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FusionChart-based Information System for the Aged and Handicapped in Nigeria

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ABSTRACT

This research facilitates the capturing, collation and analysis of data about some vulnerable Nigeria citizens (the aged and handicapped) through a website for an easy government decision. A local visualized information system website “fusionchart-based information system for the aged and handicapped in Nigeria (FISAH)” was created to enable the visualization of real-time information about the vulnerable citizens using fusionchart technology. The system was actualized using fusionchart plugin in Eclipse, Wamp Server, PHP, Mysql, HTML and JavaScript to deliver interactive powerful charts and data presentation in 2D and 3D, pie chart and line graphs structures. The charts produced were animated and made interactive using JSON Encode.

Keywords: Visualized-Information-System, Website, FusionChart, Real-Time Information, Eclipse, JSON-Encode.

1. INTRODUCTION

The fusionchart-based information system for the aged and handicapped (FISAH) in Nigeria is a website that captures and analysis data about some vulnerable Nigerian citizens (the aged and handicaps) to generate a real-time information in the visualized form needed for easy government planning and timely decision making. Different types of disabilities are noted in Nigeria among which includes Hearing, Speech, Mobility, Sight, Learning, Psychiatric, Autism, Albinism and Others [1]. ‘Others’ disabilities as presented in this study represents disabilities not classify in the Nigerian Census 2006 gazette but were noted to have a serious effect on the performance of an individual, such as having one arm, frequent epilepsy, stroke, schizophrenia.

The existing system of data gathering, collation, analysis, and presentation on the size of the vulnerable groups (the aged and handicapped) in our country is done manually and periodically which is highly inefficient, inconsistent, inaccurate, unreliable and time-consuming process for quality governance.

This research aims at design and implementation of a fusion chart-based information system for the aged and handicapped in Nigeria that dynamically gathers, collates, analyze and present efficient, consistent, accurate and reliable information about vulnerable groups (the aged and handicapped) in our society in a visualized form for timely decision making. It uses different statistical analysis and presentation formats such as graphical presentation as well as 2D and 3D data presentation to show the prevalence of vulnerabilities in each state of the federation in real-time.

1.1 FusionCharts

A FusionChart is an open-source flash charting component that can be used to render data-driven animated charts. It is an industry-leading JavaScript charting library that offers a unified experience across all devices and browsers. FusionCharts is probably the most exhaustive collection of charts and maps [2]. A chart is a graphical representation of data, in which the data is represented by symbols, such as bars in a bar chart, lines in a line chart, or slices in a pie chart [3]. A chart can represent tabular numeric data, functions or some kinds of qualitative structure and provides different information. Made in Macromedia Flash MX, FusionCharts can be used with any web scripting language like PHP, ASP, .NET, JSP, ColdFusion, JavaScript, Ruby on Rails among others, to deliver interactive and powerful charts [4]. Using XML as its data interface, FusionCharts makes full use of the fluid beauty of Flash to create compact, interactive and visually-arresting charts. This charting

system was used in developing an information system such as digital dashboards (Federal IT Dashboard) for the US federal administration in 2010[5]. FusionCharts is a perfect addition to reports, dashboards, surveys, monitors, and analytics. Its comprehensive range of chart types with smart reporting capabilities, animations and interactivity [6] are bound to make any information system look stunning and power-packed. FusionCharts functions seamlessly on PCs, Macs, iPads, iPhones and a majority of other mobile devices to enhance easy access to this information system. It consists of all charting requirements in an information system such as a simple column chart, pie chart, a combination chart, advanced zoom and scroll charts, or specialized sales and marketing charts that support interactive options like tooltips, drill-down, exporting as image, PDF, or CSV and JavaScript integration. FusionCharts uses XML to specify both the data to be charted and the look and feel of the presentation. FusionCharts offers the perfect example of the power of using XML to specify data and presentation information [7].

1.2 Information System

An information system is a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization or government. In addition to supporting decision making, coordination, and control, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new products. Information system has become the backbone of the most organization as banks could not process payment, the government could not collect taxes, hospitals could not treat patients without the support of information system. In almost every sector be it education, finance, government [8], health care, manufacturing, information system plays a prominent role in decision making. The roles and functions of information systems within an organization include providing management information [9], supporting e-commerce, supporting knowledge work and undertaking transaction processing. There are three activities in an information system that produces the information that an organization needs to make decisions, control operations, analyze problems, and create new products or services. These activities are input, processing, and output. Input captures or collects raw data from within the organization or from its external environment. Processing converts this raw input into a more meaningful form. Output transfers the processed information to the people who will use it or to the activities for which it will be used. The fusionchart-based information system generates its inputs from the number of disabled persons in the country analyze them automatically and generate a real-time graphical output as the right amount of information at the right time is a key factor for every organization [10] or government planning. The government needs relevant information on which to base their planning, control and decision-making functions most especially as regards the fewer privilege people (i.e. the aged and handicapped). The data analyzed, summarized or processed through the fusionchart-based information system become information to government agencies as they easily understands the meaning of the generated graphical information. The fusionchart-base information system generates real-time information that is accurate, complete and Comprehensive. It enhances data capturing and collection, storage, processing, and distribution or dissemination of information as a required function of any complete information system.

