Centralized Database: A Prerequisite for Security and Sustainable Development in Nigeria

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Abstract- **The volume of data organizations and government agencies usually collect and store are increasing rapidly. Centralized database according to Elmasri and Navathe [1] stores data or information in a particular location within a network. It allows data from existing database to be collected and stored in a single database for sharing, analysis or updating in an organisation. In Nigeria, organizations and government agencies usually operates distributed databases and do not have a centralised database in a central location for sharing and other policy making. Therefore, this paper highlights the need for centralised database that can be adopted by government to control data redundancy and inconsistency for security and sustainable development. The paper is a survey paper that explored the use of research schedules for data collection. Enumeratorwas picked from each of the four agencies that constitutes the population and samples of the study. The data collected were categorised and presented based on the research schedules retrieved. The results show the common fields used on personal information of individuals as ID, names, Date of Birth, Gender, address, phone no, finger print, and photograph. The results also show that data sharing among agencies are rarely done using the distributed databases, but plans are on the way to actualize that especially with the yet-to-be implemented model of National Identity Management Commission known as National Identity Management System (NIMS). Finally, the paper recommends that government should explore the possibility of adopting centralised database that can harmonise records of organisations and agencieswhich will help in ensuring security and sustainable development in the country; a model of centralised database should be designed to ascertain the feasibility of implementing a centralised database in Nigeria; thorough research should also be made to ensure the compatibility between organisations and agencies with the centralised database for data sharing and other accessibility issues.**

Keywords: **Centralised Database, Distributed Database, Security, Sustainable Development**

I.   INTRODUCTION

Centralized database usually stores data or information in a particular location within a network. It allows data from existing database to be collected and stored in a single database for sharing, analysis, or updating in an organization [1].

The volume of data organizations and government agencies usually collect and store has been rapidly increasing, and this brings need for more efficient and effective means to manage these data. The current practice by organizations and government agencies in Nigeria lead to distributed data with redundancy and inconsistencies at various levels. Agencies like Nigerian Communication Commission (NCC), National Identity Management Commission (NIMC), Federal Road Safety Corps (FRSC), and Banks collect almost same data from people.

For instance, NCC directed all mobile operators to collect data about their subscribers including biometric data. Similarly, Central Bank of Nigeria (CBN) directed all banks to comply with Bank Verification Number (BVN) exercise so that customers' bank details including their biometric will be linked together so that CBN can have control over bank accounts of customers using unique number identification (i.e. BVN). FRSC also provide drivers with license, they captured details and biometric of drivers during the exercise and stored them in their database. Nigerian Immigration Service (NIS) also captured data and biometric of citizens applying for international passport. NIMC is recently registering and providing citizens with National Identity Card. The citizens' data including biometric are captured and stored within their database.

Despite all these efforts by government and agencies to create database at various organisations for data collection and storage, the entire processes are not integrated together and that lead to data redundancy and inconsistency. Same data are repeatedly stored in multiple locations. In some cases, users give different data at various organisations or agencies. For example, a particular person will register with the mobile operator using three (3) names while at the bank or NIMC same person is registered with two (2) names. In some cases, inconsistencies exist in date of birth, addresses, occupations, etc.

Therefore, this paper aimed at highlighting the need for centralised database that can be adopted by government to control data redundancy and inconsistency for security and sustainable development. This can be achieved with the following objectives:
i. To conduct system analysis on the existing database management system used in banking system and government agencies in Nigeria.

ii. To portray the necessity of Centralized database in ensuring security and sustainable development

The scope of the paper is limited to Central Bank of Nigeria (CBN), National Identity Management Commission (NIMC), Nigerian Communication Commissions (NCC), and Federal Road Safety Corps (FRSC).

II.   LITERATURE REVIEW

A. ICT and Sustainable Development

Sustainable development is development that meets the desires of the present generation without compromising the ability of future generations to meet their own needs. The goals of economic and social development must be defined in terms of sustainability in all countries whether developed or developing, market oriented or centrally planned. Interpretations on sustainable development will vary, but it must share certain general features and must flow on the basic concept of sustainable development and on a broad strategic framework for achieving it. The capacity for technological innovation needs to be greatly enhanced in developing countries so that they can respond more effectively to the challenges of sustainable development. The orientation of technological development must also be changed to pay greater attention to environmental factors [2].

