Reengineering Revenue Monitoring and Control System for Tertiary Institutions Using the Digital Nervous System Approach

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ABSTRACT

the invention of computer and the internet has simplified a lot of job processes and functions in today's work place, but a look at the revenue monitoring and control systems of the tertiary institutions in Nigeria shows a little lag in the computerization race, hence an overdue need to reengineer that sector. This research seeks to bridge this gap by developing an online, network based and fully IT driven revenue monitoring system which would enable the management of these institutions to monitor their revenue generating system effectively. The research work uses the Structured System Analysis and Design Methodology Approach of research and software development, while the actual coding was done in the Java Programming language environment, running on a MySQL database management system. The completed system receives inputs from certified users (tellers), posts it onto two or more databases simultaneously, from where it could be accessed by both the financial institution's management and the educational institutions' management or finance monitoring team for proper accountability and better informed decision making processes.

Key words: Revenue Monitoring, Control system, Software, Reengineering, digital nervous system.

1. INTRODUCTION

The partnership between the tertiary institutions and the financial institutions in recent years had been a successful one. The financial institutions are better equipped to handle the ever increasing cash flow within the school due to their expertise in fund management. However, a fundamental problem could be spotted in that partnership. The school now has to depend entirely, as it were, on the banks to account for its revenue generations. Because the banks have monopoly of access to the database of these receipts, the institution is now forced to believe whatever the banks tell her is what she has generated. This is not very acceptable for various obvious reasons.

- First, because the management of the institution cannot know how much money they have generated or expect to generate (except of course the banks inform them), budgeting and planning may be a little cumbersome and attended with many irregularities.

- Secondly, if there is an illegal representation or movement of funds from the end of the banks, they could conveniently and completely cover their 'tracks' because the school management do not have enough information database to data-mine for such activities, they depend entirely on the reports from the banks.

- Also because the departments and faculties within the tertiary institution are given some level of autonomy to generate funds through avenues like departmental dues, sales of journals etc, the management does not have first-hand knowledge of how much these units amassed and cannot accurately issue adequate disciplinary action were a unit head to misuse these funds. They may not even know that some monies were raised and squandered.

Sequel to the afore mentioned processes, a few points stand out as some major limitation that plague the system of revenue monitoring and control currently existing in these institutions viz:

1. The manual method of monitoring and control of the system makes this process a cumbersome and tedious one.
2. It also exposes it to various forms of infiltration like incorrect representation of data (whether consciously or unconsciously done).
3. Also the manual method of inputting of these reports back into the accounting software creates a possibility of introducing mistakes or even conscious mutilation of data due to human weakness or greed.
4. The cost overhead of producing reports could be quite enormous.
5. Communications of status and other details between levels of organizational hierarchy or units are slow and often attended with other forms of inconsistencies.
6. Decision making are often delayed because data needed for such decision cannot be promptly made available.

Now somebody may ask, 'what is the way out?'

We proposed a system in which the school's management may be able to monitor – first hand – all funds that comes into the institution, whether those accruing from its partnership with other companies or those generated by units within the institution. A system that will run parallel databases and sends an exact image copy of all receipts to the school's database server which will thus have the same information as the databases of the partnering banks. This

way management will know exactly what comes in, when it came in and from what source(s) it came in.

The primary objective here is to develop a system that will capture all the institutions transactions in real-time, hence the system should be able to:

i)   Receive inputs of payment details of various transaction types
ii) Accept the receipts from different points at the same time, hence it should be a multiple entry online system.
iii) Organize and store these data on online relational databases.
iv) Make copies of each individual transaction and send it to two or more online-based servers in real-time
v)   Generate appropriate reports, as needed, in an appropriate format and post it to designated points on the system via software.

The benefits of this reengineering effort include but are not limited to the following:

1. It will empower and equip the management of these tertiary institutions with tools to monitor their fund generation system.
2. This project used effectively with data mining could help the management of these institutions to be able to predict expected revenue. This would facilitate budgeting and planning processes.
3. Also it will help the institution to check fraudulent activities and mismanagement of funds both from within and without.
4. Another very important aspect of this work is that if the institution were to terminate its partnership with any of the partnering banks, she will not lose her database of financial activities done through the bank because she would have her own complete up-to-date copy.

The implication of implementing the system using the Digital Nervous System concept is that the system would be developed strictly with information and communication technology running as its backbone and supporting frame.

