

Design and Evaluation of Integrated National Database in Nigeria

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Abstract

Several organizations in Nigeria create their databases independently, which is costly, and sometime the citizens found it uncomfortable, having no guarantee that their information will be protected by a robust data protection law. Coercing them to be giving false information. This research work gives birth to the idea of "integrated national database" a relational database management system technique to address the absence of a comprehensive set of citizen's data. An application was developed in this research work, a prototype serving as a central data repository that will interconnect the citizens, public and private organizations. The system will allow individual to register conveniently and then a unique reference will be given to every citizens, which will be tied with the database for easier retrieval of individual information in the database. Only authorised agencies can access the stored information, and organizations can access only information prescribe to it by the system super administrator. The developed prototype is tested using Blackbox technique to determine the effectiveness of the system which prove positive and survey has been conducted to explore the citizen's compliance and perception of the entire civic registration in Nigeria and another to assess technical view of the system.

Keywords: E-governance, Integrated, Identity, Database, National, Perception, Compliance, Citizens

1.0. Introduction

An artefact will be designed and tested in this research work "Integrate National database". An investigation and evaluation will follow regarding the suitability of such system in Nigeria. Whether Nigerian citizens will comply with such system after decades of successive failure to capture the citizens' data comprehensively for easy retrieval of information and quicker decision making. Another trending issue is the way Nigerian citizens perceive previous data gathering such as the National Population Commission (NPC), National Identity management commission as unimportant to their social life.

The research will explore whether effective implementation of a national database in Nigeria will help to provide a comprehensive databank repository of the citizens. Despite the fact that, the Nigerians have lost confidence in the government, as well as the political system of the country. With high number people from different part of the nation, frequently showing lack compliance to a series of national exercises. In addition, the researcher will also investigate on how the Nigerian government will promote compliance during the data collection in the field as well as promoting good data governance. The motivation behind this research work is to assist in bridging the gap from; non-compliance and wrong perception (from the citizens) to good data management (among the technical and administrative data managers) laying a foundation of effective citizens' information gathering for quick and easy retrieval. These will however, help to strengthen the relationship between the government and citizen's, technically known as "e-governance".

A system was designed "an integrated national database" free from bias (free of religion, tribe and ethnicity). A

prototype which will be implemented for research purpose only, the first of its kind in Nigeria that allow citizens' choice of filling their information without enumerator's intervention. The citizens from different part of the selected area of the research will be enrolled into the database, evaluation was conducted which explored the citizens behaviour, perception, compliance and their exposure and understanding of information technology based systems. In addition, technical aspect of the system was evaluated using feedback from technical staff of selected major organisation responsible for data collection in the country, such as NIMC, NPC and INEC. Black box technique was used to test the system performance which yielded a positive result.

2.0. Background

Technology motivated governance commonly known as e-governance is the application of information and communication technology (ICT) for conveying good government services, interactions and sharing of numerous unconnected services and system among government and their respective businesses. In addition, it facilitates the uses and appropriate management of information technology. It also offers a range of ICT facilities in an efficient and cost-effective manner. Despite the evolution witnessed because of the massive information technology tools for quick and efficient retrieval of information. Nigeria seems to be struggling with achieving a unified identity database that provides an easier flat form of accessing, sharing and integrating data by various organisations easily and without much waste of time. The major organisations responsible for providing Nigeria with comprehensive demographic information of the citizens are; National Population Commission (NPC) and National Identity Management Commission (NIMC). However,

manual and traditional method of data collection in Nigeria encourages human factors which brings about controversies and distrust in the preceding exercises conducted by the organisations Adedayo., Olaomi., (2010), and Waziri et al., (2014). These create discrepancies in data collected for the same variable, which proved to be time consuming and make information very difficult to manage and process for future use Waziri et al., (2014).

