

EFFICIENCY IMPLICATIONS OF CENTRAL BANK DIGITAL CURRENCY ADOPTION: A DESCRIPTIVE ASSESSMENT OF NIGERIA'S ENAIRA

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ABSTRACT

Nigeria's eNaira is one of the earliest live retail central bank digital currencies (CBDCs) in an emerging economy. This study provides a descriptive assessment of the efficiency implications associated with eNaira adoption in Nigeria, while distinguishing eNaira-specific indicators from the much broader expansion of electronic payments. An ex post facto secondary-data design was used. Official Central Bank of Nigeria (CBN) data on electronic-payment activity, eNaira wallets and currency in circulation were combined with recent peer-reviewed and institutional studies. The assessment covers transaction-system expansion, operational availability, adoption intensity, monetary footprint, access-related channels and possible implications for financial intermediation. Nigeria's total e-payment volume increased from 16.33 billion transactions in 2021 to 38.73 billion in 2023, an increase of about 137.2%. This growth cannot be attributed to the eNaira because the aggregate series covers multiple payment channels and the study does not have a continuous public series for eNaira-specific transaction volume and value. eNaira circulation increased from ₦0.94 billion in the second half of 2021 to ₦18.31 billion in the second half of 2024. At end-June 2024, 28.46 million customers had been on boarded while 197,041 wallets were classified as active; the resulting 0.69% ratio is treated only as an approximate reported activity indicator because the CBN figures refer to customers and wallets. The eNaira accounted for about 0.34% of currency in circulation at end-2024. The evidence therefore indicates strong technical capacity but limited realised network utilisation. The study does not establish a causal economy-wide efficiency effect. Instead, it concludes that the eNaira's present contribution is constrained mainly by repeated use, merchant acceptance, interoperability, trust and the absence of sufficiently strong user value propositions.

Keywords: active wallets; financial inclusion; financial intermediation; network effects; payment-system efficiency

1. Introduction

Digital payment systems have changed how households, firms and governments transfer value. A central bank digital currency adds another layer because it is a direct liability of the central bank in digital form rather than a deposit claim on a commercial bank. The policy case for CBDCs includes safer public money in a digital economy, greater payment competition, lower settlement frictions and wider financial access, although design choices can also affect bank funding, deposit substitution and operational risk (Agur et al., 2022; Keister & Sanches, 2023; Soderberg et al., 2022). Consequently, CBDC performance should be assessed not simply by launch or registration numbers but by operational reliability, actual use and interaction with the existing payment ecosystem.

Nigeria became an important case when the Central Bank of Nigeria (CBN) launched the eNaira on 25 October 2021. The eNaira is denominated one-for-one with the naira and was designed for person-to-person, person-to-business and other digital payments. The CBN continues to provide official information on the eNaira, while the latest detailed public stock and activity observations used in this study extend to 2024 (Central Bank of Nigeria, n.d.-a, 2025a, 2025b). Early policy documents associated the project with payment efficiency, financial inclusion, lower cash-management costs, direct welfare payments and support for a more digital economy (Mohammed & Yusuf, 2023; Ree, 2023). The two-tier distribution arrangement also sought to retain the role of banks and other intermediaries.

The Nigerian setting requires a cautious efficiency assessment because electronic payments were already expanding before the eNaira. A rise in aggregate electronic transactions after 2021 therefore cannot, by itself, demonstrate an eNaira effect. Nigeria has established bank-transfer networks, mobile applications, point-of-sale terminals, mobile-money operators and USSD services. A second issue is the difference between onboarding and active use. Payment efficiency is realised through repeated transactions, acceptance and network reach rather than registration alone. A technically available platform can make only a limited contribution when buyers and sellers do not use it regularly (Tan, 2023b).

Existing eNaira studies address expected benefits, adoption intentions, app experience, financial inclusion and bank-disintermediation risks (Adegbite & Aremu, 2022; Olaleye et al., 2024; Osakwe et al., 2025). The present study narrows the question to what can reasonably be observed from publicly available official data. It therefore distinguishes three levels of evidence: the growth of Nigeria's overall electronic-payment system, eNaira-specific adoption and circulation indicators, and operational or financial-intermediation implications. This distinction prevents broad digital-payment growth from being interpreted automatically as an eNaira outcome.

1.1 Statement of the Problem

Despite the introduction of the eNaira as Nigeria's central bank digital currency, its contribution to payment-system efficiency remains unclear. The rapid growth of Nigeria's electronic-payment activity since 2021 cannot be attributed to the eNaira because national payment statistics combine several established channels, including bank transfers, web transactions, point-of-sale services and mobile applications. At the same time, available eNaira indicators show a substantial gap between cumulative onboarding and active use, while the eNaira's share of currency in circulation remains small. The absence of a sufficiently continuous public series on eNaira-specific transaction volume and value further limits the ability to determine its direct contribution to payment efficiency. The problem addressed by this study is therefore not whether Nigeria's digital payments have expanded, but what efficiency

implications can reasonably be observed from the available eNaira-specific evidence and how these compare with the wider development of the Nigerian digital-payment system.

1.2 Objectives of the Study

The main objective of this study is to assess the observable efficiency implications of eNaira adoption in Nigeria using publicly available official data. Specifically, the study seeks to:

- i. Examine the trend in Nigeria's electronic-payment transaction volume and value from 2020 to H1 2024.
- ii. Assess the level of eNaira adoption and active wallet utilisation using available eNaira customer and wallet indicators for 2021 to June 2024.
- iii. Determine the monetary footprint of the eNaira by comparing eNaira circulation with total currency in circulation for H2 2021 to H2 2024.
- iv. Analyse the distribution of Nigeria's electronic-payment activity across major payment channels, including web-based transactions, point-of-sale services and mobile applications, using H1 2024 data.
- v. Evaluate the observed relationship between eNaira adoption indicators and payment-system efficiency using the available 2021–2024 aggregate evidence, while explicitly distinguishing descriptive association from causal effects

2. Literature Review

2.1 Conceptual Review

2.1.1 Central Bank Digital Currency and the eNaira

A retail CBDC is a digital form of sovereign money made available to households and firms. It differs from cryptocurrency because its value is anchored to the national unit of account and its issuer is the monetary authority. It also differs from ordinary bank-account money: bank deposits are liabilities of commercial banks, whereas CBDC balances are claims on the central bank. These distinctions affect trust, settlement finality and the way funds move through the financial system. Auer and Böhme (2020) argue that CBDC design is not only a choice of technology; it is a choice about who has access, who validates transactions, how privacy is managed and how the new instrument connects with existing payment infrastructure. Auer and Böhme (2021) later describe a 'minimally invasive' approach in which central-bank money is modernised without unnecessarily displacing private intermediaries.

