

Assessment of Spatial Distribution Pattern of Restaurants in Port Harcourt Metropolis, Rivers State, Nigeria

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ABSTRACT

Founding restaurants in the developing country has contributed a lot to the economic development. The geography of restaurants despite its significant economic roles is not really studied in-depth. As a result, the present study examined the spatial pattern of restaurants in Port Harcourt Metropolis, Rivers State, Nigeria. Global positioning system was used to capture the locational data of each restaurant to generate the spatial distribution and pattern was generated by nearest neighbour analysis. Both descriptive were used for the data analysis. The distribution pattern was found to be significantly clustered ($Z = -8.2542$, $p = 0.0000$). The study concluded that restaurants in Port Harcourt City are not distributed randomly. It is therefore recommended that areas within the Port Harcourt Metropolis that are lagging behind with respect to the establishment of restaurants should be investigated in order to understand the reasons why such places do not have or have a few ones; in addition, the peri-urban places should be developed with the establishment of the restaurants and that government should provide a level ground for more restaurant to be cited within the study area to promote the economic development in the communities, Local Government Areas and the entire Rivers State.

Keywords: Restaurants, Distribution, Clustered, Nearest Neighbour, Pattern

I. INTRODUCTION

During the last few decades, the developing countries of the world have experienced a phenomenal growth in the size of their urban population resulting from un-interrupted urbanisation, modernisation and expansion of their cities. This has resulted to urban dynamics which has caused changing economic character, nature

and location of residential land, commercial and industrial development (Kleeman, 2018).

Establishing restaurants in the developing country has contributed a lot to the economic development. The restaurants or catering industry has been considered as one of the most important indicators concerning economic development of a city (Zeng et al., 2018); as they provide residents with a variety of food and beverage service (Xi and Luo, 2016). They are very important facilities in each city especially with the accelerating pace of life, people's daily diet more and more depends on restaurants. Restaurants are forms of business which can be drivers of sustainable economic growth (Enthoven and Brouwer, 2019). Therefore, the reasonableness of spatial distribution of restaurants will influence the evaluation of the whole city from citizens and foreign tourists (Enthoven and Brouwer, 2019).

For instance, it was noted also that food and beverage industry in Indonesia grew significantly (Widaningrum et al., 2017) as it is becoming one of the key drivers which includes huge investment in the long term and the highest investment value. It has become one of the favorite industries for many banks in Indonesia in the disbursement of loans in 2016 as it is considered as a promising sector (addition to infrastructure sector) (Arifand and Oeji, 2016). The spatial information has been powerful tools to gain a comprehensive analysis, both to understand the behaviour and for a specific purpose, such as for determining the location (Widaningrum et al., 2017). Johnston (1986) concluded that there are two fundamental questions of geographical research which include the relationships between phenomena in various locations and differences in places in terms of the phenomena present there. Anselin (1999) has formulated various ideas include spatial analysis and social sciences and also

concluded that the development of theoretical and empirical studies in social sciences have been increased the interest in spatial analysis, thus interaction between theory, data analysis, and computation is required. There are many spatial analyses dealing with locational pattern and these include the catchment area i.e. using buffer analysis and Voronoi diagram (Dolega et al., 2016]. Geertman et al. (2004) has used an analytical tool (flow map) and catchment area to relocate the ambulance facilities, so its distribution becomes more optimal. Dolega et al. (2016) produced the concept and estimation of empirical catchment area of a retail store or a shopping center, and serves as well as test model of the network of retail centers on a national scale, with the analysis of spatial interaction between potential customers with a hierarchical network of retail centers to estimate the probability of customers choose store certain and the development of area catchment based on the size of retail centers, the proportion store / main unit (anchor), a trip to the retail center (cost, time, and distance), network street, walking distance. It has not included the qualitative factors that may affect customers in choosing a retail such as the level of cleanliness, safety, or operating hours; necessary comparative approach other than gravity models to model the area with a high level of competition; have not considered the impact of population movements on the model; do not consider external factors that are going on conditions / certain time, for example, is currently developing an online sales. Other spatial analyses have been conducting, as has been done by Murray (2010) who perform location modeling approaches using GIS; Uelmen (2010) analyzed the siting wind turbine based on the parameters water depth, wind speed, distance to the coastline, shipping routes, and urban areas; Abramovich (2012) performed an analysis to determine the location using GIS methods based on maximal distance, travel time, and network analysis, using tools and extensions such as ArcGIS Spatial Analyst and network analyst to determine the location of the fire station; Al-Marwani (2014) performed spatial and

