Web Based Automated Census Management System

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Abstract

Many existing methods of census taking are tedious because they involve going from town to town to count individuals from one house to the other. These approaches are also time consuming, criticized and prone to errors because data could be lost in the process due to lack of proper and secure data storage systems. This defeats the aim of a census in the first place. The web-based Automated Census Management System (ACMS) was introduced to fill this gap. ACMS is an easy to use and understand application that requires all citizens to register and provide required information. However, the information provided can be changed or updated in the future. The registration process seamless and access to citizen’s information is readily available via this system. Conclusively, the system designed is functional and could be adopted or adapted by the National Population Commission (NPC) to drive future electioneering processes.

Keywords: Automation, Census, Census Process, Management System, Population.

1. Introduction

Population refers to the sum of all habitants of a geographical place. The United Nations defines a population census as the total process of gathering, assembling, and dissemination demographic, economic, and social data pertaining to a specific time to all persons in a country or delimited part of a country. The process of taking census has been a useful exercise since about 3800 B.C., however, in Nigeria the 1st national census can be traced back to the era shortly after the colonization and a number of other attempts have been made since then. This process is fraught with many challenges which include delirium attempts to bloat figures for political reasons, insufficient manpower, nonexistence of equipment, poor data organization to mention a few [1], [2], [3]. These challenges prevent the presiding body, National Population Commission from having data that truly represents the population of the country. In order to address these challenges, this work aims at developing a web-based system that will ease the burden of data collection so as to minimize possible errors, store the captured data and creating a management module for easy administration.
2. Literature Review

Census is an important exercise that should be carried out in every country for numerous reasons, some of which include: proper representation of all parts of the country, providing historical and genealogical documentation. It becomes more efficient in presenting these advantages to a nation when the process rides on Information Technology. Some of the benefits include: faster access to files and information, confidentiality, little of no need for physical storage areas and centrality of data.

A number of researchers have made proposition on the issues of census. In the works of [4] and [5], a systematic development of a responsive database was done using Microsoft SQL Server 2005 and it was integrated with a web-based application built with C# to have a secured information system. However, [5] incorporated a biometric fingerprint scanner which adds security and authentication to the system. [6] addressed how to perform quality census by proposing how an integrated web information system will be used to manage a multiphase census workflow. In order to solve the time consuming, monotonous and repetitive [7] adopted the System Analysis and Design Methodology (SSADM) where a high-level model of a system was proposed. The parallel change over method was adopted. [2] translated the geometric population model into programming that was executed to yield various populations to be predicted and forecasted while the SSADM was employed. The program front-end was developed using Microsoft Visual Basic 6 and the backend was done using Microsoft Access 2010. Using the forecasting system, countries can make informed decisions for effective policy and planning. The disadvantage of the system is the scalability and portability issue associated with it.

3. Proposed System

The proposed system adopted incremental software development model to build a web-based application for census management system which could be accessed from various platforms, be it a smartphone i.e. android or IOS, laptop or any device that has the ability to connect to the internet. The automated census management system is designed to take the data of every citizen in a specified society (Nigeria) and automate the total population every 10 years. This system aims to eradicate the archaic method of house to house head counting during census. This system comprises of three modules which are:

(a) Admin
Here, the administrator has full access to the database i.e. the data to the citizens when they are uploaded. The admin can view registered users, can view the total population, can decide to view and export in a graphical form. He/she also has the privilege of selecting whom to delete from the database in case of suspicious registration, and finally the authority to edit and make changes to the system they receive suggestions, feedbacks and complaints sent by users and staff.

(b) Users/Citizens
The user is expected to register, login with the BVN/NIN or username. On completion of registration and uploading the required information, he/she can view their details after uploading, and also make changes to their details if the need arises. A user is allowed to register another user and also can send suggestions, feedback and complaints. Users are mandated to ensure they are still alive so as to help reduce data redundancy by logging in and following the instruction most likely done with the click of a button. This is applicable to both admin and staff. The time for this to be done is between Jan1st – Jan 31st of every year. Table 1 illustrates the registration requirement:

<table>
<thead>
<tr>
<th>S/N</th>
<th>FIELD NAME</th>
<th>DATA TYPE</th>
<th>DESCRIPTION</th>
<th>FIELD LENGTH</th>
</tr>
</thead>
</table>

Table 1: User Registration Requirement
(c) Staff
The staff are in charge of monitoring the system from the backend. They approve the information sent by the citizen before inputting it into the system database. They also have some administrative privileges like access to the database and authority to drop a citizen’s information if suspected for fraudulent behavior they can also send suggestions, feedback and complaints.

Table 2: Staff Registration Requirements

<table>
<thead>
<tr>
<th>S/N</th>
<th>FIELD NAME</th>
<th>DATA TYPE</th>
<th>DESCRIPTION</th>
<th>FIELD LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Staff Name</td>
<td>Text</td>
<td>Name of Staff</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Sex</td>
<td>Text</td>
<td>Sex of Staff</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Age</td>
<td>Number</td>
<td>Age of Staff</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Address</td>
<td>Text</td>
<td>Address of Staff</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>E-mail</td>
<td>Text</td>
<td>Staff e-mail</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>DOB</td>
<td>Date/Time</td>
<td>Staff Date of Birth</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>Phone-Num</td>
<td>Number</td>
<td>Staff Phone Number</td>
<td>11</td>
</tr>
<tr>
<td>8</td>
<td>Marital Status</td>
<td>Text</td>
<td>Staff Marital Status</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>Approval-Date</td>
<td>Text</td>
<td>Staff Date of Appointment</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>Username</td>
<td>Text</td>
<td>Staff User Name</td>
<td>15</td>
</tr>
<tr>
<td>11</td>
<td>Password</td>
<td>Text</td>
<td>Staff Password</td>
<td>15</td>
</tr>
</tbody>
</table>

3.1 Requirement Analysis
This has to do with the analysis of both functional and non-functional requirements of a proposed system. This is the process of defining the expectation of the users for the application that is to be built.

