Terms of Reference for Design and Implementation of Commercial Information Management System for Lagos Water Corporation (LWC) for Improved Billing and Collection

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Terms of Reference for Design and Implementation of Commercial Information Management Systems for improved Billing and Collection at LWC

1 INTRODUCTION

1 *Background*

Lagos Water Corporation (LWC) is the State Government Agency responsible for abstraction, treatment and supply of potable water to the populace of Lagos State. Lagos State has more than 21 million inhabitants, and an annual growth rate estimated at 3-5 percent per annum.

LWC intends to procure the services of a Consultant to support the development of an integrated commercial management information system that will enhance decision making and promote operational efficiency in specified functions. The functions under consideration include billing, revenue collection and **customer** management services.

2 *Purpose*

These Terms of Reference are for the in-house development and implementation of an integrated commercial management information system that conforms to industry best practice of software functionality requirements and aligns to LWC's work flow processes and operating environment; while addressing security concerns related to the application, utility data and information safety, business continuity and disaster recovery.

3 Organisation of LWC

LWC operates through 8 Regions and a network of 31 zonal offices serving about 180,000 properties, institutions and other organizations in urban and peri-urban areas. Less than 15% of these customers are active. Only about 34% of the bills produced are distributed; and collection efficiency stands at about 36%.

4 *Description of the Legacy System*

LWC has a Server room which houses 6 server units applications. There are also four heavy duty bill printers and a Local Area Network at the Headquarters building which is in a poor state. There is no Wide Area Network. The company also has an under-utilized Active Directory.

The LWC Customer database software is Oracle 10g while billing is carried out from Microsoft Access connected to the Customer database. The payments are collection from either Banks, POS machines at LWC offices or through the internet. Payment details are downloaded daily from Interswitch and AlfaBeta , saved in a temporary database and updated once a month before the next billing cycle. This system has the following challenges:

- The billing system is not integrated with the meter management system
- Customer payments are not updated immediately – a barrier to revenue collection efforts
- Payment reconciliation is manual and this leads to human error and leaves room for fraudulent practices
- The Alfabeta platform is often slow which either discourages customer payment or delays posting of payments

The above issues are exuberated by other general infrastructure and IT related challenges as follows:

- The current Infrastructure is underutilized especially the use of Active Directory and Company website.
- There is no IT policy in place that governs the use and access of applications, however the corporation has an IT strategic plan
- There is no documentation of systems and this makes recovery difficult when there is failure of applications
- There is high reliance on external support for the troubleshooting of failed applications
- There is no integration of main processes and co-dependent processes including Commercial, Billing, Revenue collection and Customer Services.
- Processes are predominantly manual and as such there are many physical files which makes customer and corporation data vulnerable to attack, loss and corruption.
- There is no standard Backup and disaster recovery plan or system.
- Server space is wasted due to too many standalone applications and each one occupying a physical server
- Most of the customers are not metered and this causes irregularities in the billing data

LWC has a Customer care unit with help desks in all 31 zonal offices in Lagos and one at the Head office. There is an online Chat function on the current LWC website which is functional. There are two dedicated email address, customercare@lagoswater.org and info@lagoswater.org which are checked regularly. There are also some dedicated phone lines. There is however no centrally controlled Customer relationship management software that connects calls, email, help desk and interactive voice response and Customer Care staff have no online access to Customer data and usually refer any query in that regard to the commercial department which takes time to respond.

Other information Technology systems currently in use at LWC include: a Human Resource Management Application Software developed for LWC on Oracle formats, and a SunSystems 4.2.6 version 5 Financial and Business Management Software.

2. CONSULTANCY SERVICES AND OBJECTIVES OF THE ASSIGNMENT

2.1 *Objectives of the Assignment*

LWC is cognizant of the fact that the legacy system is inadequate to meet its corporate strategy and information management requirements. LWC now seeks to engage the services of a Consultant to support the development of an in-house integrated commercial information system that will address the issues of the legacy system, conforms to industry best practice software functionality requirements and aligns to LWC's work flow processes and operating environment while addressing security concerns related to the application, utility data and information safety, business continuity and disaster recovery. The system to be developed will also enhance in-house capacity and ensure no recurrent fees.

3.2.1 Specific Objectives

Specifically, the objectives of this assignment are to:

i. Carry out process reengineering and alignment of Billing, revenue collection and customer service processes to support Corporate Strategy
ii. Ensure integration of the Billing, revenue collection and customer service processes
iii. Design and develop an integrated billing and customer system with a payment module
iv. Integrate existing Meter management software with customer database
v. Carry out data capture, conversion, evaluation and validation
vi. Carry out systems customization, set-up and configuration
vii. Carry out systems acceptance testing
viii. Carry out systems installation
ix. Development of Manuals and training of users
x. Post-implementation support to LWC staff

3. SCOPE OF THE CONSULTANT'S ASSIGNMENT

The scope of the assignment shall include among others the following activities;

3.1 *Mobilisation and Inception*

The consultant shall mobilize for the inception mission 1 week after notification of the contract award.

