



# LOCAL CURRENCY NETWORKS IN RURAL COMMUNITIES IN AFRICA

Master Thesis proposal Y. Zhan

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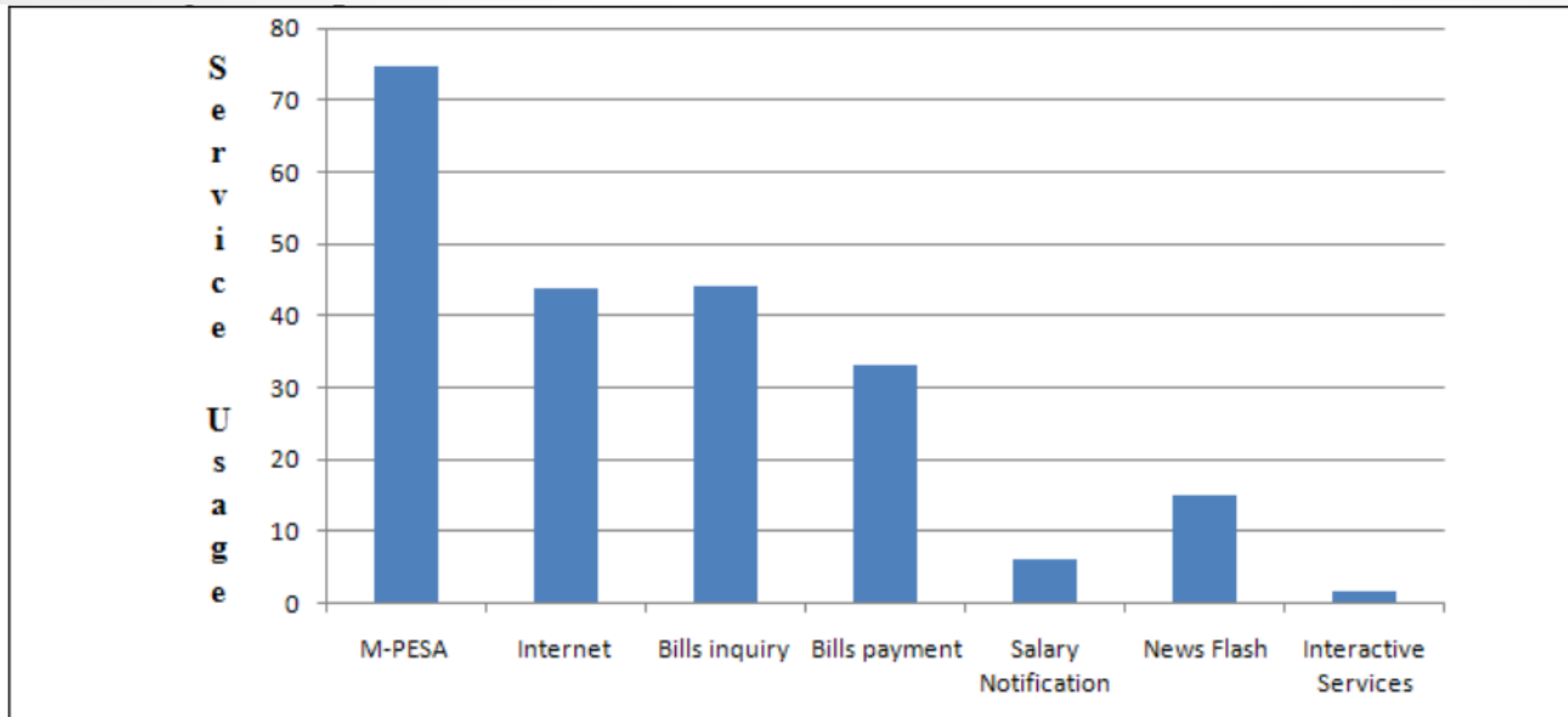
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# 1. RESEARCH SETTING

- There are 1,7 billion people around world that are unbanked, and that consist of 50% of the poorest households.<sup>1</sup>
- There is a high adoption rate of mobile phones in Africa. This opens the opportunity to delivery service to these devices
- For instance, the rapid adoption of mobile money in Africa like: M-PESA, Orange Money and MTN Money for peer-to-peer payments

<sup>1</sup>DEMIRGÜÇ-KUNT, KLAPPER, SINGER, ANSAR & HESS., 2017).