1.3 Importance of Fusionchart-based Information System

The fusionchart-based information system for the aged and handicaps in Nigeria focuses on information visualization to enable Nigerian government makes quick and viable decision for the most vulnerable group in a Nigerian population. Information visualization is the art of representing data in a way that it is easy to understand and to manipulate. It is an emerging discipline that utilizes visual representations of abstract data to help people to understand the underlying meanings of the information [11]. Visual data observation makes more sense on human beings than looking at the raw information. Card et al. [1999] in [11] describes information visualization as the use of computer-supported, interactive, visual representations of abstract data to amplify cognition. One of the main goals of information visualization can be regarded as augmenting human cognition in a way that viewers gain knowledge about the underlying meaning of the data. Visualized Information is more effective than bland tables, text, and numbers [12] as it communicates more clearly and powerfully. For instance, notice the table below, and try to spot the state capital with the highest number of aged persons in Nigeria.

Table 1: State Capital with Various Number of the Aged

State capital	Jalingo	Makurdi	Lokoja	Enugwu	Oyo	Jos
Aged Persons	45	56	36	58	75	62

The data in table 1 is visualized to give the same information in a much easier way as seen in figure 1

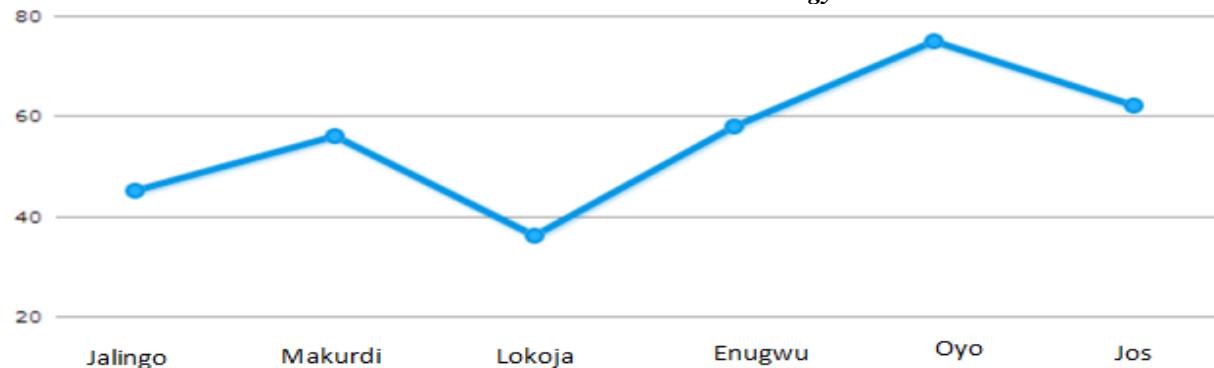


Figure 1: Graphical Representation of Data in table 1

This information visualizations enable users to identify patterns and pattern violations (trends, gaps, and outliers) in the data. It visually communicates relevant, up-to-date details of the state of vulnerable population in our country. By eliminating the delay of manually collecting and aggregating data, information visualization and analytics systems have improved productivity and collaboration, simplified work processes as well as reducing the decision-making cycle time[13]. With the aid of information visualization that gives real-time insight about vulnerable citizens, Nigeria government achieves an in-depth understanding of the number of vulnerable persons in each part of the country and implement polices that will adequately facilitate their well being. One of the common trends in information visualization is the creation of information dashboards using FusionCharts technology. A dashboard is an easy-to-read, often single page, real-time user interfaces, showing a graphical representation of the current status and the historical trends of an organization's key performance indicators to enable instantaneous and informed decisions to be made at a glance [14]. It allows visualization of complex data and their relationship in a format that can be easily understood by decision makers [15] as every government turns to data analysis for important decisions [16]. Information visualization influences the quality of government decision directly as government agencies need not search through the valuable information hidden in large amounts of data about vulnerable citizen-generated nation wild.

2. MATERIALS AND METHODS

A local graphical information system website; fusionchart-based information system for the aged and handicaps (FISAH) was developed to facilitate the capturing and analysis of information about vulnerable Nigerian citizen (the aged and handicaps).



Figure 2: Fusioncart [17]

The system was actualized using fusionchart plug-in and Eclipse environment, Wamp Server, PHP, Mysql, HTML and JavaScript to deliver interactive powerful charts and data presentation in 2D and 3D, pie chart and line graphs structures. The charts produced were animated and made interactive using JSON Encode.

2.1 Eclipse and Fusionchart Plug-in

During the system development phase, Eclipse was used as an Integrated Development Environment (IDE) for PHP codes. The fusionchart plug-in was referenced through require_once 'fusioncharts.php' and require_once 'phplot.php' classes. These classes contain functions; SetDataValues() through which data was passed in an Eclipse IDE and DrawGraph() or render() which finally renders the desired graphical structure. The dimension of the needed structure was achieved through an appropriate alignment of phplot(\$width_value, \$height_value) function. The variables, \$width_value, and \$height_value were set as numerical strings that extend graph area both vertically and horizontally. A function SetPlotAreaWorld(\$value1, \$value2, \$value3, \$value4) sets scale of the drawn structure such that \$value1 indicates the originating value of the graph while \$value2 and \$value3 are increment values on y-axis and x-axis respectively with \$value4, the maximum value on y-axis. SetTitle () function was referenced to give a noticeable heading (title) for the drawn structure.

