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# American International University-Bangladesh (AIUB) Department of Computer Science Faculty of Science & Technology (FST)

**PROJECT TITLE**

**Rural Village Empowerment System**

A Software Engineering Project Submitted By

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| --- | --- | --- | --- | --- |
| **Semester: Summer 2024-2025** | | **Section: K** | **Group Number: 01** | |
| SN | Student Name | Student ID | Contribution (CO3+CO4) | Individual Marks |
| 01 | Md. Sifat | 23-51221-1 |  |  |
| 02 | T.A Nahian | 23-51257-1 |  |  |
| 03 | Md. Saidul Islam | 22-49719-3 |  |  |
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The project will be Evaluated for the following Course Outcomes

|  |  |  |
| --- | --- | --- |
| **CO3:** *Select* appropriate software engineering models, project management roles and their associated skills for the complex software engineering project and evaluate the sustainability of developed software, taking into consideration the societal and environmental aspects | Total Marks | |
|  | |
| Appropriate Process Model Selection and Argumentation with Evidence | [5 Marks] |  |
| Evidence of Argumentation regarding process model selection | [5Marks] |  |
| Analysis the impact of societal, health, safety, legal and cultural issues | [5Marks] |  |
| Submission, Defense, Completeness, Spelling, grammar and Organization of the Project report | [5Marks] |  |
| **CO4:** *Develop* project management plan to manage software engineering projects following the principles of engineering management and economic decision process | Total Marks | |
|  | |
| Develop the project plan, its components of the proposed software products | [5Marks] |  |
| Identify all the activities/tasks related to project management and categorize them within the WBS structure. Perform detailed effort estimation correspond with the WBS and schedule the activities with resources | [5Marks] |  |
| Identify all the potential risks in your project and prioritize them to overcome these risk factors. | [5Marks] |  |

Description of Student’s Contribution in the Project work

|  |
| --- |
| Student Name: Md. Sifat  Student ID: 23-51221-1  Contribution in Percentage (34%):  Contribution in the Project:   * UI / UX Form Design * Class Diagram * Activity Diagram * Data Flow Diagram (DFD) * Budget Estimation * Scheduling   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Signature of the Student |
| Student Name: Saidul Islam  Student ID: 22-49719-3  Contribution in Percentage (33%):  Contribution in the Project:   * Risk Management * Risk Reduction Leverage (RRL) * Gantt Chart   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Signature of the Student |
| Student Name: TA NAHIAN  Student ID: 23-51257-1  Contribution in Percentage (33%):  Contribution in the Project:   * Effort Estimation * Revision & minor correction   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Signature of the Student |

# PROJECT PROPOSAL

## Background to the Problem

* Background to the Problem Bangladesh is a country where the majority of people live in rural areas, facing various socio-economic challenges due to lack of access to modern facilities. Seasonal labor shortages, syndicates controlling labor wages, absence of proper agricultural machinery sharing systems, limited skill development opportunities for rural women, inefficient local transportation systems, and lack of technological support in farming processes are prevalent issues. Additionally, a large portion of the rural population is technologically illiterate, making digital service accessibility a significant challenge.
* The root causes include the lack of a centralized platform to manage agricultural labor and equipment, poor linkage between rural producers and urban buyers, no structured platform for skill development of women, and absence of affordable technological solutions for daily life problems in rural Bangladesh. This has resulted in underemployment, resource wastage, and economic disparity in rural areas. Addressing these problems is crucial for rural economic development, self-reliance, and national progress.

## Solution to the Problem

Solution to the Problem The objective of our project is to develop a "Rural Digital Empowerment Platform (RDEP)"—an all-in-one mobile and booth-based system designed to solve the key problems faced by rural communities in Bangladesh. The solution will integrate multiple modules including:

1. Agri Workforce & Resource Sharing System: Enables farmers and landowners to hire agricultural workers based on demand and seasonality. It also facilitates renting essential farming equipment (Pumps, Tractors) on-demand through a P2P model.
2. Crop Disease Detection & Treatment Suggestion: Allows farmers to detect crop diseases using AI-based image recognition via mobile camera and provides instant treatment suggestions with product purchasing options.
3. Rural Women Skill Development & Work-from-Home Platform: Offers video tutorials, a work marketplace, and a product showcase to empower rural women for home-based income opportunities.
4. Local Transportation Sharing Module: Facilitates van/auto/rickshaw booking services within villages to eliminate transport syndicates and ensure fair pricing.
5. Smart Village Booth System: For people who are not comfortable with smartphones, dedicated booths with trained volunteers will assist in availing services at a minimal fee.

This solution directly addresses societal challenges by creating employment opportunities, eliminating exploitation by middlemen, increasing productivity, and ensuring inclusivity for all levels of users (both tech-literate and illiterate).

