

Ministry of Health



**Software Requirement Specification for
The
Development of District Supervision Data System, Portal, Data
Warehouse and Business Intelligence System**

By



Approvals and Authorizations

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1.2	19/10/2012	Emmanuel Shivina	Bhanu	23/11/2012		
1.3	7/01/2013	Srinivas	Bhanu	24/01/2013	Venu, Leul	
1.4	31/1/2013	Srinivas	Bhanu	05/02/2013		
1.5	05/01/2013	Srinivas	Bhanu	06/02/2013		
1.6	08/02/2013	Srinivas	Bhanu	14/02/2013		

[Template Version History (not to be modified by project teams)]

Ver. No.	Ver. Date	Prepared By	Reviewed By	Review Date	Approved By	Affected Section & Summary of Change	PIF No.
1.0	10-Feb-2011	SQA TEAM	SEPG	10-Feb-2011	SEPG	Initial release	NA
1.1	01-Mar-2011	SQA TEAM	SEPG	01-Mar-2011	SEPG	Updated System Features section and alignment	PI-001
1.2	26-Jun-2012	SQA TEAM	SEPG	26-Jun-2012	SEPG	Added approvals table	PI-001

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1. Introduction

1.1 Background

Management Sciences for Health (MSH) is a nongovernmental organization that has partnered with the Ministry of Health Uganda to develop a program called SURE (Securing Ugandans' Right to Essential Medicines). SURE's mandate is to strengthen the national pharmaceutical supply system to ensure that Uganda's population has access to quality essential medicines and health supplies. The project works to integrate Uganda's currently fragmented supply chain and establish a pharmaceutical management information system that provides full transparency to minimize medicine stock-outs and waste.

SURE works with the Government of Uganda to strengthen the health care system by providing support and technical assistance to the Ministry of Health and its regional and district offices. MOH PD/SURE work together to improve diagnosis and treatment for diseases such as Malaria, Diarrhea, Cough and Cold among other common diseases in order to increase access to quality health services increase access to quality drugs and commodities and improve districts' measurement and evaluation systems.

The Ministry of Health Pharmacy Division together with the SURE program has a strong focus on making data available for decision makers at central as well as district level. Due to existing data being scattered, inaccessible and of questionable quality analysis and following decision making is cumbersome and very laborious. This therefore led to the need of developing a Pharmaceutical Information Portal (PIP). The PIP unit has envisioned a national Data Warehouse containing all information required by decision makers on all levels to analyze current challenges and improve decision making. Using the Data Warehouse, decision makers will be able to analyze whether purchase orders were sent and delivered on time. The Data Warehouse will import data from various sources; National Medical Stores (NMS), Joint Medical Stores (JMS), National Drug Authority (NDA), Health Management Information System (HMIS), and District Supervision Data System (DSDS). Data will be cleaned, restructured and then imported. It will then be presented through a web-browser in various formats (ex. OLAP, slice-and-dice, spatial reports, dashboards, and Key Performance Indicator). The first phase of the PIP is the development, import, and presentation of the District Supervision Data.

1.2 Purpose

The purpose of this document is to describe the complete scope of features, functionalities and technologies for the development of an electronic version of the Routine Data Collection Tool and the District Supervision Data System Database (DSDS) to be used by MoH Medicine Management Supervisors (MMS). The electronic Routine Data Collection Tool will be used to capture and input data into the District Supervision Data System Database which in turn will be part of the data source systems that feed the Data Warehouse. The design of the entire Data Warehouse is also in line with Uganda MOH's vision to develop and implement the Pharmaceutical Information Portal (PIP) which will form the basis of the National Health Information System (NHIS)

1.3 Document Conventions

- Font: Calibri for Body Text and Headings
- Size: 11 for Body Text and 11 Bold for Headings
- Color: Black for Body Text and Black Bold for Headings

1.4 Intended Audience and Reading Suggestions

This document is intended for the following audience:

- The Project team at the Ministry of Health – Uganda
- The Project team at SURE – Uganda
- Executive Management at SURE
- Project Management Team at Techno Brain Ltd
- Project Development Team at Techno Brain Ltd
- Testing and QA team at Techno Brain Ltd

1.5 Project Scope

- Design, Develop and Implement a Pharmaceutical Information Portal for District Supervision Data System.
 - This will culminate into a fully-fledged Data Warehouse and Business Intelligence System integrated with the Pharmaceutical Information Portal which will serve as complete and comprehensive data collection and analysis center for providing critical information to decision makers at all levels (National, Regional, District, Health sub district, and Health Facility Level).

- Development of 5 Dashboards with 10 reports (Section 4).
- Development of 2 GIS Enabled Reports.
- Development of Routine Data Collection Tool with capability to function offline.
- Development of Cube and Excel Power Pivot Template.
- 7 roles for Users namely: General public User (Anonymous Access), Facility user, MMS User, District User, Regional User, Central User, M&E Expert User.
- Data Source is SharePoint Lists and SQL Server.
- Define schedules for frequency of data upload in Staging Server.
- Email notification upon data upload success/failure for documentation and tracking purpose.
- Data Capture will be done through the electronic Routine Data Collection Tool by MMS and will be demonstrated when doing on the job training and supervision at health facilities at all levels in Uganda.

2. Overall Description and Architecture of the Current Business Scenario

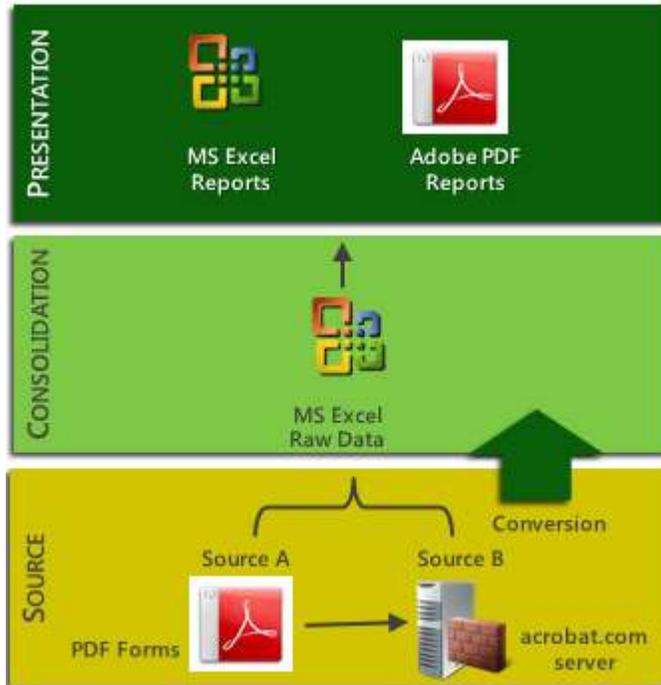
2.1 Current Perspective

Current Business Process and Constraints

S/N	Description of challenge identified in logical sequence starting from the data collection point	Staff/people involved	
1.	Manual update of the form using Microsoft Word as editing tool and then Adobe LiveCycle to generate the PDF form.	Form designer at central level. Currently the form is designed by pharmacists.	
2.	Offline filling of the form.	The Medicine Management Supervisor (MMS) Typically a Nurse Aid, Medical Superintendent or similar.	
3.	Printing the form for filling out manually as a backup system.		
4.	Linking the form to the database/SharePoint in the future.		
5.	Manual export of the data at administrator level.		

