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Design and Implementation of a Unified Identity Number System in Nigeria Using Object Oriented Programming Approach

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Abstract:
This study covers the exploration of the integrity of the national identification system in Nigeria, and thus, helps to minimize the existence of multiple forms of identities with the aid of a unified resident's identification number system that will provide a platform that links all existing identities of residents as well as providing each resident with a unique identity number. The system provides ease of access to all citizens identification registry. This system is an android based system developed and implemented with XML and java programming language. Firebase database was deployed as the database engine because of real time features. OOADM (object-oriented analysis and design methodology) was used as the choice of methodology because it is the best choice for web-based and android applications. Simple front-end validation was used to authenticate users' entry (input of invalid characters). Google authenticator served as the third-party random number generator for the new unique identity number.

Keywords: *XML, OOADM, web based, firebase*

1. Introduction

1.1. Background Concept/Study

A national identification number, national identity number, or national insurance number is used by the governments of many countries as a means of tracking their citizens, permanent residents, and temporary residents for the purposes of work, taxation, government benefits, health care, and other governmentally-related functions. The number appears on identity documents issued by several countries.

The ways in which such a system is implemented vary among countries, but in most cases, citizens are issued an identification number upon reaching legal age, or when they are born. Non-citizens may be issued such numbers when they enter the country, or when granted a temporary or permanent residence permit.

Many countries issued such numbers for a singular purpose, but over time, they become a de facto national identification number. For example, the United States developed its social security number (SSN) system as a means of organizing disbursing of social security benefits. However, due to function creep, the number has become used for other purposes to the point where it is almost essential to have one to, among other things, open a bank account, obtain a credit card, or drive a car. Although some countries are required to collect taxpayer identification number (TIN) information for overseas payment procedures, some countries, like the US, are not required to collect other nations' TIN if other requirements are met, such as date of birth. Authorities use databases and they need a unique identifier so that data actually refer to the searched person. In countries where there is no established nationwide number, authorities need to create their own number for each person, though there is a risk of mismatching people.

In the United States, a selective service number must be applied for by all male citizens and immigrant non-citizens turning age 18, to register for military conscription. Though the United States currently employs a volunteer military, all males are required to register in case of a potential draft.

An 'optional' national identity number is the social security number (SSN), a nine-digit number issued to U.S. citizens, permanent residents, and temporary (working) residents. Its purpose was to identify individuals for the purposes of social security, but it is now also used to track individuals for taxation purposes. There is no legal requirement to have an SSN if it is not required for social security or taxation purposes, but in practice one is required for many other purposes, for example to open a bank account or apply for a driving license, so that nearly all U.S. citizens and permanent residents have one. The SSN has therefore become a *de facto* national identification number,despite the fact that originally it was expressly not for this purpose.

Presently in Nigeria, several government agencies issue an identity credential to residents for specific uses. National identity management commission (NIMC) leads the identity agenda of Nigeria and offers a 'foundational identity' or an 'official identity.' Over the years, several government agencies have rolled out their own 'functional identity' programs. Currently, there is little or no interoperability across these identity systems. The degree and nature of technology used in these identity systems varies. Currently, no identity system has fully reached scale to serve the masses in Nigeria. Since gaining independence in 1960, (World Bank. 2016. ID4D Country Diagnostic: Nigeria) Nigeria has recognized the need to create a central system of national identity management for citizens and legal residents. In 1978, Nigeria created the department of national civic registration (DNCR), within the federal ministry of interior (FMI), as the organization responsible for civil registration, and made its first attempt to issue a national identity card to its citizens.

The federal government of Nigeria paid roughly $236.8 million for registering 52.6 million people, out of a planned 60 million, and issuing identity cards to 37.3 million Nigerian citizens. The project was later shelved in 2006 and involved allegations of impropriety over the award of the bid to the firm. In 2005, with an objective of revitalizing the Nigerian economy, the government of Nigeria embarked on a package of economic reforms, as encapsulated by the national economic empowerment development strategy (NEEDS). As part of this effort, the government wanted to develop a national policy and regulatory framework on consumer credit aimed at enhancing access to consumer credit for Nigerians. Absence of a universal identity management system and verification process was seen to lead to distorted growth and underdevelopment of the consumer credit market in Nigeria.