3.0. Context Review

Nigeria seems to be facing daunting challenges in managing citizen's data. Especially, one that is accessible for efficient and quick decision-making. Both governmental and non-governmental organizations are striving hard, when it comes to an effective retrieval of citizens' information. Particularly, when vital citizens' information is needed for various registration and identification purposes. Nigeria appears to be struggling with achieving a unified identity database that provides an easier flat form of accessing, sharing and integrating data by various organizations easily and without much waste of time UN, (2014). In Nigeria, more attention is paid to primary data collection, sample size estimation and statistical analysis, whereas, less consideration is waged in the automation of citizen's data for identification of individual. Therefore, accurate citizens' information such as estimated population of the country is often difficult and costly to obtain. In 1979, the National Identity Scheme was initially introduced in Nigeria and vigorously executed somewhere around February and March in 2004, and failed to serve its purposes and expectations. Nevertheless, In May 2012, Nigerian National Identity Management Commission (NIMC) disclosed yet another project to capture all citizens' information for the purpose of national identification; even in May 2015, the project is still yet to begin. Similarly, the National Population Commission also proposed to carry out fresh registration of the citizens. There were worries that the proposed exercises might possibly end similar way the previous ones end.

Adeyemi and Honey, (2010) have tinted the difficulties in data collection in some cultural settings, although the issue of data collection have their inherent challenges across the globe. Therefore many researchers experienced hardship while gathering data in the field, because some questionnaire may be 'unwelcome' in some cultural or ethnic perceptions. For instance, census and other data collection exercise may require some demographic data such as dates of birth, names, children, numbers of wives etc., depending on the nature of subject and sample. This information is vital information which can be used for research, planning and social benefits. In most of the record

keeping or information system surnames and Date of birth are considered as primary keys for distinguishing and cross referencing individuals. But Apart from the fact that many older generations do not know their exact date of birth, traditions may frown at asking questions on surnames, dates of births, parent's information or total noncompliance as shown in the figure 1.

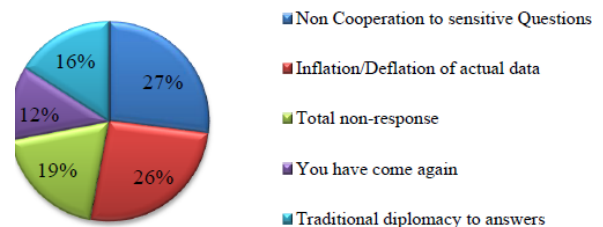


Figure 1. Factors affecting data collection

Tradition and belief has always been considered as among many other factors affecting the implementation and adoption of the innovation or technology Adeniyi, (2010). The underlying argument for this is based on the premise that a community's belief and values (i.e culture) can actually influence the perception and behaviour that might either promote or demote any-technological change. There has been supporting evidence of research signifying the effect of national culture values and behaviour, indicative of fundamental differences when relative technology is implemented in another environment until recently, national culture and values are being considered and actively used in technology acceptance research and information systems. Although a research work has been conducted on the design and development of integrated national database in Nigeria, likewise the Nigerian government is recently undergoing a civic registration of citizens through the national identity management commission. However, this research work is focusing on the design and evaluation of the integrated national database in the Nigeria with a aiming at exploring the end user perception of the countries decades of citizens' data collection and the technical view of the developed system Oladele, (2013).

Therefore this research works proposed a solution to the pressing issue in data collection in the field in Nigeria by designing a prototype national database. However, the theme of the study will be the perception and compliance of the citizens while trying to capture their information. Questionnaires will be designed to serve this purpose, before the respondent register their information in the system that is, if they are willing to, which will be the parameter to analyse the level of compliance. If they agree to participate, the research focus here will be to exploit the end user perception while capturing their data on the

system. However, technical view of the system will also be exploited through asking people with the IT background or staff of the selected areas of study as mention in section 2.0.

3.1. Inherited Problems from the Existing System

Nowadays, automation of record plays a vital role in retrieving any stored information easily and quickly. It assists numerous organisations for quick and prompt usage of information. However, it is not feasible in the current plethora of data collection and management in Nigeria. Identifying individual citizens has some inherent challenges from the existing system in the country. The method of capturing the citizens data were investigated in some agencies and the following lop-sidedness were revealed;

- There are difficulties in the means of storing and retrieving individuals' record for identification, because of the manual and tradition way of managing the information.
- Securing the manually stored files from unauthorized access is almost inevitable in the existing systems and data can be easily lost or stolen.
- If the data is lost or stolen then it is as if the identity of the person is totally vanished because there are no feasible provisions of a backup.
- Different fake identification are been made by fraudsters to claim others identity, as there is no any means that provide a flat form for justifying or verifying the claimed identity.
- The existing system can scarcely handle ad-hoc queries, because the difficulty in the effective management of information. As a result, different organisations have to create their databases independently.
- Inaccuracy and discrepancies has been found in many cases as regards the estimated population of the country, as well as identification of individual Adedayo&Olaomi, 2010, Jega, 2014, Akinsuyi, 2014, Odunfa, (2006).

