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A Smart Database System for Civil Registration and Vital Statistics

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Abstract - ***Civil Registration and Vital Statistics (CRVS) Systems are playing increasing roles in national and global data infrastructure, facilitating the achievement of key developmental goals. The performance of CRVS systems in many developing countries including Nigeria is sub-optimal and information on their structure and operations scanty. The major weaknesses include intra-organizational conflicts in resource allocation, weak ICT infrastructure and lack of a central repository system with reliable data. These are compounded by overarching contextual issues namely registration unfriendly sociocultural norms, weak national data infrastructure, systemic corruption, poverty and undeveloped civic culture. The aim of this research work is to develop a smart database system for civil registration and vital statistics, that will handle activities of civil registration, provide reliable data sources for vital statistics, maintain eligible voter's database and being able to capture birth and death anywhere and anytime. This research work adopted a qualitative research method and an Agile model for system development. The proposed system was evaluated in terms of accessibility, speed, cost, and capacity, and the result confirmed that the system will be able to assist the government in terms of having a portable, available and globally accessible system, and maintaining a reliable data source. The system implementation is achieved using PostgreSQL, as the backend database, Python and Django as the application programming interface.***

Keywords: Civic Registration, Vital Statistics, population, Smart Database, tiered architecture

I. INTRODUCTION

Vital event registration is the systematic, continuous, permanent, compulsory and universal recording of the occurrence and characteristics of vital events (live births, deaths, fetal deaths, marriages, and divorces) and other civil status events pertaining to the population as provided by decree, law or regulation, in accordance with the legal requirements in each country. Records from vital event registration systems are also the main and preferred source of continuous vital statistics on live births, fetal deaths, marriages, divorces, legal separations, and deaths. Civil registration is the foundation of a legal system for establishing the rights and privileges of individuals. Birth registration opens the door for a new-born child to enter into a permanent identity.

A birth certificate is considered as a ticket to citizenship, without which an individual does not officially exist and therefore lacks legal access to the privileges and protection of a nation. On the other hand, a death certificate is a mandatory proof for relieving a person from the entire social, legal and financial obligation and supports his/her family members on having the property rights and schemes like policy benefits and other entitled privileges. The definition of vital events is usually backed by statutory enactments within a given administrative territory but usually includes live births, deaths, stillbirths, marriages, and migrations.

Data from CRVS is useful in epidemiological and public health analysis, health systems studies, policy planning and implementation. Administratively, it provides a platform for citizenship right determination, legal processes, enrolments (for schools, employment, etc.) as well as for national planning and resource allocation to every citizen of a delineated territory [1]. The completeness rate of registration of vital events have been improving over the years, but particularly for birth registration, albeit less than expected. The WHO puts Nigeria's birth registration completeness rate as at 2013 at 30%; and sadly, there is no national average for death registration in Nigeria [2] and only 23 out of 36 states (FCT included) reported on the numbers of deaths that were recorded between 2014 and 2016 [3].

From this foregoing therefore, Nigeria consequently has incomplete vital statistics, lacking in leadership and particular viable framework to assess, improve and track progress. Perhaps, this informs why Nigeria ranked very low in an assessment of CRVS systems on the basis of Vital Statistics Performance Index (VSPI <0.70) between 2005 and 2012 [4]. Nigeria was particularly weak in three components - registration completeness, cause of death detail and data quality. Hence, there is poor data from CRVS system to inform government policies and good governance and this impacts effective public service delivery and sustainable development. Nigeria as a country is in the throes of daunting security challenges, infrastructural gaps and other socio-economic challenges underscoring the need for robust sources of data on the citizens and their conditions. This underlines the critical and expanding imperatives of a functional CRVS System to various aspects of national life.

The study however presents a smart database system for civil registration and vital statistics, which provides a more efficient and effective means of birth and death registration, minimize data duplication (providing a central repository system) and mitigate distances.

II. RELATED WORK

E–Birth Registration and Certificate Issuance System [5]. Birth registration provides a person with a name and identity and usually enables access to a wide variety of basic rights and services through the acquisition of a driving license, passport, and voter's registration. The absence of birth registration may lead to the deprivation of such rights and services, contributing to the emergence of different forms of poverty and under-development. Manual child-birth registration is complex and impractical for a large increase in the population of newborn babies.