Thus, Nigeria currently has one national identity program, and several functional identity programs, run by various government agencies, who conduct biometric enrolment of their target populations. The duplicated effort has led to inefficiencies in public resource management, as these programs require significant amounts of funding for enrolment, operations, and maintenance. Moreover, a resident of Nigeria has to provide biometrics to multiple government agencies and carry multiple identity cards for different uses. To minimize the duplication of effort, reduce fiscal spending across identity programs, and streamline service delivery, the federal government is currently implementing harmonization of its functional identity programs with NIMC.

Different countries call their systems and registries in different ways depending on their historical trajectory (Barca, 2017; Leite et al., 2017). Depending on the country, the term 'Unified system' has been used as a synonym of social registry, or integrated beneficiary registry – both components of an integrated information system for social protection.

1.2. Statement of the Problem

In the wake of the Covid-19 nationwide lockdown in 2020, citizens of Nigeria were often stranded and in need of financial assistance where possible. Workers lost their jobs, traders were running losses here and there. The Federal government took it upon themselves to carve out a place in the national budget to provide relief funds for all citizens, but this couldn't come to pass, why? There was no form of unified identification system to uniquely identify a citizen and reach out to such person genuinely. On Wednesday 8 April, 2020, (Nigeria Punch Newspaper) reported that the national assembly of Nigeria directed the minister of finance to explain how two (2) trillion naira was distributed to the poor in Nigeria. They further asked for their names and to explain how they arrived at the database used and the demographical spread.

This calls to question, the issue of database for all residents in Nigeria. In recent years, many government agencies have engaged in the collection of data for their own use with or without biometrics apart from the Federal government national identification registration (NIR) which started in 2003 but did not take off until 2007 and has produced minimal result to date.

Anyone who resides in Nigeria apart from the local farmers in the rural areas who have no business keeping bank account, driver's license, probably must have participated in not less than four data capturing processes in recent years.

Awodokun (2018), in writing for Techpoint Africa, noted and provided a simple solution to Nigeria's unified database problem. He observed that data is collected and stored everywhere, most of which contain certain personal information such as name, gender, address, blood group, place of birth, and so on at one time or the other. However, these data are collected across multiple government parastatal databases, thereby making it difficult to glean correct information.

In his words, 'As a matter of fact, by the time you show up for your first job after completing college in Nigeria, such record would probably exist in multiple databases belonging to one or more following parastatals — national youth service (NYSC), driver license (FRSC), bank verification number (BVN), tax registration (FIRS), national census (NPC), voter registration (INEC) etc. Not surprisingly, since each of these separate databases is not aware of the other (i.e., not synchronized), e.g., 'Mr. Olusegun' who lived in 'street ABC' in Lagos Nigeria according to his driver's license (FRSC database), may live in 'street XYZ' according to the bank's statement (BVN database)'. These are anomalies that require attention, hence the urgent need for the unification and synchronization of resident's identity system in Nigeria.

1.3. Aim and objectives of the Study

The aim of this study is to design and implement a unified resident identification number system in Nigeria. Various objectives include:

- To provide a platform that links all existing identity of residents together
- To provide each resident with a unique unified identity number
- Providing ease of access to all citizens identification and bio data.

2. Literature Review

2.1. Review of the Case Study or Problem Domain

Identity management is very key to the economic success of developing countries. For developing countries to make good progress in the global space, they must be able to orderly develop a national identity management system and also ensure the proper execution of such policies (Adjei, 2013). However, extant studies have indicated that most developing countries are yet to fully embrace the application of identity management policy to the socio-economic and political life of their citizens (Olesen, 2011). The major impediment with regard to the adoption and implementation of identity management policy in Nigeria is the government's indifference towards adequate investment on identity management technologies. (Al-khouri, 2012) opined that the greatest obstacle to identity management improvement has been the disposition of the government and the longing to control the populace. Most times, it is only the enormous cost that is looked at oblivious of the myriad advantages to a developing country from setting up an effective identity management infrastructure. A good number of seminars, workshops and conferences have been organized by the Nigerian government, yet there is no significant achievement. Though, some developing countries such as Kenya, Ethiopia, South Africa, Ghana, Cameroun and Egypt have been making some progress in national identity card production and issuance to their citizens, this does not bring the full benefits that an effective national identity management system, which goes beyond mere card issuance, brings. Countries such as USA, UK, Germany, Sweden, Japan, Malaysia, Indonesia, Singapore and several others have all adopted a strategy which aims at promotion of an enabling legal, operational, infrastructural and technological environment for sustainable development, that uses a biometric-linked identification code to create a single, uniform, standard process for personal information, interoperability in data management, as well as a common gateway for verification and authentication, towards efficient deployment of resources and service delivery across the economy through applications of services in management, health care, microelectronics, manufacturing, computer products, education, distribution, as well as finance.

