

Design and Development of a Real Time Data Warehouse System for Tax Audit of Akwa Ibom State Internal Revenue Service (IRS)

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Abstract

Compliance attitude of tax payers in Nigeria is a major challenge which has a direct effect on the economic growth of a society. An obligation to pay taxes though constitutional is always neglected by some citizens either as a result of multiple taxation, wrong tax computations, victimization by tax officials and those who claim to comply do it unwillingly by submitting wrong tax records, not paying tax on time, hiding some important financial records in order to avoid tax, the officials on the other hand seize the opportunity to embezzle tax refunds. Tax is a mandatory financial charge or some other type of levy imposed upon a tax payer by a governmental organization in order to fund public expenditures. Tax audit is an independent examination of accounts, tax return, tax payments and other financial records of a payer to confirm compliance with tax laws, rules and regulation, accuracy and correctness of tax paid. Proper tax auditing eradicates the problems such as nil tax return (remittance), fraud, multiple taxations, difficulty in accessing tax clearance by tax payers, lack of accurate and timely information for decision making . The purpose of this study was to design and develop a real time data warehouse system for tax audit of Akwa Ibom State Internal Revenue Service (IRS). Structured System Analysis and Design Methodology (SSADM) and Object-Oriented Analysis and Design Methodology (OOADM) were adopted at the analysis and design phase. Implementation was done using C sharp (C#) and MySQL server. The result was a real time web-based data warehouse system for tax auditing. The new system computes tax due, interest and fines to defaulters, confirms tax remittance, generates a centralized data warehouse, generates tax identification numbers to tax payers, generates tax report, and generates tax clearance.

Keywords: Audit, Remittance, Taxation, Taxpayer, Warehouse,

Introduction

Decision makers are faced with the challenge of getting the required information needed for decision making, as data volumes are exponentially growing, the need for timely and accurate business intelligence is also constantly increasing. In any organization, batches of operational data are loaded into the data warehouse daily, weekly or monthly. Today's businesses demand information that is current, therefore data must be properly stored and readily accessible when they are needed. An operational database undergoes frequent changes on a daily basis on account of the transactions that take place. The government of Nigeria is continuously lamenting that there is a short fall in internally generated revenue, this may partly be as a result of the short fall in the country's petroleum resources which has been the country's major source of income. Consequently, the government is beginning to look at other directions for the purpose of revenue generation. This has made the government to beam its search light on the activities of the Board of Internal Revenue at the State and Federal levels. The purpose is to motivate these revenue collection agencies to assist the government in building up its revenue base. In Nigeria and particularly in Akwa Ibom State, for example, there has been an erratic pattern in tax collection by the relevant agencies probably due to poor tax auditing method. Recently, the State Government has embarked on review of internally generated revenue drive, particularly increase in collection of taxes to boost its revenue (Adediran, et al, 2013). This cannot be achieved without an effective tax auditing system that can provide the necessary information on taxable individuals, private and corporate businesses, and institutions which include income, expenditures, tax policies, payment and remittance. Presently, in Akwa Ibom State, the available tax auditing system runs on a stand-alone system with only few features which are incapable of solving most tax audit problems. A data warehouse is a database, which is kept separate from the organization's operational database, it solves a major problem of pulling data out of transactional systems quickly and efficiently and converting that data into actionable information, it maintains historical data, allows for processing of large and complex queries in a highly-efficient manner, Upon successful implementation of a data warehouse or data mart, businesses will realize numerous improvements and positive gains. A data warehouse provides generalization and consolidation of data in a multidimensional view. It also provides Online Analytical Processing (OLAP) tools which allow interactive and effective analysis of data in a multidimensional space (Bhaskar, 2016). The results of this analysis include data generalization and data mining. The data mining functions which include association, clustering, classification, prediction are integrated with OLAP operations to enhance the interactive mining of knowledge. This makes data warehouse an important platform for data analysis and online analytical processing.

Real time data warehousing is the aggregation of analytical data in a data warehouse using continuous or near real-time loads. *It* describes a system that reflects the state of the

warehouse in real time. If a query is run against the real-time data warehouse to understand a particular facet about the business or entity described by the warehouse, the answer reflects the state of that entity at the time the query was run. Most data warehouses have data that are highly latent or reflect the business at a point in the past. A real-time data warehouse has low latency data and provides current (or real-time) data. Data warehousing is therefore referred to as a coordinated, architected, and periodic copying of data from various sources, both inside and outside an organization, into a centralized repository (data warehouse) optimized for reporting and analytical processing (Rengarajan, 2011).

Taxation refers to compulsory or coercive money collection by a levying authority, usually a government. The term "taxation" applies to all types of involuntary levies, from income to capital gains to estate taxes. The resulting revenue from the act of taxation is termed tax. A tax is a mandatory financial charge or some other type of levy imposed upon a taxpayer by a governmental organization in order to fund various public expenditures (Wikipedia, 2017). A failure to pay, or evasion of or resistance to taxation, is punishable by law. The most basic function of taxation is to fund government expenditures. Tax auditing is a routine check or inspection of a taxpayer's records and financial affairs to ensure that the amount of tax reported and paid are in accordance with tax laws and regulations. In the word of Okonkwo (2014), tax audit is independent examination of accounts, tax returns, tax payments and other records of a taxpayer to confirm compliance with tax laws, rules and regulations and accuracy and correctness of tax paid and adhering to generally relevant accounting principles and standards. Tax audit is carried out by tax officials from a relevant tax authority, the conditions that instigate tax audit include persistent losses, nil tax returns, refund cases, non-submission of returns, low tax yield, suspicion of tax avoidance, fraud or evasion, transfer mispricing, thin capitalization and most often when the taxpayers request for tax clearance certificate among others (Bitrus, 2014, Okonkwo 2014, Oyedokun 2014). The purpose of tax audit is to determine a true and fair view of the business records for tax purposes. It is to ensure that the reported amount is correct and that the amount of tax paid is correct in accordance with tax laws and regulations. Tax audit aids the government to ensure that tax payers voluntarily comply with the tax laws and regulations and that a higher tax compliance rate is achieved under the Self-Assessment System.

