INBAR KMS Solution Proposal

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A. INTRODUCTION

The International Bamboo and Rattan Organisation (INBAR) is a multilateral development organisation that promotes environmentally sustainable development using bamboo and rattan. It has 46 Member States. In addition to its Secretariat headquarters in China, INBAR has Regional Offices in Cameroon, Ecuador, Ethiopia, Ghana and India. The Inter-Africa Bamboo Smallholder Farmers Livelihood Development Programme of INBAR seeks to harness the potential of bamboo to contribute to poverty reduction, women and youth employment, environmental protection and south-south cooperation in line with the United Nations Sustainable Development Goals (SDGs). With financial support from the International Fund for Agricultural Development (IFAD), the programme aims to enhance incomes, livelihoods and climate change adaptive capacities of African smallholder farmers, women and youth by upscaling and increasing their participation in climate-smart bamboo value chains. The programme since its inception in 2019 has been producing knowledge products and impactful outcomes covering different thematic areas of among others, bamboo seedlings production, land restoration, training and capacity building, knowledge transfer, creating market linkage and research in Africa linked to socio-economic livelihood and sustainable development.

A.1. BACKGROUND

The program seeks to develop an interactive knowledge management web-interface that could serve as a repository of knowledge for products, manuals, data and information produced by the programme as well as capacity strengthening platform for south-south cooperation.

A.2. PURPOSE STATEMENT

This document provides an overview of the recommended software solution and outlines project management tools/methodologies required to achieve success with the software using an Agile Software Development Lifecycle plan. The software solution will be hosted on INBAR servers.

A.3. GOALS AND OBJECTIVES

The goals are outline as follows:

- Develop a Knowledge Management System that consist of both mobile and web which consist of two main components:
    - o Public Interface (accessible to all users) : A progressive web app which can run on both mobile and web and can be installed as an app.
    - o Secured Private Interface (access restricted to Inter-Africa Team members and community stewards) : A dashboard system for reports, data analytics and administration.
- They system will contain the knowledge of products from the project and also linked to INBAR blogs, youtube and other social media platforms.
- Monitor and evaluate progress at the country level and project level by developing an activity dashboard with indicators.
- A GPS-enabled data repository system that allows staff members to log in and upload field data remotely from the different target countries.

- In addition to the key deliverables above the system will seek to :

- Scale to current and any potential of future business needs

- Provide a system that is initiative to users and easy to use.

- Implement a system that can manage data archives, record deletion, version control, auditing, and roll back for audit trail

- Implement data security and user access control within the system to prevent unauthorized access.

- Ensure all data is managed in house within the INBAR

- Integrate into existing active directory hierarchies existing on current company servers

A.4. PREREQUISITES

The following project prerequisites are not extensive, but they are critical to the success of the KMS system.

Note: Below is an outline of the required prerequisites

Number	Prerequisite	Description	Delivered by
1	None	A requirements document must be provided that clearly outlines the goals and how those goals fit within the workflow. – This is the most important prerequisite	INBAR
2	1	The requirements document must be reviewed and accepted	INBAR and CONSULTANT DEVELOPER

A.5. SCOPE

This document provides an overview of the requirements, general architecture, project management, timelines, budget and a testing plan for the proposed solution.

A.6. ENVIRONMENT

Although we recommend a cloud platform per the requirements of this project the software will be hosted on INBAR servers. It will be compatible with all web and mobile browser applications in use by the INBAR's staff and affiliated partners. These web browsers include Google Chrome, Internet Explorer, Safari, Firefox, and Opera. Additionally, there must be compatible with the android and iOS versions of these browsers. User's should be able to login into their account through a provided website and view a complete graphical interface.