The economic benefits of identity management both as a policy and in terms of its influence on economic development cannot be overemphasized. Effective identity management makes the world a safer place and creates new information pathways of high-speed electronic citizens' data exchange. The economic implications of identity management are extensive: fraud reduction, e-transactions are just a few instances of the way in which identity management is changing how people communicate, become informed or do business. The relation between identity management policy and economic development and benefit has been a subject of numerous studies, and all agree that there is a close link between identity management and economic development. In different researches by Birrell&Shneider, (2013) and Pang & Lips (2008) on economic development implications of identity management, the studies found an interdependent relationship between economic activity and identity management infrastructure investment at country levels. The findings of the various research endeavours including the study align with the conclusion that identity management investments affect economic activity and that economic activity affects identity management investments, and there is a serious cut in Nigerian business costs resulting from a system of identification.

2.1.1. Impact of National ID in Service Delivery—the Case of India and Pakistan

(The World Bank [WB], 2014) India's national ID—Aadhaar—was created with an objective of not only providing a unique ID to each resident of India but also to act as a mechanism for plugging leakages in safety net programs. Aadhaar acts as a tool to remove ghost and duplicate beneficiaries. Government of India has started an effort to include Aadhaar numbers in databases of functional identity programs and transfer benefits using Aadhaar numbers to linked bank accounts. This mechanism is currently being used for transferring subsidies provided on cooking gas and is expected to save ~10% of $6.5 billion annually spent on subsidy. This savings is achieved through elimination of ghost and duplicate beneficiaries in the database. A study by India's national institute of public finance and policy (NIPFP) estimates that use of Aadhaar for transfer of benefits will save roughly $4 billion each year for the Government of India and provide a rate of return of about 52% for implementation of the Aadhaar program.

Pakistan was one of the first countries in the world to introduce a national ID program based on biometric de-duplication through national database and registration authority (NADRA). After successful registration, NADRA issues a computerized national identity card (CNIC) along with a 13-digit ID number. This CNIC is used by multiple government agencies for identity establishment and eligibility confirmation. The most significant usage of CNIC was made in 2010 for providing relief to citizens of Pakistan affected by flash floods. The Government of Pakistan disbursed about Rs. 77 billion to 2.84 million families under citizens damage compensation program (CDCP) that were affected by flash floods in Pakistan. CNIC was used as a tool for establishing eligibility for receipt of benefits. Similarly, CNIC is currently being used in multiple social safety net programs including benazir income support program (BISP), a program aimed to advance financial inclusion and provide financial stimulus to women living below the poverty line.

2.1.2. Multiple Identity Management Systems in Nigeria

- The Nigerian banking sector instituted a bank verification numbers (BVN) exercise where a unique identity number is issued to every bank account holder. This is so that all bank account holdersdon't have to register with every bank they operate an account with. This made it possible to have a unique identity for commercial banks' customers. But this is not comprehensive because it will be difficult to identify the unbanked in Nigeria.
- The Nigerian communications commission (NCC) mandated every telecommunication operator to ensure that every GSM user has their data and biometric captured for every mobile number they use. This implies that

anyone with five mobile lines would have to register each time and will be asked the same set of questions. A single person can easily give his residence to be house number 8 to MTN, 2 to Airtel, 16 to GLO or house number 3 on another street to NIMC, with none of the agencies making effort to verify the data. This leads to duplication of records and waste of time and resources.

- The federal road safety commission (FRSC) also capture data and biometric information of all driver's license holder in the course of obtaining or renewal of driver's license annually. This is not also comprehensive as the resulting database contains only the record of all persons capable of driving on Nigerian roads.
- The independent national electoral commission (INEC) collected data and biometrics of only adults of voting age in Nigeria. This database is updated (as they say) every voting year. The database is verified by the voters most of whom cannot find their name or at best find their names with mis-matched date of birth, wrong address. The names of many registered voters were completely missing while some could not vote in the 2019 elections because they could not find their details in the local government where they initially registered.
- National identity management commission (NIMC) which was established by the NIMC Act No. 23 of 2007 has one of its mandate to be 'establishment, operation and management of the national identity management system (NIMS).' It was established to create, operate and manage Nigeria's national identity card database, integrate the existing identity database in government institutions, register individuals and legal residents, assign a unique national identification number and introduce general multi-purpose cards.