socioeconomic data analysis using GIS to assist understanding of the causal links that can be used to predict the cost of real estate; Cui and Mahoney (2015) integrated Google Map APIs and Internet GIS into an online survey instrument to collect data related to the movement of the spatial reference to use boats to demonstrate how GIS can be used for the Internet survey tool. Explaining the distribution pattern of human restaurant using geospatial tool is not in exemption because of the relevance of the mapping analysis in the recent times. Considering the previous studies, it is realized that very few made use of GIS to compute the spatial distribution of restaurants especially in the developing world. Therefore, the present study focuses at examining the spatial analysis of restaurants in Port Harcourt Metropolis, Rivers State, Nigeria.

II. MATERIALS AND METHODS

The study area is Port Harcourt Metropolis, Rivers State, Nigeria. Port Harcourt comprises Port Harcourt City Council and Obio/Akpor Local Government Area (Figure 1). It is located on latitude $04^{\circ} 48'$ and $05^{\circ} 00'N$ of the Equator and longitude $06^{\circ} 55'$ and $07^{\circ} 10'E$ of the Greenwich Meridian. Port Harcourt Metropolis covers an area of 387.261000 (sq.km). Port Harcourt is the Capital City of Rivers State of Nigeria. The study area has a tropical monsoon climate with mean annual temperature of $28^{\circ}C$ and annual rainfall over 2500mm. The relative humidity is very high with an annual mean of 85%. The relief is generally lowland which has an average of elevation between 20m and 30m above sea level and the geology of the area comprises basically of alluvial sedimentary basin and basement complex. The vegetation found in this area includes raffia palms, thick mangrove forest and light rain forest. The soil is usually sandy or sandy loam underlain by a layer of impervious pan and is always leached due to the heavy rainfall. The study area is well drained with both fresh and salt water. The salt water is caused by the intrusion of sea water inland, thereby making the water slightly salty.