A.7 FUNCTIONAL REQUIREMENTS

Below is a detailed outline of the functional requirements:

1. **Knowledge Management System:** This will enable the creation, classification, management of various types of digital content by also retaining and protecting electronic information. To this end, it will be necessary to include the following sub-functionalities:
   a) Designed wireframe and metadata structure for the proposed online knowledge repository and knowledge exchange platform.
   b) Developed centralized information system and storage for remote and universal access to knowledge products.
   c) Support for creation of digital documents as well as management of information, records and other content.
   d) Support for system use and maintenance

2. **Information Sharing System** : This system will enable INBAR to disseminate data and processed information in multiple ways to make sure different stakeholders and audience are adequately supported and reached. To this end, it will be necessary to integrate the following sub-functionalities:
   a) Analytics System: This will enable the computational and statistical analysis of project data, especially for managers and donors.
   b) Interactive Mapping System: The interactive map will allow people to have project information on each immediate sharing of relevant updates on activities and events.African country related to activities being implemented in target countries.
   c) **i**Story: The **i**story will distribute impact stories networks and stakeholders, and it will be used for the immediate sharing of relevant updates on activities and events

3. **Performance Dashboard for Monitoring and Evaluation (M&E)** : INBAR aims to showcase its impact at all levels through monitoring and evaluation of activities in the target countries. To this end, it will be necessary to develop a real-time and interactive performance dashboard that shows the key impact, outcomes and outputs. The dashboard is also expected to help track the results of the activities being implemented. The system should have the following features:
   a) The front end and back end application/system should be developed on free and open-source software.
   b) The application/system for data entry should able to work offline for data collection. It should only require internet for data upload and/or synchronization.
   c) The system should be able to collect and synchronise geographic/spatial data, attribute data and pictures.
   d) The web interface should able to display the web map of data collected interactively.
   e) The web interface should allow the project managers and users to filter and aggregate data using different parameters and download the data in different formats for further analysis.

A. SYSTEMS DESIGN

At a high a level the INBAR KMS will consist of 3 applications as follows :

1. PUBLIC/USERS INTERFACE : This application will be used by the public will for accessing information shared by INBAR.
2. PRIVATE DASHBOARD INTERFACE : This will be used by INBAR staff and affiliates only for administering of data in the public app, uploading data, visualizing data collected, report generation, database administration and all other INBAR staff only related activities.

3. ANDROID DATA COLLECTION APP : This will be the data collection app for uploading field data and taking of GPS coordinates. This app will work in offline mode and synchronize data to the server on internet availability.

