MAKERERE UNIVERSITY

COLLEGE OF COMPUTING AND INFORMATION SCIENCES

DEPARTMENT OF INFORMATION TECHNOLOGY

A REAL TIME REVENUE RECOGNITION TOOL

BY

FORTUNATE BINTUBIZIBU

Reg No. 2007/HD18/ 9459U

(Education) (Mak), PGDCS (Mak), PGDFM (UMI)

A PROJECT REPORT SUBMITTED TO THE GRADUATE SCHOOL IN

PARTIAL FULFILLMENT FOR THE AWARD OF MASTER OF INFORMATION

TECHNOLOGY DEGREEE OF MAKERERE UNIVERSITY

NOVEMBER 2018

DECLARATION

I, Fortunate Bintubizibu, a Postgraduate student in the College of Computing and Information Sciences, Makerere University with registration number 2007/HD18/9459U has satisfactorily completed the requirements for Project work for the Degree of Master of Information Technology (IT Management Option).

The work embodied in this report is original and has not been submitted in part or full for any other diploma or degree of this or any other University.

Fortunate Bintubizibu (Student) Signature……

Date 10/12/18

for

Dr. Benjamin Kanagwa (Supervisor) Signature……

Date 10/12/18

DEDICATION

This work is wholly dedicated to the Lord Almighty for his divine provision and protection all the days of my life. May His name be glorified and lifted above every other name, Amen.

Secondly to my family especially my children for being so patient and giving me courage and hope while I struggled to cater for their education as well.

For this, I say MAY GOD BE WITH YOU ALWAYS.

ACKNOWLEDGEMENT

Sincere gratitude to the College of Computing and Information Sciences through the Dean for all the knowledge acquired during my training and for creating a very conducive atmosphere for my studies.

Special thanks are due to my supervisor Dr. Benjamin Kanagwa for his able supervision, patience and valuable assistance in the preparation of this project work. Despite his busy schedules, he worked so tirelessly and gave me his full support and encouragement throughout.

Special thanks to Dr. Florence Kivunike for her guidance and support in seeing me through the final report.

Lastly but not least, to all my classmates and many other individuals for their valuable contributions to my project work and my stay at the institute.

TABLE OF CONTENTS:

List of Figures:(Document)**.....**Error! Bookmark not defined.

LIST OF ACRONYMS

ATM	Automatic Teller Machine
CDR	Call Data Record
CPU	Central Processing Unit
DB	Database
ERD	Entity Relationship Diagram
ERP	Enterprise Resource Planning
GAAP	Generally Acceptable Accounting Principles
GPRS	General Packet Radio Service
GSM	Global Systems Mobile
IAS	International Accounting Standards
IFRS	International Financial Reporting Standards
IN	Intelligent Networks
IO	Input/output
IP	Internet Protocol
ISDN	Integrated Service Digital Network
ITU	International Telecommunication Union
IVR	Interactive voice response
MSISDN	Mobile Station International Subscriber Directory Number
MTN	Mobile Telecommunications Network
OLTP	Online transactional processing
OTA	Over the Air
PIN	Personal Identification Number
PSTN	Public Switched Telephone Network
SMSC	Short Message Service Center
USSD	Unstructured Supplementary Service Data
VMS	Voucher Management System

ABSTRACT:

Many Organizations receive money from customers for services or products for which the benefit is yet to be fulfilled. This arrangement creates a liability on the part of the seller equal to the revenue earned until delivery of the good or service. In case the seller ceases operations then the unconsumed service or product is refundable to the consumer, which is referred to as unearned revenue according to Generally Acceptable Accounting Principles (GAAP). Examples of such organisations or companies include Telecommunication companies selling prepaid services like airtime e.g., MTN, Digital Television subscriptions and Prepaid Electricity to mention but a few.

Currently the challenge to most of the prepaid vendors is to accurately determine the liability of what is due to the customer in real-time or good time. Part of this challenge is due to architectural design and setup.

It was necessary to carry out a study on the existing systems architecture of a prepaid organization to come up with an improved tool that could be used to quickly determine, accurately compute and manage unearned revenue.

A study of the existing systems was carried out through a review of the various business processes related to the distribution, activation and usage of services and products, as well as interviews with various stakeholders within the prepaid environment. This led to a better understanding of the existing systems and the required system improvements.

It is from these requirements that the system specifications were outlined, and the proposed system design developed. A prototype was then developed using PHP (5.5.38) scripting language and MySQL (5.6) database.

Based on the prototype system and with the growth of the prepaid environment there is a need to have integration within the different systems in the environment to enable accurate and timely unearned revenue reporting and management.

This system can be moderated for use in any related organization that needs to track, report and maintain its unearned revenue of prepaid products or prepaid services in general.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Preamble

Many organizations sell services before the actual benefit of the service has been delivered.

Examples of such would include prepaid airtime by the Telecommunication companies, Prepaid Cable or Digital Subscriptions like Digital Satellite Television (DSTV), Prepaid Electricity-Yaka, to mention but a few.

These organizations usually have various distribution channels through which these services reach the final consumer. When the final consumer pays for the service before he consumes it, it is considered a liability and therefore should the organization cease operations at any given time, it should be able to compute with a high degree of accuracy that liability that it owes to these consumers. Therefore, when sales are made, in the companies' records they are only sales and revenue should only be recognized when the actual service is consumed and depleted. According to GAAP (Generally Acceptable Accounting Principles) -Revenue is earned when the service is completed.

1.2 Background to the Project

The government of Uganda, since 1997 has been carrying out an ambitious reform program of public enterprises. Economic growth was sustained through increased private investment and more efficient resource allocation, stimulated by liberalization of the economy. Uganda has been lowering tariff and non-tariff barriers to regional trade, removed all restrictions on international capital transactions, and about two thirds of Uganda's public enterprises were privatized in the past decade.

In the telecommunications sector, two aspects of reform were used; privatization and competition. In August 1997, Parliament passed the Uganda Communications Act, which provided the legal framework for introduction of competition in the telecommunications

sector. According to Uganda Communication Commission, [1] Uganda currently has nine major telecoms companies that include MTN, AIRTEL, SMILE, UTL, AFRICELL, SMARTTELECOM, K2, VODAFONE and LIQUID Telecom.

The most popular and sustainable payment used by these telecommunication companies is the prepaid mechanism used for the distribution of airtime.

As the players and the numbers of susbscribers has greatly increased it has also increased the selling of airtime in large volumes and thus increased the number of airtime cards that have been dispersed to the market. The distribution process itself has several systems being interfaced. The synchronization of this data among these systems has also been a challenge and therefore lowering the integrity of information accruing from these systems.

Management of the prepaid mechanism and the information relating to airtime sells and transactions has now become of more interest to the stakeholders for example finance managers, auditors, revenue assurance managers and tax bodies.

The purpose of accounting is to provide the information that is needed for sound economic decision making. The purpose of financial accounting is to prepare financial reports that provide information about a firm's performance to external parties such as investors, creditors and tax authorities.

This then increases the demand of automation of systems, well designed and integrated to support sound financial management and reporting.

1.3 How Telecommunication Companies carry out their airtime business.

Currently the mobile companies offer two types of service provider-customer relationships: Prepaid and post-paid. Although in the early years the mobile services were primarily targeted to the post-paid subscribers, prepaid services have become more and more popular in recent years.

By the end of 2003 the proportion of prepaid subscribers had become more than 5 million. No single technological innovation has done more for the explosion in the growth of wireless technology than prepaid [1].

The prepaid model makes telecommunications services available to an incredibly broad range of customers that could not be serviced in the past. The bad news is that the prepaid business model can only work using an architectural approach completely contrary to the standard telecommunications industry approach to tracking and billing revenues.

Revenue assurance for prepaid services is an incredibly challenging and profitable area for most telecoms. There are several areas where revenue assurance can be done for prepaid services. These include:

a) Assurance of the Physical Distribution of Vouchers.

One of the most challenging issue about prepaid, is the way that it changes around the entire revenue management process. With pre-paid, you have two additional factors, one positive and one negative.

On the positive side is the fact that customers pay before they use the service. This means that you have the potential for realizing the revenue sooner, and you greatly reduce the risk of not being paid.

On the negative side is the fact that you now must create, purchase and manage the distribution of vouchers through the Voucher Management system and other systems.
Vouchers which have a value built into them and can be stolen easily.

Equally difficult is the fact that most Telco's find that managing their own distribution channels is too expensive and limiting. This means that you must work with retail distribution channels which might not pay you on time, thereby duplicating the cash flow risks associated with postpaid.

Providing assurance on the distribution and management of vouchers is a process that is best borrowed from the retail industry. Retailers have been buying and distributing small items of high value for many years. Some of the techniques employed to assure this revenue stream include:

Voucher Tracking and Audit: - Many times, organizations need the help of an outsider, to simply review their voucher management operations, and determine if there is a problem or not. To accomplish this, the auditor needs to understand how the entire voucher management process works, and where the weaknesses and vulnerabilities in that process might be.

Inventory and Distribution Management Systems: - These systems are created to track vouchers across their entire life cycle, from creation, purchase, distribution until their ultimate activation by the customer. This type of inventory management can provide an incredible increase in confidence regarding voucher management and has resulted in the identification of many leakage points for customers in the past.

The diagram below illustrates the various states in the life cycle of a voucher from initial PIN generation to Allocation of serial numbers through to being used by a customer or subscriber.

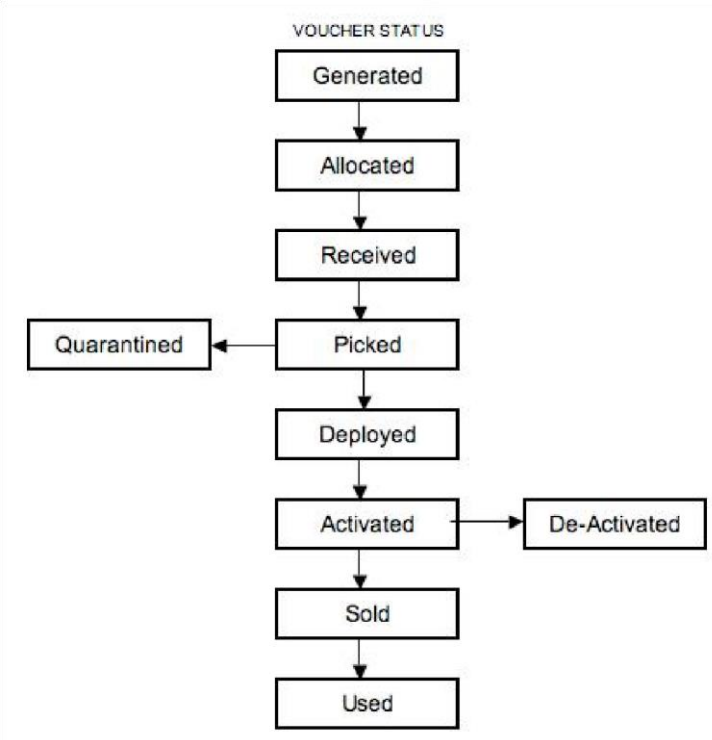


Figure 1: Voucher Life Cycle (As observed from MTN Voucher Distribution business process).