The procedures of tax auditing should be properly executed in order to overcome the numerous auditing challenges viz; poor record keeping by taxpayers, lack of co-operation by taxpayers and agents, partial submission of books and records for auditing, deliberate delay of auditing processes, aggression and poor attitude of tax payers and tax agents towards auditing, ineffective reconciliation meetings, poor audit skills of some tax auditors, influence peddling and inducement of tax auditors. Manual tax auditing yields greater number of problems such as inefficiency, insecurity, inaccuracy and delay audit results (*Penn, 2014*). Information assets

are immensely valuable to any enterprise, and because of this, these, information which is a basic asset of enterprises but must be properly stored and readily accessible when they are needed especially as a reference point (Uwah and Etim, 2024). However, the availability of too much data makes the extraction of the most important information difficult and time consuming, if not impossible. Taxation involves a huge amount of data that needs to be adequately stored for easy retrieval and analysis as could be required by decision support experts. Data warehousing is a phenomenon that grew from the huge amount of electronic data stored in recent years and from the urgent need to use that data to accomplish goals that go beyond the routine tasks linked to daily processing. Tax audit is carried out by tax officials from a relevant tax authority, the conditions that instigate tax audit include persistent losses, nil tax returns, refund cases, non-submission of returns, low tax yield, suspicion of tax avoidance, fraud or evasion, transfer mispricing, thin capitalization and most often when the taxpayers request for tax clearance certificate (Bitrus, 2014). Manual tax auditing procedures pose so much problems, these include; the inability of the government to gather required information on the revenue generated from tax, tax auditors find it difficult to collect the necessary document from taxpayers and agents, the tax payers do not voluntarily pay their tax and as at when due, manual computation of tax is stressful and the results generated are always full of errors, most tax deducted are not remitted and on the stipulated time. The tax payers undergo difficulties in trying to collect tax clearance. To curb these problems there is need to design and implement a real time data warehouse system for tax auditing which will be efficient, secured, provide accurate results and immediate feedback to the government, tax auditors and tax payers/ tax agents anytime and anywhere.

The aim of this study is to design and implement a real time data warehouse system for tax auditing of Akwa Ibom State Internal Revenue Service (IRS). To accomplish the said aim, the specific objectives are as follows:

- i. Create an integrated database for different categories of tax payers
- ii. Prepare data marts from the raw data of the tax records.
- iii. Automate tax computations base on tax laws
- iv. Automate audit procedures

Review of Related Literature

Kimball, Ross, Thornthwaite and Mundy (2008) stated that the term "Data Warehouse" was first coined by Bill Inmon in 1990; that, a data warehouse is a subject-oriented, integrated, time-variant, and non-volatile collection of data This data helps analysts to take informed decisions in an organization. An operational database undergoes frequent changes on a daily basis on account of the transactions that take place. Suppose a business executive wants to analyze previous feedback on any data such as a product, a supplier, or any consumer data,

then the executive will have no data available to analyze because the previous data has been updated due to transactions.

Inmon (2005) postulated that a data warehouse provides users with generalized and consolidated data in multidimensional view. Along with generalized and consolidated view of data, a data warehouses also provides various Online Analytical Processing (OLAP) tools. These tools help users to carryout interactive and effective analysis of data in a multidimensional space. This analysis results in data generalization and data mining. Data mining functions include association, clustering, classification and prediction; these can be integrated with OLAP operations to enhance the interactive mining of knowledge at multiple level of abstraction. That's why data warehouse has now become an important platform for data analysis and online analytical processing. Some of the characteristics of a data warehouse according to Bhaskar (2016) include;

- i. A data warehouse is a database, which is kept separate from the organization's operational database.
- ii. There is no frequent updating done in a data warehouse.
- iii. It possesses consolidated historical data, which helps the organization to analyze its business.
- iv. A data warehouse helps executives to organize, understand, and use their data to take strategic decisions.
- v. Data warehouse systems help in the integration of diversity of application systems.
- vi. A data warehouse system helps in consolidated historical data analysis

According to Golferelli and Rizzi (2009) data warehousing generate a unique, consistent and integrated data in a database consisting of data from heterogeneous operational databases. It makes it possible to select, group and manipulate data in every possible way by providing user friendly tools used to conduct ad hoc analysis. Examining data at the maximum level of detail is not only useless for decision-making processes, but is also self-defeating, because it does not allow users to focus their attention on meaningful information, a data warehouse generate exact query results avoiding unnecessary details. The data in a warehouse, are correct, consistent and unique. Unlike Operational data which covers a short period of time, because most transactions involve the latest data. A data warehouse cover a few years. For this reason, data warehouses are regularly updated from operational data and keep on growing. According to Essien, Uwah, and Ododo (2022), data were visually represented and are progressive; a photograph of operational data is made at regular intervals. The sequence of photographs would be stored to a data warehouse, and results would be shown in a movie that reveals the status of an enterprise from its foundation until present. Bhaskar (2016) defined a data warehouse as a repository of historical data that are organized by subject to support

decision makers in the organization. Once data are stored in a data mart or warehouse, they can be accessed easily. Devin (1997) reviewed that the concept of data warehousing dated back to the late 1980s when IBM researchers Barry Devlin and Paul Murphy developed the "business data warehouse". In essence, the data warehousing concept was intended to provide an architectural model for the flow of data from operational systems to decision support environments. The diagrams of data warehouse systems with staging area and the one without staging are shown in Figures 1 and 2 respectively

