Agpaytech's Research
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# Interlinking Retail Central Bank Digital Currency in Africa:

## Architectural Design Perspective

Agpaytech

# Executive Summary

Globally, Africa represents 8.5% of central banks that have announced issuing central bank digital currencies (CBDCs) which are in different stages. Also, 32.7% of the central banks have publicly announced their intention to issue CBDC, whereas 67.3% of central banks have not shown interest or are yet to make pronouncements on their intent to explore across the African continent. Digital currencies have presented an excellent opportunity for central banks in Africa to pay much attention to financial technology innovations around money usage in the wholesale and retail markets.

While numerous central banks in Africa are currently investigating the adoption of retail central bank digital currencies (rCBDCs), it is important to consider the prerequisites for linking these domestic rCBDC systems from the beginning, ensuring that cross-border payments can be enabled when needed. Thus, successful implementation of rCBDCs necessitates a framework that enables interoperability and seamless transactions between different rCBDC systems. The report highlights four pillars; base pillars, technical infrastructure, settlement mechanisms, and deployment for interlink rCBDCs. The report concluded that interlinking rCBDCs have the potential benefits of enhancing financial inclusion, reducing transaction costs, and promoting economic growth and regional trade in the continent.

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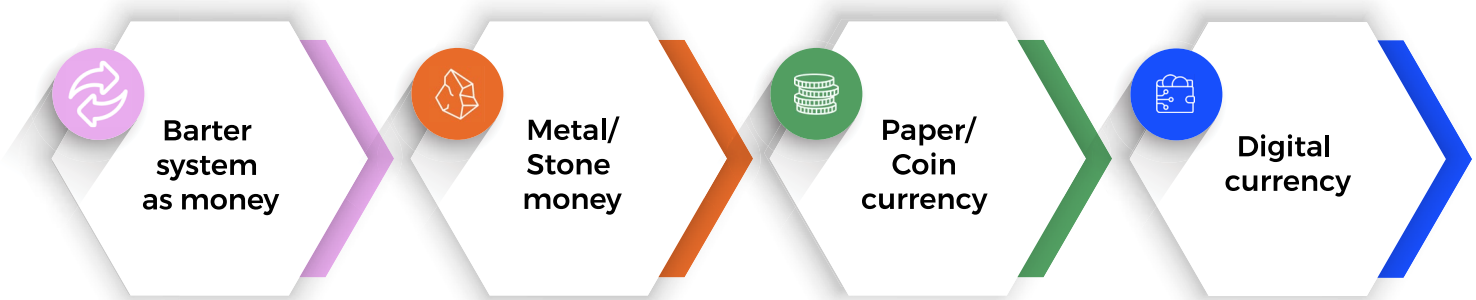
# The Central Bank Digital Currency (CBDC)

The history of money is still being written. The barter trade system has moved from swapping animal skins (objects) to metal minting coins to printing paper money. Today, there is a crossover of a massive shift to electronic transactions and digital currencies like central bank digital currency, and cryptocurrency.

In recent years, there has been generalized progress in most regions, and more payments are being made with instruments other than cash, reflecting a safer, more efficient, and more inclusive provision of payment and settlement services in Africa.

Figure 1: Currency transformation




Source: Agpaytech

Today, digital payment services and infrastructure in Africa have developed rapidly to meet the financial demand and needs of governments, corporate firms and individuals. Digital financial services in Africa include online processed payment transactions, mobile payments, point of sale, credit card, cross-border payments and remittance sending, electronic banking, payment via social networks, mobile apps and many others.

# Global Perspective

The CBDC is becoming a new important project for central banks, and there is at least one CBDC project ongoing in each of the continents worldwide. CBDC is being used as a complement to paper/coin money, and it has the same value and purpose as physical cash. It is not a substitute for cash. CBDC is a new form of electronic money that, unlike well-known cryptocurrencies, e.g. Bitcoin or Ether, is issued by the central bank of a country. It is a digital version of state money or banknote/coin also known as fiat currency, which is different from private or community-based digital currency due to its legality within a jurisdiction or collaborative usage as in the case of multi-CBDC projects.