3.2. Selection of DBMS Software

Three of the most popular database management systems are selected for benchmark comparison. They are MySQL, Oracle and PostgreSQL. One of the distinctions among the software is that; MySQL and PostgreSQL are open source, while oracle is a commercial database that may require a licence Zhonghai Z., et al. (2009). Although the oracle databases are more scalable because it handle very large databases which is in terabytes, while MySQL can handle larger databases than PostgreSQL. However MySQL and PostgreSQL have higher compatibility compare to Oracle

Fermilab, (2014). Comparatively, MySQL is the most widely used and popular relational database management system, which provides multiple user access to several databases. It also has more acceptability in the PHP web development Khan, (2014).

3.3. Data protection

Collection and proccession of data by organisations can be exceptionally sensitive. Meanwhile a working legal framework is often required in states where there are weak legislations such as Nigeria. Therefore, there is a need for the organisations to establish privacy protections of individuals' and convincing legislation system that cannot be easily dismantled. While working with private associates, the implications and abuse of corporate access to personal information should be-carefully handled. Additionally, the shared access to personal data may likely put the subject in harm, information such as region and tribe falls into the wrong hands Privacy International, (2014).A brief comparative study of European, US and Nigerian data privacy laws by Akinsuyi reveals the following gaps:

- Lack of clarity in the privacy right and personal data collected;
- It is unclear what constitute the subject data rights;
- No governing body to redress a breach of confidentiality;
- No identification of the fact that organisations can also breach data protection rules;
- Lack of establishing conditions whereby the subjects' data can be obtained without their approval;

There is no definition, provision or needed requirements for technical actions to mitigate breaches of confidentiality Akinsuyi, (2014).However, Nigeria like her few African counterparts should embrace an effective data protection laws recommended by the United Nations resolution and the ECOWAS, to allow a good legislation of collecting and sharing of citizens' data.

4.0. Database Design

Design method of the system is a conventional software development life cycle, MySQL has been used as the back end database based on the suitability of the research as explained in section 3.2. Notepad++ is used for coding and Wampserver to host the prototype. Blackbox technique was used to determine the effectiveness of the system which prove positive. A conceptual design is pictured below to develop high level structural overview of the systems' database.

