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DEVELOPMENT OF A PROTOTYPE ONLINE SYSTEM FOR BIRTH AND DEATH REGISTRATION IN NIGERIA

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Abstract
Accurate population statistics is very important for good development planning and economic management of any country. This can be achieved through adequate and close registration and monitoring of births, deaths and migrations; many developing countries however do not have adequate facilities for these tasks. Where such facilities are available, the processes are tedious, slow and stressful, hence they are not widely used. This work is an attempt to bridge the gap, it presents an online information system for monitoring births and deaths rates in Nigeria. A database for registering births and deaths was created with SQLite at the backend, JavaScript – a lightweight, interpretive scripting language was used to ensure dynamic web pages and object-oriented Node JS for the server side language due to its efficiency as a server side language.
Keywords**: birth registration, death registration, population, birth rate, death rate, online system**

1.0 INTRODUCTION

The population of any country, either developed or developing depends on three demography components: birth rate, death rate and migration. Olatayo and Adeboye (2013) opined that accurate population statistics which is very important for development planning and economic management is lacking in Nigeria. Apart from information on the country's entire population, it is essential to know the rate at which the population is increasing and decreasing.
Accurate data collection on birth and death rates is vital to development planning and economic management of a nation. The government needs the information for budget planning, provision of basic amenities in the country, and this information gives the government a better understanding of the dynamics of poverty and also, to make adequate plans such as making provision to avoid inflation or recession in the country in later years, allocation of government resources, monitoring and evaluating welfare programmes. Birth registration is a process by which the birth of a new born baby is recorded in a civil register by the applicable government authority. It establishes the existence of the child under the law and provides the foundation for ensuring the rights of the child. According to WHO (2014), two-thirds (38 million) of 56 million annual deaths are still not registered globally, almost half of the world's children go unregistered. According to UNICEF (2005), countries like Amenia, Burkina Faso, Coata Rica, Turkey, Somalia have no birth registration data, Afghanistan, Bangladesh, Ghana have less than 25% of their children registered, Angola, Niger, Gambia, Sierra Leone registered less than 50%. Nigeria, Botswana, Indonesia, Kenya have less than 75% and Albania, Bolvia, Korea, Venezuela have above 75% of their children registered. UNICEF (2007) states that about 70% of the 5 million children born annually are not registered in Nigeria. Ignorance, distance to the registration centres, difficulty of access or attached cost and system complexity are some of the problems preventing people from registering births in Nigeria.
Birth and death registration gives an individual the right to be counted at both extreme ends of life which is fundamental to social inclusion. Death registration and certification are often required prerequisites for burial, remarriage, or the resolution of criminal cases (WHO 2014).

1.1 Birth Rate

The British-American dictionary defines birth rate as the ratio of total live birth to total population for a specific community or nation in a specific period. Birth rates determine the increase in population of a nation in a particular time (Alho and Spencer 2005), this covers the number of children born in a year in a community. Birth rate can be calculated using live birth by birth registration system and counts from population census. Data on birth are gathered through maternal features including age, live-birth order, race for maternal, marital status of the parents, method of delivery and other infant characteristics such as birth weight and gestation period. The Nigerian Census conducted in 2006 by the National Population Commission puts the population of Nigeria at about One Hundred and Forty million (Olatayo and Adeboye 2013). This census reports indicate that Nigeria is one of the countries with the highest population in the world. The origin of this massive population can be traced to high birth rates. The consequence of over population is well known, with feature of socio-economic problems such as low standard of living, poverty and unemployment, among others. The factors that determine high birth rates or low birth rates are high fertility and low mortality rates. The total fertility rate can be

interpreted as the expected number of children a woman will have in her lifetime. In some countries, the reduction of birth rates has been a major concern because high birth rates are accompanied with health problems, low standard of living, low level of education, unemployment and economic problems. Low birth rates on the other hand, may force the government to pay more attention to welfare programs, advancement of health sector and awareness to educate families.