The interest in CBDC has grown due to some successful implementation of CBDC projects like the Chinese digital yuan (e-CNY), the Bahamas Sand Dollar, and the eNaira from Nigeria.

According to the 2021 BIS survey of central banks, 86% of central banks are actively researching the potential for CBDCs, 60% are experimenting with the technology and 14% are deploying pilot projects. Several reports have established that 98% of global central banks are exploring CBDC to enhance financial payment systems. The earliest digital currencies include the Bahamian Sand Dollar, Jamaica's JAM-DEX, the Caribbean Islands, and Nigeria's eNaira.

The issuance of CBDC could have implications for the banking and other payment services providers in the payment industry, yet the policy goal has been financial inclusion, access to payments, improving monetary sovereignty and payment efficiency (Soderberg et al., 2022; Mancini-Griffoli et al., 2018). Recent CBDC scholars have debunked the negative effects of competition such as the disintermediation of commercial banks, and argued for the hybrid model of CBDC such that banks and payment service providers still hold the market power to distribute to individuals (Chiu et al. (2019).

Figure 2: Cross-border CBDC Projects


Source: Agpaytech

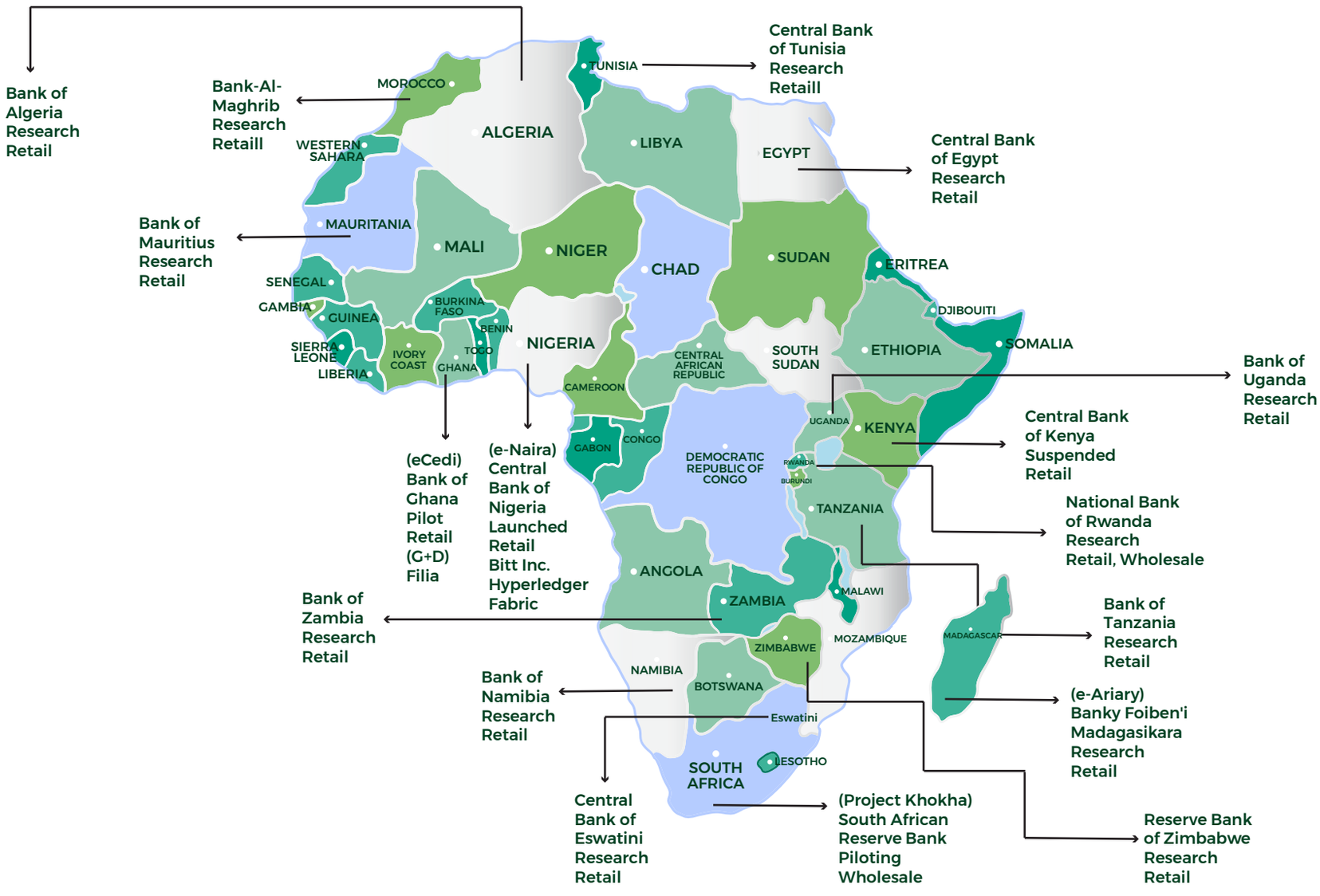
# Growing CBDC Pilot or Research in Africa