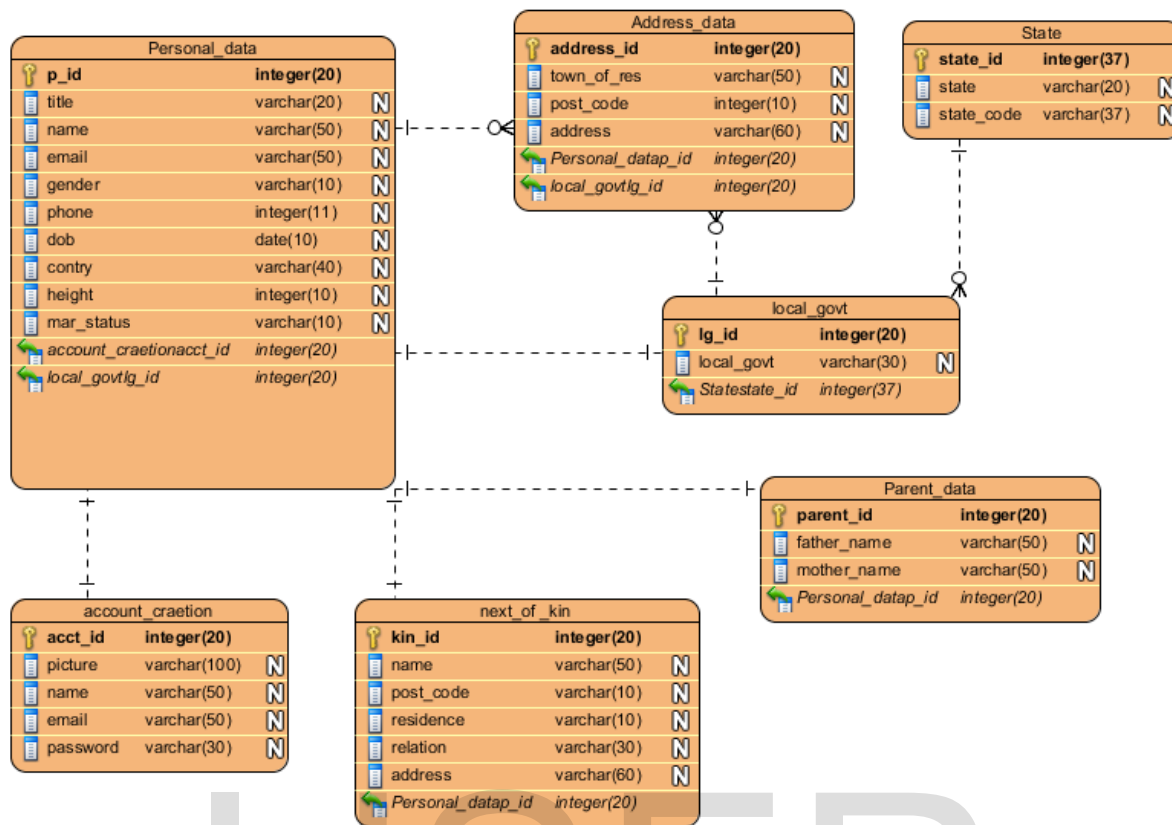


Figure 2. An Entity Relationship

The model above is an entity relationship diagram, commonly written as ER-Diagram. It is the conceptual system architecture, describing the actual end user need and transactional requirement of the system Coronel, Morris & Rob, (2013). All description of the attributes, their entities, the domain and the relationships are defined in the table above.

5.0. Methodology

An artefact was successfully developed to serve as a prototype, allowing citizens to register their information. Thus investigating their perception and compliance. An online questionnaires was designed to take care of that. Whereas the use of interviews and questionnaires was adopted to get the technical view of the system. The technical and non-technical administrators of the National Population Commission, Independent National Electoral Commission and National Identity Management Commission. These are selected because they are considered as major organisation responsible for collecting and managing citizens' information in Nigeria. The selected research areas include;

Karasuwa, Bade, Bursari, Damaturu, Potiskum and Nangere making two localities from each senatorial zone and a total of 30 responses were obtained.

6.0. Result and Discussion

The aimed of this research work is to provide a system that will replace the older civic registration exercise and to understand the view of the citizens concern regarding the previous method and the proposed one. After successful design of the system, views were collected form the selected case study area of Yobe state. This part will explore the findings of the research work as categorized in to the following modules:

- System Modules
- Evaluation Modules

6.1. The system Modules

This part is further divided into sub-modules, the Super Admin module, the Sub Admin module and the User module. Below is the home page of the system



Figure 3. Homepage

6.2. The Super Admin Module

This is a super module that enjoy privilege to add sub admin, update required fields and even delete a user

-account or the sub admin account. The super administrator is the superior of this system. The figure below is the interface showing the admin page.



Figure 4. The super admin login page

6.3. The sub admin Module

This is an integrated module created by the super administrator and role and privileges is assigned by the super admin depending on the need of that particular sub

-admin. For instance the system contains two sub admin which consist of Inec and NPC admin.

- The Inec Admin

This sub admin is a simulation of the organizational work of the Nigerian independent national electoral commission (INEC), where by citizens are been registered almost on every election period. This system provides an avenue where by the Inec admin will just use the reference number of a citizens and verify whether the person is eligible or not and if a citizens is registered and has attained the age of 18

as dictated in the Nigerian electoral act. Therefore, the system will validate person and allow print temporary voter's slip, saving amount of time wastage in registering people individually and help to control falsification of age by ineligible voters. Below is the depicted screen shot of validation page, showing activity of the Inec sub admin.