# PERCENTAGE OF MOBILE PHONE USAGE



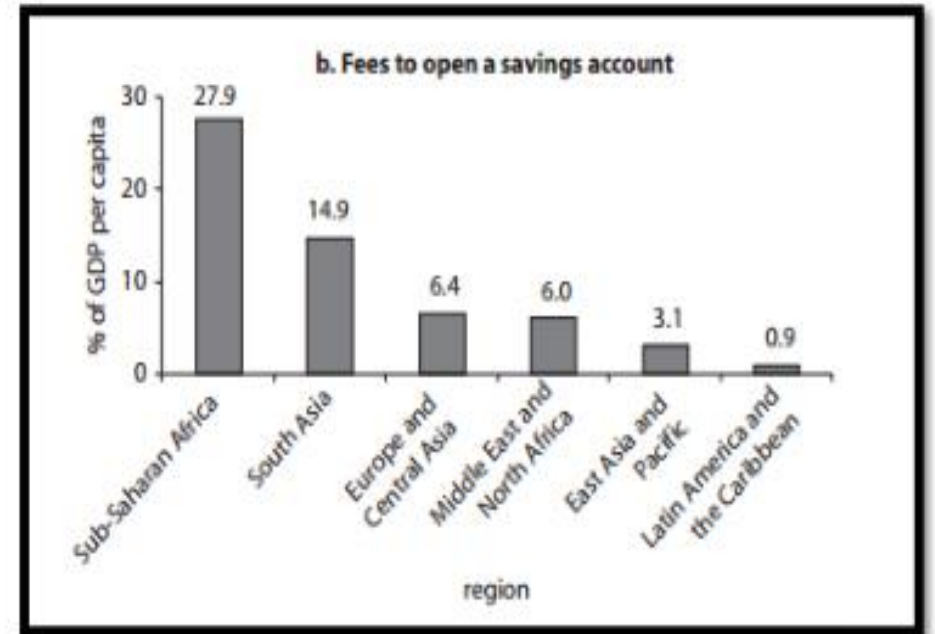
**Figure 2: Percentage Usage of Mobile Phones to Conduct Related Value added Data Services Beyond M-PESA**