The eNaira follows this public-money logic. It is legal tender and a direct CBN liability held through digital wallets. Nigeria adopted a tiered wallet structure with different identity requirements and limits, while banks and other payment providers have roles in onboarding and service delivery. The CBN also introduced USSD access and worked on interoperability with financial institutions and payment service providers. These features were intended to reduce access barriers and make the platform useful beyond smartphone users (Mohammed & Yusuf, 2023). In practice, however, a digital instrument becomes economically important only when it develops frequent use cases, a dense acceptance network and a clear advantage over familiar alternatives. In the Nigerian context, these design features make the eNaira a useful case for examining whether a publicly issued digital currency can gain practical relevance within an already active electronic-payment system.

2.1.2 Meaning of Payment-System Efficiency

Payment-system efficiency has several meanings. In this article it refers to the ability to complete payments with less time, lower friction, wider reach, dependable availability and resilient settlement, while avoiding excessive cost or instability elsewhere in the financial system. Efficiency therefore includes technical performance and realised user performance. A

system that processes transactions continuously and settles safely has technical efficiency. Realised efficiency appears when users adopt it at sufficient scale to reduce payment frictions in everyday economic activity. Morales-Resendiz et al. (2021) stress that retail-CBDC implementation should be judged not only by launch but also by operational arrangements, user needs and the surrounding payment ecosystem.

CBDCs may improve efficiency by providing instant or near-instant settlement in central-bank money, lowering dependence on cash handling, widening payment access and encouraging competition among service providers. The efficiency implications therefore depend on operational arrangements, user needs and integration with the surrounding payment ecosystem (Morales-Resendiz et al., 2021). This is particularly relevant to Nigeria because the eNaira operates alongside established bank transfers, mobile applications, point-of-sale services and other electronic-payment channels; consequently, aggregate growth in electronic payments cannot automatically be interpreted as an eNaira-specific efficiency effect.

2.1.3 Adoption and Network Effects

Efficiency can also be reduced by weak network effects. Digital payments are two-sided: consumers gain more value when many merchants accept the instrument, and merchants gain more value when many consumers want to pay with it. Tan (2023b) models this adoption problem directly and shows that the decisions of users and merchants reinforce each other. A CBDC with high initial publicity but low repeated use can therefore remain below a critical scale. Information, trust and ease of use matter as well. Ozili (2023) finds that interest in eNaira information is connected with interest in financial inclusion and FinTech information, while Akindipe et al. (2023) report limited awareness and understanding in their Nigerian sample. These findings imply that a technically available platform may still face behavioural barriers. In Nigeria, the distinction between cumulative onboarding and active wallet use is therefore central to assessing the depth of eNaira adoption and the strength of its network effects.

2.2 Theoretical Framework

2.2.2 Diffusion of Innovation Theory

As a supporting theoretical perspective, the study also draws on Diffusion of Innovation Theory, developed by Everett M. Rogers (2003). The theory explains how new ideas, technologies and practices spread among members of a social system over time. Rogers identifies five major perceived characteristics of an innovation that influence its adoption: relative advantage, compatibility, complexity, trialability and observability.

The first assumption is that adoption is influenced by the relative advantage of an innovation over existing alternatives. For the eNaira, this concerns whether users perceive meaningful benefits compared with familiar payment methods such as bank transfers, mobile applications, POS payments and cash.

The second assumption is compatibility, meaning the extent to which an innovation is consistent with users' existing practices, values and needs. This is relevant to the eNaira because adoption may depend on its compatibility with Nigeria's existing banking and payment infrastructure and with the ways individuals and businesses already make digital payments.

The third assumption concerns complexity. Innovations perceived as difficult to understand or use are less likely to be adopted. In the Nigerian eNaira context, wallet registration, authentication, application usability, transaction procedures and access requirements can therefore influence actual adoption and continued use.

The fourth assumption is trialability, or the extent to which potential users can experiment with an innovation before making a stronger commitment. The availability of

accessible eNaira services and practical opportunities to use the wallet can therefore influence willingness to adopt.

The fifth assumption is observability, referring to the extent to which the benefits and results of an innovation are visible to potential users. For the eNaira, visible evidence of successful transactions, merchant acceptance and practical benefits may encourage additional users to participate.

Diffusion of Innovation Theory therefore complements Two-Sided Market Theory. While Two-Sided Market Theory explains the importance of network participation between users and merchants, Diffusion of Innovation Theory explains how perceptions of the innovation itself can influence adoption. Together, the theories provide a basis for interpreting why the existence of an operational CBDC does not necessarily translate into widespread active use.

2.2.3 Application of the Theoretical Framework to the Study

The two theories provide complementary explanations for the study's central empirical problem. Two-Sided Market Theory suggests that eNaira efficiency depends partly on the development of sufficient participation and acceptance across the payment network. Diffusion of Innovation Theory suggests that adoption also depends on whether users perceive the eNaira as advantageous, compatible, sufficiently simple, testable and visibly useful.

These theoretical assumptions guide the interpretation of the study's empirical indicators. Aggregate electronic-payment volume and value provide evidence on the wider Nigerian payment environment, while eNaira onboarding and active-wallet indicators provide evidence on adoption. E-Naira circulation relative to currency in circulation provides an indication of its monetary footprint. The results are therefore interpreted as evidence of observable adoption and payment-system implications, rather than proof of a causal economy-wide effect.

Importantly, the theoretical framework does **not** assume that growth in Nigeria's electronic-payment activity after 2021 was caused by the eNaira. The eNaira operates within an already-developed payment ecosystem, and the study lacks a sufficiently continuous eNaira-specific transaction series for causal identification.

Figure 2.1 presents the conceptual relationship between eNaira adoption and payment-system efficiency. The model begins with eNaira adoption, represented by user participation and active use, which are expected to influence the strength of network effects within the payment system. Greater participation by consumers and merchants can increase the usefulness and acceptance of the eNaira, potentially improving payment accessibility, convenience and transaction efficiency. The model also recognises that the resulting efficiency implications are conditioned by the wider Nigerian payment ecosystem and by possible financial-intermediation considerations.

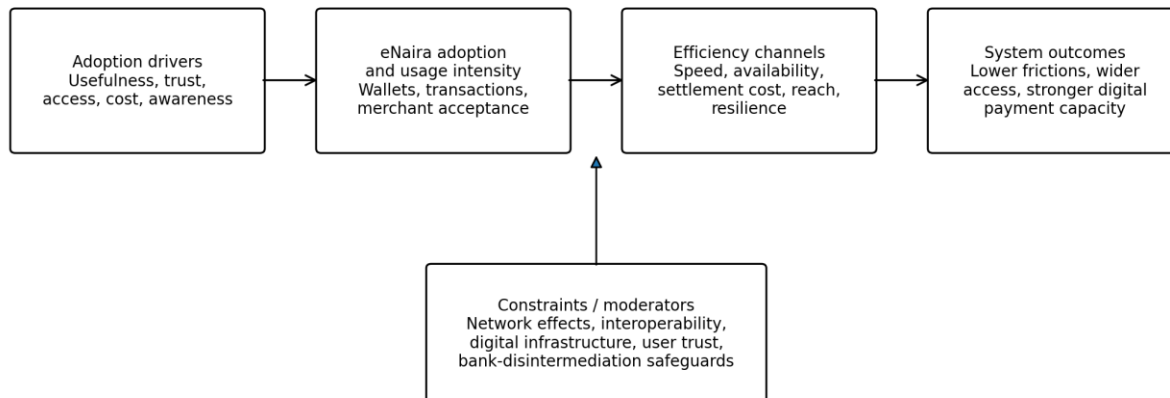


Figure 2.1. Conceptual model linking eNaira adoption to payment-system efficiency.