1.2 Death Rates

According to Oxford English Dictionary, death rate is the number of death per given unit of population over a given period of time. It is also known as mortality rate. Monitoring of death rates is needed to observe the change in population of a country and to monitor global health system. Well monitored death rates can be used by government officials or health officials to determine the causes of death, the age, gender, and time of death of the deceased (Musah *et al.* 2015). This information is very essential in monitoring the health system of a country. However, the causes of death may be from some deadly diseases, auto crash, plane crash and murder. In Nigeria, death is caused by few infections which are ecological situated. Poor ecological sanitation as evident in poor sewage disposal, deficient supply of clean drinking water are the real reasons for some known sickness like Typhoid, Malaria, Cholera and a few others (Olatayo and Adeboye 2013).

World Health Organization revealed that about 830 women died every day due to complications during pregnancy and child birth (WHO 2014). Stroke, chronic lung disease and lower respiratory infection have been the top killers for the past ten years. Road accident claims many lives each day and other causes of death according to medical scientists are those that arise from habits such as tobacco, smoking, alcohol and illegal drugs or drug abuse. By relating all deaths in the population of a community to the basic cause of death, the danger of a disease can be determined and it can also help in taking preventive measures against the disease. Decision makers in the health sector including doctors, matrons, nurse, and basically all health practitioners need an up-to-date understanding on causes of death, the age range of the deceased, the season and how communicable the disease is. Malaria is one of the commonest diseases that claim many lives in tropical countries including Nigeria (Olatayo and Adeboye 2013). The calculation of crude birth rate and crude death rate in the time interval *t* and *t+1* is given by:

$$Crude\ Birth(or\ Death)\ Rate = \frac{Number\ of\ Births\ (or\ Deaths)\ between\ t\ and\ t+1}{Mean\ Total\ Population\ Size}$$

where

$$Mean\ Population\ Size = (N_t + N_{t+1})/2 \quad \ldots\ldots\ldots\ldots (1)$$

1.3 Types of Death Rates

There various types of death rate and some of them are defined in the following:

a. **Crude Death Rate:** This death rate or mortality rate counts all deaths, all causes of death in all ages and for both sexes.
b. **Age-Specific Death Rates:** This counts only death in specific age group.
c. **Prenatal Death Rate:** This is the number of still births (foetal death) in a community.
d. **Infant Death Rate:** The number of deaths of children that are less than five years of age.
e. **Maternal Death Rate:** The number of maternal death per 1000 women of reproductive age in the entire population; the reproductive age is generally defined as ages 15 to 44 years of age.
f. **Cause-Specific Death Rate:** the death rate for a specified cause of death in a population.
g. **Late Mortality Rate:** This is the total number of birth in the late stages of an ongoing treatment.

2.0 REVIEW OF EXISTING SYSTEMS

Existing literatures on birth and death registrations are reviewed in this Section. Civil birth registration has been a method of monitoring birth and death rates. The civil registration is a way of keeping accurate and consistent record of the people in the community. Birth registration is a coordinated information system that primarily generates legal, administrative and statistical information that benefit the citizens, community and government and non-governmental agencies. Registration of vital events involves recording birth and death rates.

According to (Muzzi 2010), registering children at birth is first step in securing their national recognition before the law and protecting their human rights. Currently in Nigeria children are register at the hospital where midwives and health workers are instructed to register the child immediately after delivery and most times the parents register the child at the local government later. The parent provides the child's full name, child's place of birth, child's date and time of birth, child's gender and parents' details. A birth certificate is given to the parent as a proof of registration. Birth certificate is the first step towards citizenship in Nigeria, it is the document that can be used to obtain other documents like apply for international passport and admission into tertiary institution. Sometimes, during child health campaigns children are registered to satisfy the requirement for that specific campaign, this information can also be used to calculate the number of birth in that community. UNICEF (2013), stated that the promulgation of birth and death registration in Nigeria was Decree 39 of 1979. The decree is aim at establishing consistent national and state level birth and death registration. Decree

number 69 of 1992 gave national population commission the authority to take over birth and death registration nationwide. This commission has made effort of creating maximum of three registration centre in each local government area of every state in Nigeria. The citizens are given a form to fill at the local government registration centre and submit to the local government registrar. The registrar signs and issues a birth certificate to the registered citizen and a token amount is charged as the registration fee.