INBAR KMS GENERAL ARCHITECTURAL OVERVIEW
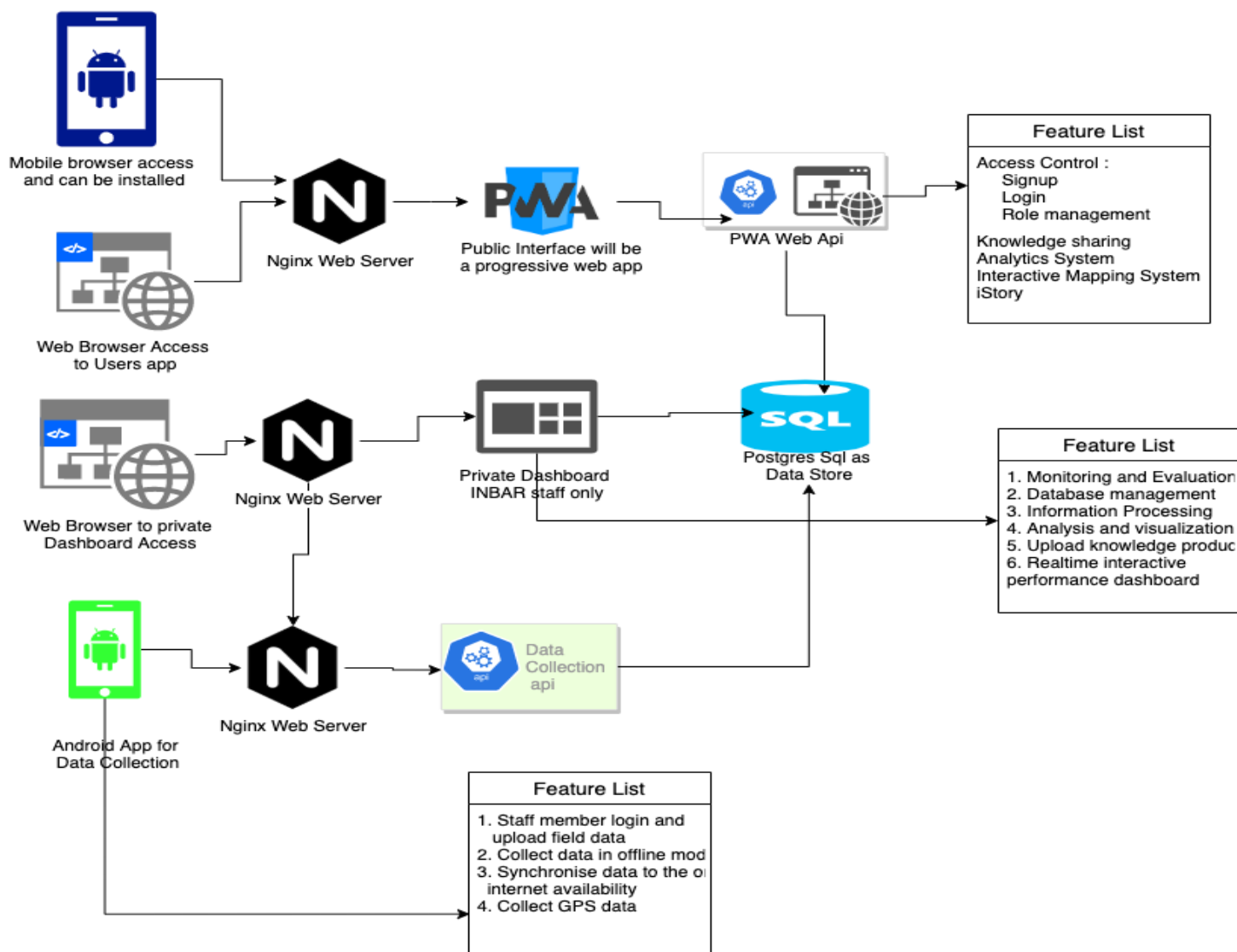
A.1. ARCHITECTURAL OVERVIEW

The above image describes the general architecture of the KMS system to be designed for INBAR.

The **Public/Users Interface** will be designed into a Progressive Web App(PWA). This will allow the app to be used both in web browsers as well as use on mobile phones running like an app. This will have the following features :

- Access Control : Signup, Login

- Knowledge sharing
- Analytics System
- Interactive Mapping System
- iStories

Brief Note on PWAs **:** Unlike traditional apps, progressive web apps are a hybrid between regular web pages and mobile applications. The term "progressive" refers to the fact that they introduce new features and, from the user experience's point of view, they are initially perceived as normal websites but progressively behave more like mobile apps.

The app will connect to a web api hosted behind an Nginx reverse proxy. The model will also be adopted for the private dashboard. Using Nginx provides the following advantages :

- **Increased security** : No information about your backend servers is visible outside your internal network, so malicious clients cannot access them directly to exploit any vulnerabilities.
- **Increased scalability and flexibility** : Because clients see only the reverse proxy's IP address, you are free to change the configuration of your backend infrastructure.
- **Compression** : Compressing server responses before returning them to the client reduces the amount of bandwidth they require, which speeds their transit over the network.
- **SSL termination** : Encrypting the traffic between clients and servers protects it as it crosses a public network like the Internet. But decryption and encryption can be computationally expensive. By decrypting incoming requests and encrypting server responses, the reverse proxy frees up resources on backend servers which they can then devote to their main purpose, serving content.
- **Caching** : Before returning the backend server's response to the client, the reverse proxy stores a copy of it locally. When the client (or any client) makes the same request, the reverse proxy can provide the response itself from the cache instead of forwarding the request to the backend server. This both decreases response time to the client and reduces the load on the backend server.