Source: Developed by the author from Two-Sided Market Theory and CBDC adoption literature (Rochet & Tirole, 2003; Agur et al., 2022; Keister & Sanches, 2023; Tan, 2023b).

2.3 Empirical Review

Empirical evidence on the eNaira indicates that adoption, actual use and its broader economic implications are not yet fully aligned. Nigerian studies generally agree that awareness, perceived usefulness, trust, usability and technological factors influence eNaira adoption, but they differ in the extent to which they demonstrate realised usage. Adegbite and Aremu (2022), using survey evidence, report that educational, technological, policy and behavioural factors influence eNaira adoption and that respondents expect transaction and cash-management benefits. Similarly, Akindipe et al. (2023) find limited awareness and understanding of the eNaira, while Abdullahi and Abdullah (2024), based on 120 cleaned responses, show that behavioural and technology-related factors influence intention to use the currency. Osakwe et al. (2025) extend this line of evidence by combining PLS-SEM and fsQCA and finding that transaction convenience, financial-inclusion value and trust support adoption intentions, whereas perceived financial cost constrains them. Taken together, these studies suggest that the challenge is not simply whether Nigerians are aware of the eNaira, but whether the instrument offers sufficiently strong and sustained value to generate repeated use.

Evidence based on observed usage provides a more cautious picture. Ree (2023), using CBN operational information from the first year of the eNaira, reports that the platform was technically operational but that wallet use remained low and network effects were weak. Olaleye et al. (2024), through sentiment and content analysis of 214 eNaira application reviews, similarly identify usability and service-related concerns that may discourage actual use. These findings complement the adoption-intention studies but also reveal an important methodological difference: survey studies often measure perceptions or intentions, whereas operational and app-based studies provide closer evidence of realised user experience. Consequently, registration, intention to adopt and active usage should not be treated as equivalent measures of eNaira adoption.

The literature also differs in its treatment of wider economic and financial-system effects. Nwosu et al. (2023), Olusegun et al. (2023) and Adamgbe et al. (2023) examine deposit substitution, credit supply and disintermediation using scenario and balance-sheet analyses

contained in the CBN's *Economics of Digital Currencies: A Book of Readings*. These studies are useful for understanding possible financial-intermediation effects, but they should be distinguished from independently peer-reviewed journal evidence because they appear as chapters in a CBN institutional publication. Ozili (2024), in contrast, uses Nigerian macroeconomic data and 2SLS and Granger-causality methods to examine the post-CBDC period in relation to economic growth and inflation. While this provides a stronger econometric approach to macroeconomic outcomes, its dependent variables are growth and inflation rather than direct measures of payment-system efficiency or eNaira transaction activity. The existing literature therefore provides useful evidence on adoption intentions, user experience, financial intermediation and macroeconomic outcomes, but leaves a gap in combining official eNaira-specific adoption and monetary-footprint indicators with the wider trend in Nigeria's electronic-payment system. The present study addresses this gap descriptively rather than claiming a causal e-Naira effect.

Table 2.1. Selected empirical studies on eNaira/CBDC adoption and efficiency

Author(s)	Setting/data	Method	Focus	Main finding
Adegbite & Aremu (2022)	Nigeria; 2,583 respondents	Survey; MANOVA, correlation, chi-square	Adoption and expected economic effects	Education, technology, policy and behaviour shaped adoption; respondents expected transaction and cash-cost benefits.
Ree (2023)	Nigeria; CBN operational data, first year	Descriptive / institutional assessment	Actual wallet and transaction use	Technical operation was stable, but wallet use was low and network effects were weak.
Ozili (2023)	Nigeria; Google Trends	OLS, GMM and 2SLS	Information interest / inclusion	Interest in eNaira information was positively linked with interest in financial-inclusion information.
Akindipe et al. (2023)	Nigeria; 120 respondents	Questionnaire analysis	Awareness and understanding	Awareness, understanding and receptiveness were limited, pointing to adoption frictions.
Nwosu et al. (2023)	Nigeria; banking/deposit scenarios	Scenario-based analysis	Deposit substitution	Current adoption had little effect on transferable deposits; larger circulation could reduce deposits.
Olusegun et al. (2023)	Nigeria; financial-system scenarios	Descriptive and scenario analysis	Stability, deposits and credit	Small eNaira demand had limited credit effect; substantial demand could constrain bank credit.
Adamgbe et al. (2023)	Nigeria; monetary/bank balance sheets	Payment portfolio and stylised balance-sheet analysis	Disintermediation	Deposit-to-eNaira substitution can create liquidity and intermediation risk as adoption rises.
Abdullahi & Abdullah (2024)	Abuja, Nigeria; 120 respondents	Adoption-model survey	Intention to use	Behavioural and technology factors influenced intention; low adoption remained a

				practical challenge.
Olaleye et al. (2024)	Nigeria; 214 eNaira app reviews	Sentiment and content analysis	Usability / actual experience	User experience and service concerns can discourage actual CBDC use.
Ozili (2024)	Nigeria; GDP and inflation data	2SLS and causality tests	Growth and inflation	CBDC periods were associated with higher growth and inflation, but causal interpretation requires caution.
Osakwe et al. (2025)	Nigeria; individual users	PLS-SEM and fsQCA	Attitudes and adoption intention	Seamless transactions, time convenience, inclusion value and central-bank trust supported use intentions; financial cost hindered them.
Giraldo-Gordillo & Bustillo-Mesanza (2025)	Nigeria and Bahamas; macro-financial data	Synthetic control method	Post-CBDC outcomes	Nigeria's mobile-money transactions/GDP rose relative to synthetic control, suggesting complementarity with FinTech.

The empirical evidence points to a consistent distinction between technical availability and realised adoption. Survey studies explain intention and expected benefits, operational assessments document the early platform experience, app-review studies identify usability barriers, and scenario models identify possible banking risks at higher adoption. However, these strands rarely combine official eNaira stock/activity indicators with the scale of Nigeria's wider electronic-payment system. The studies also differ in what they can infer: surveys measure attitudes, scenario models examine conditional outcomes, and descriptive institutional studies document observed use. The present study therefore complements rather than replaces these approaches by separating national payment growth from eNaira-specific evidence and by avoiding causal claims that the available public data cannot support.