2.2 WAMP Server

WAMP is an acronym for Windows, Apache, MYSQL and PHP, Perl or Python. It refers to a set of open source applications, which are commonly used in Web server environments. In this research, the Wamp server serves as a local host where the system was

tested on the browser. PHP, a scripting language was responsible for the functional interaction between the front and back ends modules of the system. PHP codes alongside Java Scripts basically ensured that all designed web pages have dynamic content. Figure 3 shows the system implementation architecture.

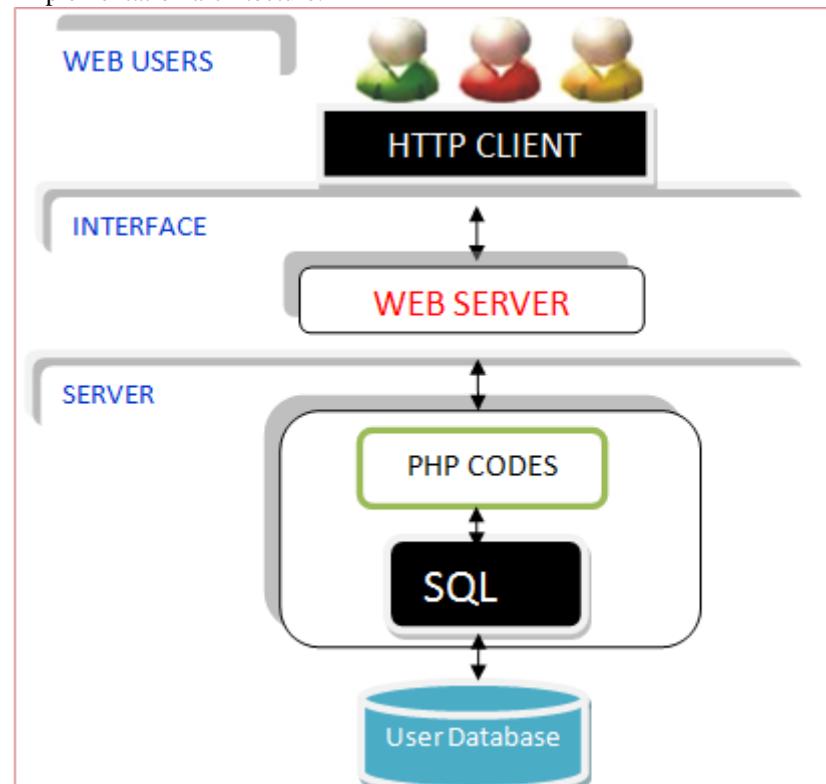


Figure 3: System Implementation Architecture

In this architecture, the primary data repository for the system was MySQL database, which was used to create a relational database structure on the web-Server to store data about the aged and handicapped in Nigeria automatically. In this work, four database tables were designed namely: The persons table which contains bio-data of all the vulnerable population in Nigeria, the disable_types table contains all known and recorded physical and mental disabilities in the country, the reorg table holds information on both public and private organization responsible for data capturing on vulnerable citizens in the country and the indexorg table contains the super administrators information. The various relationships between these tables are shown in an entity relationship diagram (ERD) in Figure 4.

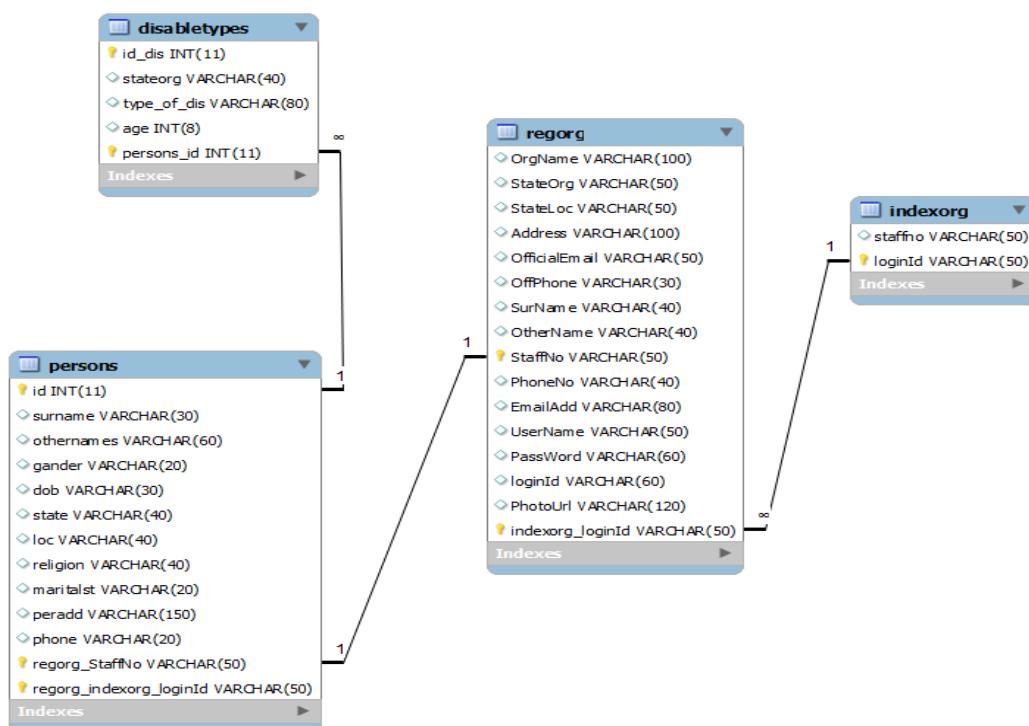


Figure 4: Entity Relation Diagram (ERD)