3.2 *Systems Requirements Analysis*

An analysis of the new defined processes will be carried out in order to ascertain the specific requirements of the system to be developed as well as assess the tools required for the development and integration of the applications to be developed. The workflow design of the new reengineered processes will be reviewed and integration models clearly mapped. The analysis will also clearly map out the architecture for the different levels of interaction with the different system modules to verify that all user requirements are clearly defined and captured for development of the system prototype. The Outcome of this phase will be a user requirement document submitted for sign off by the process owners.

3.3 *System Design and Development*

This stage comprises of the system design, system development, system customization and system integration.

i) **System Design**

A system design is a diagrammatical illustration of the system outlay. It details the sequential/ chronological outlay of all the system modules. The system design will also illustrate the other external systems to which the proposed system will be integrated to as well as the integration mechanism to be employed to achieve the integration. During this stage, the clear inputs to each module, the activities that are executed and their sequence of execution in each module and the expected outputs and reports will also be illustrated. The data schemas will also be defined at this stage. The output of this phase is the proposed system architecture and design to be submitted to Lagos water for approval.

ii)**Technical Specifications of System**

The software to be developed will also integrate with all the Meter Management Software (MMS) used to manage the prepaid meters and have an open architecture to allow integration of new Meter management systems. The software functions shall include the current functions of the current software and include step billing (for conventional metered customers) where customers will be charged at a higher tariff once they exceed a pre-set consumption threshold for their property type. Other minimum required functions include:

A) Front End Functions

- Software shall provide for, via the internet, the ability for customers to view and make payments on utility bills, view payment history, customer usage and consumption history
- Software shall provide real-time access to customer account activity, to include payment activity performed and source of transaction i.e bank, mobile platform, etc with web functions
- It should also allow for capturing, manipulating and updating customer information

B) Billing Functions

- Software shall provide the ability to bill on scheduled days or every so many days. There will be no restriction on the number and times of billing cycles
- Software shall provide the ability for different rate structures(for tiered rates, surcharge rates and graduated rates etc)
- Software shall provide the ability to prorate a customer's bill
- Software shall provide the ability to bill for a selected group of customers quarterly
- Software shall provide the ability to provide separate bills or a single consolidated bill for customers with multiple accounts and/or locations/properties
- Software shall provide the ability to bill more than one party for the same account (landlord/ tenant)
- Software shall provide the ability to enable LWC print bills with existing bill printers or create a file to send to a third party vendor to print bills which includes paper bills and electronic bills
- Software shall provide the ability to create a delinquent account listing
- Software shall provide the ability to prepare delinquent notices automatically
- Software shall provide the ability to customize bills (print one or more user defined message(s), add logos etc.) on bills
- Software shall provide the ability to generate a meter reading exception report used as the first step in the billing process to review high/low, zero usage, and skipped meter reads
- Software shall provide the ability to automatically and manually add late penalties to delinquent accounts according to rate structure
- Software shall provide the ability to generate a corrected bill after an adjustment (credit/ debit) has been made to a customer’s account
- Software shall provide the ability to provide a bill register after a cycle update for a billing, this serves as a final quality assurance mechanism to ensure accurate bills

C) Administration Functions

- Software shall provide the ability to easily incorporate new and unique rates
- Software shall provide the ability to internally audit accounts within the billing database for accounts that were initially set up incorrectly, have conflicting information, etc

- Software shall provide the ability to export data generated through reports and filters/queries to other formats such as MS Excel and Adobe Acrobat
- Software shall provide the ability to import batch payment files from all payment sources
- Software shall provide the ability to provide an audit trail by user name, date and time to reflect account, administrative, and configuration changes
- Software shall provide the ability to control user permissions
- Software shall provide the ability to create a daily batch to review prior to updating the billing software for specific meter information from work orders completed

D) Reports

- Software shall provide the ability for comprehensive utility reports that may be customized for specific utility billing users and departments
- Software shall provide the ability to allow creation of monthly reports, custom reports by LWC staff
    - Reports after consumption transferred reads:
        - Consumption listing
        - Meters not written to meter read file
        - Deduct meter greater than house's main meter
        - Zero consumption usage
        - Water read adjustment listing (manual and estimates)
    - Reports Pre- billing:
        - List of re-reads
        - Accounts not billed
        - Water type and multiple code billing
        - No bill water only
        - Invalid meter reads
        - Prior billing reports:
        - Account status report
        - Accounts balance report (arrears register)
        - Long term water obligation register