Death registration is mainly carried out at the hospitals, the data on death rate and causes of death are mainly drawn from hospital records. Between year 2003 and 2005 the National Population Commission (NPC) developed a plan to create more appropriate birth and death registration system. The plan is to create awareness on the importance of birth and death registration to individuals, society and to the nation. The National Population Commission waives the registration fees for three year (from July 2005-July 2008) as way to encourage the citizens to participate in the registration system. Ajayi *et al*. (2016) opined that the conventional method for birth registration in Nigeria is by human inspection. This manual method of registering birth and death is complex and for the large population in Nigeria. The birth and registration system in Nigeria has been a major concern in government and health sector since countless number of children still go uncounted every year.

Ajayi *et al*. (2016) proposed a mobile-based child-birth registration system in Nigeria. The research was carried out to address the issues facing child-birth registration in Nigeria. It was discovered that the obstacles to child-birth registration are the loss of birth certificate by parents, long distance to registration centres, difficult access to civil registry services and many parents are not aware of the importance of child-birth registration. This system is to assist the government officials in terms of portable and globally accessible system to speed up child-birth registration system also to reduce the cost of registration. The performance of this mobile application was evaluated with respect to accessible, speed, cost and capacity.

In 2006, a birth and death registration information system was developed by NIC in Andama and Nichobar Island in India called (BIRDS). According to Guatam, Mini et al. (2015) the software is a web based in open source platform but now hosted on NIC server.

The Sweden and Finland have continuous register based population statistic since 1749 onwards. The registers were kept by the church based on ecclesiastic law of 1686. Each parish keep track of vital processes of births, death, marriages and changes of parish (Alho and Spencer 2005). In March 2010, an information system was developed called population information system. The combination of all existing registers data is stored in a national database of this information system. The software is a web-based system that contains forms that accept input from citizens of Finland. The voting register of Finland is based on the information from this web application. Birth and death rates are monitored through this platform. The system is open to citizens residing abroad to keep personal data that has been entered updated.

The introduction of online information system for birth and death registration in Bangladesh has been a great benefit to the government and health sector. According to Musah *et al*. (2015), citizens now used the birth certificate as proof of age to gain legal access to services which include passport application, school admissions and marriage registration.

In 2009, an online information system was developed in Bangladesh called Birth Registration information system (BRIS) to enable local registrars in the country and embassies abroad to register birth and death. Also, the system enables issuance of birth and death certificates through a web-based application. All birth and death data collected through this platform are stored in a central database. The database contains the basic information of every individuals in the country, from the day there were born till date.

The United Nation Children Emergency Fund (UNICEF) provides technical support and training on the effective use of the online birth registration system to guarantee consistency and quality of the birth registration in Bangladesh (UNICEF 2015). UNICEF also facilitates coordination between local government division in Bangladesh, health services and national and local subsidiaries to ensure that birth of new-born children is registered within the forty-five days.

The major problem facing this type of information system is illiteracy, that is, lack of public awareness of importance of birth and death registration. Educated parent are aware of the importance of birth and death registration unlike the uneducated peers. Lack of effective public awareness may also be a problem where some rural community may not be aware of birth or death registration system and the importance to the society. In this work, an online information system for registration of birth and death and monitoring birth and death rate is proposed.

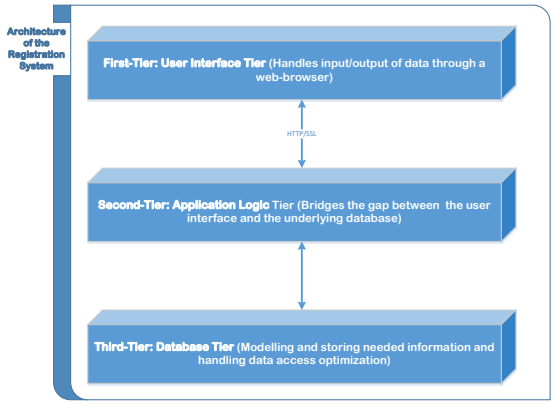

Figure 1 Three-Tier Architecture of Online Birth and Death Registration System

In Nigeria, the National Population Commission has a birth register in each of the offices across the country. But these are stand-alone applications which can only afford local generation of statistics. The proposed system is proposing a centralized database system that can be populated from the various birth and death registries. Thus, statistics can be generated across the country and information can be available for effective planning.