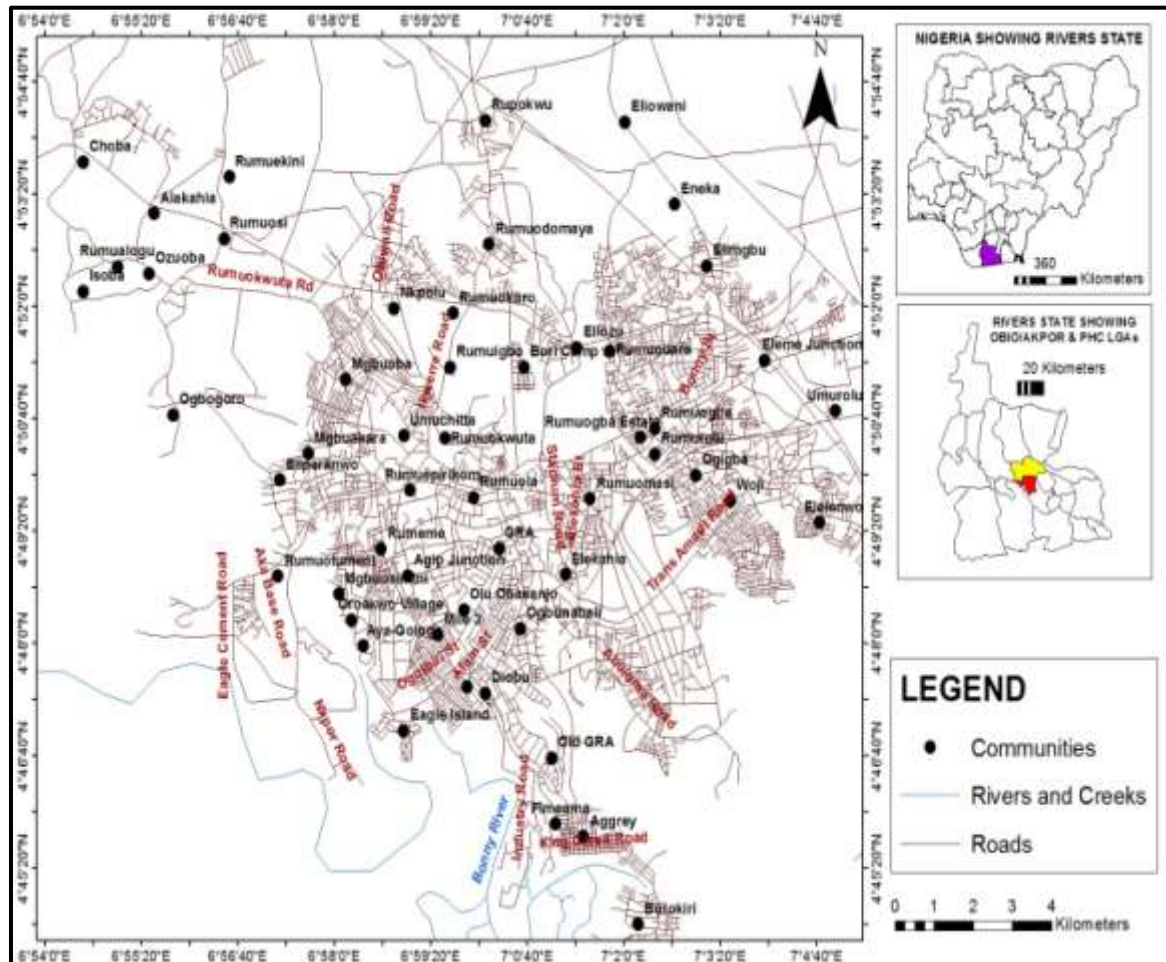


Figure 1: Port Harcourt Metropolis showing Communities

Source: Rivers State Ministry of Regional and Town Planning (2019)

Port Harcourt experiences a tropical humid climate with lengthy and heavy rainy seasons and very short dry seasons. The city is endowed with abundant sunshine and the average temperatures are between 25°C-28°C in the city (Ogbonna et al., 2007). Port Harcourt is dominated by low lying coastal plains, which structurally belongs to the sedimentary formation of the recent Niger Delta, with an elevation less than 15.24m (Oyegun and Adeyemo, 1999). Drainage of the study area is poor because of the presence of many surface water and heavy rainfall between 2000mm and 2400mm (Mmom and Fred-Nwagwu, 2013). However, Bonny River, New Calabar River, creeks and streams drain Port Harcourt Metropolis and all enter into the Atlantic Ocean through estuaries (NDEBUMOG, 2007). The study area is underlain by the Coastal Plain sands having its place from the Pleistocene Formation (Nwakoala and Warmate, 2014). The area is occupied by rainforest, freshwater swamp and mangrove swamp in some cases, which has been drastically modified by

human activities. The vegetation is nourished with high rainfall and high temperature, which provide favourable condition for the growth of a varieties of tall and big trees like mahogany, Obeche, Afara and abundance of oil palm trees and several other species of economically valuable plants such as raffia palms, Abura, ferns and grasses (Eludoyin et al, 2013). The city is a major industrial centre as it has a large number of multinational firms as well as other industrial concerns, particularly business related to the petroleum industry (Hudgens, et al, 2003; Austin, 2010).

The study made use of primary data and secondary data. The primary data were collected mainly through global positioning systems (GPS). The secondary sources of data were taken from the archived information of the list of registered restaurants with their addresses, road and administrative maps of Port Harcourt City and satellite imageries of study area from Google to validate this study. GPS was used to register the coordinates (longitude and latitudes) of the

restaurants within Port Harcourt City. The coordinates were brought into the ArcGIS environment to determine their spatial distribution within the study area. Both descriptive and inferential statistics were used for data analysis. Descriptive statistics involved the use of frequencies and percentages. However, inferential statistics were used to test the hypothesis which states that the spatial distribution of restaurants in the metropolis is random was tested using nearest neighbour analysis.

