

Modeling and Simulation of a Decision Support System for Population Census in Nigerian

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Abstract

In recent times, Nigeria had made series of attempt to know the population dynamics of her people but the results have always been associated with incompleteness and inaccuracy. This study presents the modeling and simulation of the decision support system for population census in Nigeria. A structural framework to implement an accurate and complete population census is presented with analytical models for the classification and tabulation of population parameters such as relation to head of household, sex, age, disability, home local government area, home place, address, literacy, educational qualification, work status, type of employment, sector of employment, marital status, statistics of marriage were formulated. The analytical model was prototyped using the decision support systems approach. The Microsoft visual basic programming language and embedding Microsoft excel were used. A case study of Ilutitun community was carried out to demonstrate the practical implementation of the designed DSS and the result suggested the population structures of the community.

Keywords: population census, demographic data, enumeration, classification

1. Introduction

A Decision Support System can be described as a computer-based interactive human-computer decision-making system that supports decision makers rather than replaces them; Utilizes data and models; Solves problems with varying degrees of structure (non-structured and unstructured or ill-structured; semi-structured; and unstructured) (Keen & Scott-Morton, 1989; Bonczek, Holsapple, & Whinston, 1981; Sprague & Carlson, 1982).

Decision support systems (DSS) are information systems that facilitate decision-making by offering information access, model analysis, and tools support (Keen & Scott-Morton, 1989; Alter, 1977). Modeling is an important feature of Decision Support Systems (DSS). DSS provides the framework that allows decision-makers to view alternatives and make good decisions. Decision support system represents a point view on the role of the computer in the management decision-making process. Decision support implies the use of computer to:

- a. Assist managers in their decision processes in semi-structured task.
- b. Support rather than replace, managerial judgment.
- c. Improve the effectiveness of decision making rather than its efficiency.

These uses have been made increasingly effective by rapid changes in computer technology that now permit low-cost access to models, systems, and databases through the use of "interactive" terminals. As these facilities become cheaper, more flexible, and more powerful, it therefore open up new opportunities for managers to draw on computer support in making key decisions (Keen & Scott-Morton, 1989). In (Turban, McLean, & Wetherbe, 2001), concepts and framework of DSS is presented. According to them, DSS is an interactive, flexible and adaptable CBIS (Computer Based Information System), specially developed for supporting the solution of a particular management problem for improved decision-making. It utilizes data, it provides a user-friendly interface and it allows for the decision-maker's own insights. DSS also utilises models (either standard and/or custom-made), it is built by an iterative process (frequently by end-users), it supports all the phases of the decision making (Turban, McLean, & Wetherbe, 2001) and it includes a knowledge base. Decision-making often involves the exploration of situations that do not yet exist. Analysing such situations requires a model or abstraction of reality rather than reality itself. A model is a simplified representation or abstraction of reality. Models are used to portray the important aspects of reality while eliminating other aspects, which cause

difficulties in a particular situation. Models make the structure of the problem explicit. Examining a simple model may show general principles of how the system in question behaves and may lead to a deeper understanding of the problem (Turban, 1993; Mallach, 1994). One important factor to be noted is that in Nigeria, the wealth of the nation is shared based on some political factors. The sharing formula is not size or structure dependent. Some state and local government receive in share allocation on the basis of their political influence and not wholly on size. The population of a nation's citizen is the net value of the birth and death together with migration. Politically, socially and economically the strength of a nation is measured by the size of its population. According to Heisel (1969), the accurate and up to date information on the component and patterns of change of population is a primary requisite for intelligent decision making in any society. As it is reported in N.P.C. (1991), the Nigerian National Population Commission has made various attempts at conducting accurate census in the past (Olabode, Akinyokun, & Olowofeso, 2003). Population census experience in Nigeria has shown that there are persistent and difficult pattern of error in the demographic data collection and analysis in Nigeria. Heisel (1969) discussed the patterns of errors commonly found in African demographic data as, the complete omission of some individuals who should be included. The failure to report all vital events especially, erroneous dating of vital event when they are reported, and usually reports on age distribution for children up to ten years old are not always clear and accurate. Nigeria has over the years expended lots of hundred and financial resources on estimating what her population is without a positive result (Olabode, Akinyokun, & Olowofeso, 2003). It was reported in N.P.C. (1991) that the Nigeria National population Commission had made various attempts at conducting accurate census in 1866, 1871, 1881, 1891, 1901. All these attempts produced various numbers and statistics which were not accepted by the Federal Government because they did not exhibit the true features of the Nigeria society. The census conducted in 1921 puts Nigeria's total population at 18.72 million. Another conducted in 1931 was partially disrupted in parts of Eastern Nigeria by women who reckoned that the exercise was meant to extort taxes from them. This incidence was known as 'the Aba Women's Riot'. The result however put Nigeria population at 19.3 million. No census was conducted in 1941 due to the World War II but there was one in 1953, which puts the total population at 30.42 million. The 1962 Census was canceled due to irregularities while that of 1963 which officially is still recognized today put the country's population at 55.6 million. The result of 1973 census was rejected on the grounds of over enumeration and gross manipulation of figures. In 1991, the National Population Commission made another effort at knowing what the country's population is which consequently puts Nigeria population figure at 120 million. The provisional result of 2006 population census puts Nigeria population at 150 million people living in Nigeria (United Nations, 2001). There is now a great awareness of the growing need for information on population dynamics, hence a comprehensive study of demography in Nigeria with particular reference to population census is a desirable venture. A study of the Nigerian 2006 census suggests that an automated population census is still in the infancy in Nigeria as of today. In this research work, an attempt is made at modeling and simulating the decision support system for population census of Nigeria.

2. Taking Population Census in Nigeria

A population census is the total process of collecting, compiling, evaluating, publishing and disseminating demographic, economic and social data pertaining, at a specific time, to all persons in a country or in a well-delimited part of it (N. P. C., 1991; Olatubosun & Olabode, 2008). The essential features of a population census, as stated in (Yesufu, 1969), are individual enumeration, universality within a defined territory, simultaneity and defined periodicity. However, it has been observed that, in practice, the period of enumerating people in a census programme often cover some days, weeks or months. The more protracted the period of the canvass, however, the more difficult it becomes to avoid omissions and duplications.