The designed fusionChart-based information system is modeled in classes. Core PHP classes which drive the system are presented in Figure 5. These classes are DataCollection, GetData, and Analysis. The data for the data collection class actually input to the system, captured on the vulnerable Nigerian citizens. The behavior of the data collection class is therefore restrained on data capturing and specified according to the dataset so captured. The captured data are stored in relational database structure (Mysql) and retrieved for manipulation through GetData class. The final computation, analysis, and presentation are achieved by a call for the Analysis class, which loads data into SetDataValues() function for onward display by DrawGraph() or render() functions of fusionChart technology.

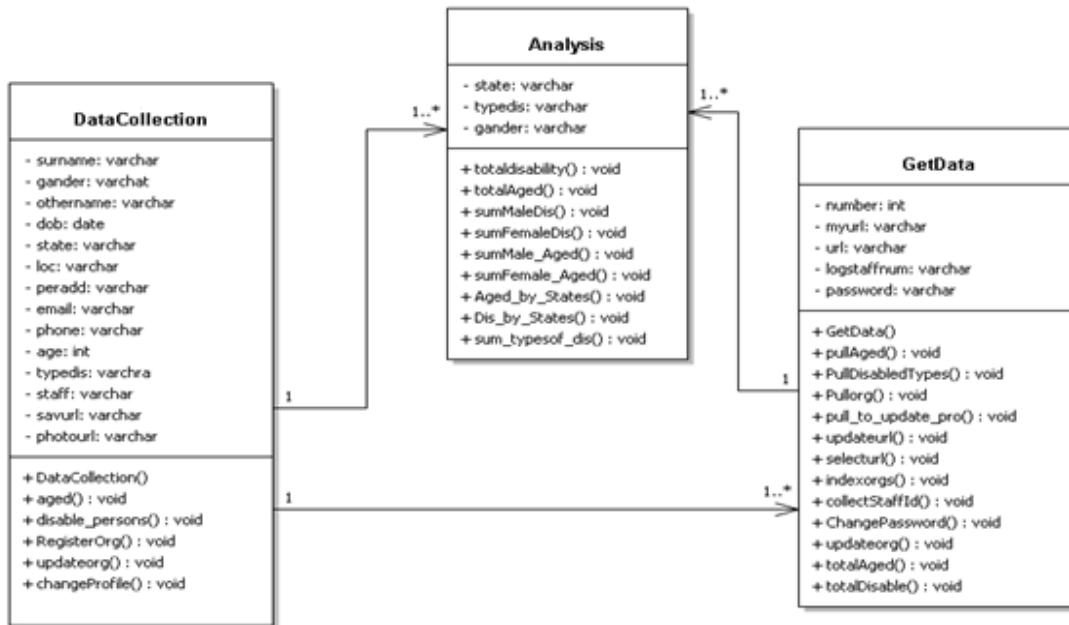


Figure 5: Class Diagram of the System

2.3 HTML (Hyper Text Mark-up Language)

HTML is a standard mark-up language used to create Web pages. A mark-up language is a set of mark-up tags which describes different document content. It is written in the form of HTML elements consisting of tags enclosed in angled brackets, like <html>. In this information system, HTML was used for creating users' interactive interface such as the aged/handicapped data capturing forms and dashboard. These structures provided inputs driving surface for the developed system.

3. RESULTS AND DISCUSSION

The results of the study are displayed in the snapshots in figures 6 through figure 13. **Figure 6** shows the Index/login Page that enables system users to obtain comprehensive records or information on the aged and handicapped in real-time. It shows on a glance, the analysis of the total number of the aged and handicapped in the country. It equally facilitates administrative login for system administrators in order to perform their administrative functions.