3.0 THE PROPOSED SYSTEM

The proposed system is aimed at providing a tool registering birth and death which are the two extremes of human existence in Nigeria and indeed the world over. It would subsequently provide avenue for monitoring birth and death rates, as statistics for economic and demographic planning. It is a web-based system that automates and simplifies the registration of birth and death. This system will allow the Registrars at each level of Government to perform online registration of birth and death taking place within their jurisdiction and to monitor the birth and death rates. Its features are easy registration of birth and death, security and good storage and live views of the number of registration. The three-tier system architecture was adopted in this development. The three-tier architecture is a client-server architecture used in web application development in which the functional process logic, data access/computer data storage and user interface are developed and maintained as independent modules on separate platform. Three-tier architecture was chosen due to its flexibility that allows any one of the three-tiers to be upgraded or replaced independently. The three-tiers are presentation tier, logic (business) tier, and data tier. Figure 1 depicts the proposed system architecture.

3.1 System Design

The Unified Modelling Language (UML) is used to describe the flow of this system. The Unified Modelling Language (UML) is a standard language for specifying, visualizing, constructing, and documenting the artefacts of software systems. Four UML diagrams are used to model the proposed systems, these are: Class Diagrams (Figure 2), Use Case diagrams shown in Figure 3, Sequence diagram as depicted by Figure 4, Activity diagrams depicted in figure 5 and 6

Figure 3 depicts the Use Cases available in the system. The two actors involved are the Registrars and the Admin. The Registrar can login and perform birth and death registration. After the registration exercise, he logs out of the system. The Admin on the other hand can login and perform statistical operations involving the generation of birth rate and death rate. Figure 3 shows the Sequence Diagram of the Registration system from Login, to Registration of birth and death. Figure 4 shows the activities of the Admin on the system while Figure 5 depicts the generation operations of the system. The class diagram of the registration system is depicted in Figure 6.

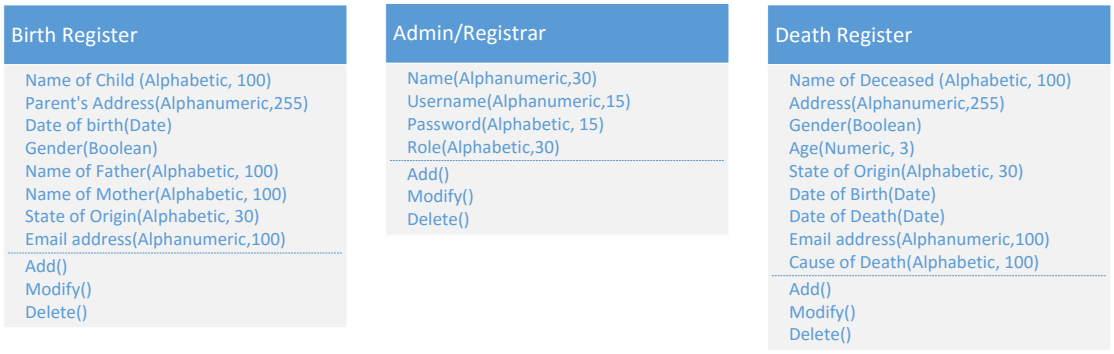

Figure 2 Class Diagrams of the Registration System

3.2 Implementation

A database is created with SQLite at the backend to register births and deaths, HTML and CSS are used to create the web pages while JavaScript, a lightweight, interpreted scripting language is used for the dynamic web contents. The object-oriented Node JS is adopted for the server side language due to its efficiency as server side language. The birth and death registration system is user-friendly and menu driven. Icons can be clicked to select registration forms for birth or death registration and the registration forms can be filled and submitted from any location provided there is Internet Connection. Snapshots of the processes are depicted in Figures 7-12.

