

Designing Usable Digital Community Cryptocurrency Wallets for Low-Income Community Members

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ABSTRACT

In South Africa, high unemployment rates and significant income disparities create challenges for many, particularly those in townships. Despite being unemployed, individuals possess a diverse range of skills that often remain untapped due to limited opportunities. Community currencies offer a solution to this problem by enabling members of a community to exchange skills and resources, thereby boosting the local economy. This is particularly crucial in South Africa, where a large portion of the population resides in townships but seeks employment opportunities outside these areas. Community currencies provide an alternative means of exchange, allowing individuals to leverage their skills and resources within their own community. As technology continues to advance, community currencies are evolving into digital forms. It is imperative to develop usable digital currency wallets tailored to the needs of these communities. By providing accessible and user-friendly digital wallets, we can empower individuals in low-income communities to participate more actively in the digital economy and improve their livelihoods.

CCS CONCEPTS

• **Community Currency** → **Financial Inclusion**.

KEYWORDS

Community Currency, Cryptocurrency, Financial Inclusion, Sustainable Development, Cryptocurrency Wallet

1 INTRODUCTION

Complementary currencies, social currencies or local currencies all refer to Community Currencies (CCs). Community currencies are generally regarded as tools for fighting social exclusion and encouraging local development by promoting financial inclusion [8]. There are more than 6000 complementary currencies in use worldwide, crises in the mainstream global economy and new possibilities enabled by information technology might be the main explanations for the growth of community currency projects worldwide[8].

CCs encompass a diverse range of currency systems that coexist alongside conventional currencies. These CCs circulate within specific geographic regions or communities and facilitate exchanges of goods and services without accruing interest [2, 6, 8, 20, 24]. A complementary currency represents an agreement to use something other than legal tender (such as national money) for transactions,

with the goal of connecting unmet needs to otherwise underutilized resources. Rather than replacing legal tender, complementary currencies are designed to complement it [2].

In addition to enabling members to trade goods and services without relying on conventional money, community currencies serve as a means to channel locally generated wealth toward benefiting local residents[26]. This approach prevents resources from being diverted to distant corporations and contributes to increased local economic activity and support for local businesses[20]. CCs exhibit remarkable diversity in terms of design and objectives. Some employ physical paper-based currencies, while others rely solely on digital records in registers or electronic databases. Their scale and intended outcomes also vary significantly[8].

Motivations for creating such systems differ; some CCs emerge in response to crises, safeguarding local livelihoods. Overall, these community currencies aim to ensure that a larger share of savings and local income remains within the local community[6]. They have garnered support from practitioners in green and political economy movements, who view them as tools for promoting sustainable development[26].

The literature review highlights the relevance of community currencies and emphasizes the potential for well-designed cryptocurrency wallets to enhance the livelihoods of marginalized groups. It discusses the shift towards digital formats, citing the Sarafu community currency in South Africa as an example. However, it points out a lack of research on the usability of these digital wallets, especially in the South African context. By addressing this gap, there is an opportunity to develop user-friendly platforms that promote economic empowerment and inclusivity for marginalized communities.

2 FEATURES OF COMMUNITY CURRENCIES

Community currencies encompass attributes beyond mere economic worth, all aimed at furthering their objectives. Two significant components pertinent to this discourse are demurrage and the establishment of a fund for financial assistance.[32].

2.1 Demurrage

Demurrage entails diminishing the value of currency in proportion to its duration of retention, rather than expenditure. For instance, the "peanuts" LETS currency in Chiba Prefecture, Japan, imposes a 1% fee per month on idle currency. This mechanism incentivizes continuous circulation to avert depreciation, a factor reportedly pivotal to the success of Peanuts [19]. Notably, the velocity of a

community currency, representing how frequently a single unit is spent in the economy, can be notably high, with demurrage often cited as a contributing factor[32].