The proposed E-birth registration and certificate issuance system provide an easy way of registering and obtaining the birth certificate anywhere and at any time. Through this proposed system, anyone can apply for birth certificates, can view the online application status and can even verify or download their birth certificates. In this research, the system is developed on three-tier architecture; The back end which is piloted by the MySQL Database Management System, this stores all information on the website which is not visible to the end-user. The Middle end which is characterized by a web server that is; Apache Web Server, MySQL DBMS, PHP (WAMP) server and; The front end which is implemented by HTML (Hypertext Markup Language), CSS (Cascading Style Sheet), jQuery and Java Scripts.

A Mobile-Based Child-Birth Registration System in Nigeria [6].

They propose a mobile-based child-birth registration that will be able to assist government officials in terms of having a portable and globally accessible system, speeding up the child-birth registration process, reducing the cost of registering a child and capable of keeping registration details for future use. In this research, hash (SHA-1) encrypting technique as our method of encryption because the level of security provided by a hash function is based on the difficulty of generating a plain-text that will produce a given hash signature (the output of the hash) in order to prevent packet sniffing hackers from being able to steal a user's data. Bar code was also used.

By using a barcode, data (birth ID) is woven into the birth certificate, giving it digital identity, which will go a long way in reducing human error, recognition errors and reduces the level of forgery of birth certificates.

The system implementation was achieved using MySQL as the backend database, and object-oriented PHP as the application programming interface.

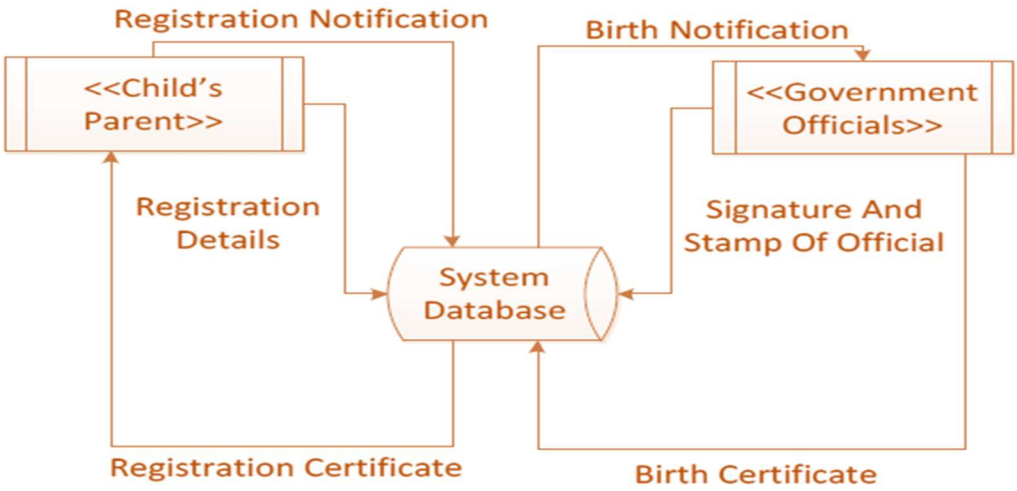

Fig. 1: Proposed Architecture for the Mobile-Base Child-Birth Registration System.
Source: (Olusola O. A et al., 2017)

A Web Application for Birth and Death Certificate Request [7].

He proposed web-based birth and death certificate request application that will be able to assist government officials in terms of having an easily and globally accessible system, speeding up the process of issuing birth or death certificates, it eliminates having a certificate in paper form, it reduces the stress of communicating with government officials and finally reduces the cost of obtaining certificates. The proposed system was made up of a two-level architecture, the front-end, which is the actual program and the back-end which is the underlying database. The user interface would consist of two sections for the user's section. Here, the user would be able to register on the website. Then the user can log in to the website with a user-name and password. The user fills an application form then afterward uploads a scanned copy of any proof of identity.

The user also uploads proof of birth or death depending on whichever he/she needs. Then proceeds to fill the birth or death certificate form as needed. The user pays the necessary fee for the selected certificate through the payment gateway. Then the administrator section, the admin logins to the website. The admin is able to see all the applicants at once, the admin is able to view the details of each user that have applied, the proof of identity and proof of birth or death.

The admin makes necessary verification He can then approve the application for a certificate after verifying citizen's payment. The admin then messages the user that the certificate is ready for download. The user logs into the website to download the certificate in Adobe Portable Document Format. The system implementation of the proposed system is achieved using MySQL for the database, PHP for programming the interface and Bootstrap for the User Interface.

