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A Distributed Database Architecture For Enhanced Governance And Economic Development Of The Niger Delta Region.

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Abstract
The Niger Delta has for sometimes now been embroiled in desperate crisis due largely to misunderstanding between Oil – Producing Communities and Oil Companies over youth employment, empowerment and developmental issues. Various efforts are in progress to resolve these disagreements and formulate development strategies for the oil – producing communities in the Niger Delta. The role of government at different levels – Local, State and Federal is crucial to the resolutions of these crisis. Similarly, the oil companies e.g. Shell, Mobil, Chevron etc and oil – producing communities must forge a closer understanding and arrive at a common approach for the current efforts to crisis resolution to be effective. Central to any long – term stability in the Niger Delta is the effective use of modern information and communication technology (ICT) which highly felt in enlightening, educating, informing and communicating, which will act as a facilitator in creating the awareness towards developing the people of the region. This research, under structural system analysis and design methods is recommending the design of a highly scalable Distributed Relational Database Network System. The ICT assisted Database System in the center of governance would accommodate all data entities that entails the birth records, educational/ professional records and vocational training records of our youths to communicate with employment agencies of the stakeholders of our economy for job/ training placement and empowerment. This will restore peace by periodically providing jobs and training opportunities through the ICT setup and media houses which will prove to the youths of self belonging to the economy. The system will provide a central communicative link among the stakeholders to enhance and facilitate harmony and the overall economic development of the region.

Keywords: **Distributed Database, Architecture, Niger Delta, Development**

1. Introduction

The name Niger Delta was gotten from the River Niger. River Niger has it source in the Futa Jallon Hills in Sierra Leone. It runs through several countries including Guinea, Mali and Niger, before entering Nigeria, where it is joined at Lokoja by the River Benue, which comes from the Republic of Cameroon. The River Niger empties its waters into the Atlantic Ocean through a large number of tributaries, which form the Niger Delta. The core Niger Deltans is known to cover the former British Colonial divisions of Ahoada – (Abuans, Omoku, Engene, Ekpeye and others), Brass, Degema, Opobo, Ogoni western Ijaw and Warri. The states of Rivers, Ondo, Bayelsa, Delta, Edo, Imo, Abia, Akwa Ibom and Cross River States [1].

1.1 Discovery of Oil in the Niger Delta

For centuries, the people of the Niger Delta were contented to engage themselves in farming, fishing and other endeavors, unaware that the underneath their soil was one of nature's most prized minerals – petroleum. They were oblivious of the fact that they would, in the future become the goose that would lay the golden eggs for Nigeria. With the discovery of oil in 1956 by Shell in Oloibiri, in the hearth of the Niger Delta [2] the company began commercial production and export of oil two years later. The break through recorded by Shell attracted other multinational oil firms into Niger Delta, notably; Mobil, Agip, Safrap (now ELF), Texaco and Amosea (now Texaco and Chevron).

One of the basic challenges facing oil company and host-community relationship in the oil and gas sectors in the Niger Delta is the absence of mutual confidence and community harmony. This is manifested in the expression of distrust and in

extreme cases has led to assault of oil workers, hostage taking, piracy, vandalization of pipelines and facilities, sabotage illegal bunkering etc.

As early as February 1966, the revolutionary Movement Niger Delta Volunteer Service, launched by Isaac Jasper Adaka Boro is one clear manifestation of the frustration of the Niger Deltans and their ability to resist coercive exploitation.

Further, by 1990, Ken Saro – wiwa went deep in the struggle by founding the Movement for the Survival of the Ogoni People (MOSOP) to fight against environmental degradation of the Oil Companies. The struggle of Ken Saro – Wiwa impacted most profoundly and unforgettably on the history of the Delta and the Nigerian information [3]. The examples of his movement building, mass mobilization as well as local and international networking have invested the Ogoni experience with the quality of a model not just for the people of the Delta but indeed for all people who can muster sufficient dignity to challenge marginalization and domination; his vision analytical and organizational acuteness, courage and commitment often sum up the dynamics of social history. Environmental degradation of the area is as illustrated in picture plate1 were a massive oil spill along the pipeline for a very long distance had occurred. [5]

Plate 1 Massive Oil Spill at Amukpe

The youths and people of the Niger Delta continued in the struggle, in Bayelsa State, on December 11, 1998, they formed the Ijaw Youth Council (IYC), which led to the Kaima Declaration and the Odi Massacre [4]. The declaration forced them to raise militants which continued to stock arms and fight the Federal Government as illustrated in picture Plate 2.

Plate 18 Fighters with Movement for the Emancipation of the Niger Delta (Mend) brandish weapons near their camp in Oporoza. The movement vows to shut off oil if demands for access to the oil wealth in their territories and local control of resources aren't met.

This research reveals that, the grassroots youths are the primary agents that could stand as the key to unlock the gates to long term peace in the region. These set of people are found in great populations in the villages/ communities/ creeks/ plantations and even in the urban areas. They are ever ready to accept any offer to involve themselves in criminal activities in other to earn their living as illustrated in figure 2. The youths could be engaged into employment, privately trained as security men/ women and even other manual jobs in the companies.