2.2 Loan/Grant Funds

Within the domain of community currencies, the provision of loan and grant resources emerges as a potent facilitator of development. BerkShares, for instance, operates a fund specifically tailored to assist local enterprises, while systems like Ithaca Hours and Calgary Dollars commonly extend financial support to local businesses [22]. These endeavors not only fuel economic expansion but also serve as mechanisms for aiding individuals in need, offering both personal loans and grants. Moreover, community currencies have the flexibility to customize these financial mechanisms to target specific business sectors or align interest rates with social and economic objectives. Additional features like geofencing, privileged transactions, interest payments, and participant dividends further enhance the adaptability of community currency systems[2].

3 COMMUNITY CURRENCIES AND SUSTAINABLE DEVELOPMENT

The prevailing monetary system presents hurdles to achieving sustainable development [28]. Criticized for perpetuating inequality, it operates under what is commonly referred to as the "fairness misconception," wherein equitable treatment of all individuals remains elusive[16]. Sustainable development advocates emphasize the necessity of decisions that consider the interconnectedness of economic, social, and environmental dimensions[27]. In this context, community currencies emerge as potent tools endorsed by proponents of green and political economy movements to foster sustainable development.

3.1 Economic Sustainability

The concept of economic sustainability revolves around providing equal economic opportunities to all individuals, regardless of their socio-economic status. Community currency strives to offer all individuals the same avenues for economic gain [17]. Community currencies aim to achieve this by offering avenues for economic participation to marginalized groups. By promoting the circulation of savings and local income within the community, they bolster local economic resilience [30].

Advocates argue that community currencies contribute to economic sustainability by promoting localization and stimulating local economic activity. By keeping transactions local, these currencies facilitate faster and more extensive circulation of money within the community, thereby enhancing the local economic multiplier and increasing local incomes[27]. When the usage of the currency remains local, it is safe to assume that the money will circulate faster and in larger proportion, thereby stimulating the local economic multiplier and increasing local incomes [17].

CCs provide a means to recognize informal work and value skills that often go unacknowledged by the formal labour market. By incorporating these contributions into the local economy, CCs empower individuals who might otherwise be marginalized [28]. CCs encourage local import substitution. When businesses within the community accept CCs, they gain a competitive advantage

over external companies [15, 24]. This sustains local economic activity and supports local enterprises. CCs can also stimulate an entrepreneurial spirit with lower financial risk. Providing an alternative currency for transactions creates opportunities for small enterprises to thrive [30].

3.2 Social Sustainability

Social sustainability entails maintaining social capital and fostering cooperation, trust, and cohesion within the community[27]. Community currencies contribute to social sustainability by creating small exchange circuits that build trust and strengthen relationships among businesses and users[30]. Through the exchange of goods and services, community members expand their social networks and enhance community cohesion. Furthermore, community currencies boost the self-esteem and confidence of marginalized groups by acknowledging the value of their time and skills[13].

3.3 Environmental Sustainability

Environmental sustainability emphasizes sustainable consumption and the conservation of natural resources[24]. It also stresses that natural resources used for human needs must be regenerated faster than they may be consumed and that the environment can properly assimilate waste [9]. Community currencies can contribute to environmental sustainability by promoting localization, which reduces the environmental impact of global flows through import substitution and decreased transportation costs [29]

4 CRYPTO CURRENCY

Cryptocurrencies fall within the category of digital or virtual currencies[5]. At their core, cryptocurrencies function as a decentralized form of electronic cash operating and regulated through blockchain technology [5]. The blockchain comprises a ledger that records all transactions within these cryptocurrencies, forming a chain of certified and encrypted transaction blocks facilitated by a network of computers [33]. Unlike traditional banking systems or government-controlled central banks, cryptocurrencies operate as decentralized entities governing monetary and financial transactions.

