

APPLYING THE GEOGRAPHICAL INFORMATION SYSTEM TO CADASTRAL RECORD KEEPING BEKAJI HOUSING ESTATE, YOLA

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Abstract

This research focuses on the integration of Geographic Information System (GIS) with conventional cadastral survey. It also compares data management, storage and retrieval from the database created. A GIS database was created; the procedure entails three steps; creating spatial database, attribute database and linking the two. The attribute data was represented in tabular form, four tables were designed. These include registration, transaction, ownership and cadastral land parcel tables. On screen digitizing of the cadastral map and the linkage of the attribute data to the cadastral land parcel was carried out, using Arc-View Software. The result shows that data can be stores and retrieved with maximum speed in a GIS than the conventional cadastral system. It recommends the integration of GIS with cadastral survey to meet the challenges of data processing, storage and retrieval land use allocation, development control and management.

Introduction

The professional practice of survey has been going through unprecedented changes in recent years. Land records are maintained for deciding ownership and boundaries of land or property.

Generally, we keep track of our land areas as well as the people and everything attached to them using maps (and other information of data acquisition drawn by the conventional method of ground survey. This involves a number of steps such as:

- Reconnaissance
- Actual data acquisition
- Graphical representation
- Storage
- Management and retrieval

These steps deal with large volume of data, the process cost time and the accuracy obtained is low. Adamawa State is committed to a national policy that ensures sustainable development based on proper land ownership information in order to meet the growing need of the present and future generations. Surveyors have found it necessary to change from traditional methods to modern system of digital data acquisition and management through the use of GIS.

Lack of adequate information on natural resources and alternative management posed

serious problems especially for planning and development projects in Adamawa State; land related information is not readily available to public and the data cannot be easily updated using GIS facilities. Because of the complexity, volume and diversity of information expected from cadastral, manual procedures and methods of data process are not able to meet the pressure of demand.

This research is aimed at producing an efficient computer aided cadastral map of Bekaji Housing Estates; through the creation of accurate record keeping system that will ensure security and accessibility of data. It will also design a database that will cope with large volume of data that can easily be updated and retrieved.

Only an efficient use of computerized database management system makes the information manageable. Accurate computer aided cadastral maps can be used to check unwanted development. A good cadastral plan can be used by Town Planners to check conformity with laid down planning laws. Developmental growth in urban centres can easily be monitored; data can easily be upgraded since it is stored in digital form.

A number of studies have shown that Cadastral Survey and Geographical

Information System (GIS) can be applied in various ways depending on the need and purpose of the study. For land records system; Gore, Gulb and Jain (2005) design and implemented land record system to store ownership for Indian Land Records, while Vanna (2003) carried out studies on application of GIS in Cambodian Land Title Department for updating of records and their attributes, Ashork and Patti (2000) carried out periodical update on cadastral maps at micro level.

Faris and Rains (2003) attempted to develop a model of commercial land use through the application of GIS and the result was used for the land use changes. Xiaoyon and Diohara (2003) developed an algorithms system for automated editing of old cadastral maps. Tapas Ghatak (2000) adopted Geographical Technology in land use planning and this Ad-hoc plan was for easy implementation.

This research is focused on integration of GIS with cadastral surveying, using Bekaji Housing Estate as a case study. It intends to use the basic principle of cadastral survey to develop database system using the GIS.

The study area is located in Jimeta part of Yola-North Local Government Area of Adamawa State. It is covered by Jimeta cadastral metric sheet 31 and 32. The area is located in a medium density area designed for both residential and commercial purposes in 1979; it has an area of 275 acres, it is located on flat topography, the vegetation is bare except for some trees and shrubs that covered the landscape. The weather is dry and hot during dry season. Temperature ranges between 30 and 35 degrees all years round (Zakari 2006).

Methodology

Data and Equipment

Equipment:

1. HP Compaq Mini Laptop Computer with 1GB RAM, 150GB HDD.
2. HP DeskJet j1000 Printer
3. Hewlett Packard Scan Jet5300C Scanner

4. The Computer Laptop is equipped with Arc-view GIS 3.2a data.

- i. Data required for this study consist of spatial data, which is the cadastral survey plan of Bekaji housing estate, obtained from the ministry of land and survey Yola.
- ii. Non-spatial data (attribute data): this data shows the characteristics description of the spatial data: they were obtained from files in the ministry of land and survey Yola and by personal interview to the owners of the various houses.