Local, state, and federal government authorities cannot solve problems of the so-called hoodlum or restive youth, or “a acrimony and rancor” between communities, unless they take measures to turn the economy around, this was contained in a lecture delivered by Prof. E.J Alagoa at the 4th convention of Ijaw National congress at Yenagoa, Bayelsa State, [6] further, he said , “government leaders will, of course, point to various commissions and boards they have set up in the past intended to promote

development, what did OMPADEC (Oil Mineral Producing Areas Development Commission) do to improve the economy of the Niger Delta, and promote social security? And what can we expect the NDDC to do to turn youth of the region from the path of war and struggle to the ways of peaceful enterprise?

1.2 Need for Employment Data

In order to get the people of Niger Delta employed their data of unemployment and requisite skills community by community must be collected. The study has recommended a Distributed Database (IT) assisted Network system for governance and wealth creation in geographically challenged states. This database would be at the center of developmental schemes, including employment, empowerment, scholarship and the functions of other aspects of life such as agriculture, education, commerce and industry, health, environmental and degradation problems and etc.

To initiate the move towards a long term success in solving the Niger Delta problem, taking youths, first as the key to unlock the gate, the following data files are recommended in the community database:

a. Birth and Death registration database file
b. Employment file
c. Empowerment file
d. Contract leasing file
e. Social amenities etc and other developments.

The recommended Database Network is highly scalable distributed relational database system, typically geographically separated, and is separately administered and can differentiate between local and global transactions pivoting affairs, empowering youths and the entire development of the Niger Delta. This Network system would be able to spot out a youth in the area who is not attached to any employment, definitely detecting a cry of Deltan with the help of the Age registration file, whether resident in the village/ community/ creek or urban city. Therefore the unskilled and uneducated young men and women are recruited and trained as securities and posted to the oil companies' gates as guards, and also trained to be able to translate the network messages at gates of Head offices, flow stations, Rigs etc of the oil companies. While those educated or skilled indigenes are given corresponding oil jobs positions in the companies.

By web definition of employment, as the state of being employed or having a job, this however implies that someone is offered a job or something doing elsewhere which will earn him or her a living. Also web defines employment problems as factors that affect our employment exercises and operations. The later is practiced in the oil companies, deliberately denying the Deltans of high or senior positions, and even the junior opportunities.

State Govt. Stations or Site (FG, DPR, NDDC, NNPC etc); where they always confirm of oil companies and host communities, are maintaining their standards, like MOUs and conventions/treaties or keep their statutory role of policing the oil companies and communities. This stops all visits to oil companies by host community people, and oil servicing companies e.g. Wilbros Plc, and others, individual/contractors and co-operate companies can access the Network System at selected Headquarters where accesses and updates including applications are communicated.

Secondly, the Host Communities must produce the Network Managers (Administrators) to be trained by the system for its management. The above if implemented will create a transparent environment for host communities which will facilitate fast development to initiate the race for total peace, i.e. the empty cans are filled up, to stop the noise, as in a recent study [7] it was declared that youths restiveness and other social vices can be curbed when our leaders lead by good examples, when there are jobs, when there is food on the table and our youths have a hope for a better tomorrow.

Finally, the system distributed database at centre of every development would be friendly with the functions of all aspects of life, e.g. Agriculture, Commerce and Industry, Health, Environmental and etc. the System provides a balanced benefits to all stakeholders by maintaining a total peace environment, providing jobs to youths, developments to Delta Region, possibilities for huge profits without destruction to companies properties and giving foreign investors the total love and freedom for business transactions. It is recommended feasible for use.

a. To provide a central and communicative link which will harmonize the relationship between Host

communities and other stakeholders of the oil industry.

b. Development of a robust and highly scalable database system to capture Birth and Death registration inclusing employment, empowerment and other files for the overall development of the region.

c. E-governance will enhance transparency and accountability to elevate the standard of living of the people.

d. ICT would promote enlightenment, education and facilitate the awareness towards rapid careerier and youth development.

2. Database Systems

A major motivation behind the development of database systems is the desire to integrate the operational data of an organization and to provide controlled access to the data. Although integration and controlled access may imply centralization, this is not the intention. In fact, the development of computer networks promotes a decentralized mode of work. This decentralized approach mirrors the organizational structure of many companies, which are logically distributed in divisions, departments, projects and so on, and physically distributed into offices, plants, factories, geographical regions and so on, where each unit maintain its own operational data. The share ability of the data and the efficiency of data access should be improved by the development of a distributed database system that reflect this organizational structure, makes the data in all units accessible, and stores data proximate to the location where it is most frequently used. Distributed databases need robust database management system to be able to handle its complex requirements. There are certain features required in the DBMS to make them capable of standing up to distribution requirement and some DBMS have provided these features at certain degrees.