III. PROBLEM FORMULATION

Child-birth and death registration became an issue of utmost importance as a result of difficulties encountered while obtaining accurate population statistics which is essential in social services planning for any government and in ensuring that adequate resources and budgets are made available to address the needs of the citizen.

The problems with the existing system include:

I. Long distances to registration centers.
II. The manual method of registration.
III. Duplication of data.

Hence, there is a need to establish an effective, available and reliable system for civil registration and vital statistics.

IV. PROPOSED SOLUTION

The proposed system is a Smart Database for the Civil Registration and Vital Statistics has a 3-tiered client/server architecture, which consists of a user-interface, processing level, and data level.

The user-interface layer contains all that is necessary to directly interface with the user. The middle tier typically contains the processing logic. Finally, at the bottom, the data level actually manages the data that is being acted on.

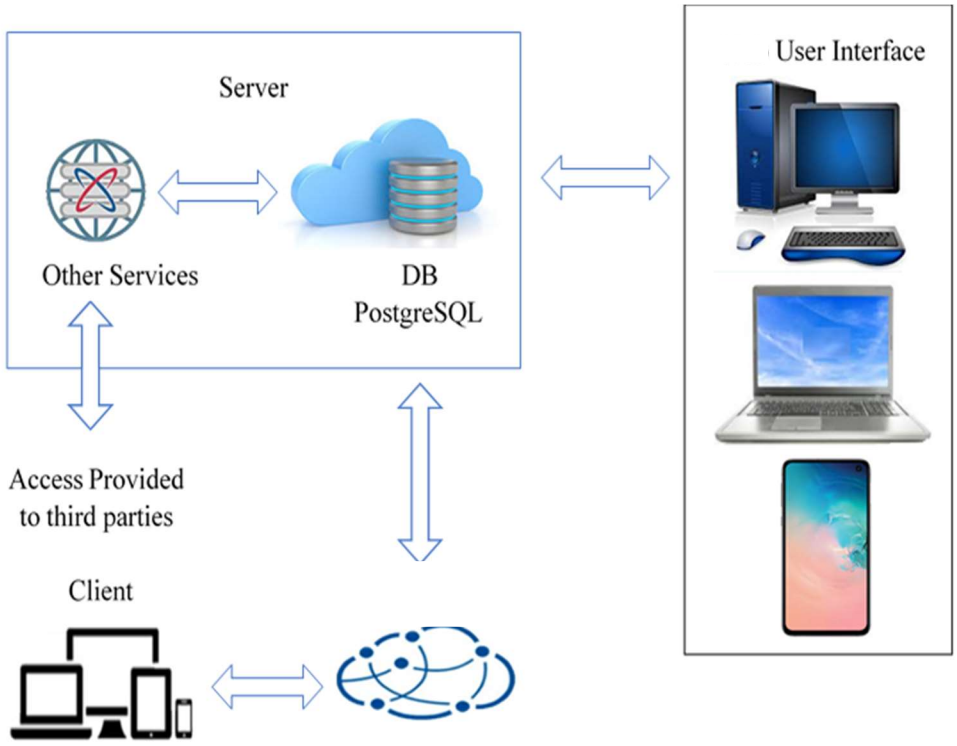

Fig. 2: Proposed System Model

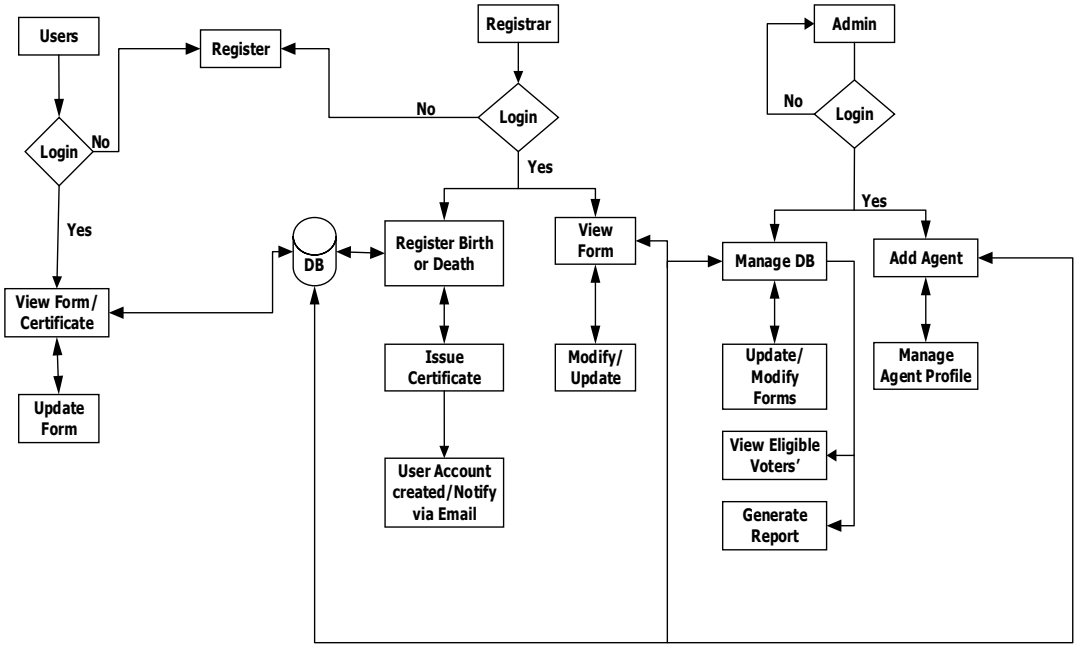

Fig. 3: Basic flow chart

V. RESEARCH METHODOLOGY

In this research, we have adopted salted hash (SHA-2)encrypting technique as our method of encryption because the level of security provided by a hash function is based on the difficulty of generating a plain-text that will produce a given hash signature (the output of the hash) in order to prevent packet sniffing hackers from being able to steal a user's data. By using QR code, data (birth, death ID) is woven into the birth and death certificate, giving it digital identity, which will go a long way in reducing human error, recognition errors and reduces the level of forgery of birth certificates.