Information and Communication Technology (ICT) helps in improving sectors like public administration (role of e-government), health, education, environment, agriculture and business. ICTs have considerable potential to cut administrative costs through the reorganization of internal administration and through alternative provision of services. It gives room for electronic delivery and points of access from homes, schools, and libraries. ICT applications can improve clinical effectiveness, continuity, and quality of care by the full range of healthcare professionals. The employment of ICT into the health sector brings the idea of what we called telemedicine. This is idea of providing medical or clinical health care on demand and independent of person-to-person contact through the use of telecommunications and information technology at a distance. Telemedicine can provide medical care to people in their homes, in isolated places or in times of emergency [3].

ICT applications can help in collating environment data in a form suitable to particular groups of users and mobile services, and can allow access to up-to-date information and provide real time decision support to speed up and increase efficiency in environmental monitoring [4]. Specific implementation of ICT in the environmental sector includes Geographic Information Systems (GIS) and Global Positioning Systems (GPS).

It can thus be clearly deduced as ICT help in improving public administration, health, education, environment, agriculture and business, the objective of

United Nation Millennium Development Goals can be achieved through the use of ICT.

B. Concept of Database and Database Management System

Database is the collection of related data built for a particular purpose or objective. It serves as a repository that collects related records together. Database Management System is a program used in creating and managing Database. It serves as a software package that aids definition, creation, manipulation and sharing of data in a database [1].

Database consists of interacting components such as the Users (database designers/ programmers and end-users), application program (database system), Software to access stored data or process queries/programs (DBMS), and Database Storage (Meta-data Definition and Stored database). This is shown in Figure 1 below:
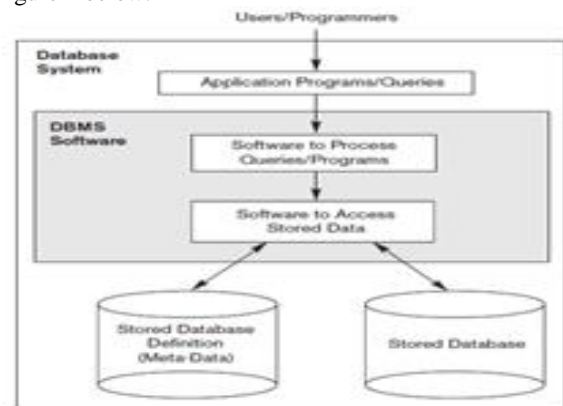

Figure 1: Database interacting components

DBMS are designed and managed using Data Definition Language (DDL) and Data Manipulation Language (DML) components. DDL deals with defining database structures, data types, constraints and relationships (i.e. database schema). DML deals with data retrieval, update or modification, insertion or deletion of records from the database. DML is divided into procedural and declarative DMLs. Procedural DMLs require users to specify what data type are needed and how to get those data while declarative DMLs require users to specify what data are needed without specifying how to get those data [5].

However, database structure relies on database model. A database model is a collection of conceptual tools for describing data, data relationships, data semantics, consistency and constraints. It provides a way to describe the design of a database at the physical, logical, and view level. The model is divided into network model, hierarchical model, relational model, and object oriented model [5].

III.   METHODOLOGY

The paper is a survey research and it makes use of schedules for data collection. Four agencies, namely:

Central Bank of Nigeria (CBN), National Identity Management Commission (NIMC), Nigerian Communication Commission (NCC), and Federal Road Safety Corps (FRSC) form the population of the study. An enumerator was picked from each of the agencies to interact and recordthe responsesprovided by the ICT and technical staffof the agencies in the space provided on the schedules. The data collected were categorised and presented in tables based on personal information, data sharing and accessibility, and current system in existence.