2.4 Critical Synthesis and Gap in Literature

Existing studies have generated useful evidence on eNaira adoption, user perceptions, operational experience, financial inclusion and possible financial-intermediation effects. However, important limitations remain in the way the available evidence is brought together. First, several studies focus on adoption intentions, awareness or user experience rather than combining eNaira-specific administrative indicators with the broader trajectory of Nigeria's electronic-payment system. Second, studies that examine the eNaira's wider payment environment do not provide the same combination of the latest publicly available eNaira activity indicators, monetary footprint and aggregate electronic-payment trends used in the present study. Ree (2023), for example, assessed the eNaira's first year and documented low adoption, limited transaction activity and the importance of network effects, while Giraldo-Gordillo and Bustillo-Mesanza (2025) examined the relationship between CBDC introduction and mobile-money outcomes. These studies demonstrate that the eNaira should be considered within the wider digital-payment ecosystem, but they do not provide the specific 2024 CBN-based combination of active-wallet evidence, eNaira circulation relative to currency in circulation, and aggregate electronic-payment activity assembled in the present study.

The present study therefore contributes a more recent descriptive evidence frame rather than claiming to be the first study to compare the eNaira with wider digital payments. It brings

together the available CBN indicators through 2024 to examine three related dimensions in one assessment: the expansion of Nigeria's overall electronic-payment system, the depth of eNaira adoption and active-wallet use, and the eNaira's monetary footprint. This approach is intended to show what can reasonably be observed about the eNaira's efficiency implications from official data while avoiding unsupported causal attribution. The study consequently fills an evidence-integration and updating gap rather than a claim that no previous study has examined eNaira use alongside Nigeria's wider digital-payment development.

3. Methodology

3.1 Research Design and Scope

This study adopts an ex post facto research design based on secondary data. The design is appropriate because the study examines historical developments in Nigeria's electronic-payment system and eNaira indicators after the events and observations have already occurred, without manipulating or controlling the variables. The study uses official secondary data published by the Central Bank of Nigeria (CBN), including electronic-payment statistics, eNaira adoption and wallet indicators, and currency-in-circulation data.

The method of analysis is descriptive statistics. Specifically, the study uses frequencies/absolute values, percentage shares, growth rates and ratios to summarise and compare the available payment-system and eNaira indicators. The analysis does not employ causal econometric estimation because the available public eNaira data do not provide a sufficiently continuous transaction-level or high-frequency series for identifying a causal effect of eNaira adoption on aggregate payment activity. The descriptive approach is therefore consistent with the study's objective of establishing what can reasonably be observed from the available official data.

The study period covers 2020 to H2 2024. The starting year, 2020, provides a pre-eNaira baseline because the eNaira was launched on 25 October 2021. This allows the study to observe the trajectory of Nigeria's electronic-payment system before and after the introduction of the CBDC. The period is extended through H2 2024 because this is the latest period for which the CBN sources used in the study provide the relevant eNaira circulation and related monetary indicators. For aggregate electronic-payment activity, the available series extends through H1 2024, while the eNaira stock/circulation evidence extends to H2 2024. The use of these periods therefore reflects the availability and frequency of the official CBN data rather than an assumption that the eNaira caused changes observed after 2021.

3.2 Variables and Efficiency Measures

Table 3.1. Operational measures used in the efficiency assessment

Measure	Operational Definition	Interpretation
Total e-payment volume	Annual/H1 number of electronic-payment transactions reported by CBN	Context for national digital-payment scale
E-payment growth rate	Percentage change in annual transaction volume	Speed of digital-payment expansion
Reported eNaira activity indicator	Reported active wallets relative to reported onboarded customers, expressed as a percentage	Approximate descriptive indicator of reported active use relative to reported onboarding; not a precise customer-level adoption rate because wallets and customers are

Measure	Operational Definition	Interpretation
		different units
eNaira circulation	eNaira component of currency in circulation	Nominal CBDC monetary scale
Monetary-footprint ratio	eNaira circulation / total currency in circulation $\times 100$	CBDC scale relative to total currency in circulation
Operational evidence	Availability, access channels and published service performance	Technical/resilience dimension of efficiency

Measurement Procedures

Three indicators are computed.

First, the annual transaction expansion rate is calculated as:

$$\text{Transaction Expansion Rate (\%)} = \frac{V_t - V_{t-1}}{V_{t-1}} \times 100 \quad (1)$$

where V_t represents electronic-payment transaction volume in the current period and V_{t-1}

represents transaction volume in the preceding period.

Second, the reported eNaira activity indicator is calculated as:

$$\text{Reported Activity Indicator (\%)} = \frac{\text{Active eNaira Wallets}}{\text{Onboarded eNaira Customers}} \times 100 \quad (2)$$

The resulting value is approximately 0.69% based on the reported June 2024 figures. However, active wallets and onboarded customers are different units of measurement. One customer may hold more than one wallet, and the available CBN data do not provide a directly matched customer-level denominator for the active-wallet figure. Therefore, the 0.69% value is not treated as a clean customer-level adoption or wallet-activation rate. Instead, it is used only as a reported activity indicator showing the magnitude of the difference between reported onboarding and reported active-wallet status. This unit limitation is taken into account when interpreting the result.

Third, the monetary-footprint ratio measures eNaira balances relative to total currency in circulation:

$$\text{Monetary – Footprint Ratio (\%)} = \frac{\text{eNaira Circulation}}{\text{Total Currency in Circulation}} \times 100 \quad (3)$$

These measures are descriptive and do not identify causality. They indicate national payment scale, reported eNaira usage intensity and monetary presence. They should not be interpreted as a direct estimate of the share of transactions conducted through eNaira because a continuous public series of eNaira-specific transaction volume and value is not available in the data used for this study.

3.3 Identification Caution and Data Limitations

The study does not interpret changes in Nigeria's aggregate electronic payment activity after the introduction of the eNaira as causal effects of the CBDC. The post-2021 period was influenced by several other developments, including FinTech expansion, changes in consumer payment behaviour, growth in point-of-sale and mobile-payment channels, and the cash constraints associated with the 2022–2023 currency redesign episode. Accordingly, the aggregate e-payment series is used as a descriptive indicator of the wider payment environment rather than as a direct measure of eNaira performance.

A further limitation is that the official public data used in this study do not provide a sufficiently continuous, same-period series of eNaira-specific transaction volume and transaction

value comparable with the aggregate CBN e-payment series. Consequently, eNaira transaction share cannot be calculated reliably for the full study period without combining data from different reporting periods. The analysis therefore focuses on the eNaira indicators that are publicly reported consistently enough for comparison, including circulation, onboarding and active-wallet measures.

