Prototype Development Proposal for Microfinance Web Application

1. Project Overview

The primary objective of this project is to develop a functional web application prototype that demonstrates the core functionalities of a microfinance platform. The prototype will focus on **KYC (Know Your Customer) automation, fraud detection, and loan processing**, all powered by smart contract technology on the **Cardano blockchain**. It will also simulate fiat currency transactions to provide a realistic user experience. The project is expected to be completed within **60 working days**.

This prototype is designed for **microfinance institutions** and **end-users (borrowers)**. It ensures compliance with local and international financial regulations, particularly those regarding KYC and data privacy.

2. Project Goals

The prototype aims to achieve the following key goals:

KYC Automation: Streamline and automate the KYC process using smart contracts to ensure regulatory compliance and enhance customer onboarding efficiency.

Fraud Detection: Incorporate advanced fraud detection mechanisms, including rule-based systems and machine learning algorithms, to identify and prevent fraudulent activities.

Fiat Currency Simulation: Simulate fiat currency transactions using mock payment gateways or banking APIs to provide a realistic representation of financial interactions.

User-Friendly Interface: Deliver an intuitive and responsive user interface to ensure a seamless experience for both borrowers and microfinance institutions.

3. Detailed Requirements and Process Flow

The prototype's workflow will encompass the following key stages:

1. **Customer Queries Loan Information:** Users can access the web application to view available loan products, and terms, and use a loan calculator to estimate repayment amounts and interest rates.
2. **Loan Application:** Users complete a loan application form, providing personal and financial information.
3. **Verification of Customer Identity and KYC Checks:** The system integrates with third-party KYC providers to verify user identity. A smart contract automates the KYC process.
4. **Adding Customer Profile to Blockchain:** Upon successful KYC verification, a customer profile is created and securely stored on the Cardano blockchain.
5. **Checking Customer Credit Score:** The system interacts with a credit scoring engine to assess creditworthiness based on user-provided data and external credit history (if available).
6. **Evaluation Against Approval Threshold:** The loan amount requested is evaluated against a predefined threshold. Applications exceeding the threshold are flagged for manual review.
7. **Approval Workflow:** Approved loans are processed automatically, while flagged applications undergo manual review. Users are notified of their application status via email or SMS.
8. **Disbursing Funds (Prototype Simulation):** The prototype simulates fund disbursement using a mock payment gateway (e.g., Stripe or PayPal sandbox).
9. **Loan Repayment (Prototype Simulation):** Users can simulate loan repayments, updating the blockchain record accordingly.

4. Proposed Solution

The prototype will be built using the following technological components:

- **Web Front-end:** Next.js for a modern, scalable, and responsive web interface with support for SSR/SSG.
- **Backend & Database:** Supabase for database management, authentication, and backend-as-a-service functionality.
- **Mobile Application:** React Native for cross-platform mobile app development (iOS & Android) with a single codebase.
- **Smart Contracts:** Solidity for implementing the core loan processing, KYC, and fraud detection logic.
- **Blockchain Network:** Polygon for low-cost, scalable, and EVM-compatible smart contract execution.
- **Smart Contract Framework:** Foundry for fast development, testing, and deployment of Solidity contracts.
- **Data Privacy:** Compliance with GDPR and/or local data protection standards, with encryption of sensitive data.

- **APIs:** REST APIs for communication between the front-end, back-end, and blockchain.
- **Fraud Detection:** Integration of rule-based systems and machine learning algorithms for anomaly detection.

5. Prototype Development Timeline

The project will be delivered in **three major phases** over 12 weeks:

Weeks 1–4: Web Application Development (Next.js + Supabase)

- Finalize requirements and UX/UI design.
- Develop and deploy the web-based frontend.
- Implement backend integration with Supabase for authentication, storage, and APIs.
- Build basic loan product listing, calculator, and application workflows.
- Early testing and stakeholder feedback.

Weeks 5–8: Smart Contract Development (Solidity + Polygon + Foundry)

- Design and implement smart contracts for KYC automation, fraud detection, and loan processing.
- Connect contracts to the web app for loan applications and repayments.
- Conduct testing using Foundry (unit, fuzz, and integration tests).
- Security audits (static analysis and simulation).
- Deploy contracts to Polygon testnet.

Weeks 9–12: Mobile Application Development (React Native)

- Build mobile app for borrowers and institutions, mirroring key web functionalities.
- Integrate with Supabase backend and deployed smart contracts on Polygon.
- Enable wallet connection and loan interactions from mobile.
- Conduct cross-platform testing (iOS & Android).
- Final refinements, documentation, and prototype presentation.
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7. Next Steps

1. Stakeholder Approval: Review and approve this updated proposal.
2. Team Formation: Assemble a team with expertise in blockchain development, front-end/back-end development, and UI/UX design.

3. Development Environment Setup: Prepare the necessary tools Commence Development: Begin the development process according to the outlined timeline.

8. Conclusion

This proposal outlines a focused and achievable plan to develop a web application prototype that demonstrates the potential of smart contracts in the microfinance sector. By leveraging Cardano's blockchain and Plutus smart contracts, the prototype will serve as a valuable proof of concept, showcasing the feasibility and benefits of integrating blockchain technology into microfinance operations.