Billing reports:

- Billing register
- Consumption
- Debit Account Listing
- After billing reports:
- Accounts status report
- Accounts balance report (arrears register)
- Long term water obligation register

Balancing and reconciliation reports

- Trial balance report – To monitor A/R aging reports from month to month
- Billing register detail – This allows customer service to review prior to billing
- Billing register summary – This is a summary of all billings
- Service address/location register – This is a listing by street address

E) Customer Payments and Protective Measures

- Software shall provide the ability to process in real time and receive payments from all LWC payment points

- Software shall provide the ability to update billing payments and integrate with any third party cash receipting system
- System shall provide the ability to track payments by amount, location, receipt date, customer and payment method
- System shall provide the ability to allow for multiple levels of administration and end-user security (read-only, add/update/delete, etc.)
- System shall provide the ability to control security at a department and/or division level

F) System Architecture

- The system shall have a graphical user-friendly interface with a consistent interaction mechanism, look and feel.
- The system shall have simple and Intuitive navigation between functions such as drop-down menu driven options for common/known data fields. Such fields may include customer type, payment types
- The system shall enable automatic population of known fields to reduce data re-entry.
- The system shall provide data validation and error checking facility to minimize data entry errors. Data entry fields shall only accept the correct data input format and size for instance digits only for ID number, account number should take 7 digits.
- The system user interface shall be accessed from a standard web browser including but not limited to the various versions of Internet Explorer, Google Chrome, Firefox Mozilla, Safari among others.
- The system shall provide advanced searching facilities.
- The system shall provide a map window capable of displaying spatial based features. The window shall enable one to view, capture coordinates, add and display various GIS related data sets.
- The system shall have multiuser functionality which can be deployed over a Local Area Network, Wide Area Network and the Internet.
- The system shall be based on at least 3-tier architecture:
    - Presentation tier (displays services and forms available on the system) ii) Application tier (controls application functionality by performing detailed processing)
    - Database tier (houses database servers)
- The system shall support open architecture, to make adding, upgrading and swapping components easy
- The consultant shall provide and describe the required and recommended network infrastructure including bandwidth requirements for the system to operate at acceptable - high performance levels (bandwidth, latency and availability).
- The system shall support virtual and physical infrastructure

G) Web Technology

- The system shall be web based in design.
- The system design shall be based on Model View Control (MVC) framework.
- The vendor shall indicate the minimum browser requirements for the proposed system (include browser name, version, vendor and security options) and the standards that are supported.
- The system shall employ secure socket layer protocols and encryption for transmitting requests, data and documents over the Internet.

- System design shall provide an optimal viewing and interaction across a wide range of devices; desktop computer monitors, mobile phones, tablets (preferably presentation layer scripted in HTML5)
- The presentation layer shall be based on 4th generation language to provide a rich User Interface Experience

H) System Scalability

The system shall be modular in design characterized by functional partitioning into discrete scalable well-defined modular interfaces.

The system shall implement the following modules:

i) customer care

ii) meter reading and billing

iii)Revenue collection

- The system shall provide the ability to add further modules to the system in future.
- The system shall provide the ability to add functionalities to the existing modules.
- The system shall be scalable to accommodate growth in the customer base (Greater than 500,000 customers). The system shall maintain current customers and allow creation of new ones
- The system shall forecast future resource needs by analyzing trend reports.
- The system shall reduce DBA time by automating deployment of standard database and schema configurations, and cloning large databases.

I) Integration

- The system shall include industry standard integration mechanisms and tools to facilitate integration with internal and external systems.
- The system shall have standard integration interfaces such as APIs to enable contracted revenue collecting agencies to exchange data.
- The system shall be able to support continuous integration using well defined workflows in a test driven environment. The system shall be work flow based and be able to integrate using open standards

J) Security

- The system shall employ multifactor authentication.
- The system shall allow only authorized user access and prevent unwarranted user access or intrusion. Authentication of users shall be done at the application level.
- The system shall support secure password authentication and management
- The system shall enable users to have profiles that allow access only to the modules, areas, information and functions that are appropriate for them.
- The system shall enable the setting of lock-out conditions for instance 5 minutes for multiple wrong password tries.
- The system shall store all passwords in an encrypted format.
- The system shall support Data Masking to help organizations comply with data privacy and protection mandates that restrict the use of actual customer data.