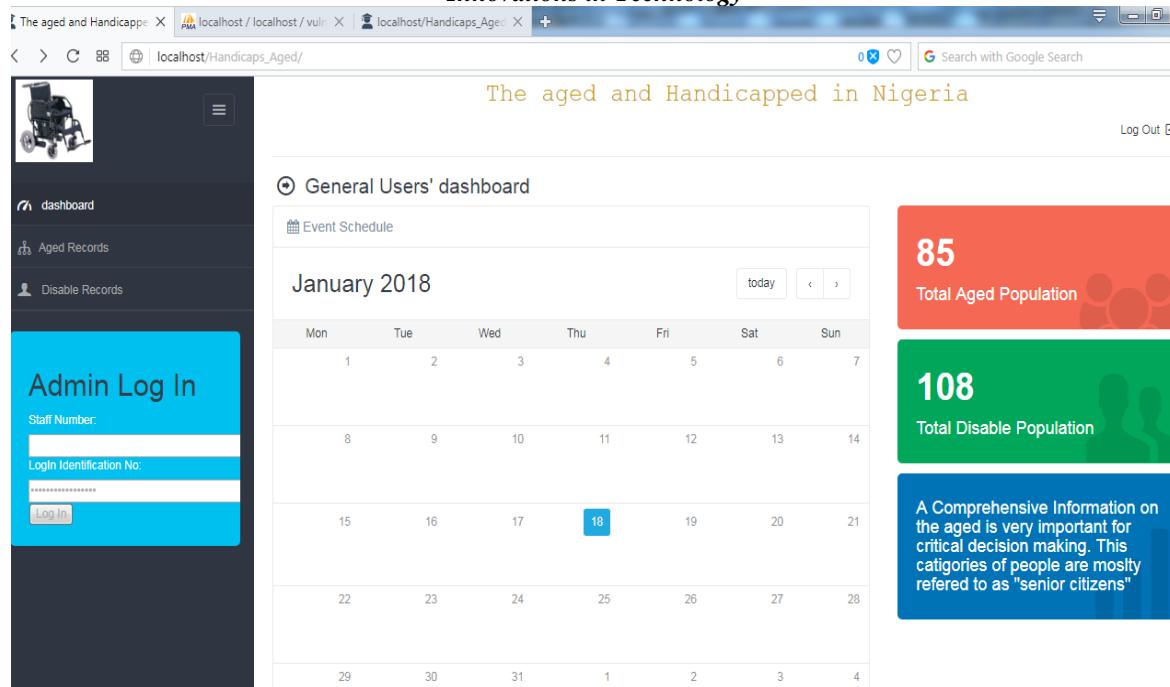


Figure 6: Index/login page

Figure 7 shows the registration form that captures all records of the aged population in the country. Once the data is captured, the system filters it into sex groups and automatically applies fusionChart technology to present result in the analytical form using bar charts, line graphs, and tabular structures.

The screenshot shows a registration form titled 'Posts All Old Ages'. The form includes fields for 'Sur Name' (with a dropdown menu for 'The aged and Handicapped in Nigeria'), 'Other Names', 'Gender' (Male), 'Date of Birth' (with a date picker showing 'December 20 1998'), 'State of Origin' (ABIA), 'Local Govt' (ABADAN), and 'Religion' (Christianity). The sidebar on the left includes links for 'Register the Aged', 'Register Disable Persons', 'Aged Records', 'Disable Records', 'Update the Aged/Disable Reg', and 'Update Account'.

Figure 7 Registration Form for the Aged

Figure 8 shows relevant information retrieval links of the information system developed. On this page, a user can retrieve information such as the total number of disabled population in the country, a number of disabled men and women in each state of the federation, the total number of disabled persons per state, compares the various level of vulnerabilities as well as view disabilities based on type. All these information are then visualized in various forms such as bar chart (2D and 3D) structures, pie chart and a line graph to ease the level of understanding in order to facilitate real-time analysis and decision making.

The screenshot shows a web application interface titled "The aged and Handicapped in Nigeria". On the left is a dark sidebar with icons for "dashboard", "Aged Records", and "Disable Records". The main content area has a title "Statistics on Disabilities" and a summary box stating "Total Disable Population: 108". Below this are several navigation links: "Bar", "Pie", "Line Graph", "Comparisons: The Aged/Handicaps", "View by Types of Disabilities", "Tabular Records", "Bar", "Line Graph", and "Disabilities by States". A table below lists the total disable population by state, showing counts for males, females, and totals.

S/N	State	Male	Female	Total
0	ABIA	5	2	7
1	ADAMAWA	4	1	5
2	AKWA-IBOM	3	1	4
3	ANAMBRA	4	2	6
4	BAUCHI	4	1	5
5	BAYELSA	2	1	3
6	BENUE	3	0	3
7	BORNO	1	1	2
8	CROSS RIVER	1	1	2
9	DELTA	2	1	3
10	EBONYI	2	1	3
11	EDO	1	1	2
12	EKITI	2	0	2
13	ENUGU	2	0	2
14	FCT ABUJA	2	0	2
15	GOMBE	2	1	3
16	IMO	2	1	3
17	JIGAWA	1	1	2

Figure 8: Information Retrieval/Analysis Page

Figure 9 shows how information is presented on a bar chart depicting the growth (height) of the aged and handicapped population under each state of the federation.

