Terms of Reference (TOR)
for
Development of a Portal-based Information Management, Monitoring, and Reporting Mechanism for the EARN Project

1. Background and Context

The Economic Acceleration and Resilience for NEET (EARN) Project (P178077), with the financial support of the International Development Association (IDA), is undertaken by the Government of the People's Republic of Bangladesh. As its primary focus, the EARN Project aims to engage with the NEET (Not in Education, Employment, or Training) youths in rural and semi-urban areas of Bangladesh and connect them to significant and gainful employment. Specifically, the project also devises female-centric approaches that endorse women's economic participation in the labor force by providing tailored-made educational and skill-building opportunities. The project EARN, thus, addresses system-level strengthening to ensure access to alternate education, relevant skills development, and enhanced employability, including access to seed financing, internship, entrepreneurship development, and mentorship support.

The NEET matter of Bangladesh is predominantly a gender issue since 90 percent of the country's total (around 12.6 million) NEET population is covered with female NEETs (aged between 15-35). Hence, the project fosters an environment conducive to women through strategic awareness campaigns, family-oriented planning, counseling, and community and familial engagement in its executions to ensure broader inclusive participation. Its ambitious goal is to create around 900,000 skilled workers (with a 60% concentration of female participants) in the priority sectors by 2030, contributing to economic transformation and graduation from LDC status and promoting economic inclusions and diversifications. The core concept that the EARN project mainstreams is identifying eligible NEET youth from selected rural areas for several types of support: from facilitating access to relevant skills development training (especially for the women NEETs) by creating women-centric facilities in terms of their locations, safe and inclusive infrastructure and accelerated learning environment, flexible course timings, free choice of trades, childcare facilities to the gender of trainers.

A total of 250 Upazila have been selected for the project implementations based on a) areas with vulnerability characteristics (Poverty-prone, hard-to-reach, tea garden, hill-tracts, natural disaster-prone and struggling areas such as Cox's Bazar); b) areas having a high concentration of the NEET population; c) areas being highly potential in employability/ job-offering opportunities (despite high overall employment rate and a relatively high share of NEET youth). In its beneficiary selection, the project also approaches a 'priority criteria' for Persons with Disabilities (PwDs), transgender NEETs, inhabitants from ethnic minority groups, and female-headed households. In addition, making the most of the Climate Co-Benefits, the project includes climate-resilient trades, prioritizes climate-vulnerable Upazilas, and formulates climate-resilient seed financing measures.

The project has four key components. These are (i) Component 1: Enhancing access to alternate education and relevant skills development opportunities; (ii) Component 2: Promoting support for wage and self-employment; (iii) Component 3: Promoting an enabling environment for NEET youth; (iv) Component 4: Enhancing institutional capacity and project management.

The Department of Youth Development (DYD), under the supervision and guidance of the Ministry of Youth and Sports (MoYS), is the implementing agency for the EARN Project. A dedicated Project Management Unit (PMU) is established within the DYD to ensure efficient management and implementation of the project within its scope/timeline. Supporting this initiative, the Local Government Engineering Department (LGED)

will leverage its expertise in Management Information Systems (MIS) by establishing a dedicated MIS Support Cell, drawing from its experience in projects like ROSC-I, ROSC-II, and SEQAEP.

Enhancing Institutional Capacity and Project Management is one of the core components of the project, and some activities are defined in relation to supporting institutional capacity development, project management, communications, monitoring, and evaluation. An automated portal management system for an elevated information flow among the project stakeholders is a fundamental prerequisite. The use of such a portal management system aids a project like EARN, taking higher control of implementation activities at the field level, shaping more responsible decision-making, and ensuring goal-oriented outputs. Instituting a digital backbone in the project management through several digital processes in the survey implementation activities and real-time data collection with smart devices also calls for a computerized portal-based management, monitoring, and reporting mechanism.

The EARN project, for this reason, is interested in developing a comprehensive, integrated Management Information System (MIS) that will support and strengthen the collection, aggregation, summarizing, and reporting of the project results in a structured and harmonized format for all the project components. The data captured in the system will be used to monitor the processes, outputs, and outcomes, as well as to evaluate the project's impact. In alignment with the Financing Agreement between the International Development Association (IDA) and the Government of Bangladesh (GoB), a MoU has already been established between the DYD and LGED to ensure robust MIS support for the PMU.

2. Objectives of the Assignment

The salient objective of this assignment is to design, develop, implement, and maintain an innovative, robust, secure, and flexible app-based tool and a web-based portal for capturing and analyzing records of the project beneficiaries. The portal will facilitate a seamless information flow between the key stakeholders, including the PMU, field-level units, a Third-Party Evaluation Firm, and implementing partners, with the provision of accurate and comprehensive data collection, analysis of implementation results, and generation of all-inclusive reports on the progress towards the achievement of project objectives.

The web portal, access-controlled apps, and its underlying database will become the core part of the EARN project's Information Management System (EIMS) and facilitate a paperless M&E system for the project to supervise and monitor the activities under all components and sub-components.

3. Scope of Services

The scope of this system extends from collecting information from different project components/sub-components to reviewing and approving at respective authorities at various levels. Analyzing and disseminating information on project progression, financial analysis, monitoring, and indicator-based progress evaluation also lie within the scope of this assignment.

The overall scope of the services, associated tasks, required system features and functionalities, and system compliance requirements are described below. The consulting firm will propose and submit the best possible System Development Life Cycle (SDLC) approach for this project, considering the scope, requirements, objectives, organizational environmental factors and behavior, project timeline, ultimate deliverables, and various resources to be used.

The scope of service will include but not necessarily be limited to the following:

A. Features and Functionalities

The EARN Project will introduce a comprehensive system to streamline portal-based information management, monitoring, and reporting processes. This integrated system will encompass a user-

friendly web portal alongside versatile mobile applications tailored to the project's dynamic needs. While the final array of features and functionalities will be determined during the requirement analysis phase, this section will detail the core components forming the backbone of the project's technological infrastructure.

a) User Management & Access Control

A **Single Sign-On (SSO)** module will be designed to serve as a centralized authentication gateway, allowing users to **access the web portal and mobile applications with unique credentials**. This module will be fortified with **advanced encryption** methodologies to **safeguard user credentials**, ensuring compliance with World Wide Web Consortium (W3C) standards for universal browser and operating system compatibility. In alignment with the Bangladesh National Digital Architecture (BNDA) framework, the SSO module will adhere to strict Authentication and Authorization protocols. It will feature a **comprehensive logging system** that records service utilization and access specifics. An integrated Log monitor dashboard will provide extensive analytics and reporting tools, enhancing system oversight and administrative operations.

All the services and applications developed for the project will be integrated with the SSO module for **user authentication and Access Control List (ACL) management**, enforcing **granular access control down to individual interface elements**. The system will be designed with administrative functionalities to assign user permissions based on defined roles, ensuring a secure and efficient operational environment.

b) Web-based Application

The web portal will be designed to offer a comprehensive suite of features that facilitate the input, update, and display of data alongside robust analysis capabilities. It will also enable the generation of essential outputs. Additionally, a publicly accessible webpage will be established, featuring restricted data access to ensure security and privacy. The key features and functionalities of this web portal/application are extensive and include, but are not limited to:

Sl. No.	Feature	Salient Functionalities	Phase
1	User Registration, Authentication and Authorization	• Integration of the **SSO module** to ensure a streamlined and secure **registration and login** experience • Implementation of One Time Password (**OTP**) mechanisms for enhanced **user verification** processes • Comprehensive **user account and profile management** capabilities	I
2	Basic Information	• Information of **project coverage area,** including the Geo-Codes of Bangladesh Bureau of Statistics (BBS) • Information of **Service Providers** (SP) • Information on **Upazila Coordinators** (UC) with their deployment • Information on **Upazila Youth Development Officers** (UYDO) • **Trade Specific Curriculum**-related information • **SEB & EDT Curriculum**-related information	I

Sl. No.	Feature	Salient Functionalities	Phase
		• Information of **Youth Club** with activities	
3	Dashboard	• Implementation of a **tiered dashboard system**, structured according to the Access Control List (ACL), to provide appropriate data visibility for various user levels • Integrated **task tracking** features with automated **notification and reminder** system to enhance project management and productivity • Development of a **customizable dashboard** interface, enabling users to configure their view with role-specific **analytics, charts, and graphs**, updated in real-time for optimal data relevance and immediacy • Centralized **notification center** aggregating alerts from various modules, **categorically organized and filterable** over custom time ranges • Dedicated **support and help desk** for assisting users with queries and technical issues	I-II
4	Public Portal	• Comprehensive **project information** detailing the overview, objectives, coverage area, components/sub-components, targets and achievements, analytics, visualization, etc. • Directory with **contact details** for the PMU, UC, UYDO, SP, and other relevant entities • **Photo gallery** showcasing project implementation • **Resource center** that provides access to reports, publications, manuals, and guidelines pertinent to the project • Section for the latest **news, updates, and notices** • Section for the **success stories** • System to **verify the training completion certificates** of trainees to ensure authenticity and accuracy • Functionality to record **Innovation Grant (IG) proposals** • Provision to record and track **feedback**	I
5	Household Survey	• Feature for **planning and monitoring** survey progression • Functionality for **reviewing, updating, and approving** collected survey data through a mobile application	I
6	Beneficiary Selection	• Implementation of **weighted eligibility criteria** to identify potential beneficiaries • **Beneficiary Selection and Categorization** based on the predefined criteria	I