The nearest neighbour formula is

..... Equ1

$$R_n = \frac{D(\text{Obs})}{0.5 \sqrt{\frac{a}{n}}}$$

Where: R_n = nearest neighbour value
 $D(\text{Obs})$ = Mean Observed nearest neighbour distance
 a = Area under study
 n = Total Number of Points

The nearest neighbour (R_n) provides for clustering result when $R_n = 0-0.8$,
 For random result, when $R_n = 0.8-1$ and for regular result when $R_n = 1-.2.15$

III. RESULTS AND DISCUSSIONS

In total, 51 restaurants were worked with in the entire Port Harcourt Metropolis and they are found in different locations across the study area. The analysis on the distribution pattern is shown in Figure 4.1 and Table 4.5 revealing that the pattern of distribution of restaurant in Port Harcourt was significantly tending towards clustering ($z = -$

8.2542, $p=0.0000$). This showed that the distribution is uneven and skewed towards a particular direction. This could be partly attributed to the kind of people dwelling in a particular time in terms of their purchasing power and interest in that restaurant. Therefore, the null hypothesis stating that the spatial distribution of restaurants in the metropolis is random is hereby accepted and the alternative hypothesis is rejected.

Summarily, the spatial pattern of restaurants in Port Harcourt metropolis tends towards clustering. This is because of the various socio-economic variables such as the kind of people dwelling in a particular place, household sizes and their purchasing power, concentration of restaurants around an imminent and feasible area such as the university communities, the secretariats, the hospitals etc. therefore, the null hypothesis stating that the spatial distribution of restaurants in the metropolis is random is rejected and the alternative hypothesis is accepted. The spatial pattern of restaurants in Port Harcourt Metropolis was clustered and this is attributed to various socio-economic variables like household size and purchasing power of individuals or where the development is imminent or already feasible. This findings is in terms with Austin et al (2005) whereby fast-food restaurants were found to cluster significantly around schools in regions of the city in the highest income domicile, where median annual household incomes were \$43700 or greater. Majority of the visit was weekly and the highest visit is recorded between Saturday and Sunday because of the free time majority have to relax with their families. It is known that the rate of patronage determines the security rate of the restaurants while that the restaurant is contributing largely to the economic growth of the state and 96.3% agreed that the restaurant is strategic enough.