VI. RESULTS

The system is capable of generating a report based on the data collected and these could help the economic policies makers to have an efficient data that can be used in the country in implementation of budget by different organization, provide eligible voters list and maintain death and population stat.

VII. DISCUSSION

A web-based Demographic system helps to ensure the conduct of a good and credible Demographic data collections program. There are three (3) primary modules contained in this system. The integration and systematic combination of the module. The modules are as follows:

I. Administrator Module
II. Registrar Module
III. User Module

A. Administrator Module

The Administrators module is one who has privilege to assign privileges, manage both user and vital registrar account. The administrator is the one who fills or changes the bio data form manage eligible voters' list and generate vital statistics. The administrator is the superior of this system.

B. Administrator/Registrar Login Page

This is the Login page through which the admin or registrar specifies it login credential for him/her to be granted access into the system. Both admin and registrar access are denied until he/she enters a valid username and password.

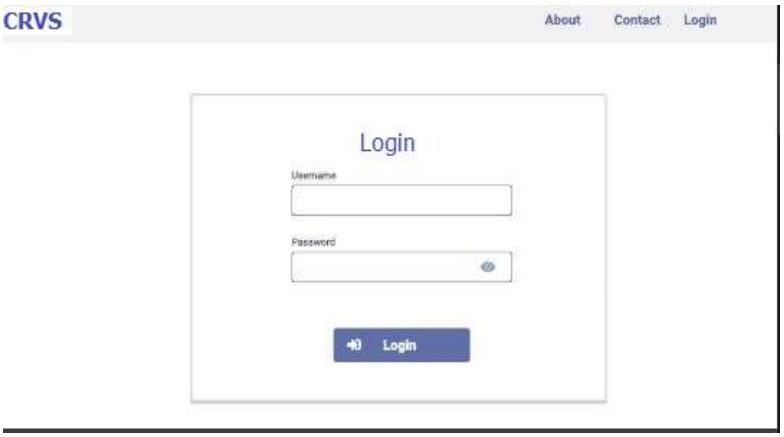

Fig. 4: Login page

Admin would have access to choose registration categories such as a Registrar registration, Group or Organization registration, While Registrar can register birth and death, modify and update citizen data and issue out certificate.