6.	Manual aggregation of the data at administrator level.		
7.	Manual generation/updating standard reports.	Currently performed at central level using manual export, manual aggregation at central level and manual update of the reports.	 
8.	Manual distribution of various reports including the district reports and the national report.	Currently performed by a statistician.	

Figure 1: Diagram depicting current Business Scenario



2.2 Data Delivery Challenges

Current data delivery challenges experienced by the client include:

- i. Untimely delivery of data resulting from network related constraints during submission
- ii. Poor data quality resulting in long duration of the validation and cleaning process that affects report production and quality
- iii. Human intervention is required especially during conversion of data from forms into excel (Export from Acrobat.com server)
- iv. Limitation in the organization of data caused by the capability of the tools in use (MS Excel)

3. Business Intelligence Vision and Solution Architecture

To deliver strategic information to decision makers at all levels of the medicines supply chain to help improve access and availability of medicines. This product will be developed in the context of Health Management to ensure that Uganda's population has access to adequate quantities of good quality essential medicines and health supplies and to satisfy the management needs such as:

- i. Ensuring adequate quantities of quality essential medicines and health supplies at facilities

- ii. Regular performance monitoring and improved reporting and ordering of medicines and health supplies
- iii. Better stock and storage management practices
- iv. Easy access to pharmaceutical information
- v. Improved dispensing and prescribing practices

3.1 Product Features

The PIP/DSDS is a specific data warehouse integrating currently present and historical data resources. It also includes Business Intelligence functionality for reporting purposes.

Data Sources:

SharePoint List Source

MS SQL Server Database Data Source

ETL (Extract, Transform and Load) Process

The ETL process will fetch data from source systems into target tables of the data warehouse. This process requires a deep knowledge of the schema objects of the source databases, in order to map every field of the source tables with the opportune field of the target tables, and store data.

Data Ware House

The Data Warehouse will contain cleaned historical and integrated data. The Data Warehouse will comprise of dimension tables and fact tables.

Business Intelligence (BI)

BI will cover many different functions (e.g. reporting and analysis) and support technologies (e.g. data warehouse, online analytical processing (OLAP), portal). BI is a broad category of applications and technologies for gathering, storing, analyzing, and providing access to data to help enterprise users make better business decisions. BI applications include the activities of decision support systems (DSS), query and reporting, OLAP, statistical analysis, forecasting, and data mining.

3.2 Proposed Solution

The solution for the design and the development of Pharmaceutical Information Portal include:

- Development of electronic Routine Data Collection Tool form for online and offline use

- Developing a database system for Routine Data Collection data collected by supervisors - District Supervision Data System (DSDS)
- Development of a Data Warehouse to form the basis of deploying Business Intelligence applications
- Development of a Business Intelligence Reports and Dashboards for decision making at all levels, central and district.

Figure 2: Logical Data Architectural Design for Data Warehouse and Business Intelligence Solution

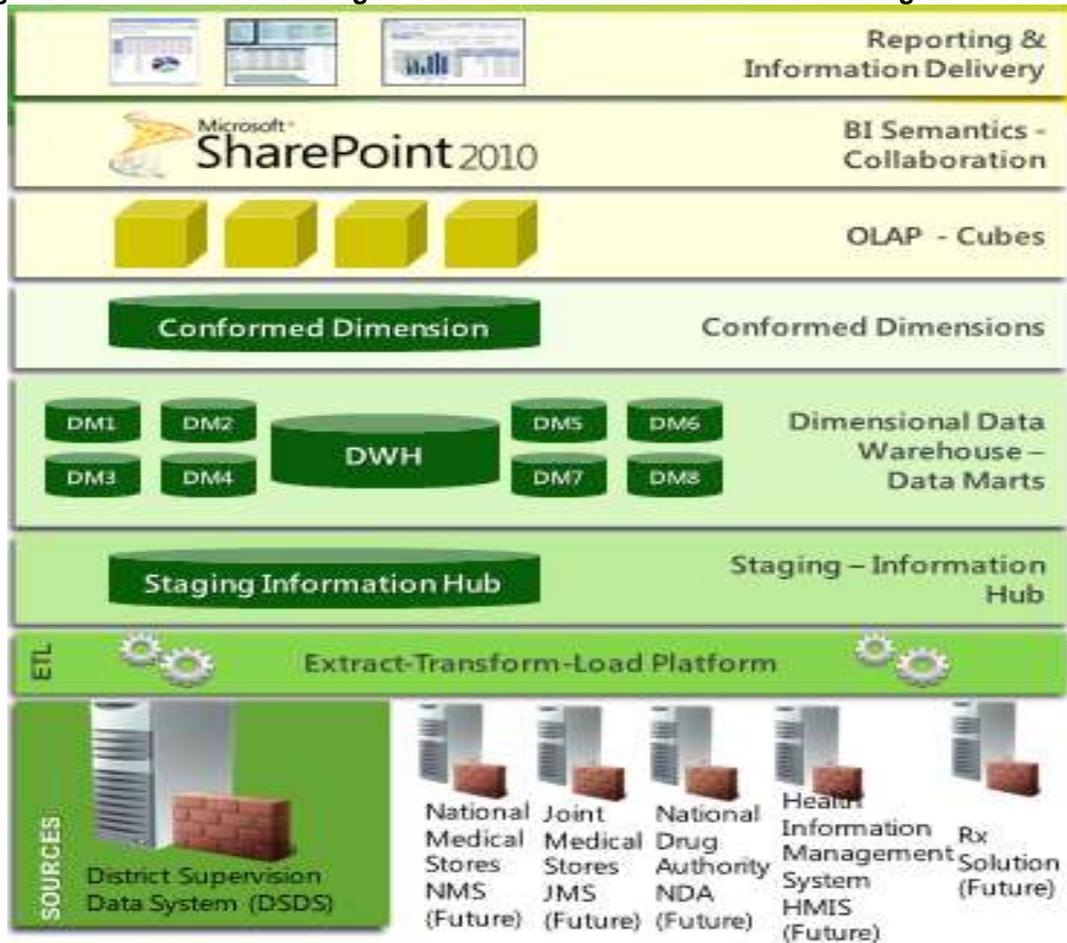
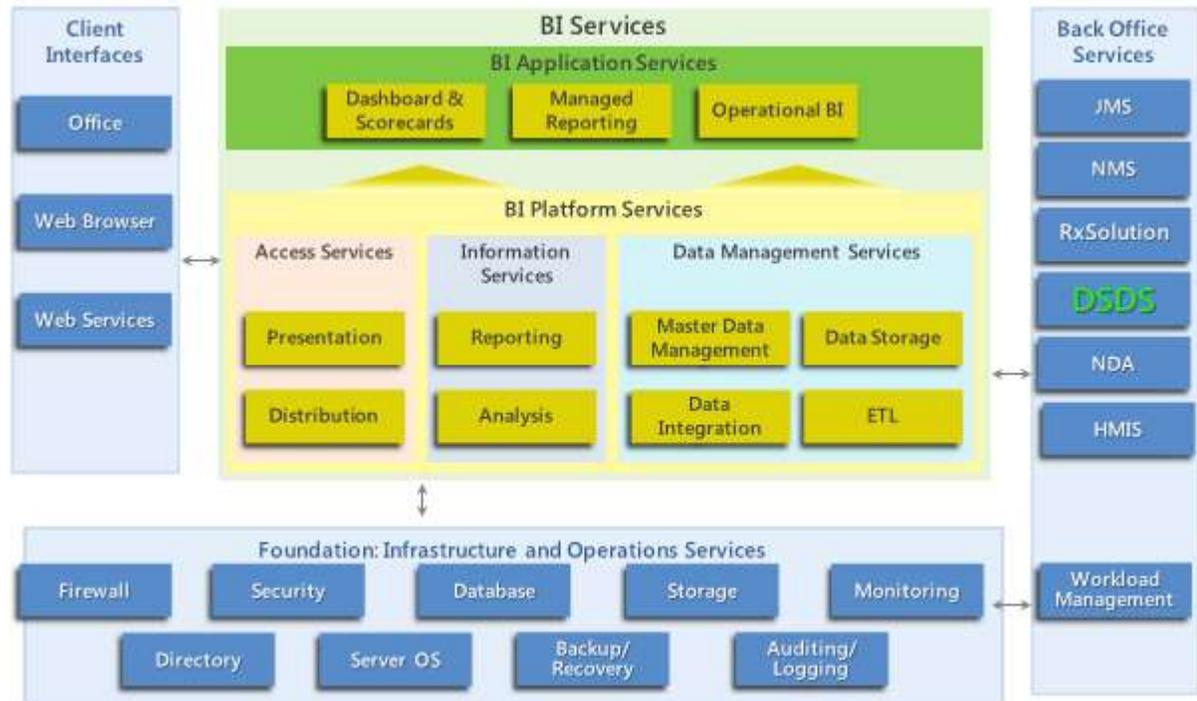