Like in the other continents, many central banks in Africa are exploring the possibility of issuing CBDC that will be minted, controlled, and issued by the state. Although many African nations have announced their interest in issuing CBDC, few have released the proof-of-concept or plan, while others are researching the feasibility of the project. Previously, the Agpaytech Survey indicated that 67.3% of central banks in Africa have not shown interest or are yet to make pronouncements on their intent to issue CBDC. Also, 32.7% which represent seventeen (17) countries in Africa are in different stages of CBDC development (research, pilot, or launch).

Nigeria and Ghana are in the advanced stages of the CBDC exploitation. For instance, Nigeria is the first and only country that has launched its eNaira in Africa as of May 2024, whereas Ghana's eCedi is in the piloting stage. Nigeria partnered with Bitt Inc. and Ghana contracted Giesecke+Devrient (G+D) as the technology service provider. Both countries are exploring the offline and online versions of digital currency which will co-exist with the various existing payment systems. Some countries have withheld their plans to issue CBDCs in the short and medium periods. For example, on 2 June 2023, Kenya released a discussion paper on their CBDC which prioritized strengthening innovations around the existing payment ecosystem, and therefore the implementation of a CBDC may not be a priority in Kenya in the short to medium term. In terms of wholesale CBDC and CBDC projects, only the South African Reserve Bank has introduced a wholesale CBDC known as "Project Khokha" and "Project Dunbar". The Project Dunbar brings together the Reserve Bank of Australia, Bank Negara Malaysia, the Monetary Authority of Singapore, and the South African Reserve Bank with the BIS to experiment and facilitate direct cross-border transactions between financial institutions in different currencies. Table 3 exhibits the list of African countries, central banks and status in the quest to issue digital currency.

**The Project Dunbar brings together the Reserve Bank of Australia, Bank Negara Malaysia, the Monetary Authority of Singapore, and the South African Reserve Bank with the BIS to experiment and facilitate direct cross-border transactions between financial institutions in different currencies.**