Figure 5. Inec validation form

- The NPC admin

Unlike the Inec admin which can only view user names, Date of Birth, address, the NPC admin can view population size according to the need of the commission for instance the admin here can view the number males and females in particular place and can also register birth and date. This is also another imitation of the Nigerian national population commission (NPC) and its duty is to provide the country with an accurate statistics of its citizens which can be used for future planning. The existing frame work of the organization has been facing challenges due to the manual method involved in the data process. Below is the snapshot of the Inec admin operation, which include validation of voters from the registered citizens.

| 2014 Population Summary | | | | |
|-------------------------|--------------|----------------|------------|-------|
| Total Summation | No. OF MALES | No. OF FEMALES | Total | |
| S/No | State | No. Male | No. Female | Total |
| 1 | Abia | 0 | 0 | =0 |
| 2 | Adamawa | 0 | 0 | =0 |
| 3 | Akwa-Ibom | 2 | 0 | =2 |
| 4 | Anambra | 0 | 0 | =0 |
| 5 | Bauchi | 0 | 0 | =0 |
| 6 | Bayelsa | 0 | 0 | =0 |
| 7 | Benue | 0 | 0 | =0 |
| 8 | Borno | 0 | 0 | =0 |
| 9 | Cross River | 0 | 0 | =0 |
| 10 | Delta | 0 | 0 | =0 |

Figure 6. Viewing population summary

6.4. The User/Citizens Module

The user module or citizen's module as define in this system is the target module that are expected to be capture in the system and get their feedback based on their fast experience with civic registration exercises in-case study area. At the top right hand corner of the home page the user login appears and users can register their information and added to the system. Once a user is added, the account cannot be edited, but when there is need for that, users can post a complaint to the super admin. The admin can

received their complaint and allow the edit mode as indicated in figure

| S/NO. | USER NAME | REF. NO | COMPLAIN | ACTION |
|-------|------------------------|--------------|---|-----------------------|
| 1 | Abba Umar Kura | HC/AK/054166 | I want to edit my profile | Reply |
| 2 | Haina Abdullahi Haruna | HC/ED/714227 | I made a mistake while selecting my date of birth | Reply |
| 3 | Haina Abdullahi Haruna | HC/ED/714227 | I made a mistake while selecting my date of birth | Reply |

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Figure 7. Complaint page

6.5. Testing the system

Blackbox is used in testing the external performance of a system, where by the tester may not necessarily have any idea of the program code. This technique is only concerned about the input and the output of the software that is why is called a Blackbox method. The objective of the function testing is to make sure that there are no requirements left unfulfilled and that the artefact meets the end user or the designers need to work as expected. The testing is done from the view point of the user not the developer and the test design can be done as soon as the specifications are met. However, the chosen technique has some disadvantages which include: Earlier test case by the software developer may render any test redundant; Difficulty in designing the test case and testing every bit of the input may be unrealistic because it is time consuming and therefore, some of the path might not be fully tested. Myers, Sandler & Badgett (2011).

6.6. The Evaluation Modules

The selected area of study seem a little bit diversified, because of the dominance of few languages. Therefore, a less likely differences in culture and tradition is expected which has a direct impact on one perception as indicated by Hofstede, G. (2014). As mention before the evaluation was done to uncover the citizen's perception and the technical view of the system

- The citizens/User perception and compliance

The study reveal that less than 32% have ever had the privileges to use computers their own for any civic registration and alarming number of the responses indicate close to 57% have no computer literacy at all, as depicted below in figure 8.

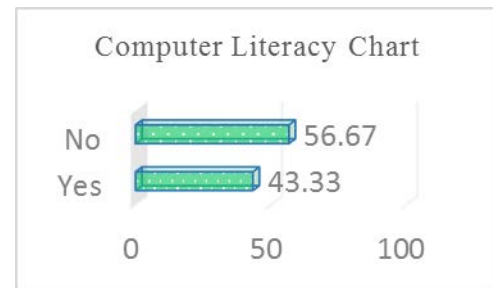


Figure 8. Computer literacy Chart

The above figure depict the gap between the computer literates and non-computer literates, although the gap did not seem too much. On the other hand, less than 30% used computer often among the computer literate. Only 30% of the respondent ever have the privileges to register their information/data using computerized information system. Thus showing the citizens unfamiliarity with such type of system. Likewise, the research unveiled less than 50% of the respondent realize that their personal information is worthy of safeguarding and more than 50% are between the range of my information should not be guarded or they do not know whether to be safeguarded or not. The question read "Do you consider your demographic information worthy of securing under strong data protection act" the chart of response depicted in the figure 9 below.