A population census is of great relevance to the economic, political cultural and social development of a country. It is the major source of the bench-mark data on the size, structure and distribution of the country's population required for both planning revenue allocation, distribution of public utilities and research purposes. The 1991 Population Census is one of the cardinal items on the Transition to Civil Rule Programme of Nigeria's Federal Military Government (1988-1992). In pursuance of the conduct of a population census, the Government promulgated Decree No. 23 of 1989 establishing the National Population Commission (NPC). The same Decree also gave legal backing to the conduct of the 1991 population census. The primary objective of that census is to provide information on the number, distribution and social-demographic characteristics of the people.

National census or major survey involves a vast amount of preparatory work, some aspects of which may be in process in a number of years before the enumeration date. The preliminary activities include the following (Owusu, 1969):

- a. Geographic work, such as preparing maps and lists of places of living of people

- b. Determining the data needs of the national and local governments, business, labour, and the public
- c. Choosing the questions to be asked and the tabulations to be made
- d. Deciding on the method of enumeration
- e. Designing the questionnaire
- f. Testing the forms and procedures
- g. Planning the data processing procedures
- h. Acquiring the equipment to be used

In a census the procedures for enumeration are affected by the type of population count to be obtained. The census may be designed to count persons where they are found on census day that is *de facto* count or according to their usual residence, a *de jure* count (Kpendekpo, 1982).

Also in (Kpendekpo, 1982), achieving coverage of all persons in Nigeria at the time of the census is the objective of the planning and methodology of the 1991 population census. The enumeration was conducted on a *de-facto* basis, in other words, persons were counted where they were found at the time of the census. Persons who were away from their places of usual residence were not enumerated there, in the hope that they were enumerated wherever they were within the country. Provision was made for call-backs, realising that the people are very mobile and that the requirement that respondents be enumerated only if they were physically present required several visits to some households to ensure a thorough and complete enumeration. There are two major types of enumeration (Kpendekpo, 1982): the direct interview or canvasser method and the self- enumeration or householder method.

3. Design of Population Census Knowledge Based Decision Support System

An important emerging DSS sub-specialty is the study of knowledge-based decision support systems (KBDSS), which are hybrid systems of DSS and ES that help solve a broad range of organizational problems (King, 1993). The Population Census Knowledge Based Decision Support System (KBDSSPC) is viewed as a system comprising of the following components:

- a. Knowledge Base
- b. Inference engine (Analyser and Predictor of Population Parameter)
- c. Decision Support Engine

3.1 Knowledge Base

The Database is composed of the quantitative (structured) and qualitative (unstructured) knowledge of population dynamic acquired by the human. The database is a network of semantically related static and dynamic objects, each of which is modeled, in a relational form. The structured knowledge is concerned with facts, rule and events of human population dynamics, which are commonly agreed upon by experts in demography. The unstructured knowledge is that knowledge which is acquired by demographic expert from experience and population census survey. Data may be organized using a relational, hierarchical network or object orientated database model. The databases may be accessed via networks using technologies like client-server.

The prominent form of database organization described as relation allows the user to think in the form of two dimensional tables which is the way many people see data reports. It takes its name from the mathematical theory of relations. The data in the database are stored together with minimum of redundancy to serve multiple applications, so the database is independent of the computer program that uses it and the type of hardware where it is stored.

The general description of a relation is given in (Dates, 1986; Navathe, 2000), a relation (or relation state) r of the relation schema $R(A_1, A_2, \dots, A_n)$, also denoted by $r(R)$, is a set of n -tuples $r = \{t_1, t_2, \dots, t_m\}$. Each n -tuple t is an ordered list of n values $t = \langle v_1, v_2, \dots, v_n \rangle$, where each value v_i is an element of $\text{dom}(A_i)$ or is a special null value. The i^{th} value in tuple t , which corresponds to the attribute A_i , is referred to as $t(A_i)$. Some of the relations in this database is as presented below.

The relations supported by system are shown below.

ZONE (zone_id, zone_name, zone_head_quarter)

STATE (state_zone_id, state_id, state_name, state_capital)

LOCAL GOVERNMENT (lg_state_id, lg_id, lg_name, lg_headquarter)

TOWN (town_lg_id, town_id, town_name, Head_of_community)

WARD (ward_town_id, ward_id, ward_name)

STREET (street_ward_id, street_id, street_name)

HOUSEHOLD (household_id, street_id, ward_id, town_id, lg_id, state_id, zone_id, house_description, head_of_household)

BIO (respondent_id, house_id, respondent_name, relation_to_household_head, sex, age, tribe, nationality, disability, duration_of_residence, previous_residential_address, present_residential_address)

EDUCATION (respondent_id, literacy, highest_educational_qualification)

ECONOMIC (respondent_id, work_status, type_of_employment, sector_of_employment)

MARITAL (respondent_id, marital_status, age_at_marriage, no_of_children_born, n_death_child_the_last_1year)

3.2 Inference Engine

The inference engine is concerned with the adoption of an appropriate line of reasoning (Alter, 1977; Turban, McLean, & Wetherbe, 2001; Akinyokun & Uzoka, 1999), leading to the solution of a given demographic problem or the formulation of a body of consultative advice on a given demographic phenomenon.

Carrying out population census tabulation program involves a determination of the number of different levels of geographic details. Data are presented for administrative divisions and subdivisions of the country, Federal government, state government and local government in various categories. For small geographic area, such as villages, the results as a rule are limited to a report of the number of inhabitants or perhaps the population by sex only. At another level, tabulation may provide only inventory statistics that is simply a count of persons in the various categories of age, marital status, economic activity and so on, with but little cross-classification with other characteristics. In some cases, most subjects are cross-tabulated by age and sex and often there are cross-classification with social and economic characteristics, such as educational attainment by economic activity or employment status by occupation.

Data from the population census questionnaire were edited to correct for consistencies and to eliminate omissions. Responses from census questionnaire were coded. In other word, converting entries on the questionnaire into symbols, which can be used as, input data to the system. Some entries required no coding. For example, sex, marital status and questions which were answered in terms of a numerical entry such as age number of children ever born and so on.