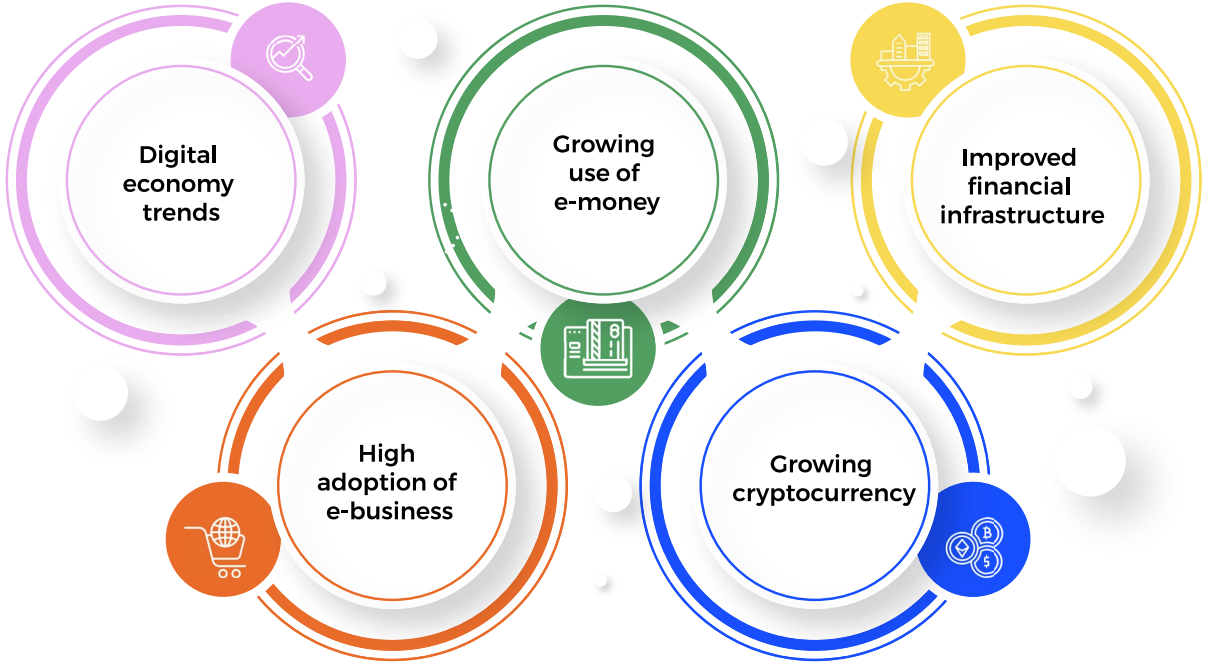
Figure 3: CBDC in Africa




Source: Agpaytech

# Why the Need to Interlink Retail CBDC Projects in Africa

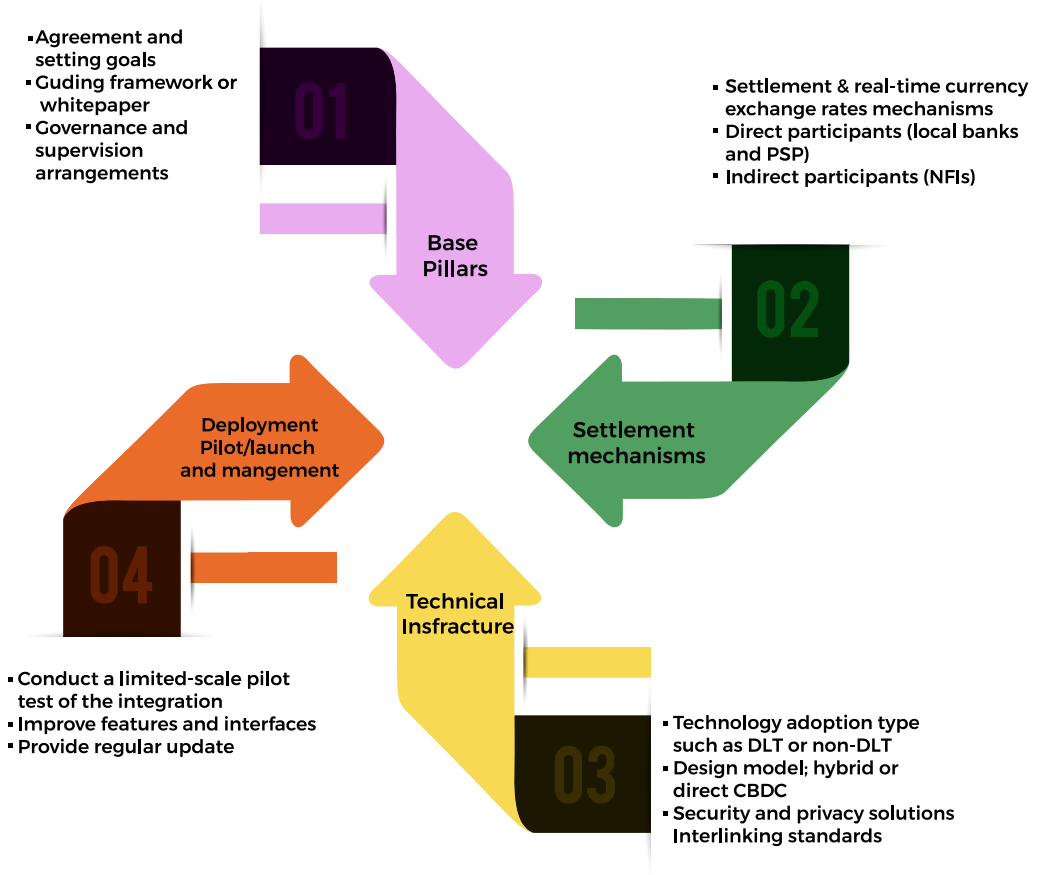
Interlinking CBDC projects in Africa holds the potential to foster economic integration, financial inclusion, and stability throughout the continent. African countries often rely on foreign currencies for international transactions, which can expose them to currency risk. Interlinked CBDCs could reduce this dependency and promote the use of local currencies. Africa has numerous countries with diverse currencies, which can complicate cross-border transactions. Interlinked CBDCs could streamline these transactions, reducing costs and processing times. By having such an electronic payment account/wallet users do not have to carry large amounts of their currencies to pay for high-value transactions in other countries.