Figure 3: Logical BI Architecture Diagram



3.3 Data Modeling

The data models for DSDS and the Data Warehouse will be designed to produce abstract data structures for one or more database components of the DWH/BI solution. This is an important part in the over-all process of data warehouse development within MOH PD/SURE; others being data warehouse architecture, design, and deployment.

To identify dimensions and measures, for the proposed Data warehouse; table structures will be designed by Techno Brain and approved by MOH PD/SURE System administrators in order to attain the refined final database and Data Warehouse structures for Business Intelligence Reporting.

3.4 Logical Data Model (LDM)

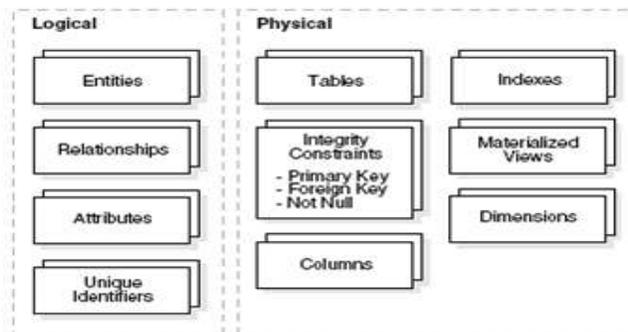
Logical data model will be created after SURE agrees and signs off the scope of the project. The project team will translate these requirements into a system deliverable format, and create a logical and physical design for the Business Intelligence solution and define the following:

- DSDS specific data content
- The system environment supporting the Data Warehouse and Business Intelligence platform

- The data transformations required of DSDS

3.5 Physical Data Model (PDM)

During the Physical design phase, a model for DSDS Database, the Data Warehouse and Business Intelligence components consisting of entities, attributes, relationships, dimensions, cubes, facts, measures will be defined. The entities will be linked together using relationships. Attributes will be used to describe the entities. The unique identifier (UID) distinguishes between one instance of an entity and another.



During the physical design process, the logical design will be translated in to the expected schemas and into actual database structures. Following mappings will be created:

- Entities to tables
- Relationships to foreign key constraints
- Attributes to columns
- Primary unique identifiers to primary key constraints
- Unique identifiers to unique key constraint

3.6 Business Intelligence Solution Abstraction

3.6.1 Data Entry Level Database Structural Components (Base Level)

The Data Entry Level will comprise Table structures that will be used to store data input from the forms provided. The Software to be used will be SQL Server 2008 R2 (64 Bit). The table sets will comprise table structure with Field Names, Field Data Types, Field Length Specification and Constraints. Relational constraints will be used to ensure data entered into the tables are accurate.

The tables will be populated from the SharePoint list (data from the Supervision form), or through a data entry/upload process (coding tables, like list of MMSs, facilities etc).

3.6.2 Data Warehouse/ Data Mart Level Database Structural Components – (Middle Level)

The Data Warehouse Level will comprise Table structures that will be used to store Dimension Tables as well as Fact Tables with data sourced from data entry level database. The Software to be used will be SQL Server 2008 R2 (64 Bit). Table below shows the list of Dimension and Fact tables to be designed within the data warehouse. The table set structures will be defined with Field Names, Field Data Types, Field Length Specification and Constraints. The data warehouse design is based on five major Subject areas: Dispensing Quality, Prescribing, Stock Management, Store Management and Ordering and Reporting.

The Data Warehouse will be designed using the BUS Architecture in which Dimensions are conformed to be reused in different star-schemas (dimensions surrounding a fact table) and also are ready for use in future extensions of the warehouse.

A detailed documentation on dimensional modeling will be submitted in the design document.

3.6.3 Business Intelligence Level Structural Components – (Top Level)

The Business intelligence layer will be designed using the following components:

a. SQL Server Integration Services (SSIS)

This component will be responsible for defining connectivity links between source database and target database. SSIS has built in support for SCD (slowly changing dimension). Within a data warehouse, SCD can be handled in several ways. These methods fall into various categories based on the company's need to preserve an accurate history of the dimensional changes.

b. SQL Server Analysis Services (SSAS)

This component will be used for designing and deploying Data Warehouse and Business intelligence components including: Dimension and Fact Tables, Measures and Cubes

c. SQL Server Reporting Services (SSRS)

This component will be used for designing and deploying performance dashboard reports: National Performance, Regional Performance, District Performance, Health sub district Performance and Facility Performance.