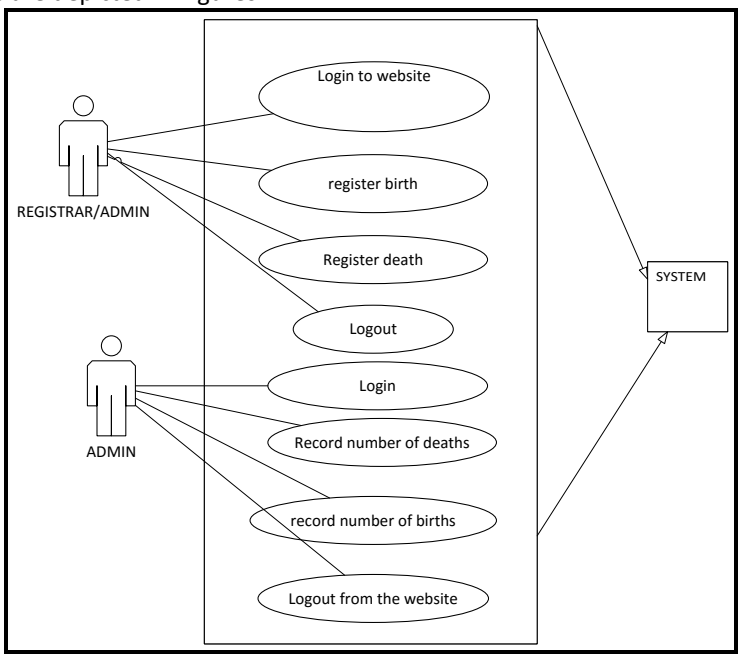

Figure 3 Use Case Diagram of Birth & Death Registration System

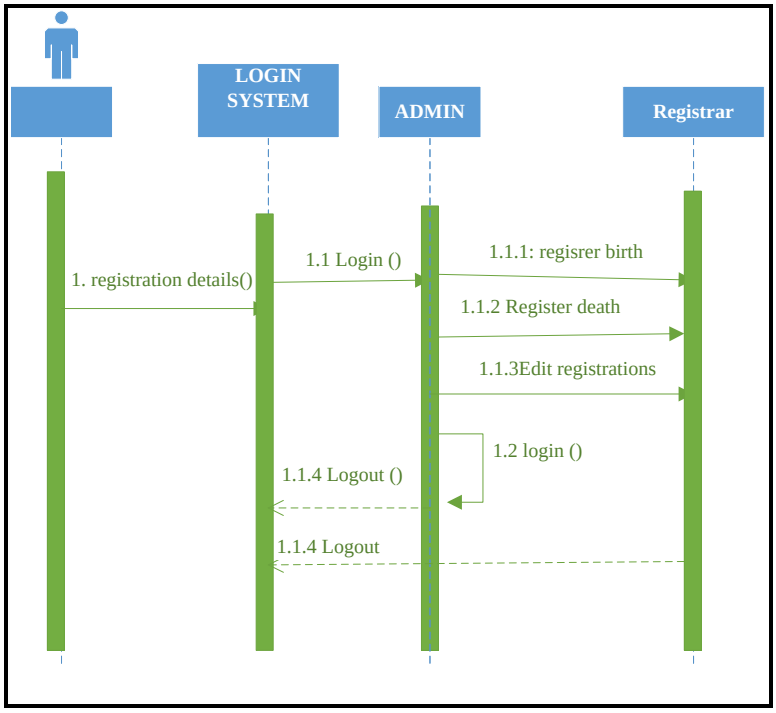

Figure 4 System Sequence diagram for the registration system