# BANKING FEES

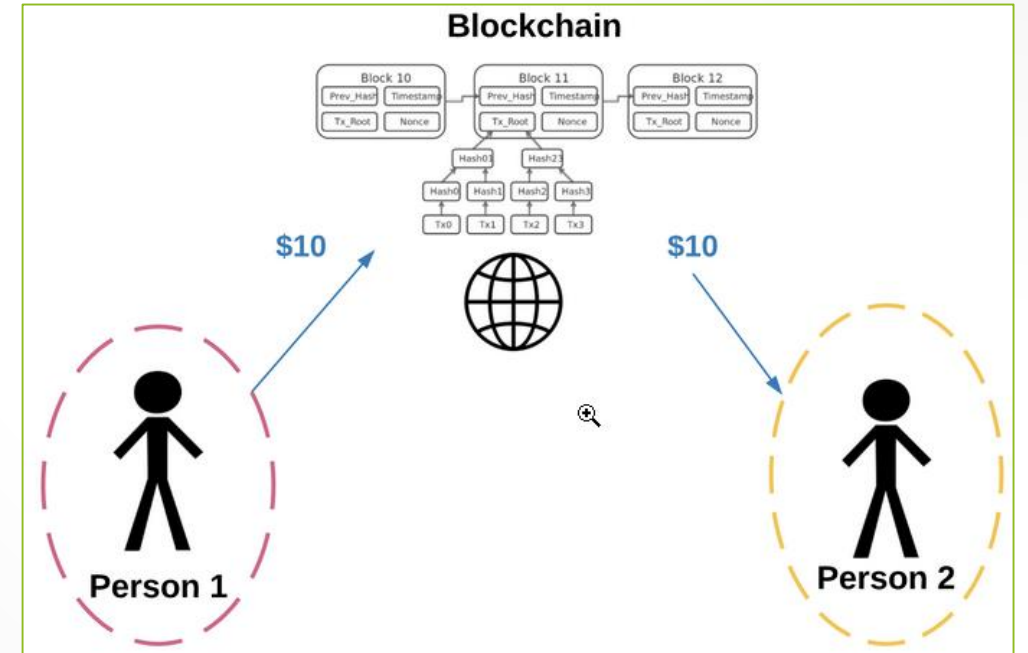
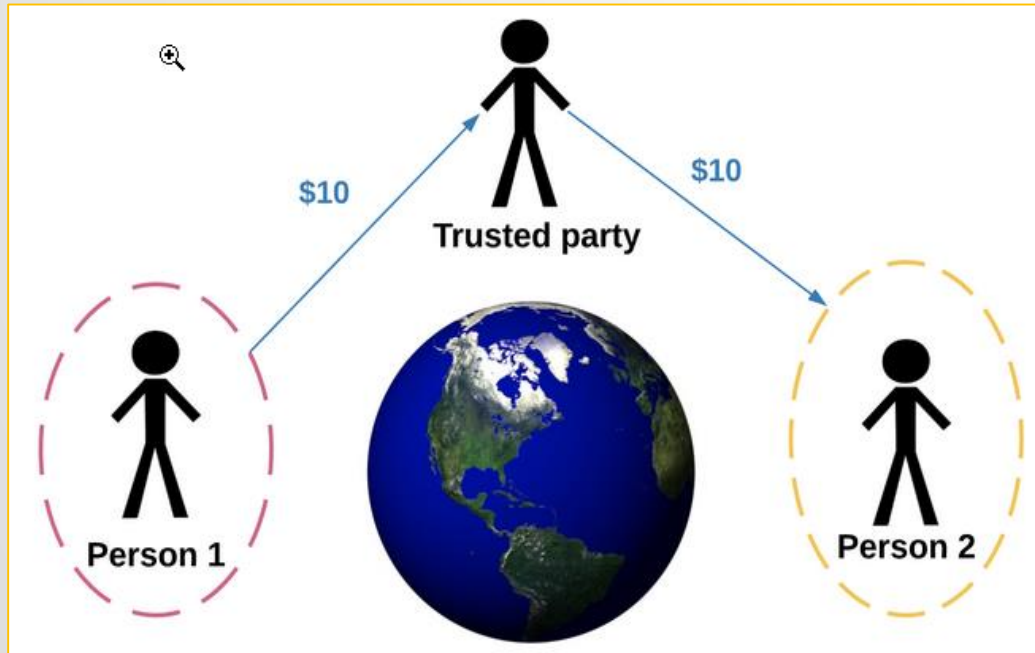
Another problem for the access to formal bank services are the high banking fees.

The banking fees for Sub-Saharan Africa is **4x higher compared** to someone in the middle east. This make it even harder for the people to get access to banking services.

**Graph 2:** Associated Fees to Open a Bank Account



# THE INTRODUCTION OF BLOCKCHAIN P2P PAYMENT NETWORK



# RESEARCH QUESTIONS

Main research question:

Is it possible to implement a community currency network for rural communities Africa based on blockchain?

Sub-questions:

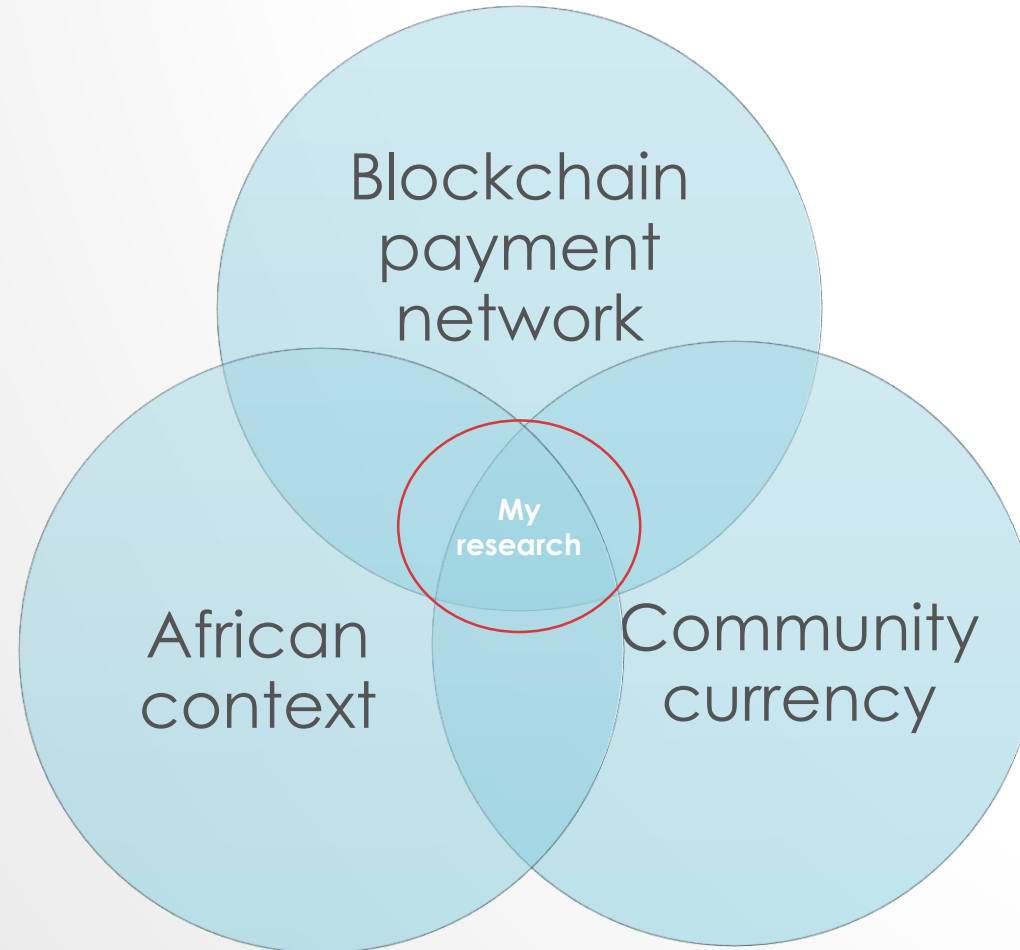
- Organizational aspect

Which properties of community currency are best suited for a local payment network in rural Africa context.

- Technical aspect

Is there a blockchain implementation of suited for a local payment network based on lightweight devices.

# RESEARCH GAP





# STATE OF LITERATURE

Blockchain technology:

- Diet coin
- Lightning network

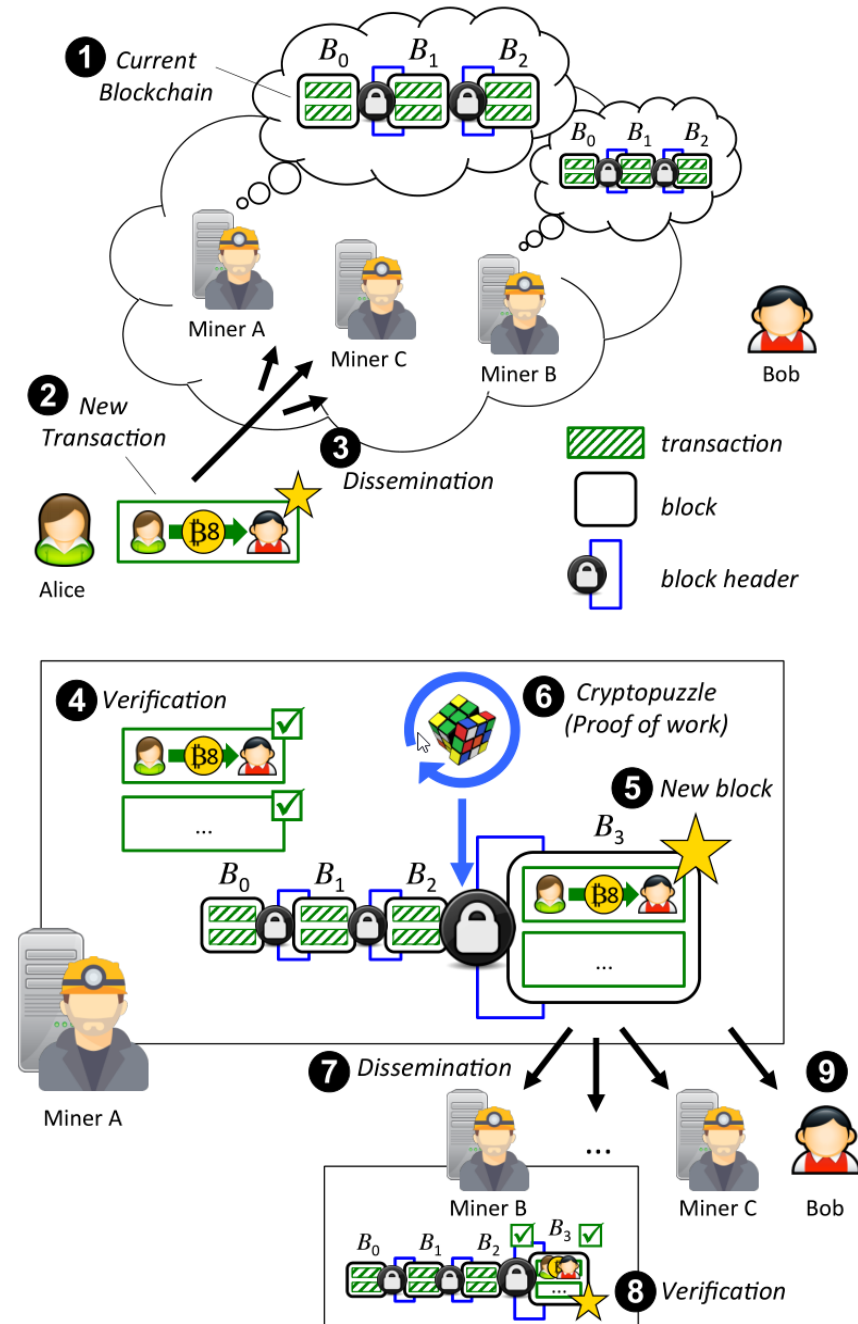
Organizational aspects:

- Community currency

## Blockchain transaction:

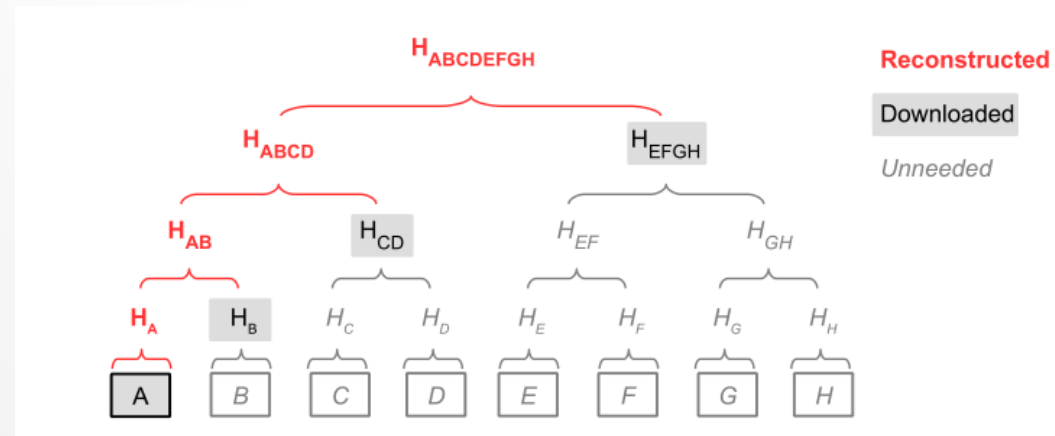
2. Alice creates a valid transaction by verifying that she owns 1 bitcoin.
3. Alice broadcast this new transaction to the network of miners, to be included in the blockchain.
4. Miner A verifies the transaction of Alice
5. Miner A attempts to include the new transaction to the current blockchain.
6. The linkage requires Miner A to solve the cryptopuzzle.
7. If successful the new block will be added to the blockchain and spread through other miners.
8. Other miners will check for both the validity of the transaction and the cryptopuzzle before adding to their blockchain locally.
9. Eventually the new block will also arrive to Bob.