The webapi will connected directly to a PostgresSQL data store for all database related functionalities

The **Private dashboard Interface** will be designed as a mobile friendly web interface. This will have the following core features

- Monitoring and evaluation
- Database management
- Information Processing
- Analysis and Visualization
- Data Upload
- Download data/reports
- Realtime Interactive performance display

The dashboard will connect directly to the PostgresSQL data store for managing all data collected by the KMS. We recommend a PostgresSQL data store over Mysql for the following reasons:

Advantages of PostgreSQL over MySql:

Although MySQL is good for websites and online transactions, PostgreSQL is better for large and complicated analytical processes which is of great benefit for the analytics features required by the KMS. PostgreSQL comes with other rich features such as like extensibility and native NoSQL capabilities to help deal with challenging database circumstances. Postgres is open source has a long stable history is highly extendable.

Notwithstanding the client's choice of database can be used if required.

The **Android data collection app** will be used to gather field data. The app will be designed designed to have the following features :

- Collect data in offline mode
    - Text
    - Pictures
    - Geospatial
- GPS coordinate data collection
- Automatic Data synchronization on internet availability

The app will interface with a backend web api behind an Nginx reverse proxy. This allows for security and efficiency outlined for Nginx above.

B. SOFTWARE DEVELOPMENT METHODOLOGY

Agile software methodology is selected for this project. Agile software development is an umbrella term for a set of frameworks and practices based on the values and principles expressed in the Agile manifesto the principles behind it. One thing that separates Agile from other approaches to software development is the focus on the people doing the work and how they work together. Solutions evolve through collaboration between self-organizing cross-functional teams utilizing the appropriate practices for their context.
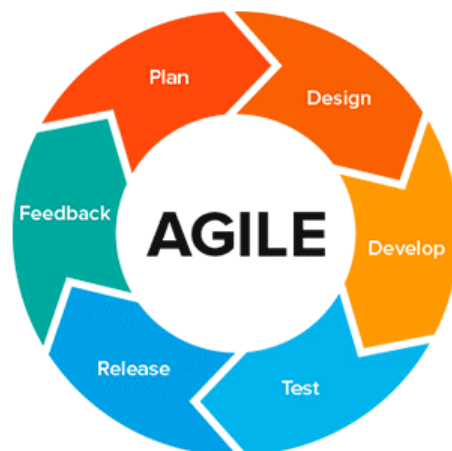
The Agile Manifesto

Agile Software development has the following core underlying principles

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

B.1. ADVANTAGES OF THE AGILE METHOD

The main benefit is the ability to change dynamically to the customers' wants and needs. A focus on the features that are the highest value to the customer. A short-fixed timeline that allows for immediate feedback from the customer and the ability to move deliverables into production.

C. TESTING

The application testing will focus primarily on the functional requirements of KMS for INBAR. This includes signup, login, gps functionality, analytics , social media integration includes report generation, tag management, contact management, user access control, and much more. Below we outline 3 different tests that ensure critical requirements of the initial deployment are thoroughly tested and working as intended. Our goal in testing these specific scenarios is to demonstrate program functions that would be frequently used and require a large amount of resources to execute.

C.1. TESTING TYPE: BLACKBOX

We have chosen to execute these tests under a Blackbox method for two reasons. Frist, we want the key users for each function in the organization to use the system as normal. This will help us determine how much processing power is needed for each super user and will help us ultimately determine the server resources that need to be initially allocated to the Reach CRM System. Secondly, this process allows us to remove any bias from the tester because we are depending on user reported results. If the user did not receive the results, they were expecting than we can further investigate to determine what went wrong.

D. TIMELINE

ID	PHASES	DELIVERIES	DURATION
1	Public Users Application	• Knowledge sharing • Analytics System • Interactive Mapping System • iStories	3 months
2	Private INBAR staff Dashboard	• Monitoring and evaluation • Database management • Information Processing • Analysis and Visualization • Data Upload • Download data/reports • Realtime Interactive performance display	1.5 months
3	Android Data collection App	• Collect data in offline mode o Text o Pictures o Geospatial • GPS coordinate data collection • Automatic Data synchronization on internet availability	1 month
4	Training(Ghana)	Training Users to use all systems of the KMS	2weeks

E. PRICING

SERVICES	ESTIMATED COST ($)
Public Users Application	5,000
Private INBAR staff Dashboard	3,500
Android Data collection App	2,500
Training Users to use all systems of the KMS	1,000
TOTAL	12,000