DEVELOPMENT OF BIRTH RECORDS AND BIRTH RATE MONITORING APP FOR SUSTAINABLE DEVELOPMENT IN THE 21ST CENTURY

NEKABARI-UEDEME, L. F. & AMANNAH, C.I.
[1&2]Department of Computer Science, Ignatius Ajuru University of Education, Port Harcourt, Rivers State, Nigeria

Abstract

Over half of Nigerian children are born at home rather than hospitals where their births could have been registered. It is disheartening to note that most births are not registered especially in rural areas where there are little or no health facilities with functional birth registration system. The aim of the study was to develop birthrate monitoring

Keywords: *App, Development, Birth, Birth rate, Monitoring*

system. To achieve this aim, the study set as its objectives to; ascertain the birth record system of the understudied

INTRODUCTION

Background to the Study

"Birth monitoring system involves the registration of birth which is done by the National Population Commission (NPC). Registering a child is the first step taken to safeguard and protect the child. Promoting the right of children through birth registration falls within the jurisdiction of United Nation International Children Emergency Fund (UNICEF). There has been reasonable progress towards raising birth registration levels. For instance between 2000 and 2010 global birth registration levels rose from 58 percent to 65 percent. Birth rate in Nigeria was last measured at 41.24 percent in 2013, according to the World Bank. Birth registration is the official statistics that

hospitals, develop a platform for birth information, design a module that computes birth statistics and to integrate the birth information platform with the birth statistics module. The Rapid Application Development (RAD) was used to develop the study. The Object-Oriented Analysis and Design Methodology (OOAaD) was used to analyze and design this system. The Hyper-Preprocessor (PHP) and MYSQL were used as tools to implementing the system. The MYSQL was used to develop a centralized web-based database. Birth rate monitoring information system was developed. The system was tested and deployed. The result showed that using the proposed system makes data entry and information retrieval easier and simple compared to the existing system.

account for the details of a child's birth; including the town, tribe, nationality, clan, and city of the child including the weight of the child the parents details, hospital of birth, the colour of the child and ultimately the name and date, day, time of birth. These details are added to the existing records of children's birth repository thereby updating the records' database.

"The application will be very useful in terms of effective monitoring and tracking of birth rate by hospitals. Today, the case for accuracy and convenience when making headcount or taking adequate statistics in our locality has resulted to a drastic shift from the use of analogy and manual approaches to a computerized approach. Introducing the computer program that will assist the National Population Commission to monitor and manage the increasing rate of birth as well as population growth in our locality.

Today, demographic information system is used also by local or state government authorities, since these authorities hold and manage large numerical statistics of citizens and are easily made available on request (Audrey 2015)."

Statement of the Problem

Some health centres have contributed immensely to the fluctuating figure in national population statistics. Investigation shows that these fluctuating figures are caused by the following problems: misplacement of critical records of previous birth rate or death rate, duplication of allocation of identification number for each birth or death

during documentation, poor record management system, delay in information retrieval and Loss of vital information.

"The near inability of most health centres to keep accurate data of their registered new born babies have been responsible for the difficulty faced by the National Population Commission and other relevant agencies in the proper or accurate documentation of birth rates. "It is disheartening to note that to note that most births or deaths are not even registered, especially in the rural areas where there are little or no health facilities with functional birth registration system. There are no central base systems that will enhance the collection of demographic information, hence inability to present an annual information concerning birth rate. Perhaps, if we use computerized birth rate monitoring system developed using high level programming language such as hyper pre-processor language, the birth rate can be monitored effectively in the country."

This study is therefore carried out to develop a birth rate monitoring system which will enhance effective birth rate registration, a secured central base system for all demographic information as well as quick retrieval of birth records when the need arises."

The purpose the study

"The aim of this research work is to develop birthrate monitoring system.
The following are the objective of the study;

    i.   to ascertain the birth record system of the understudied hospitals.
    ii.   to develop a platform for birth information.
    iii.   to design a module that compute the statistics of births.
    iv.   to integrate the birth information platform with the birth statistics module.
    v.   to implement the integrated system.
    vi.   to test and deploy the implemented system."

