SPATIAL DISTRIBUTION OF HOTELS IN MINNA: A GIS CLOUD MAPPING TECHNOLOGY MODEL

Odekunle, M.O[1] Adebona, A. O[2] Ahmed, Y[3] Acha, S. & Waziri, A.M[3]
[1,2,3,4]Department of Geography, Federal University of Technology Minna, Niger State. Nigeria
Corresponding email: odemary@futminna.edu.ng yusuf.ahmed@futminna.edu.ng
a.waziri@futminna.edu.ng

Abstract
Hotels are important to every society. This is because they create lodging facilities for businesses people and tourists. Hotels commonly provide a number of different services within the same or different building which are often available for the use of both residents and non-residents of the hotel. This study evaluates spatial distribution of hotels in Minna metropolis using Geographic information techniques and creating a mobile application of the hotels using GIS cloud. Coordinates and information about each hotel used in this study was collected. The points were analyzed in ArcGIS 10.2 environment to depict each hotel's geographical location on the map. A total of 46 hotels were surveyed. 6 Guest inns, 5 lodges, 1 motel, 2 Suites and 32 Hotels were surveyed. A cursory look at the map of the metropolis shows that hotels are found almost throughout the metropolis. It can also be seen that most of these hotels are situated along major roads for easy access. The hotels data were imported into the GIS cloud engine in csv. Format. A database was created on the GIS cloud engine anchoring the data using javascript. GIS cloud Mobile Data Collection was obtained from iOperating System Appstore to anchor the data on mobile phone. It is recommended that hoteliers who already have hotels should endeavor to upgrade their services so that they can compete with other international brands.

Keywords-Hotels; Geographic Information Systems; GIS Cloud; Mobile Data Collection.

1.0 Introduction

Hotel is an establishment that provides paid lodging on a short term basis. A hotel provides different services which may range from lodging, restaurant etc. It can be said to be a business enterprise having a building for public accommodation and furnishes lodging and usually provides meals, beverages and personal services, usually regarded as home away from home. Mapping hotels and developing a mobile map with the GIS cloud technology is essential in the modern era as paper maps are gradually becoming obsolete (Baba, 2016).

Hotels have long been a significant constituent in the economies of many nations. Hotels are directly linked to the economy and are an integral part of many other economic activities (Mohanty, 2008). A hotel as a service commerce are keen on locations that are accessible to their potential market because they seek for increased demand from potential guests. Hotels in urban areas are usually highly clustered, because agglomeration results in hotels enjoying benefits from clustering. Generally, one incentive for choosing to locate close to other hotels is to gain a significant positive influence in hotel efficiency (Barros, 2005; Urtasun and Guiterriez, 2006).

Internationally, hotels can be classified based on different criteria. They may be classified based on the location, range of property, the amenities and the kind of service they render. The length of stay of customers, theme, as well as the target market may also be used as a basis for classification (Omogunloye and Ayeni, 2012). The most common method used in classifying hotels is the use of rating (star rating) based on the services rendered. High number of stars indicates more luxury. The most rated star is the 5-star hotel.

The use of service-oriented architecture in Geographic Information Systems (GIS) is becoming progressively more prevalent. This approach helps to hide the technical information of the datasets in question by revealing them through standard, implementation neutral web interfaces, potentially making them presented to wider audiences. The recent emergence of cloud computing conveys new possibilities in service deployment. In the modern societies, Geodata sets are crucial, especially following the near explosive growth in the use and importance of location-aware devices. The most efficient way to convey data geodata to, and between humans is by the use of maps.

Cloud has demonstrated a potential to fulfill a demand that brings about the way IT (Information Technology) is devised, developed, implemented, extended, enhanced, maintained and sold. Cloud computing has been used for different purposes like tourism management. Cloud computing can also be employed in the spatial distribution of some phenomenon's, in this case, it's the spatial distribution of hotels in a particular place. This research shows the spatial distribution of hotels operating in the cloud, in relation with their location, working hours, the kind of the hotel.

Minna is a city in Middle Belt Nigeria, with an estimated population of 304,113 in 2007. Minna is the capital of Niger state. This is largely responsible for the concentration of hotels in the area and as therefore, given birth to the need to map the distribution of hotels using GIS cloud technology. It is located between latitude 9º41'6.3''N, 6º30'0''E and longitude 9º35'7.7''N, 6º36'34''E and it is situated at elevation 243 meters above sea level. Minna is estimated to occupy a land mass of about 6,784SqKm (Simon, Duntoye, & Oyewole, 2018). Minna is the home of Nigeria's former Head of State Abdulsalami Abubakar and former Military President Gen. Ibrahim B. Babangida, Presently Abubakar Sani Bello is the governor of Niger State (Encyclopedia Britannica, 2009).