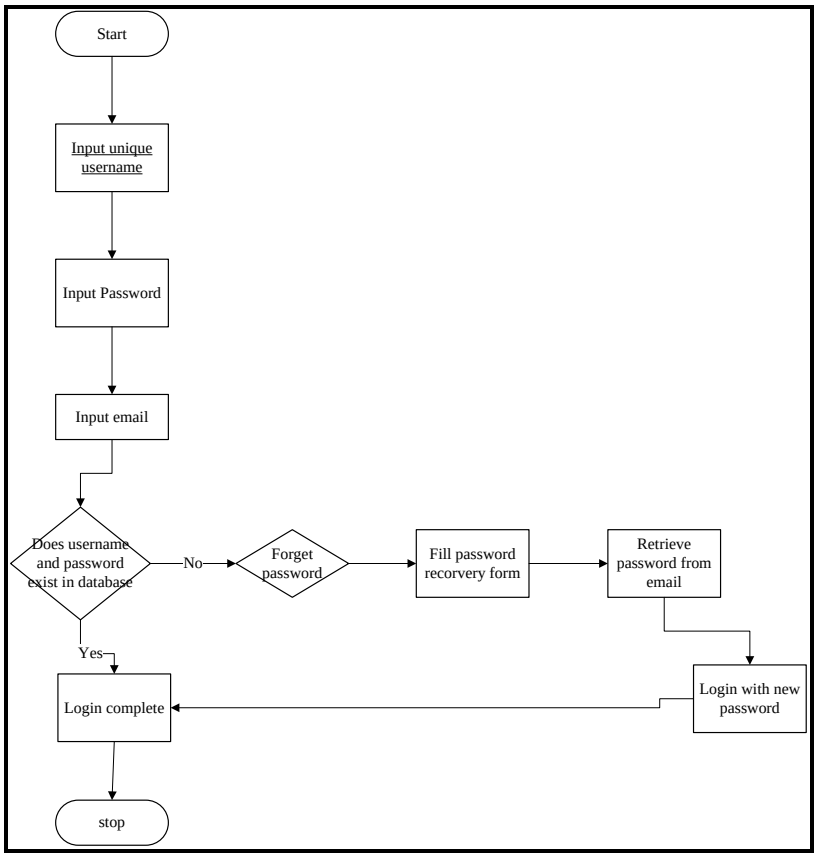

Figure 5 Activity Diagram of the Administrator of the Registration System

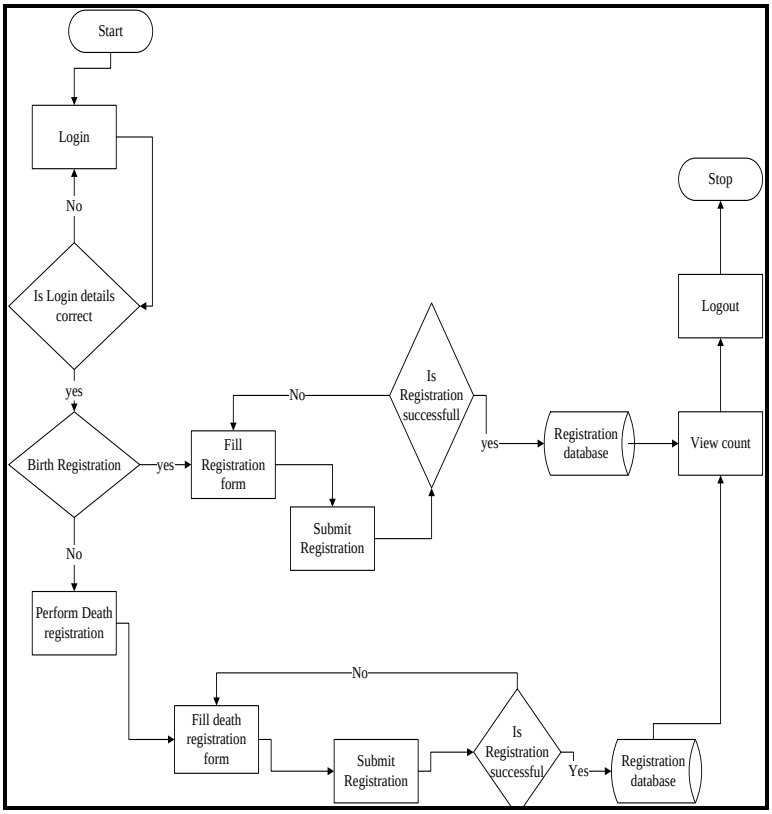

Figure 6 General Activity Diagram of the Overall Interaction in the Registration System

