HCW Mobile Training Platform Solution for Clinton Health Access Initiative (CHAI)

April, 2014

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1.0 SYSTEM OVERVIEW

Sufficient and continuous learning is important for healthcare workers (HCW) to be able to improve their medical knowledge and expertise. It helps them stay revised and keeps them abreast with old and new field knowledge respectively thereby staying relevant and efficient with healthcare practices and treatment procedures.

Learning can be done in various ways such as observation, tutoring/mentoring, self-learning etc. The innovative form of learning put forward by this project is a great way to create relevant and pertinent self-learnt knowledge for HCWs. Its quality is guaranteed as contents will be created/endorsed by authorities in the health sector and it is channelled via a free, easy to use medium that is quite accessible to its targeted audience thereby making it effective. Targeting it at HCWs also helps to increase their knowledge and results into the saving of many lives.

This project is about creating the technological solution to manage the learning experience of HCWs. It requires a mobile application for delivering training content via tablet devices situated at PHCs which ensures proximity of information, assessing users on training knowledge, monitoring and recording of usage data and behaviours of users, alert/notification system and provision of help/support system to help users get around technical and usage problems. It also requires a web application that will support content management (creating and updating of training content and assessment tests), performance monitoring (storage, analysis of users' usage data), reporting, data exchange and communication capabilities with the mobile application running in various PHCs and admin functionalities such as user access controls. It also involves the system interacting with an IVR system to send and receive data where necessary.

The mobile application will be deployed in about 300 PHCs situated in the rural areas and therefore will be better running offline to avoid internet connectivity issues. It would feature an easy to use interface to ensure that even new device users can get along easily.

The web application needs to be able to create content to be downloaded periodically by the mobile application and facilitate data exchange in both directions. It would be the administrative and management platform for the entire solution. The web application should be accessible to only authorised and trained users. It should also feature relationships and data exchange schemes with the IVR system for the project.

Techie Planet is capable and ready to provide a high standard solution that will take care of the above requirements even in more technical detail to help achieve the goals of this project. We will employ state of the art software engineering and development technologies and methodologies to create a solution that is tailored particularly to your requirements but also easily extensible to handle more requirements in the future. This will also be achieved by working closely with your team throughout the development process. We shall endeavour to work within the project timeline provided (April 2014 – July 2014) and provide support for the solution after deployment to ensure its smooth running.