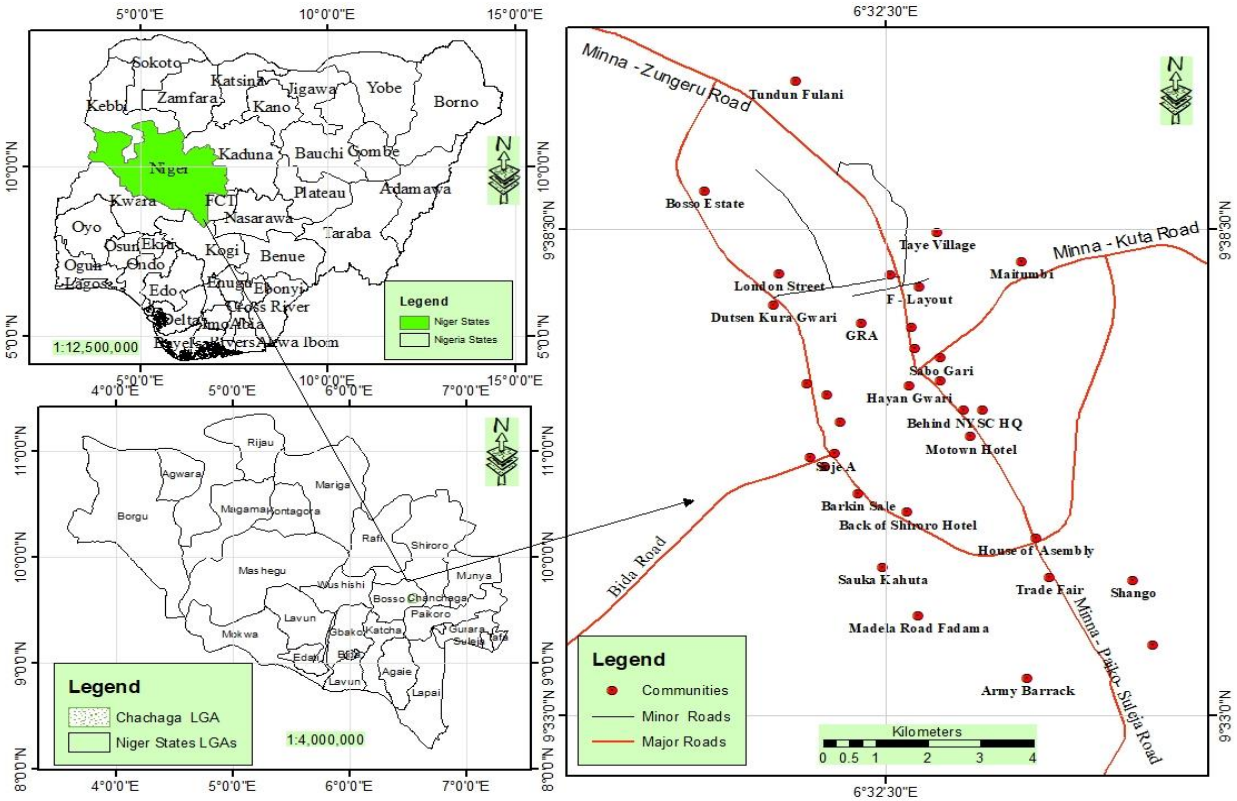

Figure 1: The Study Area

Technology is advancing all over the world and the use of manual maps, that is, paper maps is becoming obsolete. This sole reason prompts the use of Geographic Information System and Remote Sensing techniques in gathering information and to understand our immediate

environment. Therefore, there is need to create a mobile map of hotels in Minna metropolis which can be used by individuals.

2.0 Literature Review

(Scott, 2008) defines a hotel as a wide spectrum of property types from larger units having up to or maybe in excess of 1000 letting bedrooms, to smaller units maybe having as few as 10 or even less. Hotels commonly provide a number of different services within the same or different building which are often available for the use of both residents and non-residents of the hotel. These include the provision of letting bedroom, food and beverage services in restaurants, bars and banqueting rooms, conference/mailing rooms and leisure facilities (Otegbulu and Tenigbade, 2011).