iv)**System Development and customization**

This is the implementation of the system design. A new database will be created for each of the modules in a web based format customized to the specific processes and sub processes for billing, customer service and revenue collection as per the system design. The system developer will develop these modules in line with the procedures as documented during business process mapping as well as address the system design. This process will take approximately two to three weeks.
The development will be modular and each will be signed off before proceeding based on the system architecture

v) **System Integration**

This is the process of achieving data transfer and interaction between disparate systems and or modules. The integration of each module will be done during the customization and or development. This process therefore follows a modular approach where each module is developed and integrated with other already existing modules. The implementation of this phase is aimed at achieving the following:
An integrated web based codependent system integrating information from the Billing, customer service and revenue collection databases. This means that there will be a single log in required to access the three integrated databases and data will be accessed in a centralized environment.
Dummy data will be used to simulate actual execution of the documented procedures in order to test the completeness of each module to meet the requirements as defined in the Terms of reference.

3.4 ***Testing and Data Migration***

A series of tests will be carried out on the system, and its environment.

i) **System Testing**

The developed systems should be able to meet the required performance levels. This ensures that the system meets the requirements as specified in the analysis and the functionality as documented during business process mapping.
In order to attain the above objectives, a test environment will be set up. The test environment will replicate the actual system implementation. It will be used for testing the functionality of the system as well as conducting hands-on training for the system users and administrators. A complete set of all modules that constitute the system as well as the integration required will be set up in the test environment. Activities to simulate actual operations will then be performed, to reflect all the procedures documented pertaining the system. The system testing will be performed together with LWC by the systems administrator, systems analyst and database administrator from LWSC and the Consulting firm. During system testing, the following should be achieved:

- Validation of the performance of the modules in relation to the requirements in the assessment report
- Validation of the functionality of system integration
- Validation of system security and infrastructure
- Validation system controls embedded in the system
- Validation of the various data schema both as input and outputs from the system

All errors, bugs and or non-functionalities identified should be documented and resolved by the software developer. In the event where errors have been identified, system re-testing should be performed until such errors and or issues have been resolved.

At the conclusion of system testing, a user acceptance test report will be prepared for sign off by Lagos Water.

ii) **Environment Testing**

This is necessary in order to determine the adequacy of the system environment to support effective system operations. In this regard such tests like data backup, replication, hardware and infrastructure adequacy (Bandwidth, servers), System Access over the network as well as environment security will be carried out.

The Consultant will improve the LAN/WAN infrastructure by configuring the virtual environment to support the new integrated systems. The configuration of the virtual environment will include optimization of the Active Directory to execute the necessary controls for user access to systems.

iii)**Data Migration**

It is important to migrate the existing data into the new system. Data migration will ensure continuity in operations especially where reference has to be made to previous transactions in the form of report generation and search functionally among others. Data will be migrated into the new system. The live system will be a replica of the test environment.

All data that is existing in the current systems used will be reviewed for completeness and relevance. The data that is deemed necessary to be imported into the new system will then be prepared in an appropriate format in preparation for migration. The preparation of this data may involve changing the formats, structure (schema), and or completing vacant fields that may have not been captured or deleting unnecessary fields.

Data that is successfully prepared will then be migrated into the new system through import queries and or automated routines that will be developed specifically together with LWC staff for this purpose. It is proposed that the data migration follows simulating the system approach that replicates the process from the creation of customers, Billing, Payments, Reconciliations and finally customer relations management. This will allow the data to link from one module to the other. Migrated data will be validated by Lagos Water and a report generated indicating the specific datasets that have been successfully populated into the live environment. The completion of the data migration will signal the readiness of the live database to be deployed.

3.5 ***Training and System Deployment***

Successful completion of system testing and data migration will signal the readiness of the system to be deployed. However, prior to system deployment, users will need to be trained on how to use the system. We expect to use demonstrations, lectures, PowerPoint presentations, interactive discussions, instructor led hands-on demonstrations, and tests. The training will be modular in nature and hands-on for the system users and administrators

3.6 ***System Deployment***

Given that the systems would have already been installed in a server environment and are all web-based, user accounts will be created according to the different levels of access for all users that will

be interfacing with the system. Sometimes, data migration may not become complete and as such some datasets in the old system may not be successfully migrated into the new system due to incompleteness. In the event that this occurs a parallel run of systems will be done during this period. Users will still have access to the old system, but only for querying/reference purposes. Users will not be allowed to enter new records into the old system as this may expose the new system to incomplete data capture. The system shall be deemed as successfully deployed and commissioned when all users can perform their expected roles in the new system.