The Voucher status will change accordingly as the Voucher moves through the business process as illustrated below in Figure 2.

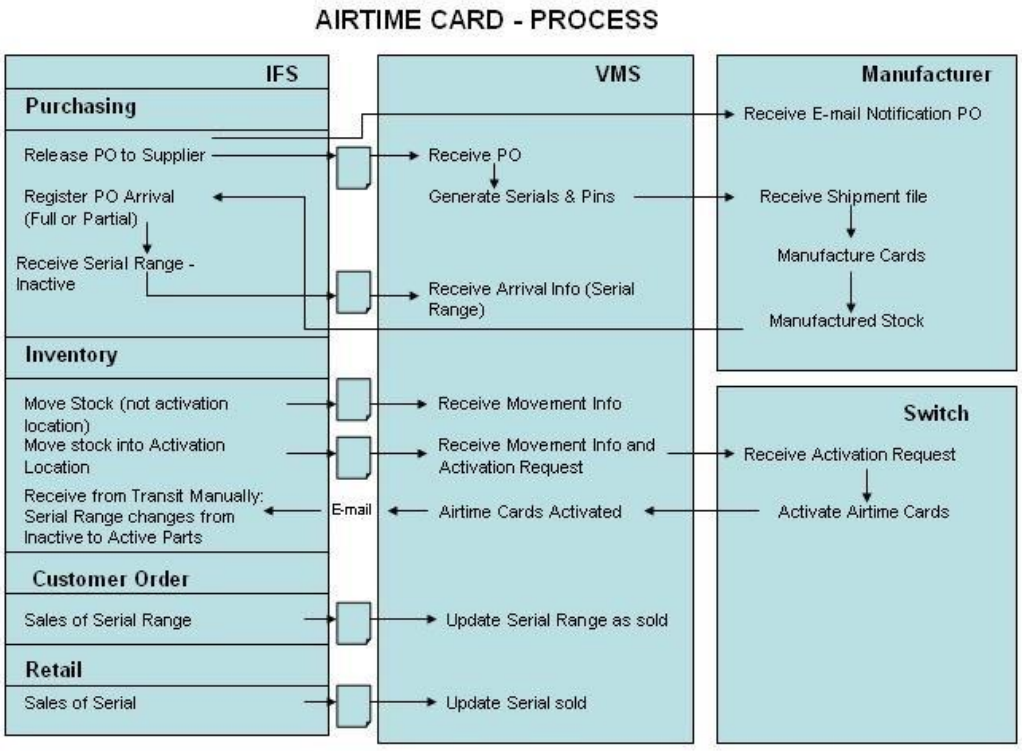


Figure 2: Voucher Business Process (Adopted from VMS Interface Specification Document) [2].

b) Assurance on the Workings of the IN (Intelligent Network).

Prepaid operations create a series of special challenges for the revenue assurance analyst. One of the biggest is the fact that the "normal" post-paid CDR (Call Detail Record) mediation based "check and reconciliation" process is bypassed by the intelligent network. In these cases, the accounting operations are executed in real time by a system with no manual intervention possible.

This means that one of the biggest jobs of the revenue assurance analyst is to make sure that this software is functioning properly. While it is possible to perform a check of CDRs, there

are also several levels of assurance that need to be performed in order to assure the working of the IN itself. The biggest vulnerabilities in the operation of the IN include:

i. The possibility of fraud (employees entering invalid vouchers, or programmatically altering voucher balances).
ii. The possibility of programming errors that fail to accurately decrement the voucher database.

There are several ways that assurance of these areas can be accomplished. These include:

- Voucher Balance Reports- These are reports that take a snapshot of what the starting balances for all customers at the beginning of a specified period (daily, weekly, or monthly), and then reports on all the additions voucher balance that have been made, and then keeps track of the sum total of the decrements (phone calls) that were made against those balances. This kind of independent audit report can greatly reduce the chances of fraud and program error.

- Customer Audit Reports- Similar to the voucher balance reports, these reports perform the same kind of reporting, but on an individual customer basis.

- Test Calls- The other way that the operation of the IN can be checked is through the performance of test calls. Under this approach, accounts are singled out, and specific phone calls, to predetermined phone numbers, of predetermined duration are made. The voucher management database is then consulted to see if the appropriate accounting occurred within the system.

The combination of complex systems involved and incompetent management of prepaid product or service delivery results into these problems below;

i. Inaccurate and untimely reporting, due to the lack of trustworthy data sources and the complexity involved with data manipulation which causes data discrepancies,
ii. system failures and bad configurations,

iii. billed traffic discrepancies, and iv. the lack of proper integration between existing and newly implemented software and hardware systems.

1.4 Problem Statement

In many organizations that offer prepaid services, customers or agents pay for services in advance. The service maybe supplied in full, partially or not at all. Moreover, the service maybe consumed fully, partially or not at all. The important aspect of the problem is that where the organization has received the money it should not be recognized as revenue until it ascertains that the service has been consumed. This is because it is still a liability for the service offering organization.

For an organization offering prepaid services like airtime sales, it is important to recognize revenue only when the services have been fully consumed. This is according to the Generally Accepted Accounting Principles.

Achievement of timely and accurate Revenue recognition or Unearned Revenue
Reporting for prepaid services is a challenge with reference to Airtime sales in Telecommunication Companies.

This research aims to integrate systems that manage prepaid products or services and as a result ease implementation of a real-time reporting tool.

1.5 Objective

The overall objective of the project was to integrate systems that manage the voucher management process and as well as develop a tool that offers real-time reporting of unearned revenue and integrate it into the voucher management process for prepaid services.

This tool would offer a single point of truth as opposed to generating the report from different sources with a lot of manipulation of data and human intervention.

1.6 Specific Objectives

i. To study and analyze the existing system(s)/approaches to real-time reporting of unearned revenue in prepaid services

ii. To design and integrate systems within a prepaid environment to facilitate real time reporting

iii. To develop and implement areal time reporting tool for unearned revenue. iv. To test and validate the real-time reporting tool

1.7 Scope

This project developed an integrated Real-time un-earned revenue reporting tool for telecommunication companies.

It was limited to Unearned Revenue in terms of sales of Airtime Vouchers or cards. This project did not involve balances on subscriber accounts related to data and mobile money which are monitored and reported off another database system.

MTN Uganda was specifically used in this research and development of the tool.

1.8 Significance

This research will benefit the Information system area especially database management as good database management practices are critical in the design of these systems.

Data is a valuable resource and therefore its management cannot be overemphasized. Critical areas of Database management, e.g. Data security and data sharing, data warehousing and business intelligence management, to mention a few have to be dealt with.

Good database management practices aim to reduce security risks, reduce data losses and enable accurate decisions from the reporting tools developed thereof.

An integrated system with the reporting tool will improve on reporting and management of unearned revenue thereby;

Improving compliance by meeting reporting deadlines; Improve data integrity by eliminating multiple data points and databases. Improve reporting timelines and accuracy since it is now real-time reporting as opposed to manual file extracts and manipulations. This will then improve stakeholders' confidence in reports because of a more efficient and integrated system with a more automated process.

Reduce on IT cost incurred in maintaining multiple systems since there are now less systems because of the integrations as well as simplifying business processes through automation and thus reduce on manual time-consuming tasks. When you save on time, you reduce on costs and thus increase productivity.

It will also benefit business in the prepaid environment especially telecommunications where the dynamics of airtime selling are changing as is witnessed recently in Uganda with the ban on airtime scratch cards selling and loading.

Tracking on performance of sales and the market at large. This will be done by observing the trends of un-earned revenue from the report in line with trends of sales from the sales report. This helps to identify risk and plan for action in time. It gives users more control and learnings to inform future actions.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 ICT and Accounting

Effectiveness of IT in companies is clear and obvious. Integrated system like enterprise resource planning systems (ERP) as well as Internet keep pace with the newest transitions in companies' knowledge. Some of these technologies, especially Internet, with widespread usages have changed companies accounting procedures and structures.

Before the advent of this medium (Internet), organizations typically had made use of IT in the form of application of computer systems such as payment and financial reporting systems which had employed certain operational methods and or supported given
managerial processes automatically. Usually, it is argued that accounting field was the first to use information systems in that IT often relates to company's main ledger and reporting systems. But continuous growth and changes in IT area had an important effect on executive roles at all organizational levels [3]. Today, there is a lot of research into management accounting and information systems such as enterprise resource planning ones. In this sense, the term "Information management" was coined as the simplest and shortest name for management of IT usage in organizations. The utilization of ICT is one of the key areas that modern companies develop in order to achieve strategic gains. Today, the utilization of ICT can be related to production of goods, mobile solutions or outsourcing of services such as the accounting function, just to name a few. The idea itself is not new, but instead it seems that the concept of strategy has been linked to the development of the information systems from the very beginning.

Today's rapidly changing and highly competitive business environment, in conjunction with the technology expansion, put pressure on enterprises to search for new ways to survive and succeed. In order to ensure both their position in the market and a competitive advantage, a large number of companies perhaps the majority all around the world, has adopted or are in the process of implementing Enterprise resource planning (ERP hereafter) systems. ERPs have fundamentally re-shaped the operating practices of companies. The significant changes

ERPs brought in enterprises have important implications for Management accounting and Management accountants as well, who may need to adjust their methods and procedures when working in such an environment [3].

Today, the business world is changing rapidly. Frequent investments and rapid pace of changes in IT along with increased costs of research and development (R&D) all are reasons for globalization. During past decades, role of IT has changed in relation to how corporations manage and control their resources. As a result, IT plays a vital role in new trade, especially with respect to accounting performance. IT alters the nature of practices of business and accounting basically [4].

The first advantage of relationships between accounting and IT is that they will be accepted gradually; without IT, accounting is not accomplished easily, and it is assumed that IT is a base for accounting data, allowing certain distortions on performance to be inquired. Therefore, IT and accounting systems will constitute main acknowledged part of accounting research [4].