Hotels are important to every society. This is because they create lodging facilities for business people and tourists (Omoguloye and Ayeni, 2012). Hotel investments hold vast potentials for job creation and economic stimulus. They create jobs, generate foreign exchange, purchase goods and services locally, and also pay taxes. Visitors in the hotels spend outside the hotel and help to improve the socio-economic status of the area (International Finance Corporation, 2012).

Cloud computing is a technology that allows the provision and utilization of resources over the internet in lieu of installations on a desktop computer (Cecowski, M. 2007). Information Systems (IS) can be consumed as utilities like water and electricity through cloud computing (Carr, N.G. 2008). Four deployment models are specified in the National Institute of Standards and Technology (NIST) cloud computing definition: Private, Public, Community and Hybrid clouds. Adoption of cloud computing brings about technological, economical and environmental benefits to an organization, which is also the case for hospitality industry. New technologies and competitive marketing strategies available through the cloud such as the use of social media, channel management, online reservation streams, hotel review portals and increased use of mobile technology for improved customer service have significantly changed the way hotels interact with their customers and will still change for a long time to come (Protel hotelsoftware GmbH. 2012).

GIS Cloud is an Integrated System of Hardware, Software and Spatial Data to produce maps and reports which simplifies the analysis and the informed decision making. It is a type of virtualized computing resources that are provisioned based on service-level agreements. ESRI and GIS Cloud Ltd are among the global organizations that are already using cloud computing to provide on-demand services to users (Rajkumar Buyya, 2008). GIS Cloud main characteristic is its unique vector visualization engine which improve the way we can use and present maps. It also allows the integration to any other GIS solutions. The GIS CLOUD solutions include: Mobile Data Collecting, Map viewer, Map portal, Map editor. Customers focus more on their applications and the development team manages and supervises the security and reliability of the GIS Cloud solution. GIS Cloud is the solution for increased GIS applications in optimized planning, informed decision making and emergencies at reasonable cost in no time and efforts. It allows in site mobile data collection, editing and publishing in real time using another programmer or application. Also, it gives the opportunity to develop, edit, and publish on the map from the field using the internet and simple gadgets (Omar Al-Bayari, 2018).

In 2013, Adeyemi mapped the locational patterns of hotels in Akure, Ondo State, Nigeria. In order to make this possible, a record of hotels in the area, their addresses, as well as an analogue map of Akure were obtained from the Ondo State Tourism Board. Coordinates of the hotels were captured (64 out of 65) using a hand held GPS. The study records that hotels are found all over the town but are concentrated outside the central business district. It further revealed that Oke-Ijebu/ Ijapo axis located in the North Eastern part of the town is were the highest number of hotels in the area are found representing 31.3%. It is so because this axis is majorly the residential area in Akure and has an express road linking it to the CBD (Central Business District) which allows patrons easy access. The study further showed that most of the hotels with higher ratings cluster around the Government Residential Area of the state.

Similarly, Shunopaul Baba (2016), investigate the spatial distribution and service delivery of hotels in Kaduna metropolis. Where research questions were formulated to guide the study among which is where the hotels are located, what the pattern of distribution is and what are the services provided by these hotels and the proximity of the hotels to banks, offices. Findings reveals that the number of hotels in one area differs from that of other areas. It is worthy of note that the metropolis does not have a single hotel in the 4 and 5star categories. This means they do not provide the services that guest require and they do not meet the international standards for hotels.

3.0 Methodology

This includes the various stages involved in acquiring the desired result. It also involves the steps employed in digital mapping and includes all activities carried out from planning to actual data acquisition and refinement.

3.1 Sources of Data

- Primary data: this is the data collected by the researcher himself for the purpose of the research. Coordinate points of various hotels within the study area were collected using hand held GPS.
- Secondary data: these are the data being utilized by the researcher that was provided by other people. These include shapefiles (LGA, minor roads shp, major roads shp), journals, materials obtained from the internet and others.

3.2 Data Collection

Coordinates of hotels across the study area was collected with parameters which include name of the hotels, working hours, address, district, road name and pictures were taken. The hotel coordinates obtained from the field was input into excel in csv. Format. The georeferenced shape files of the study area was used in the ArcGIS 10.1 environment.

3.3 Methods of Data Analysis

The hotels in the study area were identified using hand held GPS and then mapped. This was achieved by computing the coordinate points into excel and saved on the local disk. Thereafter, the coordinates were added to the shape files (LGA, minor road shp, major road shp) in the ArcGIS environment were the point location of various hotels in the study area was displayed with their attributes.