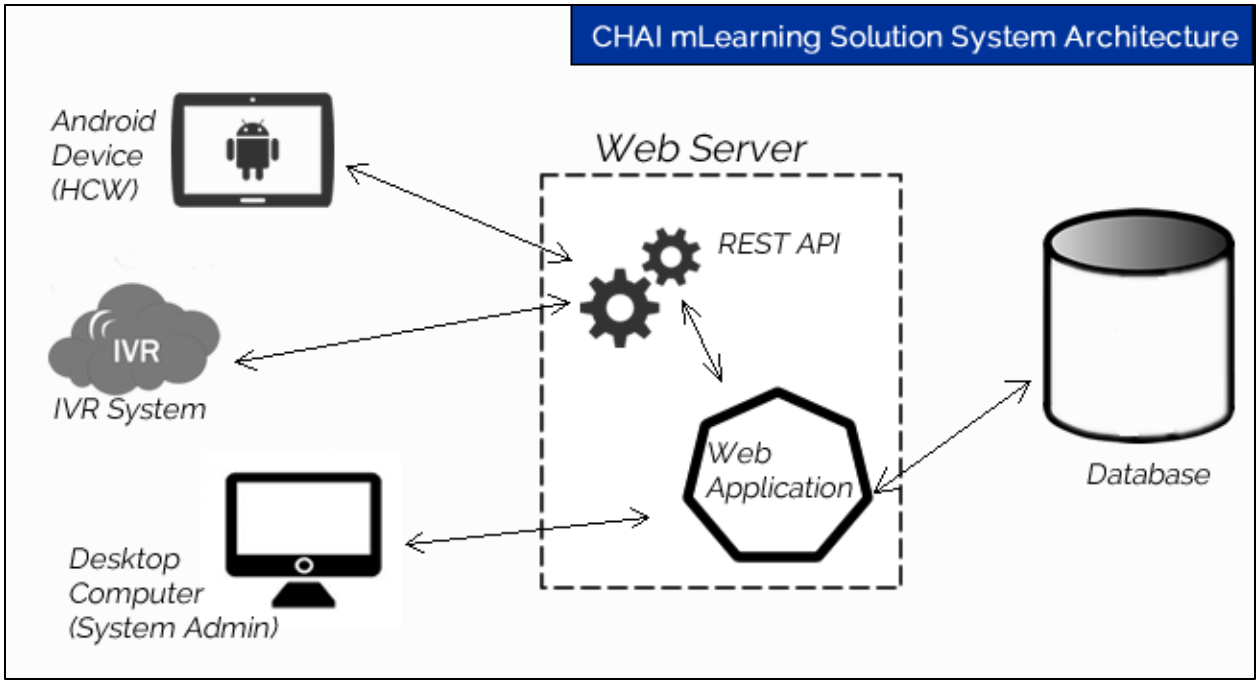

Figure 1: System Overview Diagram

2.0 REQUIREMENTS ELICITATION AND SYSTEM IMPLEMENTATION

2.1 FUNCTIONAL MODULES

The solution is divided into two major subsystems which are the web and mobile applications. The two are connected by a client/server relationship in which the web application is the server and the mobile application is the (fat) client.

Each of the above can be further broken down into constituent functional modules as discussed below.

2.1.1 THE WEB (SERVER) APPLICATION

This is a three tier web solution for managing and administrating the entire system. It will be accessed by the MOH and CHAI admin personnel. Modules that make up this subsystem are discussed below.

User Registration and Profiling

Every user of the system must be preregistered with their personal and professional information. They will be able to make changes to their own information (except where not allowed e.g. cadre). They will also choose a username and password at registration time. Passwords will be kept in a database in a 32-128 bit encryption format.

User Roles and Privileges

Based on the cadre of registered users (both HCW and admin), Role Based Access Control (RBAC) limits will be defined to control the types of information and functionalities they can access and/or manipulate. This will be defined by the organization and configured on the web application by the system administrator. Changes can also be made to the privileges available to particular roles (or cadres) at a later time.

System Login

The solution will be deployed on the web and so will require a user login system to ensure information and functionalities provided are only available to authorised users. This will be implemented using a user login system utilizing the username and password combination of registered users only.

Dashboard and analytics

This will be the first page to greet admin personnel after logging into the system. Its purpose is to provide an overview of the state of things as concerns the solution. It will show cumulative usage and user performance data from various facilities where the solution is deployed. This will include

information such as total number of users per facility, number of trainings taken per user, number of updates downloaded by each facility, the number of times a particular training has been accessed and so on. It will also provide a breakdown of these information where possible.

Reports

Reports will help to create printable versions of summarised data concerning the usage of the system. It will generally include information in the dashboard but will also feature specific information queries for example total information about a user, his/her usage and performance metrics. As stated in the requirements, reports will be made available with one click buttons. However, we may have an additional dedicated menu for reports if needed.

System Administration and System Settings

This involves performing administrative tasks, content management activities and setting up system-wide policies. These tasks will be performed by trained system admin personnel either at the FMOH or CHAI. Modules in this category are discussed below.

i. **Training Content Management**
   This involves the creation of training materials and topics along with associated videos and training guides. It will also come with the capability of editing the training information, changing associated videos and guides as well as totally deleting the training. Each training will also be associated with a set of cadres eligible to take it and the date limits it is required to have been taken by relevant HCWs. The latter forms the training time table.

ii. **Assessment Management**
   This involves setting up assessment contents with associated multiple choice answer options, specifying the correct option and linking the assessment to the training it is meant for if any. **Create, Read, Update and Delete (CRUD)** operations will also be available for each assessment.

iii. **Job Aids**
   This involves setting up job aids to go with relevant trainings. CRUD operations will be available for the job aids. Each job aid will be linked with relevant trainings and related job aids.

iv. **HCW Data Setup**
   This module is about setting up or uploading information of HCWs from various facilities into the system. The system will provide options for doing this either in batch or singly.