Scope of the study

This study is restricted to birth information originating from primary, secondary and tertiary health facilities in Rivers State

LITERATURE REVIEW

Theoretical Framework

"For proper understanding and appreciation of the concepts of birth rate monitoring system and the need to develop an effective birth rate monitoring system, it is necessary to have a birds-eye-view at birth rate as a demographic index and its role

in population growth (either population explosion or reduction), hence the need to monitor birth rates becomes necessary."

Demographic Transition Theory -DTT

"DTT simply involves the dynamism in the physical characteristics of human populations The application of the DTT is not always consistent as a result of the social, political and economic factors peculiar to specific populations. However, there is a wide acceptance of the presence of demographic transition in the social sciences because of the strong correlation of dropping fertility to the socio-economic development of any country. Many scholars ask whether it is possible that lower populations can in anyway enhance industrialization and higher incomes. Scholars are also concerned the extent of involvement of certain factors such as higher per capita income, lower mortality, old-age security, and rise of demand for human capital. The development of the Demographic transition theory in 1929 was predicated on the need to interpret the history of the characteristics of human population, on an interpretation of demographic history. The theory provides the best explanation for population growth. "According to Elizabeth, (2012), The DTT holds that in times to come growth of population will progress through a sequence of four stages, namely;

Stage 1: In this stage, death of infant, birth and death rates will rise while life expectation will drop

Stage 2: Here, birth rates are on the increase while death of infant and death rates are on the decrease, and life expectation is on the increase.

Stage 3: Here, natality decrease while life expectancy increases and death rates decline. At this stage, the country is thoroughly industrialized.

Stage 4: At this stage, natality and fatality decrease while people are good health and there is longevity. In this phase, there is a stable population.

Notestein (1945) gave an interpretation to this theory. According to Notestein the growth of population in every nations is in three stages namely:

     i.   increase in natality and fatality

     ii.   rise in natality and decrease in rate of death

     iii.   the rates of birth and death are low

Since the study is aimed at developing a birth rate monitoring system, and birth rate is one of the indices used to measure population growth, the demographic transition theory therefore forms a relevant theoretical framework."

Related Literature

This section is concerned with the review of relevant literature, published by various authors and researchers.

Awareness on the importance of Registration of Birth

The modality, Method, and approach used by UNICEF promote registration of birth in Nigeria. The operation was launched on July 24, 2007, in Abuja by Dr. Goodluck Jonathan, the then Vice President of Nigeria, (Elisabeth, 2012). This was a demonstration of Government's obligation to raise the registration of birth throughout the country. It makes provision for Federal Radio Corporation of Nigeria for broadcasting a three-month crusade on trafficking of children and monitoring of birth which will be broadcasted on the national Network from October 1 to December 31 2007, as well as daily jingles (Duncan, 2001). UNICEF also provides support in the area of finance, logistics and technical services in order to develop and publish a full report on the up-to-date registration of births in Nigeria between 1995 and 2006. Turkington (2017) posited that the printed report will contain the modalities that will ensure that the monitoring mechanism for documentation of births of children in Nigeria are sustained which will be used for advocacy.

Birth monitoring in Ghana, is mandatory under the Births and Death Registration Act of 1965.

In Ghana, there are ten (10) administrative regions with each of her 170 registration districts having at least one registry office one registry office. Unfortunately, the rural areas do not have registration offices and the number of registration staff are not also enough, hence registration is hindered. When birth registration is done in health facilities, medical certificate and health cards are issued.

Formally, parents are requested to show their health card when they go for registration of birth. Birth registration offices are positioned within the buildings or in the vicinity of public health facilities, though most hospitals do not have a registration office.