3.6.4 Data Warehouse ETL Design

The Extraction-Transformation-Loading process will retrieve data from the DSDS data source, transform the data based on predefined set of rules in order to meet target requirements before loading the data into the Data Warehouse. In the current solution, Extraction will gather data from the Share Point lists and DSDS database. These sources are operational systems that will be developed to replace the currently existing PDF forms and MS Excel. Data from the source systems will be loaded to staging area for the purpose of data cleansing. The already collected data will be presented in EXCEL format to go through the Transformation process.

Transformation will modify the data from the format of the data sources to the acceptable, Data Warehouse format. This may include 'Data cleansing', which removes errors and inconsistencies in the data and converts into a standard format. Errors found will be sent to the Data Quality team and also collected in a database. The techniques to be implemented include: 'Integration' for the purpose of reconciling data from different data sources, both at the schema and the data level: and 'Aggregation', which summarizes the data, obtained from data sources according to the level of detail, or 'Granularity', of the Data Warehouse.

Loading will feed Data Warehouse with the transformed data. This also includes 'refreshing' data in the Data Warehouse; i.e., propagating updates from the data source to the Data Warehouse at a specified frequency in order to provide up-to-date data for the decision making process.

Automated schedules for ETL (i.e. MS SSIS- Mappings) process will be created to load data in an order starting from Source Systems (MMS) -> Staging area-> Data Warehouse.

3.7 Meta Data

Metadata creation and management of data has the following "steps" in the Data Warehouse process:

- Data Warehouse model
- Source definitions
- Table definitions
- Source-to-target maps
- Mapping and transformation information

- Physical information
- Load statistics
- Business Logic Descriptions

4. Category and List of Reports and the Content

4.1 National Performance Assessment Report based on number of Visits, Ref: National report 20121213 - 3rd Quarter 2012 v3

Overview

Fact Box

- Quarterly
- Visits made over a selected period of time
- Average visits/MMS/Month
- Facilities certified in GPP
- Facilities certified in GFP
- Visits performed for the current period per Facility Type
- Total to date
- Start SPART in district by date
- Number of Active MMS nationwide
- Total number of visits done
- Facilities that have started SPARS supervision
- Average number of visits done per facility
- Facilities certified in GPP
- Facilities certified in GFP
- Spider (Radar) Graph (A penta-point graph on a 1-5 scale score based on)
 - Dispensing Quality
 - Prescribing Quality
 - Stock Management
 - Store Management
 - Reporting Quality
 - Visit Number, Total Average Score and Number of Visits

District League Table (Quarterly and total to date)

- Average Total Score
 - District Performance scores

National Progress on SPAS Indicators

- Overall average Indicator progress by visit number
- Breakdown of SPAS (Supervision Performance Assessment Strategy) Indicator Progress by visit number and percentage score

Quarterly Availability of Medicines in health facilities

- Tracer Medicines from a period of Time based on a number of Visits in Facility Types

- Other Medicines from a period of Time based on a number of Visits in Facility Types
- Highest physical count of ACT (Artemisinin Combination) in Health facility types
- Measles Vaccine highest Stock Count in Health facility types
- ORS highest physical Count in Health facility types
- Stock out Days of medicines in Health facility types

Stock Management

- Stock card availability for a basket of medicines
- Use of the stock card system
- The graph on availability has been changed

Store Conditions

- Storage handling
- Store Condition
- Hygiene overall
- Expired Drugs

Reporting from Health Facilities

- Knowledge of VEN (Vital Essential Necessary)
- Calculations – Is the facility calculating the right quantity to order based on AMC, Stock on hand, Consumption and maximum stock?
- HMIS Accuracy
- Average Lead time
- Was ordering timely
- Documents filed in facility

Dispensing Quality

- Drinking water in dispensing area
- Discrepancy between prescribed and dispensed
- Dispensing equipment
- Patient Care
- Labeling

Prescribing Quality

- Rational prescribing
- Diarrhea Treatment
- Cold/Cough Treatment
- Malaria Treatment
- Filling of prescribing and dispensing logs

Top 3 facilities for each level – Hospital, HC4, HC3 and HC2

4.2 District Performance Report based on Visits, Ref: District report 201301.xlsm

Fact Box

- Add the indicators of the factbox
- Number of active MMS nationwide to date
- Facilities that have started SPAS supervision to date

- Total number of visits performed to date
- Average number of visits done per facility to date
- Facilities certified in good Pharmacy Practice
- Facilities certified in good Financial Practice
- Visits performed this period
- Visits this quarter
- Visits made from

Average District performance

- Radar Graph
- Quarterly availability of tracer medicines
- Overall tracer medicines availability
- Tracer medicines availability per medicine
- Quarterly availability of other medicines
- Overall other medicines availability
- Other medicines availability per medicine

Healthy facility top score

- Facility current total score

Health facility League Table

4.3 New Reports

- Medicines Management supervisors report based on Visits and quality of Information captured
- Availability of Medicines Report
- Health facility performance report
- Regional Performance Report
- Zone performance Report

4.4 Data Warehouse and Pharmaceutical Information Portal Network Architecture

The Central Server Architecture will make use of MSH/SURE's core network infrastructure and will be accessible both through the Internet and the intranet. The portal access infrastructure will be presented through URL thus no extra software installation requirements will be needed on the client PCs. However SharePoint 2010 Workspace will be installed as part of Office Professional Plus in order to provide offline access to the Routine Data Collection Tool using SharePoint Lists and Offline functionality will work as per the standard features of SharePoint 2010 Workspace and InfoPath 2010 given by Microsoft. Portal will be accessible through Intranet/Internet browsers only. SharePoint Workspace 2010 and InfoPath 2010 are features that are embedded with Office 2010 Pro Plus.

BI and GIS Reporting will be developed using the Microsoft SQL Server Reporting Services, where the SPAS data will be collected in the PIP Data Warehouse. This will give users flexible reporting features so that even a non-technical staff, with appropriate authority, can export user-specified data elements to a properly formatted file for use by commercial office applications. The database will be SQLServer2008 R2 which has the flexibility of importing / exporting data into an XML format that can be used universally.

4.5 Development of Routine Data Collection Tool

Currently the Routine Data Collection form is in Adobe PDF format and all users are filling it and submitting it to Acrobat.com server. Data is collected in a specialised PDF format called a PDF portfolio from where data is exported into Excel to generate reports. The solution for the development of electronic Routine Data Collection Form will make use of InfoPath 2010. The electronic data collection form to be used by MMS to collect data to be submitted to the SQL database will be divided into multiple sub-forms based on sections in order to fit with the SharePoint 2010 and InfoPath 2010. The form details are explained in Section 3 – System Features.

Below are the sections of the form

1. Basic Information
2. Dispensing Quality
3. Prescribing Quality
4. Stock Management
5. Storage Management
6. Ordering and Reporting Quality
7. Medicines Management Dashboard

In PDF Form, Spider graph is provided and it will be generated based upon the values entered. In the Proposed solution, the Spider Graph will be provided as a report within SQL Server Reporting Services as Radar Chart online as well as offline.