IV. RESULTS AND FINDINGS

This section provides the major findings of the research and discusses the results as well. The section is presented based on the data collected from the research schedules distributed to the agencies under studies. These are presented as follows:

A. Common Fields

The results of the research prepared the common fields of data collected by these agencies. This is presented in Table 1 below.

Table 1: Common Fields used by agencies on personal information of individuals

S/NO	FIELD NAME	DESCRIPTION
1	ID	Unique Identifier
2	Names	Full names of individuals
3	DOB	Date of birth of Individuals
4	Address	Permanent address of individuals
5	PhoneNo	Contact numbers of individual
6	FingerPrint	Biometric details of individuals
7	Photograph	Biometric details of individuals
8	Gender	Sex status of individuals

The above table gives various fields about individuals which can be used to store their records within the database. The ID field as used by all the agencies provides a unique identification to individuals. Bank uses account numbers as customer's ID in addition to other fields, NIMC uses national identification number (NIN) as ID to individuals, and FRSC uses license number as ID to drivers.

All the agencies collect individual names which consists of first name, surname and other names (if any). They equally collect date of birth of individuals, permanent addresses of individuals are also recorded as well as contact numbers. Biometric details of individuals are equally collected which consists of finger prints and facial photographs of individuals.

B. Data Sharing

The finding of this research revealed that the four agencies keep the records within their individual distributed databases and they do not share data among them. But plans are on the way to enable the data sharing among the agencies possible. This is contained in the interaction between the Executive Vice Chairman, Nigerian Communications Commission (NCC), Prof Umar Garba Danbatta and Director-General of NIMC Aliyu Abdulaziz during the courtesy visit by the DG NIMCto the NCC. The NCC has agreed to release the commission's data from the ongoing Subscriber Identity Module (SIM) cards registration exercise to the National Identity Management Commission (NIMC). Danbatta said the decision to release the data is in line with Federal Government'sinstruction to transfer validated data to the agency.

The NIMC is also working towards providing a National Identity Management System (NIMS) which will allow them to create, operate and manage the National Identity Database (NID) that can serve as a central source of identity verification and authentication. According to NIMC, the verification infrastructure will be available to the stakeholders. The NID is based on the use of fingerprint biometrics to uniquely and unambiguously identify each individual and thereafter issue a unique identification number to each verified individual which will be common across the other databases.

However, Central Bank of Nigeria (CBN) does not collect or share details of customers from commercial banks. It only regulates the activities of the commercial banks. The Bank Verification Number (BVN) exercise conducted by the commercial banks under the directive of the CBN is still not managed by the CBN. The Nigeria Inter-Bank Settlement System (NIBSS) is responsible for managing and linking the BVN to customers' respective accounts with commercial banks. NIBSS is owned jointly by the CBN and all licensed Deposit Money Banks (DMBs) in Nigeria.NIBSS is also saddled with responsibility of interoperability between various players in the financial system. This involves the ability of various banks, mobile payment operators, non-banking financial institutions, payment terminal providers, government institutions, etc and their respective customers or clients to send, receive, and process funds, documents or other instruments electronically through a common channel (i.e. NIBSS).

V. CONCLUSION AND RECOMMENDATIONS

Centralized database permits records or information to be collected and stored in a central location for easy sharing, update or analysis. With centralized database, government can access citizens' data or records and use it for decision making whenever the need arise.

Despite efforts by government and other agencies to establish and adopt a database management system for record keeping by agencies and organizations, the databases used remain distributed database for these organizations and agencies. No centralized database created that will collect and harmonize the various data collected from various agencies and organizations. As a result, a lot of inconsistencies and redundancies occurs within these agencies and organizations.

Therefore, a centralized database should be designed and implemented by the government in order to collect data from various organizations and agencies. This can eliminate the issue of inconsistencies as well as reduce the data redundancies in the records of citizens. The database should be deployed in NIMC so that data can be shared directly to any agency or organization that may need such data. NIMC is the agency or commission that is responsible for registration of citizens and provide them with unique national identity number (NIN). If that is achieved, it will bring improvement to nation security since records can be tracked using the unique identifier that is attached with biometric details of each individual.