2.2 MOBILE APPLICATION FUNCTIONAL MODULES

This section discusses the mobile application that will run on the tablets in the rural health facilities. The mobile app will be accessed by the HCWs in the facility as well as the facility local tech admin.

The mobile application is a fat client to the web application and is where all the content created in the web application is consumed. It is also from here that most of the usage data cumulated in the web application is gotten. Therefore, there must be a seamless communication and data exchange mechanism for passing data between the two subsystems. Data will be exported from the tablet periodically for permanent storage on the web server. The mobile application will be a hybrid application that will run primarily on the Android platform but can be easily ported to other platforms such as iOS, Blackberry OS and Windows Phone devices if/when needed.

Modules that make up this subsystem are discussed below.

Application Login

Only users (HCWs) that have been preregistered (on the web application) can access the mobile application on the tablet. HCWs would have been registered on the web application and their information transferred to the tablet for their facility. Subsequent registrations may also be done on the tablet by local facility admins in cases of omissions or new personnel transferred to the facility. In cases of new personnel, their personal, professional and current usage information must be transferred to the new facility's tablet if they are coming from a facility that participates in this program.

Dashboard, Alerts/Notifications System

A successful login greets the user with a dashboard showing their own usage information such as number of trainings taken, number of tests passed, average performance, etc. On this screen they also get all the notifications relevant to them for example, a user may see notification that they are due to take a training or are yet to take the test associated with a training they have taken.

The dashboard will link to the main menu. The main menu will provide links to every part of the application.

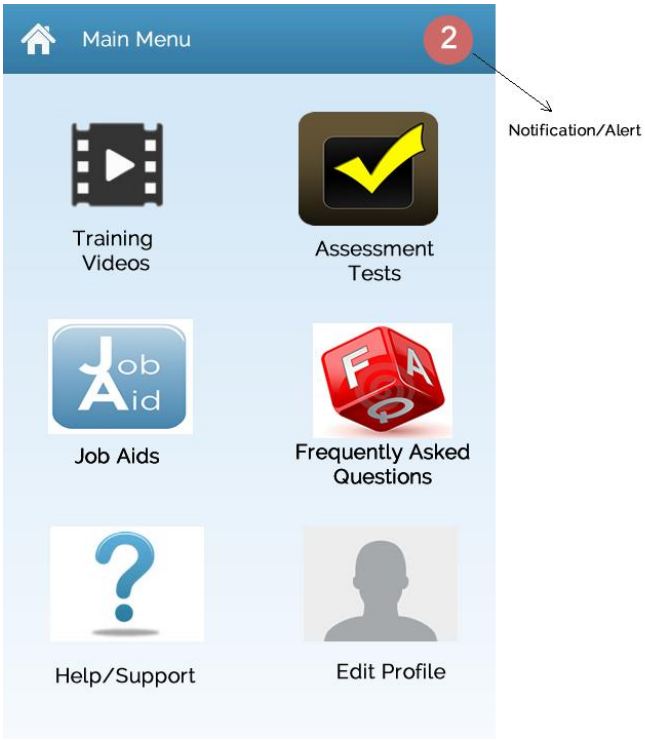

Figure 2: Main Menu Model

Training Content Access and Training Guides

Trainings are video materials that explain a concept, technique or any knowledge in healthcare provision. Trainings will be accessed by starting training sessions either at the user's profile page or via the main menu. As stated in the requirements, individual and group sessions can be started; an individual session training is followed by a test while a group session training is followed by another training.

Usage data are recorded automatically in the background as activities are going on. Information such as the training that was started, in what session, who started it and so on will be stored offline on the device. Periodically, these information will be exported to the web database for permanent storage.

Links to relevant training guides, job aids and FAQ are shown on the side of the video.

Figure 3: Training Video Model

Tests and Assessment

This involves taking associated test after taking a training. The test questions will be in multiple choice format for users to pick from. The app will indicate whether the user made a correct choice immediately they confirm their selection. This notice comes with extra information about the concept of the question.

The app displays a certificate containing the test scores and stores the data offline on the tablet pending periodic exporting for permanent storage on the web database.