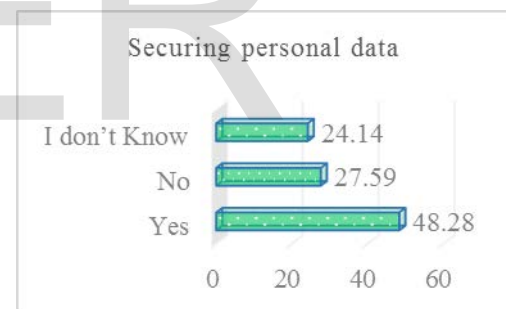


Figure 9. Securing personal data.

Another set of responses gotten below in figure 10 discovered that an alarming number of the respondent, close to 53% did not mind revealing their personal information to a third party, and only an approximate of 47% express concern to their information accessibility by third party. This is however do to the lack of orientation and awareness among the citizens.

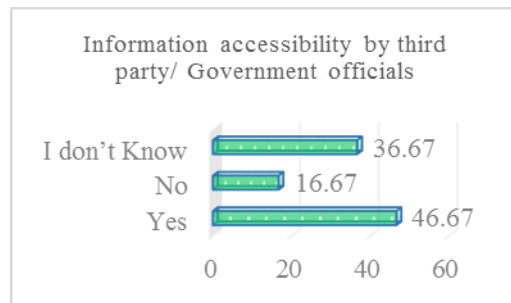


Figure 10. Information Accessibility

In the review of the literature in 3.0. It has been reported that there has been a series of discrepancies of information on the same data collected by different organizations. The revelation of the research buttress the above claimed, when ask the respondents "have you ever inflate or deflate your exact information" in any data collection processes? Surprisingly about 24% of the respondent answer yes, and, the reasons given were capture in table below.

| S/N | Reason for inflation/deflation |
|-----|---|
| 1. | Tired of given my information to unknown |
| 2. | Want my village to record more population |
| 3. | I don't think it will make any difference whether I give wrong or write answers |
| 4. | I want my tribe to be populous |
| 5. | We were told to increase our numbers so we can have more benefit |
| 6. | I don't want to give my personal information to a stranger |

Table 1. Reason for inflation/deflation of data

It has been reported that a number of unsuccessful civic registration in Nigeria has taken place from precolonial era to date, as explained in the context review in section 3.0. Respondent were asked whether they can comply to take part in the designed artefact (Integrated National Database System) or any related information system that require data capture, but there level of noncompliance is very high amounting to 37%. Therefore this result might have arisen as a result of either lack of computer literacy or the trust in the entire civic registration.

In view of the above, the research has uncover a greater correlation between lack of computer literacy and understanding the value of one's personal data. Therefore, there is need for proper orientation for Nigerian citizens to understand the confidentiality of their personal data or information and what harm the computer can do to them, if care is not taken. On the technical view of the system which was gotten from respondent whose line of work is somewhat related to data capture as explained in section 5. The question ask here is based on the Likert scale, that is from very helpful to not helpful. No fewer than 22% agreed that the system will be of very helpful when implemented, helpful is 27%, relatively helpful is approximately 28%, somewhat helpful is 22% and no respondent answer that the system will not helpful at all. Figure 11 revealed the

responses for encryption of sensitive data in the system and the question read as; "Sensitive information are encrypted"

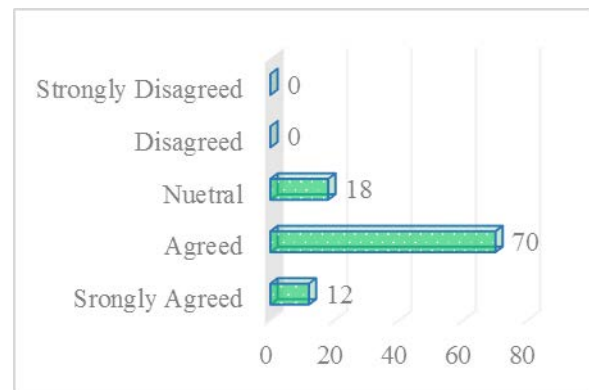


Figure 11. Encryption of sensitive information

Furthermore, all the subsequent question ask in this section are based on the Likert scale, but in this case is from strongly agree to strongly disagree. The technical view of the said "the design is less complex and is easier to used" the responses in percentage order are; 61% agreed, 33% neutral, only 6% disagree, while 0% for both strongly agreed and strongly disagree. 72% responded that the system has a good navigating, 22% neither agree nor disagree, only close to 6% disagree, none for strongly agree and strongly disagree as shown in figure 12.