4.6 Solution Features

- Robust Architecture to support multiple data sources in future
- Role based Dashboards and Report viewing

- Routine Data Collection Tool online on the Portal and also as Offline version including the Spider graph
- Portal Security through Single Sign on using Windows Active Directory
- GIS Enabled Reports
- Job based email alerts for data upload success and failure from staging to live data.

4.7 User Classes and Characteristics

The products mentioned will be used by the following category of users bearing in mind the scope of expansion using the products outlined. The assignment of roles will also relate to the classes of users mentioned.

- i. Data Entry Personnel: To capture and feed data into the database system using forms
 - a. **MMS Users**

MMS Users will be given access to the Routine Data Collection Tool and will be provided with Offline access to enter data in their local machines and later submit to the main server using SharePoint 2010 Workspace subject to network availability. Due to network availability the data amount to be received and sent will be minimized. Currently the pdf form is 500kb for download and less when submitting the form in xml format. MMS will further have access to the district reports for their own district, the national report and the MMS performance report for themselves.
- ii. Data Experts: To manage and maintain the business rules and constraints in order to have proper data getting into the system
 - a. **M&E Expert**

M&E Experts will be given access to all reports and these users will be taking care of data cleaning and error checks for data quality.
- iii. Application Developers: Manage deployed application through implementation of changes required to the form structures and backend code sets
 - a. **Database Administrators**

To deploy, manage and maintain the database systems deployed and make them available for access to users
 - b. **System Administrator**

Administrator will be given access to the complete system and responsible for managing users and User roles.

c. **Report Creators/Managers**

Create and Manage report templates as well as publish reports for accessibility

iv. Report Users: View reports for decision making purposes

a. **General public**

Users also will have anonymous access rights to public information on the portal

b. **Health facility user**

(Selected) Health Facility staff will be provided access to data for their facility. They can also select their district to see the consolidated data of all facilities and the aggregated national data.

c. **District User**

District Health Officers will be provided access to all reports and Officers can select their district to see the consolidated data of all facilities and Officers can also view the data for a particular facility as well.

d. **Regional User**

Region Officers will be provided access to all reports and Dashboards and Logistics information based on their regions

e. **National User**

Users with National User Role will be provided access to all Reports and Dashboards

4.8 Operating Environment

The Solution proposed will make use of a set of Microsoft technologies namely:

- i. Microsoft SQL Server 2008 R2
 - This will be the primary software solution to be used for both the Data Entry database as well as the Data Warehouse database
- ii. Microsoft Office SharePoint
 - Microsoft InfoPath
 - Data Entry form tool
 - Microsoft Power Pivot
 - Data Analysis and reporting tool
- iii. Microsoft Business Intelligence
 - SQL Server Integration Services (SSIS)
 - Used for integrating various sources of data

- SQL Server Analysis Services (SSAS)
 - Used for creation OLAP objects (Cubes, Dimensions, Measures)
- SQL Server Reporting Services (SSRS)
 - Primary Interface for rendering reports

Software Scenario	Additional Software
Desktop Client	Microsoft Windows 7, Microsoft Office 2010 , Internet Explorer, Mozilla Firefox and Chrome, Adobe Reader
Server	
Operating System	Windows Server 2008 R2
Database	Microsoft SQL Server 2008 R2
ETL Tool	Microsoft SQL Server Integration Services (SSIS)
BI/Analytical Tool	Microsoft SQL Server Analysis Services (SSAS)
Reporting Tool	Microsoft SQL Server Reporting Services (SSRS), Report Builder
Web Technologies	Microsoft Share Point 2010, Info Path

5. System Features

5.1 Portal Home Page and Login

Description and Priority

Pharmaceutical Information Portal Home Page will be designed and developed with content provided by the Client. Login window will be default SharePoint 2010 windows AD login.

Stimulus/Response Sequences

In Home Page, Users will be able to see all basic information related to Portal and Links to Dashboards and Reports. In Addition, Administrator can see User Management. Login Window will be given with Username and Password, Users should be able to enter their windows active directory username and password and click on login.

Functional Requirements

Req ID	Requirement Description	Input	Output
7.1.1_Home_Page	Home Page should be designed with the content provided by client.	Providing Login Details	Home Page will be opened and Links will be displayed to get Reports
7.1.2_Home_Page	Access links to Dashboards and Reports based on User should be provided.	Click on Link provided	Each Link will be redirected to a dashboard/report which will open that report in the browser.
7.1.3_Home_Page	Link to User Manual to configure SharePoint workspace should be provided.	Click on Link provided	User Manual to configure SharePoint workspace will be opened/downloaded based on their browser.
7.1.4_Login	Standard SharePoint Login with Windows Active Directory will be provided which will accept Domain User Name and Password	Enter User Name and Password and Click Login button	System will validate with the active directory and redirect to the home page.

5.2 Routine Data Collection Tool

Description and Priority

Routine Data Collection Tool with 7 sections will be developed in InfoPath and submitted to 7 lists in SharePoint with a reference number for all sections. The below are the sections of InfoPath Form:

- a. Basic Information
- b. Dispensing Quality

- c. Prescribing Quality
- d. Stock Management
- e. Storage Management
- f. Ordering and Reporting Quality
- g. Medicines Management Dashboard

This form will also be accessible for users in Offline mode. The drop down boxes to select the facility, based on the hierarchy Region-District-Health Sub District, are active. The form can be downloaded by the MMS and printed. The printed version looks identical to the paper version of the form to avoid confusion in the transitioning from the PDF form to the InfoPath form.

Stimulus/Response Sequences

This Form will be available in two modes:

1. Online Submission
2. Offline Submission

In Online Submission, Users will open the Basic Information form in browser and input all the details and User should enter a reference number which will act as a reference for remaining sections. Users click on Dispensing Quality link and enter data and submit data to Dispensing Quality list. For remaining 5 sections, User can open and submit data online. Same reference number should be provided in all forms in order to maintain data quality and accuracy.

In Offline Submission, all client machines will be installed with SharePoint 2010 workspace and InfoPath 2010. All the 7 Sections of the Form will be provided as templates to the users. The users will then fill in the forms and save to the workspace for submission. On availability of internet access, each workspace will be synchronized with the database automatically.