Modeled on the human nervous system, which coordinates each separate system of the human body, the Digital Nervous System (DNS) is a phrase used to describe how the IT infrastructure of an enterprise could be analogous to the autonomic nervous system of a biological organism and coordinates all the internal and external processes of the organization to easily and swiftly obtain information.

Quoting H. H. Sheikh Mohammed (2005) [1], DNS is not a program nor a hardware product, but a combination of IT infrastructures, different software applications, Internet technology and the web concept, which enables the efficient exchange of information on an organizational network.

Steve Ballmer (1997) [2] attempted to explain the Digital Nervous System by saying:

"If you think of the human body, what does our nervous system let us do? It lets us hear, see, take input. It lets us think and analyze and plan. It lets us make decisions and communicate and take action. Every company essentially has a nervous system: Companies take inputs, they think, they plan, they communicate, they take action. The question is how does the nervous system in your company operate? Is the IT infrastructure really adding value? …

"In other words, if there is a nervous system in your company, how important is the PC? Is the communication electronic? Is the data available in a way that you can access it from the same PC that you use for your own personal planning and communication? When a decision gets made, how do you communicate the decision -- how important is the electronics -- if you need to train people on how to implement the decision, how important is the computer infrastructure in that training process?

"Those are the concepts that we are talking about with the digital nervous system."

Bill Gates [3] of Microsoft himself offered the following explanation as part of a keynote speech at Microsoft's Second Annual CEO Summit in 1998.

"The term 'digital nervous system' is kind of an interesting one. The analogy, of course, is to the biological nervous system where you always have the information you need. You always are alert to the most important things, and you block out the information that's not important. And companies really need to have that same kind of thing: the information that's valuable getting to the people who need to know about it."

2. MATERIALS AND METHODS

The Structured Systems Analysis and Design Methodology (SSADM) was used because it adopts a perspective approach to information systems development. It is a waterfall method by which an information system design can be arrived at. It specifies the modules, stages and tasks which have to be carried out in advance and the deliverable to be produced. It is a very strategic methodology to adopt, especially when one is working on software development.

Java software development kit (Java SDK) was used to develop the software/User interface aspect of the system because of its versatility and ability to interface with several platforms and operating systems, and also its availability. The database which houses all the data was implemented using the Structured Query Language (MySQL).

3. System Design and Implementation

Figure 1 shows a block diagram of the internal structure of the designed system. It features

- The online data capture subsystem which provides a user interface for the receiving officer to interact with a customer and properly documents the transaction. It also omprise a tracker which compares the new input with previously inputted data using an identification tag (say the students matric number), and makes the necessary relationship between these.
- The Database Subsystem which comprise of the operational database where all the data are stored.
- The database management system and analysis subsystem which enables the administrator to manage the database and mine for data as required and
- The report generation and query subsystem which could be used to generate all manner of report to enable decision makers to make informed decisions as and at when due.

Figure 2 shows the flow chart of the revenue monitoring and control system. This shows a general overview of the chain of control within the system and the main menu. When the software is initialized, the main system driver displays all the subsystems contained in the system via the main menu display. Upon selection of a subsystem, control is transferred from the system driver to the subsystem driver, which then displays the menu for that subsystem, allowing the user to select the desired module. Selecting exit within a subsystem takes the user back to the main menu display. Selecting quit within the main menu allows the user to either quit to the language environment or to windows.
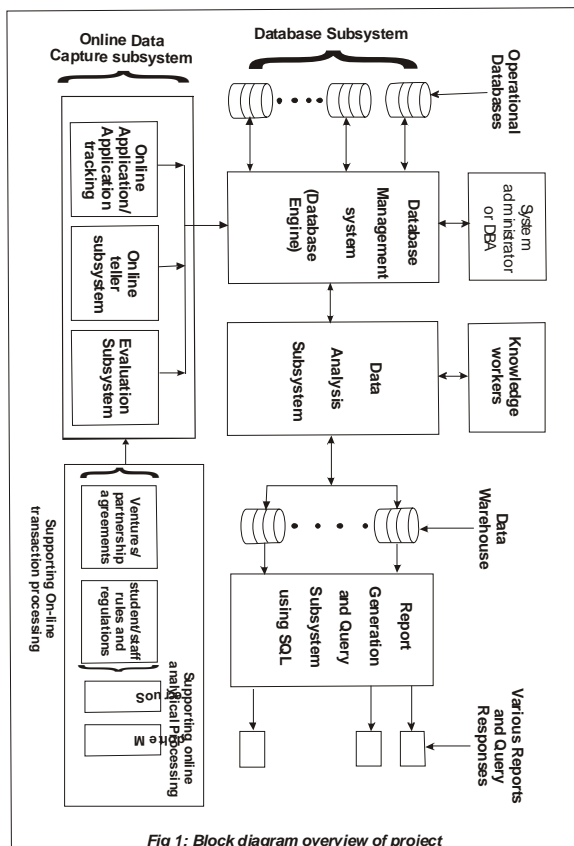