Sl. No.	Feature	Salient Functionalities	Phase
		• **Integration with national databases** for verification of National ID (**NID**) and/or Birth Registration Number (**BRN**) for selected beneficiaries • **Mobile number validation** of selected beneficiaries in coordination with Mobile Financial Service (**MFS**) providers • Generation of **unique identification numbers** (UID) for each selected beneficiary • **Finalization** of beneficiaries **categorized** according to the established criteria	
7	Trade Survey	• Comprehensive **planning and progress tracking** of the survey • Provision of **entry, review, update and approval** of survey data • Finalization of the **list of trade**	I
8	VLTC Activities	• Comprehensive data on Village Level Training Centers (**VLTCs**), encompassing addresses, geolocation, infrastructure, and facilities, along with ESMF indicators and visual documentation • Functionality to create and manage **batch-specific and trade-specific trainee lists** • Detailed information for **trainers/instructors** • Feature for reviewing and analyzing **attendance data of trainees and trainers** collected through a mobile application • Functionality for management of **trainee assessment** data, including entry, review and analysis • Facilities and information regarding **childcare** services • Features to support the planning and implementation of Socio-Emotional and Behavioral (**SEB**) & Enterprise Development Training (**EDT**) Training • Provisions for generating **training completion certificates** for trainees • Data management for Environmental and Social (**E&S**) aspects, including Grievance Redress Mechanism (**GRM**) • Data management for **Field-level monitoring** • Feature for reviewing and analyzing the **VLTC Visit** data collected through a mobile application • Feature for developing **annual plans for VLTCs** tailored to specific unions and villages	II

Sl. No.	Feature	Salient Functionalities	Phase
9	CG Activities	• Detailed records of **Community Groups** (CGs) alongside unique IDs for member identification • Feature to plan and track the progress of **CG training** • Functionality for plan and track the progress of **CG monthly meeting**	II
10	BOU LC Activities	• Comprehensive data on Bangladesh Open University (BOU) Learning Centers (LC), encompassing addresses, geolocation, infrastructure, and facilities, along with ESMF indicators and visual documentation • Detailed information on **tutors** • Capability to record and manage **learner enrolment** data • Functionality for entry, review and analysis of **learner and tutor attendance** data • Provision for entry, review and analysis of **learner assessment and grade completion** data • Feature for reviewing and analyzing the **LC Visit** data collected through a mobile application	II
11	IDG Activities	• Feature of **need assessment** under the Institutional Development Grant (IDG) • Capability to plan and track the progress of **civil works and construction activities** within the scope of the IDG • Provisions for planning and tracking the progress of **capacity development activities** under the IDG • Functionality to record and manage the **compliance** of Environmental and Social Management Framework (**ESMF**) guidelines • Feature for reviewing and analyzing **Data on IDG activities** collected through a mobile application	II
12	IG Activities	• Capability to **manage and analyze** the proposals for IG award notification • Provisions to keep a record of the **Activity Plan and Budget** of the individual IG Agencies • Feature to keep a record of **the beneficiaries** of IG	II
13	Communication	• Comprehensive management for **organizing and documenting** various events such as Uthan Boithak, meetings, workshops, and training sessions • Functionality for recording and archiving **minutes of events along with participant attendance** • Capability to **upload and store photographs** related to events, enhancing the documentation process	II

Sl. No.	Feature	Salient Functionalities	Phase
14	Employment and Job Fair	• Provision of comprehensive **employment and job placement** information • Facilities to record and manage data on **internships, apprenticeships, and mentorship** programs • Updates and details on **Job Fairs and Employer Meetings**	II
15	Payment Management	• Preparation of Award Confirmation Form (**ACF**) for the beneficiaries and IG Agencies with a **multi-layer approval system** • **Integration with the MFS** provider for electronic disbursement of ACF to beneficiaries • Implementation of a detailed **transactional log** for monitoring the status of each transaction at every stage • Functionality to ensure the **security of transactions** through appropriate technology and maintain a comprehensive transaction record for operational verification • Provision to record and manage the information on **disbursement to the institutions** • Capability to record and manage the information on **disbursement to IG Agencies** • Functionality for the execution of thorough **reconciliation** processes for disbursements	II
16	Beneficiary Feedback	• Provision for **GRM and feedback management** on Sexual Exploitation and Abuse/ Sexual Harassment (SEA/SH) and Gender Based Violence (GBV). • Functionality to **tracking of compliments/feedback**	II
17	AI-powered Chatbot	• Development and training of a Large Language Model (**LLM**), utilizing **datasets specific to the project's needs** • Integration of **natural language processing** for intuitive user interactions • Deployment of an **AI-powered Chatbot** to provide answers to relevant questions and deliver insights, exclusively **available to verified users** via a secure portal and designated messaging platforms	II
18	Reporting	• Provision for **customized report generation** in various formats, including tabular and template-based, with comprehensive filtering and searching capabilities within each module • Capability to **display project areas and VLTC locations** on interactive maps	I-II

Sl. No.	Feature	Salient Functionalities	Phase
		• Options to **select and filter specific columns/rows** before report printing • Facility for **instant report printing**, with additional options to **export/download reports** in Word, Excel, and PDF formats • Advanced **data analysis** tools for generating insightful **data visualizations**	
19	Application Settings and System Monitor	• **Configurable master data** to tailor the application's architecture based on parameters • Provision for **health and status monitoring** of APIs/services, including alert and notification mechanisms for administrators upon service disruptions • Comprehensive **audit logs** with detailed timestamps for tracking system activities • Versatile **notification system** capable of delivering alerts through push notifications, SMS, email, and various messaging platforms	I-II

c) Mobile Applications

Several mobile applications/modules will be developed to facilitate the Household Survey and enhance internal monitoring by collecting trainee attendance and VLTC visit reports. The salient features and functionalities of the mobile applications will include but are not limited to:

Sl. No.	Feature	Salient Functionalities	Phase
1	User Registration, Authentication and Authorization	• Integration of Single Sign-On (SSO) module for efficient and secure **user registration and login** • Implementation of One Time Password (**OTP**) for enhanced **user verification** • **Device-based user authentication** through binding user accounts with the International Mobile Equipment Identity (**IMEI**) number	I
2	Dashboard	• Implementation of a **tiered dashboard system**, structured according to the Access Control List (ACL), to provide appropriate data visibility for various user levels • Integrated **task tracking** features with automated **notification and reminder** system to enhance project management and productivity • Development of a **customizable dashboard** interface, enabling users to modify the layout and tools to fit their roles and preferences	I-II

Sl. No.	Feature	Salient Functionalities	Phase
3	Offline Data Management	• **Data synchronization** feature to enable the app to update the central database and vice versa, ensuring consistency across platforms • **Offline capability** to allow users to operate the app without an internet connection, with automatic synchronization of offline data to the central server once connectivity is restored	I-II
4	Household Survey	• Comprehensive **beneficiary profiling** encompassing demographic details, family composition, NID/BRN, educational background, vocational training, employment history, current occupation, household economic status, and disability status, along with cognitive abilities • Provision of **tracking the progress** of the survey • Mechanism for the **review and real-time updating** of survey data • Advanced capabilities to record **geolocations**, capture **images** and attach relevant **supporting documentation**	I
5	Attendance Management	• Provision to collect the **biometric authenticated attendance data** of the trainees and trainers at **the start and end of each class** • Capability for **reviewing and verifying** attendance records • Facilities to collect geolocation and photographic evidence to support attendance verification.	II
6	Field Visit Management	• **Information on field,** including training/class/IDG activities, E&S compliance, availability of necessary equipment, etc. • **Tracking the progress** of the **upazila-wise monthly** visit • **Review and update** of collected data • Facility to **capture geolocation, pictures and attach supporting documents**	II
7	Reporting	• **Comprehensive report viewing** facility enabling users to access both sent and customized reports • **Advanced filtering and search** capabilities within each module or application for enhanced user experience	I-II

The consulting firm must comply with all the abovementioned features and functionalities, but they are not limited to this list. It is crucial to acknowledge that during the system requirement analysis phase, the client reserves the right to introduce additional relevant features and functionalities.

Furthermore, the firm is expected to thoroughly analyze other relevant scopes within the outlined areas and present the most effective and comprehensive ICT solutions in its technical proposal. The

definitive modules, services, and features of the proposed system will be determined during the requirement study and analysis phase of the Software Development Life Cycle (SDLC), contingent upon the client's approval of requirements.

B. Functional and Compliance Requirements

The Functional and Compliance Requirements for the web portal and associated access-controlled applications are comprehensive and extend beyond the following scope. These requirements ensure the system performs its intended functions efficiently, reliably, and securely. They will address user authentication, data integrity, system interoperability, and adherence to relevant legal and regulatory standards.