There are two (2) visits where the form will be used;

Baseline Visit - This is the first time Visit that is made at the health facility and the base information regarding the facility is captured – **This form is out of scope for DSDS**

Follow-up visits - These are visits that are made after the baseline visit and happen depending on the Schedules drafted which involves training of Users on the 5 aspects of monitoring health Facilities

Functional Requirements, Ref: Routine tool with dash board and spider graph 2013

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Req ID	Requirement Description	Input	Output
7.2.1_Form	<p>Basic Information form will be developed with below details</p> <p>Reference Number – Text</p> <p>Form Reference Number – Number</p> <p>Submission Number – Number</p> <p>Region – Dropdown</p> <p>District – Dropdown</p> <p>Health Sub District – Dropdown</p> <p>Health Facility – Dropdown</p> <p>Level – Dropdown</p> <p>Ownership - Dropdown</p> <p>Date of Visit – Date</p> <p>Supervision Visit No – Number</p> <p>Date of Next Visit – Date</p> <p>Days to Next Visit – Number</p> <p>Accreditation - Dropdown</p> <p>Name of Persons Supervised – Section Name</p> <p>Name – Text</p> <p>Gender F/M – Dropdown</p> <p>Profession – Dropdown</p> <p>Contact/Phone no – Number</p> <p>Details of Five Persons will be allowed</p> <p>Name of Supervisors – Section Name</p> <p>Name – Text</p> <p>Contact Phone No – Number</p> <p>Title – Option (District MMS or HSD MMS)</p>		

	Details of Four Persons will be allowed		
7.2.2_Form	<p>Dispensing Quality Form will be designed with below sections</p> <ul style="list-style-type: none"> ○ Dispensing Time ○ Packaging Material ○ Dispensing Equipment ○ Services available at dispensing area ○ Patient Care ○ Labeling ○ Rationing of Antibiotics <p>Details of the fields and formula is available in the below attached PDF – Link to PDF</p>		
7.2.3_Form	<p>Prescribing Quality Form will be designed with below sections</p> <ul style="list-style-type: none"> ○ Correct use of prescription recording system ○ Rational prescribing ○ Diarrhea ○ Cough/Cold ○ Malaria Treatment <p>Details of the fields and formula is available in the below attached PDF – Link to PDF</p>		
7.2.4_Form	<p>Stock Management Form will be designed with below sections</p> <ul style="list-style-type: none"> ○ Availability and correct use of stock cards, stock books etc. <p>Details of the fields and formula is available in the below attached PDF</p>		
7.2.5_Form	<p>Storage Management Form will be designed with below sections</p> <ul style="list-style-type: none"> ○ Cleanliness of the Pharmacy 		

	<ul style="list-style-type: none"> ○ Hygiene of the Pharmacy ○ System for storage of medicines and supplies ○ Storage conditions ○ Storage practices of medicines in the pharmacy (Stores & Dispensary) <p>Details of the fields and formula is available in the below attached PDF</p>		
7.2.6_Form	<p>Ordering and Reporting Quality Form will be designed with below sections</p> <ul style="list-style-type: none"> ○ Reorder level calculation ○ Timeliness of orders and distribution ○ Accuracy of HMIS report ○ Filing ○ Lead time <p>Details of the fields and formula is available in the below attached PDF – Link to PDF</p>		
7.2.7_Form	<p>Medicines Management Dashboard Form will be designed with the following indicators</p> <ul style="list-style-type: none"> ○ Dispensing Quality ○ Prescribing Quality ○ Stock Management ○ Storage Management ○ Ordering and Reporting quality <p>Details of the fields and formula is available in the below attached PDF – Link to PDF</p>		
7.2.8_Form	<p>Form Reference number, In current scenario, it is XXX-XXX-XX format, in the proposed system to provide offline</p>		

	<p>functionality in the system and because serial numbers cannot be generated in offline mode and it will be generated only when they submit the form to the server and this reference number will be stored to map the actual serial number generated and same has to be followed in online mode also. Users should enter a unique number based on their Personal Identification Number and Health Facility number and Number of Form they are submitting in that month. And this will be reference between all the seven forms and when they submit it to the server, then actual form serial number will generated based on the sequence.</p>		
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5.3 Dimensional Model

Description and Priority

The below mentioned dimensions are identified as main dimensions and will be created as a base of dimensions. Fact Tables identified are mentioned

Stimulus/Response Sequences

Dimensions and Fact Tables should be provided in the system.

Functional Requirements

Req ID	Requirement Description	Input	Output
7.3.1_Dim	<p>The below dimensions will be created in the system</p> <ul style="list-style-type: none"> ➤ GeographyDim ➤ Facility Dim ➤ Time Dim ➤ Dispensing Dim 		

	<ul style="list-style-type: none"> ➤ Packaging Dim ➤ Equipment Dim ➤ Service DIM ➤ PatientCareDim ➤ Labeling Dim ➤ PDDDim ➤ STAGDiarrheaDim ➤ STAGCoughColdDim ➤ STAGMalariaDim ➤ StockMgmtDim ➤ CleanlinessDim ➤ HygieneDim ➤ StorageSystemDim ➤ StoreConditionsDim ➤ StorePracticeDim 		
7.3.2_Dim	<p>The below Fact Tables will be created in the system</p> <ul style="list-style-type: none"> ➤ DispensingQualityFact ➤ PrescribingQualityFact ➤ StockManagementFact ➤ StoreManagementFact ➤ OrderReportingFact 		

5.4 SSIS Package for Data Extraction Transformation and Loading to Central Data Warehouse

Description and Priority

A SSIS Package will be developed to extract data from SharePoint Lists and the MS SQL Server Database Data Source, transform data, and load data into Central Data Warehouse.

Additional data source locations such as EXCEL, CSV and XML files will also have SSIS packages developed for them in order to load data into the intermediate database before loading into the Data Warehouse. Data that will be loaded using these other sources:

- The already collected data from the supervision visits will be availed to the SSIS for loading in EXCEL format.

- Two indicators for inclusion in the national reports are not collected in the supervision form and will have to be entered: “Number of facilities GPP certified” and “ Number of facilities GFP certified”

Stimulus/Response Sequences

SSIS Package will run based on the schedule and SQL Job will be created to run this package and schedule will be defined.

Functional Requirements

Req ID	Requirement Description	Input	Output
7.4.1_Dim	SSIS Package will be developed to extract, transform and load data to the Data Warehouse from source location. This is an automatic job which will load data in defined frequency.		
7.4.2_Dim	<p>Scheduling Job</p> <p>SSIS Package will be created and attached to a SQL Job/Process which will run the package and load data to the server.</p> <p>Frequency can be selected from below</p> <ul style="list-style-type: none"> ○ Daily ○ Weekly ○ Monthly ○ Yearly 		

5.5 SQL Job for Data Upload Success/Failure

Description and Priority

Using DB mail functionality of SQL Server, a SQL job will be created to send emails to administrator on every data load.

Stimulus/Response Sequences

Administrator will get an email on every successful/failure load of data to the server and SQL Server Agent will run this job.