The method involves the design of a cadastral database for Bekaji Estate. Basically the entity relationship approach was used to design the database unlike the normalization approach the entity relationship requires that the various entities must have been determined before commencement of the design. The entities involved in the design are:

- i. The parcel
- ii. The owner

For each of these entities two tables were created. For the land parcel entity there was the:

- a. Ownership table
- b. The transaction table

In all, there were four tables created. The cadastral land parcel was the theme tables were merely joined to the theme table using the "join tool".

Arc view version 3.2a was the software used in joining the same tables. Similar software was used for scanning and on screen digitalization of the cadastral map to form the other layers. The parcel -ID field was the primary key field used in joining the entire tables together.

The spatial data consisted of four layers, one raster and three vectors. The raster was the scanned map of Bekaji, which the other were digitized on screen. The other layers were:

- i. Building layer
- ii. The Cadastral land layer

iii. The road layers

Since this study was about land parcels, it was only the cadastral layers that were linked with attribute data. The cadastral themes were overlaid to produce a single cadastral map.

The main design work was adopted from Kufonyi (1998) though a lot of variations has to be incorporated to fall in line with the specific objectives of the case study.

The design phase for this research study involved synthesis.

- i. Identification of the basic geometric and thematic components of the cadastre i.e. parcels base information system.

ii. Identification of related data set

- iii. Identification of other important basic components of land parcel to which attributes are attached or joined.

Entities were first determined before the commencement of the design.

1. The land parcel
2. The owner

The attributes attached or joined are:

- i. Parcel base information
- ii. Ownership of instrument or title
- iii. Transaction or mode of acquisition