(a) Functional Requirements
This defines a function of a system or its component, where a function is described as a specification of behavior between outputs and inputs.
i) Functional Requirements for Admins
1) The System lets the Admin login using his unique ID and Password
2) The System would give the Admin access to the database containing all registered citizen
3) The System allows the Admin make changes to the system
4) The System allows the Admin disable and drop users suspected of fraudulent registration
5) The System allows the Admin Export the current Population at any point in time either in graphical or statistical view.

ii) Functional Requirements for Users/Citizens
1) The System creates a Unique ID for Users which is required for logging in
2) The System requires users to upload the required information
3) The System allows the user to view his/her profile
4) The System allows the User to edit the uploaded information and view it anytime
5) The System allows users to Register another User.
6) The System allows users send feedback, suggestions or complains to the admin
7) The System allows the User change his/her password and also request a new Unique ID if he/she has forgotten theirs

iii) Functional Requirements for Staff
1) The System gives the staff some administrative rights to make changes to the system
2) The System submits information submitted by the User or the Staff to be reviewed before being inputted into the System’s Database
3) The System gives right to the Staff to disable or drop users from the System’s Database if suspected of fraudulent registration.

(b) Non-Functional Requirements
This is a type of requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. The following are requirements:
1) Usability: The System should be able to achieve its goals while being easy to use by all users
2) Security: The System should be secure and not accessible to anybody except admins and staffs
3) Availability: This is a web-based application thereby making it readily available to everyone with internet access
4) Maintainability: The System should be easy to maintain and quick to restore if it crashes or goes down
5) Regulatory: The System must be constantly monitored and regulated according to the set of given rules or instructions else there might be penalties.

Figure 1 shows the process flow of the registration process by the system:
Figure 1: Flowchart diagram to illustrate the registration process

Figure 2 shows the use case diagram for the Proposed System highlighting different functions that the actors can carry out:
Figure 2: Use Case Diagram for the Proposed System

Figure 3 illustrates the Entity Relationship Diagram for the system:
Figure 3: Entity Relationship Diagram
The following (Table3) shows the table of the precondition and post condition in the use case:

**Table 3: Use case Description involving the Pre and Post Conditions**

<table>
<thead>
<tr>
<th>USE CASE NAME</th>
<th>Census Management Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY ACTOR</td>
<td>User/Citizens of a particular Society</td>
</tr>
<tr>
<td>SECONDARY ACTOR</td>
<td>Staff and Admin</td>
</tr>
<tr>
<td>SUMMARY</td>
<td>User Registers, can register a family member, view and edit submitted info</td>
</tr>
<tr>
<td>PRECONDITION(S)</td>
<td>I. Users must be having internet access</td>
</tr>
<tr>
<td>NORMAL FLOW OF EVENTS</td>
<td>I. User Login into the system.</td>
</tr>
<tr>
<td></td>
<td>II. Registers and submit</td>
</tr>
<tr>
<td></td>
<td>III. The submitted info goes to the staff for clarification before being inputted into the database</td>
</tr>
<tr>
<td></td>
<td>I. The admin has the right to view the database and export the total population whenever he wants</td>
</tr>
<tr>
<td></td>
<td>II. Users are Expected to indicate that they are alive during the first month of every year</td>
</tr>
<tr>
<td></td>
<td>III. Every 10 years, the System automatically gets the total number of citizens from the Database.</td>
</tr>
<tr>
<td>POST CONDITION(S)</td>
<td>Database is Updated</td>
</tr>
</tbody>
</table>

4. Implementation and Output

The automated census management system applies various seamless methods and techniques to help in correcting problem areas in the existing system. The Development Tools employed include HTML (hypertext markup language), CSS (Cascading Stylesheet), JavaScript, C#, ASP.NET Core, SQL (Structured Query Language), IIS Express and Visual Studio (as Integrated Development Environment).

Figure 4 depicts the login page which requires users to login using their BVN/NIN and their Secured Password and they can recover their password if forgotten:

![Figure 4: Login Page](image)

Figure 5 represents the Registration page where the details of the citizens are requested and to be submitted to the staff for verification before storing in the country’s Database. This information can be updated at any
time. There is also an indication if a person is presently in the country or not which helps to maintain an accurate population figure.

![Figure 5 Registration Page](image)

Figure 5 Registration Page

Figure 6 shows the Consensus Page revealing important facts and figures, visible only to the admin. It contains the summary of the information stored in the database in a simplified view. Here you can see the total population in general, the total population of citizens available in the country, the total number of states registered there by showing the state with the highest population, the total number of males, females, employed citizens, unemployed citizens and Marital Status of the citizens.

![Figure 6: Consensus Page](image)

Figure 6: Consensus Page

The Feedback Page (Figure 7) is where both users and staff can write their feedback, suggestions, and complaints concerning the system or useful feedback. For privacy reasons this would be sent anonymously. This makes the users or staff feel safe when issuing a complaint, making a suggestion of how to improve the system or giving feedback of the whole registration process or experience.
5. Conclusion and Recommendation

This project aims to efficiently and seamlessly eradicate the existing system in census taking and information gathering and has offered my partner and I the opportunity to contribute to this task by developing a web application that takes in the details of every citizen (children, teens or adult) in a specified area which can be used by the government on request for resource allocation and other reasons best known to the government, with this we can accurately estimate the total population of people and it simplifies census taking by automatically generating the total population every 10 years.

References