The list of demographic statistics which can be generated from the system are listed below (Olatubosun & Olabode, 2008):

- a. Population distribution by age group and sex
- b. Population distribution of type of employment by age group and sex
- c. Population distribution of marital statistics by age group and sex
- d. Population distribution of work status by age group and sex
- e. Population distribution of literacy by age group and sex
- f. Population distribution of relationship to household head by age group and sex
- g. Population distribution of disability by age group and sex
- h. Population distribution of educational attainment by age group and sex
- i. Population distribution of sector of employment by age group and sex
- j. Population distribution of tribe by age group and sex
- k. Population distribution of death by age group and sex
- l. Population distribution of marital status by age group and sex
- m. Population Distribution by Date of Birth and Months of year
- n. Population Distribution by Birth Rate and Months of the Year
- o. Population Distribution of Marital Status by Age Group for Male and Female
- p. Population Distribution of Employment Status by Age Group and Sex

q. Population Distribution of Birth in Wards by Year Group and Months of the Year

- i. Population distribution of birth in the ward by year of birth and month
- ii. Population distribution of birth rate of the ward by year of birth and month
- iii. Population distribution of ward by year group, male, female and total of sexes
- iv. Population distribution of ward by age group, male, female and total of sexes
- v. Population distribution of the ward by relative density

r. Population Distribution by PSLC, JSS, SSS, OND, HND, NCE, B.SC, MSC and PHD for Male and Female

The demographic statistics stated above are largely determined by the age group of sampled population. The generation of each statistics is determined by a unique function, that is, each function differs from the other. For example, the function for generating the population distribution of marital status by age group and sex is different from that function for generating the population distribution of employment status by age group and sex. Generally we assume therefore that there is the existence of a function F_k ($k = 1, 2, 3, \dots, n$) which is a vector defined on age group of population denoted by g_i ($i = 1, 2, 3, \dots, m$) and other population parameter, where n is the number of statistical/demographic information, m is the number of age group of the sample population.

An Example of the Inference Procedure for Generating Population Distribution by Population Parameters (Age Group and Sex):

Let F_1 represents the function defined on g_i to generate the population distribution by age group and sex. The types of sex considered in this research is either a male or female

Hence, $F_1(g_i)$ produces a matrix defined by $A_{i,j}$ ($i = 1, 2, \dots, m; j = 1, 2$), where m is the number of age group and $A_{i,j}$ is defined by:

$$A_{i,j} = \begin{pmatrix} a_{1,1} & a_{1,2} \\ a_{2,1} & a_{2,2} \\ " & " \\ " & " \\ " & " \\ a_{m,1} & a_{m,2} \end{pmatrix}$$

$a_{i,j}$ represents the frequency of i th age group for j th type of sex and it is generated by $a_{i,j} = \sum_{k=1}^n h_k(g_i)$, where $i = 1, 2, 3, \dots, m, j = 1, 2; n$ represent the population census sample size, m represents the number of Age groups.

The pseudocode for generating $a_{i,j}$ is given as follows:

```

loop k from 1 to m          /* m represents age group
  loop j from 1 to n        /* n represents number of attributes of statistics
    set  $a_{i,j}$  to 0
    loop i from 1 to p      /* p represents the sample population
      if  $h_k(g_i) = 1$  then  /*  $h_k(g_i)$  represents. the statistics of  $i$ th respondent in  $k$ th group
         $a_{i,j} = a_{i,j} + 1$ 
      endif
    endloop
  endloop
endloop

```

Inference procedure to compute the frequency of each tabulation from the census data set

Sub evaluate()

```

If age <= 1 Then j = 1; grp(j, i) = grp(j, i) + 1
ElseIf age > 1 And age < 5 Then j = 2; grp(j, i) = grp(j, i) + 1
ElseIf age >= 5 And age < 10 Then j = 3; grp(j, i) = grp(j, i) + 1
ElseIf age >= 10 And age < 15 Then j = 4; grp(j, i) = grp(j, i) + 1
ElseIf age >= 15 And age < 20 Then j = 5; grp(j, i) = grp(j, i) + 1
ElseIf age >= 20 And age < 25 Then j = 6; grp(j, i) = grp(j, i) + 1
ElseIf age >= 25 And age < 30 Then j = 7; grp(j, i) = grp(j, i) + 1
ElseIf age >= 30 And age < 35 Then j = 8; grp(j, i) = grp(j, i) + 1
ElseIf age >= 35 And age < 40 Then j = 9; grp(j, i) = grp(j, i) + 1
ElseIf age >= 40 And age < 45 Then j = 10; grp(j, i) = grp(j, i) + 1
ElseIf age >= 45 And age < 50 Then j = 11; grp(j, i) = grp(j, i) + 1
ElseIf age >= 50 And age < 55 Then j = 12; grp(j, i) = grp(j, i) + 1
ElseIf age >= 55 And age < 60 Then j = 13; grp(j, i) = grp(j, i) + 1
ElseIf age >= 60 And age < 65 Then j = 14; grp(j, i) = grp(j, i) + 1
ElseIf age >= 65 And age < 70 Then j = 15; grp(j, i) = grp(j, i) + 1
ElseIf age >= 70 And age < 75 Then j = 16; grp(j, i) = grp(j, i) + 1
Else
    j = 17; grp(j, i) = grp(j, i) + 1
End If
End Sub

```

For example, the tabulation of population based on type of employment and age groups

```

Sub employmenttype()
While Not rsteconomic.EOF
    rstbio.Index = "biokey"
    rstbio.Seek "=", rsteconomic!respondent_id
        If Not rstbio.NoMatch Then
            age = rstbio!age
            i = rsteconomic!employment_type
            call the evaluate procedure
        End If
    Loop next record
Reporting the computation
For j = 1 to end of age groupings
    rsteemploymenttype!permanent = grp(j, 1)
    rsteemploymenttype!temporary = grp(j, 2)
    rsteemploymenttype!contract = grp(j, 3)
    rsteemploymenttype!self = grp(j, 4)
    rsteemploymenttype!student = grp(j, 5)
    rsteemploymenttype.Update
loop
End Sub

```

For example, the tabulation of population based on type of marital status and age groups

Private Sub marital()

While Not rstmarital.EOF

 rstmarital.Edit

 rstbio.Index = "biokey"

 rstbio.Seek "=", rstmarital!respondent_id

 If Not rstbio.NoMatch Then

 age = rstbio!age

 i = rstmarital!marital_status

 call the evaluate procedure

 rstmarital.MoveNext

 End If

Wend

Reporting the computation

For j = 1 to 17

 rstmarital!Nevermarried = grp(j, 1)

 rstmarital!married = grp(j, 2)

 rstmarital!separated = grp(j, 3)

 rstmarital!divorced = grp(j, 4)

 rstmarital!widowed = grp(j, 5)

 rstmarital.Update

loop

End Sub

It is emphasized that basically, the inference follows the same principles and procedures.