2.1 Distributed Database Management System (DBMS)

From the definition of the distributed DBMS, the system is expected to make the distribution transparent (invisible) to the user. Thus, the fact that a distributed database is split into fragment that can be stored on different computers and perhaps replicated should be hidden from the user. The objective of transparency is to make the distributed system appear like a centralized system.

Users access the distributed database via applications. Applications can be classified into two:

1. Local Applications
2. Global Applications

Local Applications are those applications that do not require data from other sites.

Global Applications are those applications that do require data from other sites.

There is a need for a DDBMS to have at least one global application. Therefore, a distributed DBMS has the following characteristics [8]:

1. A collection of logically related shared data
2. The data is split into a number of fragments
3. Fragments may be replicated
4. Fragments are allocated to sites
5. The sites are linked to a communication network
6. The data at each site is under the control of a DBMS
7. The DBMS at each site handle local application
8. Each DBMS participate in at least one global application

2.2 Distributed Database Network Systems.

Is therefore, a database that is stored in more than one physical location. Parts or copies of the database are physically stored in one location and other parts or copies are stored and maintained in other locations. In other words, the distribution of computer processing among multiple geographically or functionally separate locations linked by a communication network.

3. Overview Of Networking

Networks have evolved from simple terminal-based systems to complex multitier systems. Today's networks can comprise many computers on multiple operating systems using a wide variety of protocols and communicating across wide geographic areas. We need look no further than the explosion of the Internet to see how networking has matured and what a profound impact networks have on the way we work and communicate. Although networks have become increasingly complex, they also have become easier to use and manage. For instance, we all take advantage of the Internet without knowing or caring about the components that make this communication

possible because the complexity of this huge network is completely hidden from us. The experienced database administrator has seen this maturation process in the DBMS network architecture as well. Some DMBSs has evolved their network strategy and infrastructure to meet the demands of the rapidly changing landscape of network communications [9].

3. 1 Network Design Considerations

Many factors are involved in making network design decisions. First and foremost, you need to understand the design of the DBMS network architecture itself. You can choose from a variety of network configurations that are designed to meet the needs of both small and large organizations. The sections that follow summarize the areas that you need to consider:

1. Network Complexity Issues
2. Network Security Issues
3. Interfacing Existing Systems with New Systems.

3.2 Interfacing Existing Systems with New Systems

Many organizations are faced with the challenge of interfacing legacy systems to new systems. Often these legacy systems contain mission-critical information, and must be able to communicate to new applications as the business evolves. If existing computer systems must communicate with the DBMS product networks, you need to answer the following questions:

- Does the application that needs to perform the communication require a seamless, real time interface?
- Do the existing system and the new system use different distributed DBMS products?
- Will information be transferred periodically from the existing system to the new system?
- If so, which transport mechanisms should be used? Will the new system need to send information back to the existing system?
- Do applications need to gather data from multiple sources, including heterogeneous distributed DBMS, simultaneously?
- What are the applications involved that require this interface?
- Will these network requirements necessitate design changes to existing systems?

Answering these questions will give you a better understanding of what systems need to be able to communicate with DBMS network and to what degree these systems need to be integrated.

4.Architecture and Design

The design for an information system can be broken down into logical and physical design specifications. Lays out the components of the system and relationship to each other as they would appear to users. It shows what the system solution will do as opposed to how it is actually implemented physical. It described inputs and outputs, processing functions to be performed, business procedures, data models and controls. (Controls specify standards for acceptable performance and methods for measuring actual performance in relation to those standards as regards users needs). Is the process of translating the abstract logical model into specific technical design for the new system. It produces the actual specifications for hardware, software, physical databases, procedures and specific controls. Physical design provides the remaining specifications that transform the abstract logical design plan into a functioning system of people and machines completing the systems development process, the remaining steps:

4.1 Analysis of the Architecture

This study has recommended for the immediate provision of a key, like a padlock key to a locked room of a building, showing that without the key at hand first, the entering into the room would be extremely difficult except by destruction. The above identified method is the opening of the way to a peaceful enterprise in the Niger Delta Region, by involving the youths and people of the region in the employment and empowerment schemes of the oil industry. Youths in their frustrated state of life, who are ever ready and always available at rural and urban areas to go or involve in any mission of misconduct, that will pay them money/ gifts and over – sized promises to enable them make their livelihood. The youths are considered first, because at the grass root, they are the most popular citizens of the region. Secondly, employment of skilled and educated persons into high/ key positions of the oil companies operating in the area and finally the overall development of the region. Table 1 show the

detail of the Birth and Death registration in the community.