The Concept of Demographic management

"The term demographic management deals with the processes and procedure of documenting and managing the information of numbers of both death (mortality) and birth rate of a particular locality for a certain period. Birth rate is the complete number of live births per 1,000 of a populace in a year. Birth rates is calculated in numerous ways i.e.: live births from a general registration system for births, population census, marriages and deaths, estimation through expert demographic methods. Birth rate is used as a tool to determine growth of population. The total

birth rate is the amount of live births per 1,000 persons in a year. When the total death rate is deducted from the total birth rate, the product is the rate of natural increase (RNI). This gives the rate of population change (migration not included). The total birth rate normally indicated as births per 1,000 populations is differentiated from an age-specified rate (the number of births in every 1,000 persons within an age group). Monitoring of birth rate refers to the registration, management and control of child birth rate as applied in its most broad terms. Monitoring here, is an indication of the necessity of watching, record keeping and accountability given for its useful life and condition. Birth rate monitoring comprises the procedures, systems and manpower needed to accomplish the lifecycle of all child delivering as mentioned above as well as registration, control, accountability, and recordings."

Increase and Decrease in Birth Rate

"Some authoritarian governments sought after increase or decrease in birth rates in the 20th century, at times through forceful interference. One of the greatest disreputable natality policies is that which happened in communist Romania within 1999 to 2003 in communist leader Nicolae Caucasus, who took on a very violent natality strategy that involved illegalization of abortion and contraception, routine pregnancy tests for women, levies on barrenness (childlessness), and lawful discrimination contrary to childless people. This period has later been shown in cinemas and documentaries. These rules in the meantime increased birth rates for a few ages, but this was followed by a later drop owed to an increased use of unlawful abortion (Horga, 2015). Kligman, (2016) opined that Caucasus's policy caused death of about 9,000 women owing to illegal abortions, great numbers of kids were placed in Romanian orphanage homes by parents who could not be able to raise them, street children in the 1990s (when various homes were shut and the children remained on the streets), and congestion in homes and schools.

"Opposed to Caucasus's natality policy was China's one child rule, which came into effect from 1978 to 2015, that involved cruel act of forced abortions. This policy has given rise to certain obnoxious practices of sex selective abortion leading to an unfair sex proportion in the country. As a result of the severe limitations placed on family-size and undue preference for male children, female children are fast becoming undesirable in China because they are regarded as stumbling blocks to the possibility of families having a male child. Due to the presence of technologies for determination of sex and forceful abortion, the policy of one-child eventually became a one-male child policy (McGreevy, 2014)."

"In most nations of the world, the continual fall in birth rates over the past years can be traceable to the remarkable benefits associated with the freedom of women, which includes the battle against forced marriage and child marriage, women education and better socioeconomic opportunities. Given all economic, educational, religious and social persuasions, women are now deciding on having less number of children since they are gradually having a firm grip over their own reproductive rights. According to *Blastland (2013)*, besides additional children living into their adult years, women are always determined to work, get educated and live their own lives rather than just raising children. In third world countries, Birth rates have decreased as a result of the introduction of family planning clinics."

"According to Fred (2011), as at 1960, fertility rate in Australia was relatively low (about 3.14 births per woman). This was accompanied by a drop which lasted till the mid-2000, when a one off financial motivation was introduced to stop the drop. In 2004, the then Howard government presented a non-means tested 'Maternity Payment' as a substitute to maternity leave, This payment known as the 'baby bonus' which amounted to three thousand dollars ($3,000) per child was paid to parent of every new born. The amount was later reviewed upward to five thousand dollars ($5,000) per child.

"When unemployment in Australia became as low as 5.2%, Peter Costello who was the Treasurer then remarked that there was opportunity to lower it further. He was of the view that with a good economy the population could be expanded, quoting that each family should have three children (one for mother, one for father and one for the nation). By 2010, the fertility rate of Australia has reached a climax of 1.95 offspring per mother.

In order to restore birth rate, France also adopted a strong incentive policy founded on two key methods. This was the 'family benefits and family-coefficient of income tax'. Ever since the World War II was over, France initial family policy has been founded on a family tradition that involves children supporting multi-child family. This way a third child aids a multi-child family and hence benefit from family grants and income tax exceptions. This was to enable families which have three children to share the equal standards of living as families that do not have children (Ashley, 2015)."