Although it has been that IT plays an important role in accounting field, few studies have been performed on relationships between them. Based on review of literature previous research and studies, it is concluded that very little is known about effectiveness of advancement of the newest today's world technologies in accounting field [4].

Although IT clearly plays an important role in accounting and management control, this relationship has not been studied sufficiently. Present researches greatly focus on relationships between investment in IT and performance of companies. In particular, such studies have tried to measure the amounts of investment in IT and of companies' productivity or even the material payoff of investment in IT. But experimental studies test relationship between IT and performance reported from mixed findings. And conflicting results show that there is no direct relationship between investment in IT and performance of companies. So, it seems that the relationship between IT and companies' performance is more complex than what was imagined before. The aim of this paper is to focus on IT effectiveness regarding organizational changes, especially performance of management accounting. We seek to

prepare profession of management accounting for challenges outlined by IT, and to help knowledge recognize to what extent IT influences empowerment of different accounting functions. Thus, we will make efforts to measure effectiveness of IT application in fulfilling an accountant's duties[4].

ICT has been a major factor of efficient accounting system and great organizational performance recently. ICT has been used to augment the reliability of accounting information and organizational performance. Accounting systems include the computer hardware and software fundamentals in recording accounting information. Organizational performance in this study was related to ability finances, ability to meet set goals and actions. However, to maximise the benefits of information technology systems, the appropriate implementation and adoption procedures have tobe used, or else, there is little or no impact of these technologies on the earlier mentioned variables. This study investigates empirically the impact of information technology on accounting systems and organizational performance. The results of the empirical findings show that there is a significant positive relationship between ICT systems and accounting systems and a significant positive relationship between ICT and organizational performance [5].

Information technology has changed the way that just about every industry functions, including accounting. While you might not be able to afford an in-house accountant, technology makes it effective and easy to have a professional working on your business finances. Take a look at how you can use information technology to partner with an off-site accountant and keep your business's financial goals on track [6].

The aim of this work is to focus on IT effectiveness regarding integration of business processes and organizational changes and performance of management accounting. We seek to use IT in resolving challenges of management accounting and to help knowledge recognize to what extent IT influences empowerment of different business processes and accounting functions. Thus, we will make efforts to integrate systems of IT to deal with challenges in determining Unearned Revenue.

2.2 Un-earned or Deferred Revenue

Unearned revenue is a liability for the recipient of the payment, so the initial entry is the cash account and a credit to the unearned revenue account. As a company earns the revenue, it reduces the balance in the unearned revenue account (with a debit) and increases the balance in the revenue account (with a credit) [7].

The unearned revenue account is usually classified as a current liability on the balance sheet. If a company were not to deal with unearned revenue in this manner, and instead recognize it all at once, revenues and profits would initially be overstated, and then understated for the additional periods during which the revenues and profits should have been recognized [7].

This is also a violation of the matching principle, since revenues are being recognized at once, while related expenses are not being recognized until later periods [7].

Examples of Unearned Revenue include: - prepaid airtime services, prepaid TV subscriptions, a rent payment made in advance, services contract paid in advance, legal retainer paid in advance.

Under current accounting practice, the amount of cash prepaid by customers is classified as a liability ("unearned revenue liability") pending delivery of the goods or services. While waiting until completion of the earnings process to recognize the cash proceeds as revenue is fully consistent with revenue recognition under accrual accounting, this treatment may not reflect the underlying economics of the transaction. If so, the relation between accounting data and firm value is obscured [7].

Accounting practice is based on the notion that the accrual accounting process results in a superior measure of firm performance over short time periods [8]. By transforming firm cash flows, accruals and deferrals enable the matching of efforts with accomplishments. However, given the widely accepted notion that firm value is equal to the present value of future cash flows, the accrual accounting system may fail to record increments in firm value on a timely basis when customers prepay for goods and services. In this case, the revenue recognition principle does not permit an increase in shareholders' equity until the firm "has

substantially accomplished what it must do to be entitled to the benefits represented by the revenues" [9].

A case in point is Gateway Broadcasting Services (GTV), a British-based pay satellite Television Company that succumbed to the global financial turmoil, and with immediate effect switched off its signal worldwide. There were people who had paid to be provided with the service for the following period before the closure. Some had partly consumed the service for a number of days before the expiry of the agreed period. At the time of the closure which was abrupt there was a figure that should have been known to the receivers as un-earned revenue or deferred revenue.

Another case in point is airtime sales from telecoms. Airtime is also distributed through various franchises, distributors, sub distributors and resellers. When the subscriber buys airtime of say value Ushs. 100,000 he/she may not consume all of it at one go. So, at any one time there is airtime in the distribution channels that has not yet reached the final consumer, there is airtime in hands of subscribers not yet loaded on their mobile phones and as well the balances on the subscriber's accounts after loading the airtime but not yet used to depletion. All this adds up to unrecognized or unearned revenue. In simple terms, this refers to airtime sold but not used. It is prepaid airtime derived from the airtime vouchers sold but not used by the customers.

Unearned rent is deferred revenue. When you are a landlord, and you have a tenant, or renter you are responsible to that individual in providing them with the space they rent. If a tenant pays you yearly for rented space, you are obligated to provide that space for a period of one year. What would happen if you failed to provide that space for the term agreed? Would you owe the tenant a refund? Most definitely; and it is in this spirit that the unearned revenue is determined to be a liability. It is a liability in the books of accounts unlike recognized revenue according to IAS 18. You have received the money, but have not provided the service or product, yet. At the end of the year, you will have fulfilled your responsibility, and the rent will be fully realized as earned income [10].

Deferred revenue is not yet revenue. It is an amount that was received by a company in advance of earning it. The amount unearned (and therefore deferred) as of the date of the

financial statements should be reported as a liability. The title of the liability account might be Unearned Revenues or Deferred Revenues. When the deferred revenue becomes earned, an adjusting entry is prepared that will debit the Unearned Revenues or Deferred Revenues account and will credit Sales Revenues or Service Revenues [11]. It is also applicable in pre-paid annual support contracts.

Many executives and key decision makers are interested in this figure when they look at the end of year results or whenever they carry out audits in organizations of this setting. It is therefore very important to compute and report unearned revenue as timely and accurately as possible.

This figure is a liability which ends up on the balance sheet. A balance sheet communicates the financial position of a company to financial statement users.

2.3 Voucher Management Systems

A Voucher Management System (VMS) is a business system that enables service providers to manage the unique complexities of the supply chain and to add value to their prepaid business and their distribution partners. It is designed to manage the end-to end lifecycle of vouchers from product creation through PIN generation, voucher manufacture, warehouse handling, dealer distribution and finally redemption (As shown in Figure1 on page 3 above).

Statistically, the prepaid market has grown rapidly over the past few years. With a diverse consumer base that stretches across numerous demographics, it has become the need of the hour for service providers to have an effective voucher management system to manage the prepaid cards/vouchers sold to end-subscribers. With an effective voucher management system in place, flexible and secure prepaid service solutions can be provided to consumers with support for multiple payment gateways [12].

Managing and processing thousands of transactions becomes easy, while auditing and tracking within the system ensures security and minimizes the risk of fraud [12].

2.4 Conclusion

Unearned revenue refers to revenue received in advance of fully providing the service. Since future obligation exists on the part of the company to perform the services for which the advance payment was received, unearned revenue constitutes a liability on the part of the company. Based on the above discussions on how the telecoms companies carry out their airtime business especially on the revenue side it becomes a challenge for them to calculate unearned revenue for their company since they have so many systems that actually do different functions in the airtime business process if these systems are not well integrated.

CHAPTER THREE

3.0 METHODOLOGY

This section details the methodology and the various methods that were used in identifying the requirements for designing of a fully-fledged system focusing on a real-time un-earned revenue reporting tool.

The study followed the case study methodology. It was based on an already existing situation. It looked at the business processes in place in relation to the systems in place [13].

It was based on Airtime Sales in Telecommunication companies, case in point being MTN Uganda Voucher Management System and processes.

This was also based on issues and challenges observed by researcher from past work experience within the same process.

In this methodology there is focus on relationships and processes and it happened in a natural setting. There was no need to set up an environment for the study rather the existing systems in place was used in the study [13].

The choice of methodology is because it allows the use of various methods depending on the circumstances and the specific needs of the situation. It also allows focus on just one instance of the item being investigated in this case un-earned revenue which is part of a bigger voucher management system [13].

Typically, it can be generalized to cater for all other prepaid systems [13].

It is based on one of the largest telecommunication companies in Uganda so offering large volumes of data.

It is based on the unique opportunity that found the researcher directly involved in the process and therefore as one of the main stakeholders [13].

In conducting this research, the researcher went through the following stages; defining the case – this was achieved through a system study which led to the requirements; selecting the cases (s); collecting and analyzing the data using mainly qualitative techniques (i.e. interviews with focus groups, and observations; and reporting the findings [14].

3.1 System Study

A system study was conducted to establish the gaps in the existing systems and gather requirements for the new system. The system study was conducted through various methods and tools below;

Reviewing the existing documentation about the various business process in relation to the distribution of vouchers in MTN Uganda as well as existing documentation of the current systems involved in the voucher distribution processes.

Interviewing the various stakeholder groups in the Voucher distribution systems that included the IT support team, the sales teams, warehouse team, the Revenue assurance teams and reporting teams in Finance.

Observation of the existing reports related to sales, usage and activation reports.

The following data collection methods and tools were used as well;

Questionnaires (Appendix A) were given to a sample of stakeholders(focus group)that included;
Finance - Management Accounting staff, Revenue Assurance staff, Information Technology support staff and Network Group department staff who are the major stakeholders in this report and who have a lot of interest and optimism in this tool.

Semi-structured interviews (Appendix B) were given to decision makers in Finance and Information Technology departments.

Documentation of the current systems involved in the voucher processes was reviewed as well.

3.2 System design.

The findings from the analysis of the data collected above led us into the system requirements that were to guide us in our design of the new system.

3.3 System Implementation.

Here the program specifications were converted into computer instructions. To do the actual coding PHP Version 5.5.38was used for the front end of the application and MySQL5.6 database management was used for the applications. Also Transact SQL was used especially in the design of the logical programmable functions e.g. stored procedures and triggers

3.4 Testing

Before submitting the new system into operations, a test run of the system was done to remove all the bugs. A System Test was done after carrying out the unit tests for each of the programs of the system until all errors were removed.
Specifically, to test that the problem in question was handled in the solution, tests were based on thorough analysis of the reports below;

- the sales report from both the new and old system
- the usage reports from both the new and old system
- the unearned revenue reports from both the new systems and from the old process.
- the usage files during the testing phase were also be analyzed and compared with the usage reported from the new solution.