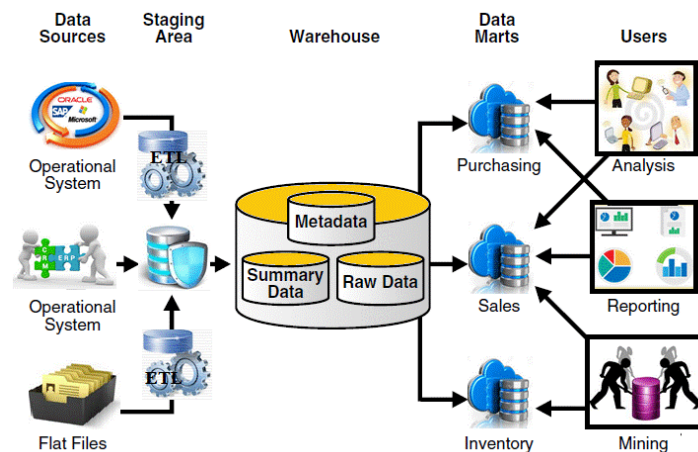


Figure 1: Diagram of data warehouse system with a staging area and data marts (source: Inmon, 2005)

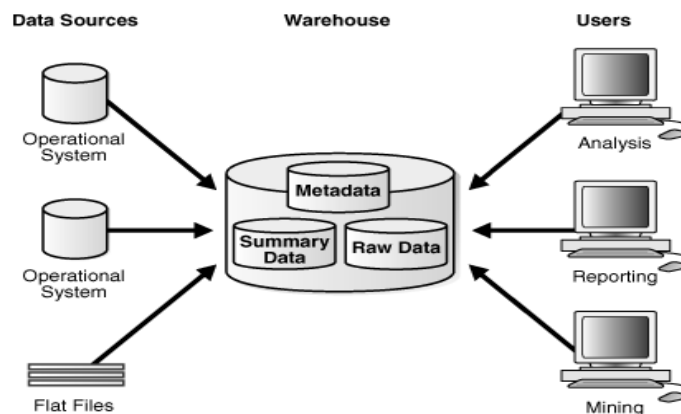


Figure 2: Diagram of a data warehouse system without a staging area and data marts (Source: Inmon, 2005).

Liu (2011) reviewed AutoAudit an example of automatic audit software developed by David McElreath. AutoAudit was designed to help teams in the internal revenue service (IRS) to manage their activities relating to tax auditing for a transparent, effective and secured tax

auditing processes. The major functions of AutoAudit software are to store all related documents in a single database, streamline processes to ensure resources are allocated fast and efficient, and eliminates manual tasks. AutoAudit, according to Liu (2011), is good for reporting purposes. It provides powerful end-user reporting capabilities such as dashboards, interactive multi-dimensional views, and a user-friendly report interface. It removes complexity involved in tax audit. It creates, shares, and stores electronic work papers in a centralized location, and set personal profiles and permissions. It creates web-enabled surveys, invite stakeholders, get responses in real-time, and build a survey history and database of questions and responses. AutoAudit enables users to use and share audit-related data with ease, as the solution's remote access provides you with the ability to work offline and replicate the content when convenient. This enhances productivity by enabling the audit teams to work collectively from any location. AutoAudit only allow the audit teams to utilize and store Word and Excel files enabling them to use familiar files and existing documents without the need to learn new software. Other audit software include ACL Analytics, IDEA, LOVAT Audit, Pedabo, Galvanize HighBond, Workiva, AuditBoard, TeamMate, and Pentana. They all simplified audit procedures and reduce errors and time (Lovat Compliance Ltd 2018). A Tax software performs maximally in solving tax problems, making tax procedures easier and more efficient, it performs tax calculation, generate tax forms, files tax returns, provides tools and insights to optimize tax strategies and minimize tax liabilities. They include TurboTax, H & R Block, TaxAct, QuickBooks and TaxJar. Tax payers do not have adequate access to these tax and audit software but rather the tax auditors.

Methodology and System Analysis

The Analysis of the present tax procedure of the existing system revealed that tax auditing is carried out in every three to six years. The first thing that happen when the tax audit process is scheduled is that a letter is issued by the audit department to the selected tax payer through email, fax or by post. The payer could be a private or corporate business owner, ministry, institution or individual tax payer.

When the letter is received, the two teams (the tax payer team and the audit team) will agree on a convenience date, the auditors will visit the payers location for the meeting. At the meeting the tax payer will be made to present the following document:

- i. List of names of all employees (both expatriate and local staff) of the organization showing their designation, gross salary, and allowances paid to each of them on monthly basis and for the period stipulated in the letter.
- ii. A list showing PAYE deductions and the amount remitted to state government with supporting government official receipt for the period stipulated in the letter.

