010	10.62	7.07	7.53	6.79
2011	9.39	6.62	7.19	5.29
2012	11.81	7.96	7.66	8.89
2013	11.29	7.24	6.72	6.89
2014	11.50	6.75	7.19	5.75
2015	15.23	3.58	2.79	5.47
2016	19.15	3.49	5.00	3.11
2017	9.12	9.49	8.61	4.90
2018	8.31	8.23	20.21	6.88
Average Rate of return	9.95	6.72	8.09	6.07
Standard deviation	2.22	1.89	4.57	1.54
Coefficient of variation	0.22	0.28	0.57	0.25

Source: Authors' analysis, 2021

Table 4: Infrastructure Condition Index (ICI) in Ilorin

Infrastructure	GRA (Alpha-α @0.80)				Adewole Housing Estate (Alpha-α @0.76)				Sabo Oke (Alpha-α @0.85)				Fate (Alpha-α @0.88)			
	N	Sum	Mean	ICI	N	Sum	Mean	ICI	N	Sum	Mean	ICI	N	Sum	Mean	ICI
Water supply	153	651	4.25	0.85	163	480	2.94	0.59	189	700	3.70	0.74	159	584	3.67	0.73
Electricity	153	643	4.20	0.84	163	530	3.25	0.65	189	677	3.58	0.72	159	530	3.33	0.67
Access Road	153	591	3.86	0.77	163	498	3.06	0.61	189	750	3.97	0.79	159	556	3.50	0.70
Security Infrastructure	153	655	4.28	0.86	163	542	3.33	0.67	189	690	3.65	0.73	159	656	4.12	0.82
Drainage System	153	684	4.47	0.89	163	503	3.09	0.62	189	597	3.16	0.63	159	621	3.91	0.78
Waste Disposal	153	652	4.26	0.85	163	504	3.09	0.62	189	673	3.56	0.71	159	593	3.73	0.67
Recreation Facilities	153	596	3.90	0.78	163	499	3.06	0.61	189	618	3.27	0.65	159	585	3.68	0.74
Education Infrastructure	153	649	4.24	0.85	163	524	3.21	0.64	189	658	3.48	0.69	159	574	3.61	0.72
Health Infrastructure	153	646	4.22	0.84	163	499	3.06	0.61	189	677	3.58	0.72	159	642	4.04	0.81
Street Light	153	650	4.25	0.85	163	519	3.18	0.64	189	766	4.05	0.81	159	596	3.74	0.75
Valid N (list-wise)	153				163				189				159			

Source: Authors' analysis, 2021

Table 5: Correlation between ICI and PIP in Ilorin

Infrastructure	GRA ®	N	Adewole Housing Estate ®	N	Sabo-Oke ®	N	Fate ®	N
Water supply	.71(.002)	153	.59(.042)	198	.71(.003)	163	.65(.001)	159
Electricity	.57(.041)	153	.55(.044)	198	.44(.055)	151	.42(.239)	159
Access Road	.65(.032)	153	.61(.022)	198	.63(.014)	151	.56(.035)	159
Neighborhood Security	.55(.044)	153	.72(.001)	198	.70(.002)	151	.78(.000)	159
Drainage System	.311(.522)	153	.50(.045)	198	.51(.045)	151	.60(.011)	159
Waste Disposal	.35(.255)	153	.49(.053)	198	.36(.244)	151	.22(.541)	159
Recreational Facilities	.31(.414)	153	.38(.122)	198	.24(.563)	151	.51(.044)	159
Educational Infrastructure	.41(.258)	153	.42(.132)	198	.33(.547)	151	.31(.462)	159
Health Infrastructure	.21(.422)	153	.44(.113)	198	.22(.643)	151	.222(.531)	159
Street Ligq8ht	.52(.046)	153	.62(.017)	198	.21(.527)	151	.129(.621)	159

Source: Authors' analysis, 2021

Table 6: Aggregate infrastructure condition index (ICI) in the study areas

Infrastructure	GRA				Adewole H/E				Sabo-Oke				Fate			
	N	Sum	Mean	ICI	N	Sum	Mean	ICI	N	Sum	Mean	ICI	N	Sum	Mean	ICI
Water supply	10	140	14.0	0.81	10	122	12.2	0.78	10	145	14.5	0.59	10	152	15.2	0.64
Electricity	10	135	13.5	0.62	10	160	16.0	0.73	10	125	12.5	0.65	10	147	14.7	0.61
Access Road	10	120	12.0	0.70	10	157	15.7	0.98	10	110	11.0	0.61	10	125	12.4	0.65
Security	10	105	10.5	0.74	10	140	14.0	0.88	10	140	14.0	0.67	10	145	14.5	0.59
Drainage System	10	150	15.0	0.70	10	129	12.9	0.84	10	170	17.0	0.62	10	140	14.0	0.71
Waste Disposal	10	130	13.0	0.71	10	100	10.0	0.74	10	155	15.5	0.62	10	147	14.7	0.61
Recreation Facilities	10	167	16.7	0.70	10	171	17.1	0.94	10	147	14.7	0.61	10	110	11.0	0.61
Education	10	152	15.2	0.75	10	158	15.8	0.76	10	155	15.5	0.64	10	170	17.0	0.62
Health	10	140	14.0	0.71	10	132	13.2	0.74	10	100	10.0	0.61	10	135	13.5	0.62
Street Light	10	125	12.5	0.72	10	140	14.0	0.81	10	152	15.2	0.64	10	120	12.0	0.70
Valid N (list-wise)	10				10				10				10			