These comparisons were given a time frame of about two months to have a fair conclusion as to the accuracy and performance of the new solution. The trends in both reports were analyzed for consistence.

CHAPTER FOUR

4.0 Findings

The project was conducted within the MTN Uganda Environment using a sample of users of the Voucher Management system in place at that time. Using the tools above it was done using a focused group of users involved in the process of reporting and generation of the unearned revenue report who were nine (9) in number. This was based on purposive sampling. It was based on the researcher's knowledge of the study and participants in the process; The participants where a limited number [15];2 from Finance - Management Accounting;1from Revenue Assurance;2 from Information Technology support;2 from Network Group department;2 executives from Finance and IT

4.1 System Analysis

During system analysis, a detailed study of the current systems was done, to get a more in-depth understanding and to establish the problem area. In this phase, the current system architecture was studied to give a clear picture of how actually the physical system is structured. This was achieved by reviewing the available systems documentation.

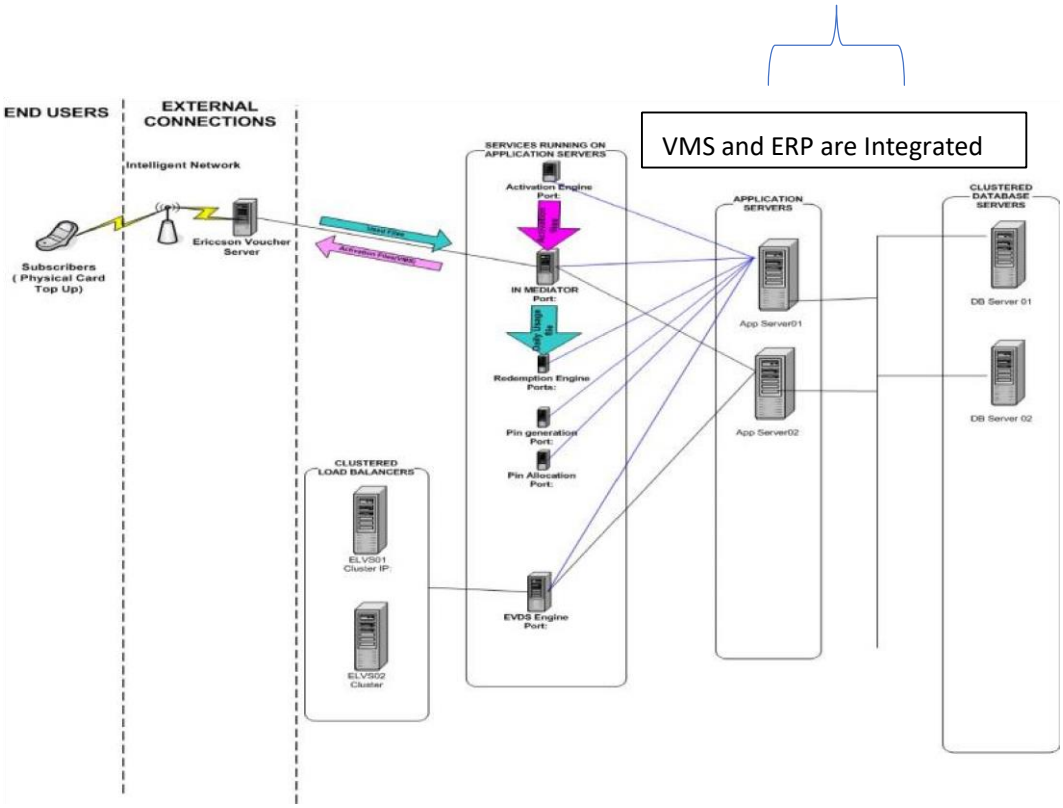


Figure 3: Current Architecture Diagram for Voucher Management Systems.

The Current infrastructure has three components;

The subscriber side (End Users) who interact with the Telecom through the Intelligent Network which has a voucher server (Ericsson voucher Server-EVS) that is updated by the Voucher Management System (VMS).

The VMS is tasked with generation and handling of the voucher life cycle which includes generation of vouchers, handling sales and updating of the different voucher statuses within the environment. The statuses that are under study is activation and usage.

Furthermore, the VMS is integrated with the ERP.

4.1.1 Current Voucher Activation Operation

Currently, the deployment and activation procedure for vouchers is as follows:

i. When a batch of Vouchers is activated on VMS, a deployment file is created and uploaded to the EVS. ii. EVS loads the individual voucher details into its database and provides an activation file back to VMS.

iii. The activation file notifies VMS that the vouchers have been loaded correctly so that VMS can update the vouchers to be in an “active” status.

iv. The above process relies on the vouchers being activated to be in serial number range, since the activation file received from the EVS represents the result for the whole batch of vouchers and does not contain individual voucher activation status.

The above operation has a lot of file exchanges most of which is manually managed.

4.1.2 Voucher Redemption or Usage Operation

Subscriber sends their voucher PIN to a defined short code. The SMSC or USSD routes the voucher PIN and MSISDN to IN

i. IN send PIN and MISIDN message to EVS which authenticates the PIN from the database and obtains the PIN denomination and any other voucher details

(e.g. expiry, bonus etc.) ii. EVS formats the recharge message, determines the IN systems to send the recharge to, and sends the top-up message.

iii. The IN system applies its own business rules and either accepts or rejects the recharge

iv. The result of the recharge is sent to the subscriber. If the recharge was successful, the Voucher is marked as used by EVS. If the recharge was unsuccessful the subscriber is notified of the failure reason and may be requested to try again.

v. Once the Recharge is successful the value of the airtime is loaded to the customer SDP account

This is illustrated in the flow diagram below (Figure 4).

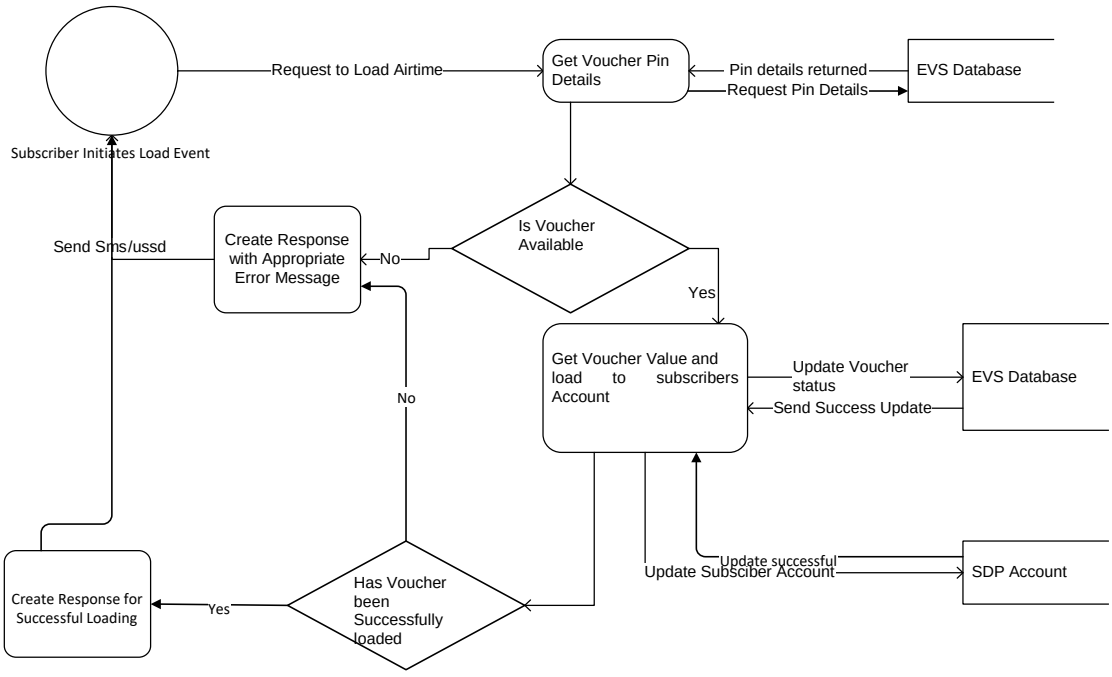


Figure 4: Voucher loading process

4.1.3 Unearned Revenue reporting

To update the status of Vouchers in VMS a file is exported from EVS server every end of day to the VMS which will use this file to update status of Vouchers as used.

The VMS does not have subscriber balances and therefore the only report on unearned revenue you can get from here is the Vouchers sold not used. This cannot be in Real time as the updates only happen once a day.

To report on unearned revenue at the end of the month this is what happens;

i. A dump of the EVS is made to derive the value of the balances on redeemed vouchers.

ii. Get Balances on Subscriber accounts from charging system.

iii. A check is done to ensure that all files of the used vouchers where received on the VMS side and VMS was updated accordingly.

iv. A report of Vouchers sold not used is run from VMS.

v. Reconciliations are done to ensure that the values being arrived at from the various systems at are aligned.

All this is a tedious exercise and may take a minimum of 4 days to get a reliable report.

Through this analysis the research concluded that integration of the systems involved in this process and developing a tool from the integrated solution would go a long way to solve the problem at hand. That there was a need to develop and more efficient way of reporting earned revenue both in terms of effort to generate the report and timeliness and accuracy of the report.

The integration of the EVS and VMS into one database that talks directly with the IN would go a long way in eliminating the file exchanges and will solve the reporting problem and make it easy to implement the reporting tool.

During analysis, data was collected on the available files, decision points and transactions handled by the present system. All procedures, requirements were analyzed and documented in the form of detailed data flow diagrams (DFDs), data dictionary, logical data structures and miniature specifications.

4.2 Requirements

The requirements of this project from the study above can be summarized as the following;

- Integration of systems so that we have real-time updates throughout the process and thereby ensuring data integrity and accuracy of reports.

- Automation- to reduce on manual interventions and resources in generation of reports.
- Real-time reporting especially the un-earned revenue and many other reports as a result of the new design.
- An integrated single database that can track all voucher statuses throughout the life cycle of the voucher – hence single source of truth rather than pulling information from various sources.

4.3 System Design

Dataflow diagram, data dictionary, entity-relationship diagrams, and state transition diagrams (see below) were created from the analysis and used in creating the software architecture, that is, a hierarchy of modules (sometimes referred to as subroutines or procedures) to implement the system requirements.