2.1.3. TheNeed for Well-Coordinated Unified Identity System in Nigeria

The solution suggested by (Awodokun, 2018) included cleaning, blending and consolidation of all data sources, by a single database company. This will afford a single database for every individual, with room for update whenever there is any change in information.

Mohammed and Saleh (2017) also discussed on the possibility of a centralized database in Nigeria. They suggested that the national identity management commission could be saddled with the job of coordinating the proposed centralize database.

Currently the ministry of welfare and social orientation is compiling a register of the poor and vulnerable people meant to use to execute the 'conditional cash transfer scheme' and/or palliatives during this Coronavirus pandemic in Nigeria. This register which is still being compiled as the palliative are being distributed in some states is subject to duplication as some people may register in two or three states within a short period of time. This type of data can be sorted from the integrated database even by state and local government by specifying the variables that characterize the poor and vulnerable in the society.

It is plausible to suggest reasons why every other government agency or departments needs to collect data directly from every individual, rather than just plugging into NIMC database.

2.2. Summary of Findings from Literature Reviewed/Existing Gap

For decades, the country has operated without proper identification systems making it harder and complicated for people to access basic services.

The longer this problem exists, the more challenging it is to fix. For starters, a majority of the population now have little understanding of why they need proper identification documentation. Who can blame them? Efforts of the government to provide a trusted identification system have led to duplicity of efforts.

There are various acceptable means of identification in the country: the BVN, drivers' licence, voters' card, international passport and the national identification number (NIN) card. They are neither harmonizednor interoperable. Rather, they are use-case specific.

The bank verification number (BVN) is tied to the banking sector and can only be issued by that industry. The drivers' licence is tied to the federal road safety corps (FRSC), which is only available to persons over the age of 18. The voter's card is issued by INEC. Then there's the international passport, issued by the Nigerian immigration services (NIS). Together, these means of identities are regarded as functional identities, According to Aguele (2020) at the Digital Identity Matters event which was themed Enabling Nigeria's economic and social growth with digital identity. 'A functional identity is an identity that you need to have so that you can participate in a service,' he explained. 'So, for example, you need your BVN for banking, you need your drivers' licence to drive. Those are functional identities.'

The fifth identity system is NIN which is issued by the NIMC. The national ID card is supposed to be the ultimate means of identification for Nigerians at home or abroad. But it has failed to live up to its basic responsibilities.

Now various innovators and initiatives are trying to harmonise the identity system by rejigging the process from the ground-up. It starts with capturing personal information and biometrics of Nigerians, then tying that information with the other identity systems.

Hence, the need for a unified or integration of identity forms to a system for a collective database for easy identification of residents in the country. The system will help checkmate all other existing databases from other parastatals involved in identity management.

3. Methods of Data Gathering/Collection

In this research, both primary and secondary data were gathered using literature sources, interviews and observations. Interview was only conducted in the south eastern part of the country. A total of 300 respondents were interviewed for this research.

Are you a Nigerian citizen?
- ☐ YES
- ☐ NO

If YES, what means of identity do you possess?
- ☐ NIN slip
- ☐ National ID card
- ☐ Voters card
- ☐ Driver'slicense
- ☐ International passport
- ☐ BVN

Do you wish to have just one means of identity instead?
- ☐ YES
- ☐ NO
- ☐ NOT SURE

What is your means of occupation?
- ☐ Student
- ☐ Entrepreneur
- ☐ Civil servant
- ☐ Trader

3.1. Data Analysis/Survey Results

Answer Choices		
Yes	**71%**	**213**
No	18%	54
Not Sure	11%	33
Total	100%	300

Table 1: Results from Survey

	Yes	**No**	**Not Sure**	**Total**
Student	80% 80	7% 7	13% 13	100
Civil Servant	46% 46	40% 40	14% 14	100
Entrepreneur	42% 21	28% 14	30% 15	50
Trader	42% 21	28% 14	30% 15	50
Total Respondents	213	54	33	300