Centralized database can bring sustainable development to a country. It can aid government to know statistical reports about the citizens of the country which in-turn can reflect in developmental decision making such as budget, educational policies, health and other related policies or issuesthat helps in sustainable development in a country.

Finally, the paper makes the following recommendations:

i. Government should look at the possibility of adopting a centralized database that can harmonize records of various organizations and agencies which helps in ensuring security and sustainable development.

ii. A model of centralized database should be designed in order to explore the feasibility of implementing a centralized database in Nigeria.

iii. Thorough research should be conducted to ensure compatibility between organizations and agencies with the centralized database for data sharing and other accessibility issues.

iv. The centralized database if designed, should be deployed to NIMC being the commission saddled with responsibility of registering citizens.

APPENDICES

Research Schedule Questions

Appendix I: This is the research schedule questions prepared for Central Bank of Nigeria (CBN)

Do you collect personal information of customers from banks?   YESNO ☐   ☐

1. If yes, what are the fields required?
2. How do you manage details of customers with multiple bank accounts?
3. What other information do you collect about customers in addition to personal information?

4. How do you access users' records from individual banks?

5. Do you share users' data with any Government agency or organization?
YES ☐   NO ☐

6. If yes, name the agencies or organizations

7. What category of data do you share with the mentioned agency(ies)?

8. Do you have unique field(s) that are used for data accessibility and sharing? YES   NO

9. If yes, name the field(s)

10. Do you have a centralized database for storing information received from different banks?
YES ☐   NO ☐

11. Do you experience any security challenge with the current system? YES   NO

12. If yes, what are the challenges experienced?

Appendix II: This is the research schedule questions prepared for National Identity Management   Commission (NIMC)

1. What are the personal information do you collect from individuals during registration?

2. What other information do you collect about individuals in addition to personal information?

3. Do you share individuals' data with any Government agency or organization? YES
NO ☐   ☐

4. If yes, name the agencies or organizations

5. What category of data do you share with the mentioned agency(ies)?

6. Do you have unique field(s) that are used for data accessibility and sharing?
YES ☐ NO ☐

7. If yes, name the field(s)

8. Do you have a centralized database for storing individuals' information received from different state offices?
YES ☐   ☐

9. Do you experience any security challenge with the current system?
YES ☐   NO ☐

10. If yes, what are the challenges experienced?

Appendix III: This is the research schedule questions prepared for Nigerian Communication Commission (NCC)

1. Do you collect personal information of mobile users from mobile service providers?
YES ☐   NO ☐

2. If yes, what are the fields required?

3. How do you manage details of users with multiple phone numbers?

4. What other information do you collect about mobile subscribers in addition to personal information?

5. How do you access mobile users' records from mobile service providers?

6. Do you share users' data with any Government agency or organization?
YES ☐ NO ☐

7. If yes, name the agencies or organizations

8. What category of data do you share with the mentioned agency(ies)?

9. Do you have unique field(s) that are used for data accessibility and sharing?
YES ☐ NO ☐

10. If yes, name the field(s)

11. Do you have a centralized database for storing information received from different mobile service providers?
YES ☐ ☐

12. Do you experience any security challenge with the current system?
YES ☐ ☐

13. If yes, what are the challenges experienced?

Appendix IV: This is the research schedule questions prepared for Federal Road Safety Corps (FRSC)

1. What are the personal information do you collect from individuals during registration?

2. What other information do you collect about individuals in addition to personal information?

3. Do you share individuals' data with any Government agency or organization? YES
NO ☐ ☐

4. If yes, name the agencies or organizations

5. What category of data do you share with the mentioned agency(ies)?

6. Do you have unique field(s) that are used for data accessibility and sharing?
YES ☐ NO ☐

7. If yes, name the field(s)

8. Do you have a centralized database for storing individuals' information received from different state offices?
YES ☐ NO ☐

9. Do you experience any security challenge with the current system?
YES ☐ NO ☐

10. If yes, what are the challenges experienced?

ACKNOWLEDGMENT

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