Target Users: Rural farmers, women entrepreneurs, local vehicle owners/drivers, small landowners, village shopkeepers, NGOs, and local union parishads.

Contribution to Scientific Results: The platform will utilize AI for real-time crop disease detection, optimize resource sharing through dynamic scheduling algorithms, and ensure service inclusivity through hybrid mobile-booth interaction. This integrated ecosystem will showcase a replicable model for rural digitization with significant societal impact.

Literature Review: Existing platforms like Krishoker Janala (BRAC) provide agricultural information, and apps like Shohoz serve urban ride-sharing. However, none offer a consolidated solution tailored for rural Bangladesh integrating workforce management, equipment sharing, skill development, and crop diagnosis in a single ecosystem. Our platform will bridge this gap by combining these services, making it a comprehensive solution for rural empowerment.

# SOFTWARE DEVELOPMENT LIFE CYCLE

## Process Model

## Process Model Considering the project's complexity, user feedback dependency, and phased development nature, we are selecting the Incremental Process Model. Initially, core functionalities like Agri Workforce & Equipment Sharing will be developed and deployed. Based on feedback, Crop Disease Detection, Women Skill Module, and Transportation Sharing features will be added in successive increments.

## Arguments for Model Selection:

## Users are diverse (Farmers, Women, Drivers, Booth Operators), so feedback-driven phased development is essential.

## Incremental delivery allows critical modules to go live early, ensuring usability and stakeholder engagement.

## Reduces risk by managing complexity in smaller, manageable releases.

## Evidence Supporting Incremental Model:

## Many rural digitization projects (e.g., India's Digital Grameen) successfully adopted incremental models.

## High flexibility for change requests post initial deployment.

## Early deployment ensures faster validation of real-world use cases.

## Project Role Identification and Responsibilities

## Project Manager – Oversee entire project development, communication with stakeholders, timeline management.

## Requirement Analyst – Collect requirements from rural users, NGO workers, and union parishad officials.

## System Architect – Design system architecture including Mobile App, Booth Kiosk System, Backend APIs.

## UI/UX Designer – Design user-friendly interfaces suitable for rural users with minimal tech literacy.

## Mobile App Developer – Develop Android application ensuring offline capabilities.

## Backend Developer – API development, database design, and integration of AI microservices.

## AI Developer – Build and integrate crop disease detection module.

## Booth Volunteer Trainer – Prepare training modules and workshops for booth operators.

## QA Tester – Ensure functionality testing with real users and validate usability.

## Deployment & Support Engineer – Handle deployment in village booths and ensure ongoing support.

**Class Diagram**

**A computer screen shot of a computer flowchart

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**Data Flow Diagram (DFD)**

A diagram of a business

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**Activity Diagram**

**A diagram of a farm

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**UI / UX Design**

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**Form-2:**

A screenshot of a phone

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**Form-3:**

A screenshot of a login screen

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**Form-4:**

A screenshot of a computer

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**Form-5:**

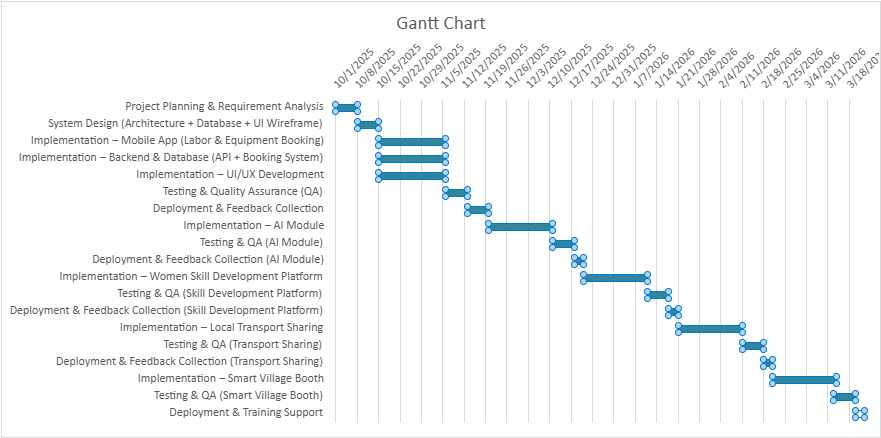
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**Scheduling (Gantt chart)**

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**Effort Estimation (CoCoMO)**

|  |  |  |  |
| --- | --- | --- | --- |
| Project Type | Coefficient Factor | P | T |
| Organic | 2.4 | 1.05 | 0.38 |
| Semi-detached | 3.0 | 1.12 | 0.35 |
| Embedded | 3.6 | 1.20 | 0.32 |