1) The application should be developed following the design principles of Service Oriented Architecture (SOA) throughout the system.
2) The system shall be designed and developed utilizing a modular approach and Agile Scrum methodology to ensure comprehensive integration of all client requirements and feedback.
3) The architecture of the application shall be distributed and based on microservices to promote scalability, flexibility, and independent service manageability.
4) The system shall support bilingual functionality, offering both Bangla and English language options to meet the diverse linguistic needs of users.
5) Considering the operating/client environment at different levels of this application, it should be developed in such a way that it requires low bandwidth to run and supports maximum concurrent users.
6) The User Interface (UI) of the application should be developed based on an analysis of User Experience (UX) and maintain consistent aesthetics, ensuring an innovative and seamless user experience.
7) The visual aspect of the application shall adhere to contemporary industry standards encompassing responsive design, clear typography, precision in design execution, and user-friendly interfaces.
8) All modules of the application should be capable of Create, Read, Update, and Delete (CRUD) operations.
9) The user interface shall be designed in such a manner that no repeated data entry is required, and data shall be validated when entered before committing to the database or sending a request to the server.
10) The application should be capable of suggesting data or text based on Optical Character Recognition (OCR) technology.
11) The application should be robust to cope with errors during execution and erroneous input.
12) Image and other content customization features should be built within the system to allow standard content sizes for easy uploading and processing.
13) The proposed solution should be secure, hosted in a secure environment, and accessed through a secure protocol.
14) There should be a proper backup plan, and backup should be done within seven (7) days.
15) The application should be scalable and upgradeable as and when the number of users and content increases.

16) The system should be built with load management functionality.
17) The application should be able to integrate seamlessly with future modules/ components/applications.
18) Continuous Integration and Continuous Deployment (CI/CD) pipelines shall be automated using open-source tools to streamline building, testing, and deployment processes.
19) The application must be cloud-native, with provisioned scripts for deployment on cloud platforms using Docker containers and orchestrated with Kubernetes.
20) No data shall be disclosed to anyone by the consulting firm.
21) EARN MIS Support Cell, LGED shall be the sole owner of the source code, user manuals, software requirement specifications, test reports, and all documents related to this project.

Platform-specific salient requirements are listed as follows:

1) Web Application

1) The web portal will be developed as a fully responsive web-based application with a Graphical User Interface (GUI) based user interface to ensure flexibility and scalability.
2) The application should be developed following the Microservice Architecture.
3) The application should be lightweight and rich in client-side scripting.
4) The application should be compatible with all common internet browsers (Mozilla Firefox, Opera, Chrome, Edge, Safari, etc.) and support modern cross-platform HTML and CSS.
5) The application shall have the functionality to export/import files based on the standard template defined through web services and APIs.

2) Mobile Application

1) The application shall be developed for the Android platform, ensuring compatibility with the latest version and at least three preceding versions of the Android operating system.
2) The application should be mobile/device responsive and adaptable to all screen sizes and resolutions.
3) The user interface shall be interactive, intuitive, and user-friendly, facilitating ease of navigation and operation by the end-users.
4) The application shall possess the capability to collect and store data offline in the absence of Internet connectivity.
5) Upon re-establishing an Internet connection, the application shall automatically synchronize the offline data with the central server without user intervention.
6) The application shall enable users to upload collected data directly to the live server securely and efficiently.
7) The application shall include geo-tagging capabilities for photos and videos, providing accurate location context for the captured media.
8) During survey operations, the application shall display Google Maps, aiding users in geographical orientation and data collection.
9) The application shall be able to display system notifications, alerting users of important updates or actions required within the application.

All Functional Requirements (such as Data Requirements, Functional Process Requirements, etc.) and Non-Functional Requirements (like- Coding Conventions, Integration, Hosting, Security, Privacy, Sizing, Performance, Scalability, Interoperability, Data Currency, Data Exchange, Recoverability, UI/UX, Language Support, Availability, Accessibility, Reliability, Audit Trail, etc.) will be defined and finalized at the time of requirement gathering and feedback stage.

C. Tools and Technologies to be used

The tools and technologies to be used to develop the web portal and mobile applications will be finalized during the requirement analysis and software design phase. However, the preferred technology stack is envisaged as follows:

1) Web Application

- Software Development Methodology: Agile Scrum
- Application Architectural Pattern: Microservice
- Server-Side Development: ASP.NET Core, C#, Python
- Client-Side Development: HTML5/CSHTML, ReactJS/AngularJS, Tailwind CSS/CSS3
- Scripting Language: jQuery, Ajax, JSON, TypeScript
- Database: MS SQL Server, MongoDB
- API Gateway: Ocelot, Kong
- Operating System: Windows Server
- Containerization: Docker
- Deployment and Orchestration: IIS Server, Kubernetes, Helm
- Reporting: HTML, SAP Crystal Reports, RDLC, Telerik Reporting, FastReport
- Service Discovery: Consul, Eureka
- Authentication and Authorization: SSO, OAuth 2.0
- Message Brokers: Apache Kafka, RabbitMQ
- GIS Mapping: Leaflet, GeoServer
- Logging and Monitoring: Serilog, Prometheus, Grafana Loki, ELK Stack
- Testing: Postman, xUnit, Jest, Cypress
- CI/CD: GitHub Actions, Jenkins, Azure DevOps

2) Mobile Application

- Software Development Methodology: Agile Scrum
- Architecture: MVVM
- Backend: RESTful API, Python
- Programming Language/Framework: Kotlin, Flutter/Dart
- UI Framework: Jetpack Compose
- Database: Room (SQLite)
- Networking: Retrofit, OkHttp
- Dependency Injection: Dagger Hilt

- Authentication and Authorization: SSO, OAuth 2.0, Firebase Authentication
- Testing: Postman, JUnit, Espresso
- Analytics and Crash Reporting: Firebase Analytics, Crashlytics
- Version Control: Git

D. Database Design, Development, and Management

Effective database design, development, and management are crucial for maintaining data integrity, performance, and security throughout the system's lifecycle. The consulting firm will design, develop, and manage a comprehensive database system. The system will centralize data collected via various modules and services of the web and mobile applications. The firm will ensure that the database's architecture allows for swift and efficient information retrieval, aligning with optimizing performance and accessibility. The task will encompass the following components:

1) Database Design

- **Requirements Analysis:** Collaborate with the stakeholders to capture functional and non-functional requirements, ensuring a comprehensive understanding of expectations.
- **Conceptual Modelling:** Develop an Entity-Relationship Diagram (ERD) that abstractly outlines the database architecture, identifying key entities, attributes, and their interrelations, along with any constraints.
- **Logical Design:** Transform the ERD into a comprehensive relational schema, applying normalization principles to maintain data integrity and minimize redundancy. The process involves organizing data into logical tables and minimizing data duplication. Define an indexing strategy to optimize data retrieval performance, identify frequently queried fields, and create appropriate indexes to speed up query execution. Consider partitioning large tables to improve manageability and query performance based on logical criteria such as date ranges or geographical regions.
- **Physical Design:** Determine the optimal storage structures and indexing strategies to facilitate efficient data retrieval and implement robust security measures and access controls.

2) Database Development

- **Schema Creation:** Develop SQL scripts to instantiate tables, views, indexes, and other database constructs, ensuring proper data type definitions and relational integrity.
- **Data Population:** Initiate the database with data, utilizing various sources such as CSV files or existing databases, and create scripts for effective data migration, if required.
- **Query Optimization:** Write efficient SQL queries by considering factors like query complexity, join operations, and index use. Use appropriate tools to analyze query execution plans and identify optimization opportunities.
- **Stored Procedures and Functions:** Integrate business logic into the database via stored procedures and functions to enhance operational efficiency and performance.
- **Triggers and Events:** Implement triggers to maintain data integrity and automate processes through scheduled events.

3) Database Management

- **Performance Tuning:** Monitor and enhance database performance through meticulous query optimization, indexing strategies, and efficient caching mechanisms.
- **Data Quality Assurance:** The firm will develop outline procedures for data validation, including data reconciliation, error detection, and resolution. They will conduct periodic audits to ensure data integrity and identify areas for improvement. The firm will develop a mechanism to verify the NID/Birth registration of beneficiaries, the parents' NID, and the registered mobile number for receiving all types of ACF. The firm will also include provisions for collecting data with GPS coordinates following the Open Geospatial Consortium (OGC) standard to ensure accuracy when required.
- **Data Integrity:** The system must enforce the completion of all required fields before submission is allowed. Incomplete forms with missing mandatory information will be automatically rejected to maintain data integrity. Rigorous data entry validation protocols, such as dates and numerical information, will be implemented to verify the accuracy of inputted data. Users will be promptly notified of errors and allowed to correct them before submission. Transactional integrity will be monitored actively for any conditions that may compromise data integrity. Should any such condition be identified, the system will immediately revoke the affected transactions to prevent the propagation of erroneous data.
- **Data Archiving:** The system should have the facility to archive all the transactional data tables in the respective history tables within the same database. The system should be able to view historical data and generate reports from historical datasets.
- **Data Synchronization:** The firm will facilitate other vendors to synchronize the database with various other web portals, including the Youth Portal (Job Portal), OTSP portal, Automation portal (Seed Financing), IG Portal, and other relevant portals to ensure interoperability and data sharing among all the applications/portals of the EARN project.
- **Data Protection and Privacy:** Implement a comprehensive backup strategy to prevent data loss, complemented by reliable recovery procedures. All information collected as part of the beneficiary selection and other surveys under the project will be subject to the Data and Information Privacy policy of GoB and the World Bank.
- **Security and Access Control:** Secure the database environment by establishing robust user authentication and authorization systems and defining precise access levels for different user groups to protect sensitive information. In this regard, data validation, comparison, and a complete workflow for the approval process should be incorporated within the system, allowing the database to be reviewed, compared, and recommended for acceptance by different levels of users to the PMU. The system will generate relevant comparison reports to view the changes.
- **Health Monitoring:** Conduct ongoing surveillance of database health and execute routine maintenance tasks to prevent issues.
- **Scaling and Replication:** Strategically plan for future growth with scalable solutions and ensure data availability and load balancing through effective replication techniques.