Fig 2: Flow Chart of Revenue Monitoring and Control System
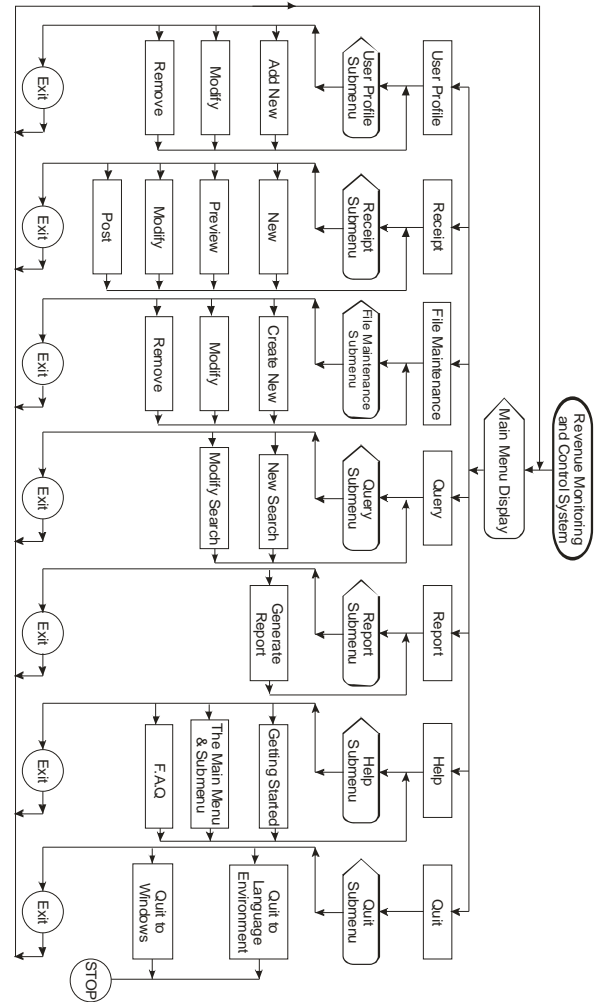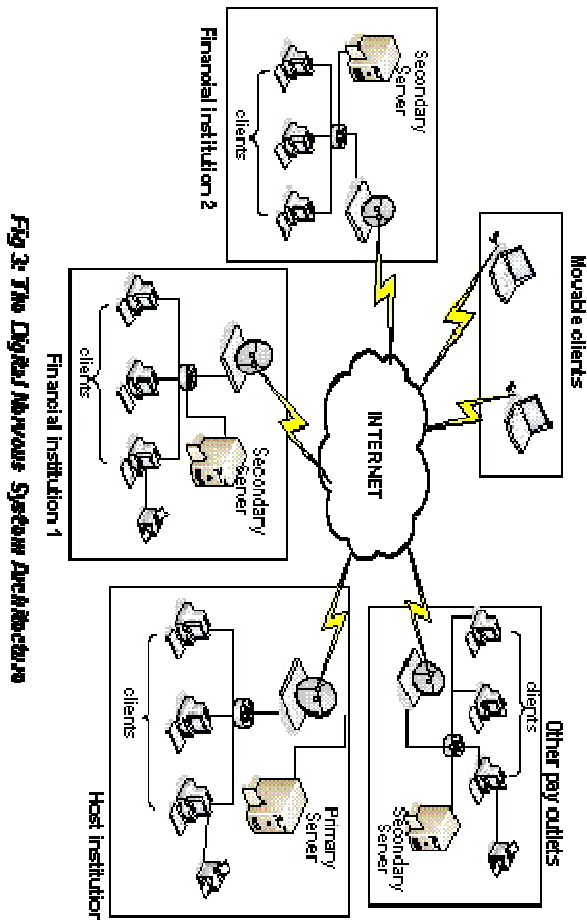