- iii. Copies of monthly salary advice send to the bank for the period
- iv. Copies of monthly expatriate quota returns to the immigration service for the period
- v. Monthly schedule of NHF, pension, NHIS and other statutory contributions returns for the period
- vi. Employment files of staff in the organization for the period
- vii. Schedule/list of all registered suppliers and contractors for the stipulated period
- viii. List of payment for supplies, contract, interest paid, professional fees and rents paid to individuals and corporate sales together with withholding taxes deducted from the payment and evidences of remittances of the deductions to the state government within the stipulated period
- ix. Payment vouchers for the period
- x. Bank cash books for period
- xi. Copies of the audited / management accounts of the organization for the period
- xii. Copies of bank statements for the period.
- xiii. Schedule of all rented properties (both residential and office accommodation) for the period.

The auditors will sit down and look at these documents one after the other to make sure that the data presented conform with the ones the tax payers usually submitted in a hardcopy and softcopy.

In Akwa Ibom State for instance, the payers visit the audit office every month precisely on or before the 10th of every new month to submit document the document following tax deductions and remittances in a softcopy and hard copy. The head of tax auditing unit receives this data and afterwards copies the data into a template designed in Ms-Excel. The template is made up formulas that assist in computing for monthly and annual individual tax based on the gross emolument and total allowances submitted and following the tax laws. The auditor copies individual details submitted on Compact Disk one after the other into the template in order to generate the individual tax for the month. For a Personal Income Tax, the auditor manually checks through the records of staff submitted to the office after every employment, promotions, and payroll and compares it with what is submitted in the softcopy and be certain that there are the same before beginning the computation using the Ms-Excel template. And for other kinds of tax like the withholding tax, Business premises, and vehicle license, the auditor performs the calculation (addition and subtraction) manually. The documents previously submitted at the auditor's office by the organization on monthly basis include payroll and receipts of transactions, failure to remit on or before the 10th of every new month attract a penalty fee of 10% of the total amount remitted. The audit interest is the interest based on the interest rates of commercial banks (21%) or the prevailing bank interest rate on the total amount which the

organization did not remit on time. The penalty is a fine paid for refusal to pay on the stipulated date.

The auditor adds the approved Economic Development Levy (₦ 100.00 to individual and ₦50,000 to companies and corporate bodies) to every tax derived. At the end of every year, an annual report is written by the tax audit officials are sent to the organization. The audit report shows the document examined, payroll, withholding tax, economic development levy and business premises (as the case may be) liability, amount remitted yearly, audit interest and penalties. If there is an overpay, procedures are made for refunds or carry forward. The report also states what the organizations did not do well and recommendations. Once in every three years, the auditors visit an organization for field auditing where the organization cooperates in terms of making regular remittances. And where there is none, the tax auditors write to organizations, make their verifications and submit report for further investigations.

The Data flow diagram of the Existing System (for tax audit)

A data flow diagram is a graphical representation of how data is processed within a system based on inputs and outputs.