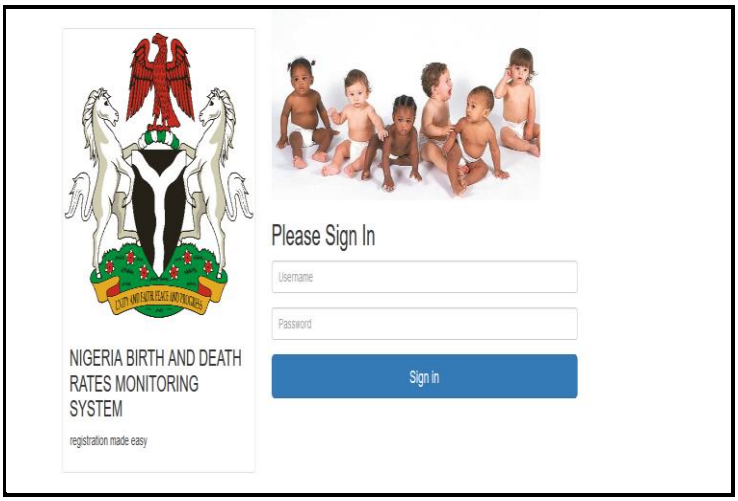

Figure 7 Login Page

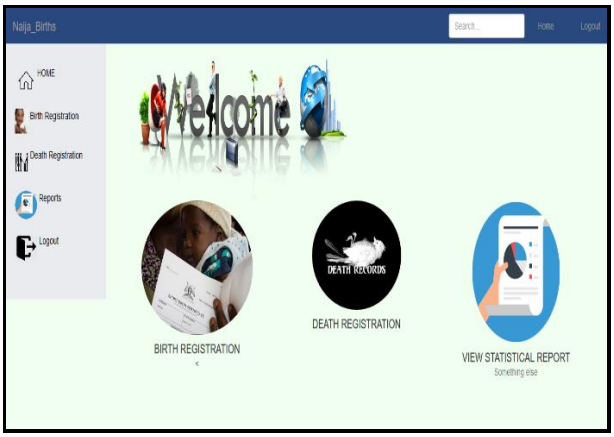

Figure 8 Main Menu of the Registration System

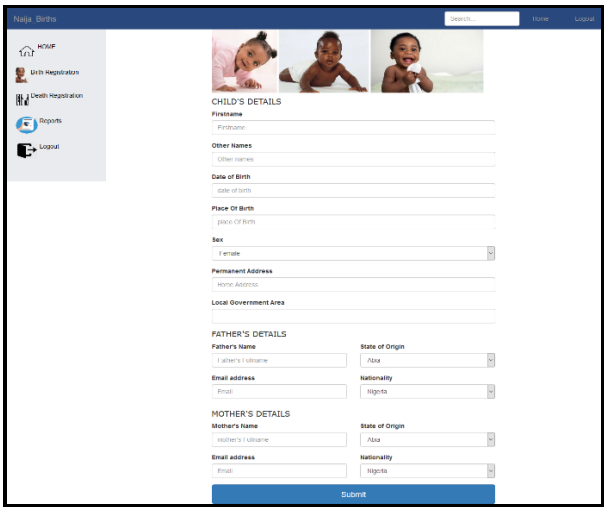

Figure 9 Birth Registration Form

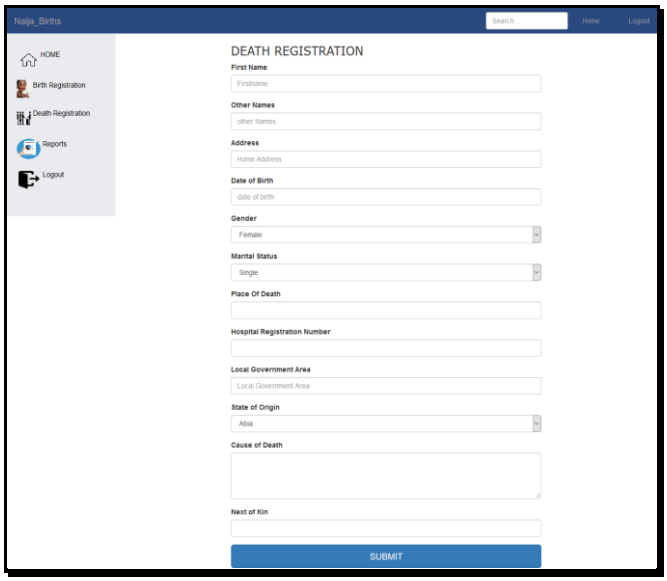

Figure 10 Death Registration Form

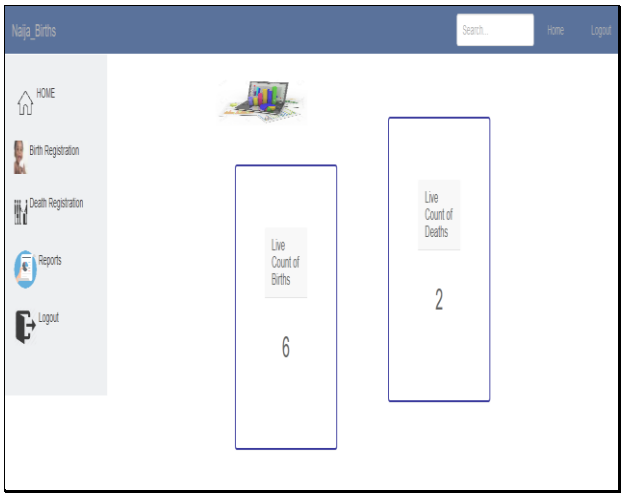

Figure 11 Sample Report

4.0 CONCLUSION

The design and implementation of a prototype birth and death registration system which is suitable for capturing birth and death occurrences and calculating and monitoring birth and death rates is reported in this work. The system was modeled using the UML modelling tools. The design adopted a three-tier architecture noted for its robustness. Java Server Pages was used for dynamic web interface design while the backend used SQLite database system. The system was implemented and tested and found to be an efficient, flexible and usable as an online information system to capture incidences of births and deaths and consequently to monitor birth and death rates in Nigeria. The tool would provide an effective and accessible platform for birth and death registration. The web-based technique enhances fast execution of birth and death registration and provides a means of integration into national database for effective planning and demographic management of population issues. As a web-based system, each registration instance is to be committed to the national database and therefore, national statistics can be generated. Other statistics based on gender, age group, state, local government area or even town also can be generated.