Mobile map of Hotels

To fulfil the objectives, a relational database of the hotels in the study area was created. The hotel was associated with a set of attributes:

- Coordinates.
- Name of hotels.
- Address.
- District.
- Road name.
- Contact.
- Working hour.
- Picture.
- Distance to city center (Mobil).
- Cost of transport.
- Hotel facilities.

Importing data to GIS cloud

It is important to import data into GIS cloud to create a mobile map. The data could be csv. Or xls. Format. In this case, csv. Format was adopted. The steps used in importing the data are;

- On the later Tab or open Database Manager.
- Select Import CSV or XLS function
- Browse for the uploaded XLS or CSV in File Manager
- Set the table parameters, select the coordinate fields and click import.

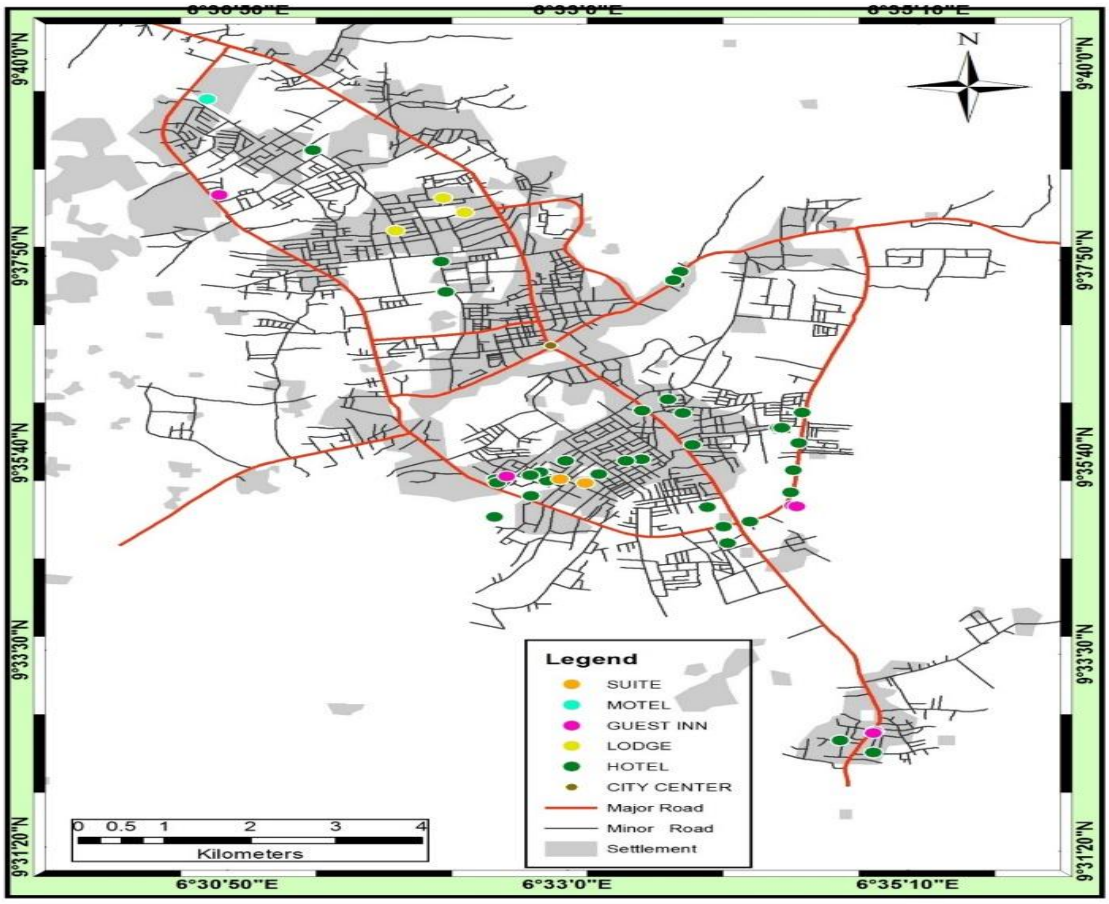

Figure 2: Distribution of different categories of hotels in Minna metropolis.