Functional Requirements

Req ID	Requirement Description	Input	Output
7.5.1_Dim	DB Mail – Send an email to administrator based on the data load status. For both success and failure, it should send an alert to the Administrator about the status		
7.5.2_Dim	Scheduling of Job using SQL Server Agent		

5.6 Dashboards and Reports

Description and Priority

Development of aggregating, trend analysis and comparison reports based on historic and current data

Stimulus/Response Sequences

Users will be able to review various reports based on their roles and profiles of access and restrictions

Functional Requirements

Dashboard	Features	Reports	MO H	Regio n	Distric t	Health sub distri ct	Facili t y	MM S
Facility Dashboard	1. Facility Performance	1 Facility Performance Report 2 Average National Performance 3 Average Region Performance 4 Average district Performance 5 Average Health sub district Performance 6 Average facility Performance 7 a. Quarterly availability of tracer medicines b. Quarterly availability of other medicines 8 a. Health Facility Top Score b. Health Facility League Table	✓	✓	✓	✓	✓	✓
Health sub district Dashboard	1. Health sub district Performance 2. Facility Performance	as above plus: 1 Health sub district Performance Report	✓	✓	✓	✓	x	✓
District dashboard	1. District Performance 2. Health sub district Performance 3. Facility Performance	as above plus: 1 District Performance Report	✓	✓	✓	x	x	✓
Region dashboard	1. Regional Performance 2. District Performance 3. Health sub district Performance	as above plus: 1 Region Performance Report	✓	✓	x	x	x	x

	4. Facility Performance							
MOH dashboard	1. National Performance 2. Regional Performance 3. District Performance 4. Health sub district Performance 5. Facility Performance	as above plus: 1 National Overview 2 Region league Table 3 District League Table 4 Health sub district League Table 5 Facility League Table 6 National Progress on SPAS Indicators 7 Availability of Medicines in health facilities 8 Overall availability of other medicines 9 Stock Management 10 Store Conditions 11 Reporting from Health Facilities 12 Dispensing Quality 13 Prescribing Quality	✓	X	X	x	x	✓

NOTE: All Kampala Districts Divisions will be taken as Health Sub-Districts

5.7 GIS Enabled Reports

Description and Priority

Development of two enabled Geographical Information Systems Reports

1. Facility Level Information

On the Country map, Regions will be displayed and drill down will be provided for districts and then to facilities. All Facilities will be marked on map and displayed with data, User will be able to drill down to details of a particular facility.

2. Medicine Availability Information

Medicine Availability Information in Regions and districts will be displayed on map.

Stimulus/Response Sequences

Users will be able to view analyzed and processed data with the power of eyeballing of data on the Map. When collecting data, Longitude and Latitude of the facility will be captured and stored in the database.

Functional Requirements

Req ID	Requirement Description	Input	Output
5.8.1_GIS Maps_1	<p>Facility Level Information</p> <p>Report will display a map of Uganda with Regions. Data will be displayed based on region, User will be able to view Facilities information in that region in data format and be will able to drill down to districts and facilities.</p>	<p>User needs to open the Report</p>	<p>Report will display a map with regions information.</p>
5.8.2_GIS Maps_2	<p>Medicine Availability Information</p> <p>Report will display a map of Uganda regions and User needs to select a region to get details of Medicine availability in that particular region. Drilldown for districts and facilities will be provided.</p>	<p>User needs to open the Report</p>	<p>Report will display a map with regions information.</p>

5.8 User Management for Administrators

Description and Priority

User Management of PIP Portal Administration will be available only for administrators.

Stimulus/Response Sequences

Administrator can add new users in active directory and adding to respective SharePoint groups.

Functional Requirements

Req ID	Requirement Description	Input	Output
5.9.1_User_Mgmt	Create all new users using Active Directory	All Users will be created in Windows Active Directory	Users will be created by the administrator and Username and password will be notified through email by administrator.
5.9.2_User_Mgmt	Add Users to particular user groups and Profiles User Groups: a. MMS Users b. Health Facility Users c. District Users d. National Officers e. M & E Experts f. Administrators	After Users creation, Administrator adds users to groups. User Groups will be created based on roles.	Users can access the system based on the Profile allocation.
5.9.3_User_Mgmt	Delete Users in Active Directory	Users can be deleted	Administrators can delete Users if

		by administr ator	they are no more with the department
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5.9 External Interface Requirements

5.9.1 User Interfaces

- Rich graphical user interface
- Proper and Uniform font in all the web pages will be consistent and user friendly.
- Proper Alignment of Text and labels
- Correct Colour contrast between text and background to ease reading
- Use of conventional page layouts
- Minimize “extraneous” navigation

5.9.2 Hardware

The architecture for the proposed solution will require a central Data Warehouse server, an Application Server for Portal and Web Server will be provided. The District Supervision Data System will reside on the application server and the users will be able to access the portal will be on Web Server. A Central Data Warehouse server will be provided to maintain data. Staging Database servers will be provided. Central Data Warehouse server will be replicated in order to provide high availability.

5.9.3 Software

The District Supervision Data System and Data Warehouse will be developed using Microsoft SQL Server 2008, InfoPath 2010, Microsoft SharePoint 2010, Microsoft BI as back bone for data processing and SQL Server Reporting Services for Reporting tools.

5.9.4 Communications Infrastructure

The application will be hosted centrally and all the users will access the system through standard internet web browser over HTTP protocol. Users are connected in a secured VPN and communication is via TCP/IP protocol.

6. Design and Implementation Constraints

- i. Design of Routine Data Collection Tool will be modified and Form will be converted into sub forms with a reference number for every record. User should be able to enter reference number in Offline mode.
- ii. Data Warehouse, Routine Facility Data and Reports will be centrally deployed in the headquarters and will provide access to internal users and external users
- iii. Dedicated VPN connection and Quality Internet Bandwidth to other locations from Headquarters.
- iv. Proper Functioning of the Data Warehouse system and Reporting System without interruption is dependent on Bandwidth provided from different locations and central server. It requires minimum 2 Mbps line at headquarters and 512 Kbps is recommended for other locations
- v. Offline functionality will be provided using Microsoft InfoPath and SharePoint workspace 2010. All Client machines should be installed with Office Professional Plus 2010.

7. Documentation

The below documents will be provided

- Enterprise Design Document for Data Warehouse
- User Manual and Administrator Manual
- Training Manual
- Installation Guide

8. Assumptions and Dependencies

- **Documentation**
 - All documentation will be in English.
- **Communication**
 - Techno Brain will provide engagement management. A joint team of Techno Brain and MOH PD/SURE will be formed to decide on changes that may have time/cost implications.
 - Any Item not defined in the Scope and is not a part of the deliverables shall not be incorporated without approval from Change Control Board.
- **BI Reports & Cubes**