E. Security and Privacy Requirements

The consulting firm should follow any industry-standard secure development methodologies, including but not limited to the Comprehensive Lightweight Application Security Process (CLASP) as outlined by the Open Web Application Security Project (OWASP). The firm must proactively address security vulnerabilities such as SQL Injection and Cross-Site Scripting (XSS).

The consulting firm is responsible for implementing and maintaining robust input validation controls, along with authorization and authentication controls, across all application testing and production environments. It is imperative that the firm must ensure protection against a predefined list of vulnerabilities from the outset, which includes:

- Cross-Site Request Forgery (CSRF)
- Cross-Site Scripting (XSS)
- Session Hijacking
- Session Fixation
- SQL Injection
- Input Validation and Filtering
- Output Escaping
- Code Injection

Secure File Access protocols must also be established and regularly updated to guard against new malware, spyware, and emerging threats. This continuous tuning is essential for the application's smooth operation and integrity.

The system must feature comprehensive audit trails and logging mechanisms for content modifications by system users. It should also maintain time series data to prevent loss of information passage of time and repeated updating. An up-to-date CAPTCHA mechanism must be integrated to deter spam and automated intrusions.

The system's data security will be ensured via a multi-layered process and functionality. All the segregated data will be encrypted into the database so that raw data will be highly secured from any violation. During data access, the data desired by and accessible to the users will be decrypted and presented through automated security functionality. The system's security will be ensured in all phases by maintaining security rules pertaining to physical security, digital security, integration security, complacency, and policy and code security.

A large volume of personal information, such as age, ethnicity, income, eligibility information, NID, birth certificates, and registered mobile numbers, will be collected and stored in the database. To help protect individuals' privacy, policies specifying who has access to what pieces of information will be embedded into the system during the development stages. Moreover, the data protection policies will be formulated in line with Section 26 of the Digital Security Act, 2018 which defines personal data as "identity information" and requires an individual's explicit consent or authorization for collecting, selling, storing/preserving, supplying, or using his/her identity information. Additionally, rigorous security measures must be adopted to transmit and store biometric data, such as fingerprints, to ensure its safety and privacy.

The consulting firm should submit an extensive and complete security and privacy plan for the application. In addition, it should provide a checklist reflecting the system and hosting security,

addressing potential fraud and hacking risks, accompanied by a test report validating the checklist's efficacy.

F. Integration Requirements

The consulting firm will develop a comprehensive platform/framework to integrate various software, applications, and services associated with the EARN project seamlessly alongside other external services. This integration must be executed straightforwardly and securely. All portals, applications, and external services connected to the system must be fully compatible and function cohesively, utilizing appropriate technologies such as APIs and Microservices.

The platform/framework will include, but is not limited to, robust and secure integration capabilities, a user-friendly interface for integration management, support for various technologies and protocols, high availability and scalability for future growth, and detailed logging and reporting functions for efficient monitoring and troubleshooting. This platform/framework must be designed with a forward-thinking approach, considering current technological needs and anticipating future advancements and requirements.

The system shall be able to integrate with the following external services:

1) NID Database
2) Birth Registration Number (BRN) Database
3) Mobile Financial Services (MFS) *(bKash/Nagad, etc.)*
4) SMS Gateway
5) Messaging Service *(WhatsApp/Viber/Telegram, etc.)*
6) Cloud Storage *(OneDrive/Dropbox/Google Drive, etc.)*
7) Google Maps
8) Firebase Cloud Messaging

The consulting firm should include an integration plan in their technical proposal, considering and understanding the scope of the application.

G. API and Service Management

The Application Programming Interface (API) and Service Management system aims to provide a robust, secure, and efficient environment for API and Service Management, which is crucial for the EARN project's operational success. The system will be designed to facilitate seamless system-to-system communication through a unified, easy-to-manage API access point, ensuring comprehensive governance and analytical capabilities. It will be seamlessly integrated with various software, applications, and services linked to the EARN project, enabling bidirectional data sharing via APIs. An extensive API Library will be available for straightforward integration with internal and external entities. A microservices-based API platform containing an API gateway, an Identity server, and APIs for secured data exchange will be developed.

1) API Gateway

An API gateway has to be developed using gateways like Ocelot or other open-source API Gateway in ASP.NET Core. It should have features for routing, authentication, authorization, rate limiting, searching, quality of service, tracing, logging, and load balancing. The firm should develop service discovery in the API gateway. It should manage all API services by allowing them to be registered in the central registry, which lets services automatically discover each other

without requiring a human operator to modify the application code. It should protect API services against network failure, provide network security using access control, check the health of services, and manage it automatically for high availability. An open-source service discovery provider (like- Consul) must be used.

2) Identity Server

An Identity Server is an authentication server that will implement OpenID Connect (OIDC) and OAuth 2.0 standards for ASP.NET Core. It's designed to provide a common way to authenticate requests to all applications, whether web, native, mobile, or API endpoints. The identity server application should Issue access tokens for APIs for various types of clients. The consulting firm has to develop a solution in ASP.NET Core where each client has to register in this application. After registration, these clients have to be provided with credentials for authentication. After successful authentication, the application has to be provided with a JWT access token for request authentication and verification.

3) APIs

The consulting firm has to develop RESTful APIs in ASP.NET Core to exchange vital event data with client applications. These APIs have to implement the microservices architecture. These services have to be registered in the API gateway and should authenticate the client using the identity server.

Key features of the system will include but are not limited to:

- The capability to publish APIs/Services across multiple gateways within a multi-gateway setup.
- Comprehensive management of the API/Service lifecycle.
- Enhanced security measures for APIs/Services, including domain/IP-specific API access token restrictions, API payload validation against predefined schemas, and the implementation of robust security policies for API authentication.
- Encompasses advanced threat protection, bot detection, and token fraud prevention mechanisms.
- Generation of JSON Web Tokens (JWT) to facilitate secure interactions with backend servers.
- High-performance message routing to ensure minimal latency during data transmission.
- Robust management and scaling of API traffic, with provisions for rate limiting and dynamic throttling based on predefined usage and bandwidth quotas.
- A pluggable analytics framework that provides detailed insights into API utilization patterns, including requests, responses, faults, throttling effects, subscriptions, and more.
- Adequate provisions for necessary integration with the Single Sign-On (SSO) System, enhancing user authentication processes.
- Caching to provide fast results for repeated GET requests with pagination and filtering capabilities.
- Capability of proper error handling mechanism using standard HTTP error codes.

A suite of APIs has to be developed, configured, and deployed for data synchronization between the application/services/portals of the EARN project. This includes, but is not limited to, APIs tailored for the following components:

1) The Mobile Applications
2) The OTSP Portal
3) The Automation Portal *(Seed Financing)*
4) The IG Portal
5) The Youth Portal *(Job Portal)*

The firm will provide the Full API documentation so that third-party integrators can integrate their system with this system.

H. System Requirement Analysis

a) Identification of information need

The consulting firm is expected to carry out a detailed needs assessment to prepare the precise Software Requirement Specification (SRS) for designing and developing the system and provide a concrete development plan in the SRS. The SRS should include a context diagram of the proposed system, a sequence diagram, a use case diagram, and a process flow diagram. Under this scope of work, the consulting firm will precisely analyze the details of the functions, methods, documents, actors, sites, and infrastructure of the relevant prevailing system.

The complete information to be captured by the MIS portal and access-controlled apps will be finalized during the SRS phase. The consulting firm will arrange several consultations with the PMU, key project stakeholders, and the EARN MIS Support Cell (EMSC) to capture the requirements to be incorporated within the system. The extent of information will be disseminated to which user level will also be identified at this stage. At this phase, the ultimate objective of the consulting firm will be the finalization of the system requirements in detail under the scope of ToR and approval from the EMSC.

b) Assessment of hardware, software, and overall requirement

The consulting firm will comprehensively analyze and furnish detailed technical specifications of all hardware, software, data communication, and security devices to run the proposed solution. Following this, EMSC will proceed with the procurement of the recommended hardware and software solutions.

1) Software Requirements

The firm will identify the necessary software components, including operating systems, database management systems, programming languages, component diagrams, and analytical tools. It will also furnish comprehensive guidelines for installing, configuring, and maintaining these software components.

2) Hardware Requirements

The firm will specify the hardware infrastructure to bolster the EARN MIS Support Cell. This includes, but is not limited to, servers, workstations, mobile and biometric devices, along with networking equipment. The firm will also ensure that the proposed hardware is compatible with the existing technological framework and possesses the flexibility for future growth and expansion.