Fig 1: Block diagram overview of project

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Fig 3: The Digital Nervous System Architecture

The architecture of the Digital Nervous system is as shown in Fig 3. The functionality of the diagram is as follows:

The Primary server serves as the main host for the software and houses the composite database. The other servers (secondary servers) contain also a copy of the database. When transactions are received from any of the financial institutions or pay inlets or even one of the clients in the host institution, the transaction record is sent to the server networked directly to the receiving client, but also, at the same time, a duplicate copy is sent to the primary server. This is achieved by a cloner as depicted by the code:

```
    public boolean cloner(String table) throws
SQLException {
      String url2
="jdbc:mysql://localhost:3306/bank";
      String url3
="jdbc:mysql://localhost:3306/school";
      Connection con2, con3;
      Statement stmt2,stmt3;
      ResultSet rs2, rs3;
       ResultSetMetaData rsmd2, rsmd3;
      java.sql.Array array2, array3;
```

In the code the url2 and url3 depicts the address of the secondary server on which the transaction is received and the primary server respectively. The 'localhost' in those addresses could be replaced by the exact IP address of the servers and the 'bank' or 'school' which represents the hostnames of the secondary and primary servers could also be replaced with their respective alternatives.

This creates an exact and comprehensive copy of all the transactions done in all the other networks in the host institution's database. This arrangement ensures that the institution has a copy of every record from every one of their partnering inlets, and this record can be accessed and monitored by the institutions' management staff from their own office PCs or laptops.
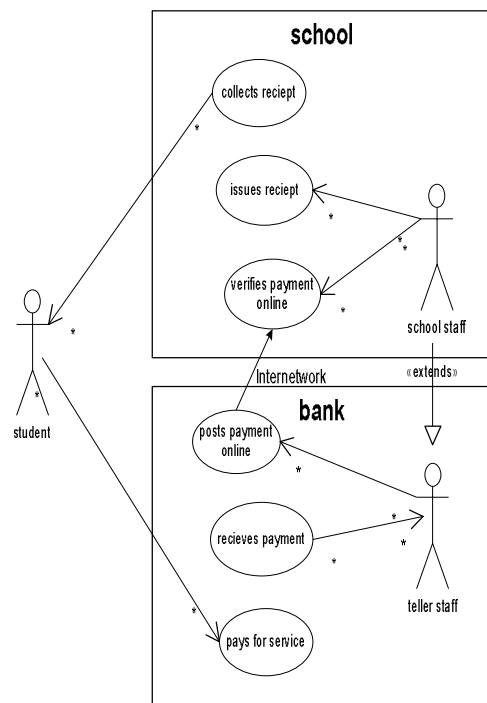

Fig 4: A Use Case diagram showing service payment procedure

Fig 4 is a use case diagram showing a typical use scenario for the online monitoring system. The student makes payment at the bank for, say his school fees. The teller staff at the bank receives his money and posts the transaction detail to their online server. At the school end, the staff in charge logs into the system and accesses the payment detail which was also posted to the school's database at the instant it was posted at the bank. He can then issue a receipt to the student, having confirmed his payment.
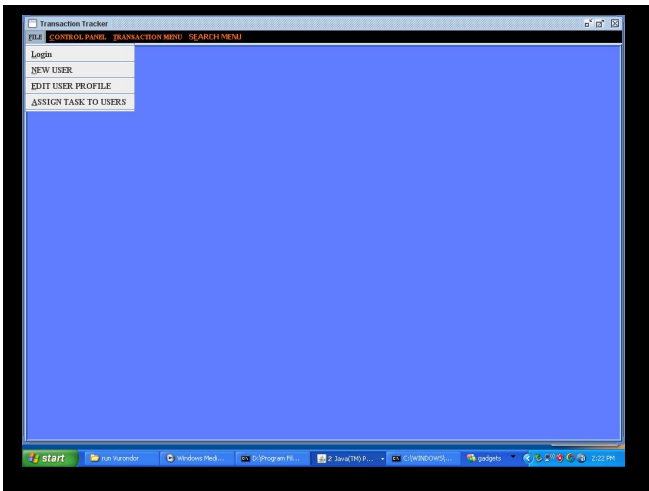
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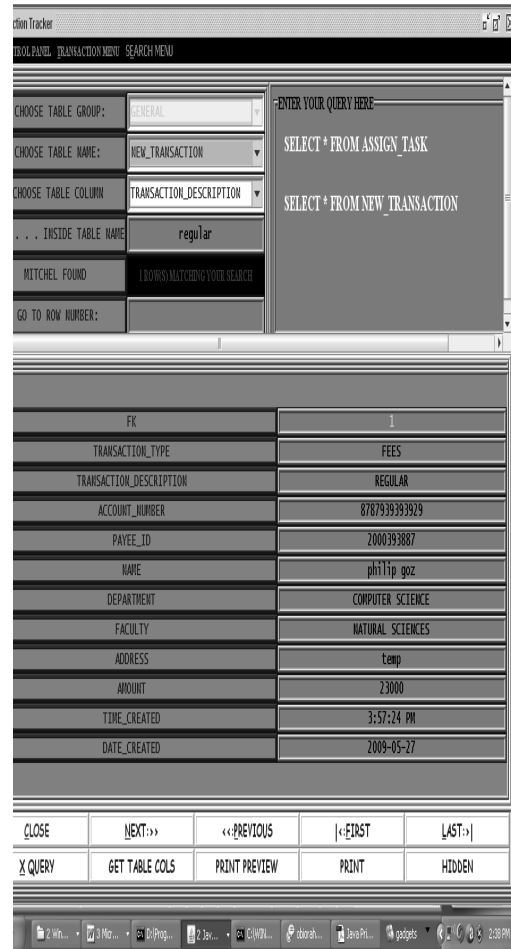**Fig 5a:** Screen shots of the completed work showing administrators' task menu.