"The French income tax policy system is specifically tailored to enable households with children to collect tax breaks higher than single adults who do not have children. This policy is referred to as the family coefficient of income tax. An attribute of the family factor is that large family's' size can receive more tax exemptions benefits even though they enjoy the same standard of living. "

The attention has been on lending supports to vulnerable families (i.e. single parent families and children with poor family background) to enhance equal opportunities. Again, with the participation of many women in the labour market, government presented policies to financially support maternity leave along with childcare amenities. The parent education allowance for mothers having two children was expanded by Government in 1994, to ensure freedom of choice and reduce unemployment for the purpose of promoting the well-being of the family and women's work participation (Meheus, 2015)."Others included:

- ➤ Allowances for infant child care, family, multi-child family, and the multi-element family pension structure.
- ➤ Health insurance scheme covering everything about medical expenditures and hospital bills experienced above six (6) months of pregnancy such as 100% of the national health insurance scheme in the national social security system, and the statutory leave system during the period of pregnancy."

"

The population of Nigeria has been on the increase in the last five (5) years as a result of high birth rates, multiplying its population at this time. The child mortality reduced in 1980s because of the rapid growth experienced, and gradually reduced a little as the birth rate dropped slightly.

The 2017 revision of the World Population Projections indicated that the overall population was 185,989,640 in 2016, as against 37,860,000 in 1950. There is a great population explosion, with 3.2 percent growth rate resulting in the anticipated population (Wolfgang, 2013).The government of Nigeria in an attempt to avert fast population growth, has offered free contraception services for the past ten (10) years and has taken practical steps towards discouraging those who intend to have large families. The government expect smaller families to secure future financial recovery.

"The family planning programme has not been successfully executed at Abuja for proper child spacing due to absence of political will, government financial provision, lack of affordable services and products, and the undue cultural inclination for large families. There is need for increased educational improvement among women, developments in health care are desirable to help inspire and to sensitise parents on the need to go for lesser families (Reiji, 2014). Eze Duruiheoma,, the Chairman of National Population Commission (NPC), conveying a speech on behalf of Nigeria in New York on Sustainable Cities, Human Mobility and International Migration during the 51st Conference of Commission on Population and Development, remarked that "Nigeria is the most highly populated nation in Africa, the seventh (7th) worldwide having a projected population of above one hundred and ninety eight (198) million.

Recently, the World Population Prospects envisages that by the year 2050, the country Nigeria will come to be the third most populated nation in the world. The urban population of Nigeria in the last 50 years, has accelerated at an average growth rate of over 6.5 per cent annually, without corresponding growth in social and infrastructural facilities." He further remarked   that the population "increased considerably from 17.3 percent in 1967 to 49.4 percent in 2017 (Reiji, 2014)."

Review of Empirical Studies
"This section reviews similar works done by different authors x-raying their objectives, methodologies used, their results, conclusions and what they recommended."

Application of record of new birth in three Jordanian hospitals
"The work of Reham and Lesley (2007) on the application of record of new birth focused on three Jordanian hospitals. Jordanian Consolidated on Birth Records. The empirical, descriptive design and practice research arrangement were applied in the study, to examine and report on the procedure of modification to develop and implement the record of fresh births. The study recommended that data be consolidated into automated records which can be automatically evaluated and hence provide the ability to monitor the national childbearing system."

"Although the study advocated the consolidation of data record electronically, to be automatically evaluated, it did not make for full integration of the birth information platform with the birth statistics module to foster a more effective monitoring. The present study therefore intends to bridge the gap by integrating the birth information platform with the birth statistics module."

The Good Practices Adopted by UNICEF in Incorporating Birth Registration in Health Sectors
"This work by the UNICEF (2009), focused on integrating registration of birth and health facilities using Bangladesh, the Gambia, Brazil, and India as case studies."