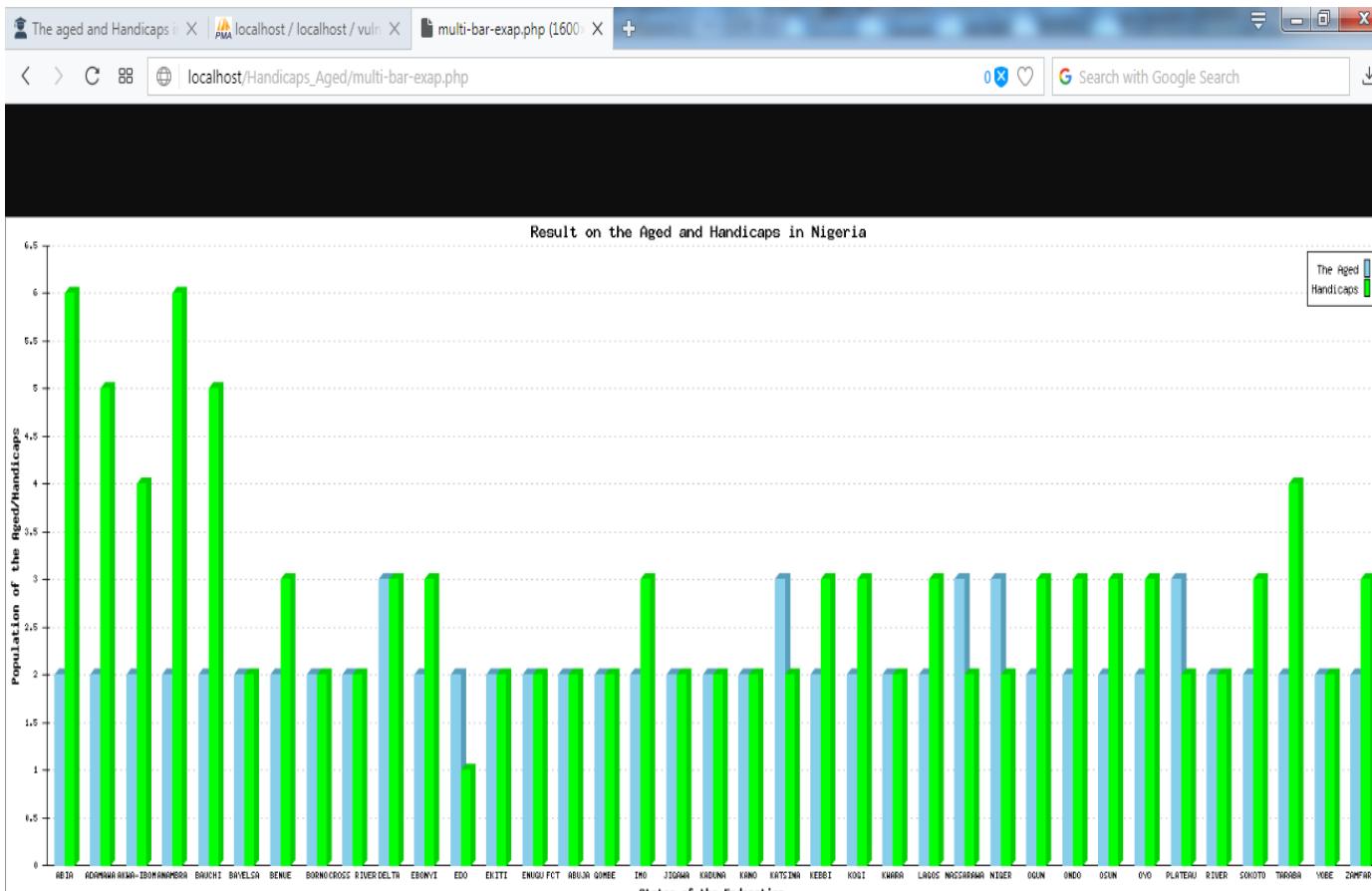


Figure 9: A 2D Bar Chart Result Representing the Aged and Handicapped Population

Figure 10 shows how information is presented on line graph depicting the growth (height) of the aged and handicapped population under each state of the federation. A light-blue slope indicates the aged population while a forest green slope depicts the handicapped population growth.