Below is the Data Flow Diagram of a Voucher through the Voucher Management process.

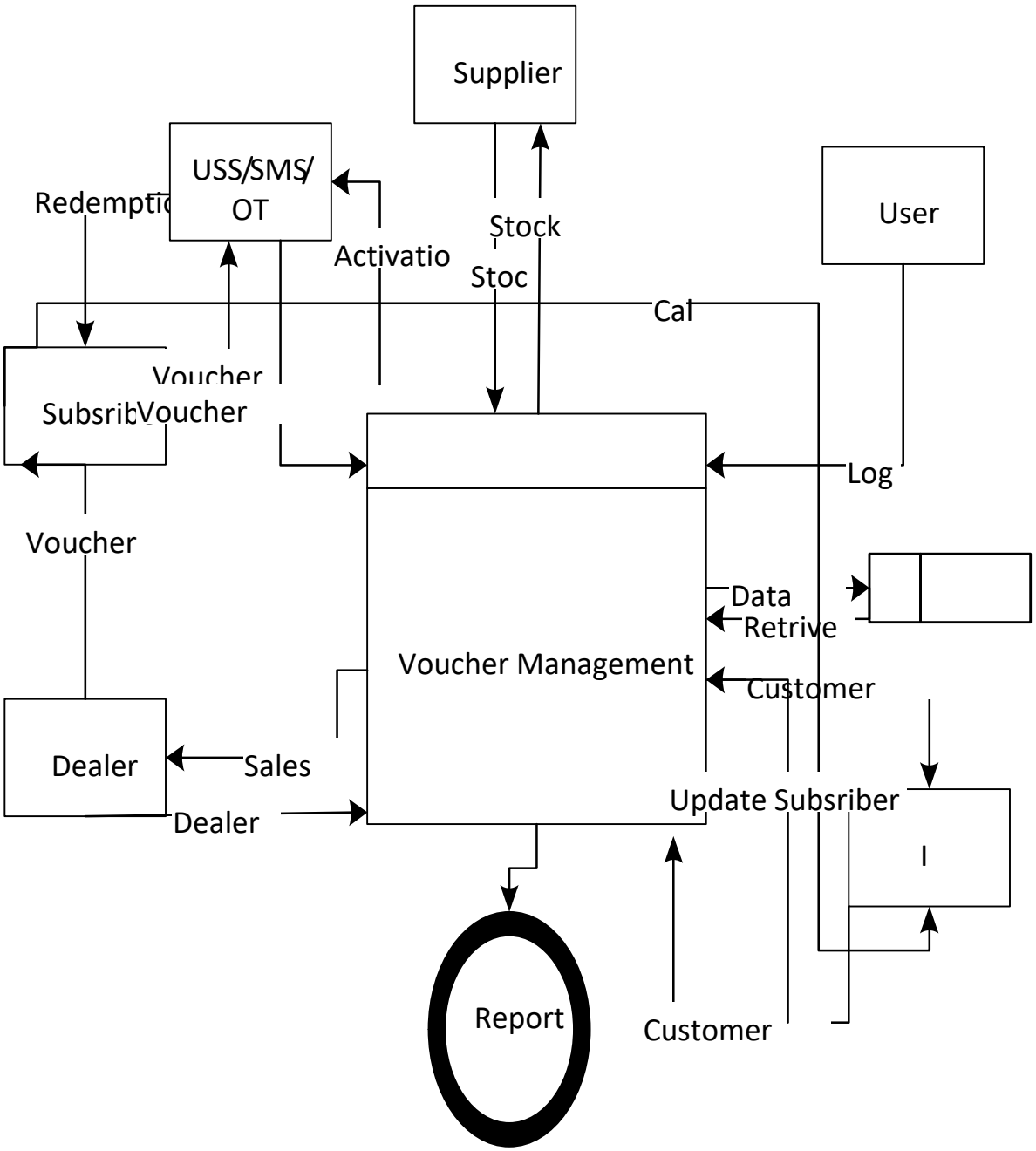


Figure 5: Data Flow Diagram.

4.3.1 Flow Chart and Architectural Diagrams

A Vouchers database VMS was designed to integrate directly with the IN and the EVS was removed as show in the architectural diagram below (Figure 6).

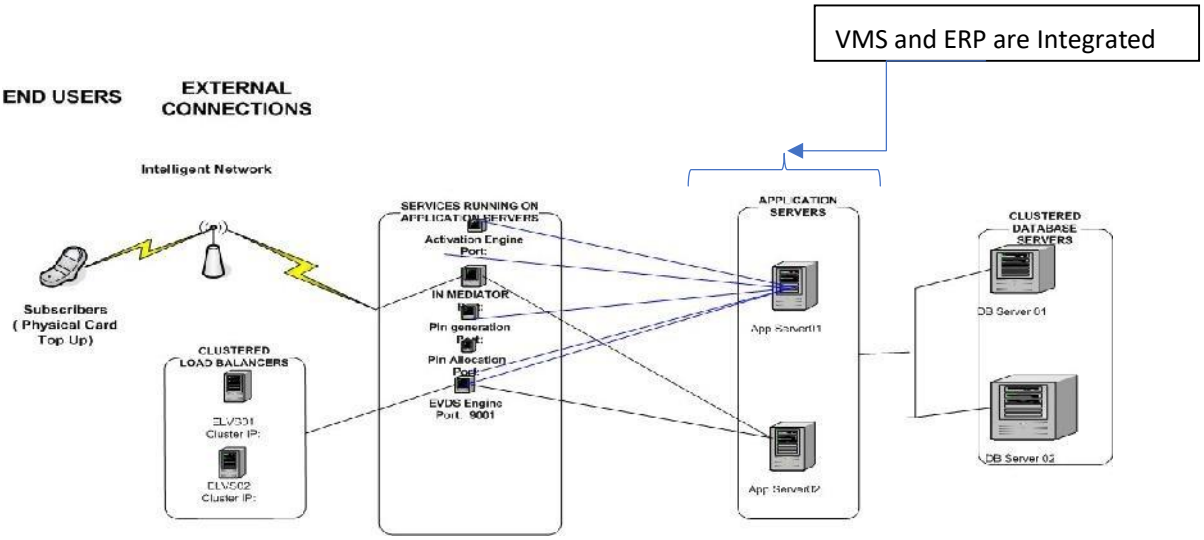


Figure 6: Proposed Architectural Diagram for The New Voucher Management Solution

A New Vouchers database VMS was designed to track the Voucher statuses in realtime and be able to track account balances for customers as well.

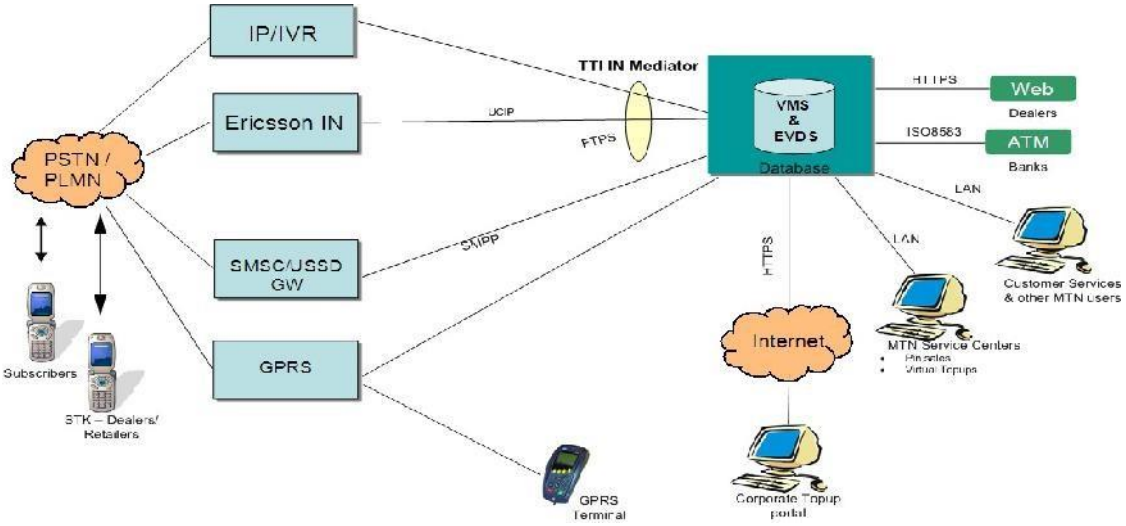


Figure 7: Proposed Conceptual Diagram for The New Voucher Management Solution

4.3.2 Flow Chart Diagram

The designed database was able to track the voucher statuses (as in Figure 1 page 3) throughout its lifecycle and therefore it should be able to report on status of vouchers at any time from a single source including the subscriber balances. This enabled us to design and implement a reporting tool for unearned revenue which does not require file exports and imports.

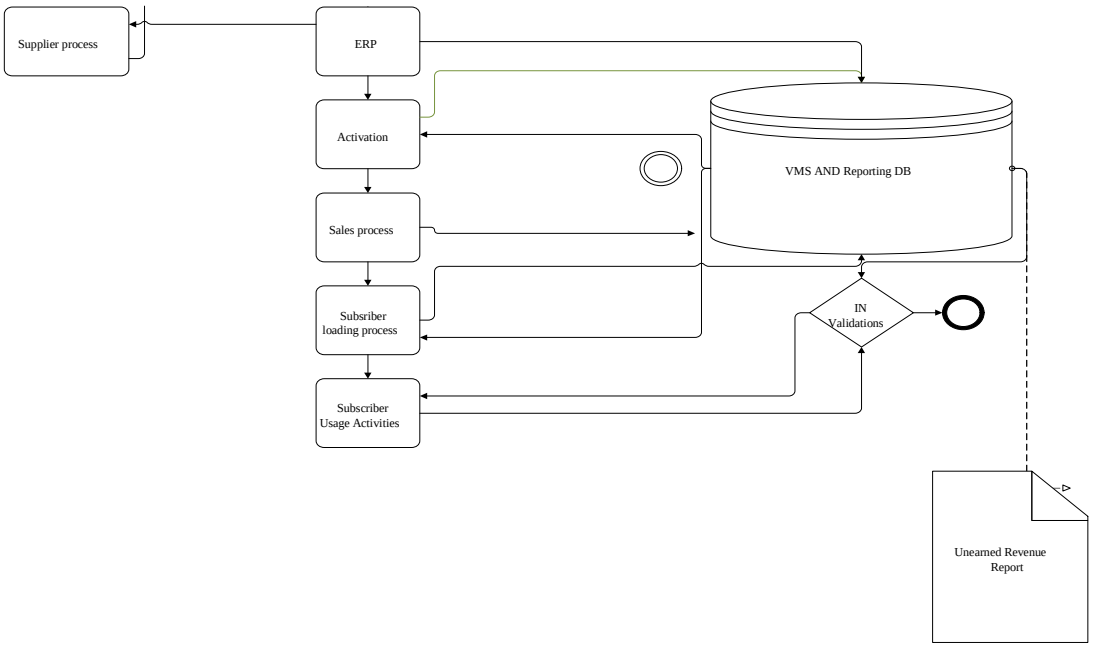

Supplier process
ERP
Activation
Sales process
Subsriber loading process
Subscriber Usage Activities
VMS AND Reporting DB
IN Validations
Unearned Revenue Report

Figure 8: Flow chart for Unearned revenue reporting tool.