Steps in creating mobile map on GIS cloud

The steps involved in creating a data base with GIS cloud to synchronizing it with mobile data collector includes:

1. Import csv. or xls. data into GIS cloud.
2. Edit the data structure using variables, strings or reals.
3. Name the fields starting with letters or an underscore(_)
4. Overlay the data with an open street map.
5. Synchronize the data with mobile data collector on a mobile phone.

Features of mobile map of hotels in Minna metropolis.

- It will give users information about the hotels in Minna metropolis.
- It will give a friendly user interface.
- It will provide a navigation option where users can get direction.

4.0 Result/Discussion

GIS cloud for mobile app is synchronized with mobile data collector which enables users to interact with the app with a friendly user interface. Data collected and analyzed with ArcMap can be turned into mobile map using the GIS cloud model. Figure 3 on the last page of this paper gives an outlook of mobile map of hotels in Minna. When running the app, the data integrated with GIS cloud synchronized with mobile data collector will be displayed which is on the main screen. There is also splash screen that comes up linked with the main screen that display the information of each hotels on the app. This information linked with the main screen includes:

- Coordinates.
- Name of hotels.
- Address.
- District.
- Road name.
- Contact.
- Working hour.
- Picture.
- Distance to city center (Mobil).
- Cost of transport.
- Hotel facilities.

There is also a navigation option that allow the users to access locations. Each hotel on the map is depicted as a point and when clicked on displays the information about the hotel.