Here our project is a semi-detached COCOMO model with approximately 75k lines of codes

Here, the coefficient factor=3.0

Project Complexity, p = 1.12

SLOC Dependent Coefficient, T = 0.35

SLOC=75k

Total Effort=PM=Coefficient factor\*(SLOC/ 1000) ^P

=3 \* (75000/1000)^1.12

=377.74

Total Development Time=DM=2.50\*(PM)^T

=2.50\*(377.74) ^0.35

=19.95

=20 months

Required number of people, ST=PM/DM

=377.74/19.95

=18.93

=19 persons

**Budget Estimation**

**Approximate Cost path:**

* Total Effort (COCOMO): 377.74 person-months.
* Total Duration: 20 months → average staffing ≈ 18.9 → round up 19 persons.
* Average cost per person-month: 35,000 BDT (assumed).
* Overhead: 25% (office, licences, infra).
* Contingency: 10%.

**Result (rounded):**

* Development cost (PM × rate): 13,220,900 BDT
* Overhead (25%): 3,305,225 BDT
* Subtotal: 16,526,125 BDT
* Contingency (10% of subtotal): 1,652,612.5 BDT
* Final estimated budget: 18,178,737.5 BDT ≈ 18,178,738 BDT

**Phase-wise allocation (sample — allocated PM and cost proportional to phase duration):**

* Planning & Requirements (7 days): 12.13 PM → 424,524 BDT
* System Design (7 days): 12.13 PM → 424,524 BDT
* Implementation — Mobile (22 days): 38.12 PM → 1,334,219 BDT
* Implementation — Backend (22 days): 38.12 PM → 1,334,219 BDT
* Implementation — UI/UX (22 days): 38.12 PM → 1,334,219 BDT

Overall Cost (approximately):