Job Aids

Job aids help for quick referrals on the job to provide quick information about procedures. They need to be quite accessible. We will have related job aids on a sidebar while playing training videos. Job aids will also be accessible via the main menu. While a job aid is being read there would be a list of related job aids on a sidebar on the screen.

We will also attempt creating a video playback interrupt if the user tries to view a job aid whilst a training video is being played.

FAQ

Frequently Asked Questions (FAQ) help users find answers to issues and questions easily. Each FAQ section will go with each training module/category. FAQ icon that links to the FAQ of the category the training belongs to will be on sidebar of each training video.

The main menu will yet feature a central FAQ icon for general questions and application usage questions.

We will also adorn each FAQ section with a filter text box to be able to filter out sought questions easily when there are many of them in a section.

Help and Support

We will provide help icons on pages as specified in the specifications and link it to relevant FAQ sections.

Monitoring and Analytics

As users are using the application, some information need to be stored about their usage activities and behaviours. This will form the data for the metrics of the application usage. We will implement the mobile solution such that these information are recorded right on the tablet but provide an export feature to be able to transfer these data to the web database for persistent storage. Such data will include users' training participation details, test scores, login frequency information, etc.

2.2.1 SEAMLESS DATA EXCHANGE AND COMMUNICATION CAPABILITIES

Though we are dealing with only two of them, it is worthy of note that this mobile Learning solution is made of three subsystems – web application, mobile application and the IVR system. To achieve a homogenous system, the three systems obviously have to be able to communicate.

The server web application and client mobile application need to exchange data between each other. For example, the mobile app needs to push usage data stored offline on the tablet device to the web database via the server application, the mobile application also needs to download data from the web application periodically, for example, when there are new training materials to download onto the device.

There are also instances when the mobile or web application needs to interact with the IVR system such as storing training restore points for the basic phone training scheme.

To achieve this all important data exchange and communication between the three diverse systems we would be making use of the **Representational State Transfer (REST)** web services technology. This will enable us to define formats and parameters of information to be sent and received from subsystem to subsystem; creating a form of common language between the systems and have them exchange data easily and efficiently.

It should be noted however, that data upload and download between the mobile app and the web application will be done periodically or on schedule, maybe once or twice a month per facility since the mobile app stores and manipulates its information offline primarily.

2.2.2 SYSTEM SECURITY

User Login System

Users shall have to login with their preregistered username and password combination both on the web and mobile applications before gaining access to perform any activities. This will help to forestall unauthorized access to the solutions.

Role Based Access Control (RBAC)

We shall implement roles and privileges for users in the system so that users even when logged in only have access to functionalities they are permitted to. This will ensure that users are curtailed in their usage of the applications and it also checks their liability to tamper with things inadvertently or otherwise.

Data Inspection

We shall inspect every bit of data input into the system for malicious content e.g. using SQL injection.

Secure Cloud Hosting

We shall ensure the application is hosted in a highly secure cloud based web location with adequate firewalls and security techniques to fend off malicious attacks

2.2.3 OTHER CONSIDERATIONS

Offline Notifications/Alerts Validity Period

Since the mobile app is meant to run primarily offline, it needs to store notifications/alerts data locally on the tablet. However, tablets have limited disk storage space, therefore, so as not to exhaust the

limited storage space quickly, we will be implementing a validity period scheme for stored notifications. If a notification is more than a certain number of days (e.g. 30 days) old, then the system will automatically delete it to free up space.

Ease of use

We would develop both the web and mobile application to take into cognizance all the requirements stated under the Ease of Use section 'Business Requirements' sheet on the solutions specifications document - **icon/picture driven, easy access to information by reducing number of clicks, modal windows**, etc.

This would also help in creating an attractive User Interface (UI) and an exciting User Experience (UX) both on the mobile and web application.

Speed/Performance

We would ensure that both the mobile application and the web application execute processes speedily by using technologies and programming algorithms that will aid/enhance this purpose.

Video Interrupts

We will attempt to interrupt (pause) training videos if a user clicks on a job aid or training guide while the training video is playing on the tablet.