# A framework for the interlinking of CBDC

In Africa, where traditional banking infrastructure faces challenges, CBDCs hold immense potential to foster financial inclusion and drive economic growth. However, the successful implementation of CBDC projects in Africa requires a cohesive framework that addresses the diverse needs and challenges across the continent. This paper presents a comprehensive framework for the interlinking of CBDC projects in Africa, outlining key stakeholders, conditions, and principles necessary for its realization. This principle is anchored in base pillars, technical infrastructure, settlement mechanisms and deployment.

Figure 4: Pillars of interlinking CBDC




Source: Agpaytech

# Base Pillars

The base pillars are the foundation or groundbreaking preparation that central banks need to arrange kick-off CBDC projects. It includes sharing ideas on the feasibility of joining CBDC infrastructure, guiding framework, supervision and governance mechanism and common creation of a friendly environment usually through a memorandum of understanding (MOU) among the participating countries.

## ■ Agreement and Setting Strategic Goals

This is the starting point. The countries or central banks in the African region that have the idea to create a common CBDC interface for usage need to come together and agree on key principles, align major differences and work towards common goals or direction. At this stage, the participating central banks should decide on the type of CBDC they intend to issue on a common platform; either wholesale, retail CBDC, or both.

## ■ Guiding Framework / White paper

Central banks seeking to link or create CBDC may not have the same financial infrastructure, language, currency, time zones and laws. Therefore, a white paper would consider the basic requirements, architectural framework, deployment plan, maintenance and sustainability mechanism to ensure objectivity in the project.

## ■ Governance and supervision arrangement

Harmony in the governance and supervision and mechanism among the participating central banks is necessary. This includes the cooperative arrangement on data usage, how to store the customers' data, onboarding mechanism, evaluating risk, and fraud uncertainties. The supervision arrangement spells out the central banks' extent of influence, dialogue process, and operational risk of the multi-CBDC project. Under the governance model, participants define the powers and roles of the infrastructure owners, technical operators, intermediaries and users to help provide day-to-day administration of the linked arrangement.

### 01 Overseer

Central banks shall ensure the safety, and efficiency of the payment system, formulating regulatory framework, monitoring and assessing risk of digital currency.

### 02 Operator

Central banks facilitate both settlement and clearing services and promote the efficient use of payment systems by other intermediaries.

### 03 Catalyst

Central banks shall ensure that interlinked CBDCs are on par with modern payment needs, contribute to payment innovations and coordinate efforts to prevent fragmentation.