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**Risk Management:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Description** | **Impact** | **Response** | **Level** | **Owner** | **Notes** | **Proba**  **bility**  **(%)** |
| R01 | Server overload during harvest or planting season | System crash | Use cloud auto-scaling and load balancing | Critical | System Architect | High usage expected in seasonal demand spikes | 80 |
| R02 | Data breaches exposing farmer or landowner information | Loss of trust | Regular security audits | Critical | Security Lead | Farmers’ personal data (NID or Phone) highly sensitive | 70 |
| R03 | Inaccurate crop disease detection by AI | Wrong treatment suggestions | Add expert review + feedback loop | High | AI Developer | Farmers may lose crops if AI is wrong | 65 |
| R04 | Limited internet connectivity in rural areas | Service inaccessible | Offline support + SMS-based booking | Critical | Mobile Development Team | Many villages still rely on 2G | 75 |
| R05 | Low adoption due to digital illiteracy | Platform underused | Smart Booths with trained volunteers | Medium | Community Officer | Elder farmers may prefer booth service | 60 |
| R06 | Language or cultural barrier in UI | Misunderstood features | Multi-language + icon-based UI | Medium | UI/UX Designer | Support Bangla and regional dialects | 55 |
| R07 | Fake workforce booking (spam/abuse) | Wastage of resources | Farmer verification + OTP system | High | Backend  Designer | Fake job requests could frustrate workers | 45 |
| R08 | Payment disputes between farmers & workers | Trust issues | Digital ledger + instant receipts | High | Finance Lead | Need transaction logs for transparency | 60 |
| R09 | Resistance from local transport syndicates | Conflict with project goals | Local partnerships + awareness drives | Medium | Field Officer | Syndicates may block adoption | 55 |
| R10 | Third-party API (maps, payment) failure | Booking/payment failures | API fallback + cached data | High | Integration Team | Google Maps not always reliable offline | 50 |
| R11 | System downtime during updates | Service disruption for farmers | Blue-green deployment, scheduled off-peak updates | Critical | QA Team | Updates must be tested in staging | 40 |
| R12 | Lack of funding for booth setup | Delay in rollout | Seek NGO/Govt grants, phased rollout | Medium | Project Manage | Focus on 5 priority areas first | 50 |
| R13 | Women skill module underutilized | Reduced empowerment impact | Campaigns + NGO partnerships | Medium | Women Lead | Promote early success stories | 50 |
| R14 | Loss of critical data during migration | Loss of records | Daily backups | Critical | QA Team | Must test backup restore process | 40 |
| R15 | Government system integration delays | Limited collaboration | API standards | Medium | Legal Officer | Bureaucracy may cause delays | 45 |
| R16 | Farmers misclassify crop diseases | Wrong recommendations | AI confidence score + second check | Medium | AI Developer | Education module may help accuracy | 55 |
| R17 | Mobile apps not working on old devices | Excludes vulnerable groups | Optimize for low-end hardware | Medium | Mobile Team | Many farmers use cheap phones | 50 |
| R18 | Volunteer booth operators poorly trained | Bad user experience | Standard training modules + tests | High | Training Lead | Training must be simple and visual | 65 |
| R19 | Natural disasters (floods, storms) disrupt services | Service downtime | Disaster recovery servers | Critical | Operation Manager | Must be tested in drills | 70 |
| R20 | Farmers reluctant to share personal info | Low adoption | privacy campaign | Medium | Community Officer | Transparency builds trust | 55 |
| R21 | Poor power supply in villages | Booths offline | Solar backup for booths | High | Hardware Lead | Common in remote areas | 60 |
| R22 | Farmers expect instant problem-solving | Unmet expectations | chatbot for FAQs | Medium | Support Team | Manage expectations carefully | 50 |
| R23 | Delay in payment disbursement | Loss of trust in platform | Auto-payment via MFS integration | High | Finance Lead | Farmers prefer bKash/Nagad | 65 |
| R24 | Cyberattacks | data loss | Firewalls + regular patches | Critical | Security Lead | Bangladesh agriculture systems are soft targets | 60 |
| R25 | Poor user feedback collection | Slow improvement | In-app rating & feedback forms | Medium | UX Designer | Farmers need simple icons to give feedback | 55 |
| R26 | Farmers provide false reports for subsidies | Misuse of system | manual review | Medium | QA Team | Verification needed for reports | 40 |
| R27 | Farmers distrust AI decisions | Low confidence in platform | Transparent explanation of AI results | Medium | AI Developer | Why AI chose this feature | 45 |
| R28 | Volunteers overburdened during peak season | Burnout, errors | Rotation system | High | Volunteer Coordinator | Critical during planting season | 55 |
| R29 | Political influence on booth management | Biased service delivery | Neutral NGO supervision | Medium | Governance Officer | Must keep politics out of project | 40 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Risks** | **Category** | **Probability** | **Impact** | **RMMM** |
| System overload during harvest/planting season | PS | 80% | 2 – Critical | Use cloud auto-scaling, conduct stress/load tests |
| Low adoption due to rural digital illiteracy | CU | 60% | 2 – Critical | Deploy Smart Booths, awareness campaigns, NGO partnerships |
| Inaccurate crop disease detection (AI module) | TE | 65% | 2 – Critical | Hybrid AI-human verification, feedback loop for accuracy |
| Limited internet connectivity in villages | DE | 75% | 2 – Critical | Offline-first design, SMS booking and reporting support |
| Wage/payment disputes between workers & farmers | BU | 60% | 2 – Critical | Secure mobile payment system with digital receipts |
| Transportation syndicate resistance | PR | 55% | 3 – Marginal | Partner with local leaders, incentivize drivers to register |
| Data breaches of farmer/landowner data | ST | 70% | 2 – Critical | Data encryption (AES-256), RBAC, periodic audits |
| Lack of funding for booth setup | BU | 50% | 3 – Marginal | Phase-wise deployment, seek grants & govt/NGO support |
| Language/cultural barriers in UI | CU | 55% | 3 – Marginal | Add Bangla & local dialect options, icon-based UI |
| Misuse of workforce booking (fake requests) | PR | 45% | 2 – Critical | User reputation system, OTP verification, fraud detection |
| Government integration delays | PR | 45% | 3 – Marginal | API standards |
| Women skill module underutilized | CU | 50% | 3 – Marginal | Awareness campaigns, NGO workshops, success story promotion |

Here,

* **PS** – Product Size
* **BU** – Business Impact
* **CU** – Customer Characteristics
* **PR** – Process Definition
* **DE** – Development Environment
* **TE** – Technology to be Built
* **ST** – Staff Size and Experience

## Impact Values:

* 1. — Catastrophic
  2. — Critical
  3. — Marginal
  4. — Negligible

# Risk Reduction Leverage (RRL):

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Where:

* **Risk Exposure (RE)** = Probability × Impact
* **Cost of Risk Reduction** = Estimated cost of implementing a risk mitigation strategy.

**Risk:** System overload during peak agricultural season  
**Category:** PS (Product Size)  
**Probability:** 80%  
**Impact:** 2 (Critical)

## Calculate Risk Exposure Before

RE before ​= 0.80 × 2

= 1.6

**Assume Mitigation is Cloud auto-scaling + load testing**

* New probability: **30%**
* Impact remains: **2 (Critical)**

RE after​ = 0.30 × 2

=0.6

## Estimate Cost of Risk Reduction

Assume implementing **cloud auto-scaling & load testing = 5,000 BDT**

**Apply The Formula**

RRL= (RE before​ − RE after​​) / Cost

= (1.6 − 0.6) / 5000

= 0.0002