Table 2: Results from Survey II

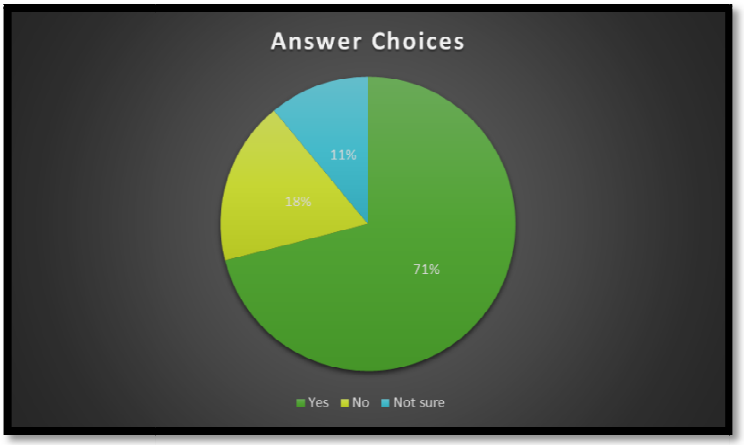

Figure 1: A Pie Chart Representing Answer Choices

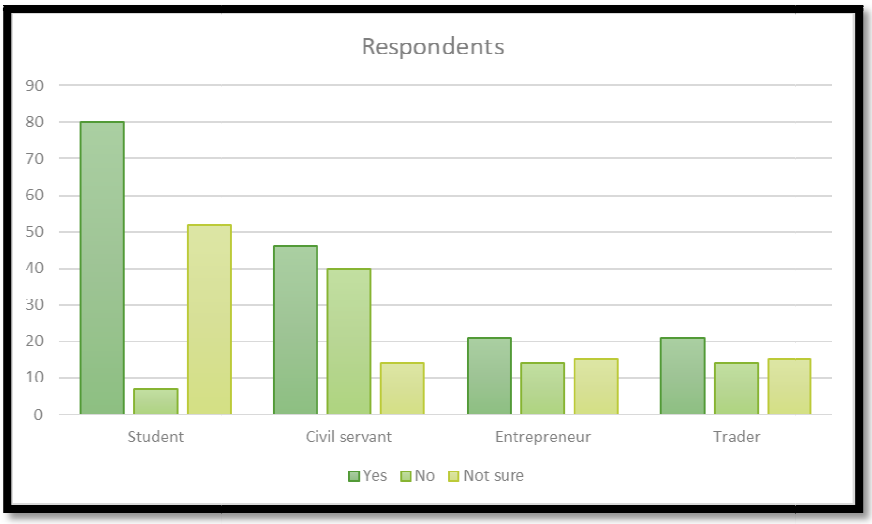

Figure 2: A Bar Chart Representing Respondents

3.2. SoftwareModules Specification

The following software is required for the adequate implementation of the new design;

- Firebase database engine
- Android studio developer
- Java

3.3. System Design Methodology

System development methodology refers to the framework that is used to structure, plan and control the process of developing an information system. A wide variety of such frameworks have evolved over the years, with its own recognized strengths and weaknesses. A recommended collection of phases; procedures; rules; techniques; tools; documentation; management, and training to improve the quality of a software development effort.

3.4. Choice of Methodology and Its Justification

There are many ways how to develop an application or software. Developers can take their time and develop it as they want, or if they are working in teams or cooperating with potential users they can use some of existing software development methodologies like traditional methodologies or agile methodologies which are becoming a standard in developing any kind of projects. Software development methodology in software engineering, including application development for mobile devices, is conceptual framework which is used to plan, design, structure and test or control developing processes. Application 'RINS' was developed by waterfall methodology. 'RINS' is a very simple android application which links all existing form of identity and generate a unique unified identity number for residents in Nigeria. Development lasted from April 2021 to May 2021.

3.5. Choice of Implementation Tools and Platform

The implementation of the residents unified identification system for Nigerian residents was done through the utilization of both the Android studio development software and Firebase database system. Xml was also used for the user interface. Java was chosen to implement the programming logic of the system while the Firebase database system provided the auxiliary storage unit for the information about the system.

3.5.1. Program Interface

This interaction is between the system components at the level of both hardware and software.