Table 1: Needed Database Files

Birth Registration Files	Death Registration Files
The Fields: - Name of Child -Place of Birth -Date of Birth -Sex of Child - Name of Mother - Address of Mother -Name of Father -Address of Father -Occupation of Mother -Occupation of Father -Name of Village/ Community -Name of Village Head -Level of Education -LGA & State etc.	The Fields: - Name of Deceased - Birth Registration ID - Name of Death Reporter - Relationship of Reporter to Deceased - Permanent Address of Deceased - Address of Reporter - Date of Death - Place of work of Deceased - Names of Deceased's Children - Wife's Name, if married - Telephone Number of Reporter - LGA & State/ Nationality of Deceased

A Continuation of Table 1

Employment/ Empowerment Database Files	Contract Database Files
The Fields: - Name of Applicant -Birth Reg. ID No. -Employment/ Empowerment Sort -Level of Education -Telephone Number of Applicant -Name of Village Head -Name of Village/ Community -LGA/ State -Sex -Contact Address etc.	The Fields: - Name of Applicant/ Company – Permanent Address - Level of Education/ Company Status - Contract Sort - Birth Reg. ID No. of Applicant - Name of Village Head - Sex - Telephone Number

4.2 View Design And Integration

The empowerment/ employment distributed database is not generated at a single site, therefore it can be

assified as large and complex. Therefore, there ust be a way to manage the complexity of the design process. View design and integration can be used in managing the empowerment/ employment database design project by providing a way to break a large effort into smaller parts. In these cases, we combine individual views into a complete database design.

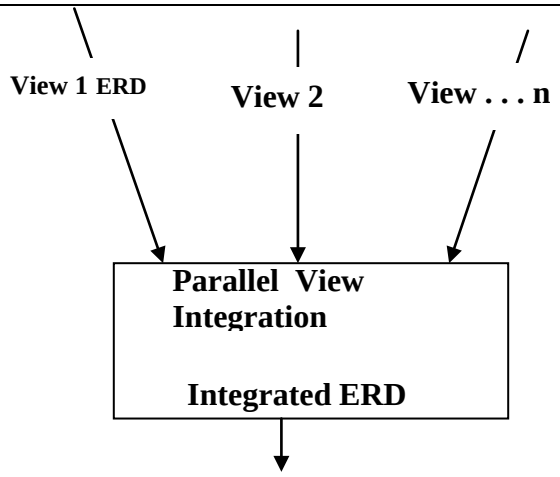


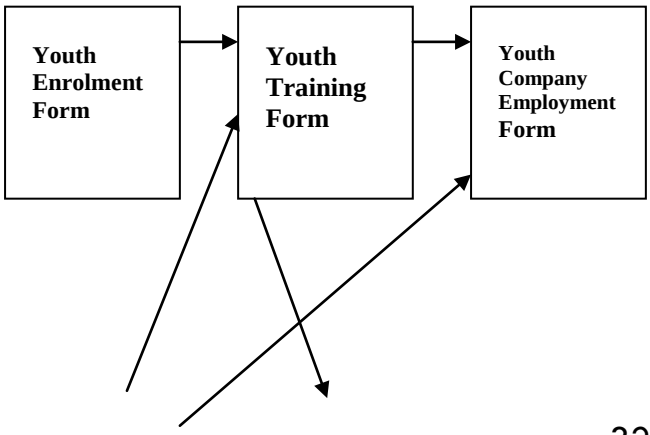
Fig 1: Parallel Integration Process

In Fig. 1, the parallel approach, ERDs are produced for each view and then the view ERDs are merged. The integration occurs in one large step after all views are analyzed. This approach is parallel because different designers can perform view designs at the same time. In this approach we postponed integration until the end when all views are integrated to produce the final ERD. The incremental approach is well suited for the implementation in this work because of closely related views. For example, the training and employment forms are closely related, because training proceeds employment.

The parallel approach can only be used after the empowerment system has been on and running for few years. Since it works well on views that are not closely related. Independent teams can work on different parts of a design in parallel. The company databases, government agencies databases (like NDDC etc) and community databases can be integrated in this manner to generate reports on the progress of the youth empowerment programs in the Niger Delta.

4.3 Relationship Among Forms

In other to determine an integration strategy, we identified precedence relationships among forms. Form A precedes Form B if, Form A must be completed before Form B is used. For example, the training form precedes employment form, since the employers uses the result of the training. A good rule of thumb is to place forms with precedence relationships in the same view subset.



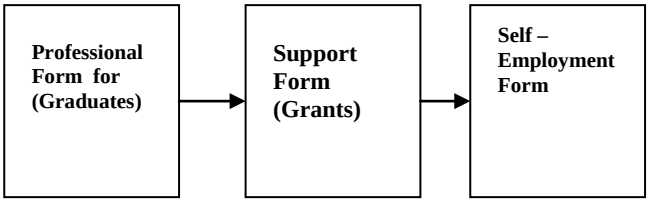


Fig 2: Precedence Relationships among Forms for Niger Delta Youths Empowerment.