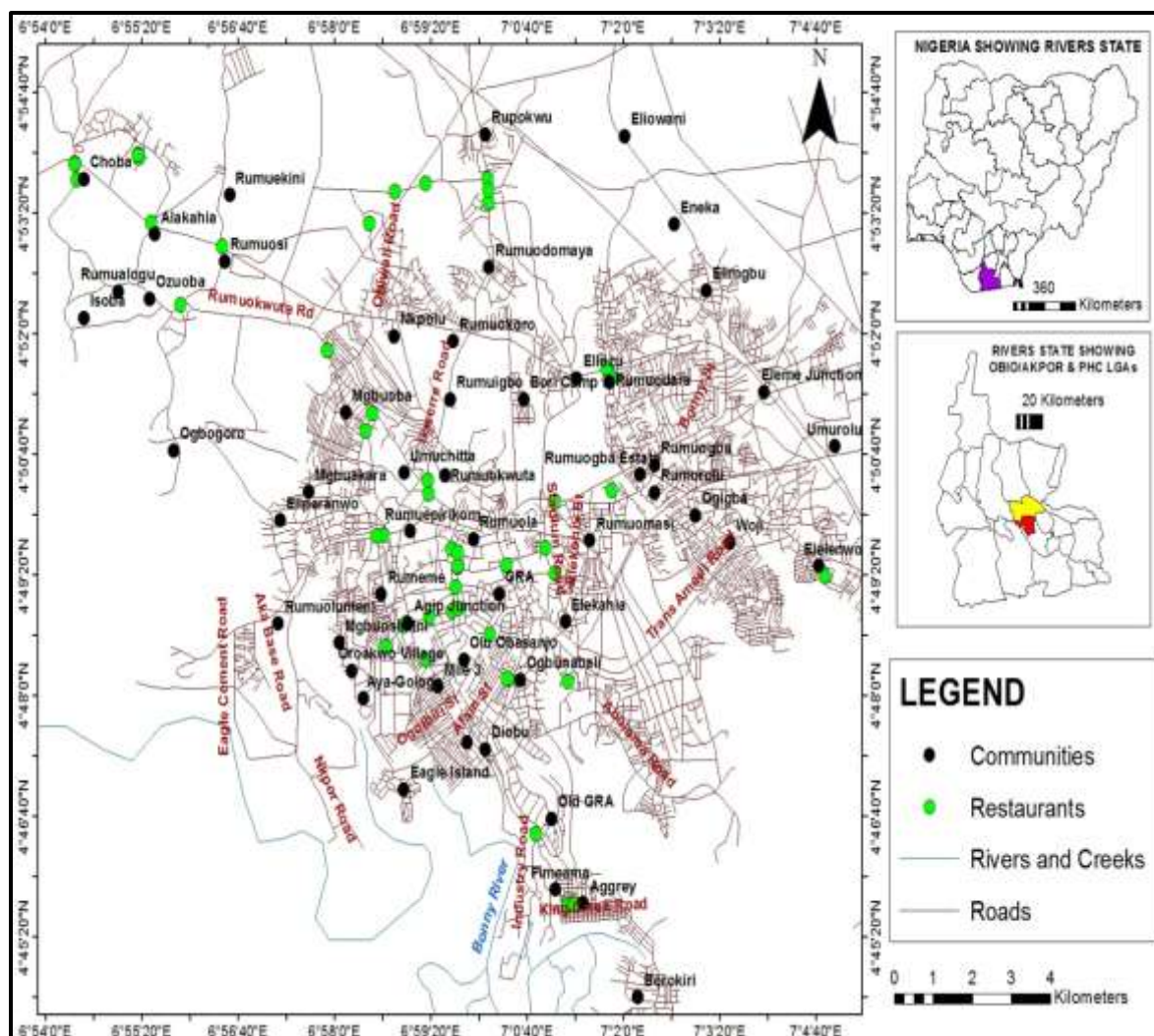


Figure 2: Port Harcourt Metropolis showing the Restaurants and Communities

Table 1: Coordinates of Restaurants of Port Harcourt Metropolis

S/N	Name of Restaurant	Coordinates	Location
1	Accolade	4.82218N, 7.07969E	Stadium Road
2	Big Treat	4.83600N, 7.01740E	Air force junction Aba Road
3	Big Treat	4.89543N, 7.00203E	Rukpokwu
4	Bukka choice	4.80334N, 7.00649E	D/line
5	Casablanca	4.82005N, 6.99451E	Abacha Road by GRA
6	Chicken Republic	4.81618N, 6.99519E	Abacha Road
7	Chicken Republic	4.76171N, 7.02169E	Aggrey Road
8	Country style	4.81449N, 6.98850E	Abacha Road
9	D lounge	4.82647N, 6.99500E	GRA
10	Day spring	4.89984N, 6.92133E	Abuja park
11	Domino pizza place	4.81129N, 7.00241E	OluObasanjo Road
12	Durables	4.80312N, 7.00679E	D/line
13	Evagold	4.89931N, 6.92141E	Abuja park
14	Evergreen	4.81578N, 6.99371E	Abacha Road
15	Final fantasy	4.88734N, 6.92436E	Alakahia
16	Gee's kitchen	4.84895N, 6.97386E	Ada George Road