The findings should consequently be interpreted as descriptive evidence on the observable efficiency implications associated with eNaira adoption, rather than as a causal estimate of the eNaira's effect on Nigeria's overall payment-system efficiency.

4. Results

4.1 Growth of Nigeria's Electronic-Payment System

Nigeria's electronic-payment system expanded strongly over the study period. Total e-payment volume rose from 10.146 billion transactions in 2020 to 16.326 billion in 2021, 22.074 billion in 2022 and 38.731 billion in 2023. The annual volume growth rates were approximately 60.9%, 35.2% and 75.5%, respectively. From 2021 to 2023, aggregate transaction volume increased by about 137.2%. The corresponding value series rose from about ₦1,245.66 trillion in 2020 to ₦1,670.50 trillion in 2021, fell to ₦1,550.44 trillion in 2022 and increased to ₦2,240.79 trillion in 2023. January–June 2024 recorded 22.42 billion e-payment transactions valued at about ₦1,558.91 trillion (Central Bank of Nigeria, n.d.-b). These figures describe the wider electronic-payment system and should not be interpreted as eNaira transactions.

Table 4.1. Nigeria's e-payment activity, 2020–H1 2024

Period	Volume (billion transactions)	Value (₦ trillion)	Volume growth (%)
2020	10.146	1,245.66	—
2021	16.326	1,670.50	60.9
2022	22.074	1,550.44	35.2
2023	38.731	2,240.79	75.5
H1 2024	22.420	1,558.91	Not comparable to full year

Source: Central Bank of Nigeria e-Payment Statistics. H1 2024 covers January–June only.

Values are expressed in trillions of naira; calculations are by the author.

Importantly, the aggregate e-payment figures should not be interpreted as eNaira transactions. The CBN's e-payment statistics combine multiple payment channels, including web transfers, point-of-sale transactions, mobile payments and other electronic channels. Although the CBN reported 875,000 eNaira transactions amounting to ₦11.83 billion by the first anniversary of the eNaira, this cumulative figure does not correspond to the same reporting period as the annual aggregate e-payment series used in Table 4.1 and therefore cannot be used to calculate a directly comparable annual eNaira share without introducing a period mismatch. The absence of a continuous, same-period public eNaira transaction-volume series is therefore an important limitation of the present descriptive comparison.

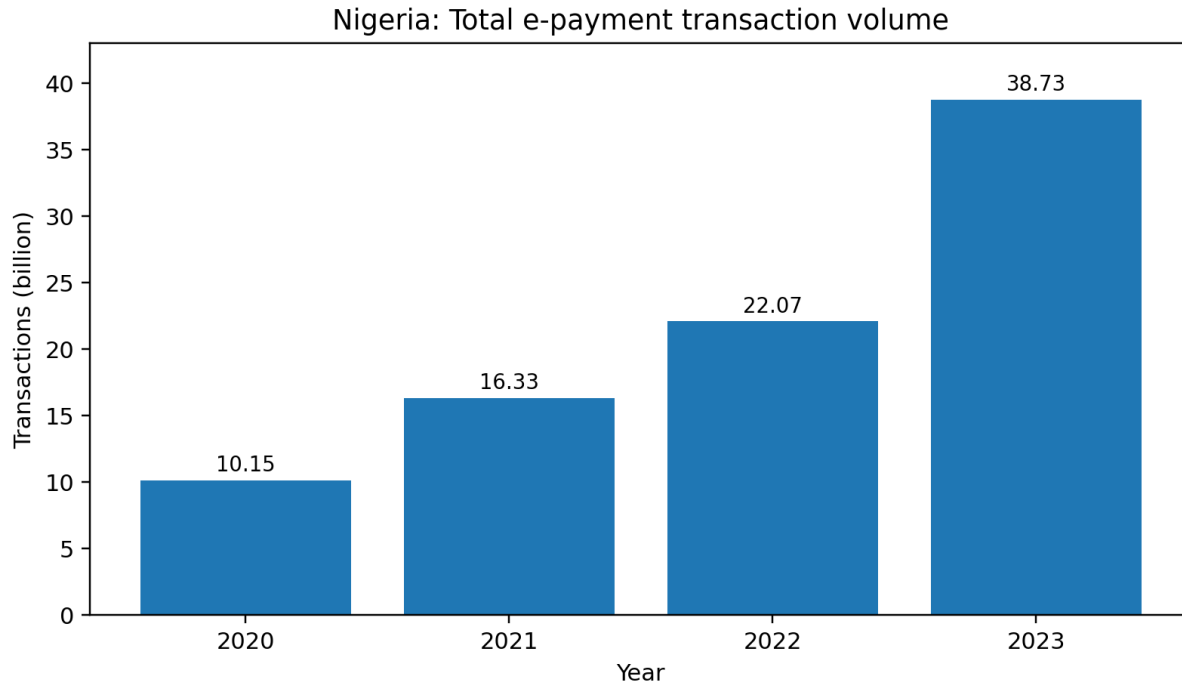


Figure 4.1. Total e-payment transaction volume in Nigeria, 2020–2023.

Source: Central Bank of Nigeria e-Payment Statistics; author's graph. H1 2024 is excluded from the annual graph because it represents only six months.

The channel composition reinforces this distinction. In H1 2024, web transfers accounted for approximately 51.9% of reported core e-payment volume, point-of-sale transactions about 28.5% and mobile-app transfers about 15.6% (Central Bank of Nigeria, n.d.-b). The dominance of established channels means that the strong national increase should be described as expansion of digital payments generally, not as evidence of an eNaira-caused increase.

4.2 eNaira Circulation and Monetary Footprint

The eNaira's stock increased substantially from a very small initial base. Its component of currency in circulation increased from ₦0.94 billion in H2 2021 to ₦1.35 billion in H1 2022, ₦2.55 billion in H2 2022, ₦7.16 billion in H1 2023, ₦13.98 billion in H2 2023 and ₦18.38 billion in H1 2024. It then declined slightly to ₦18.31 billion in H2 2024 (Central Bank of Nigeria, 2025b).

The sharp increase during 2023 occurred during a period that also included the cash constraints associated with Nigeria's currency redesign and related disruptions to cash availability. The broader cash shortage may have increased the attractiveness of electronic payment alternatives during this period, although the available data do not allow the increase in eNaira balances to be attributed specifically to the cash-scarcity episode. The rise in eNaira circulation should therefore be interpreted as occurring within a wider period of accelerated digital-payment activity rather than as evidence of a direct causal response to the cash shortage.

From H2 2021 to H2 2024, eNaira circulation increased from ₦0.94 billion to ₦18.31 billion, representing approximately 19.5 times the H2 2021 level. However, the movement from ₦18.38 billion in H1 2024 to ₦18.31 billion in H2 2024 is only a small six-month decline. It is therefore not sufficient to conclude that eNaira circulation had levelled off or entered a sustained decline. At most, the H2 2024 figure indicates that the rapid upward movement observed in earlier periods was not maintained during that particular half-year.