Fig. 2, shows precedence relationships among forms for Niger Delta youth empowerment programs. The designed form contains data about the components of the system. The youth enrollment form contains data about enrollment of unskilled and semi – skilled youths for training. The training and company employment forms contain data for training and qualified persons for company employment. The profession form contains information of youth who have graduated from universities and polytechnics. The youth must graduate or pass through training to be employed, this clearly shows precedence relationship. Using these, precedence relationship, the forms can be divided into two groups:

- Skilled and Unskilled
- Employment/ Empowerment processes

As illustrated in the precedence relationship form diagram in figure 2, an unskilled youth enrolls for training from where he can get grant or seek company employment. A skilled youth graduates, seeks companies job or get grant and set up personal enterprise. Though the entire entities have different precedence they have been well integrated to give clear relationship that can be used in creating the queries and getting clearly anticipated results from the databases for the Niger Delta empowerment/ employment system.

4.4 Architecture of the Connectivity

This is the general outlook of the Network connectivity. The diagram in figure 3 illustrate the links and connectivity expected from the community, Local government, State government and the Federal government. The Network connection and the

database distribution is expected to follow the connectivity pattern designed in this architecture.

The architecture also show connectivity between government agencies such as DPR and NNPC and the Federal government. The State is also interconnected with each of the local government within its area that is Oil producing or that have future prospect of producing oil within the Niger Delta States. The Communities in each of the local government covered is expected to interconnect with the local government system forming one complex and interlinked distributed database from where the information for use in the employment of the Niger Delta youths will be derived from. Manpower development effort from the Local, State and Federal government could be derived.

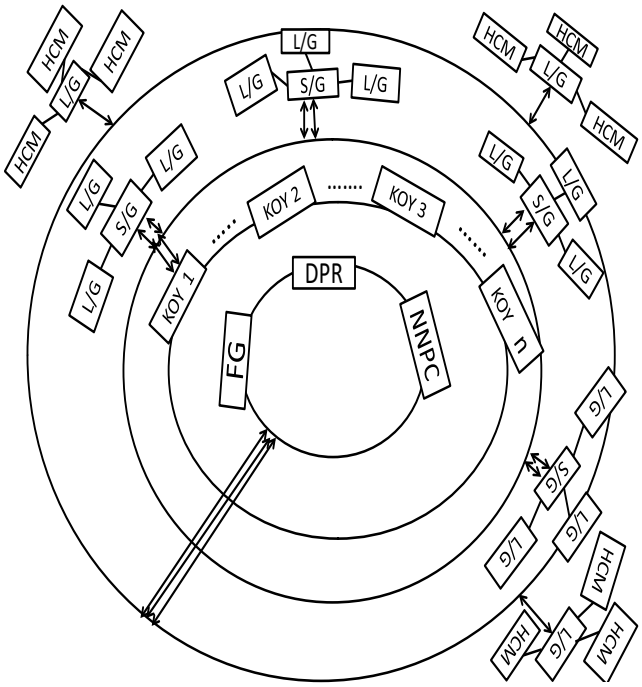


Fig 3: Overview of Network

KEY:

1. ***HCM = HOST COMMUNITY***
2. ***L/G = LOCAL GOVERNMENT***
3. ***S/G = STATE GOVERNMENT***
4. ***KOY 1 … n = OIL COMPANY 1 … n***

Figure 3 clearly shows how the Oil Communities are connected to their oil L.G.As through star topology connections in the outer most layer of the Net. The second layer of the Net connects Oil L.G.As to the State Government. The next layer connects the Oil Companies to both State Governments and the last layer where FG, DPR, NNPC and NDDC reside.