# Technical Pillar

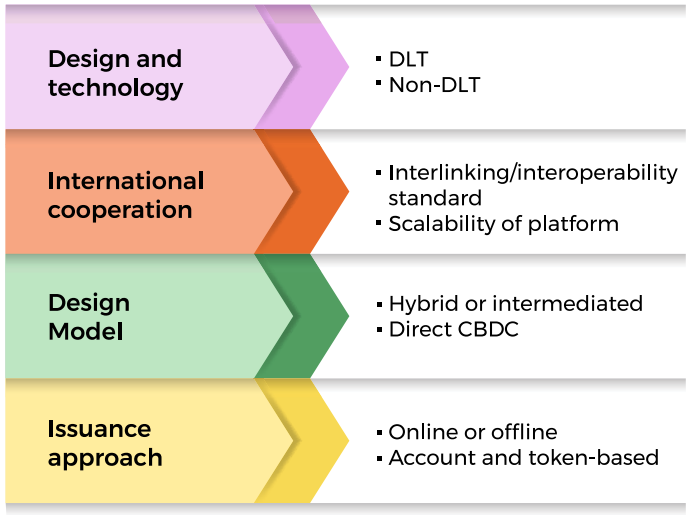
The technical pillar is the core of the project. It is the architecture of a CBDC project, which is critical to its functionality, security, scalability, and interoperability, and requires careful consideration and planning during the project's design and implementation phases. The technical team needs to explore and evaluate all jurisdictions participating in the CBDC projects to determine a consensus mechanism that will work for all. The choice of blockchain or DLT platform, such as Ethereum, Hyperledger, or a custom-built solution, serves as the foundation for recording and validating transactions securely and transparently. The choice of technology must work for all participating central banks. Technology firms specializing in blockchain, cybersecurity, and digital identity solutions are essential partners in CBDC development and deployment. Investment in digital infrastructure, including broadband connectivity and cybersecurity measures, is essential to support the robust and secure operation of CBDCs.

At this stage, the technical team must think deeply about the architectural considerations to ensure that the CBDC system can handle

> **Choice of technology is crucial for developing scalable and secured CBDC system**

At this stage, the technical team must think deeply about the architectural considerations to ensure that the CBDC system can handle a high volume of transactions efficiently and reliably without sacrificing performance or compromising network scalability. Also, the standards and protocols for interoperability with existing payment systems, financial infrastructure, and other CBDC projects to facilitate seamless cross-border transactions and integration with the broader financial ecosystem are looked into. The team must lay out foundation mechanisms for preserving the privacy and confidentiality of transactional data while still ensuring transparency and auditability as required by regulatory requirements.

Figure 5: Design considerations




Source: Agpaytech

# Settlement mechanism

The settlement mechanism provides clear responsibility between the technology operator or provider, central banks (owners) and intermediary payment institutions on the revenue, funding, onboarding and technical administration of the CBDC. In the process of interlinking rCBDCs, aligning the data transfer requirements of many jurisdictions may be far more challenging than just two jurisdictions depending on the difference in the requirements involved. The settlement mechanism lies between the intermediaries (central banks, commercial banks, payment service providers) and the funding approach. Much attention should be given to the underlying governance and commercial and technical models of linked arrangements.

- Settlement & real-time currency exchange rate mechanisms
- Direct participants (local banks and PSP)
- Indirect participants (NFIs)