While Bitcoin pioneered the concept of cryptocurrencies, the blockchain technology extends beyond currency to other realms of economic activity such as community currencies [25]. There is a growing financial and virtual community embracing cryptocurrencies, facilitating financing for internet startups through initial coin offerings (ICOs) and serving as a means of online payment or alternative asset class[10]. Additionally, cryptocurrencies are intertwined with libertarian ideals, challenging conventional banking and state control over monetary movements while advocating for privacy and anonymity. The potential for cryptocurrencies to reduce transaction costs for money transfers and remittances suggests a role in poverty alleviation, yet their complex operation may pose barriers for less technologically and financially literate individuals[21].

4.1 Enhancing Bitcoin for Community-Centric Cryptocurrencies

There have been several forays into using Bitcoin technology for community currencies. Examples include the following.

- Mazacoin, purported as the national currency of the Lakota Nation, reserved 25 million pre-mined coins for a tribal fund supporting individuals, businesses, and nonprofits focused on the tribe [31].
- IrishCoin aims to boost tourism in Ireland, with 7% of its total coin volume allocated for distribution to tourism-related businesses and organizations as a "discount token" [32].
- This coin has the unusual goal of becoming the currency used by colonists on Mars. Four hundred thousand coins were pre-mined and donated to the Mars Society, a not-for-profit organization that seeks to establish a colony on Mars. The eventual goal is for colonists to take the Marscoin blockchain with them to Mars and use it as the basis for a local economy [32].

These community cryptocurrencies, along with others, leverage Bitcoin's protocol to meet their specific needs, often without significant modifications (Issues). However, further adaptations and enhancements of existing Bitcoin features can enhance differentiation and utility for community-centric cryptocurrencies [32].

5 SARAFU COMMUNITY CURRENCY

Grassroots Economics (GE) in Kenya has been implementing Community Inclusion Currencies (CICs), managed through mobile interfaces, to support local economic development since 2015. These currencies, collectively known as the "Sarafu system," were consolidated into a single CIC called "Sarafu" in 2020. By the end of 2021, Sarafu had over 55,000 registered accounts and facilitated transactions worth 2.8 million USD [4]. GE focuses on marginalized, food-insecure areas, where residents face challenges like volatile markets and increased food costs, leading to extreme poverty. The Sarafu-Credit voucher system, introduced by GE in 2011, aims to address food security issues by providing a complementary means of exchange backed by local assets. [18]

The arid and semi-arid lands (ASAL) in Kenya, covering over 80% of the country's land mass and housing approximately 36% of its population, are the most vulnerable to food insecurity [4]. These regions face poverty, underdevelopment, conflict, and disease. They exhibit the lowest development indicators and highest poverty rates in the country. The agricultural sector, contributing over 25% of Kenya's GDP, is particularly affected by climate change, with almost all crop production being rain-fed [3]. Food security remains a significant challenge in these rural areas due to chronic poverty, poor infrastructure, high population growth, dysfunctional markets, overreliance on rain-fed agriculture, and limited investments [23].

Climate change exacerbates these issues, leading to land degradation and fragmentation, further threatening food security and smallholder incomes. In response to droughts and unpredictable

rainfall, locals resort to harmful coping mechanisms such as selling productive assets and withdrawing children from school [1]. Despite slight improvements, Kenya remains food insecure according to the Global Hunger Index. Addressing these underlying causes of food insecurity requires concerted efforts to enhance infrastructure, improve market functionality, promote sustainable agricultural practices, and mitigate the impacts of climate change [18].

The Grassroots Economics (GE) non-governmental organization has introduced the Sarafu-Credit voucher system, also known as Community Currency (CCs), in Kenya to address the lack of national currency and promote sustainable development in vulnerable communities [4]. These Sarafu vouchers, backed by local assets, are distributed through zero-interest loans to locals for a one-year period. By supplementing the national currency, the Sarafu-Credit voucher system enables trade even in circumstances where the national currency is scarce. [1] It is believed that this system could contribute to fostering food security by providing an alternative means of payment for purchasing food. By offering a complementary medium of exchange, the Sarafu-Credit voucher system aims to mitigate the challenges posed by limited access to the national currency, thereby enhancing economic resilience and access to essential goods such as food within these communities. [4]