- Techno Brain shall develop reports and dashboards as mentioned in SRS, any additional reports will be considered as out of Scope.
- The number of cubes to be created will depend on the number of fact tables created for MMS Data.
- Two GIS enabled Reports will be developed and Client will be responsible for providing Geographical information in co-ordinates (Longitudes and Latitudes).
- **Design**
 - Data Warehouse architecture shall be designed using BUS.
 - One Master page design for Business Intelligence Portal shall be developed.
 - Techno Brain shall develop Routine Data Collection Tool only in InfoPath and Form will be divided into multiple forms in order to accommodate proper design.
 - No Offline access to Reports and Dashboards
 - SharePoint Workspace will be used to achieve Offline Functionality.
 - Routine Data Collection Form, National Report and District Report versions mentioned in SRS will be taken as final for Design and Development
 - MOH PD/SURE will provide GEO Data (longitudes and latitudes) for mapping locations for GIS Reports.
- **Hardware & Software Environment**
 - Techno Brain and MOH PD/SURE shall provide the team for testing the application.
 - All hardware and system software required for executing the project will be provided by the client.
 - Any third party components identified to be used will be procured by the client.
 - Active Directory and MOSS infrastructure is in place.
 - Techno Brain suggests that Exchange Server 2010 should be in place to send emails.
 - Techno Brain suggests that the application can be hosted on Windows Operating System.
 - All Netbooks/Laptops who will have access to Routine Data Facility Form should have Office Professional Plus 2010.
 - Techno Brain suggests that SharePoint workspace 2010 should be installed.
- **Other Assumptions:**
 - Techno Brain understands that the current scope does not include integration with other existing systems. With this in mind the solution that will be provided by Techno Brain will

allow systems to be added into the current systems infrastructure and architecture with ease as and when they are available.

- Any public IP requirement shall be provided by client
- Client should ensure the availability of key users for providing required inputs
- Availability of necessary infrastructure Hardware and Software to Techno Brain team during system test/performance/UAT & installation phases.
- Should have VPN/ Network connectivity of the sites / systems with minimum of 1 MBPS dedicated bandwidth with required latency say less than 40ms
- Any delays on account of unavailability or delay of items not covered under Techno Brain scope of work would not be considered into Vendor delay.
- Any delays caused due to unavailability of site space will not be accountable to Techno Brain. MOH PD/SURE & Techno Brain would agree on a project timeline and associated tasks within a reasonable time from the start of the project consistent with the high level plan presented in this proposal. Any change to this project plan that results in a change in the go live date not in the control of Techno Brain will be addressed through change orders.
- Techno Brain and Client will agree not to disclose or use confidential or proprietary information that is acquired during the course of the project to any third party.
- The project plan may be adjusted by Techno Brain based on real world findings and MOH PD/SURE's ability to secure required resources required for Project completion.
- Necessary infrastructure including Hardware and Software needs to be procured by Client.
- Techno Brain has already informed MOH PD/SURE that SharePoint workspace 2010 will not be supported by Microsoft in future versions of MS Office.
- Client will provide the necessary electricity and network cables for deployment.
- All Power, Infrastructure and network failures would not be counted in the project efforts and it is the responsibility of Client to sort out any issue related to the above areas which might have an impact on the project deliverables.
- Any changes in requirements which are defined in SRS would go through the Change Management process and based on the requirements, Effort and cost estimates will be provided to Client.
- Techno Brain shall approach the Client Project Coordinator for any clarifications required prior or during the Project. Intermediate deliverables provided by Techno Brain during the

course of the project must be accepted or rejected on a timely basis. Delays in this process will impact the project schedule, cost.

- Any changes to the above assumptions could lead to an impact on effort/costs and schedule

9. Other Nonfunctional Requirements

9.1 Performance Requirements

- System should allow multiple user access
- Bandwidth should be available in order to make sure the system is online for Users accessing from remote places
- Hardware and Software scalability will be supported

9.2 Safety Requirements

- The solution will be highly secure to safeguard against eavesdropping and unauthorized access to the data over the access channels. A strong password protection & encryption policies would be incorporated. Windows Active Directory Authentication or any other authentication system with support of LDAP is used in this application to ensure that security is robust and no unauthorized Access.

9.3 Security Requirements

User Access control:

- User authentication will be provided form the Operating System, Data Database as well as through SharePoint to ensure that only authenticated users are permitted to access application Solution and the supporting IT Infrastructure.
- All the users of the system will be categorized into Key Users (Administrators and National Users), Secondary users (District Users, Facility Users, M & E Experts and Other Users).
- The procedure for creation / activation and deletion of user accounts can only be done in active directory and needs to be added to the respective groups in SharePoint.
- Access to the application software shall be restricted to only authenticated and authorized users.
- Direct access to the backend database shall be restricted to Database Administrators

- Access to the Servers Operating systems / data and other supporting infrastructure such as routers, switches, firewalls in the setup should be restricted only to the authorized System and Network Administrators.

Password Policy

- Techno Brain recommends the use of a strong password policies which is also an embedded feature provided by the software stack (Operating System, Database, SharePoint) of which all the users will need to comply with it as minimum requirement for authentication. The policy shall at minimum include the following set of rules.
- All passwords shall be of six characters (minimum) in length, and be comprised of letters, numbers, and special characters to the extent possible.
- Passwords shall not be visibly displayed on the screen when being typed.

Application Security Controls

- The application shall include, at minimum, the following security controls:
 - Data input validation controls.
 - Data process validation controls.
 - Data output validation controls.
 - Strict access restriction to program source libraries including code.
- The web application shall include, at minimum, the following security controls:
 - The information relating to users of the system shall be secured by devising appropriate level of controls. The data about users shall be stored in a SharePoint Lists.
 - The solution shall restrict access for specific users to only certain resources in the solution based on their role definition.
 - Any access to the database shall only be via application / portal authorization/ or by Database Administrator.
 - At a minimum the following database level security controls shall implemented in order to ensure appropriate levels of security.
 - Shall provide for comprehensive auditing for inserts / deletes / updates / selects for quick identification and response to security breaches.
 - The critical data and the related documents stored in the database shall be stored in Encrypted format.

9.4 Software Quality Attributes

- Easy and secure access from the web browser and no installations required in the client machines.
- The application can be integrated with external web applications.
- The application will be developed using 3-tier architecture which can be easily maintained and reused.

10. Annexures

10.1 Appendix A – Data Dictionary

Uploaded in Dropbox/SRS/Annexures Folder

10.2 Appendix B – Routine tool with dash board and spider graph 2013 JANUARY_KH

Uploaded in Dropbox/SRS/Annexures Folder

10.3 Appendix C- National Performance Assessment Report based on number of Visits, Ref:

National report 20121213 - 3rd Quarter 2012 v3 (Considered part of scope)

Uploaded in Dropbox/SRS/Annexures Folder

10.4 Appendix D – District report 201301.xlsm (Considered part of scope)

Uploaded in Drop box/SRS/Annexures Folder

10.5 Appendix E – SSAS – OLAP Functionality (Provided by Microsoft)

Uploaded in Dropbox/SRS/Annexures Folder

Hereby MOH PD/SURE, Uganda and Techno Brain have agreed the scope of the work for the Supply, Delivery, Installation and Commissioning of District Supervision Data System Phase I for MOH PD/SURE, Uganda.

MOH PD/SURE Uganda Representatives	Techno Brain Representatives
Sign: <Name> < Designation >	Sign: <Name> < Designation >
Sign: <Name> < Designation >	Sign: <Name> < Designation >