4.3.3 The Entity Relation Diagram

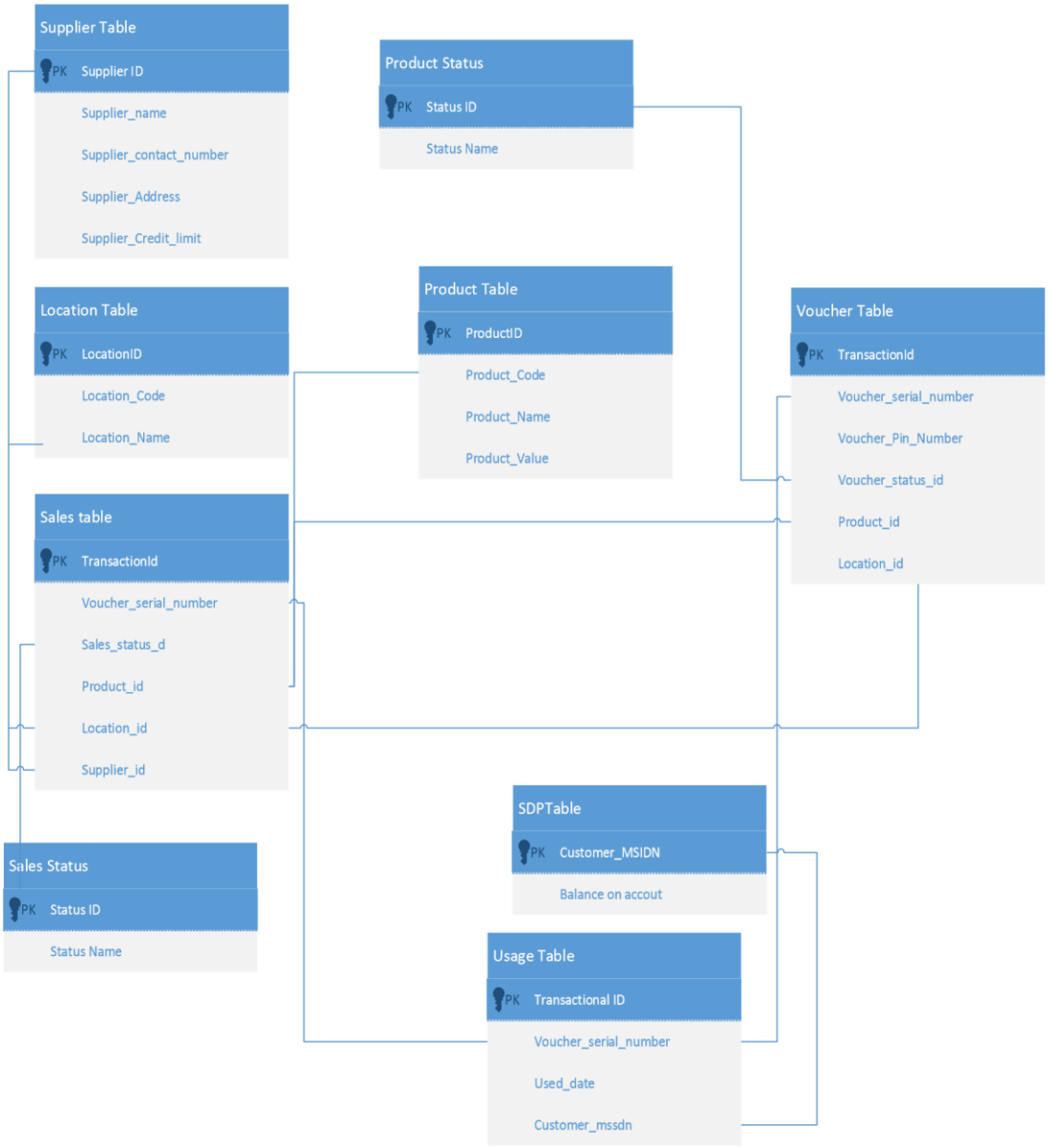


Figure 9: Proposed ERD of the Voucher Database.

From the voucher table all the voucher statuses of the voucher can be tracked in realtime as the voucher moves through its lifecycle. The corresponding data dictionary is shown below;

4.3.4 Data Dictionary

Element or value display Name	Description	Data type	Character length	Acceptable values	Required?	Accepts null value?
Transaction Id	Unique Identifier for Transaction	Autonumber	50	System generated	Yes	No
Voucher_serial_number	Serial Number	Text	50	Alphanumeric	Yes	No
Voucher_Pin_Number	Pin Number for Use	Text	50	Number	Yes	No
Voucher_status_id	Foreign Key from Sale Status	Number	50	Number	Yes	No
Product_id	Foreign Key from Product Table	Number	50	Number	Yes	No
Location_id	Foreign Key for Location of Voucher	Number	50	Number	Yes	No

Figure 10:Voucher Table

Element or value display Name	Description	Data type	Character length	Acceptable values	Required?	Accepts null value?
TransactionId	Unique Identifier for Transaction	Autonumber	50	System Generated	Yes	No
Voucher_serial_number	Serial Number	Text	50	Alphanumeric	Yes	No
Supplier	Foreign Key from Product Table	Number	50	Number	Yes	No
Product_Id	Foreign Key from Product Table	Number	50	Number	No	No
Location_id	Foreign Key for Location of Voucher	Number	50	Number	Yes	No
Sales_Status_Id	Location_id	Foreign Key for Location of Voucher	50	Number	Yes	No

Figure 11:Sales Table

Element or value display Name	Description	Data type	Character length	Acceptable values	Required?	Accepts null value?
StatusID	Unique Identifier for Status	Autonumber	50	System Generated	Yes	No
Status_Name	Status Name	Text	50	Alphanumeric	No	Yes

Figure 12:Sales Status

Element or value display name	Description	Data type	Character length	Acceptable values	Required?	Accepts null value?
TransactionId	Unique Identifier for Transaction	Autonumber	50	System Generated	Yes	No
Voucher_serial_number	Serial Number	Text	50	Alphanumeric	Yes	No
Used_date	Usage Date of Customer	Number	50	Number	Yes	No
Customer_mssdn	Customer Mobile Number	Number	50	Number	Yes	No

Figure 13: Usage Table

Element or value display name	Description	Data type	Character length	Acceptable values	Required?	Accepts null value?
Customer_mssdn	Customer Mobile Number	Number	50	Number	Yes	No
Balance_on_account	Balance	Number	50	Number	Yes	No

Figure 14:SDPtable

Element or value display Name	Description	Data type	Character length	Acceptable values	Required?	Accepts null value?
StatusID	Unique Identifier for Status	Autonumber	50	System Generated	Yes	No
Status_Name	Status Name	Text	50	Alphanumeric	No	Yes

Figure 15:Product Status

Element or value display Name	Description	Data type	Character length	Acceptable values	Required?	Accepts null value?
ProductID	Unique Identifier for Product	Autonumber	50	System Generated	Yes	No
Product_Code	Product Code	Text	50	Alphanumeric	Yes	No
Product_Name	Product Name	Text	50	Alphanumeric	Yes	Yes
Product_status_id	Status ID	Number	1	Alphanumeric	Yes	No
Product_Value	Value_of_Product	Number	50	Alphanumeric	Yes	No

Figure 16:Product Table

Element or value display Name	Description	Data type	Character length	Acceptable values	Required?	Accepts null value?
LocationID	Unique Identifier for Location	Autonumber	50	System Generated	Yes	No
Location_Code	Location Code	Text	50	Alphanumeric	Yes	No
Location_Name	Location Name	Text	50	Alphanumeric	No	Yes

Figure 17:Location Table

Element or value display Name	Description	Data type	Character length	Acceptable values	Required?	Accepts null value?
Supplier	Unique Identifier for Supplier	Autonumber	50	System Generated	Yes	No
Supplier_name	Name of Supplier	Text	50	Alphanumeric	Yes	No
Supplier_contact_number	Supplier Contact Number	Text	50	Alphanumeric	No	Yes

Supplier_Address	Address of Supplier	Text	50	Alphanumeric	Yes	No
Supplier_Credit_limit	Supplier Credit Limit	Number	50	Number	Yes	No

Figure 18:Supplier Table

4.3.5 New Voucher/PIN Redemption process

This system supports PIN redemption, where the value assigned to a PIN is used to recharge the subscriber's prepaid account. The transaction flow for a successful PIN redemption by a customer is illustrated below;

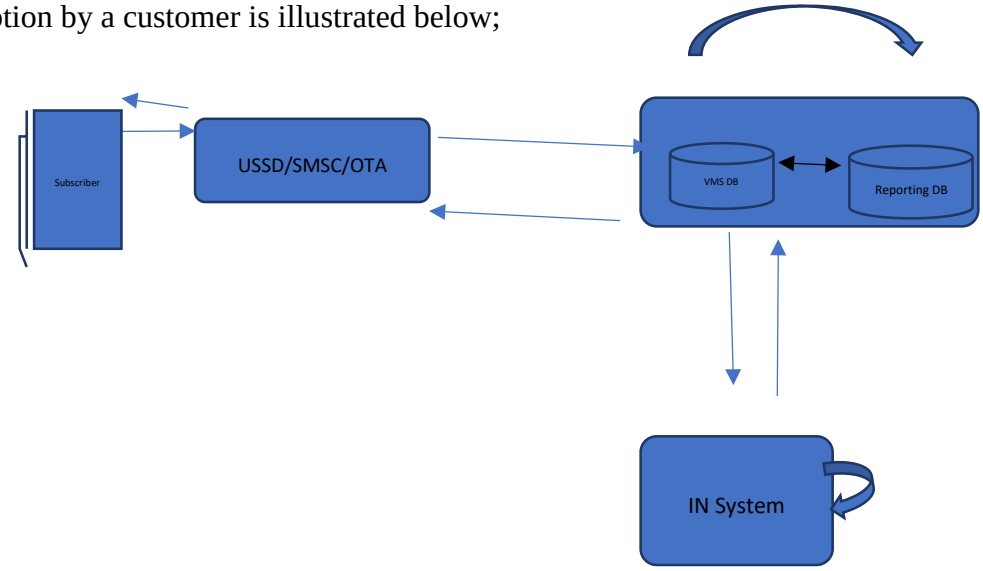


Figure 19: Transaction flow for PIN redemption

i. Subscriber sends their voucher PIN to a defined short code. The SMSC routes the voucher PIN and MSISDN to VMS.

ii. VMS authenticates the PIN from the PIN database and obtains the PIN denomination and any other voucher details (e.g. expiry, bonus etc.).

iii. VMS formats the recharge message, determines the IN systems to send the recharge to, and sends the top-up message.

iv. The IN system applies its own business rules and either accepts or rejects the recharge.

v. The IN system send the results of the recharge to VMS.

vi. The result of the recharge is sent to the subscriber. If the recharge was successful, the Voucher is marked as used by VMS. If the recharge was unsuccessful the subscriber is notified of the failure reason and may be requested to try again.

vii. VMS Updates the reporting Database with Voucher details MSISDN, Voucher value.