SOURCE



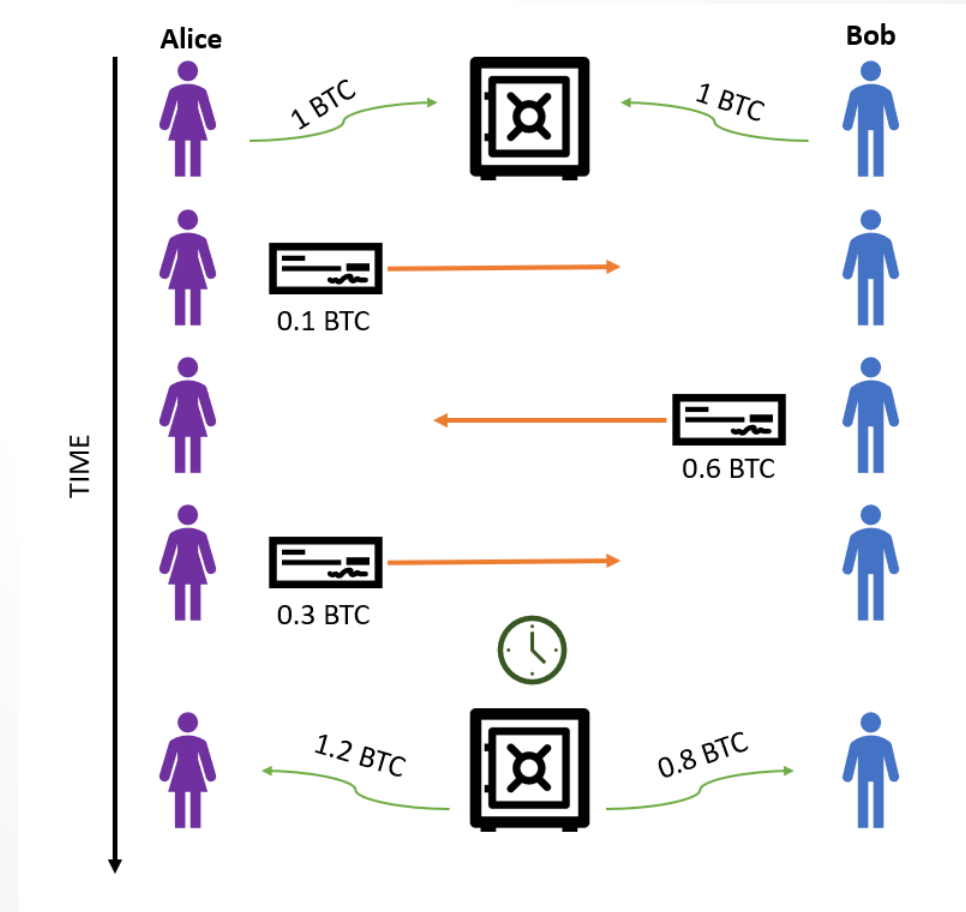
# LITERATURE: DIET COIN

- Due to the chained nature of the blockchain, in order for a transaction to be verified, potentially requires to parse through the whole blockchain. (200 GiB as of 2019).
- Solution Diet Coin: reconstruction of the merkle tree with only the necessary nodes.



# LITERATURE: LIGHTNING NETWORK CONCEPT

- A off-chain solution to the payment scaling issue of blockchain.
- Payment channels are establish between 2 parties.
- Only opening and closing of the payment channel will be recorded on the blockchain.
- The transaction on the payment channel will not be recorded on the blockchain.