"The cardinal objective of this research work was to integrate registration of birth in Health systems as a way of enhancing increased birth registration. The methodology adopted in carrying out this study included review of existing works, Identification of case studies based on the literature review, collation of data from field staff using interviews and communicating with UNICEF staff via email at national and regional levels, governmental and non-governmental organizations; tendering of the first draft of the report to UNICEF, New York Headquarters for response, integration of

remarks and inserting into the second draft for factual correction and other feedbacks."

From UNICEF findings:

"About fifty-one million births are not registered annually in unindustrialized countries, translating to one third (⅓) of children worldwide."

UNICEF (2009) recommended the following:

(i)   Community health workers should embark on the twofold responsibility of registration/certifying children and giving health care services.

(ii)   Inclusion of registration of birth in health information systems and creating request for data of birth registration in the health sector.

(iii)   Supporting the ministry of Justice towards reformation of national laws and regulations that will boost birth registration

(iv)   Producing mandates within the Ministry of Health for health worker and traditional birth attendants for registration of births and deaths.

(v)   Incorporate registration of birth in public health awareness campaigns.

(vi)   Application of computer technology to enhance quick service, automation of certificates issuance and the production of reference IDs for each child.

"This study on "Development of Birth Rate Monitoring System" therefore intends to use the finding in the empirical studies above and other reports available as guide and make recommendations that will enhance an effective birth rate monitoring system."

SYSTEM ANALYSIS AND DESIGN

Analysis of the Existing System

"The existing system is a birth rate monitoring system that uses traditional method in its operation. Once a child is delivered, the clerk or doctor in the hospital where the child is born will register the child for record purpose. The same thing is applied in other hospitals within the country but there is no central database that all these hospital information is sent to for proper monitoring by the ministry of health to check the state that have the highest birth rate."

Problem of the existing system

"So many problems are usually encountered during registration of birth in hospitals, and health centres, which have caused various draw backs in effective registration process. Some of the problems of the existing system are as follows."

- "Manual system of birth registration: method of data collection is slow and time consuming
- Lack of knowledge on the use of management information system.
- Retrieval of the information stored is slow
- It makes the analysis of birth rate to be delayed especially when the information is needed by the government for statistical purpose."

Analysis of the new System

"The anticipated method of birth records is a web-based. The new system will be efficient and effective in the monitoring of birth rate in Rivers state. The system has a central database where all the children given birth to each day is registered for future use. The system is designed in such a way that it is interactive and informative and simple to even non-expert users. With this system, the retrieval of birth information in Rivers state will be fast and simple. What this proposed system requires is just the availability of Internet access and computer systems in all hospitals, clinics and maternity homes so that data entry will be easy."

Justification of the new System

"The new is designed for quality information gathering, processing and storage on child birth. In the proposed system, data entry and information retrieval are easy, simple and fast compared to the existing system which is characterized by slow information retrieval. The proposed system also seeks to make the analysis of birth rate faster compared to the delay associated with the existing system."

Method adopted in the study

"Method adopted in the research is Rapid Application Development (RAD). It uses reduced planning time favourable to rapid prototyping. The RAD was used to develop the study through intelligent identification of the problems inherent in the present system, investigation of the causes of the identified problems and proffering possible solutions. Through these, the RAD was used to develop a central Database system which takes care of the daily registration of new births."