4.3.6 Transaction flow when subscriber makes a call

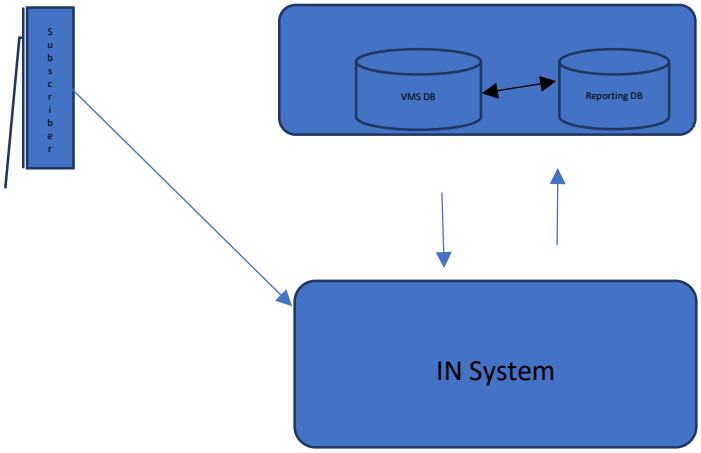


Figure 20: Transaction flow when subscriber makes a call

i. If a subscriber makes a call, the IN system will authenticate subscriber balance with VMS and using the inbuilt rules will allow the call and after the call update the VMS on usage.

ii. VMS accordingly will update the reporting Database.

4.4 The Tool;

The output of this work is an unearned revenue report. An integrated Voucher Database which connects directly with the INand voucher table where voucher statuses are updated in real time will be replicated into a reporting table and we can run our reports from here in the tool with minimum contention.

Below is a screen shot of the Main menu from the developed system. The focus here is on the process from when voucher is sold to when it is used. The main report in our focus is the Un-earned revenue report.

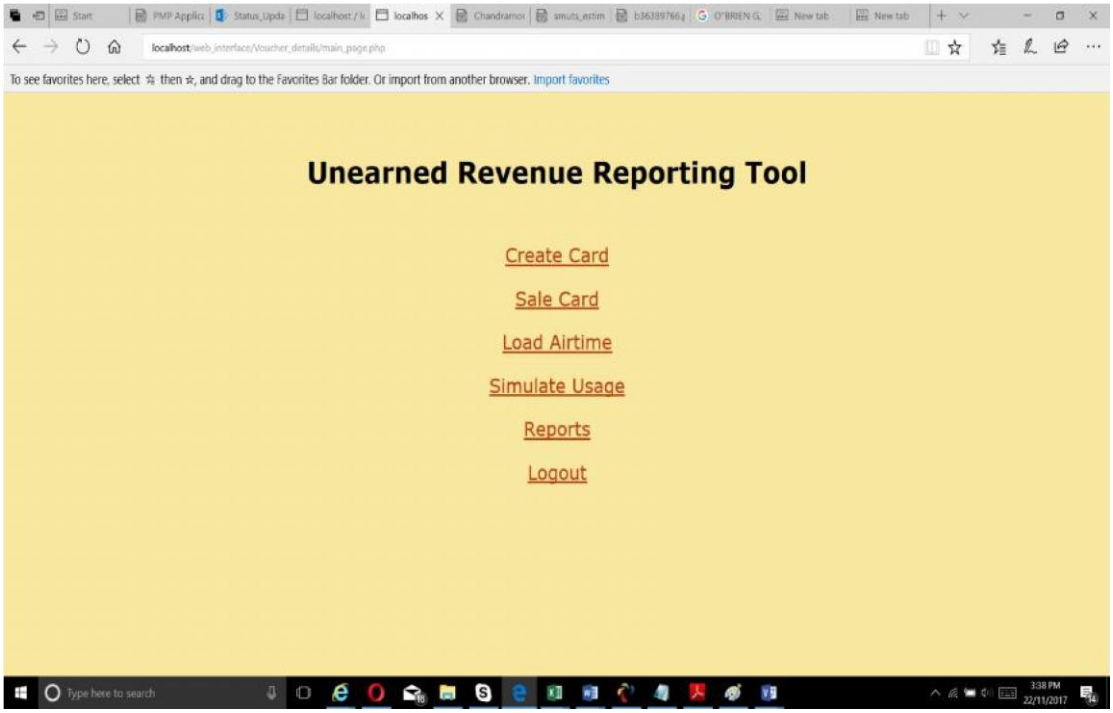


Figure 21:Main Menu Screen

1. Create Card – This was used to create Vouchers in the tool. In the real situation Vouchers are generated using a special tool to create pins randomly while pairing them with sequential serial numbers.

2. Sale Card – This simulates the Voucher selling Process as it happens in the ERP. In Some Telecommunication companies, vouchers are activated before they are sold. Others choose to activate only what has been sold to the distribution channels. In our case in this tool when we sell, the voucher will be activated at this point ready for use.

3. Load Airtime -This form or screen is for simulating voucher loading on MSISDN or subscriber accounts. In normal circumstances voucher loading is achieved through USSD, IVR and Call center channels.

4. Simulate Usage This screen/form is to simulate usage when a person places a call of some value. Under normal circumstances call will come through the IN which

will validate based on set rules and call will be set up and charged accordingly. Here all this is assumed to have happened and we are only entering value though in the background some rules similar to what the IN would have done have been simulated.

5. Reports (Figure22.)- This a Menu for Reports. Any other reports can be added but for purposes of this work the main output required here is the Unearned Revenue report. Figure 23.

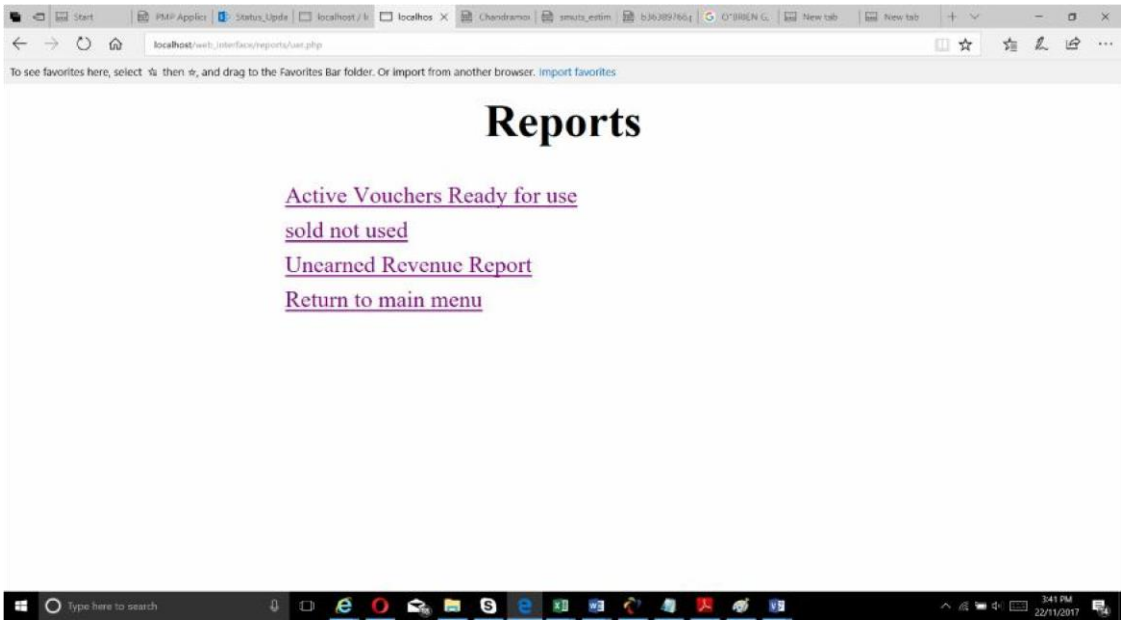
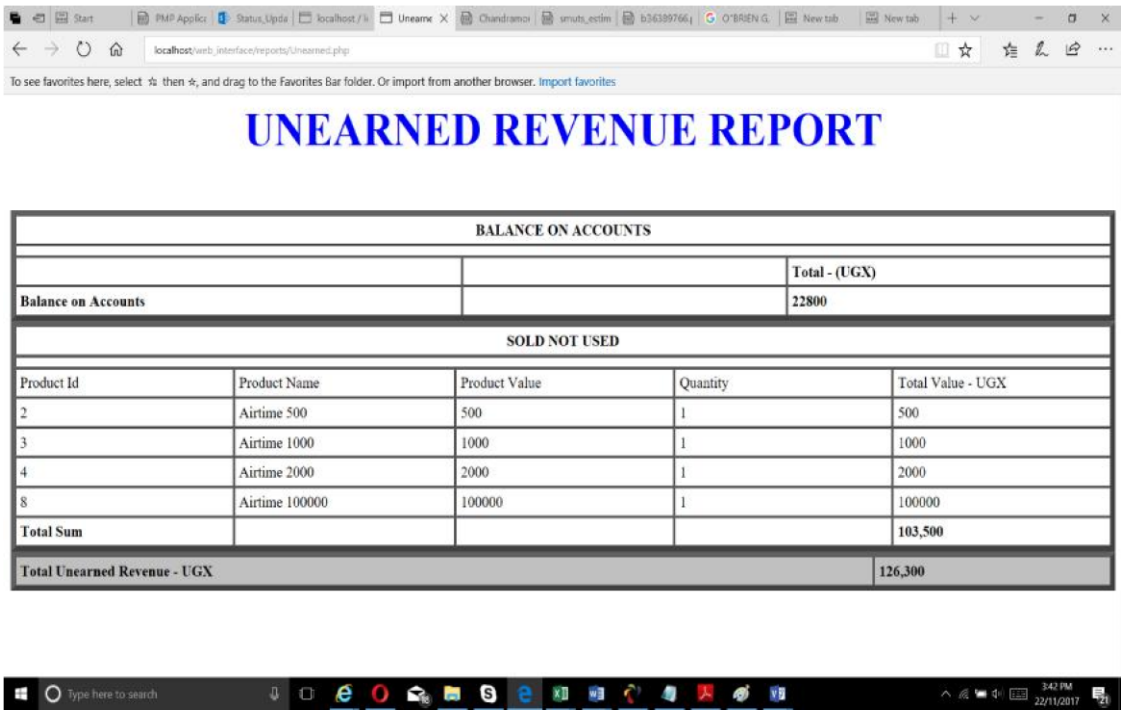