3.3 Decision Support Engine/User Interface Sub-systems

The functions of the user interface (dialogue generation and management) sub-system are to:

- allow the user to create, update, delete database files and decision models via database management systems and model-based management systems
- provide a variety of input and output formats. The formats include multi-dimensional colour graphics, tables and multiple windows in a screen
- provide different styles of dialogues (such as graphical user interfaces, menus, direct command languages, form interaction, natural language interaction, and questions and answers)

The dialogue component refers to the hardware and software that create the user interface for the framework (Alter, 1977; Turban, McLean, & Wetherbe, 2001; Akinyokun & Uzoka, 1999). Two types of dialogue style can be adopted. The menu dialogues and the form-based and question-answer dialogue and graphical user dialogue styles. The hardware support for both dialogues emphasized keyboard monitor and mouse for input. The pull-down menu Dialogue and the form-based dialogue are designed in Visual Basic programming language while the Microsoft excel can be integrated to include a spreadsheet for graphical user interface. The Graphical User-interface can present tabulate population census data and present results in pictorial form. With this dialogue management, data can be entered, retrieve, updated and stored. The windows based user-interface have four levels of pull-down menus as presented in Table 1.

Table 1. Pull down menu option on the DSSPP

| | |
|-------------------------|---|
| File Maintenance | (File_Create, Edit, Update, Save, Delete, Exit) |
| Consultation | (Cognitive, Emotional, Crude Rate Analysis) |
| Population Distribution | (Sorting, Classification, Tabulation, Presentation) |
| Report | (Screen Display, Hard Copy, Soft Copy, Back up) |
| Chart | (Bar, Line) |
| Help | (What about CensusManager) |

3.3.1 Simulation

Demographer views the knowledge base component of the system in a top down manner and gains access to it by supplying a valid user name and password, both of which serve as access right control mechanism. If access right is obtained, the user is then presented with the system's main menu and subsequently its submenus. Any selected option of the main menu or submenu calls an inference procedure or module of a particular step in the population analysis process. An inference procedure is interactive and guides the user intelligently (Olabode, 1999).

3.3.2 Login Session

The first dialogue session takes the demographer through the login procedure. On the windows desktop, the icon "DSSPP" is highlighted and clicked. The system presents an opening banner followed by the login screen.

The user name and user password is entered. Subject to verification and validation authorization is granted and the systems main menu is displayed on the screen. On clicking the "Exit" command the user is taken out of the system onto the desktop of the system. The second command button "Select" allows the user to pick an option among the ones listed on Figure 1. The three options on the main menu includes:

- a. Population Knowledge base
- b. Analyzer and predictor of Population Parameter
- c. Population Decision support system

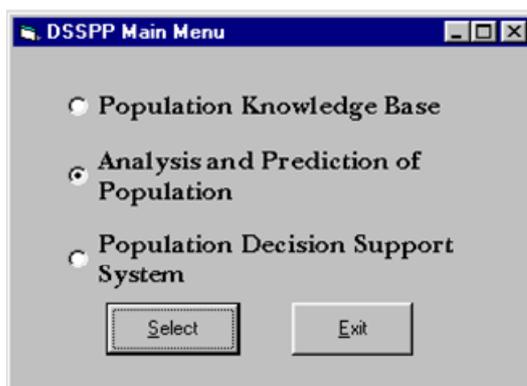


Figure 1. Main menu of the DSSPP

3.3.3 Knowledge Base Creation and Management Session

The first menu session commences when the "Population Knowledge base" option is selected from the main menu. On checking the "Knowledge Base" and clicking on "Select" command button, a submenu depicted in Figure 2 is displayed on the screen.

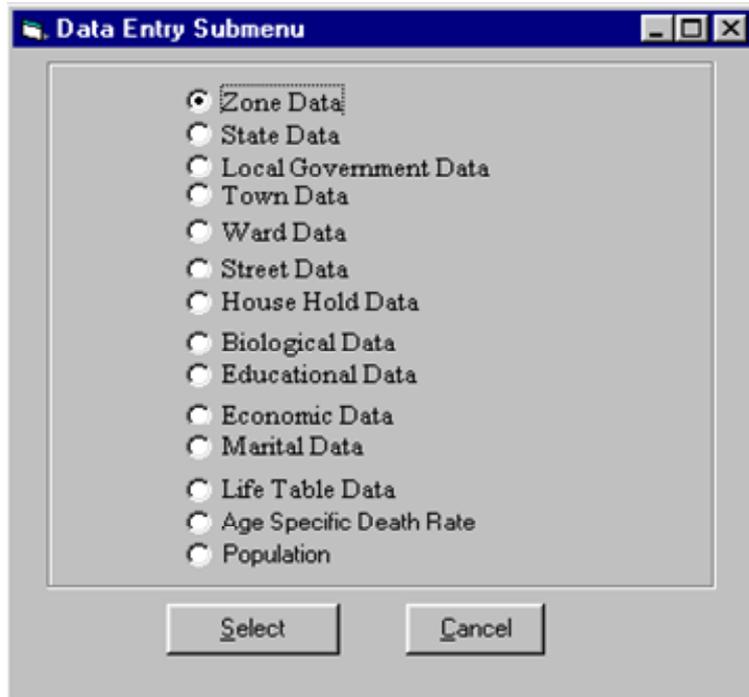


Figure 2. Population knowledge base submenu

For each option selected from Figure 2 there is a form view which enables the user to insert, delete, view or update tuple of a given relation. For example, the form view of the relation “Biological Data” is depicted in Figure 3. If “Add” command is selected, the system allows the user to enter a new record.