The consulting firm will generate a mock-up of the user interface, ensuring it aligns with the identified user needs. This will be accompanied by a comprehensive plan that addresses each requirement, outlining the application's integration process to optimize the user experience and the strategies to fulfill the requirements. The firm must secure approval from the EMSC for the SRS before initiating the technical development of the applications. Additionally, the firm will organize a **co-design and ideation workshop** to finalize the application's content. The EMSC will determine the workshop's schedule, duration, and participants list.

I. System Design

A detailed functional scope should be defined and designed per the proposed system's software engineering standard. This is a vital phase of any SDLC. Considering the ultimate development and implementation scope, the application should be designed to achieve better performance, flexibility, scalability, extendibility, and multitenancy of the system for future expansion.

The Open Group Architecture Framework (TOGAF) or any other suitable standard compatible with the National Standard would be used as the core architecture development methodology. The consulting firm will develop enterprise principles, standards, frameworks, templates, artifacts, and best practices to make a robust system. The firm will use standard components, such as Architecture Development Method (ADM) Guidelines & Techniques, Architecture Content Framework, Enterprise Continuum, Reference Models, and Architecture Capability Framework during architecture development. The system design will be based on the approved SRS, which the EMSC will further validate.

1) Business Architecture

The Business Architecture for the EARN project necessitates a centralized software solution capable of aggregating and interpreting project data through a unified portal. This system will streamline data collection across various services and modules, ensuring consistent business practices among stakeholders. By simplifying service complexities, the integrated system will uphold the integrity of business operations and enforce cross-business regulations, fostering an environment of best practices.

2) Data Architecture

The consulting firm shall be responsible for delivering critical Data Architecture components and ensuring the establishment of Validated Data Principles. Developing a comprehensive Target Data Architecture will include a Business Data Model, a Logical Data Model, and a Data Management Process Model. Additionally, the firm will thoroughly analyze the Data Architecture Requirements, identifying gaps and outlining Data Interoperability and Technical Requirements.

The firm is also tasked with creating an extensive set of Data Diagrams. These diagrams will effectively represent the Conceptual and Logical Data framework, illustrate Data Dissemination protocols, enforce Data Security standards, strategize Data Migration plans, and manage the Data Lifecycle. Fulfilling these obligations will form a solid foundation for the system's data management and processing functions.

3) Application Architecture

The consulting firm shall deliver a Statement of Architecture, encapsulating the architectural vision and principles to steer the application's design. The firm will also present a Baseline and Target Application Architecture, illustrating present and projected states across Process, Place,

Time, and People systems models. A comprehensive Gap Analysis will identify discrepancies between the current and desired states, while interoperability requirements will ensure seamless application integration. The limitations of technology architecture will be addressed through precise technical specifications coupled with the latest business and data requirements.

Furthermore, the consulting firm is responsible for supplying detailed catalogs, matrices, and diagrams to support the Application Architecture. This includes the Application Portfolio and Interface catalogs, which list all applications and their interactions. In the application/organization matrix, organizational structures will be mapped against applications, and user roles will be defined in relation to applications in the Role/Application matrix. The Application/Function and Application Interaction matrices will illustrate the functionalities and interactivities of applications.

A series of diagrams will provide visual representations of the architecture, including but not limited to the Application Communication, User Location, Use-Case, Enterprise Manageability, Process/Application Realization, Software Engineering, Application Migration, and Software Distribution diagrams. These documents will collectively form the Application Architecture components of an Architecture Roadmap, guiding the system's development and evolution.

At this system-designing phase, the consulting firm will perform the following designing-related tasks and will produce various standard Software Design Documents (SDD):

- Identifying modules, components, tasks, I/O, and functional features
- Specifying technical and functional requirements
- User Interface design
- Description of UI and requirements
- Preparing the use cases
- Defining Integration and Interoperability Scope
- Designing system architecture
- Determine process and data flow
- Database design
- API design
- Finalizing tools, technologies, and frameworks to be used, etc.

Henceforth, the consulting firm will cover system design plan details in their technical proposal, which may include relevant activities, approaches, methods, documentation, and deliverables.

J. Development

The consulting firm must obtain prior acceptance or approval from the EMSC on tools, technologies, frameworks, and UI elements that will be used to develop both the web portal and mobile applications. The consulting firm will prepare a comprehensive development plan for the application, including a schedule consisting of development item-wise start dates, test dates, review dates, completion dates, etc., based on approved SRS and SDD.

The consulting firm must follow the standard code convention at the development stage. Code-level documentation, the header of each file, algorithms, interfaces, code compression, and APIs should be supplied with proper description and documentation. The plan should mention all standard testing tasks that must be performed in the development phase. Considering the scope mentioned

in the ToR for this system, the consulting firm will include a preliminary development plan (standard approach) in its technical proposal.

K. Coding Conventions

The consulting firm must follow the standard coding styles to ensure the production of high-quality, maintainable code. This includes practices that enhance code reusability, facilitate refactoring, and streamline task automation. A comprehensive coding convention document must be provided, detailing methodologies for effective commenting, consistent indent style, and proper naming conventions.

Moreover, the system architecture must prioritize reconfigurability, strongly emphasizing reducing hard-coded elements. The application's design should be driven by parameters, allowing for dynamic adjustments and scalability. Using database-driven data to furnish options and choices is strongly advocated, ensuring a robust and adaptable application environment.

L. Documentation

The documents listed here only give an overview of the minimum requirements. The suggested standard and list of documents are as follows:

- SQAP – Software Quality Assurance Plan (IEEE 730)
- SCMP – Software Configuration Management Plan (IEEE 828)
- STD – Software Test Documentation (IEEE 829)
- SRS – Software Requirements Specification (IEEE 830)
- SVVP – Software Validation & Verification Plan (IEEE 1012)
- SDD – Software Design Description (IEEE 1016)
- SPMP – Software Project Management Plan (IEEE 1058)
- Detailed Systems Integration Document
- Disaster Recovery Procedure document
- Project Handover Document
- Technical manual and training manual (both for administrator and system user)

The system should go through at least (but not limited to) the following analysis outcome of which should be presented to the Government or government-appointed third party in report form:

1) Test Coverage Analysis
2) Penetration Analysis
3) Load Analysis
4) Disaster Recovery Procedure Analysis

API documents should include descriptions, request parameters, responses, and error scenarios. They should also include request/response samples to provide the complete picture. Full API documentation must be provided so that third-party integrators can integrate their systems with this system in the future.

The firm should submit both the hard and soft copies of these documents. Soft copies of the application software should be provided in original formats (e.g., MS Word or Visio), which will be used to develop these documents. PDF or any other converted formats shall not be accepted.

M. Quality Assurance and Testing Requirements

The consulting firm will develop a comprehensive application testing plan from development to deployment. The testing plan must incorporate all conventional testing methodologies appropriate for the application and detail phase-specific activities such as test scripting, case development, tool selection, procedural documentation, log maintenance, and the formulation of result and report standards.

The firm shall establish a Sandbox environment to execute system tests. Throughout each project stage, the firm must perform various tests, including but not limited to functional, non-functional, installation, compatibility, smoke, sanity, security, regression, unit, integration, system, load, software performance, and acceptance tests.

The firm will engage an independent third-party entity to conduct biannual security assessments to ensure the system's integrity. These assessments should be conducted by a recognized Government organization or institute, such as the Bangladesh Computer Council (BCC). This entity will identify and rectify any security vulnerabilities discovered during these evaluations. The firm must also furnish detailed testing reports that encapsulate the testing activities undertaken and the resolutions implemented. These reports are integral to maintaining and assuring the system's quality and security standards.

N. User Acceptance Test (UAT)

User Acceptance Test (UAT) is a vital and essential phase in the application development lifecycle. At this phase, the actual user feedback and review will be taken, and finally, the application will be accepted by the EMSC after passing specific tests. Based on the UAT report, the consulting firm has to update the application accordingly to ensure user satisfaction by making it more user-friendly. It is expected that considering the type of users and their role in the application, the consulting firm must propose a comprehensive UAT plan in their technical proposal, which may cover the following:

- UAT activities are to be performed (planning, designing test cases, selecting the testing team, executing test cases and documenting, bug fixing, sign-off, etc.).
- Types of user-wise roles and test items distribution
- Resource requirement
- Activity-wise time requirement
- Activity-wise test case, test results/deliverables
- Detail user feedback test reports
- System update plan.

The consulting firm will work closely with system users and stakeholders to identify and test requirements during the UAT phase and new feature and bug fix releases. Upon completing the UAT, the consulting firm must undergo the Software Quality Testing and Certification (SQTC) and Vulnerability Assessment and Penetration Test (VAPT). These evaluations should be conducted by a recognized Government organization or institute, such as the Bangladesh Computer Council (BCC), to fulfill the requirements for Operational Acceptance. This process ensures the software meets the highest quality and security standards before being officially accepted and deployed.

O. Hosting Requirements

The consulting firm will outline the prerequisites for comprehensive hosting infrastructure. These include, but are not limited to, hardware specifications, server capacities, network architecture, security protocols, data storage solutions, anticipated traffic volume, firewall configurations, and bandwidth requirements. The firm must consider the full scope of application implementation when compiling these requirements.