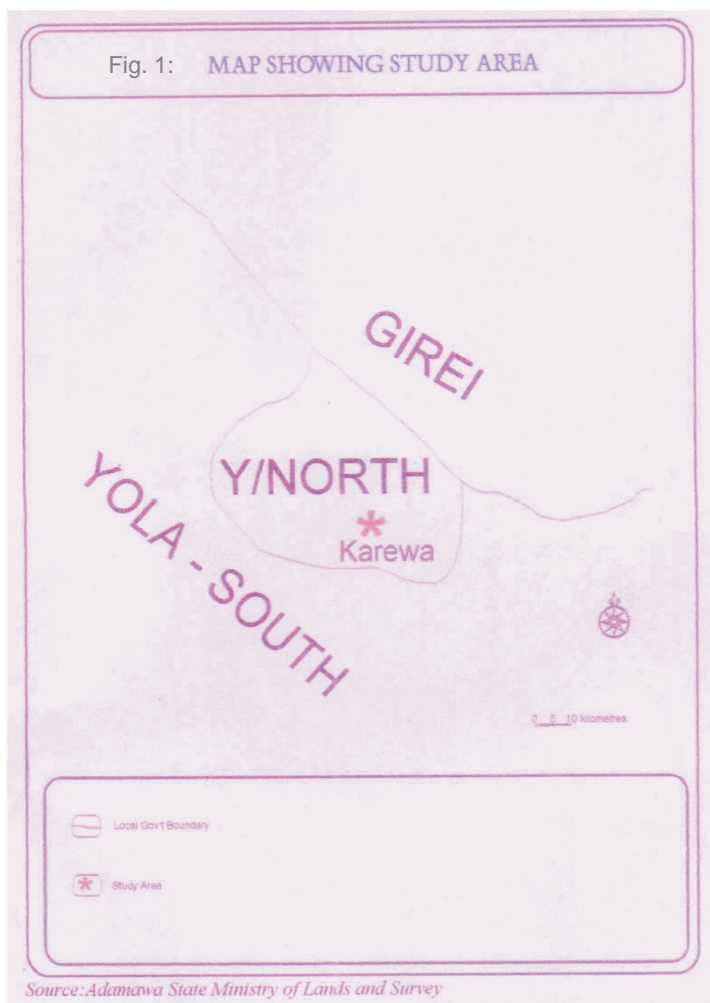
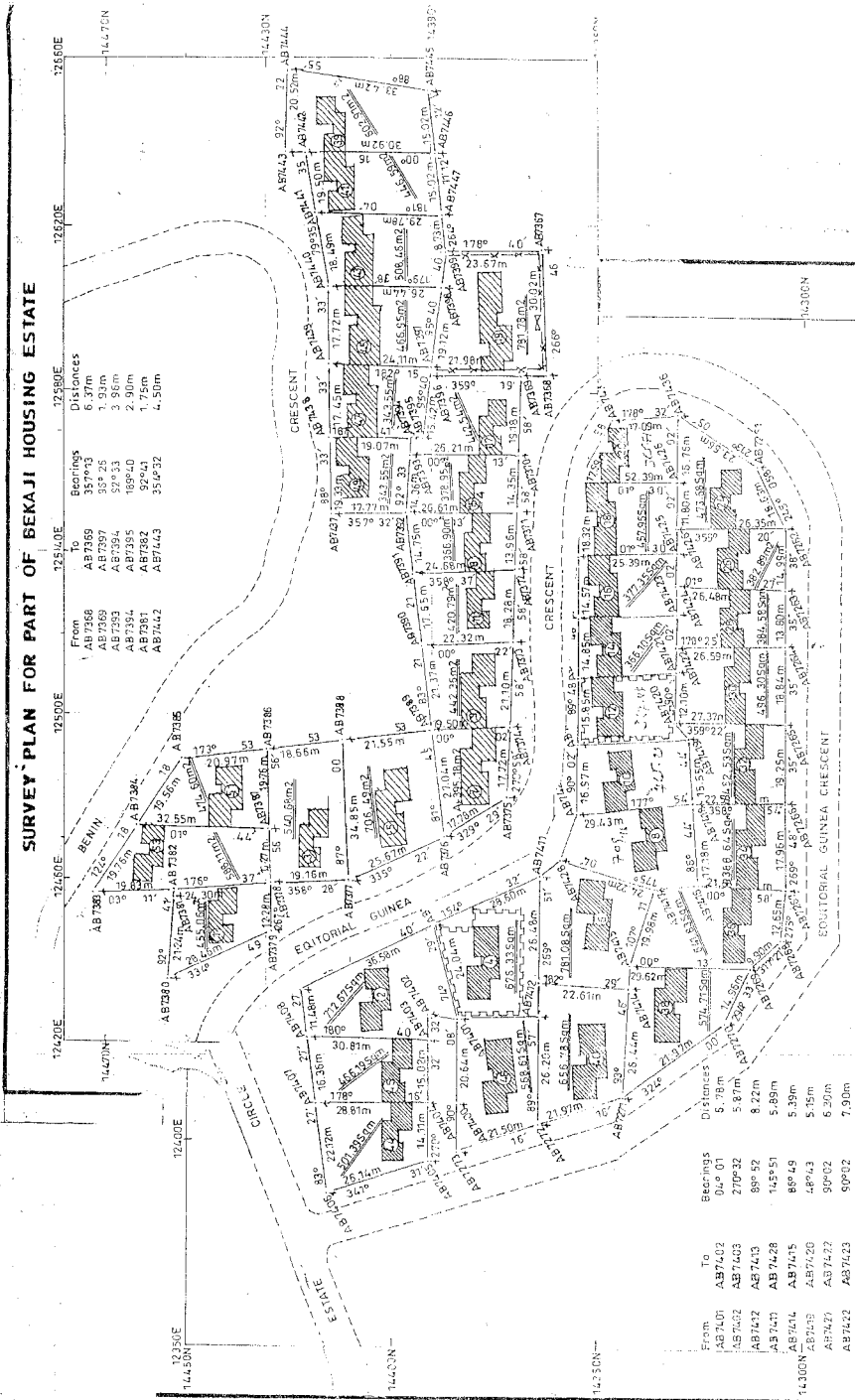