Figure 3. Form view for biological relation

The “Update” command button presents a dialogue that allows the user to confirm the save/modify operation. The “Refresh” command button helps to reset the table to initialization status. The “Delete” command button delete a specify record from the table. The “Close” command button helps to abort the current operation on the system. In which case it goes back to the submenu depicted by Figure 2.

3.3.4 Analysis and Prediction of Population Session

The second menu session commenced when the “Analysis and Prediction of Population” option of Figure 1 is selected and “Select” command button is clicked. A screen display depicted in Figure 4 comes up.

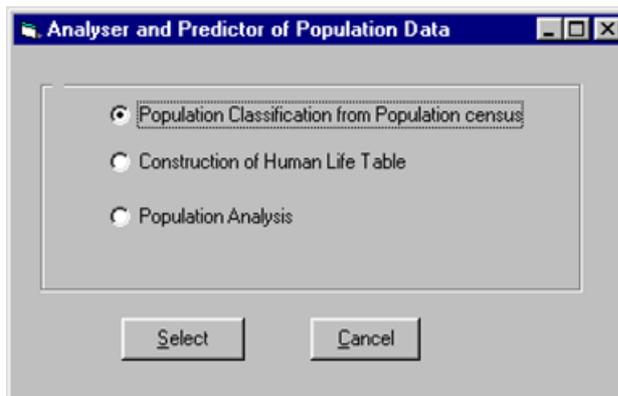


Figure 4. Analyser and predictor of population parameters

On Figure 4, two command buttons are available. The “Cancel” and the “Select” command buttons. If “Cancel” option of Figure 4 is selected, the system takes the user back to a higher level depicted by Figure 1. The second command button on Figure 4 allows demographer to pick on any of the activities as listed on Figure 4. On highlighting “Population Classification from population census” option on this Figure 4 and clicking the “Select” command button, a submenu depicted by Figure 5 is displayed. A list of possible population census distributions is presented below.

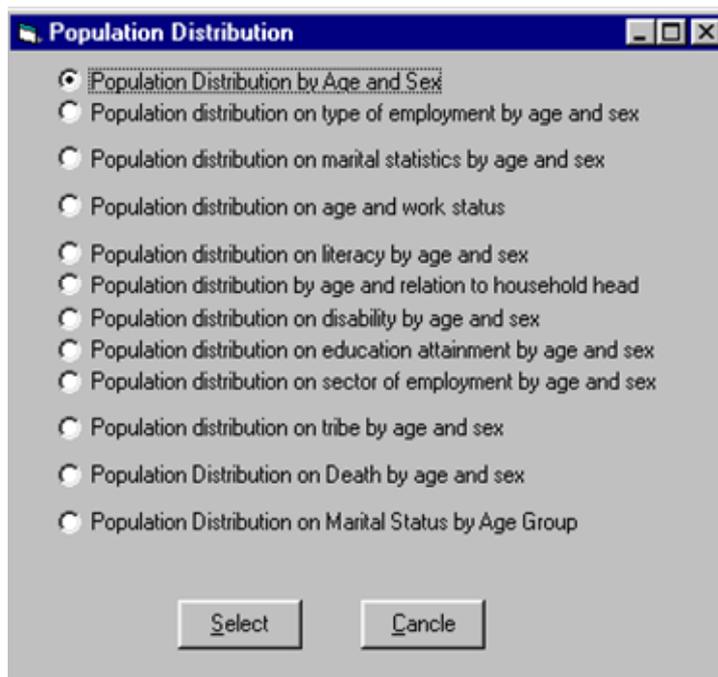


Figure 5. On population distribution from population census

On checking the first option “Population distribution by age and sex” and clicking on “Select” button of Figure 5,

inferences are drawn on population structure, based on the data set from population census and applying the pseudocodes. A transcript of such a classification for the population distribution by age group and sex is as presented in Table1. One procedure that is common to all the options in Figure 5 is that, the moment inference procedure of the option selected from Figure 5 has been executed, the resulting population classification and computation is then presented in a tabular, line graph and bar graph. This can be viewed by selecting desired option from the “Result Presentation” screen display that immediately followed as depicted in Figure 6. The “Result presentation” submenu provides the user with the different options to view results. The first option present result in Tabular form, the second option in Line graph while the third option presents result in bar graph.

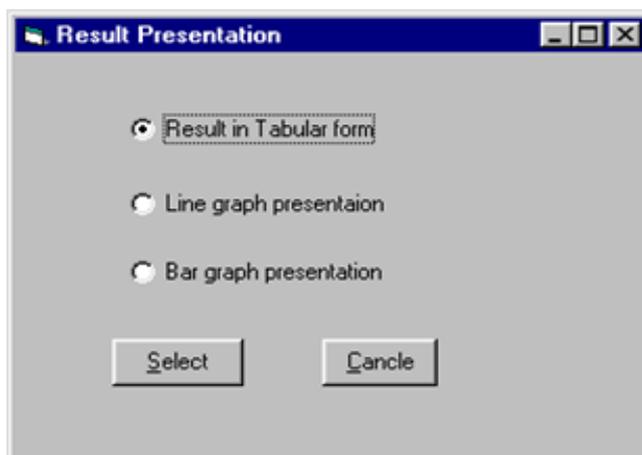


Figure 6. Result presentation submenu

Table 2 shows the population structure of ward 3 in Ilutitun, Okitipupa Local Government in Ondo State. The age modal class falls on the age group 20 - 24 years. This indicates that in the community there are more people in the school age group. It is also observed that people of this community attain high age before they pass on. 47.2% are male while 52.7% are female.