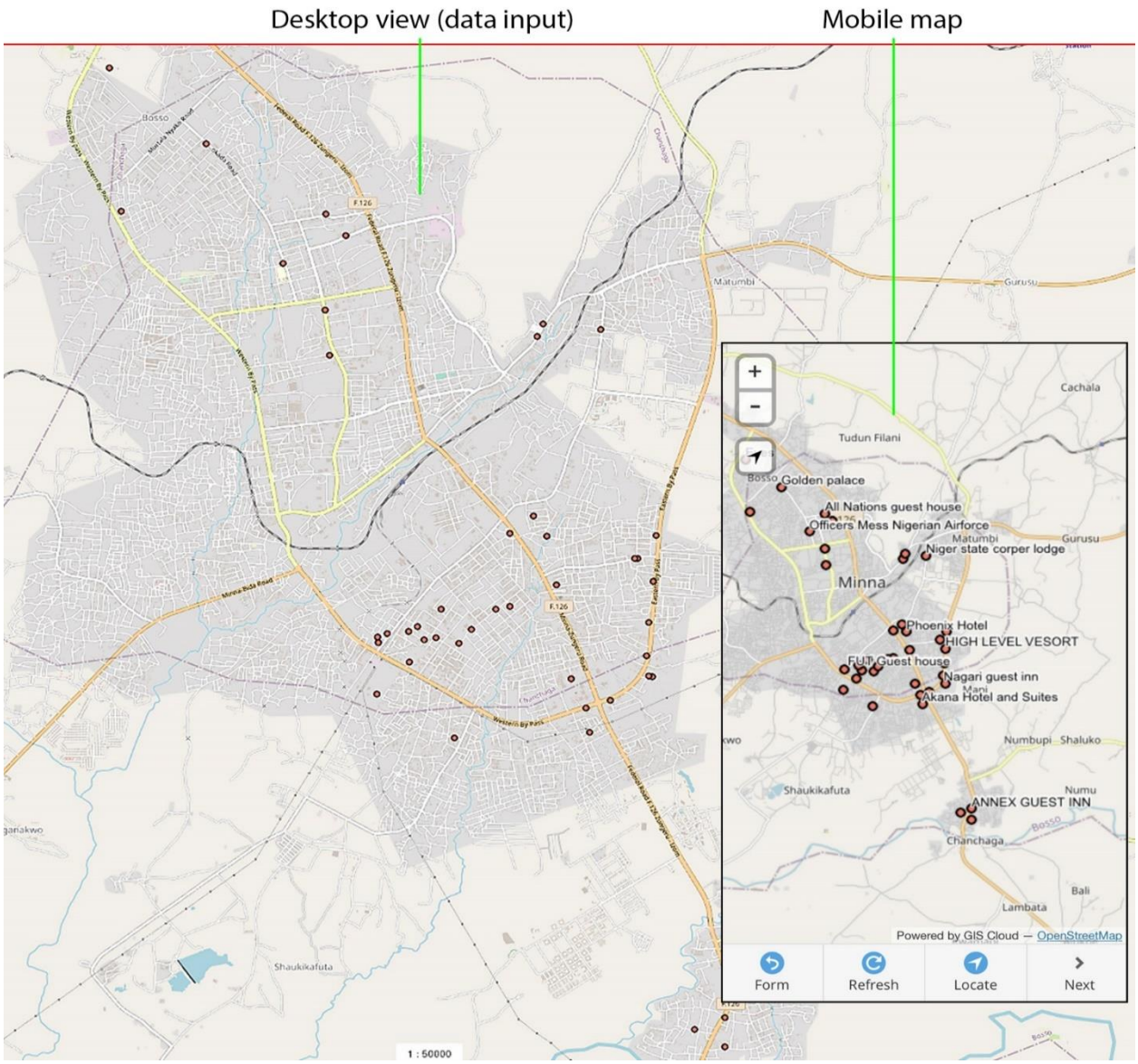

Figure 3: Hotels in Minna metropolis showing on desktop and mobile

5.0 Conclusion and Recommendation

This study was based on the spatial distribution of hotels in Minna metropolis. Three research questions were formulated to aid the study which are where are the locations of the hotels are and how it can be mapped out? What is the pattern of distribution of hotels in Minna? How can mobile app of hotels in Minna be developed? After the analysis, it was revealed that hotels in the metropolis cluster in areas that have easy access to the central business district of the city. Also, the nearest neighbor ratio is 0.629090. Mobile app of Minna was developed using GIS cloud engine which will help visitors and inhabitants to access information about hotels in Minna metropolis.

This study recommends possible methods that would aid hotels in Minna metropolis to manage their data and create a friendly database for records and for their customers.

1. Hoteliers who already have hotels should endeavor to upgrade their services so that they can compete with other international brands.
2. Hotels should have a detailed geodatabase that will help their customers in surfing the services they render.

3. Hotels in the metropolis should have a collective mobile app that would aid customers in navigation and other services.
4. Map produced in this research work should be implemented for use in other places other than hotels.

References

Adeyemi, B.A. (2013). Mapping the Locational Pattern of Hotels in Akure, Ondo State.Journal of Humanities and Social Sciences.

Barros, C.P (2005). Measuring Efficiency in the Hotel Sector. Annals Tourism of Tourism Research 32(2)456-477

Baba, S. (2016). Spatial distribution and service delivery of hotels in Kaduna metropolis, Nigeria.

Carr, N.G.: The big switch: Rewiring the world, from Edison to Google. WW Norton & Company (2008)

Cecowski, M., Becker, S., Lehrig, S. (2017): Cloud Computing Applications, pp.47 {60. Springer International Publishing, Cham (2017) Encyclopedia Britannica, (1964).London: William Benton.esri. (n.d.). Retrieved from https://www.esri.com

Encyclopedia Britannica, (1964).London: William Benton.

International Finance Corporation (2012) Annual Report. http//:www.ifc.org

Mohanty, P. (2008). *Hotel Industry and Tourism in India*.New Delhi: APH Publishing.

Omar Al-Bayari. (2018). GIS Cloud Computing; Aplication. 1-4.

Omogunloye, O.G. &Ayeni, O.O. (2012). Analysis of Hotels in Lagos State with Reference to Other Spatial Data.*Research Journal in Engineering and Applied Sciences*, 1(6), 393-403

Otegbulu, A.C&Tenigbade, O. (2011).An Assessment of Lodger‟s Value Perception of Hotel Facilities and Services. *Journal of Sustainable Development*, 4(4), 91-100

Protel hotelsoftware GmbH: Top Four Indicators it's Time to Change a Running [Property Management] System (2012)

Rajkumar Buyya, Chee Shin Yeo, and Srikumar Venugopal. (2008) “Market-Oriented Cloud Computing: Vision, Hype, and Reality for Delivering IT Services as Computing Utilities,” Keynote Paper, Proceedings of the 10th IEEE International Conference on High Performance Computing and Communications (HPCC 2008, IEEE CS Press, LosAlamitos, CA, USA), Sept. 25-27, 2008, China.

R. Funsho, Simon, Duntoye Dorcas Busayo, and Oyewole Kehinde(2018).The Effects of Urbanization on Micro-Climate of Minna Urban Area. *Journal of Geography, Environment and Earth Science International 15*

Scott, B. (2008). Hotels in the Edited Book Valuation: Principles into Practice 6 th ed. London: EG books.

Shunopaul Baba. (2016). Spatial Distribution and Service Delivery of Hotels in Kaduna Metropolis, Nigeria. 55-56.