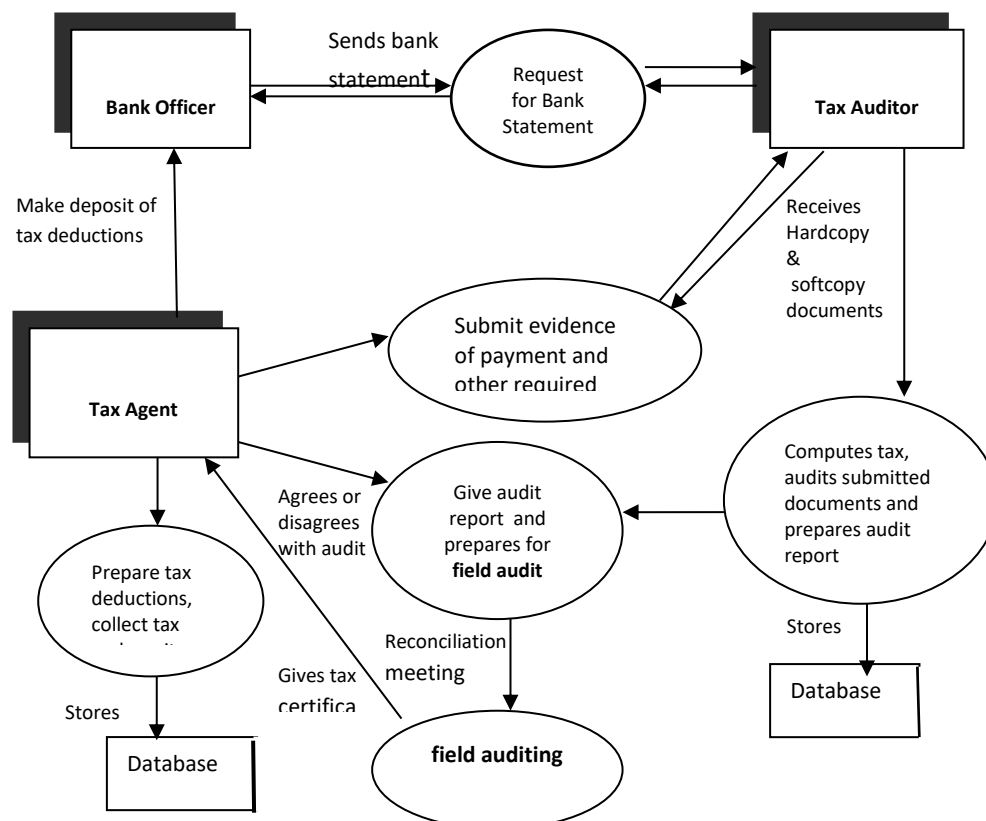


Figure 3: Data flow diagram of the Existing System

In figure 3, the tax agent prepares tax deductions of every employee or of a self employed tax payers, collect the cheque or cash and make deposit into the tax account in a specified bank, the bank officer receives the deposit and gives an endorsed deposit teller which is an evidence of remittance to the tax agent. The tax agent later takes the teller in company of the payroll of the staff, receipt of purchase and expenditure and other required documents to the tax auditor. The auditor computes the tax of each payer in line the approved tax policy, compares it to the one submitted by the tax agent, confirms the data submitted by the tax agent, identify fraud, prepares fines and interest where necessary and write an audit report which shows the conclusion of the audit if the remittance is complete or schedule for field audit if there are inconsistencies. The auditor sends the report to the tax agent; the tax agent agrees with report or disagrees and prepares for the field audit.

Analysis of the New System

The method applied in the process of tax auditing is of outmost importance as it is a great source of revenue for government leading to improve welfare of the citizenry. The new system will help to solve most of the problems faced with the existing system. It will maintain a dynamic and updated data warehouse consisting of databases of all tax payers, database of tax laws and templates for tax computations, database of payroll of staff of all establishments which will help to carry out all tax computation, a website /platform that can be accessed by authorized tax auditors and payers at anytime and anywhere for uploading and downloading data and information respectively. Despite the increase number of tax payers, the new system is aimed at achieving some level of accuracy, efficiency, security, and timely feedback. It is aimed at reducing tax evasion, inducement of tax officials, errors in tax computation, mutilation of tax records, multiple taxation, reduces stress faced tax auditors, ensure voluntary and timely compliance by tax payers and so on.

The new system is a program made up of self-sufficient modules (class) containing all of the information required to manipulate a given object. OOADM is used for this purpose in this research work. OOADM is used to create modules or classes in hierarchies and method or tasks in one class. New objects are created from existing ones and inherited their characteristics. OOADM provides a natural and intuitive way to view the software design process such as modeling objects by their attributes, behaviours and inter-relationships just like the real world objects are described. It encapsulates attributes so that objects do not know the attributes of each other. It takes advantages of class relationship, where objects of a certain class have the same characteristics or attributes. Objects oriented software has the advantage of inheritance relationships, where new objects are established by inheriting the characteristics of the existing class and adding their unique characteristics. In the design of the new system,

some of the OOADM used include Unified Modeling Language (UML) Class diagram, Use Case diagram and Activity diagram.

UML Class Diagram of the Real Time Database Warehouse System for Tax Auditing

The Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among objects (Young, 2011). The class diagram is the main building block of object-oriented modeling. In designing a system, there is need to first have a conceptual understanding of the system, that is, the classes that are needed, the functionality and information that these classes have, how the classes interact with one another, and who can see these classes. The classes in a class diagram represent both the main elements, interactions in the application, and the classes programmed. Figure 4 shows the class diagram of the new system.