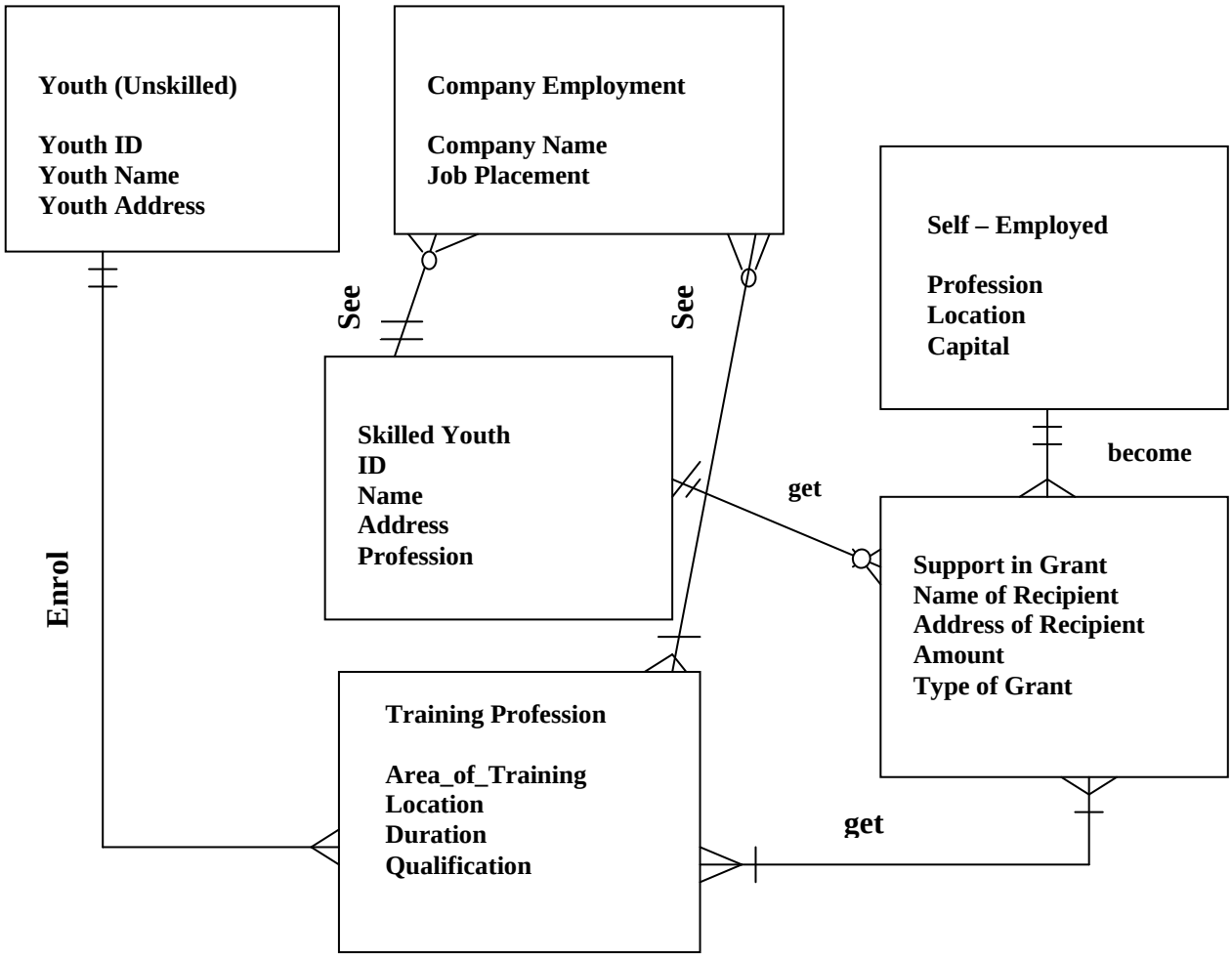


Fig 4: Integrated Entity Relationship Diagram for Niger Delta Youth Empowerment/ Employment System

The entity relationship integrated diagram in figure 4, illustrate the relationship between the entities. The entities include Youth, Training Profession, Support in Grant, Skilled Youth, Self-Employed and Company Employed. There is one-to-many relationship between Youth and Training Profession. There is also a many-to-many relationship between Training Profession and Support in Grant. There is also a one-to-many relationship between the Skilled Youth and the Support in Grant, offering one youth non, or more Grants. An unskilled youth enrolls for training from where he can get grant or seek company employment.

A skilled youth graduates, seeks companies job or get grant and set up personal enterprise.

Though the entire entities have different relationship types show the process and the entities and how they relate one to another. The relationship and entities always serve as guide for the creation of the database keys both primary and secondary keys and in the formation of the queries and getting clearly anticipated results from the databases for the Niger Delta empowerment/ employment system.

In figure 5 the oil community and LGA Connectivity is illustrated, which show that information need to get to the LGA first.

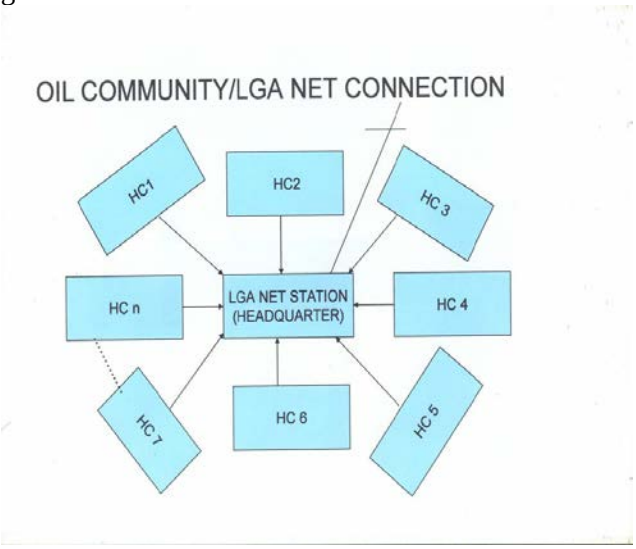


Fig 5: Oil Community/ LGA Net Connection

Figure 6 similarly shows the various oil producing local Governments (LGAs) interconnecting to the oil companies database stores. The oil companies can Connect with the State Government and the Federal Government and its Agencies as illustrated in figure 7.