The eNaira remained small relative to total currency in circulation. At end-2024, total currency in circulation was approximately ₦5,441.16 billion, compared with ₦18.31 billion in eNaira circulation. The resulting monetary-footprint ratio was approximately 0.34%:

$$\frac{18.31}{5441.16} \times 100 \approx 0.34\%$$

For comparison, the corresponding ratio at end-2023 was approximately 0.38%, based on eNaira circulation of ₦13.98 billion and total currency in circulation of approximately ₦3,653.30 billion. Thus, although the nominal eNaira balance increased between 2023 and 2024, its share of total currency in circulation declined slightly because total currency in circulation increased faster than the eNaira balance. The result indicates that the eNaira's nominal monetary presence expanded, but its relative monetary footprint remained small at the end of 2024.

Source: Central Bank of Nigeria (2025b); author's calculations.

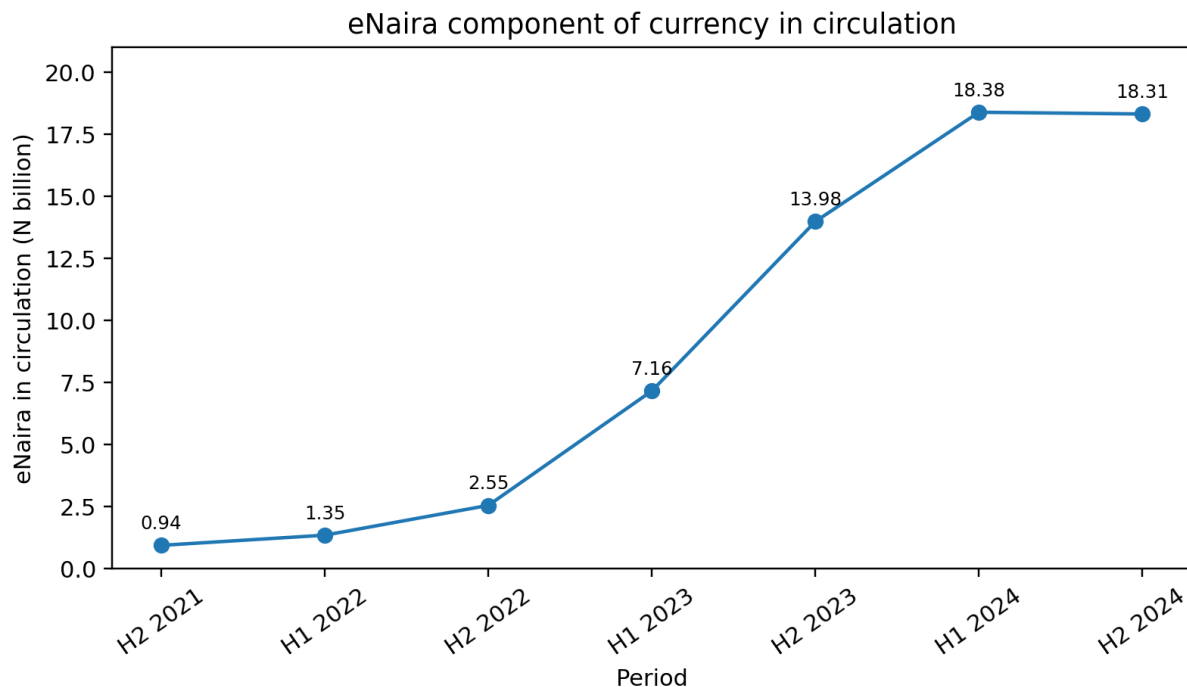


Figure 4.2. eNaira component of currency in circulation, H2 2021–H2 2024.

Source: Central Bank of Nigeria, Fourth Quarter 2024 Economic Report; author's graph.

4.3 Adoption Depth and Active Usage

The largest constraint is the gap between reported onboarding and active-wallet use. CBN financial-stability data report 28,460,316 onboarded customers and 197,041 active wallets at end-June 2024. Dividing the active-wallet count by the onboarded-customer count produces an approximate reported activity indicator of 0.69%.

However, this percentage must be interpreted cautiously because the numerator and denominator represent different units. Active wallets are wallet accounts classified as active, whereas onboarded customers are individuals or customer records reported as having been onboarded. One customer may hold more than one wallet, and the available data do not provide a directly matched customer-level denominator for the active-wallet figure. Therefore, the 0.69% value is not a precise customer-level adoption or wallet-activation rate. It is used here only as a descriptive indicator of the gap between reported onboarding and reported active-wallet status at the reporting date.

The result nevertheless indicates a substantial difference between cumulative onboarding and current active-wallet status. It should also not be interpreted to mean that every onboarded customer outside the active-wallet figure has never used the eNaira, because the CBN's "active" classification refers to activity during the reporting period. The evidence therefore points to limited current engagement relative to the reported onboarded base, rather than lifetime non-use.

Ree (2023) reported about 942,000 retail wallets by late 2022 but only about 802,000 retail transactions since inception, together with very low weekly wallet activity. At the same time, the first-year assessment reported continuous 24/7 availability without a major outage or major cyber incident. The combination of reliable technical operation and limited repeated use is therefore important for interpreting the eNaira's current efficiency position.

Table 4.2. Selected eNaira adoption and monetary-footprint indicators

Indicator	Observed Value	Efficiency Implication
Retail wallets (late 2022)	≈942,000	Early reach increased, but repeated use remained limited
Retail transactions since launch (late 2022)	≈802,000	Indicates shallow transaction activity during the first-year assessment
Onboarded customers (June 2024)	28,460,316	Large reported cumulative onboarding
Active wallets (June 2024)	197,041	Small reported active-wallet base relative to onboarding
Reported activity indicator	≈0.69%	Indicates a substantial gap between reported onboarding and active-wallet status; not a precise customer-level adoption rate because units differ
eNaira in circulation (H2 2024)	₦18.31 billion	Approximately 19.5 times the H2 2021 level

Sources: Ree (2023); Central Bank of Nigeria (2025a, 2025b). Calculations are by the author.

