# Module Nine

# Project Report

# Capstone Component II

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# Project Design

## Problem or Challenge Addressed

In underdeveloped regions, the lack of accessible financial infrastructure severely limits economic growth and personal financial security. Traditional banking services are often nonexistent or unreliable, leaving many individuals unbanked and reliant on insecure, high-risk financial practices. This situation perpetuates economic instability, stifles business growth, and leaves communities vulnerable to theft, fraud, and inflation. Additionally, the reliance on cash and volatile local currencies compounds economic instability. Addressing this gap by providing a decentralized, secure, and stable financial alternative can empower communities to manage their money effectively and participate in broader economic activities.

## Application of Stakeholder Needs

The project's stakeholders include residents of underdeveloped regions, local merchants, and mobile network providers, each with distinct needs. Residents require an easy-to-use, secure financial platform that functions on low-bandwidth networks and without traditional banking dependencies. Local merchants seek a stable currency to protect against devaluation and facilitate day-to-day transactions. Telecom providers are key partners who can integrate the platform within mobile networks to support accessibility in low-internet areas. Understanding these needs informs the project's design, ensuring it remains accessible, affordable, and beneficial for all involved parties.

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## Overall Design of the Project

The project aims to create a blockchain-based financial platform using cryptocurrency to facilitate secure financial transactions in economically challenged regions. The design leverages blockchain’s decentralized, transparent, and secure nature to offer a peer-to-peer transaction system that bypasses the need for traditional banks.

**Mobile Application and Cryptocurrency Wallet Integration**

The mobile app, developed using frameworks like React Native, will be compatible with both Android and iOS devices. Integrated with a secure cryptocurrency wallet, the app allows users to store, send, and receive digital currency. To ensure accessibility, the platform will offer SMS-based functionality for areas with limited internet access.

**Decentralized Blockchain Infrastructure**

Using blockchain technology, the platform will handle transactions directly between users, ensuring data transparency, integrity, and security. Ethereum or a similar blockchain will enable transaction recording and verification without centralized control. This approach enhances both security and trust, crucial for fostering acceptance in regions where banking options are minimal or unavailable.

**Security and Compliance Protocols**

The platform will follow security frameworks such as NIST and ISO 27001 to ensure compliance with international standards. End-to-end encryption, multi-factor authentication, and blockchain’s built-in security measures will safeguard user data and transactions. The project will comply with regulations like GDPR, AML, and KYC to prevent fraud and unauthorized access, ensuring the system remains compliant with global financial standards.

##### Adoption and Education Plan

Successful adoption will rely on community outreach, education, and partnerships with local mobile providers. The project will include instructional resources to train users on accessing and using the platform effectively. Local merchant partnerships will encourage vendors to accept cryptocurrency, creating a self-sustaining ecosystem that enhances both individual financial security and local economic activity.

##### Pilot Implementation and Iterative Development

Using an Agile methodology, the initial prototype will undergo rigorous testing, followed by a pilot in selected areas. Continuous feedback will inform the iterative development process, allowing the platform to adapt to user needs and environmental challenges.

This project combines emerging technology with culturally and economically sensitive design to address a critical challenge in underdeveloped regions. By leveraging blockchain and cryptocurrency, the platform can bypass traditional financial limitations, providing secure, stable, and accessible financial services to unbanked populations. Through careful stakeholder engagement and robust security protocols, the design intends to create a resilient infrastructure that fosters economic empowerment and stability for these communities.

# Project Implementation

As the project is still in the prototype phase, I have theorized a functional prototype of the blockchain-based platform to demonstrate its essential capabilities. These include secure wallet creation, transaction initiation, and smart contract execution. The prototype will act as a proof of concept to validate the design and showcase the system’s potential. The complete implementation of the platform will follow a phased approach, as outlined below:

**Blockchain Development**

* Establish a permissioned blockchain network using Ethereum or a similar platform. A permissioned network ensures controlled access for enhanced security and scalability while maintaining transparency in financial transactions.
* Configure the blockchain nodes and implement consensus algorithms optimized for the platform’s operational requirements.

**Wallet Integration**

* Develop a secure cryptocurrency wallet to allow users to store, send, and receive digital assets.
* Implement features such as private key management, encryption, and recovery mechanisms to ensure wallet security and reliability.

**Smart Contract Deployment**

* Design and deploy smart contracts to automate key financial processes, such as peer-to-peer transactions, lending mechanisms, and savings accounts.
* Incorporate tamper-proof logic and auditing mechanisms within the contracts to maintain integrity and trustworthiness.