FIG. 2: A SCANNED SURVEY MAP OF BEKAJI HOUSING ESTATE



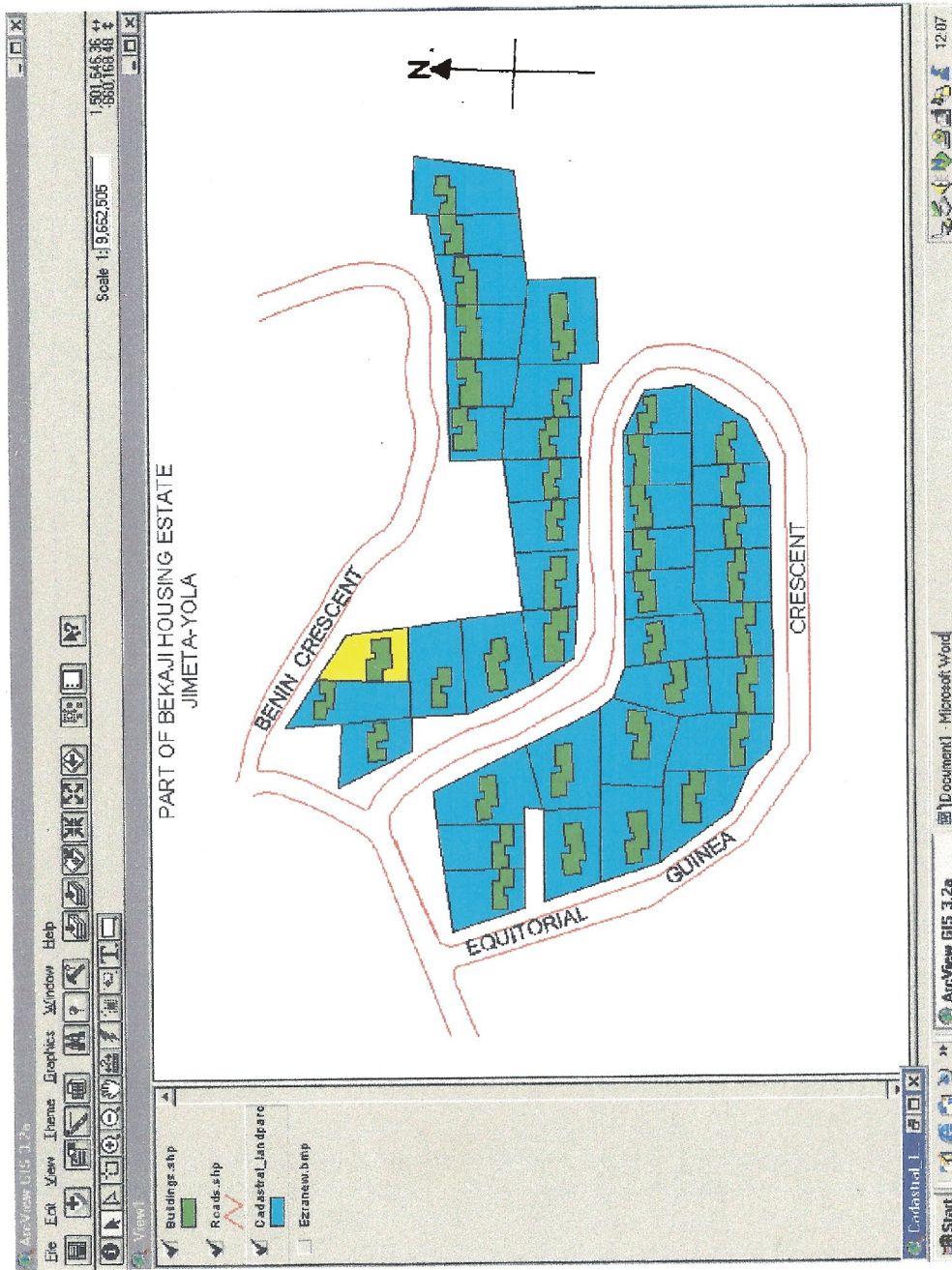


Fig. 3: Computer Aided Cadastral Map of Bekaji Housing Estate,

Produced from three cadastral themes
It shows the Road Network, Cadastral Land Parcel and the Buildings

TABLE 1: SHOWS ATTRIBUTES DATA OF:
TABLE 1: CADASTRAL LAND PARCEL, TABLE 2: REGISTRATION
TABLE 3: TRANSACTION, TABLE 4: OWNERSHIP

Parcel ID	AREA	LOCATION	PLAN No	USE	VALUE	TERMIN No	FEIN/No	REGISTRATION	Apppl No	Apppl Date	Apppl Fee (M)	Reg. Date	Cost (M)
49	343.95	BENIN CRESCENT	ADS1193	RESIDENTIAL	680000				891	19850418	265	19850525	ADS888
41	446.59	BENIN CRESCENT	ADS015	RESIDENTIAL	500000				2301	19860113	265	19860319	ADS394
39	602.91	BENIN CRESCENT	ADS813	RESIDENTIAL	390000				265	19860113	265	19860919	ADS989
15	378.96	EQUATORIAL G.	ADS904	RESIDENTIAL	400000				9867	19860812	265	19860901	ADS904
47	343.55	BENIN CRESCENT	ADS884	COMMERCIAL	800000				450	19860812	450	19860402	ADS405
17	443.64	EQUATORIAL G.	ADS1137	RESIDENTIAL	500000				11342	19860330	265	19860402	ADS1137
19	781.78	EQUATORIAL G.	ADS1093	RESIDENTIAL	700000				894	19870110	265	19870901	ADS1150
45	466.95	BENIN CRESCENT	ADS1196	COMMERCIAL	400000				1131	19870110	265	19870201	ADS1093
43	508.46	BENIN CRESCENT	ADS984	RESIDENTIAL	500000				9061	19870211	265	19870211	ADS984
1	455.06	EQUATORIAL G.	ADS519	RESIDENTIAL	400000				9862	19880812	265	19881001	ADS1056
53	588.11	BENIN CRESCENT	ADS1066	RESIDENTIAL	500000				265	19880812	265	19881001	ADS1999
51	474.60	BENIN CRESCENT	ADS1001	RESIDENTIAL	400000				265	19880812	265	19881001	ADS1999
5	640.68	EQUATORIAL G.	ADS444	RESIDENTIAL	500000				265	19880812	265	19881001	ADS1999
4	706.41	EQUATORIAL G.	ADS387	RESIDENTIAL	480000				265	19880812	265	19881001	ADS1999