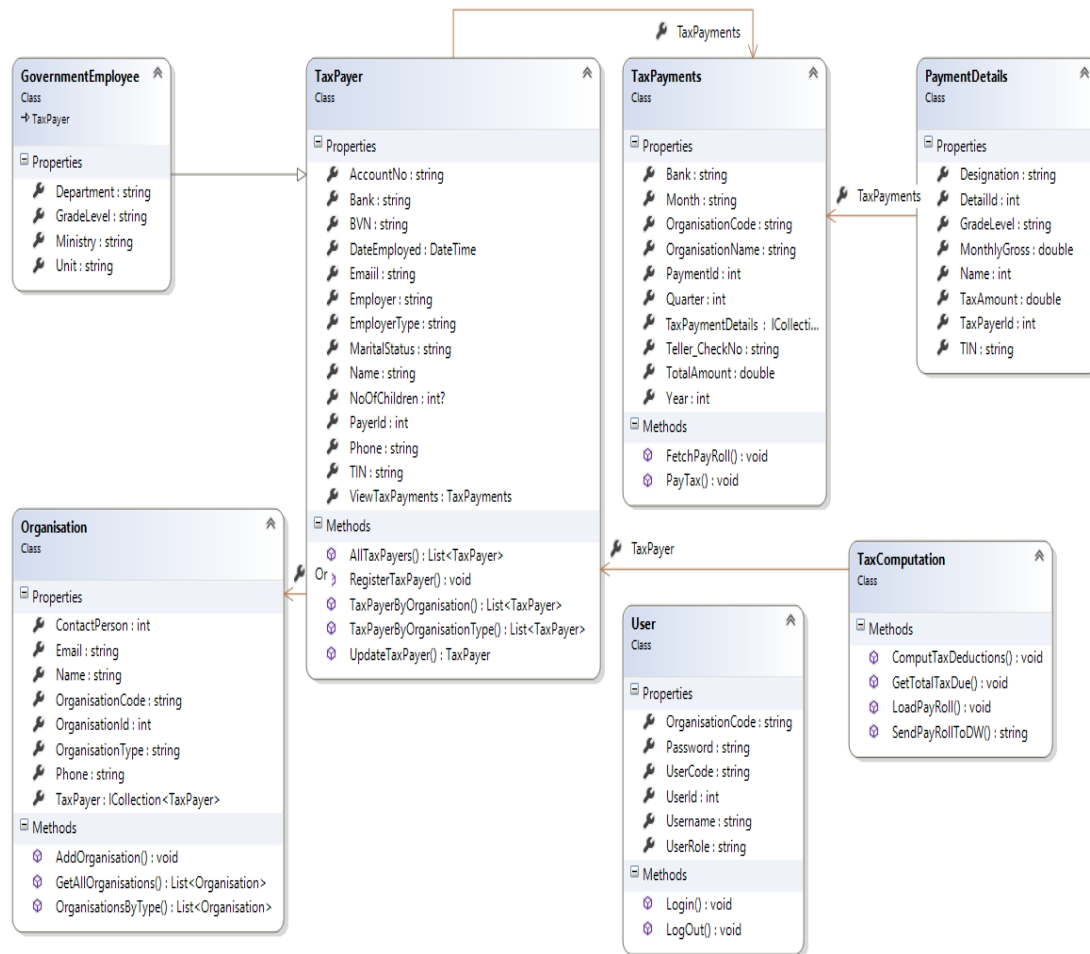


Figure 4: UML Class Diagram of the Real Time Database Warehouse System for Tax Auditing

Use Case Diagram

A Use Case diagram is a graphic depiction of the interactions among the elements of a system. A Use Case is a methodology used in system analysis to identify, clarify, and organize system requirements. It can provide a higher-level view of the system. It is like the blueprints for a system, it simplifies and graphically represents what the new system would do. A Use Case diagram can be a good communication tool for the users. According to Siau and Lee (2013), use case diagrams are used to convey the intent of the system in a more simplified manner to stakeholders. The Use Case diagrams provide a high level view of the system and convey the requirements in layman's terms for the stakeholders. Use Cases are initiated or

triggered by external users or systems called actors. An actor represents anything that needs to interact with the system to exchange information. An actor is a user, a role, which could be an external system as well as a person.

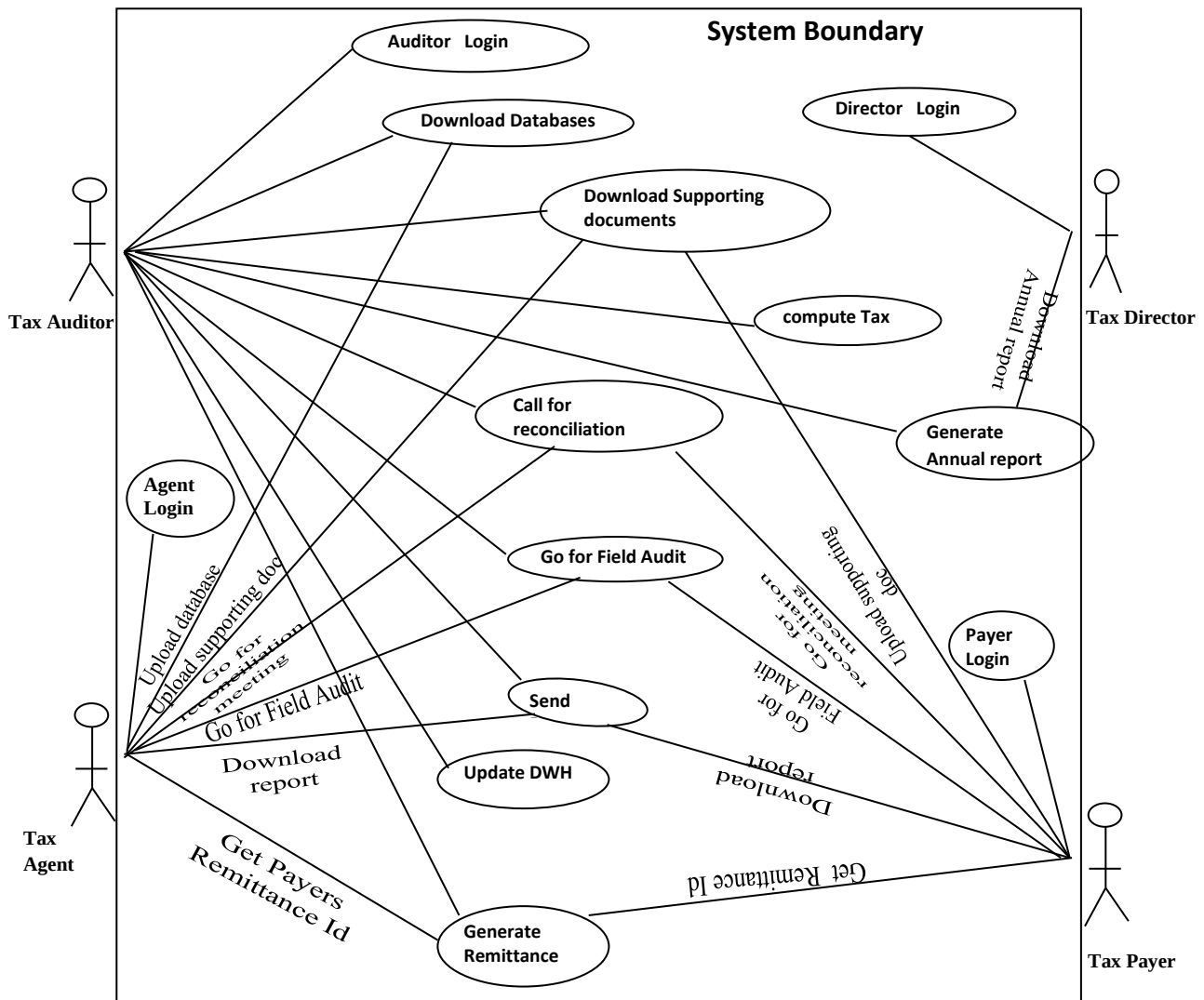


Figure 5: Use Case Diagram for Real Time Data warehouse System for Tax Audit

Activity Diagram of Real Time Data warehouse System for Tax Auditing

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. Activity diagrams are intended to

model both computational and organizational processes (i.e., workflows), as well as the data flows intersecting with the related activities as shown in figure 5.