3.0 TECHNICAL SPECIFICATIONS

3.1 SOFTWARE DEVELOPMENT TECHNOLOGIES

Web Application

i. **Yii PHP framework (version 1.1.14) –** a lightweight, speedy, highly flexible and professional PHP development framework. Will be used for server side programming and development.
ii. **Hypertext Markup Language (HTML) –** for creating web pages.
iii. **Javascript/Jquery/AJAX –** for creating a Rich Internet Application (RIA) and enhancing user interaction.
iv. **MySQL (version 5.6.17)** - Relational Database Management Software (RDBMS) to store persistent data on web server. We will be using the MySQL InnoDb engine to avoid any table size limits.

Mobile Application

i. **Phonegap –** lightweight, rapid development mobile application development framework.
ii. **SQLite –** flat database system to store data on the tablet device.

Deployment (Hosting) Operating System

i. **Linux**

Data Exchange and Communication (Web to Mobile, Web to IVR)

i. Representational State Transfer (REST) Web Service.
ii. Javascrpt Object Notation (JSON)

Development Methodology

Because of the stiffness of the timeline provided for this project, we would be employing Extreme (Agile) Software Development Methodology. It is flexible, enhances rapid development and creates less buggy solutions because it helps us involve you in the development. This will enable us to create results quickly and carry the solution owners (you) along to make adjustments as we proceed as opposed to finishing development first then having to spend so much time on adjustments and bug fixes.

3.2 HARDWARE REQUIREMENTS

Cloud Web Hosting Server Specifications

The solution will be deployed on a cloud web server. We recommend a server with the following configuration.

Parameter	Value
Total disk space	120 GB
RAM	8 GB
Number of processes	Up to 80
CPU(s)	2 CPU(s)
Operating System	CentOS 6 64bit (Linux)
IP Address(es)	1

Table 1: Cloud Web Hosting Server Specifications

Tablet Device Specifications

- Android OS
- At least 12 GB storage space
- 10.1 inches screen width
- 1 GHz Processor Clock Speed
- Dual-Core
- Supported Digital Video Formats - at least MPEG-4, FLV, AVI, 3GP, MKV, WMV and as many others as possible.
- Audio speakers
- Preloaded Software - Video Player, Polaris Office, Web Browser, World clock, Calculator.

4.0 PROJECT DELIVERY, QUOTATION AND POST-IMPLEMENTATION

4.1 PROJECT DELIVERABLES

1. Web (Server) Application – platform for creating content and managing the whole solution.
2. Mobile (Client) Application – for accessing trainings, assessments and other solution features by HCW.
3. IVR Interaction Web Service – for passing messages to and from the IVR system.
4. Usage Documentation – reference manual on application usage.

4.2 DEVELOPMENT TIMELINES AND MILESTONES

According to documents provided to us and further discussions, the development timeframe should be between April – July 2014 where development should be done by June so that testing and deployment can follow by July. We shall work hard towards delivering the project in this timeline.

We shall also set development milestones to serve as guides for timeliness of the project per time.

Milestone	**Activity**	**Duration**	Deliverables
Milestone 1	Development of Web Application	6 weeks	Functioning web application that is capable of fully supporting the mobile app and the IVR system as described in the requirements document
Milestone 2	Development of Mobile Application	6 weeks	Functioning mobile application running on the Android OS to the specifications in the requirements document
Milestone 3	Solution Testing	3 weeks	a. Well tested and user accepted web application b. Well tested and user accepted mobile application

Milestone 4	Deployment	1 week	a. Web application running on publicly accessible cloud server. b. Mobile application installable package file delivered to the project owner.
TOTAL		**16 weeks**	

Table 2: Development Timelines and Milestones Chart

At the end of each milestone, User Acceptance Testing (UAT) and Approval exercise may be done to ensure the system is being developed in line with its goals and is functioning as required.

4.4 PROJECT DOCUMENTATION

We shall create reference manual about using the functions of both the web and mobile solutions. This will help users familiarize and understand the solution easier and faster.

4.5 TRAINING

In addition to the functional reference manual, we shall train your personnel on using the application. We envisage training in two categories.