5.1 Payment Platform

The Sarafu community currency utilizes a USSD (Unstructured Supplementary Service Data) interface for user interaction, ensuring accessibility even without internet connectivity [4]. Users access core functions such as checking account balances, making transactions, and updating account details through feature-code menus on their mobile phones [23]. This approach makes the digital Community Inclusion Currencies (CICs) accessible to a majority of the Kenyan population, as evidenced by nationally representative surveys showing high ownership of SIM cards and mobile phones [3]. While digital inclusion may be slightly lower in marginalized, food-insecure areas targeted by Grassroots Economics (GE), the widespread ownership of mobile phones ensures broad technological accessibility for Sarafu users [1].

5.2 Implementation Results

Research indicates that Community Currencies (CCs) like Sarafu have the potential to foster sustainable development, social and solidarity economy, and poverty reduction in informal settlements. Scholars suggest CCs could serve as policy instruments for efficient interventions in social welfare, environmental, and economic programs. These findings underscore the importance of innovative financial solutions in addressing food security and economic challenges in vulnerable communities. [3]

Preliminary findings suggest that treatment groups (communities using Sarafu-Credit vouchers) are consuming roughly 78% more food daily than control groups (not using Sarafu-Credit vouchers) in both Urban (77.9%) and Rural (78.2%) case studies [4].

6 CRYPTOCURRENCY WALLETS

Only 8% of approximately 86,000 promoted blockchain projects have managed to survive, highlighting the challenges within the

blockchain landscape. Studies have endeavoured to identify obstacles hindering the application of blockchain technology. Major barriers include the lack of standardization, regulatory disruptions during development, and issues related to user understanding and awareness[14].

6.1 User Understanding and Awareness

Demographic factors play a significant role in shaping the usage, perception and adoption of digital community currencies (DCCs) among community members. Here's how different demographic factors influence the adoption and definition of DCCs Sarafu:

- **Age:** The study found that age was not a determining factor in DCC usage. Both young and old community members participated in DCC transactions. However, the majority of users were categorized as youth (18-49 years old), with fewer users over the age of 50. Registration and engagement with DCCs were open to all individuals over 18 years old, regardless of age[14].
- **Gender:** The data revealed that a majority of DCC users were women, with fewer male users. This higher enrollment among women may reflect their ownership of businesses within the community. Women-headed households and larger social networks among women may contribute to the wider spread of DCCs in the community[14].
- **Educational Level:** Most DCC users had relatively low levels of education, with many having only primary school education. However, the study also found that more educated individuals and younger users were more likely to embrace and benefit from DCC usage. Education and technology literacy played a role in overcoming challenges related to DCC use[11].
- **Language:** English is usually the primary language used in DCC transactions, requiring a basic understanding for interaction. However, trainings and support materials were also provided in local languages like Luo and Swahili to ensure clarity and understanding for all users. Quick recall and recognition of DCC features facilitated frequent and fast interactions.
- **Income Level:** Users engaged in a variety of businesses, with income levels ranging from very low to moderate. Most participants earned income between KShs. 0-5000, with a few earning more. Some users perceived DCCs as innovations suited for individuals with slightly higher economic status. The availability of smartphones, preferred by some users, was influenced by their economic ability to acquire and maintain them.

6.2 Common Usability Issues in Crypto Wallets

Crypto wallets, integral to managing digital assets, often encounter usability issues that hinder user experience. Understanding and addressing these challenges are crucial for improving adoption and

user satisfaction. Here are some common usability issues observed in crypto wallets[12]:

- **Complexity in Wallet Initialization Lengthy Setup Procedures:** Users may find the initial setup process cumbersome, especially when it involves complex identity verification procedures or multifactor authentication[11, 14].
- **Lack of Guidance and Instruction: Inadequate Onboarding:** Novice users often struggle with setting up wallets due to a lack of clear guidance and instructions, including explanations of functionalities like private key import/export.
- **Confusion Regarding Transaction Fees Unanticipated Fees:** Users may encounter unexpected transaction fees, impacting their willingness to engage with the wallet. **Fee Structure Complexity:** The fee structure within crypto wallets can be intricate and difficult for users to understand, leading to confusion, particularly among those unfamiliar with blockchain technology[12].
- **Inconsistencies in Balance Display Discrepancies in Displayed Balances:** Users may experience discrepancies between displayed balances in wallets and actual transaction statuses on the blockchain, causing confusion and distrust.