Upon receipt of the hosting requirements from the consulting firm, the client will provide a detailed hosting infrastructure, including facilities and environmental considerations. It is to be noted that the Bangladesh Government's National Data Centre (NDC), operated by the Bangladesh Computer Council (BCC), will serve as the hosting facility for the application. The consulting firm must submit a detailed specification of the hosting requirement to the EMSC before hosting. The firm is obligated to host the application within the NDC. The firm is responsible for providing technical support and upgrading the technology quality standards throughout the hosting period.

P. Business Continuity

Business continuity plans will play a vital role by creating prevention and recovery systems to deal with potential threats and risks to service operations. The consulting firm is requested to propose a business continuity plan for the developed applications. It may comprise of the following issues:

- The system should support all standard backup facilities. It can be started with a disk-based backup facility and gradually moved to a Network-Attached Storage (NAS)-based backup system.
- Data and the Operating system core component will be separated. A ghost image of the Operating System will always be available in case of rebuilding the server. Once the operating system is restored, all data can be restored to the data drive.
- The system can also have an automated Backup mechanism. Users can schedule backups; the system will take them without manual intervention.
- The system must check for the media and generate a report on the backup with the date, time, and details.
- If restoration fails for any reason, the system should prompt with proper error messages and suggest what has to be done to rectify the situation via on-screen, logs, email, and text messages.
- The system should maintain an automated recovery system that archives all backup versions. The versions and incremental backup details can be retrieved from the system anytime.
- The system may be hosted on virtual servers or containers, as restoration of a virtual server/container is much easier and faster than a single-host server.

Q. System Audit

This system will maintain an audit trail of any changes or updates made in any information that is considered vital and should keep the audit log with information such as

- Log the users who are accessing the system
- Log the parts of the application that are being accessed
- Log the fields that are being modified
- Log the results of these modifications

- Log attempted breaches of access
- Log attempted breaches of modification rights
- Timestamp.

An audit trail should be kept for all transactions. All audit transactions logged are kept on the trail file or trail database, from which the system can generate different audit reports as and when required. The consulting firm will submit its proposed "Audit Plan," including strategy and standard measures, in the technical proposal.

R. Production System Management

The consulting firm is responsible for configuring and maintaining staging and production servers. This includes continuous server monitoring, sizing, and tuning to ensure optimal performance.

A regular backup schedule for database content will be established, with secure storage at a data center recommended by the EMSC. The consulting firm will also ensure the protection and security of content, hosting environment, servers, network elements, and access controls. Data bandwidth usage will be monitored and optimized to ensure efficient operation without exceeding capacity. Mirror hosting will be implemented as a fail-safe measure.

The consulting firm will guarantee the instant modular expandability of cloud computing resources facilitated through a cloud resource control and configuration panel. This includes managing IP addresses and bandwidth to meet scalability requirements, user growth, and integration with other applications of the EARN project.

The Software and database backups will be maintained at a Disaster Recovery (DR) site, as the EMSC advises. The consulting firm will monitor system performance and guide users and counterpart experts to achieve maximum uptime and user satisfaction. The systems should be developed to set up an auto-backup server to ensure uninterrupted operation in any disaster.

Version control solutions, user feedback recording systems, incident management mechanisms, and database tuning services will be provided for the abovementioned systems. The consulting firm will comply with, configure, and deploy the deployment architecture as mutually decided by both parties.

S. Deployment and Implementation

The consulting firm will install and host the developed systems on the servers or virtual machines as recommended by the EMSC. The initial deployment will be conducted on a test server using simulated data, followed by a transition to a live server using actual data. Comprehensive standard testing protocols will be performed to confirm system readiness before the live deployment.

Before initiating User Acceptance Testing (UAT), the consulting firm must furnish EMSC with a detailed list of prerequisites. The firm will implement and configure the systems on the live server after completing UAT. Due to the public-facing nature of the government application and accessibility to users at various levels, this phase is particularly critical and sensitive. The consulting firm will perform all deployment activities to the live server environment, ensuring continuous technical support.

Additionally, the firm will provide EMSC with detailed guidelines for security management and system performance optimization to guarantee maximum operational uptime. The firm is also responsible for organizing the **portal's official launch** event in consultation with EMSC, who will oversee the event's planning details, including schedule, duration, and guest list.

The consulting firm will **set up a dedicated helpdesk** at the EMSC, staffed by two (2) helpdesk officers, to provide essential operational support to application users. This will include launching a dedicated hotline, providing call center management software, and supplying & installing two (2) Large Format Displays (LFDs)/video walls, IP phones, and control devices to complete the call center setup. The firm is responsible for the ongoing helpdesk management and will ensure a seamless transition of its operations to EMSC staff following the end of the maintenance period.

T. Training and Knowledge Transfer

The consulting firm shall develop comprehensive training materials for web and mobile application usage. These materials shall include a user manual, administration manual, quick start tutorial, online help, and frequently asked questions. The consulting firm should also develop multimedia training materials for the users. These materials shall be accessible to all users via the web portal and mobile application. The user manuals shall be written in Bangla. However, other manuals and materials may be written in English.

This consulting firm will deploy technical experts to lead workshops, seminars, and training programs organized by the EMSC. The firm will also establish standard operating procedures, manage the platform, and construct a thorough risk matrix to evaluate the implications of new services.

During the implementation phase, the firm will offer ongoing technical consultancy, oversee operational management, conduct regular training updates, and provide EMSC personnel with unfettered access to source code and documentation.

A Training of Trainers (TOT) initiative will be undertaken to equip personnel from the PMU, EMSC, and key project stakeholders with the skills to deliver comprehensive training sessions, who will, in turn, train/instruct end-users on the operation of newly developed applications. A dedicated training server will be managed to facilitate uninterrupted training without affecting the live server. Comprehensive online training, guided by user manuals, will be provided to all potential users, detailing the applications' purposes and core functions.

To ensure the sustainability of system operations and facilitate ongoing enhancements, the consulting firm will transfer in-depth technical knowledge pertaining to the architecture, technology, and operational methodologies of the web and mobile applications to designated EMSC IT professionals. Moreover, a specialized Administrator Training program will be conducted for EMSC officials to bolster their operational capabilities further.

The consulting firm is responsible for organizing and supplying all necessary logistics for the TOT, as well as administrator and user training programs. Additionally, the firm will conduct an **orientation workshop** to acquaint SPs, UCs, and PMU personnel with the registration processes, data management, and application operations. The EMSC shall finalize the schedule, duration, and participants for the aforementioned workshop and training sessions.

Furthermore, the firm is expected to develop and present a coherent, effective, and pragmatic strategy for knowledge transfer within the technical proposal. This strategy must encompass a detailed and organized training plan, ensuring an efficient transfer of expertise.

U. Operations, Maintenance, and Support Service

The consulting firm will offer comprehensive post-development/maintenance support services for **twelve (12) months** following the development phase. These services encompass various activities to ensure optimal system performance and user satisfaction, including but not limited to:

1) Enhance system performance through optimization, content caching, and code refactoring.
2) Conduct regular performance monitoring of the server, database, and application to ensure optimal functioning.
3) Perform regular database health checks, improve efficiency, and fine-tune code and queries to resolve issues.
4) Maintain the Virtual Private Servers (VPS) to ensure service continuity, monitor system resources, secure adequate storage space, and manage routine and periodic backups.
5) Efficiently documenting, managing, and reporting technical issues on user-level applications in line with EMSC guidelines and formulating and implementing corrective measures.
6) Continuously updating the training manual to reflect system changes and fixing all system bugs, irrespective of their nature and complexity.
7) Enhance and reconfigure existing features, including the development of supplementary features within the existing technological framework, following the core System Requirements Specification (SRS).
8) Provide comprehensive support and maintenance covering all identified bugs and system errors reported by system users.
9) Enhance the role-wise credential system to ensure better user role management.
10) Establish an automated backup and database archiving protocol to support system recovery initiatives in case of data loss or catastrophic events.
11) Ensure the flexibility to conduct operations from the EMSC office or any other specified location.

The consulting firm shall outline a comprehensive maintenance and support service plan within the technical proposal. This plan must encompass:

- A variety of support service types and modes of delivery.
- Functionalities of the service desk.
- Strategies for configuration and change management.
- Different service layers to ensure robust support.
- The tools utilized for managing support services.
- Methods for communication management and modality.
- Procedures for release, incident, and problem management.
- Reporting protocols related to maintenance and support services.
- Management of service logs.

A designated focal person/project will act as the primary liaison with the EMSC throughout the maintenance support period. The consulting firm must implement an online customer service platform, enabling EMSC officials to log system-related issues and monitor the status of responses. The project manager must acknowledge each complaint within one hour and coordinate resolution efforts within 24 to 72 hours, subject to the complexity assessed by EMSC.

The firm will provide active operational support to ensure the system is updated to comply with changes requested by the ESMC by implementing a structured support management system to

examine raised issues carefully. Furthermore, the firm will offer approval-based issue-fixing facilities in the live environment while ensuring the highest level of data security.