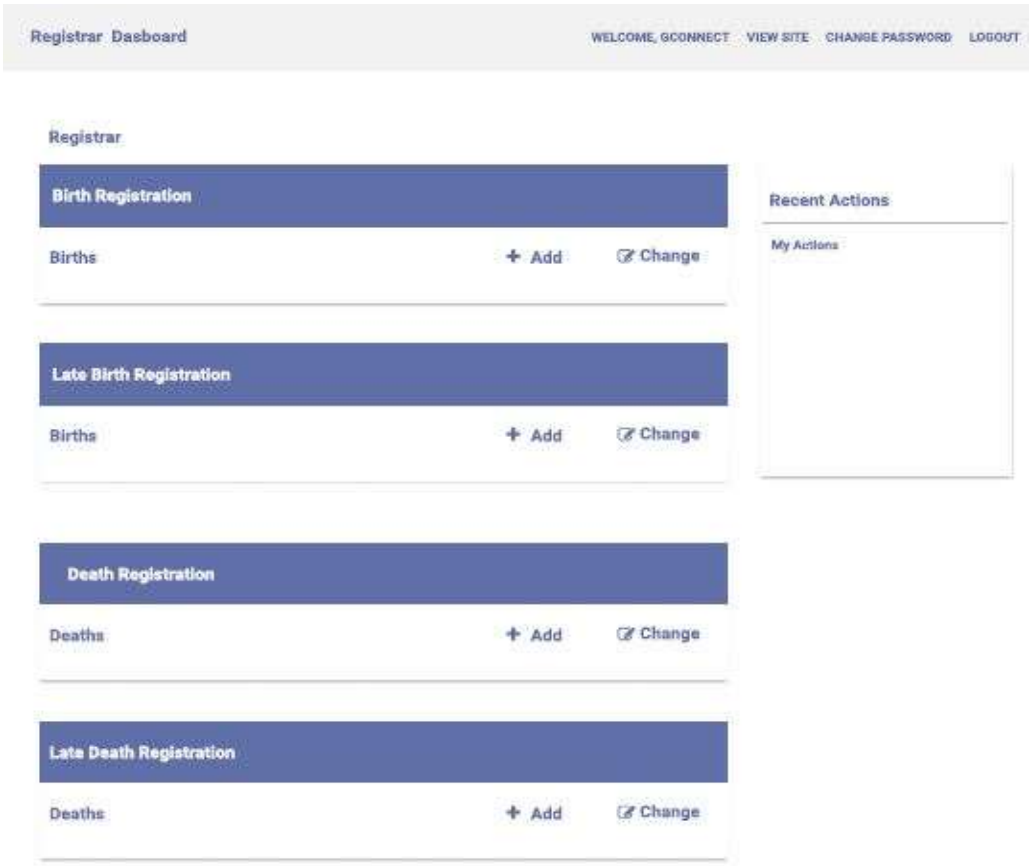

Fig. 5: Home page after Registrar Login

C. User Module

The User module gives user access to view his individual records, update his details or even view is certificate or death certificate of his relatives if granted access.

D. Online Birth/Death Registration Form

Birth or Death registration form is another category been selected from Registrar home page. Registrar has access to register birth and death, also generate a registration number serially according to their state.