As a prototype application, SQLite is a sufficient database to employ as the backend of this application. SQLite can hold a database size of 140 terabytes and 10^{13} rows of data across tables. In terms of robustness, however, a full implementation of an online birth and death registration system for Nigeria may consider a commercial database like Oracle DB which would certainly be more scalable and robust.

For future research aimed at ensuring the maximum benefits of this information system, we shall explore a mobile version of this research to enable registration with mobile devises such as android phones and tablets. Secondly, the issuance of birth and death certificates for the registered citizens can also be incorporated.

REFERENCES

Ajayi, O. O., S. C. Chiemeke and O. B. Longe (2016). "Implementing a Mobile Based Child-Birth Registration System in Nigeria." International Journal of Computer Science and Information Technology **5**(1): 114-151.

Alho, J. M. and B. D. Spencer (2005). Statistical Demography and Forecasting. New York, USA, Springer Verlag.

Guatam, R. K., P. A. Mini, R. S. Khana and C. Chandeamouli (2015) "Vital statistics of India based of civil registration."

Musah, A., Z. Abudulai, A. Abudul-Hanan and M. Dawuni (2015). "Evaluation of the effect of birth and death registration on health service delivery." Journal of Health Science **5**(2): 32-41.

Muzzi, M. (2010) "UNICEF good practices in integrating birth registration into health systems (2000-2009) ".

Olatayo, T. I. and N. O. Adeboye (2013). "Predicting population growth through births and death rate in Nigeria." Mathematical theory and modelling **3**(1): 96-101.

UNICEF (2005) "The "Rights" Start to Life."

UNICEF. (2007). "The Children." Retrieved March 15, 2017, from https://www.unicef.org/nigeria/children_1930.html.

UNICEF (2015) "UNICEF Nigeria - The children - Maternal and child health ".

WHO (2014). Civil registration: why counting births and deaths is important, World Health Organization.