The System Architecture

"In the proposed system, Doctor or Nurse can do the registration using the devices. Through the application the information will be submitted into the central database where the admin can view all birth information coming from different locations in the state.
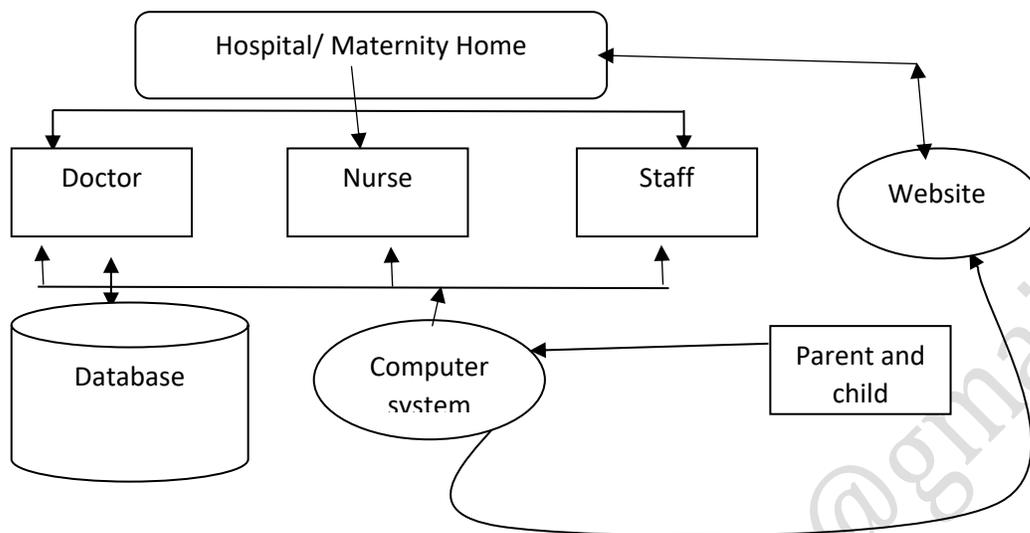
Fig. 1: System Architecture"

The System Design

The design phase is categorized into; the input, process and output designs. The inputs are recognized through a form designed in HTML and exported to PHP at the backend while MySQL as used as the database end."

The Input Design

"In the new system an html form design is created which interfaces with the user of the system. The doctor or nurse is expected to enter the information and submit it to the central database. The input design is all about where the user will enter the required data"

Fig. 2: Form design

The Process Design

"The process profile of the proposed system uses an outlay. The form contains the captured inputs such as name of child, state of child, LGA of child, Hometown etc. The doctor or nurse handling

the registration gets information from the parent of the child, fills into the various fields and then saves it in the central database for easy retrieval or analysis."

*Step 1:*START {

*"Step 2:*INPUT User should created an account with the system

*Step 3:*INPUT   Login user

Step 4:   Login user can Add new birth details into the database

*Step 5:*IF   (the   record   is   completed   fill   )   THEN: Submit into the database

Step 6: else

 Step 7:   return user to step 5

*Step 8:*PROCESS   Update record.

*Step 9:*PROCESS   Logout

Step 10:   } Stop

The Output Design

"In the birth rate monitoring system output design simply depends on input design. It is certain that any data that will be given through the input system will be processed accordingly for a corresponding output of the same system, if the necessary and appropriate channels are utilized. The output design is an html table that display the information submitted into the database where only admin can view."

Table 1: Output Design

Name	Sex	Date of Birth	State	LGA	Hospital	Home town
John	M	1/2/2015	Rivers	Khana	General Hospital, Bori	Bori
Chichi	F	2/2/2015	Rivers	Onelga	Health Centre, Omoku	Omoku
Blessing	F	3/2/2015	Rivers	Emohua	Health Centre, Isiokpo	Isiokpo
Samuel	M	4/2/2015	Rivers	Obio/ Akpor	UPTH, PH, Choba	Choba
Goodness	M	25/7/2015	Rivers	Eleme (Elga)	General Hospital, Eleme	Eleme
Sarah	F	6/9/2015	Rivers	Obio/ Akpor	Health centre, Rumuigbo	Rumuigbo

The Database Design

"Database of the proposed system include the logical and physical models. They are designed to help actualize the centralized database. That is, while the logical model defines data features and their interactions, the physical data model is expected to help design the database based on the requirements needed during the logical data modelling. Again, the proposed system will help in reading, creating, updating and deleting of data such as:"

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- ➢ **Field:** the filed name is used in designing the form which is alphanumeric data e.g. digits and characters
- ➢ **Type:** this help to determine the type of record that will be submitted into the database or is the type of data that the user can enter into the field. It is also alphanumeric, numeric etc.
- ➢ **Length**: this is the character size that a particular field can hold.