Table 2. Population distribution by age and sex

| Age group | Male | Female | Bothsexes |
|-----------|------|--------|-----------|
| Under 1 | 3 | 6 | 9 |
| 1-4 | 21 | 23 | 44 |
| 5-9 | 28 | 35 | 63 |
| 10-14 | 44 | 54 | 98 |
| 15-19 | 58 | 56 | 114 |
| 20-24 | 62 | 54 | 116 |
| 25-30 | 49 | 52 | 101 |
| 31-34 | 33 | 38 | 71 |
| 35-40 | 24 | 32 | 56 |
| 41-44 | 20 | 24 | 44 |
| 45-50 | 18 | 23 | 41 |
| 51-54 | 15 | 20 | 35 |
| 55-60 | 14 | 20 | 34 |

| | | | |
|--------|------|------|-----|
| 51-64 | 12 | 18 | 30 |
| 65-70 | 11 | 13 | 24 |
| 71-74 | 12 | 11 | 23 |
| 75+ | 28 | 25 | 53 |
| Total | 452 | 504 | 956 |
| % cent | 47.2 | 52.7 | 100 |

On checking the second option “Population distribution on type of employment by age group” and clicking on “Select” command button of Figure 5, inferences are drawn on structure of employment type, based on the data from population and applying the pseudocodes. A transcript of such a classification for the population distribution by type of employment and age is presented in Table 3. Also Figure 7 and Figure 8 present the line graph and the bar graph.

The analysis of the result indicates that there are high concentrations of people in age range 35 years to 39 years who are permanently engaged in their respective employment status. Close examination of the Table and Figure indicate 31.6% are permanently engaged, 11.4% are temporarily employed, 1.0% are on contract, 13.2% are self engaged while 42.8% are students.

Table 3. Population distribution by type of employment and age group

| Age Group | Permanent | Temporary | Contract | Self | Student |
|-----------|-----------|-----------|----------|------|---------|
| Under 1 | 0 | 0 | 0 | 0 | 6 |
| 1-4 | 0 | 0 | 0 | 0 | 24 |
| 5-9 | 0 | 0 | 0 | 0 | 58 |
| 10-14 | 0 | 1 | 1 | 0 | 74 |
| 15-19 | 1 | 12 | 1 | 0 | 102 |
| 20-24 | 21 | 17 | 0 | 9 | 92 |
| 25-30 | 75 | 15 | 1 | 17 | 23 |
| 31-34 | 59 | 29 | 2 | 13 | 13 |
| 35-40 | 36 | 17 | 3 | 13 | 4 |
| 41-44 | 34 | 4 | 0 | 9 | 3 |
| 45-50 | 24 | 1 | 0 | 8 | 2 |
| 51-54 | 19 | 2 | 1 | 10 | 3 |
| 55-60 | 12 | 1 | 1 | 2 | 0 |
| 51-64 | 6 | 1 | 0 | 6 | 1 |
| 65-70 | 8 | 2 | 0 | 7 | 0 |
| 71-74 | 2 | 3 | 0 | 11 | 3 |
| 75+ | 5 | 4 | 0 | 21 | 1 |
| Total | 302 | 109 | 10 | 126 | 409 |
| % cent | 31.6 | 11.4 | 1.0 | 13.2 | 42.8 |

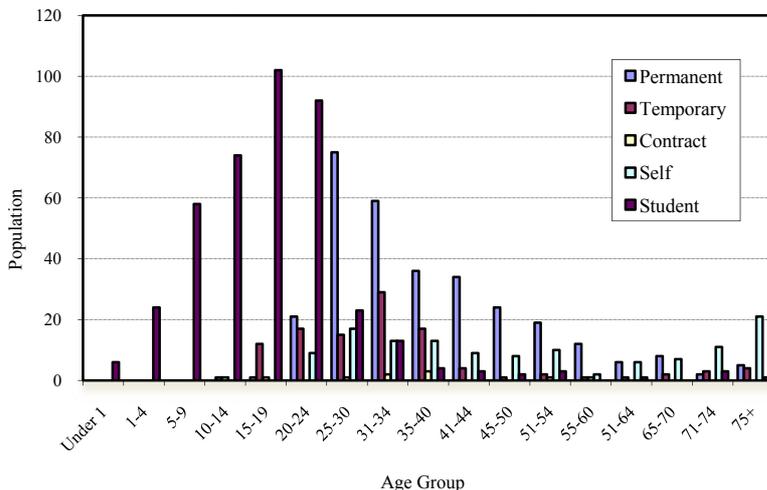


Figure 7. Line chart for population distribution by type of employment and age

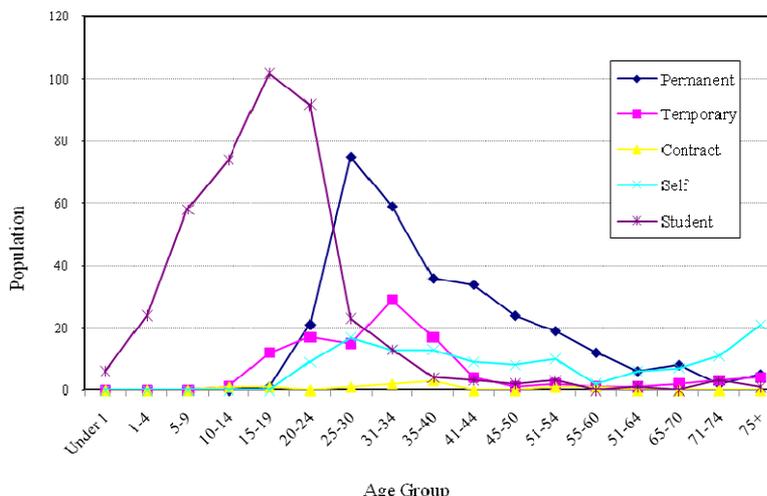


Figure 8. Line chart for population distribution by type of employment and age

On checking the option “Population distribution on marital status by age group” and clicking on “Select” command button of Figure 5. Inferences are drawn on structure of marital status, based on the data from population census and applying the pseudocodes. A transcript of such a classification for the population distribution by marital status and age is presented in Table 4.