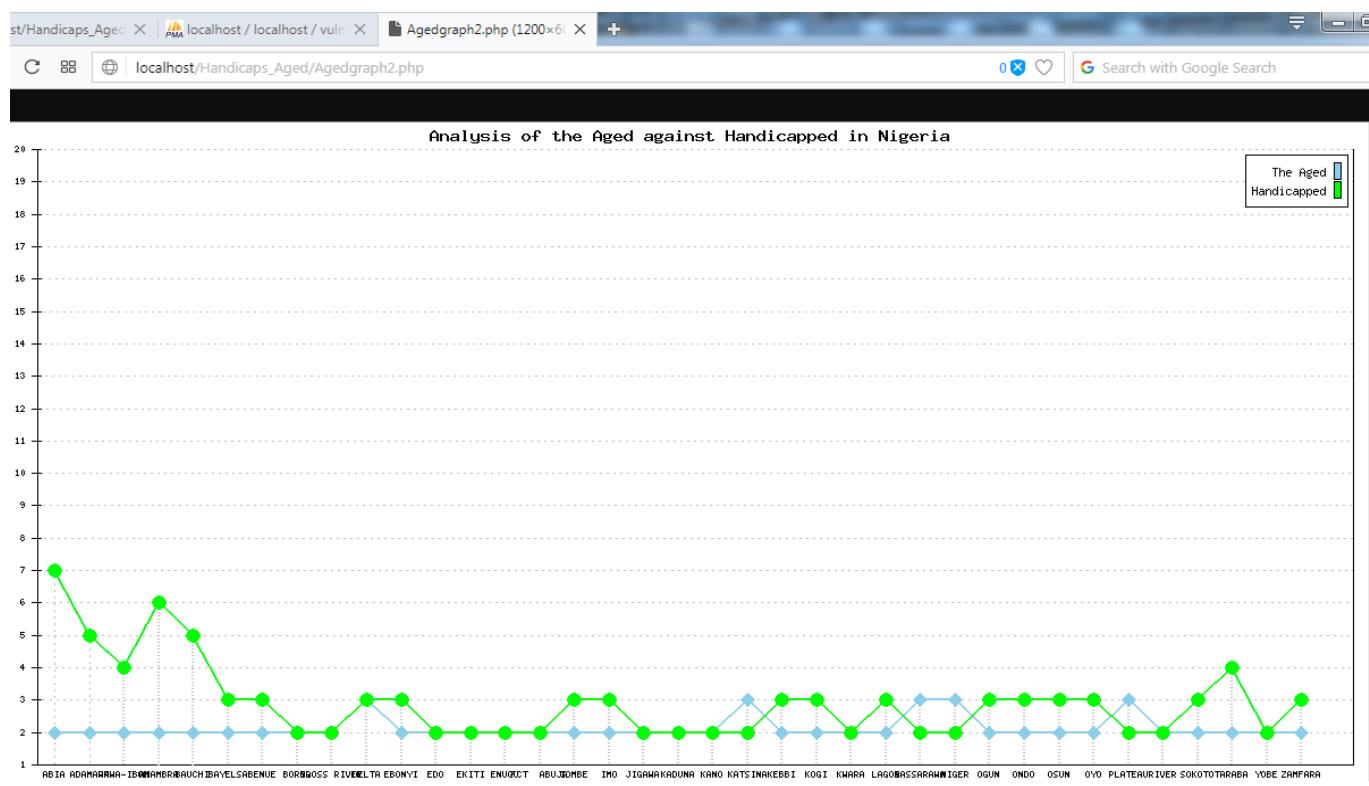


Figure 10: Graphical Presentation for the Aged and Handicapped

Figure 11 shows the extent of disability in the country in a bar chart. The height of each bar corresponds to the total population in the country suffering from such a disability.

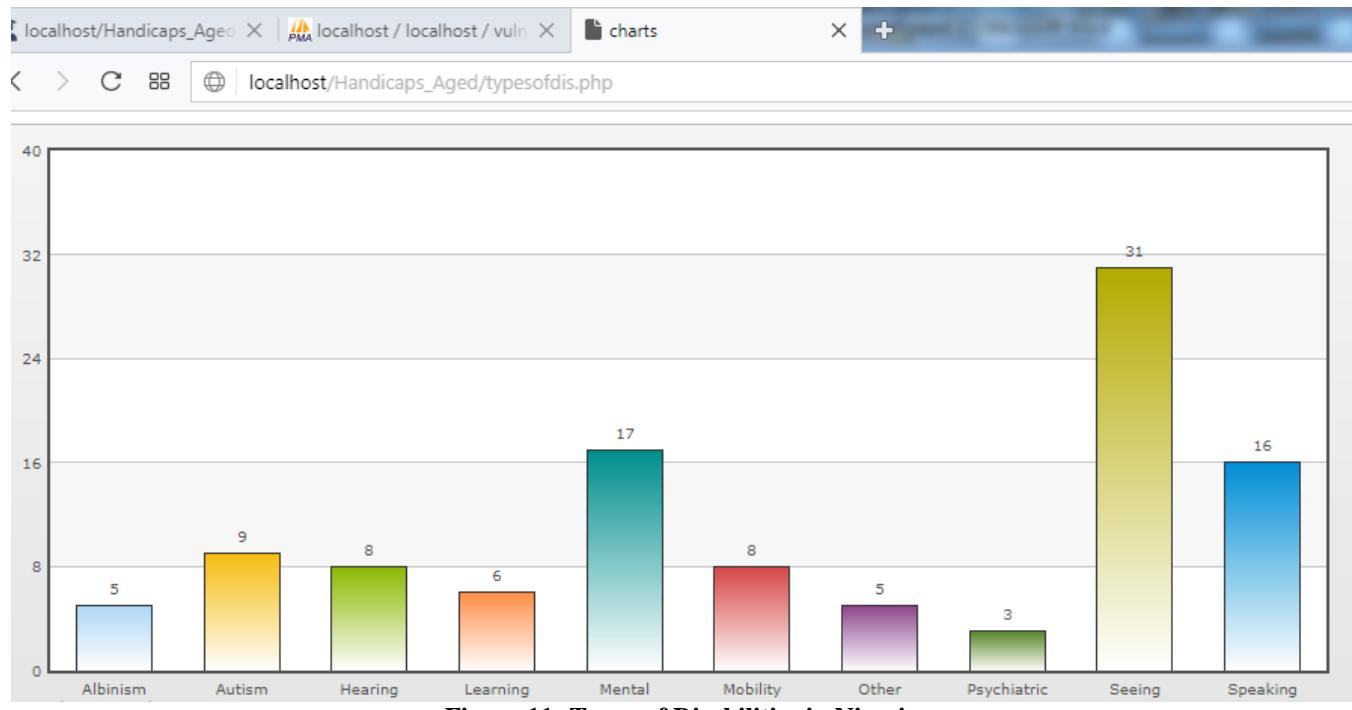


Figure 11: Types of Disabilities in Nigeria

Figure 12 shows the extent of disability in the country inline graph. The slope of the graph corresponds to the total population in the country suffering from such a disability.