Table 2: Database Design

Field	Type	Length
Name of child	Varchar	20
Sex	Varchar	20
State of birth	Varchar	20
LGA	Varchar	10
Hometown	Varchar	20
Hospital name	Varchar	50

Table 3: logical Model

Field	Type	Length
Result	Varchar	20
Hospital name	Varchar	20
Patient name	Varchar	20
State	Varchar	20
Gender	Varchar	20

The information in the logical model is very vital. It supports decision making and analysis proposed, when making any analysis the gender and state are selected to output the result.

Table 4: Physical Model

Field	Type	Length
Lga	Varchar	20
username	Varchar	20
Password	Varchar	20
Hometown	Varchar	20

The physical model contained login details of the individual, their username and password. This will enable them login into the system.

SYSTEM IMPLEMENTATION
Choice of Platform
"The programming tools used to develop the system were the php and the MYSQL."

Implementation Architecture
"In the proposed system, Doctor or Nurse can do the registration using the devices. Through the Internet, the information will be submitted into the central database where the Admin can view all birth information coming from different locations in the state."
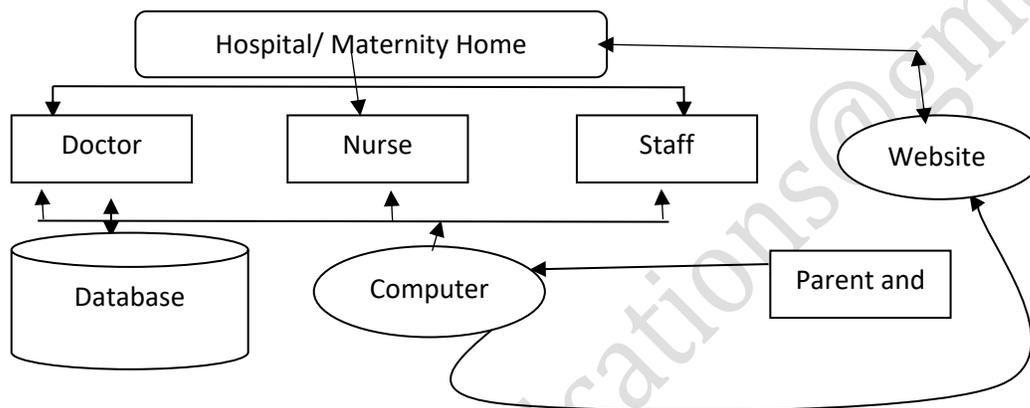

Fig. 3: Implementation Architecture

System Requirements
➕ "**Hardware Requirements**
The hardware features of the system include the following
  i.   i3 to Core i6 or Pentium R and above
  ii.   1GB RAM and above
  iii. 2.7 GHz processor and above
  iv.   The System Type of 32bit or 64 bit
  v.   Hard disk size of 200GB and above
  vi.   Hard disk file system (NTFS)

➕ **Software Requirements**
The software features required for the system setup are as follows:
  i.   Operating system used to accomplish this work is Windows 7 and above.
  ii.   Software packages required are Hypertext Preprocessor (PHP) Scripting language, and the database is MYSQL.
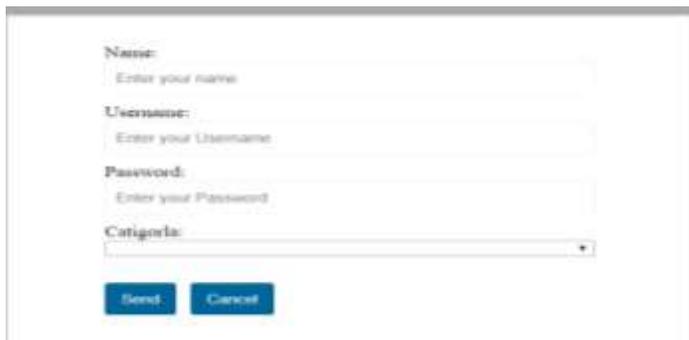 iii. Antivirus: Norton

System Testing

"The system was tested using unit test techniques and dataset from our case study and other centers, software was without defects. Hence the system functions in line with its objectives."