# LITERATURE: COMMUNITY CURRENCY

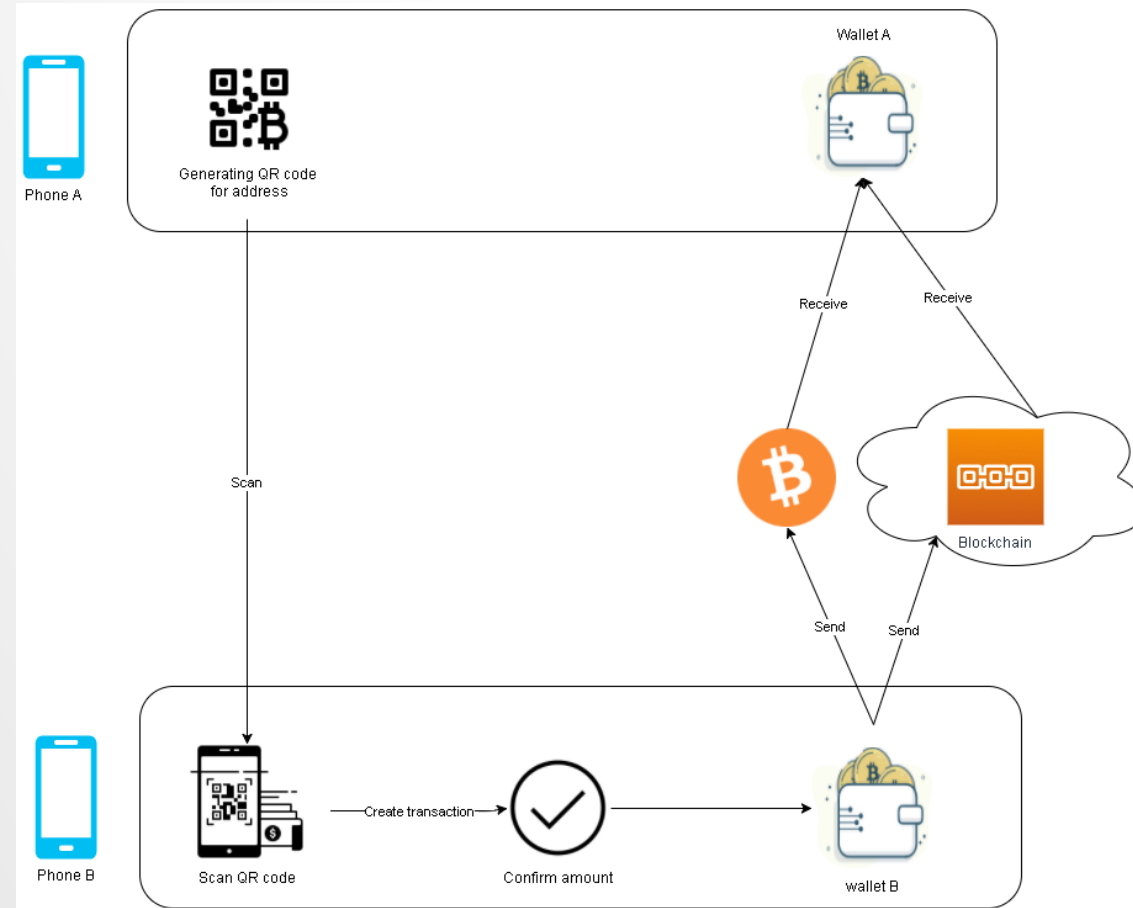
- Community currency complements the national currency.
- The lack of currency due to limited access to banking services, create a mismatch of supply and demand in goods and services where direct barter technique alone is not sufficient.<sup>2</sup>
- Therefore community currency can help solve that problem.
- Recirculating the currency by introducing it in a payment network.

<sup>2</sup> RUDDICK, W. O., RICHARDS, M. A., & BENDELL, J. (2015).

# METHODOLOGY

1. Context analysis
2. Interview potential local users of the payment network
3. Develop a conceptual model based on the requirements of the local users. Model it in a UML-diagram
4. Perform a lab test to test the technical feasibility
5. Perform a local testing the network performing in rural Africa.

# TEST SETUP LAB EXPERIMENT



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