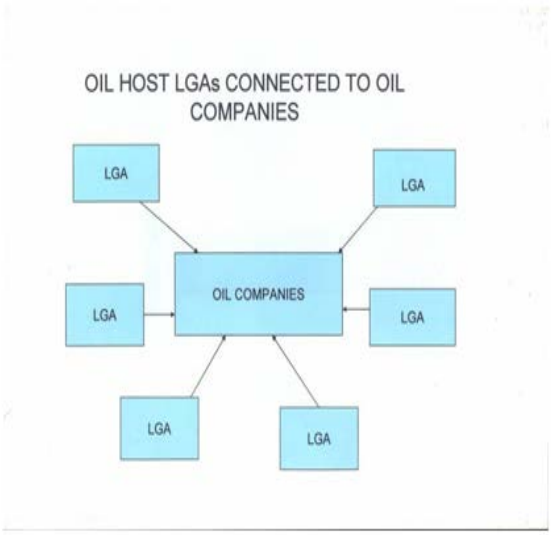


Fig 6: Oil Host LGAs Connected to Oil Companies

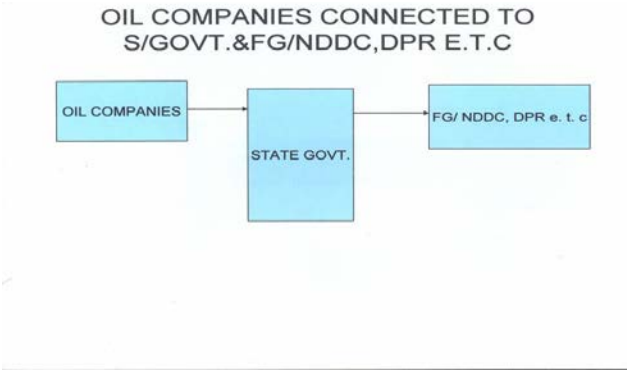


Fig.7: Oil Companies Connected to S/Govt. & FG/NDDC, DPR etc.

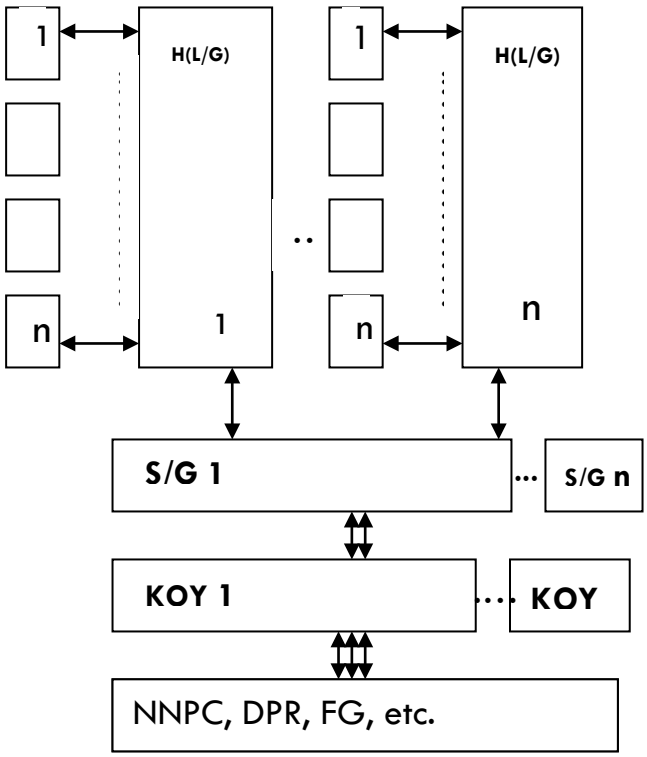


Fig. 8: Network Architecture Form

Key (Interfaces):
1. ↕ H (L/G) Connected To S/G
2. ↕↕ H(S/G) Connected To Oil Companies
3. ↕↕↕ Oil Companies Connected To Fg, DPR Or NNPC

* H (L/G) = Host Local Govt. Headquarters
* Koy = Companies

In figure 8 the layers of the network architecture form is illustrated from the Federal government and its agencies to the various communities and clans.

5. Model for verifying Persons in Niger Delta States.

In most cases in Nigeria when a program is meant for some youth, non-indigenes take over the process. There is a need to design a system of verifying beneficiaries using their family tree structure. The diagram in figure 9 is a model that X – rays the numerous settlements/ villages or communities in the various L.G.As in the Region with the aim of building the tree structure for identifying Niger Delta Youths.