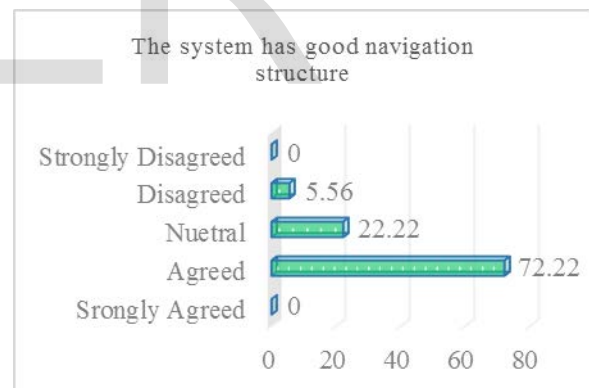


Figure 12. Navigation structure

Similarly, the following percentages of response accrued to the question that read as "All mandatory field are validated before proceeding" 11% strongly agreed, 61% agreed, 22% neither agree nor disagree, approximately 6% disagree and that 0% geos to strongly disagree. The result of the responses gotten from the technical view reveal that the system is feasible and that has lived up to its expectation. Therefore, the system is technically workable and can be implementable.

7.0. Conclusion

There are numerous ways of capturing information but in Nigeria a paper based data collection is predominantly used, thus making it difficult for the authorities to obtain all citizens information at once. Lack of computer literacy, not knowing the importance of personal information, lack of access to enough information and communication technology tools, among others as revealed in above study. Therefore this has for long stalled the process of data collection in the country, making it difficult to have a comprehensive and authentic citizens' data and leading to a number of registration by different organization.

However recently the country is undergoing a civic registration of citizens through the so called National Identity management commission. The commission has central registration point in each state of the federation and the registration process is an online for pre-registration and then the form should be taken to the registration centers for another filling of manual form and then wait in the queue for your data capture which contain biometric feature. Integrated national database system helps to ensure good and credible conduct of data collections. The developed system consist of three primary modules; Super Administrator Module, Sub Admin Module, and User Module. These module can interact with each other to achieved effective service delivery and reducing waste of time, and frequent data collection. The designed system is free from bias (free of religion, tribe and ethnicity). A prototype implemented for research purpose only, the first of its kind in Nigeria that will allow the citizens' choice of filling their information without enumerator's intervention. The citizens from different part of the country will be enrolled into the database. Evaluation of the system from the citizens' point of view was intensely conducted. The black box technique was be used for the system testing and yielded positive result. However, the central point of the research is to investigate the behaviour of the citizens, their perception, knowledge and compliance in data collection in the field from the citizens' point of view. The database administration of selected major organisation responsible for data collection in the country, as well as their administrative view of the system.

The advancement in technology couple with the social security challenges necessitate the use of a robust information capture in recent days, the duo cannot be achieved without proper compliance from the citizens. Consequently, the survey revealed a reasonable number of respondent repel third party intervention in any type of sensitive data collection, and people might likely prefer automated system that can be access without third party or enumerators' intervention. However, the citizens should be given enough computer orientation to be able to register

their information comfortably. In addition, ethnicity and religion should be remove in all data collections such as censuses to avoid people inflating their number for political purposes. Improvement of e-government services are required to facilitate and encourages its citizens to understand the benefit of information services. This can be achieved by providing them the access to information and communication technology tools, reducing the third party intervention in the data collection, reduced time wastage, and enhancing the data protection laws in the country. Moreover, this which will go long way in bridging the trust gap between the government and the citizens.

8.0. Further study

The evaluation of the designed system is conducted only in some selected area of Yobe State and it will be difficult to generalize the outcome of the result. Because of the diversified nature of different ethnic believe and culture in Nigeria. Therefore, the need to further this research work in terms of both the design and the case study. The former can be improve by adding features such as diasporas registration since the entire aim of the system is to assist the country get all its resident information to promote accurate planning for social security services. While in the case of the later, extensive data collection method should be employed, from a random selection of at least a state from each geopolitical zone. Identifying the intended target group from each state and making sure that the selected sample represents the population to make conclusions about. A detailed survey should also be included to find out the citizens of Nigerians preferences of authentication method.

9.0. Acknowledgment

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