Addressing these common usability issues is essential for enhancing the overall user experience of crypto wallets and promoting wider adoption of blockchain technology.

7 DISCUSSION

Community currencies, known by various names such as social currency or complementary currency, share a common definition that is widely accepted across scholarly literature. These currencies operate within specific boundaries, facilitating the exchange of goods and services without replacing the official legal tender. Unlike traditional currencies, community currencies are not intended for accumulation but rather for stimulating local economic activity. Failure to utilize these currencies may result in a slight decrease in their value, a mechanism known as demurrage.[6, 7, 26]

While community currencies serve multiple purposes, their primary objectives typically align with economic sustainability, social sustainability, and environmental sustainability. Economic sustainability entails promoting local economic activity and resilience by encouraging the circulation of money within the community. Social sustainability focuses on fostering community cohesion, trust, and cooperation through local exchange networks. Environmental sustainability involves reducing the environmental impact of economic activities by promoting local production and consumption[17, 24, 30, 35].

While there is ongoing debate regarding the macroeconomic impact of community currencies, many scholars agree that their influence is relatively minor due to their small-scale operations. However, there is consensus on the positive impact of community currencies on small communities and marginalized groups, particularly in terms

of social sustainability. These currencies often empower individuals by recognizing informal work and valuing skills overlooked by formal labor markets, thus contributing to social inclusion and cohesion[30, 36].

Community currencies play a vital role in promoting sustainable development at the local level, with a focus on economic, social, and environmental objectives. While their macroeconomic impact may be limited, they provide tangible benefits to small communities and marginalized groups, fostering social cohesion and resilience[24].

As technology progresses, the digitization of community currencies is becoming increasingly prevalent. While cryptocurrencies initially emerged with Bitcoin, their application has extended to include community currencies. One notable example in the South African context is the Sarafu community currency, which utilizes USSD technology. Positive outcomes have been observed, with users of Sarafu vouchers experiencing significant benefits compared to non-users[4, 18, 23].

Despite the growth of digital cryptocurrency wallets, existing research tends to focus primarily on technical aspects, neglecting user interaction. Moreover, there is a lack of literature specifically addressing community cryptocurrencies. Common issues encountered with cryptocurrency wallets include complexities during wallet initialization and confusion regarding transaction fees[10, 25].

Given the growing importance of digital community currencies, particularly in regions like South Africa, it is imperative to study their usability. Understanding how users interact with these platforms is crucial for designing user-friendly digital wallets tailored to the needs of local communities. By addressing usability challenges, we can enhance accessibility and participation in community currencies, ultimately contributing to economic empowerment and improved livelihoods. Therefore, further research into the usability of community cryptocurrencies, especially within the South African context, is warranted to inform the development of effective digital wallet solutions[11, 12, 14, 34].

8 CONCLUSION

Community cryptocurrencies serve as valuable tools for enhancing local communities, and accessibility is crucial for widespread adoption[26]. To ensure inclusivity across all demographics, the design of the interface should be intuitive and user-friendly, catering to individuals from diverse backgrounds.

One common issue faced by users when starting a cryptocurrency wallet is confusion due to the complexity of the process[12]. This confusion can be alleviated by incorporating a comprehensive guide within the interface. This guide should provide step-by-step instructions, clearly explaining each stage of the setup process in simple terms. Additionally, the steps themselves should be streamlined to minimize complexity and avoid tediousness, ensuring a smooth and efficient user experience.

By prioritizing accessibility and user-friendliness in the design of

community cryptocurrency interfaces, we can empower individuals from all walks of life to participate in and benefit from the local economy.

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