**“**

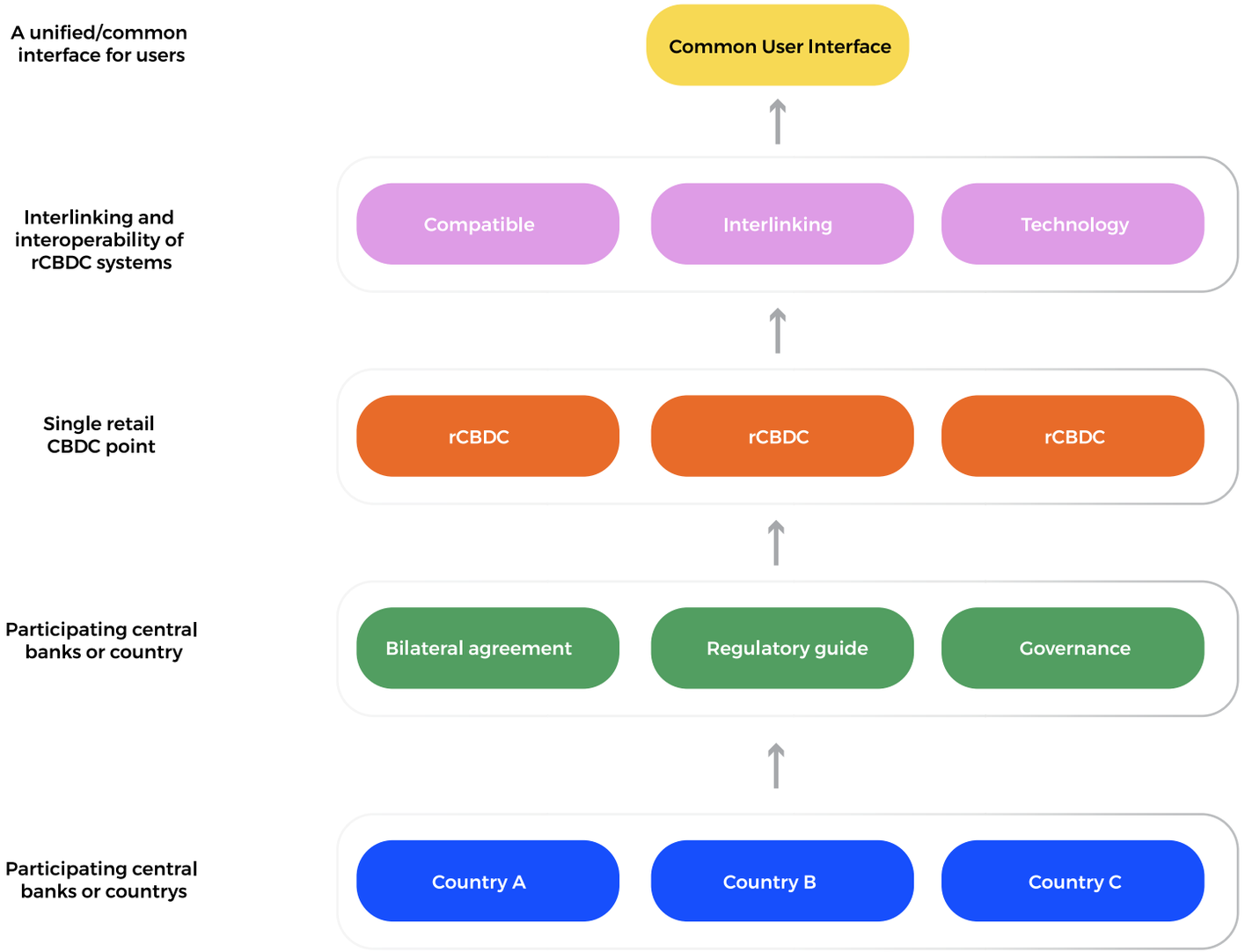
**In the settlement mechanism, adequate considerations should be given to the underlying governance, settlement and technical models of linked rCBDCs**

# Pilot/launch and management

Piloting, launching and management of interlinked CBDCs is pivotal for ensuring the smooth functioning and acceptance of this new form of digital currency. Prior to the pilot or launch, efforts should be made to educate users, including financial institutions, businesses, and the general public, about the benefits and functionalities of interlinked CBDCs. Clear communication about security measures, transaction processes, and potential use cases can help build trust and confidence. Also, there is a need for continuous monitoring and oversight mechanisms to detect and respond to potential threats, including cyberattacks, fraud, and operational disruptions. Regular audits and security assessments should be conducted to maintain the integrity and resilience of the interlinked CBDC infrastructure.