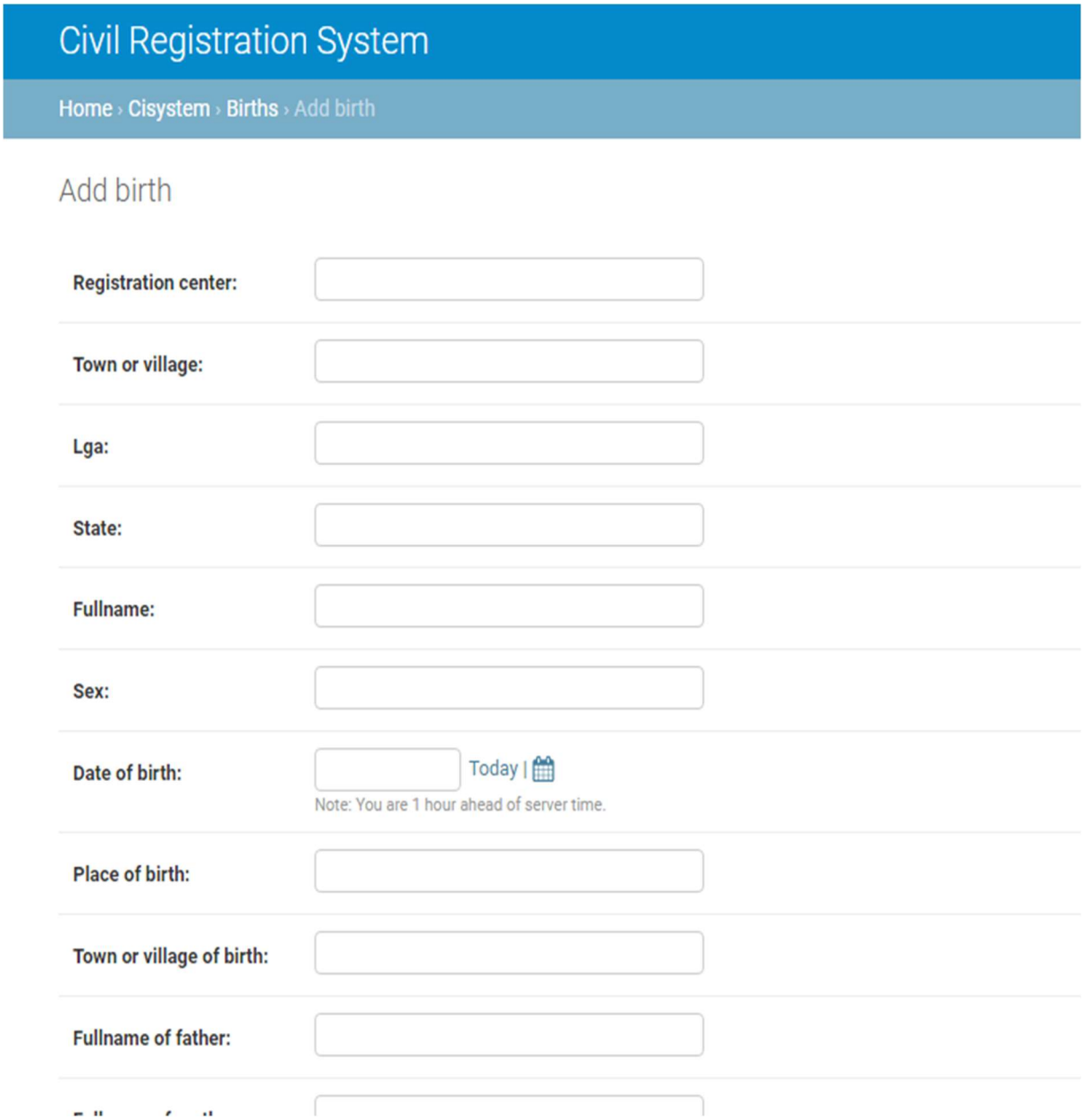

Fig. 6: Birth Registration Form

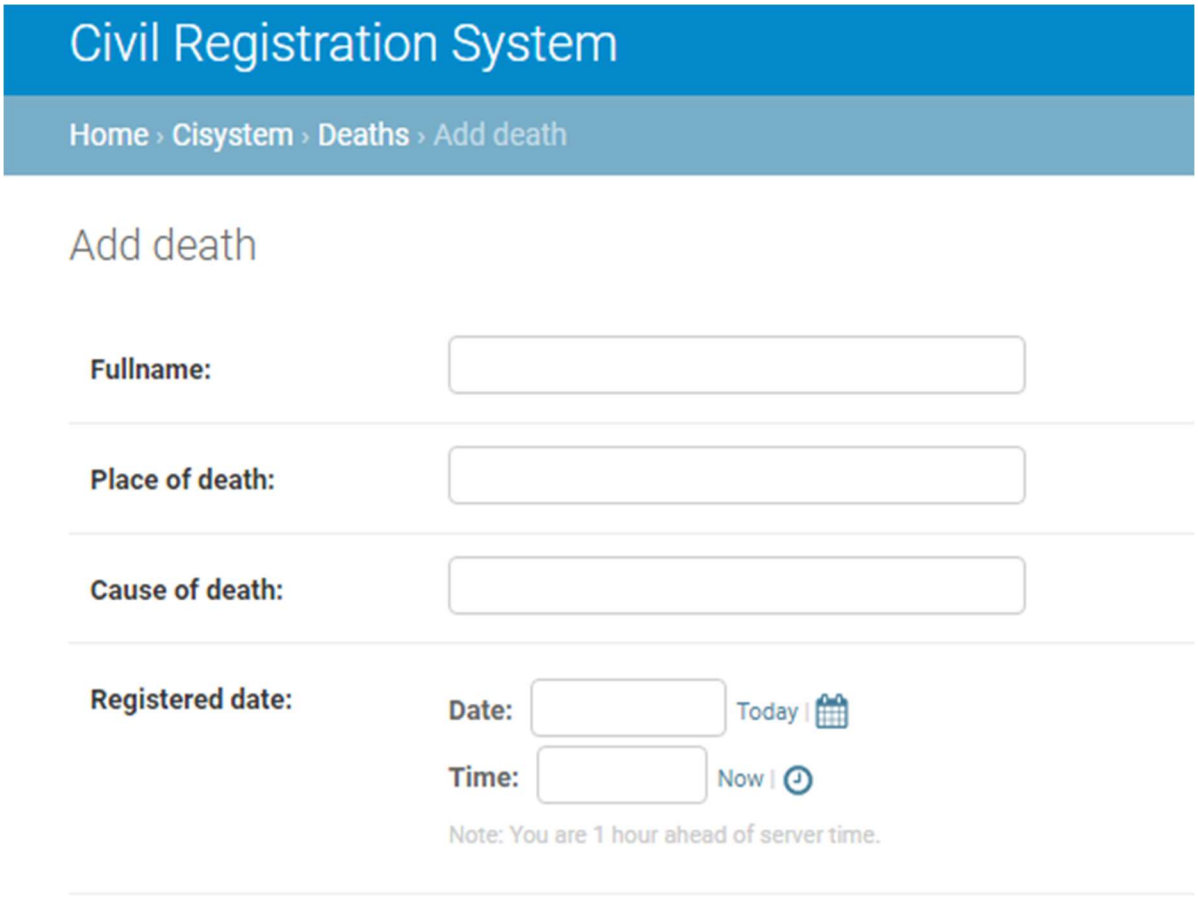

Fig.7: Death Registration Form

E. Report Capabilities

The system we design is capable of generating a report based on the data collected and these could help the economic policies makers to have an efficient data that can be used in the country in implementation of budget by different organization, below shows the sample report generated by the system with the sample data we used to test the capability of the system.

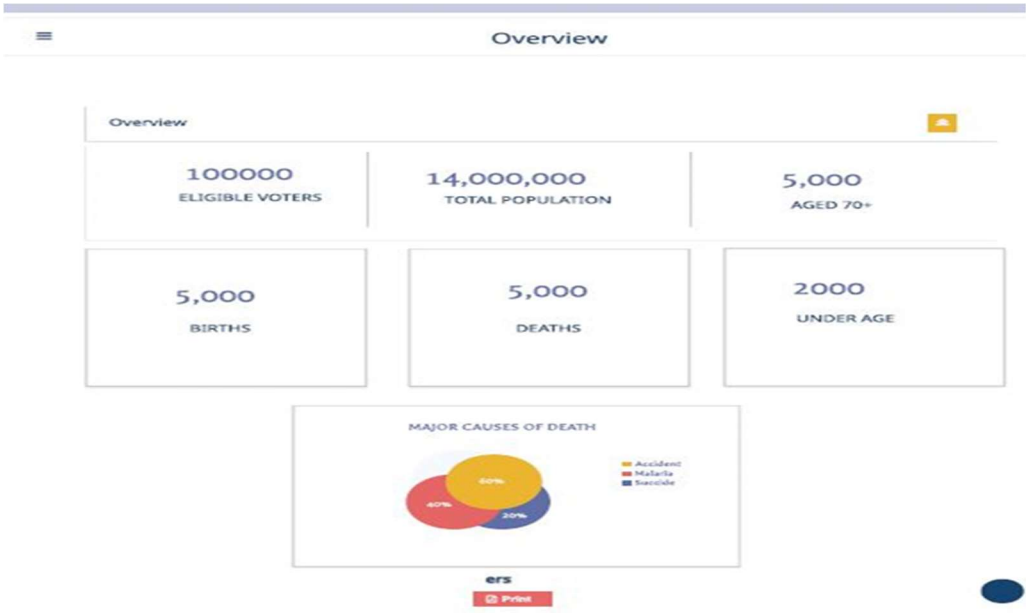

Fig. 8: Population Update

VIII.. CONCLUSION

This study has been able to provide a more effective, efficient and globally accessible platforms for birth and death registration. The smart-database technique enhances fast execution of birth and death registration, statistical and voters' procedures. The robust security measures adopted ensures adequate security of gen key and avoids its duplicity.

IX. FUTURE WORK

With the advent of biometric technology, the direction of this research should now focus on employing the more globally accessible device to implement this study. The encryption technique used can also be another consideration for improvement.

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