During the maintenance phase, the consulting firm will be responsible for promptly resolving any reported issues and implementing necessary system security measures. The firm will also be tasked with executing reasonable modifications to the application, such as the addition of data fields or alterations to user interface components, upon the client's request. The creation of new reports and the assurance of data backup and recovery protocols are also within the firm's purview. Furthermore, the firm will conduct regular knowledge transfer sessions with EMSC personnel to ensure continuous system efficiency.

V. Ownership and Intellectual Property Rights

EARN MIS Support Cell, LGED shall be entitled to all proprietary rights, including but not limited to patents, copyrights, and trademarks. All kinds of source code, including code documentation and other approved documents (all versions trail, products, developed applications, documents, and all sorts of deliverables), which bear a direct relation to or are made in consequence of the services provided by the consulting firm under this scope of this ToR will be owned by the EARN MIS Support Cell, LGED.

At the request of the EARN MIS Support Cell, LGED, the consulting firm shall assist in securing such property rights and transferring them in compliance with the requirements of the applicable law. After the completion of the project, such rights will be handed over to the EARN MIS Support Cell, LGED, which will be produced at the time of the entire system development and implementation life cycle under the scope of this ToR will be owned by EARN MIS Support Cell, LGED.

The consulting firm is obligated to submit all finalized source codes and associated deliverables to the EARN MIS Support Cell of LGED as stipulated in the approved ToR. The firm shall not retain any rights to claim royalties or exercise any form of authority over the replication of the provided source code, databases, or any other deliverables, which may be utilized by the EARN MIS Support Cell, LGED, at their discretion for any future purposes.

All materials produced by the consulting firm in the course of this assignment, including but not limited to studies, documents, reports, graphics, and other intellectual outputs, shall be the exclusive property of the EARN MIS Support Cell, LGED. These materials shall not be disclosed, disseminated, or employed in any manner without the express written consent of the EARN MIS Support Cell, LGED.

Upon the conclusion of the consultancy agreement, all non-consumable assets acquired in the execution of the contract must be handed over to the EARN MIS Support Cell, LGED.

W. Compliance with Standard and Government Policies

The firm will follow the data protection policies, which must be formulated following Section 26 of the Digital Security Act, 2018. The policy defines personal data as "identity information" and requires an individual's explicit consent or authorization for collecting, selling, storing/preserving, supplying, or using his/her identity information. "Personal Data" means any information relating to an identified or identifiable individual. An identifiable individual is one who can be identified by reasonable means, directly or indirectly, by reference to an attribute or combination of attributes within the data or combination of the data with other available information. Attributes that can be used to identify an identifiable individual include but are not limited to name, identification number, location data, online identifier, metadata, and factors specific to an individual's physical, physiological, genetic, mental, economic, cultural, or social identity.

The firm will ensure the system's security in all phases by maintaining security rules pertaining to physical security, digital security, integration security, complacency, and policy and code security. All information collected as part of beneficiary selection and other surveys will be subject to the Data and Information Privacy policy of GoB and the World Bank.

X. Hand Over the Application

Upon the satisfactory completion of the system's development, deployment, and operational phases, the consulting firm must hand over the system to the EARN MIS Support Cell, LGED. This handover will include all technical documentation necessary for complete comprehension and future system maintenance. The documentation will encompass the system architecture, business logic, entity relationship diagrams, module integration points, data flow diagrams, workflow engine, and data dictionary. The complete credentials, detailed source code, code libraries, or any other licensed or free software components used for the project with relevant licenses and keys, if applicable, will be provided. The firm will ensure the source code does not violate third-party intellectual property rights. All the source code packages must contain at least the following:

- All necessary scripts, libraries, code files, CSS, HTML files, database schema, and the latest database dump, along with any other components essential for the software's functionality.
- Three copies of the above, adequately duplicated and delivered on optical media.
- Comprehensive documentation at both the function and script levels to facilitate complete understanding by the client.
- A detailed installation guide for the system.
- An operational installation separates from the delivered copies to verify the system's successful installation.
- A technical manual detailing the design patterns, database schema, and other pertinent textual descriptions related to the software.

This will ensure a smooth transition and empower the EARN MIS Support Cell, LGED, with the knowledge and resources necessary to manage and utilize the system effectively.

4. Duration and Location of the Assignment

The consulting firm needs to work on the abovementioned scope as per the approved project management schedule. The firm must complete the development and deployment, i.e., the development life cycle as per their proposed development methodology, within **twelve (12) months**, with a maintenance and support service period of another **twelve (12) months**.

The primary location for the assignment will be Dhaka, Bangladesh. However, the scope of this assignment includes occasional travel by the firm's technical experts to various Upazilas encompassed by the project.

5. Work Distribution and Team Composition

The consulting firm shall outline a comprehensive plan that aligns with the project's objectives, milestones, and the methodology proposed for development and implementation. The proposal must detail the team structure, delineating each member's position, role, and responsibilities, along with the tasks assigned. It should also specify the anticipated person-days for each role, the deliverables expected, and the competencies required to fulfill these roles effectively. To ensure the successful

execution of the system, the proposal must, at a minimum, include personnel encompassing the essential roles specified below:

A. Qualification and Experience Requirements of the Key Professionals

Sl. No.	Position	No. of Person	Qualification Requirements	Indicative Input (PM*)
1	Project Manager	1	• A Master's degree or higher in Computer Science (CS)/ Computer Science and Engineering (CSE)/ Information Technology (IT)/ Information and Communication Technology (ICT) or a related field. • Ten (10) years of hands-on experience in the design, development, and deployment of web/mobile applications. • Five (5) years of expertise in leading projects of comparable scale and complexity, with a preference for experience in projects involving government entities. • A consistent track record of managing and implementing three (3) web/mobile applications, one (1) of which must be for the Government of Bangladesh or a large-scale corporate entity. • A proven track record with two (2) years of full-time employment within the bidding organization. • Project Management Professional (PMP) certification from the Project Management Institute (PMI) is preferred. • Demonstrated expertise in ASP.NET Core will be an advantage.	16
2	Business Analyst	1	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field. • Eight (8) years of hands-on experience in the design, development, and deployment of web/mobile applications. • Five (5) years of expertise in system architecture, development, and implementation of projects of comparable scale and complexity, with a preference for experience in projects involving government entities. • A proven track record with two (2) years of full-time employment within the bidding organization. • Proven ability to analyze system requirements and translate them into actionable development tasks. • Certified Business Analysis Professional (CBAP) certification from the International Institute of Business Analysis (IIBA) or equivalent is preferred. • Demonstrated expertise in ASP.NET Core will be an advantage.	4
3	Database Administrator	1	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field.	7

Sl. No.	Position	No. of Person	Qualification Requirements	Indicative Input (PM*)
			• Seven (7) years of hands-on experience in database design and management. • Five (5) years of expertise in database design, normalization, analysis, management, and administration of projects of comparable scale and complexity, with a preference for experience in projects involving government entities. • A proven track record with two (2) years of full-time employment within the bidding organization. • Familiarity with data backup, recovery, security, integrity and SQL. • Azure Database Administrator Associate certification from Microsoft or equivalent is preferred. • Demonstrated expertise in MS SQL Server will be an advantage.	
4	Lead Developer	1	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field. • Seven (7) years of hands-on experience in software development. • Five (5) years of expertise in System analysis and design of projects of comparable scale and complexity, with a preference for experience in projects involving government entities. • A proven track record with two (2) years of full-time employment within the bidding organization. • Exhibit strong leadership skills and the ability to guide a development team towards achieving project goals. • Demonstrated expertise in ASP.NET Core will be an advantage.	7
5	DevOps Engineer	1	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field. • Seven (7) years of hands-on experience in software development. • Five (5) years of expertise in automated deployment, continuous integration and delivery (CI/CD), and microservices architecture of projects of comparable scale and complexity, with a preference for experience in projects involving government entities. • A proven track record with two (2) years of full-time employment within the bidding organization. • Familiarity with containerization technologies like Docker and Kubernetes. • Demonstrated expertise in ASP.NET Core will be an advantage.	7

Sl. No.	Position	No. of Person	Qualification Requirements	Indicative Input (PM*)
6	Senior Software Developer	2	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field. • Seven (7) years of hands-on experience in software development. • Five (5) years of expertise in programming, coding, or scripting for web-based applications of comparable scale and complexity, with a preference for experience in projects involving government entities. • Familiarity with front-end technologies such as JavaScript, HTML5, and CSS3. • Demonstrated expertise in ASP.NET Core will be an advantage.	22
7	Mobile Application Developer	2	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field. • Seven (7) years of hands-on experience in developing mobile applications for the Android platform. • Five (5) years of expertise in programming, coding, or scripting for mobile-based applications of comparable scale and complexity, with a preference for experience in projects involving government entities. • Strong understanding of the entire mobile development life cycle, including automated testing and building. • Demonstrated expertise in Kotlin/Flutter will be an advantage.	22

**PM denotes the unit of Person-Month, which is used to measure the indicative amount of work performed across the Development and Maintenance phases.*