- Conduct a limited-scale pilot test of the integration
- Improve features and interfaces
- Continuous monitoring and provision of regular update

Figure 6: rCBDCs interlinking framework




Source: Agpaytech

# Making CBDCs Possible in Africa

## CBDC Education

Widespread adoption of CBDC may require public education and incentives to encourage its use. Some individuals and businesses may be hesitant to adopt digital currency due to unfamiliarity or mistrust. Therefore, public awareness and justification of the CBDC use among other payment methods would increase the adoption rate. Most retail CBDCs such as the eNaira have been known to have low adoption rates. Recently, the Central Bank of Nigeria(CBN) has encouraged students of higher institutions across the country to embrace payment of their school fees through the use of its eNaira platform. Similarly, the Chinese government recently announced its intention to broaden the use of the e-CNY in educational institutions. That includes areas like scholarship distribution, tax payments, and school purchases. Also, the e-CNY has been integrated into WeChat Pay and Alipay to promote public awareness, and payment options for users. Central banks planning to launch digital currencies should consider integrating them into the existing payment systems to promote financial inclusion.

## Data and Sandboxes Regulation

The financial products and services sector is highly regulated almost everywhere in the world because governments want to make sure that their citizens' money is safe and protected. Already, some countries in Africa have used the regulatory sandbox in a controlled environment that allows entrepreneurs, regulators, and other players in the FinTech industry to test out new financial products or services without being too constrained by inappropriate regulations. CBDCs in Africa should adopt a similar regulatory sandbox framework to discover the innovative solutions that CBDCs can offer to the existing payment market. A key example is the Zambia Central Bank Regulatory Sandbox. Moreover, this research has put forth a regulatory sandbox in Africa for reference purposes.

## Digital Currency Hackathon

Financial technology innovation challenges, webinars, and conferences such as hackathons among FinTechs, developers, and technocrats individuals would harness the digital currency talents in Africa. A hackathon is a time-bound, collaborative, and intensive event where individuals or teams work on creative and innovative projects, typically related to technology, software development, or problem-solving. Similarly, a hackathon is a sprint-like event where a group of people creates solutions to real-life problems on short notice. Two CBDC projects have opened for innovative challenges (hackathon). First was the eNaira hackathon. The eNaira hackathon is a joint project between CBN and the African FinTech Foundry (AFF) aimed to pool together a team of outstanding African entrepreneurs, developers, designers, solution developers, and problem solvers to create creative solutions for increased eNaira adoption. Furthermore, as part of the digital Cedi piloting, there is an innovation challenge dubbed the eCedi hackathon. eCedi hackathon was a joint initiative between the Bank of Ghana and EMTECH Inc. to provide opportunities for FinTech, developers and innovators to design innovative solutions that explore various use cases of a Central Bank Digital Currency (CBDC).

# Conclusion

The establishment of a framework for interlinking retail Central Bank Digital Currency (CBDC) in Africa represents a significant milestone in the evolution of the continent's financial ecosystem. This framework holds the promise of revolutionizing the way individuals, businesses, and governments transact, offering numerous benefits such as increased financial inclusion, enhanced efficiency, and reduced transaction costs.

Through the development of interoperable systems and collaborative partnerships among African central banks, the potential for seamless cross-border transactions and greater economic integration within the continent becomes increasingly tangible. By leveraging modern technologies and adhering to robust security standards, the interlinked retail CBDC framework can foster trust and confidence among users while mitigating risks associated with digital currency adoption.

Furthermore, the establishment of a governance framework and regulatory oversight mechanisms will be paramount in ensuring the stability, integrity, and resilience of the interlinked CBDC network. Continuous monitoring, evaluation, and adaptation will be essential to address emerging challenges and capitalize on new opportunities as the landscape of digital finance evolves.

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# About Agpaytech Ltd.

Agpaytech Ltd. is a company pioneering in the Fintech space with a focused approach to building robust technologies for e-commerce Card Processing Solutions for Payment Service Providers (PSPs). Additionally, we provide Compliance and Regulatory Umbrella, Remittance-as-a-Service (RaaS), Banking-as-a-Service (BaaS), Foreign Exchange, Cross Border Payments, and digital currency technology.

We also provide practical white paper research support to central banks, government and private institutions, economic organizations, and NGOs in Africa. Our services expand from research projects, state-of-industry reports, project assessment, data collection, and consulting services in the fintech space.

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