TABLE 1

TABLE 2

Parcel ID	NAME	SEX	DATE	OCCUPATION	ADDRESS	STATE	LEA	NATIONALITY	INCOME
49	MARY SOLOMON	M	19640916	BUSINESS	92 KALAA ST	BORNU	BIU	NIGERIAN	200000
1	HASSAN TURAKI	M	19610807	FARMER	44 MUBI RD	ADAMAWA	MUBI-SOUTH	NIGERIAN	300000
2	ABIRAKAR ALIMI	M	19490116	TRADER	7 KALAA ST	ADAMAWA	GOMBI	NIGERIAN	250000
			19650923	CIVIL SERV	18 SOKOTO ST	ADAMAWA	MAIHA	NIGERIAN	160000
			19581101	CIVIL SERV	104 BALA RD	KADUNA	KARGORKO	NIGERIAN	160000
			19560714	TRADER	229 JIERA RD	ADAMAWA	YOLA	NIGERIAN	190000
			19600920	TRADER	167 MUBI RD	KANO	FAGGE	NIGERIAN	200000
			19590117	BUSINESS	19 JIMETA ST	ADAMAWA	FAGGE	NIGERIAN	150000
			19670816	BUSINESS	47 MUBI RD	ADAMAWA	GERI	NIGERIAN	200000
			19520923	BUSINESS	116 MUSTAPHA RD	ADAMAWA	LAMURDE	NIGERIAN	200000
			19561104	FARMER	87 ROCK HEAVEN	ADAMAWA	HONG	NIGERIAN	100000
			19750308	FARMER	56 BISHOP ST	TARABA	JALINGO	NIGERIAN	70000
			19400317	FARMER	48 HOSPITAL RD	ADAMAWA	NUMAM	NIGERIAN	90000
			19401219	TRADER	126 BISHOP ST	GOMBE	BELFIRI	NIGERIAN	150000
			19421430	TRADER	91 MIURI RD	ADAMAWA	YITI A	NIGERIAN	180000

TABLE 3

TABLE 4

Parcel ID	Original Owner	Transaction Date
1	MOHAMMED BALA	19860718
2	EMEKA OJI	19860911
3	HALIMA PETER	19860101
4	HASSAN DAUDA	19500002
5	SALIHU BUBA	19811213
6	EMMANUEL YA'U	19890607
7	GAYUS ADU	19900616
8	JAMES JOHN	19901101
9	AHMED YA'U	19910817
10	JOHN PETER	19910413
11	HUSSAINI ADAMU	19920618