Figure 22:Reports Menu



UNEARNED REVENUE REPORT

BALANCE ON ACCOUNTS		
		Total - (UGX)
Balance on Accounts		22800

SOLD NOT USED				
Product Id	Product Name	Product Value	Quantity	Total Value - UGX
2	Airtime 500	500	1	500
3	Airtime 1000	1000	1	1000
4	Airtime 2000	2000	1	2000
8	Airtime 100000	100000	1	100000
Total Sum				**103,500**

Total Unearned Revenue - UGX	**126,300**

Figure 23:Un-earned revenue report sample.

Here Total Unearned Revenue = UGX 126,300 = Balance on Subscriber Accounts UGX 22,800 and Vouchers Sold Not Used UGX 103,500.

As Vouchers are sold through the distribution channel and as subscribers redeem vouchers this report should reflect and report unearned revenue in real-time.

CHAPTER FIVE

5.0 CONCLUSIONS

The problem area that was introduced in this report was reporting of unearned revenue for prepaid products and services.

The researcher set out to execute this work as described below;

5.1 Study and analyse the existing system(s)

The system study of the current system was done as described in chapter 4(Section 4.1).

The researcher identified the problem as arising from having dis-integrated systems from where the data was manually extracted, exchanged and reconciled to report unearned revenue. Basically, it wasan architectural and design problem.

The process was largely prone to data inconsistences and compromised data integrity which caused the reporting to be always suspicious to the stakeholders. The reports thereof lacked enough credibility.

5.2 Design and integrate systems

The researcher integrated systems that manage prepaid products or services as described in Section 4.3. By removing the Ericsson voucher server (EVS) anddesigning the Voucher management system (VMS) to be the single source of all information relating to the voucher lifecycle.

5.3 Implement a real-time reporting tool

The researcher implemented a real-time reporting tool as described in Section 4.4. The tool was able to deliver un-earned revenue reports in real-time. It also improved on the accuracy and integrity of other reports.

5.4 Test and validate the tool

The tool was tested and validated as described in section 3.4. For this report we focused on prepaid airtime sold by Telecommunication companies and this tool was developed for the same.

5.5 Suggestions

Effective voucher management systems would therefore require a well-integrated system. Key to this would be a well-designed database which will be able to keep the integrity of the data as well as optimise resource usage and minimize contentions in order not to affect the performance of the system at large.

Managing and processing thousands of transactions becomes easy, while auditing and tracking within the system ensures security and minimizes the risk of fraud.

Investment in speed and optimized databases is quite significant for organizations that have big volumes of data and are largely transactional.

Some examples of database platforms to consider are given below;

NoSQL Database management systems like; Apache Cassandra is a free and opensource distributed NoSQL database management system designed to handle large amounts of data across many commodity servers, providing high availability with no single point of failure [16].

IBM® Informix® is a fast and scalable database server that manages traditional relational, object-relational, and dimensional databases. Its small footprint and selfmanaging capabilities are suited to embedded data-management solutions.

Oracle Database (commonly referred to as Oracle RDBMS or simply as Oracle) is an object-relational database management system produced and marketed by Oracle Corporation. It provides comprehensive features for managing data in transaction processing, business intelligence and content management applications.

5.6 Recommendations

While decoupled systems are good in that one part of the system may go down while the other decoupled systems continue to operate, some real cost benefit analysis must be done between the decoupled systems and coupled systems in this case.

While decoupled systems present less risk, this proposed solution will yield the desired outcome as long as some good investment is made in terms of hardware, storage and robust database platforms.

The researcher recommends that a table (call this table source table) be replicated to a read-only table (call this table dest table) in the same database.

This need arises from the fact that we have a very delicate process that updates and inserts records into the source table, and querying the source table, will cause intermittent conflicts. And we need to avoid these blocks/delays to our process.

This should allow us to query the dest table as much as we want without locking the source table. The source table and dest table can reside in the same database or we can replicate the source table to another database on the same server and query across databases. The resercher would prefer one database to avoid being forced to use two separate databases.

5.7 Possible Future work

This work should form an input when upgrading or making specifications for a new voucher management system for MTN Uganda or other telecommunication companies, and other companies with similar challenges of unearned revenue
reporting.

The research can be extended to reporting on the emerging products especially data whose reporting has some challenges due to the different permutations of data offerings and how data is packaged with so many other products.

REFERENCES:

[1] Uganda Telecommunications A Case Study in the Private Provision of Rural Infrastructure Submitted by: Econ One Research, Inc. in association with ESG International July 30, 2002.

[2] Janel van Niekerk; Interface Specification – VMS, November 4, 2010.

[3] Management Accounting Practices in ERP Environments: A Research Agenda by Constantinos J. Stefanou and Marilena T. Athanasaki, June 2012.

[4] International Journal of Economy, Management and Social Sciences, 3(1) January 2014 pages 28-32.

[5] Taiwo, J.N. (2016) Effect of ICT on accounting information system and organisational performance: The application of Information and Communication Technology on Accounting Information System. European Journal of Business and Social Sciences, 5 (2). pp. 1-15. ISSN 2235 -767.

[6] Kimberlee Leornard; How is Information Technology Used in Accounting? June 28, 2018.

[7] Accounting Tools - Unearned Revenue July31, 2017 Steven Bragg.

[8] Financial Accounting Standards Board (FASB). 1978. Objectives of Financial Reporting by Business Enterprises. Statement of Financial Accounting Concepts No. 1. Norwalk, CT: FASB.

[9] 1984. Recognition and Measurement in Financial Statements of Business Enterprises. Statement of Financial Accounting Concepts No. 5. Norwalk, CT: FASB.

[10]https://www.moneyinstructor.com/doc/deferredrevenue.asp.

[11]https://www.accountingcoach.com/blog/deferred-revenue.

[12]Maarika Talja, The Importance of Effective Voucher Management 2 September 2015.

[13] Martyn Denscombe, The Good Research Guide (5t Edition) For Small-scale social research projects 09-07-2014.

[14]Sara Crowe, Kathrin Cresswell, [….],and Aziz Sheikh, The case study approach; BMC Medical Research Methodology 2011 Jun 27.

[15] https://research-methodology.net.

[16] Solving Big Data Challenges for Enterprise Application Performance Management (PDF) VLDB. Retrieved 2013-07-25.

GLOSSARY

Airtime - The amount of time a person spends talking on their mobile handset.

IN - An Intelligent Network (IN) is a service-independent telecommunications network. That is, intelligence is taken out of the switch and placed in computer nodes that are distributed throughout the network.

ITU-T- The ITU Telecommunication Standardization Sector (ITU-T) is one of the three sectors (divisions or units) of the International Telecommunication Union (ITU); it coordinates standards for telecommunications.

Electronic Voucher Distribution (EVD) - The distribution of airtime through means of an electronic Personal Identification Number (PIN) as opposed to a printed PIN.

Mobile handset - A mobile phone device used for communication on a Global Systems Mobile (GSM) network.

Personal Identification Numbers (PINs) used on vouchers for the redemption by clients.

Pre-paid - A payment mechanism used in the case where payment is received for a service, before the service is granted.

Pre-paid distribution channel - The distribution channel along which pre-paid products are distributed.

Rating engine - A programmable rule-based algorithm that calculates the amount of airtime that is consumed when a client utilizes services offered by a mobile phone network.

Revenue- Income generated through the sale of pre-paid recharge mechanisms (airtime).

Revenue assurance - A term used for the assurance of revenue as generated within an organization through its involvement with day to day business.

Subscriber - End user

Unearned Revenue/Deferred Revenue - This is revenue that is not yet assured or recognized as having been received. It is classified as a current liability on the balance sheet until it is recognized as earned during the accounting cycle.

Unused airtime - The total airtime available in distribution after being sold by the network operator, but that has not been loaded onto client mobile handsets (Also referred to as airtime liability).

Usage - The consumption of airtime, also referred to as debit applied.

Vouchers - Airtime Cards both Printed Cards and Voucher slips from the Electronic Distributors containing a token or PIN for dispensing in exchange of airtime.

APPENDICES

Appendix A.

Questionnaire

1. What is your designation?
2. What is your department?
3. What is your major functional role?
4. What do you understand by un-earned revenue?
5. What is your role in the process of un-earned revenue reporting?
6. What is your opinion of the process?
7. How do you think you can be supported to make it better?
8. How do you think the process can be improved overall?

Appendix B. Semi- structure interviews

1. Could you briefly describe your role in the end-to-end voucher management and provisioning process?
2. What challenges do you face and what problems do you foresee in the current end -to-end process?
3. Are you familiar with the concept of revenue recognition as defined by the international accounting standards board under IAS18, and how it is implemented in MTN Uganda?
4. Are you involved in this process?
5. Given the opportunity to automate the end-to-end process, what would you like to see the software system do to improve the efficiency of the process?
6. What is the source of the data that you use in the computation?
7. What is the effect of the current voucher management process and its associated problems on the revenue assurance and the computation of unearned revenue?
8. Given the opportunity to automate the end-to- end process, what would you like to see the software system do to improve the efficiency of the process?