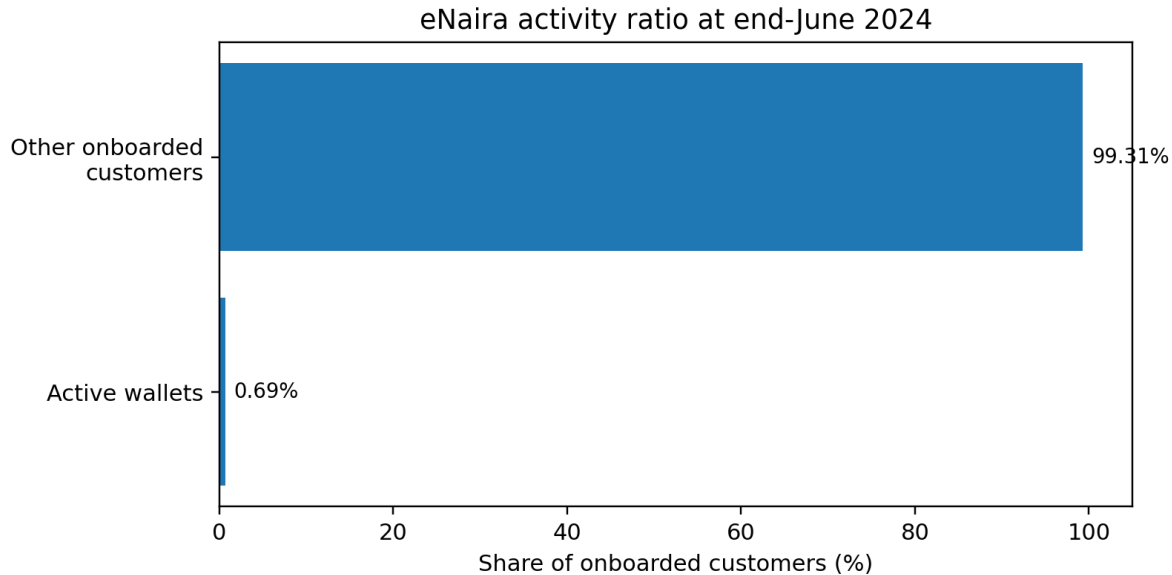


Figure 4.3. Reported active-wallet share relative to onboarded eNaira customers, end-June 2024.

4.4 Overall Efficiency Assessment

4.4 Overall Efficiency Assessment

The evidence was evaluated across the main efficiency dimensions identified in the methodology: technical availability, transaction-system capacity, active user adoption, merchant/network effects, financial inclusion potential, banking-system effects and monetary footprint. The assessment is descriptive and does not constitute a statistical efficiency score or causal estimate.

To make the ratings transparent, the following interpretation rules were applied:

- Strong: the available evidence shows substantial and sustained performance in the relevant dimension during the study period.
- Developing: measurable progress is evident, but the available evidence indicates that the dimension has not yet reached broad or sustained utilisation.
- Weak: the available evidence shows limited utilisation, a small relative footprint or a substantial gap between potential reach and realised use.
- Conditional: the outcome depends materially on factors not directly measured by the study, such as actual user demand, merchant acceptance, interoperability or wider financial-system responses.
- Currently limited; rises with scale: the available evidence indicates a small present effect, while the magnitude could increase if eNaira adoption and circulation become substantially larger.

These classifications are descriptive judgements based on the observed indicators and the stated rules above; they are not statistical scores and do not imply universal numerical cut-off points.

Table 4.3. Descriptive Evaluation of eNaira Efficiency Dimensions

Dimension	Assessment	Evidence-based reason
Technical availability	Strong	The first-year assessment reported 24/7 operation without a major outage or major cyber incident, indicating demonstrated operational availability of the additional public payment rail.
Transaction-system capacity	Developing	Nigeria's aggregate e-payment volume increased substantially, but the available CBN series combines several payment channels and does not isolate eNaira transaction volume and value.
Active user adoption	Weak	At end-June 2024, 197,041 wallets were reported as active compared with 28.46 million onboarded customers. The resulting approximately 0.69% reported activity indicator shows a substantial gap, although the numerator and denominator are different units.
Merchant/network effects	Weak developing	Existing evidence indicates that acceptance, usefulness, convenience and trust remain important constraints on sustained eNaira use, while established payment channels already have substantial network reach.
Financial inclusion potential	Conditional	The available evidence indicates potential for wider access through the eNaira's design and access arrangements, but this study does not directly measure realised inclusion outcomes.
Banking-system effect	Currently limited; rises with scale	Nigerian scenario studies indicate limited present effects under prevailing adoption, while larger eNaira demand and circulation could produce greater effects on deposits and credit.
Monetary footprint	Small	eNaira circulation reached ₦18.31 billion in H2 2024 but represented only approximately 0.34% of total currency in circulation at end-2024.

Source: Author's assessment based on CBN data and the empirical evidence reviewed in this study.

5. Discussion

The first finding is that Nigeria's electronic-payment system expanded strongly during the study period, with total e-payment volume increasing from 10.15 billion transactions in 2020 to 16.33 billion in 2021, 22.07 billion in 2022 and 38.73 billion in 2023. This represents a 137.2% increase between the eNaira launch year and 2023, while H1 2024 alone recorded 22.42 billion transactions. The result demonstrates substantial growth in Nigeria's wider digital-

payment ecosystem, but it cannot be attributed specifically to the eNaira because the CBN series covers several established payment channels. This interpretation is consistent with Ree (2023), who reported limited eNaira transaction activity during its first year, and with Ricci et al. (2025), who emphasise that CBDCs in Sub-Saharan Africa operate alongside existing fast-payment and mobile-money systems. Thus, the observed growth supports the expansion of digital payments generally rather than a direct eNaira-specific efficiency effect.

The second finding is that eNaira onboarding substantially exceeded reported active-wallet use. At end-June 2024, 28,460,316 customers had been onboarded compared with 197,041 active wallets, producing an approximate reported activity indicator of 0.69%. This figure should not be interpreted as a precise customer-level adoption rate because the numerator represents wallets whereas the denominator represents customers; nevertheless, the difference indicates a substantial gap between reported onboarding and current active-wallet status. Ree (2023) similarly documented low transaction activity relative to early wallet growth, while Osakwe et al. (2025) identified convenience, trust, usefulness and transaction cost as important factors influencing eNaira use intentions. The finding therefore suggests that cumulative registration is a weaker measure of realised adoption than repeated transactions and active use.

The third finding is that the eNaira's monetary footprint increased substantially in nominal terms but remained small relative to total currency in circulation. eNaira circulation increased from ₦0.94 billion in H2 2021 to ₦18.31 billion in H2 2024, approximately 19.5 times its H2 2021 level. However, the eNaira represented only about 0.34% of total currency in circulation at end-2024. This small relative footprint is consistent with the limited scale of active use observed in the adoption results. Nwosu et al. (2023) and Olusegun et al. (2023) similarly indicate that the current effects of eNaira demand on deposits and bank credit are limited at relatively low levels of adoption, although these effects could become more important if eNaira circulation increases substantially. The present evidence therefore indicates nominal expansion without a correspondingly large monetary presence.