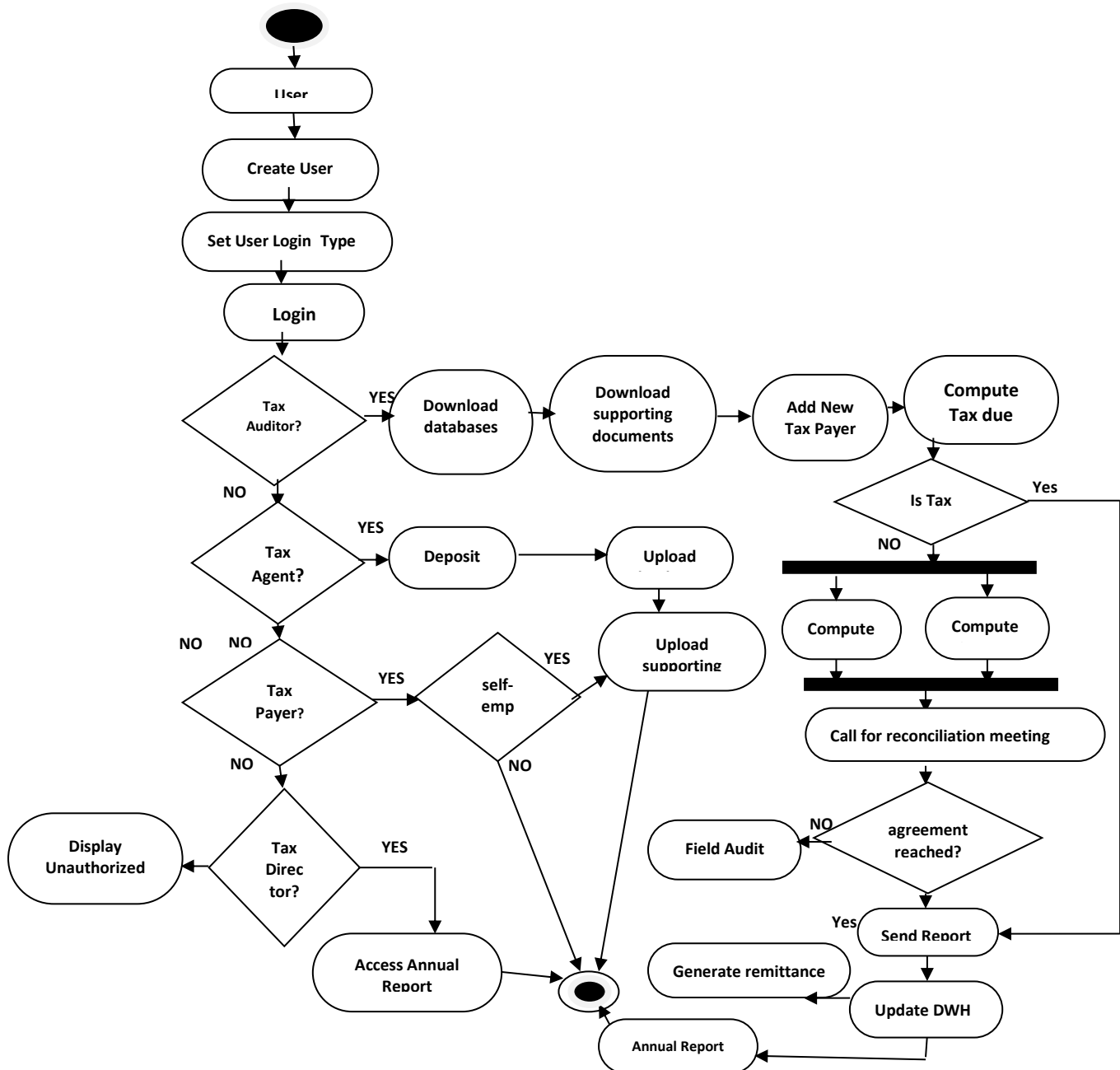
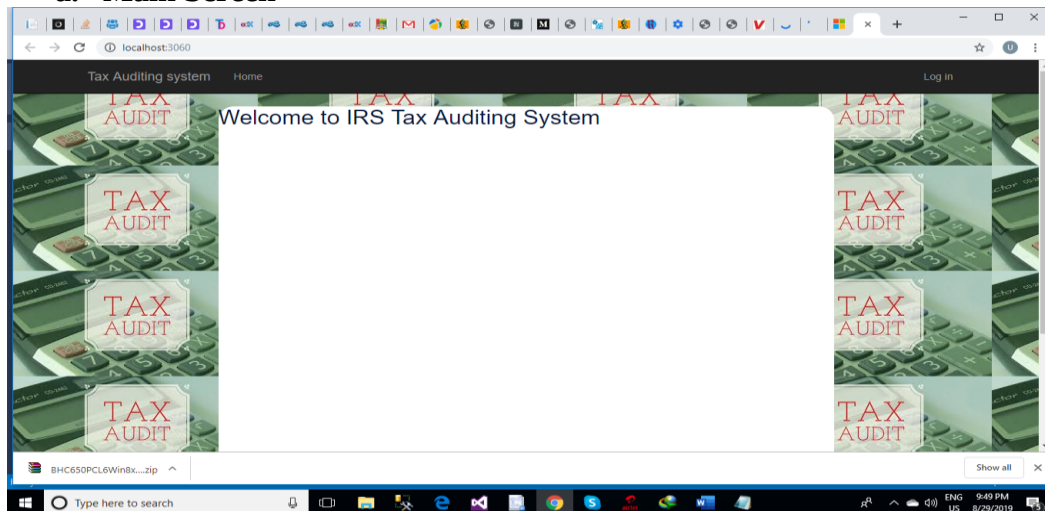