17	Genesis	4.89526N, 6.90706E	Choba Road ,oppunipark
18	Genesis	4.85214N, 6.97530E	Location Road Junction
19	Genesis	4.83979N, 6.98819E	Rumuokuta junction
20	Genesis	4.82974N, 6.97788E	Iwofe Road
21	Genesis	4.81308N, 6.98252E	Agip Junction
22	Genesis	4.80686N, 6.98755E	UST Junction Ikwerre Road
23	Genesis	4.82402N, 6.99508E	GRA
24	Genesis	4.83800N, 7.03060E	Market junction Aba Road
25	Jadys kitchen	4.89303N, 6.98064E	SARS Road
26	Jenvinik place	4.82389N, 6.99496E	GRA
27	Jovit	4.82730N, 7.01520E	Stadium Road
28	Jovit UPTH Junction	4.88709N, 6.97471E	Alakahia
29	Kilimajaro	4.82422N, 7.00633E	GRA Junction Aba Road
30	Kilimajaro	4.85946N, 7.02993E	Okporo/Rumuudara
31	Kilimajaro	4.89099N, 7.00217E	Rukpokwu
32	Kilimanjaro	4.89829N, 6.90669E	Uniport Junction Choba
33	Kilimanjaro	4.83724N, 6.98834E	Rumuokuta by Rumuola Rd
34	Kilimanjaro	4.81359N, 6.98333E	Agip Junction
35	Mama Abuja Restaurants	4.89996N, 6.92135E	Abuja park
36	Mr Biggs	4.76162N, 7.02207E	Aggrey Road
37	Old Spice	4.88289N, 6.94068E	Rumuosi
38	Pepperoni	4.82958N, 6.97630E	Iwofe Road by Ada George Junction
39	Pepperoni	4.86047N, 7.02941E	Okporo Road, Rumuudara
40	Perpertual taste	4.87224N, 6.93099E	Ozuoba, residual building
41	Revs restaurant	4.86373N, 6.96484E	Opp. NTA Road
42	Sammies	4.89812N, 6.90671E	Uniport Junction Choba
43	Shandees	4.85869N, 7.03060E	Rumuudara
44	Shandees	4.80920N, 6.27829E	Agip Road
45	Skippers	4.82714N, 6.99364E	GRA
46	SPAR PH Mall	4.7747N, 7.01300E	Azikiwe Road
47	The promise	4.76152N, 7.02036E	Aggrey Road
48	The promise	4.82267N, 7.01745E	Stadium Road
49	The promise	4.89343N, 7.00217E	Rukpokwu
50	Toki Restaurant	4.80283N, 7.02051E	Nkpogu Trans Amadi
51	Vincent	4.89450N, 6.98757E	SARS Road

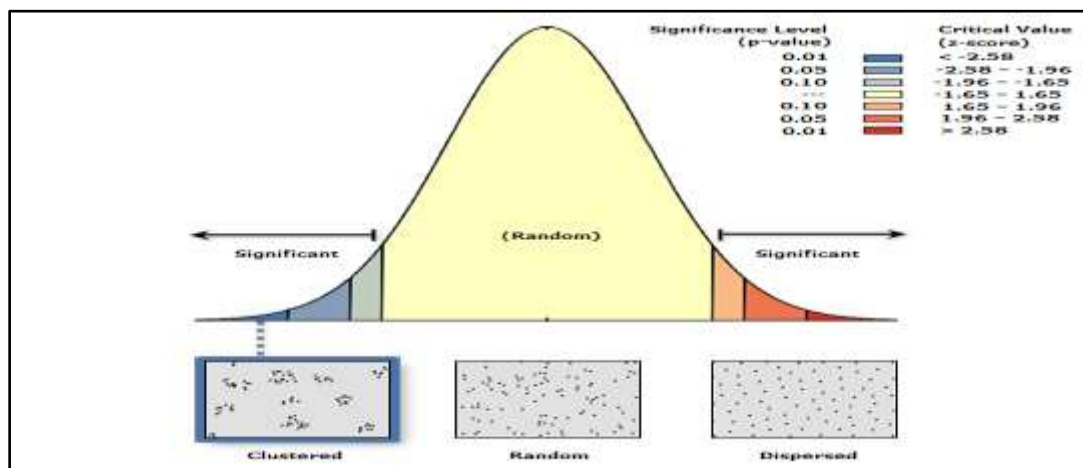


Figure 3: Nearest Neighbour Analysis of Restaurants in Port Harcourt Metropolis Showing that it is tending or skewing towards clustering.

Table 2: Average nearest Neighbor Summary

Summary	Value
Observed Mean Distance:	593.2302 Meters
Expected Mean Distance:	1498.7249 Meters
Nearest Neighbour Ratio:	0.395823*
z-score:	-8.254295
p-value:	0.000000
Input Feature Class:	Coordinates Restaurants.txt Events_1
Distance Method:	Euclidean
Study Area:	458220000.00
Selection Set:	False

IV. CONCLUSION AND RECOMMENDATIONS

It is hereby concluded that the spatial distribution pattern of restaurants in Port Harcourt Metropolis is not random nor dispersed but clustered. It is therefore recommended that areas within the Port Harcourt Metropolis that are lagging behind with respect to the establishment of restaurants should be investigated in order to understand the reasons why such places do not have or have a few ones; in addition, the peri-urban places should be developed with the establishment of the restaurants and that government should provide a level ground for more restaurant to be cited within the study area to promote the economic development in the communities, Local Government Areas and the entire Rivers State.

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