Table 4. Population distribution by marital status and age group

| Age Group | Never married | Married | Separated | Divorced | Widowed |
|-----------|---------------|---------|-----------|----------|---------|
| Under 1 | 9 | 0 | 0 | 0 | 0 |
| 1-4 | 44 | 0 | 0 | 0 | 0 |
| 5-9 | 63 | 0 | 0 | 0 | 0 |
| 10-14 | 95 | 4 | 0 | 0 | 0 |
| 15-19 | 124 | 18 | 0 | 0 | 0 |
| 20-24 | 118 | 55 | 0 | 0 | 0 |

| | | | | | |
|--------|------|------|-----|-----|-----|
| 25-30 | 101 | 42 | 0 | 0 | 0 |
| 31-34 | 4 | 67 | 2 | 0 | 0 |
| 35-40 | 1 | 55 | 0 | 0 | 0 |
| 41-44 | 1 | 39 | 0 | 0 | 0 |
| 45-50 | 0 | 27 | 0 | 0 | 0 |
| 51-54 | 0 | 19 | 0 | 1 | 0 |
| 55-60 | 0 | 13 | 0 | 0 | 1 |
| 51-64 | 0 | 23 | 0 | 0 | 0 |
| 65-70 | 0 | 11 | 0 | 0 | 0 |
| 71-74 | 0 | 10 | 0 | 0 | 5 |
| 75+ | 0 | 3 | 0 | 0 | 3 |
| Total | 560 | 386 | 2 | 1 | 7 |
| % cent | 58.6 | 40.4 | 0.2 | 0.1 | 0.7 |

Table 4 shows the population distribution on marital status by age group. The result indicates that people in the community wait until marriageable age before they engage in marriage. Once they are married they remain loyal to their respective family. The Table and Figures did not reveal the behaviour of the population structure with respect to other categories of marital status. 58.6% are not married, 40.4% are married, while only 0.1% of the population is divorced.

On checking the option “Population distribution by work status by age group” and clicking on “Select” command button of Figure 5. Inferences are drawn on structure of work status, based on the data from population census and applying the pseudocodes. A transcript of such a classification for the population distribution by work status and age is presented in Table 5.

Table 5 shows the population distribution on work status and age group. The result indicates that people in the community 19.9% are looking for job, 37.2% are employed while 42.8% are student. The statistics shows that more jobs need to be provided for about 20% of the jobless people of the community.

Table 5. Population distribution by work status and age group

| Age Group | Applicant | Employee | Student | Others |
|-----------|-----------|----------|---------|--------|
| Under 1 | 0 | 0 | 6 | 1 |
| 1-4 | 0 | 0 | 24 | 0 |
| 5-9 | 2 | 0 | 58 | 0 |
| 10-14 | 8 | 2 | 74 | 0 |
| 15-19 | 25 | 19 | 102 | 0 |
| 20-24 | 22 | 64 | 92 | 0 |
| 25-30 | 45 | 46 | 23 | 0 |
| 31-34 | 25 | 41 | 13 | 0 |
| 35-40 | 23 | 32 | 4 | 0 |
| 41-44 | 24 | 30 | 3 | 0 |
| 45-50 | 12 | 33 | 2 | 0 |
| 51-54 | 1 | 15 | 3 | 0 |

| | | | | |
|--------|------|------|------|-----|
| 55-60 | 0 | 13 | 0 | 0 |
| 51-64 | 0 | 17 | 1 | 0 |
| 65-70 | 1 | 16 | 0 | 0 |
| 71-74 | 2 | 28 | 3 | 0 |
| 75+ | 0 | 0 | 1 | 0 |
| Total | 190 | 356 | 409 | 1 |
| % cent | 19.9 | 37.2 | 42.8 | 0.1 |

On checking the option “Population distribution by relation to head of household head by age group” and clicking on “Select” command button of Figure 5. Inferences are drawn on structure of population in relation to head of household, based on the data from population census and applying the pseudocodes. A transcript of such a classification for the population distribution by relation to head of household and age is presented in Table 6.

Table 6, show the population distribution on relationship to head of household and age group. The statistics indicates that most of the houses enumerated has their household head absent 14.6% are husband 6.1% are wives 22.4% are son, while 28.2% and 26.7% are the proportion of daughter and smaller parents.

Table 6. Population distribution on relation to head of household and age group

| Age Group | Head | Husband | Wife | Son | Daughter | Parent | Institution |
|-----------|------|---------|------|------|----------|--------|-------------|
| Under 1 | 0 | 0 | 0 | 1 | 3 | 2 | 0 |
| 1-4 | 0 | 0 | 0 | 10 | 17 | 3 | 0 |
| 5-9 | 0 | 0 | 0 | 18 | 25 | 30 | 0 |
| 10-14 | 0 | 0 | 0 | 23 | 35 | 35 | 0 |
| 15-19 | 0 | 0 | 0 | 31 | 51 | 47 | 0 |
| 20-24 | 0 | 4 | 0 | 33 | 47 | 51 | 0 |
| 51-64 | 0 | 6 | 2 | 41 | 39 | 45 | 0 |
| 55-60 | 0 | 9 | 3 | 13 | 20 | 19 | 0 |
| 51-54 | 0 | 8 | 6 | 7 | 13 | 10 | 0 |
| 41-44 | 0 | 4 | 5 | 6 | 12 | 8 | 0 |
| 45-50 | 0 | 12 | 4 | 2 | 6 | 2 | 0 |
| 31-34 | 1 | 9 | 6 | 6 | 1 | 1 | 0 |
| 25-30 | 1 | 5 | 8 | 2 | 0 | 1 | 0 |
| 65-70 | 2 | 12 | 4 | 5 | 0 | 0 | 0 |
| 71-74 | 5 | 24 | 4 | 0 | 0 | 0 | 0 |
| 35-40 | 4 | 35 | 5 | 3 | 0 | 0 | 1 |
| 75+ | 5 | 12 | 11 | 13 | 1 | 1 | 0 |
| Total | 18 | 140 | 58 | 214 | 270 | 255 | 1 |
| % cent | 1.9 | 14.6 | 6.1 | 22.4 | 28.2 | 26.7 | 0.1 |

On checking the option “Population distribution on educational attainment by age group” and clicking on “Select” command button of Figure 5. Inferences are drawn on structure of population in relation educational attainment,

based on the data from population census and applying the pseudocode. A transcript of such a classification for the population distribution on educational attainment and age is presented in Table 7.