B. Qualification and Experience Requirements of the Non-Key Professional

Sl. No.	Position	No. of Person	Qualification Requirements	Indicative Input (PM*)
1	Software Developer	6	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field. • Five (5) years of hands-on experience in software development. • Three (3) years of expertise in programming, coding, or scripting for web-based applications of comparable scale and complexity, with a preference for experience in projects involving government entities. • Familiarity with front-end technologies such as JavaScript, HTML5, and CSS3. • Demonstrated expertise in C# and ASP.NET will be an advantage.	60
2	UI/UX Designer	2	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field.	13

Sl. No.	Position	No. of Person	Qualification Requirements	Indicative Input (PM*)
			• Five (5) years of hands-on experience in designing and implementing user-centric solutions for web and mobile platforms. • Three (3) years of expertise in UI/UX design for projects of comparable scale and complexity, with a preference for experience in projects involving government entities. • Proficiency in using modern design tools such as Sketch, Adobe XD, Figma, or equivalent tools. • A strong portfolio showcasing a wide range of UI/UX design work, reflecting a deep understanding of user-centered design principles.	
3	ML/AI Expert	2	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field. • Five (5) years of practical experience in designing and implementing Machine Learning (ML) algorithms. • Three (3) years of expertise in Machine Learning, Neural Networks, and Artificial Intelligence (AI) on projects of comparable scale and complexity, with a preference for experience in projects involving government entities. • Proficiency in programming languages such as Python, R, or Java. • Demonstrated experience with Natural Language Processing (NLP), computer vision, and predictive modeling.	7
4	QA Engineer	2	• A Bachelor's degree or higher in CS/CSE/IT/ICT or a related field. • Five (5) years of hands-on experience in software Quality assurance in web/mobile application development. • Three (3) years of expertise in software Quality Assurance (QA) of projects of comparable scale and complexity, with a preference for those experience in projects government entities. • Proficiency in automated testing tools and frameworks. • Professional certification from the International Software Testing Qualifications Board (ISTQB) or equivalent is preferred.	13
5	Technical Document Writer	1	• A Bachelor's degree or higher in CS/CSE/IT/ICT/English/ Business Administration or a related field. • Five (5) years of hands-on experience in technical documentation for web/mobile application development. • Three (3) years of expertise in technical documentation of projects of comparable scale and complexity, with a preference for those experience in projects government entities.	6

Sl. No.	Position	No. of Person	Qualification Requirements	Indicative Input (PM*)
			• Exceptional command of the English language, with the ability to produce precise, standard, and professional technical specifications, proposals, and documentation. • Familiarity with documentation management systems and version control tools. • Proficiency in using API documentation tools like Swagger or Postman.	
6	Training Engineer	2	• A Bachelor's degree in any discipline from a reputed University. • Three (3) years of hands-on experience in IT-related fields. • Two (2) years of expertise in conducting software training for projects of comparable scale and complexity, with a preference for those experience in projects government entities. • Demonstrated ability to design and implement comprehensive training programs. • Experience in developing and managing training materials and resources.	6
7	Support Engineer	2	• A Bachelor's degree in any discipline from a reputed University. • Three (3) years of hands-on experience in IT-related fields. • Two (2) years of expertise in solving end-user problems of projects of comparable scale and complexity, with a preference for experience in projects involving government entities. • Demonstrated ability to troubleshoot and resolve technical problems.	36
8	Helpdesk Officer	2	• A Bachelor's degree in any discipline from a reputed University. • Two (2) years of hands-on experience in IT-related fields. • One (1) year of expertise in the call center or helpdesk support of projects of comparable scale and complexity, with a preference for experience in projects involving government entities. • Proficiency in troubleshooting software and hardware issues.	36

***PM** denotes the unit of Person-Month, which is used to measure the indicative amount of work performed across the Development and Maintenance phases.*

Additionally, in its technical proposal, the consulting firm may propose any necessary additional Key, Non-Key, or Support Staff required to complete the assignment.

6. Deliverables and Time Schedule

The consulting firm is required to complete the work within a period of twenty-four (24) months from the commencement of the contract. As part of the proposal, the firm must provide a comprehensive timeline that outlines all planned activities and milestones, ensuring that the proposed schedule aligns with the overall duration of the contract.

Sl. No.	Deliverable		Expected Timeline
Development Phases- 12 Months			
01	Project Inception Report with Detailed Activity Plan		10th days after the contract
02	**PHASE-I** *(five Months)*	System Requirement Specification (SRS)	20th days after the contract
03		System Design Document (SDD), UI/UX Design, Development Plan, Testing Plan, UAT Plan, Integration Plan, Deployment Plan, Security Plan, Business Continuity Plan	40th days after the contract
04		Beta Version of the Applications/Services	90th days after the contract
05		SQTC Certification, VAPT Report, Standard Test and Analysis Reports, Piloting Report	110th days after the contract
06		UAT Report, Training Report and User Manual	130th days after the contract
07		Deployment of Final Version of Applications/Services in the Production Server	150th days after the contract
08	**PHASE-II** *(five Months)*	System Requirement Specification (SRS)	170th days after the contract
09		System Design Document (SDD), UI/UX Design, Development Plan, Testing Plan, UAT Plan, Integration Plan, Deployment Plan, Security Plan, Business Continuity Plan	200th days after the contract
10		Beta Version of the Applications/Services	250th days after the contract
11		SQTC Certification, VAPT Report, Standard Test and Analysis Reports, Piloting Report	280th days after the contract
12		UAT Report, Training Report and User Manual	310th days after the contract
13		Deployment of Final Version of Applications/Services in the Production Server	300th days after the contract
14	Final Training to transfer in-depth technical knowledge of the web and mobile applications' architecture, technology, and methodologies to EMSC's designated IT professionals		350th days after the contract
15	Delivery of the final version of the applications along with all required documentation (outlined in Section-3L & 3X), detailed source code, database, required credentials, manuals (outlined in 3T), other technical documentation & diagrams, and final version of SRS & SDD		365th days after the contract
Operation and Maintenance Support- 12 Months			
16	Quarterly Maintenance Report		Seven (7) days after the end of each quarter

Sl. No.	Deliverable	Expected Timeline
17	Biannual Security Assessment Report	Seven (7) days after the end of each semester

7. Payment Schedule

The payments shall be made in line with agreed-on outputs in prescribed formats, subject to the client's approval and according to the following schedule:

A. For the Development Phase (12 months):

1) **Inception Report:** Ten (10) percent of the total Contract Price shall be disbursed upon submission of the Inception Report (deliverable 01, Section 6) and subsequent acceptance by the Client.
2) **Beta Version of Phase-I's Application/Services:** Fifteen (15) percent of the total Contract Price shall be disbursed upon submission of the deliverables 02-04, as detailed in Section 6 and subsequent acceptance by the Client.
3) **Deployment of Phase-I's Application/Services in Production Server:** Ten (10) percent of the total Contract Price shall be disbursed upon submission of the deliverables 05-07, as detailed in Section 6 and subsequent acceptance by the Client.
4) **Beta Version of Phase-II's Application/Services:** Twenty (20) percent of the total Contract Price shall be disbursed upon submission of the deliverables 08-10, as detailed in Section 6 and subsequent acceptance by the Client.
5) **Deployment of Phase-II's Application/Services in Production Server:** Ten (10) percent of the total Contract Price shall be disbursed upon submission of the deliverables 11-13, as detailed in Section 6 and subsequent acceptance by the Client.
6) **Final Training and Report:** Fifteen (15) percent of the total Contract Price shall be disbursed upon submission of the deliverables 14-15, as detailed in Section 6 and subsequent acceptance by the Client.

B. Maintenance & Operation Phase (12 months):

The application maintenance services will be carried out over twelve (12) months from the date the client accepts the deliverables. During this phase, a quarterly payment equivalent to five percent (5%) of the total contract value will be disbursed. This is contingent upon providing a Quarterly Maintenance Report (deliverable 16, Section 6) and Biannual Security Assessment Report (deliverable 17, Section 6), which must be duly acknowledged and accepted by the Client. Cumulatively, these payments will constitute twenty (20%) of the overall contract price by the conclusion of the maintenance period.

8. Implementation Arrangements

The consulting firm shall engage in a collaborative partnership with the EARN MIS Support Cell of LGED, reporting directly to the designated Focal Person and operating under the oversight of the Technical Working Group (TWG). The TWG, to be established by EMSC, will include representatives from the PMU, EMSC, key stakeholders, and the World Bank, all of whom may provide valuable contributions to and utilize the applications developed within this TOR's framework. Regular meetings of the TWG will occur

at least once a month from the commencement of the assignment, with the provision for additional ad hoc meetings upon the firm's request.

In alignment with Section 6, the consulting firm is responsible for sharing all deliverables with EMSC for review and feedback. The firm's representatives will attend meetings convened by the EMSC as necessary, coordinated through the Focal Person, EMSC.

9. Facilities to be provided by the Client

The Client will ensure the following administrative support is provided for the duration of the assignment:

a) Allocation of adequate office space within the EMSC premises, furnished with necessary amenities, internet service, and printing facilities.

b) Prompt review and endorsement of various reports to maintain adherence to project timelines and prevent delays due to administrative hurdles.

c) Coordinate meetings with all pertinent stakeholders and the TWG.

d) Provision of access to all relevant documentation and data essential for the successful execution of the project.

e) Issuance of an acceptance certificate following the satisfactory completion of the contract, and the delivery of all applications developed under this TOR.