The fourth finding is that Nigeria's electronic-payment activity remained concentrated in established payment channels. In H1 2024, web transfers accounted for approximately 51.9% of reported e-payment volume, followed by point-of-sale transactions at 28.5% and mobile applications at 15.6%. This distribution helps explain why the rapid expansion of aggregate electronic payments should not be interpreted as evidence of eNaira-driven efficiency gains. It also supports the network-effect perspective of Tan (2023b), because the usefulness of a payment platform depends on sufficient participation by both users and merchants. The results therefore indicate that the eNaira operates within an already developed digital-payment environment in which established channels have stronger current network reach.

The fifth finding is that the observable efficiency implications of eNaira adoption are conditional rather than demonstrably economy-wide. The eNaira provides an additional public digital-payment rail and has demonstrated operational availability, but the limited active-wallet base, small monetary footprint and dominance of established payment channels do not support a causal claim that the eNaira produced Nigeria's rapid aggregate electronic-payment growth. Giraldo-Gordillo and Bustillo-Mesanza (2025) provide complementary evidence from a synthetic-control analysis suggesting that CBDC introduction can affect mobile-money activity in Nigeria, but their research design and outcome measure differ from the descriptive CBN-based approach used in this study. Overall, the evidence indicates that the eNaira has expanded Nigeria's payment-system options and demonstrated technical viability, while its realised

efficiency contribution remains constrained by limited active use, merchant/network reach and its small current monetary footprint.

6. Conclusion

The findings of this study show that Nigeria's electronic-payment system expanded substantially during the study period. First, electronic-payment transaction volume increased from 10.15 billion transactions in 2020 to 16.33 billion in 2021, 22.07 billion in 2022 and 38.73 billion in 2023, while H1 2024 alone recorded 22.42 billion transactions. This demonstrates strong growth in Nigeria's overall digital-payment environment, but the aggregate trend cannot be attributed specifically to the eNaira because the statistics cover multiple payment channels. Second, the evidence indicates a substantial difference between eNaira onboarding and reported active-wallet use. By June 2024, 28.46 million customers had been onboarded compared with 197,041 active wallets, producing a reported activity indicator of approximately 0.69%; however, this should not be interpreted as a precise customer-level adoption rate because customers and wallets are different units of measurement. Third, the eNaira's monetary footprint remained small relative to total currency in circulation despite its nominal increase over time. eNaira circulation increased from ₦0.94 billion in H2 2021 to ₦18.31 billion in H2 2024, representing approximately 0.34% of the ₦5,441.16 billion currency in circulation at the end of 2024. Fourth, Nigeria's electronic-payment activity remained concentrated in established digital-payment channels. In H1 2024, web-based transfers accounted for approximately 51.9% of reported electronic-payment activity, followed by point-of-sale transactions at 28.5% and mobile applications at 15.6%, indicating the continued importance of existing payment channels within the wider ecosystem. Fifth, the observable efficiency implications of eNaira adoption are therefore conditional rather than demonstrably economy-wide. The available evidence shows substantial expansion of Nigeria's digital-payment system alongside limited realised eNaira utilisation and a small monetary footprint, but the absence of a sufficiently continuous public series on eNaira-specific transaction volume and value prevents a causal determination of the eNaira's direct effect on aggregate payment efficiency. Overall, the main message of the study is that Nigeria's digital-payment system has expanded rapidly since the introduction of the eNaira, but the available evidence does not establish that this wider efficiency improvement was caused by the eNaira; rather, the eNaira's current efficiency implications remain constrained by its relatively low realised utilisation and small monetary footprint.

7. Policy Recommendations

First, the Central Bank of Nigeria (CBN) should shift emphasis from cumulative eNaira onboarding to active utilisation. The study found a substantial difference between reported onboarded customers and active wallets, with the resulting reported activity indicator of approximately 0.69%, although this measure has a customer-wallet unit limitation. The CBN should therefore give greater attention to regularly reporting active-wallet indicators and transaction activity rather than relying primarily on cumulative onboarding figures.

Second, the CBN, banks and other participating financial institutions should strengthen merchant acceptance and interoperability of the eNaira. The findings show that Nigeria's aggregate electronic-payment system is already expanding strongly through established channels, while the eNaira has not yet achieved comparable realised utilisation. Greater interoperability and easier movement between eNaira wallets and existing banking and payment channels could therefore help reduce barriers to repeated use.

Third, banks and other authorised eNaira service providers should improve the practical user experience of the eNaira. The study's finding of low reported active-wallet utilisation

indicates that onboarding alone has not translated into sustained use. Providers should therefore focus on reliability, ease of access and convenience in order to make repeated eNaira use more attractive relative to established electronic-payment alternatives.

Fourth, the CBN and NIBSS should improve the availability and reporting of eNaira-specific transaction data. A major limitation identified by the study is the absence of a sufficiently continuous public series for eNaira transaction volume and value. Regular publication of eNaira-specific transaction volume, transaction value, active wallets, transaction frequency and related indicators would enable future studies to assess the CBDC's payment-system contribution more directly.

Fifth, the CBN should continue to monitor the eNaira's monetary footprint and potential financial-intermediation implications as adoption develops. The study found that eNaira circulation increased substantially in nominal terms but represented only approximately 0.34% of total currency in circulation at end-2024. The current monetary footprint therefore remains small, but continued monitoring is appropriate if future adoption produces a substantially larger shift toward eNaira balances.

Sixth, merchants and participating payment providers should support the development of use cases that provide a clear practical advantage over existing payment channels. The rapid growth of Nigeria's broader electronic-payment system indicates that users are willing to adopt digital payment methods when they are convenient and widely accepted. The eNaira therefore needs to offer clear practical value rather than relying primarily on wallet registration and availability.

8. Contribution, Limitations and Future Research

The article contributes by separating three concepts that are often combined: national digital-payment growth, eNaira technical capacity and eNaira realised adoption. This produces a more conservative assessment than a simple pre/post comparison and links payment-system efficiency to the conditional bank-intermediation trade-off.

Limitation:

This study has several limitations. First, the analysis does not use individual-level or transaction-level eNaira data. Consequently, the study cannot directly measure the frequency, value, timing, or characteristics of actual eNaira transactions.

Second, there is a mismatch between customer-based and wallet-based measures. The number of customers does not necessarily correspond to the number of eNaira wallets or active eNaira users. A registered wallet may not represent an actively used wallet, and the same individual may have multiple financial accounts or wallets. Comparisons between customer and wallet figures should therefore be interpreted with caution.

Third, the study relies largely on aggregate secondary data, which limits the ability to examine differences across individual users, firms, geographical areas, or socioeconomic groups.

Fourth, the available data do not permit definitive causal conclusions about the effect of eNaira adoption on broader financial-system developments. Other factors, including changes in electronic payments, mobile money, banking activities, monetary policy, regulatory interventions, and the wider digital economy, may also have influenced the observed outcomes.

Finally, registered eNaira wallets should not necessarily be interpreted as active eNaira users. The availability and measurement limitations of the secondary data therefore constrain the extent to which the findings can be generalized.

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