Fig. 4: Output-1

Fig. 5: Output-2

Fig. 6: Output-3

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Fig. 7: Output-4

Fig. 8: Output-5

Fig. 9: Output-6

SUMMARY AND CONCLUSION
Summary
The aim of the study was to develop a centralized web based birth rate monitoring system. The objectives of the study included to: ascertain the birth record system of the understudied hospitals, develop a platform for birth information, and design a module that compute the statistics of births, integrate the birth information platform with the birth statistics module, implement the integrated system and test and deploy the implemented system.

The study was restricted to birth information originating from health facilities in University of Teaching Hospital, Rivers State Hospitals Management Board (General Hospitals), Primary Healthcare centres and Prize Medicals in Rivers State. The Demographic Transition Theory was employed to guide the work. The Rapid Application Development (RAD) was used to develop the study through Intelligent Identification of the problems inherent in the present system, investigation of the causes of these problems and proffering possible solutions. In designing the proposed system, the study considered the input, output, and database designs. The php programming language was used to develop the study, with the administrative framework created with MYSQL. The study in its process of documentation included the login page, the registration page, the analysis page and the result page. The study recommended steps to install the web server and run the applications. It also recommended the direct change over in the case of system change over.

Conclusion

The study developed birth rate monitoring system. In the newly implemented system a central database system was developed which all hospitals and health centers are connected for the submission of birth information from their hospitals. The system is implemented by lunching it in a cloud server which interfaces with users that run the server. The system is both interactive and informative, using the proposed system makes data entry and information retrieval easier and simple compared to the existing primitive system.

REFERENCES

Ashley, M. (2015). National Team Reports. Babson Park, MA: Global Entrepreneurship Monitor. Available from: http://www.gemconsortium.org. Accessed July 5, 2019.

Audrey, C. (2015). The demographic transition. Proceedings of the International Population Conference, Vol. 1. Liège, Belgium: International Union for the Scientific Study of Population.

Blastland, H. L. (2011). Birth control measurement in 21st century. Kadex publishers, NY, 234-354.

Blastland, M. (2013). On the momentum of population growth. Demography journal 8(1), 71–80.

Duncan J. (2001). Population policy options in the developing world. Science, 263, 771–776.

Elizabeth, W. (2012). Vienna Yearbook of Population Research 2005. Vienna Institute of Demography; Laxenburg, Austria.

Fred, L. (2011). Alternative paths for future European fertility: Will the birth rate recover or continue to decline? Journal of Demography, 10(7), 34-55.

Horga, G. (2015). The world demographic transition. Annals of the American Academy of Political and Social Science, 237, 1–11.

Kligman, A. M. (2016). Population and resources: Fact and interpretation. In: Davis, K. and Bernstam, M.S. (eds.) Resources, Environment and Population: Present Knowledge. Oxford, UK: Oxford University Press, 1–21.

McGreevy, J. (2014). The emergence of sub-replacement family size ideals in Europe. Population Research and Policy Review 22(5–6), pp.479–496.

Meheus.W., (2015). The New Generations of Europeans. Demography and Families in the Enlarged European Union. London: Earthscan, 83–100.

Notestein, L. (1945). Demographic transition theory, Hass publishers, UK.

Reham, S. and Lesley, H.K. (2007). Application of record of a new birth in three Jordanian hospital, Graphic publishers, Jordan.

Reiji, W. (2014). The low fertility trap hypothesis: Forces that may lead to further postponement and fewer births in Europe.

Turkington, D. (2017). The demographic transition. Proceedings of the International Population Conference, Vol. 1. Liège, Belgium: International Union for the Scientific Study of Population.

United Nations (UNICEF 2009). World Population Prospects. The 2004 Revision. New York: United Nations, Department of Economic and Social Affairs, Population Division.

Wolfgang, F.W. (2013). Population–The long view. Chicago: University of Chicago Press, 36–57.