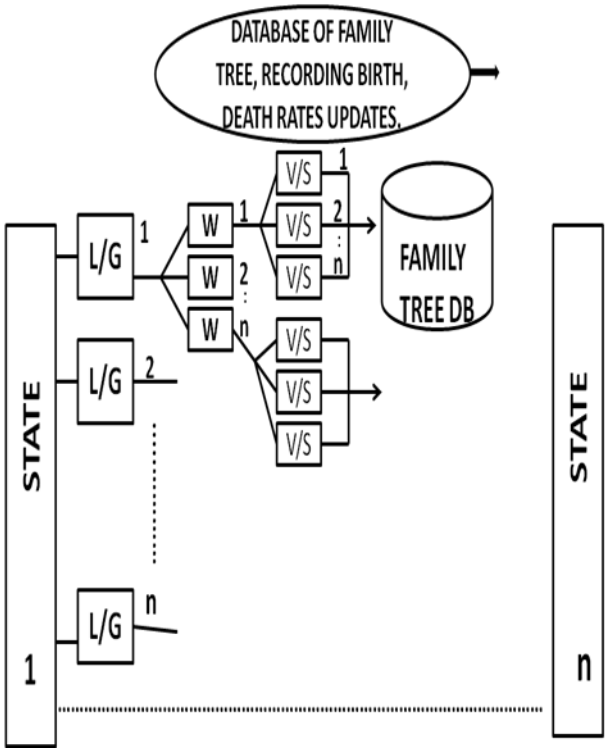


Fig. 9: A Model for Identifying the Youths of Niger Delta

Key:

1. W = Wards
2. V = Villages In A Ward
3. S = Settlement Or Creeks Or Plantaintion

Once the youths are identified the needs and expectations and how the system is expected to operate need to considered.

5.1 A Community Life Tree Model

In this model, villages/ community major families/ compounds are covered. The people of the region (Niger Delta) live in creeks, plantations, settlements and villages or communities. This is necessary because of the use of the Database for easy identification, communication of the files for the network system. This model updates the Birth registration file. The Death registration file is supported by the community family life tree. The existence of this two database records will always balance – up an accurate citizens count, of which primary objective is to enable a trace of any born person of the region. In figure 10, a case where, a Niger Delta citizen, Engr. Fubara Egbono, from Emoh Community is being identified, reflecting in the Database, Birth registration file.

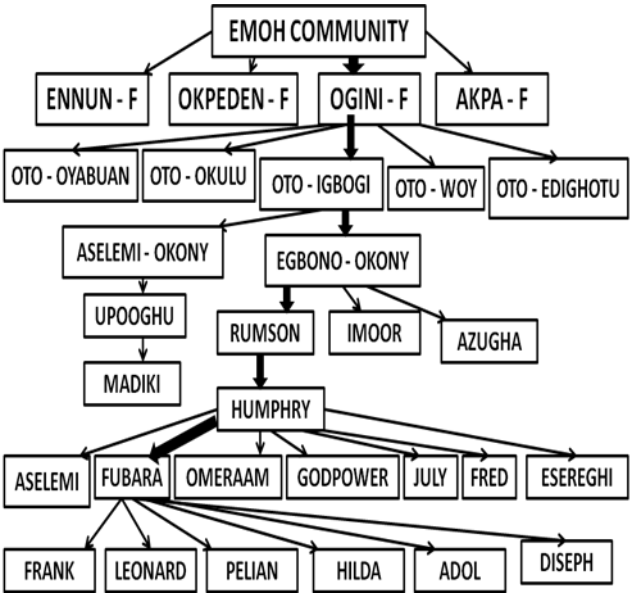


Fig 10: Emoh Community Family Life Tree Model

In tracing Fubara in the model, the mostly concerns with the hashing functions randomize keys to a file in a random (non - sequential) fashion. The balance tree type structure is real life representation of the main and sub – families of the communities, including the royal families, which is reflecting in the existence of every man and woman of the village.

6. Conclusions

The basic challenges that is facing oil companies, host – community relationship in the oil and gas sectors in the Niger Delta is the absence of mutual confidence and community harmony. This is manifested in the expression of distrust and in extreme cases has led to assault of oil workers, hostage taking, piracy, vandalization of pipelines and facilities, sabotage illegal bunkering, and killings etc.

The paper have provided the architecture of the models that can be used for the development of the System for the provision of employment to youths to rest the distrust and restiveness. In conclusion, the so claimed monumental distraction services of the then OMPADEC and NDDC with little spread bridges, scholarships, few 1000 – 1500 gallons tanks of waters found in some corners of the Niger Delta, alone cannot solve this aching problem, but the use of the benefits of the database network system, where there will be open communication link and the existing of transparency and accountability in company/ government and oil host communities relationship. Although, infrastructural development would take a gradual step to make a change, as was declared early in the report, of a step by step process.

7. Recommendations

The question at hand, is the way forward, as this Database Network System would be in operation at the center of administration in the Area. The following recommendations are deemed necessary and therefore are recommended to enable good governance in the region:

a. Computer laboratories to be installed in districts in every oil host local government areas and in the secondary schools, where teachers/ instructors are also trained to deliver an interactive youth – centered ICT curriculum, which will provide youth with access to vocational, life skills and employment training, internet and a job bank.
b. In the administration of the Birth Registration of youths born in the Niger Delta, it is strongly demanded by the rules governing the Network that every indigene of the Niger Delta, host communities be registered and Reg. ID number given to him or her.
c. The securities of these oil companies operating in the Niger Delta to be composed mainly of the uneducated youths trained under a mixed – up or to be assisted by the Nigerian military agents and services to be rotational posting within an L.G.A, at least 5 years intervals, because of not customizing behaviors against the interest of the stakeholders.

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