3.7 ***Parallel Run/Defects Liability period***

There will be a parallel access of the two systems for a period of two months. During this period, users will still be able to execute search queries and generate historical reports from the old systems. They shall however not be able to add any records into the old system. After two months, Lagos water will be required to officially decommission the old systems and access to such systems only be made possible to the system administrators to allow for specialized queries.

Defects Liability

A defects liability period of two years shall apply from the date of commissioning of the system. During this period, there will be provision of technical support relating to the functioning of the modules developed and signed off by the developer. The defects liability period will cover additional reports required and any changes on the system aesthetics. Changes that require development of additional modules and or documented procedures will not be covered under the defects liability period and will be treated as additional works.

3.8 ***Quality Assurance***

Quality assurance of all activities will be carried out on systems as they are deployed. There will be validation of all reports and development of all training materials before the training is conducted and also validation of the system modules before they are presented to the client as completed. This activity will be a parallel activity and will take one week

3.9 ***System Documentation:***

i) User Manual. The system manual will be documented based on the final system commissioned and used for the training of users.

ii) Technical Manual. This manual will document all the modules and how they interact with one another to create the system. This will be for the system administrators as well as database administrators

These will be delivered within two months from the date of commissioning of the system. This is to allow for accommodation of all the system changes that would have been made during the development, customization and integration of the system.

4. TIME INPUT, DELIVERABLES AND TIMEFRAMES

The Consultancy Services Assignment is expected to be carried out as follows; 5 weeks of intense preparation and implementation of the integrated billing and customer service solution. The time input and list of deliverables which the Consultant is expected to produce during the 5 weeks period is outlined in Table 1 below:

Activities, Deliverables and Timeframes

#	Activity	Deliverable	Timeframe / Due Date
1.1	***Design of New infrastructure***	New Process Workflows	Two Weeks from Commencement Date
1.2	***Development and coding of new billing, customer service and revenue collection modules***	Prototype of the Billing module	Three Weeks from Commencement Date
		Prototype of the revenue collection module	Three Weeks from Commencement Date
		Prototype of customer service module	Three Weeks from Commencement Date
1.3	***Integration***	Integrated billing, customer service and revenue collection Prototype	Four Weeks from Commencement Date
1.4	***System Testing***	User Acceptance Training report	Five Weeks from Commencement Date
1.5	***Data Migration***	Successful Data set report	Five Weeks from Commencement Date
1.6	***Training and deployment***	▪On job Training of staff on new modules. i.e Systems administrators, Database administrators, commercial, billing and customer service staff ▪Modules migrated to live environment	Throughout project duration
1.7	***Quality assurance***	Validation report	Six Weeks from Commencement Date
1.8	***System Documentation***	User Manuals	Six weeks from Commencement Date

5. REQUIRED FIRM EXPERIENCE

Interested Consultants should provide information demonstrating that they have the required qualifications and relevant experience in designing, developing and deployment of integrated billing, revenue collection and customer service systems in an urban water utility in Africa of similar size and level of capacity as LWC. The shortlisting criteria are:

I. At least at least 3 years' experience in deployment of commercial information management system focused on solutions for Water Utilities.

II. Demonstrable experience of key staff in design, development and implementation of integrated billing and Revenue collection systems of water utilities in Africa

III. Experience in training and development of training materials in Billing and customer service systems in utilities

6. STAFFING

The Consultant shall provide experts who have experience and a successful track record of undertaking and executing similar assignments in the respective field of expertise. Below in **Table 2** is an indication of the key minimum staff requirements and level of effort.

Experts and their Level of Effort

Experts	Staffing Requirements	Level of Effort (man-day)

1. Team Leader – Business process and Systems Analyst and Project Manager	Minimum of a Masters' Degree in Information Technology /systems or equivalent from a reputable University At least 5 years' experience in design, development and implementation of integrated billing and Revenue collection systems of water utilities in Africa	33
1. Billing expert	Minimum of a Bachelor's Degree in Information technology At least 5 years' experience in management and technical support of billing processes in water Utilities	20
1. Software development Expert	Minimum of a Bachelor's Degree in Software Development or equivalent Minimum of 4 years working experience in development of utility billing applications	33
1. Database Administrator	Minimum of a Bachelor's Degree in Software development or equivalent Minimum of three years working experience in designing and development of Billing Utility Databases	20
1. Systems Security Expert	Minimum of a Bachelor's Degree in Information Technology or equivalent with relevant Certifications Minimum of 5 years working experience in set up and implementation of systems security	25
Total		**78**

It is however the responsibility of the Consultant to propose the experts that is deemed necessary to carry out the services efficiently, comprehensively and timely. The responsibility of each proposed staff shall be detailed including his/her specialisation, duration / inputs in man-days and costs