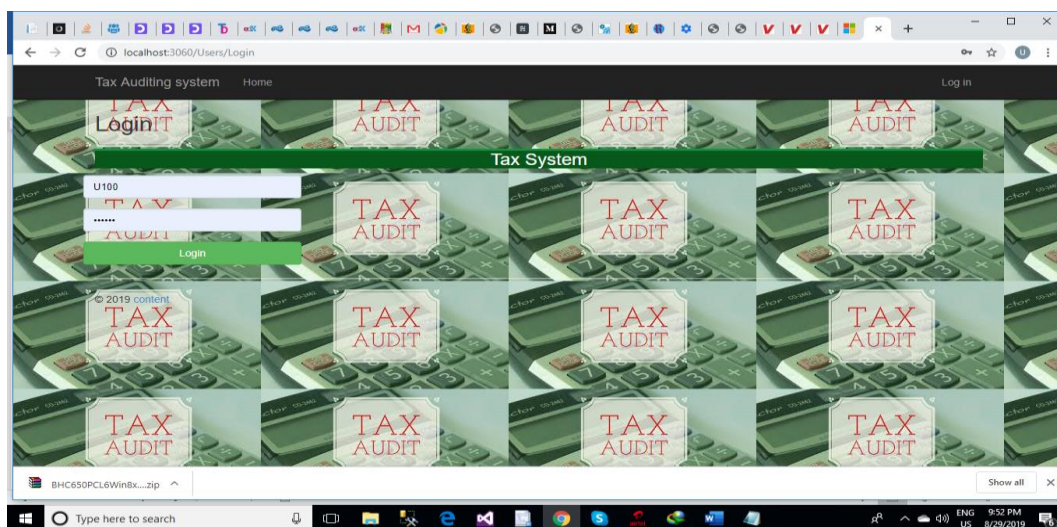
Figure 6: Activity Diagram of Real Time Data warehouse System for Tax Audit

Output Screens

a. Main Screen



b. Login Screen



c. Tax Calculation Screen

TIN	Name	Gross Pay	Non Tax	Relief	1st 300k	2nd 300k	1st 500k	2nd 500k	21% >1.6M	24% >3.4M	Tax
0969777889	Ministry of Education	025000	0	21,666.67	250.00	0.00	0.00	0.00	0.00	0.00	250.00
6767868	John ned	056000	0	27,866.67	1,750.00	344.67	0.00	0.00	0.00	0.00	2,094.67
0969777889	Mr. Eido Amadu	041000	0	24,866.67	1,129.33	0.00	0.00	0.00	0.00	0.00	1,129.33
766788	James Amanam	078000	0	32,266.67	1,750.00	2,280.67	0.00	0.00	0.00	0.00	4,030.67

d. New Tax Payer Form

Create
TaxPayer

111444

Amadi Joseph John

34 Uyo Rd, Calabar

Employer

mm/dd/yyyy

Ministry

Marital Status

Number of Children

Employer Type

Summary

From the research, it was found out that the conventional method of tax auditing is not effective enough as a result of its limitations. Most tax agents carry out tax computations using Excel Templates which is deficient in terms of carrying out most tax auditing procedure. The existing system is inaccurate, inefficient, and lacks security. Hence the need for a better procedure for tax auditing that can help make tax auditing easy, efficient, secured and generates accurate results. This work focused on the development and implementation of real time data warehouse for tax auditing. Existing system was analyzed using Structured System Analysis and Design Methodology (SSADM), data was gathered from the Tax Auditing Unit of the

Akwa Ibom State Board of Internal Revenue Service, both primary and secondary data sources were employed in gathering data for the study. Object Oriented Design and Methodology (OOADM) was used in the designing phase of the new system. The new system was implemented, data was tested, and documentation was done. The new system will allow tax payers and organization's tax representatives to upload and download necessary tax related records, it will compute and confirms taxes for payers, it will detects tax evasion and multiple tax, it will update the data warehouse and give immediate feedback, it will generate audit report and tax clearance when required

Conclusion and Recommendation

The existing system of tax auditing has been studied and the new system designed and implemented. The new system which is efficient, fast, accurate, stress-free, web-based and real time, if adopted will curb the challenges of the existing system. Tax payers , organizations, tax agent will derive satisfaction from the use of the real time data warehouse system for tax auditing. This system makes work easy for tax payers, organization's tax representatives, tax agent/auditors and other stake holders as its provides a centralized database of tax payers, accurate and immediate feedback anytime and anywhere, eradicate tax evasion, and thereby helping to raise government's internal revenue. This model is thereby recommended to tax agents/auditors, tax payers, organization's tax representatives and stakeholders especially those of Board of Internal Revenue Service.

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