Source: Authors' analysis, 2021

Table 7: Determination of Infrastructure Conditions across the Selected Areas

Infrastructure	GRA		Adewole H/E		Sabo-Oke		Fate	
	ICI	Remark	ICI	Remark	ICI	Remark	ICI	Remark
Water supply	0.60	Very Good	0.62	Good	0.59	0.59	0.64	Good
Electricity (power)	0.65	Fair	0.60	Fair	0.65	0.65	0.61	Fair
Access Road	0.64	Good	0.65	Very Good	0.61	0.61	0.65	Good
Security	0.60	Fair	0.65	Good	0.60	0.60	0.59	Fair
Drainage System	0.60	Fair	0.60	Good	0.62	0.62	0.71	Good
Waste Disposal	0.58	Fair	0.64	Fair	0.62	0.62	0.61	Fair
Recreation Facilities	0.60	Fair	0.62	Very Good	0.61	0.61	0.61	Fair
Education	0.61	Good	0.67	VeryGood	0.64	0.64	0.62	Good
Health	0.59	Fair	0.65	Fair	0.61	0.61	0.62	Fair
Street Light	0.60	Fair	0.60	Good	0.64	0.64	0.70	Good

Source: Authors' analysis, 2021

Table 8: Regression estimates of infrastructure index and property returns in Ilorin

Model	Unstandardised Coefficients		Standardised Coefficients	T	Sig.	Collinearity Statistics		R^2
						Tolerance	VIF	
	β	Std. Error	Beta					
(Constant)	15.583	1.157		13.472	.000			60,4
Water Supply	.311	.105	.262	2.969	.003	.522	1.917	
Electricity	.332	.095	.401	3.489	.001	.285	3.510	
Access Road	.533	.124	.468	4.308	.000	.312	3.200	
Security Infrastructure	.206	.095	.153	2.173	.031	.748	1.338	
Drainage System	.422	.092	.350	4.579	.000	.642	1.558	
Waste Disposal	.127	.092	.104	1.385	.168	.661	1.512	
Recreation Facilities	.106	.075	.112	1.415	.159	.620	1.613	
Education Infrastructure	.375	.102	.395	3.686	.000	.336	2.976	
Health Infrastructure	.162	.091	.123	1.789	.075	.783	1.277	
Street Light	.327	.090	.341	3.649	.000	.443	2.257	
Dependent Variable: Aggregated Return								

Source: Authors' analysis, 2021

C. The Impact of Infrastructure Conditions On Property Investment Returns

The study employed multiple sales and letting approach for regression analysis as shown in Table 8. The result revealed that 60.4% variation in property returns index can be significantly explained by seven infrastructures (that is, water supply, electricity, access road, security infrastructure, drainage system, education infrastructure and street light). These facilities were found to have a statistically significant influence on property investment performance in Ilorin. This connotes that, 1% change in the variables listed (infrastructure in question) will correspondingly cause 0.311%, 0.332%, 0.533%, 0.206%, 0.422%, 0.375% and 0.327% change in the returns respectively, such that, any significant change and improvement in all the infrastructure listed will cause significant change in property investment returns. The result of variance inflation factor (VIF) revealed that the data were non-spurious since the value of VIF is within the acceptable limit. The regression model is fit for the purpose of prediction since f-statistics (8.150) is statistically

significant at p-value of (0.000) less than 0.05 level of precision, therefore the model can be adopted for the prediction in Ilorin property market.

$$Y = 15.583 + .311WTS + .332ELEC + .533RD + .206SECT + .422DRN + .127WDIS + .106REC + .375EDU + .162HELH + .327STRL + e$$

IV. Conclusion

The study in its context has assessed the impact of infrastructure conditions on property investment performance in Ilorin. This was achieved by formulating infrastructure condition indices (ICI) from 10 neighbourhood infrastructure; which are water supply, electricity, access road, security infrastructure, drainage system, recreational facilities, education infrastructure, street light, waste disposal and health infrastructure.

This is to be able to determine the impact of these facilities on property investment performance appropriately. The study has attested that the property market in Sabo-Oke and Fate in Ilorin with fair and good condition of infrastructure are more stable, profitable and less risky than areas GRA and Adewole Housing Estate. The infrastructure conditions in Ilorin are fairly good and have effect on property market performance in terms of rate of returns.

The implication is that real estate sector contributes to the economic development of a state vis-à-vis the nation, through property market efficiency. Therefore, being one of the prominent determinants of property market viability, infrastructure is expected to be maintained in a functional condition that will better the values of property investment and in-turn enhance the performance of property investment returns. This will provide better property rates and taxes to generate adequate revenue to maintain and expand infrastructure provision in Ilorin. It is therefore recommended that, neighbourhood infrastructure should be appropriately considered before real estate investment is embarked upon and also, professional real estate investment analysts should be duly consulted for workable professional advice on the property investment projects.

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