Table 7. Population distribution on educational attainment and age group

| Education qualification | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51+ | Total | % cent |
|--------------------------|------|-------|-------|-------|-------|-----|-------|--------|
| Pry Leaving Certificate | 34 | 24 | 16 | 28 | 35 | 52 | 189 | 19.8 |
| Modern School | 0 | 13 | 5 | 5 | 4 | 12 | 39 | 4.1 |
| Grade III | 1 | 0 | 1 | 0 | 3 | 1 | 6 | 0.6 |
| Grade II | 0 | 0 | 1 | 0 | 6 | 4 | 11 | 1.2 |
| Ass Certificate Exam | 0 | 4 | 14 | 18 | 32 | 35 | 103 | 10.8 |
| Nat. Cert. of Education | 0 | 5 | 26 | 16 | 24 | 17 | 88 | 9.2 |
| Poly. Certificate Exam | 0 | 2 | 7 | 1 | 5 | 5 | 20 | 2.1 |
| Univer. Certificate Exam | 0 | 2 | 16 | 1 | 16 | 1 | 36 | 3.8 |
| Adult Education Class | 0 | 1 | 3 | 2 | 7 | 2 | 15 | 1.6 |
| Junior Secondary School | 0 | 25 | 28 | 18 | 18 | 15 | 104 | 10.9 |
| WEAC/GCE/NECO | 0 | 23 | 19 | 6 | 13 | 15 | 76 | 7.9 |
| OND | 0 | 5 | 17 | 5 | 17 | 7 | 51 | 5.3 |
| HND | 0 | 0 | 13 | 18 | 32 | 10 | 73 | 7.6 |
| H.S.C/ A leves | 0 | 0 | 0 | 2 | 4 | 19 | 25 | 2.6 |
| Postgraduate Diploma | 0 | 0 | 6 | 17 | 22 | 15 | 60 | 6.3 |
| Bachelour Degree | 0 | 2 | 7 | 9 | 19 | 11 | 48 | 5.0 |
| Postgraduste degrees | 0 | 1 | 0 | 0 | 6 | 1 | 8 | 0.8 |
| Others | 2 | 1 | 1 | 0 | 0 | 0 | 4 | 0.4 |
| Total | | | | | | | 956 | 100.0 |

Table 7 shows the population distribution on educational attainment and age group. The presentation indicates that people in this community are literate. Greater percentage of them has at least Primary School Leaving Certificate.

4. Decision Support Session

The Decision support system of the DSSPP is a procedure that provides communication between the user and other components of the DSSPP. It combines the knowledge base with the inference procedure to enhance strategic decision making. The DSS of the DSSPP applies the Adin routine of the visual Basic to integrate both the Microsoft access and crystal report manager into the DSSPP. On highlighting "Decision support system" option of Figure 1, the decision support submenu depicted in Figure 9 is displayed. At this junction, presentation and interpretation of result in pictorial form is desirable. On selecting "population Census Decision" option of Figure 1, the submenu depicted in Figure 2 again appears.

On selecting any of the options in Figure 2, the decision support takes as the input, the output of the first level analysis and presents a bar chart and line chart representation of the results. Some of the results are presented earlier. This is followed by the automatic display of report submenu depicted in Figure 10.

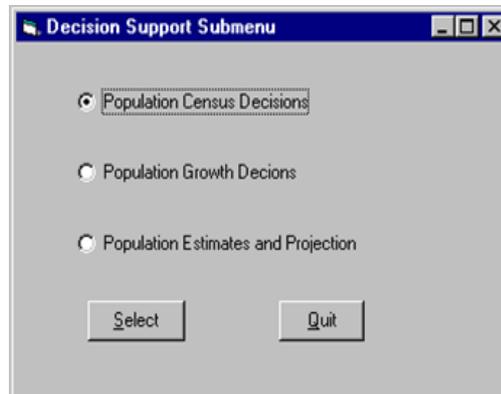


Figure 9. Decision support submenu

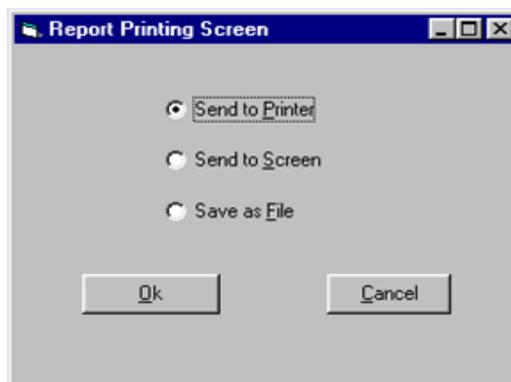


Figure 10. Report printing submenu

The “Report” submenu provides the user with the option of reporting results by printing it on paper, safe keeping on the secondary store and view on the screen. On this report submenu, the user has the access to present results in either hard or soft copy. In other words the user can send output result to the printer, display it on the screen or store it as a file for further purpose.

5. Conclusion

The primary source of information about the population of a country is the population census. This has to deal with a process of collecting, compiling and publishing demographic, economic, and social data pertaining at a specified time or times, to all persons in a country or delimited territory. There have been many developments in demographic analyses of census results in recent years. Most of them fall within the same broad direction of orientation, namely the provision of more information about the social and economic characteristics of populations and about the pattern of social and economic organization of communities.

The *de facto* and *de jure* method of population census enumeration have been discussed in the literature. In Nigeria, the major reason for the establishment of Nigeria Population Commission is to have a standard body whose only focus is to study population dynamics in Nigeria. Until recent times, no noticeable achievement has been made.

In this study, a decision support system for population census is developed with focus on the people of Ilutitun community. The study involves carrying out a population census survey on the target population. Population census was administered, coded and entered into computer using DSSPP to construct the required relations. The DSSPP system is designed and implemented using Visual Basic 6.0, Microsoft access and Microsoft excel. The system incorporates an inference procedure, which filters the turples in the relation for data classification, tabulation and cross tabulation. Derived relations are presented in both line graph and bar graph. Demographic models are also embedded, in the system, which help to estimate some population statistics. The case study was carried out to demonstrate the functionality of the system.

The system being reported in this study is capable of, accepting input data from population census for the purpose of population characteristic evaluation. This may include population distribution or structure of a person

in population census, which can be set systematically as person with the following axes (age, sex, marital status, work station, educational attainment, employment type, sector of the economic and marital statistics) and Representation of results of population census analysis in tabular, line and bar graph.

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