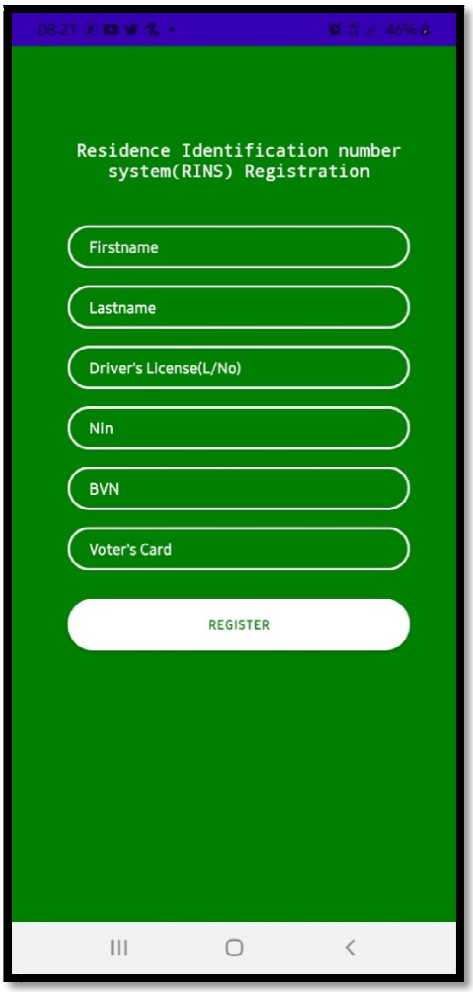

Figure 3: User Interface Implementation

Figure 4: Homepage Implementation

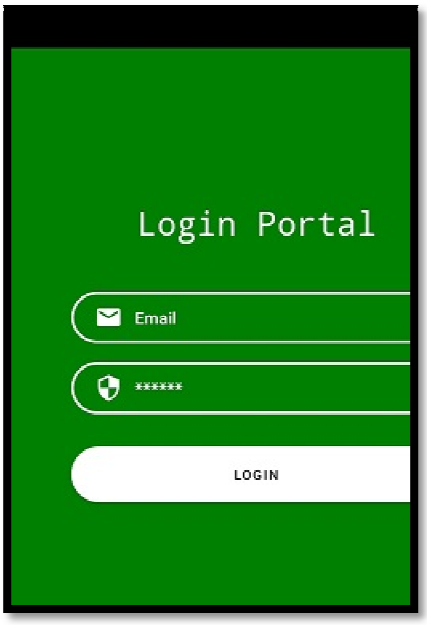

Figure 5: Login Page

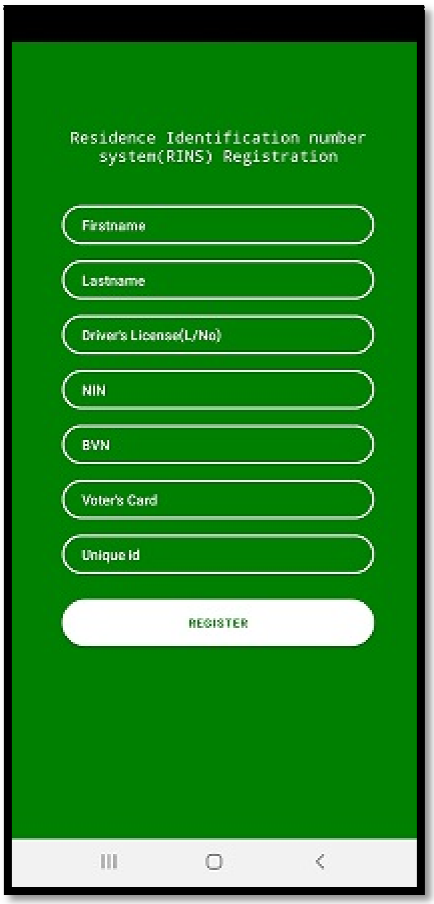

Figure 6: Registration Page

4. Results and Discussion

Figure 3: User Interface Implementation
This page displays the identification numbers of different management.
Figure 4: Home Page Implementation
This page displays the home page and the registry.
Figure 5: Login Page
This page shows where the residents have access to system.
Figure 6: Registration Page
This page displays the registration page of the residents and unifies or integrates different identification systems together.

5. Conclusion

Identity is very important in every society, every state and in every country even the world at large. A successful implementation of the unified identification System will greatly increase the efficiency of the NIMC and will help to ensure that residents' records are managed properly. An application for residents' unified identification should exist in the country as it facilitates an effective success in identifying and keeping record of residents in the country. It may not really be a communicative platform at its initial stage but mostly for the purpose of identification to the public. So, all forms of identity will be unified and each individual will possess a unique identity number. The Federal Government has a very important role to play in the implementation of this platform in the country so as to record a huge success in the platform. Thus, this study on successful deployment would have great importance to the economy and welfare of the citizens as they can benefit directly from the various social investment programs going on Nigeria that has eluded the majority without means of identification and also eradicates multiple identities of residents.

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