Fig 5b: Screen shots of the completed work showing task assignment module for access restriction.
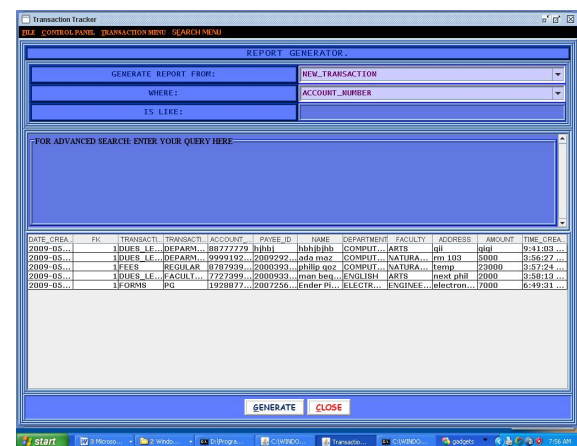

Fig 5c: Screen shots of the completed work showing new transaction module.

Fig 5d: Screen shots of the completed work showing advanced search module.

Fig 5e: Screen shots of the completed work showing advanced report generator.

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4. RESULTS/DISCUSSION

The revenue monitoring and control system software have been tested and found to achieve the following:

1. Online capture of transaction data from various inputs at dispersed locations;
   - This eliminates the problem of manual documentation of the receipts.
   - Also the user interface (front-end) of the software could be accessed from anywhere by any authorized personnel, whether internal or external.
2. Accurate, real-time posting of captured data to two or more online database servers;
   - This provides the institution a copy of all the transaction details done by their partnering banks at the instance of the transaction thus providing a first-hand knowledge of how much fund they accrued, independent of reports from the banks and hence reducing possibility of mutilation of data for fraudulent purposes;
   - Also gives the institution a database for use subsequently.
3. Accurate generation of transaction reports and other related queries from any of the client stations at a click of the mouse. Thus
   - Providing on-the-spot determination of total revenue base;
   - facilitating decision making , Budgeting and planning
   - Enabling management to monitor all the activities in real-time.
   - And reducing drastically the cost and efforts needed for report rendering.
4. It is equipped with secure login module and transmitted through secure channel making it difficult for unauthorized persons to access. Also within the system, different levels of access exist hence anybody logging in will be allowed to access only the module/information relevant to his/her work/job, and no more.

5. CONCLUSION

This work, re-engineering the revenue monitoring and control system for tertiary institutions using the digital nervous system approach is a work that will afford the management of the tertiary institutions an easy and reliable way of monitoring all funds that flow into the institution, assisting them with fast and efficient budgeting and planning, and enhances effective tracking, monitoring and detection of incomplete accounting or other fraudulent activities. It also facilitates real time payment verification as services are rendered or as products are sold.

6. REFERENCES

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