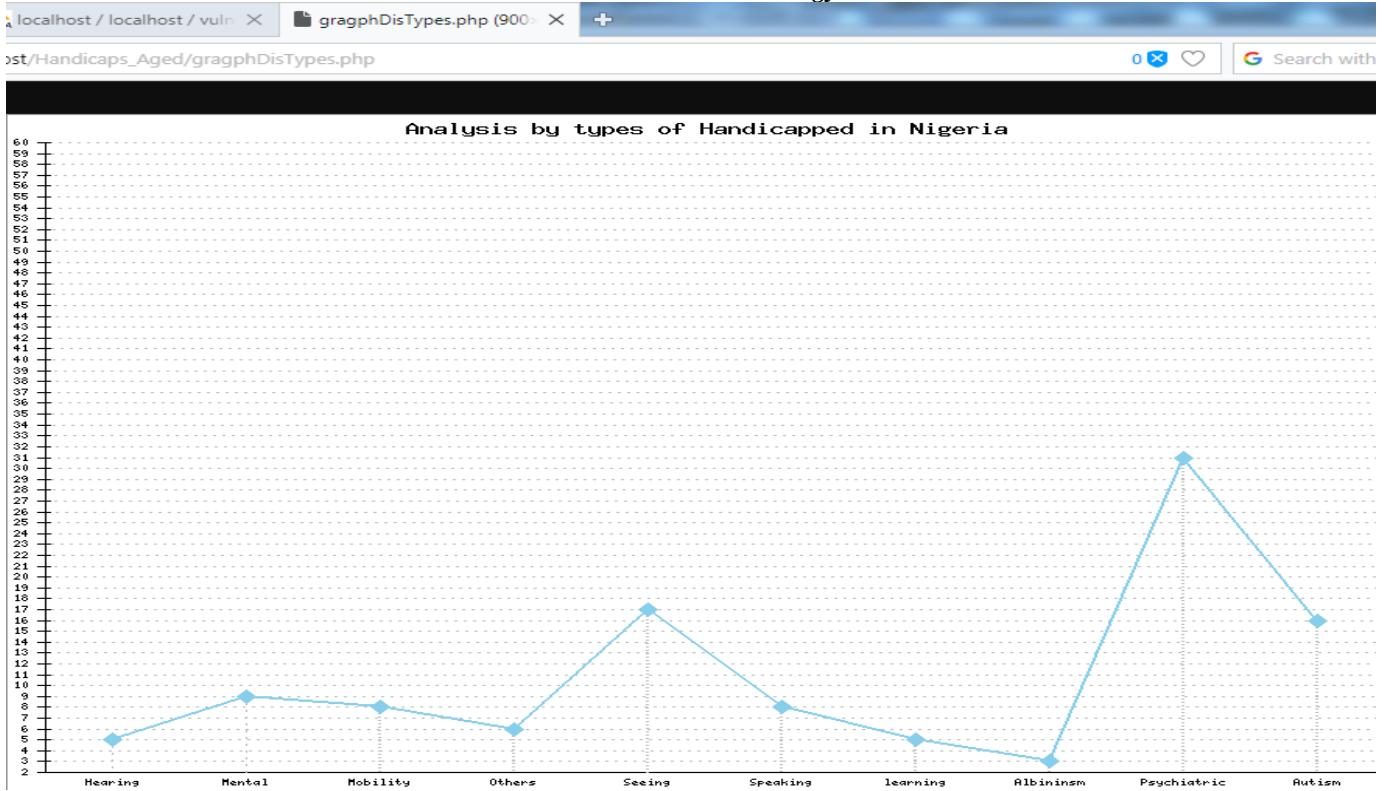


Figure 12: Graphical Presentation of Disabilities by Types

Figure 13 is a pie chart result sheet for analysis of disabling population in the country. Detailed result filtered disable population into the thirty-six states of the federation, depicting percentages of effect for each state.

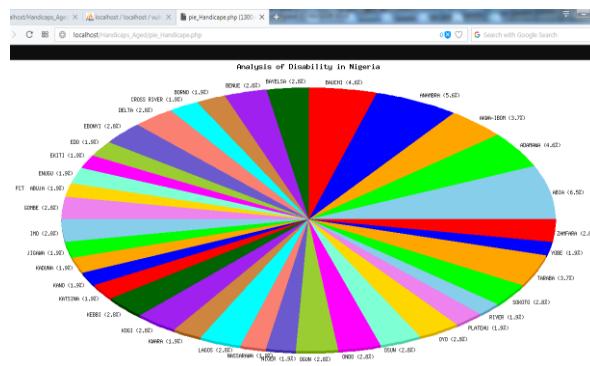


Figure 13: A Pie Chart Analysis of Disability

4. CONCLUSION AND RECOMMENDATIONS

A fusionchart-based information system for the aged and handicapped (FISAH) was developed and used to capture and analyze data about the vulnerable Nigerian citizen (the aged and handicapped) in a real-time. The analyzed information was visualized using the fusionchart technology in form of a line graph, bar chart and pie chart in 2D and 3D structures for easy understanding and quick decision making. It is therefore recommended that the system be adopted by the government for accurate information gathering, analysis, and quality governmental plans.

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