TABLE 4

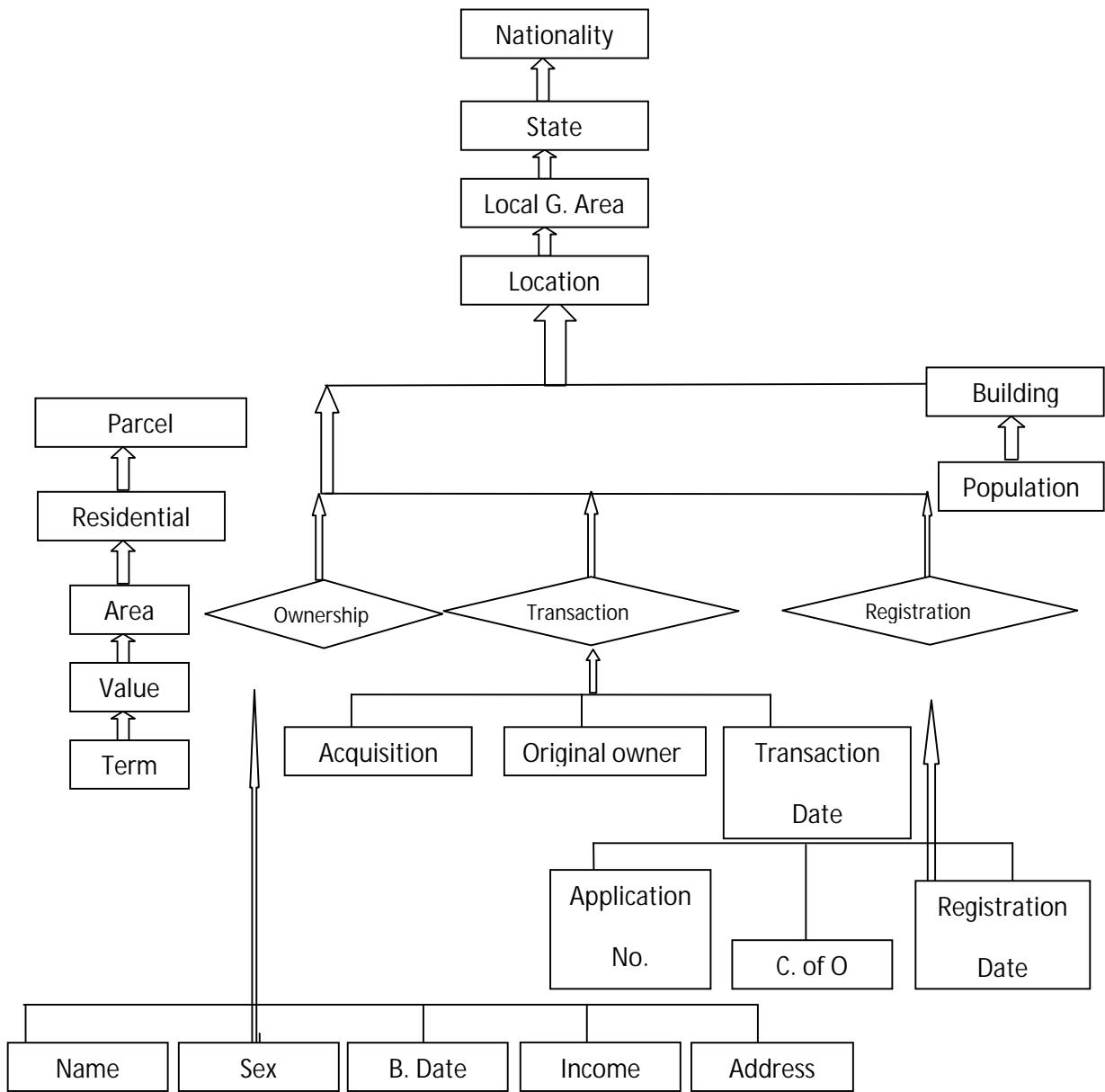


Fig. 1 Entity –Relationship Diagram of a Parcel Base Information System

Adopted from Kufoni (2000).

Results and Discussion

The Geographical; Information System (GIS) was using various criteria, Arc View Version 3.2a was the software package was

the software package employed. The query was done to ascertain the efficiency, speed and accuracy of the GIS compared with the conventional cadastral method.

Figure I show part of Bekaji Housing Estate, it shows the road network, cadastral land parcels and the buildings.

The table shows:

1. Attribute of cadastral land parcel information
2. Registration table information
3. Ownership table information
4. Transaction or mode of land acquisition

The method of data storage, management and retrieval in GIS is efficient and effective, GIS has the ability and capacity of handling large volume of data which can easily be updated in the system.

The manual cadastral system cannot cope with large volume of data generated by the system, and record keeping of data develop a lot in the files.

It is therefore recommended that a proper implementation of geographical information System for cadastral record keep will.

- Assist the government in keeping accurate cadastral records which can easily be updated.
- Revenue can be generated in areas of land taxation, tenements rates, and serious land management problems can be avoided and disputes can easily be settled.
- It is also recommended that further research studies should include utilities such as power lines, water, sewage pipes and drainage facilities; this will enhance the quality of the cadastral map.

In conclusion, the research study has demonstrated the capability of GIS approach to cadastral record keeping.

- Accessibility of data using GIS has been easy, both maps and attribute data can be updated at any time, hence its superiority over the conventional cadastral at any time, hence its superiority over the conventional cadastral survey method.
- The design and implementation of Geographical Information System (GIS) to cadastral surveying will go a long way

in providing accurate cadastral data that could be used for development and planning.

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