**Mobile App Development**

* Create a cross-platform mobile application using frameworks like Flutter or React Native. The app will provide an intuitive interface for users to interact with the blockchain, manage their wallets, and perform transactions.
* Ensure that the app is optimized for low-bandwidth environments to enhance accessibility in underserved regions.

**Security Implementation**

* Apply advanced security measures, such as data encryption, multi-factor authentication (MFA), and regular security audits, to protect user data and transaction details.
* Incorporate disaster recovery protocols to address potential system failures or cyber threats.

This phased approach ensures a robust and scalable solution while maintaining user-friendliness and security, critical for adoption in the targeted regions.

# Project Test Plans and Results

A comprehensive testing strategy will be employed to ensure the platform meets performance, security, and usability standards. The testing phases are as follows:

**Unit Testing**

* Each component of the platform, including wallet functions, blockchain interactions, and smart contracts, will be tested individually.
* Testing tools like Truffle or Hardhat will be used for smart contract verification to ensure code correctness and efficiency.

**Integration Testing**

* Validate the seamless interaction between the blockchain network, mobile app, and wallets.
* Simulate end-to-end transactions to ensure data integrity and reliability across components.

**Security Testing**

* Conduct penetration tests to identify and mitigate vulnerabilities in wallet security and transaction protocols.

**Performance Testing**

* Assess the blockchain network’s scalability by simulating high transaction volumes.
* Test the mobile app’s responsiveness and user interface performance on a variety of devices with different specifications and operating conditions.

**User Acceptance Testing (UAT)**

* Conduct a pilot test with a group of users from target regions to gather real-world feedback on platform usability and functionality.
* Utilize surveys, interviews, and usage analytics to refine the system based on user experiences and challenges.

Since the project is in the prototype phase, specific test results are not available. However, preliminary prototype testing has successfully validated essential functionalities, such as wallet creation, basic transaction handling, and secure smart contract execution. The planned full implementation and rigorous testing will further ensure that the system performs reliably under diverse real-world scenarios.

The eventual developed prototype will provide a solid foundation for the platform's development and serves as a model to address the financial challenges faced by the target audience effectively.

# Recommendations for Future Enhancements

## Application of Successes, Challenges, and Lessons Learned

The development of this blockchain initiative for underdeveloped regions has yielded significant insights into addressing economic instability and financial exclusion.

**Successes**

* Making the commitment to build future partnerships with mobile providers and local merchants will be instrumental in ensuring the platform's accessibility and usability.
* Successfully showcasing images and mockups of core components like wallet creation, transaction handling, and smart contract execution validates the concept's feasibility.
* Choosing to implement a cost-effective, permissioned blockchain has allowed us to maintain scalability while keeping transaction costs low, which is crucial for the platform’s success in low-income areas.

**Challenges**

* Low-bandwidth environments and limited access to advanced devices necessitated innovative solutions like SMS-based functionality.
* Ensuring compliance with global and regional financial regulations (e.g., GDPR, AML, KYC) proved complex, requiring ongoing research and adaptation.

**Lessons Learned**

* Agile methodologies and user feedback loops are essential to refine the platform and address real-world challenges
* Incorporating a cost-effective, permissioned blockchain allows for controlled growth while maintaining security and transparency.

## Modification Strategy and Actionable Steps

To build on the project's successes and address its challenges, the following modification strategy is proposed:

**Expand Stakeholder Involvement**

* Collaborate with local governments and NGOs to increase adoption and ensure alignment with regional development goals.
* Establish partnerships with additional mobile providers to enhance the platform’s reach in underserved areas.

**Enhance Accessibility**

* Develop a lightweight mobile application optimized for basic feature phones.
* Expand the SMS-based functionality to support a wider range of transactions, ensuring access for users without smartphones.

**Strengthen Security and Compliance**

* Conduct regular audits to maintain compliance with evolving regulations.
* Implement advanced fraud detection mechanisms powered by AI to prevent unauthorized transactions and misuse.

**Expand Educational Outreach**

* Offer multilingual resources and in-person training sessions to improve digital literacy and build user confidence.
* Develop partnerships with local schools and community centers to integrate financial literacy programs.

## Potential Issues and Resource Limitations

Despite a robust plan, several potential issues may arise during the project's expansion:

**Infrastructure Limitations**

* Some regions may lack the necessary telecommunications infrastructure to support blockchain operations reliably, particularly for real-time transactions.

**Resource Constraints**

* Scaling the platform requires additional funding and technical resources, which may be challenging to secure without broader investor confidence or governmental support.

**Regulatory Changes**

* Shifts in financial or data protection laws could necessitate costly and time-consuming modifications to the platform

**User Adoption**

* Resistance to change, especially in cash-dominant societies, could hinder adoption rates despite outreach efforts.

## 

# Appendix

(Mockups)



## References

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