1. **Web System Admins** – these are the set people that will be managing the web application.
2. **PHC Trainers** – to train the facility personnel, we would train a set of people (e.g. facility heads) on using the mobile application, then they can then train people in their own facility.

4.6 POST DEPLOYMENT SUPPORT AND MAINTENACE

This involves attending to user complaints, doing bug fixes and making necessary or newly required adjustments after the initial development and deployment. Since we are at a location rather remote to the CHAI offices, then we may need to do this remotely but we guarantee this is easily done.

If there are issues concerning the web application, which will be deployed on the web server and can be accessed from anywhere, then we can attend to the issues remotely from our location and get the problem solved.

If issues concern the mobile app, then we make the necessary changes, do a new build and send the installation file to the system administrators. This file can be used simply as an Android app downloaded from the internet.

In a situation whereby it is totally mandatory that we make a trip to the CHAI offices in Abuja, then the cost of our trip will be borne by CHAI but we don't see this happening more than very few times per year if at all it happens.

Please note however, when coming out to Abuja to initially deploy, roll out and hand over the solution, this cost will be borne by us.

Also, cost of trips that concern going to other parts of the country outside the CHAI offices will be borne by CHAI as we do not know time, destination and durations of these trips for now. These trips will also have to be scheduled by at least a two week notice to give us time to prepare and assign appropriate personnel to embark on it.

We are always glad to support our clients on solutions we create and we promise to keep the enthusiasm going on during and after the initial deployment.

4.7 QUOTATION

To:	**Clinton Health Access Initiative (CHAI)** 7B, Ganges Street, Off Alvan Ikoku Road, Maitama, FCT Abuja	**From:**	**Techie Planet** Block 263, Flat 4, LBIC Estate, Amuwo Odofin, Lagos
Date:	April 7, 2014	**Invoice Number:**	2014012
Title:	Quotation for the Development and Deployment of a HCW Mobile Training Platform Solution for Clinton Health Access Initiative	**Account Details** **Account Name:** **Account Number:** **Banker:**	 Techie Planet 0114627495 Guaranty Trust Bank Plc

A. APPLICATION DEVELOPMENT, CONFIGURATION & HOSTING

Item	Description	Qty	Unit Price (N)	Total Price (N)
1 a	**Software Development and Configuration** Mobile Application (Android Client) Web Application (Sever)	**lot**	4,900,000.00	**4,900,000.00**
	Sub Total (Software Development)			**4,900,000.00**
	Grand Total			**4,900,000.00**

Conditions:

Validity Period: 60 days

Terms of Payment:

(Please refer to Table 2 for details on milestones under Section 4.2, Development Timelines and Milestones)

1. 30% of total cost payable on award, beginning Milestone 1.
2. 40% of total cost payable on completion of Milestone 1, beginning Milestone 2.
3. 30% of total cost payable on project completion.

B. SOFTWARE ANNUAL MAINTENANCE AND SUPPORT

Item	Description	Qty	Unit Price (N)	Total Price (N)
1 a	**Software Annual Maintenance And Support** Mobile Application (Android Client) Web Application (Sever)	**lot**	980,000.00	**980,000.00**
	Sub Total			**980,000.00**
	Grand Total			**980,000.00**

Terms of Payment

1. 100% of total cost payable when due.
2. This payment is applicable only to subsequent years after the first year of deployment.

5.0 WRAP UP

5.1 WHY CHOOSE US

1. We have the skill, expertise and experience in delivering large scale multi-faceted systems such as this.
2. We develop solutions absolutely to user specifications and we always deliver on our promises.
3. We always provide cutting-edge technical support for solutions we develop to keep them up and running efficiently.
4. We are willing and ready to work with your internal team and provide our total cooperation to any IVR system provider you choose to work with to achieve the goals of the project.

5.2 CONCLUSION

This is a great and innovative mobile learning solution that can drastically increase the quality of health care provision in the country. Its success is highly important.

We (Techie Planet) are capable and willing to take this project from this conceptual stage to a functional stage and we look forward to your employment of our services to do just that.

Please feel free to contact us anytime.

5.3 CONTACT INFORMATION

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