nkadime /nkah-dee-meh/

Setswana • lend me

UNIVERSITY OF CAPE TOWN

IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

Table of Contents

1 Introduction

South Africa's financial landscape presents a critical paradox. Although 84% of adults hold bank accounts, millions, particularly those in the informal, gig, and self-employed sectors, remain locked out of the formal credit economy. Traditional credit scoring models rely on formal employment and credit histories, excluding millions of informal earners and forcing them toward unregulated lenders. Simultaneously, institutional and high-net-worth investors lack a transparent, compliant, and scalable vehicle to gain exposure to the high-yield, high-impact micro-lending sector.

Nkadime is a decentralised micro-lending platform designed to bridge this gap by creating a transparent and efficient credit ecosystem. Our model is built on four key pillars:

1. Alternative Credit Scoring: A proprietary Python engine analyses user-permissioned Open Banking data to generate fair, predictive credit scores for thin-file clients.

2. Pooled Institutional Capital: A smart-contract-driven liquidity pool diversifies investor risk across a broad loan portfolio, addressing the limitations of peer-to-peer(P2P) lending.

3. Stablecoin Infrastructure: The entire lending ecosystem operates on a proprietary, Rand-pegged stablecoin, eliminating cryptocurrency price volatility for both lenders and borrowers.

4. On-Chain Reputation: Secure smart contracts on the XRP Ledger EVM Sidechain mint non-transferable "Credit Trust Tokens" upon repayment, enabling borrowers to build a tangible, verifiable financial reputation for the first time.

We target the 10-16 million South African adults who are financially active but credit invisible, representing an estimated R260 – R390 billion untapped lending opportunity. Revenue is generated through a transparent 3% margin on loan APRs.

By combining open banking, blockchain, and alternative credit scoring, Nkadime establishes a compliant, low-friction channel that connects private capital with underserved borrowers: turning responsible financial behaviour into measurable digital trust. Recent developments such as the October 2025 ABSA–Ripple partnership affirm institutional readiness for blockchain-based credit infrastructure, validating Nkadime's vision.

2 Literature and Contextual Review

2.1. The Credit Imperative in South Africa

Credit is a cornerstone of economic development, enhancing purchasing power and enabling individuals to smooth consumption over time. Beyond personal benefits, credit circulation fuels growth in sectors such as retail, housing, and education. It can act as a buffer against financial shocks, such as medical emergencies or retrenchment, helping individuals maintain stability. Research shows that access to small loans boosts productivity and income in low-income households (Karlan & Morduch, 2010). Sustainable access to credit, therefore, underpins both financial inclusion and individual agency.

In 2023, 98 percent of adults were considered part of the formal financial sector, and 84 percent had a bank account in their own name, a vast improvement from 2003, when only 52 percent of adults were banked (Berkowitz & Mutsonziwa, 2025). However, transactional use of digital financial services remains limited. Around 76 percent of account holders withdraw their whole account balance after each deposit – equivalent to roughly 14 million adults using a form of "mailbox banking". Moreover, 71 percent of adults still rely primarily on cash for everyday expenses such as food and groceries, indicating that cash remains central to domestic financial management. Many individuals are interested in improving their financial situation yet remain cautious of traditional institutions, which are often perceived as exclusionary or inaccessible (Nanziri & Gbahabo, 2025; PwC, 2025).

Although most South Africans are banked, a large portion remain credit invisible and lack formal credit records with traditional bureaus. Approximately 26 percent of adults have no credit history, making it difficult for lenders to assess their creditworthiness (TransUnion South Africa, 2021). Despite widespread banking access, millions are excluded from affordable, fair credit due to limitations in conventional credit evaluation systems(World Bank, 2025) As a result, many turn to informal moneylenders, known locally as mashonisa, who charge excessive interest rates and use coercive collection methods, reinforcing a cycle of debt and financial exclusion.

2.2. Barriers to Traditional Credit

Traditional credit scoring models depend heavily on three data pillars: a formal credit history, proof of stable employment, and collateral (Kreiswirth et al., 2017). These pillars systematically disadvantage informal traders, gig economy workers, and low and middle-income earners who are asset-poor or lack consistent payslips. This exclusion cycle suppresses entrepreneurship and limits upward mobility, preventing individuals from building the very credit history they are denied access to.

2.3. The Data Solution (Open Banking)

A promising development involves leveraging alternative credit data, which encompasses non-traditional indicators of financial responsibility, such as rent, utilities, and digital payments (Kazimoto, 2023). Through user-permissioned Application Programming Interfaces (APIs), individuals can securely share verified financial data with lenders, creating a more accurate and holistic picture of creditworthiness.

South Africa's major banks have launched API marketplaces, reflecting a readiness for data-driven collaboration. Furthermore, the Financial Sector Conduct Authority (FSCA) released its Open Finance Policy Recommendations in 2024, laying the groundwork for regulated data sharing frameworks that enhance consumer protection and foster innovation (FSCA, 2024).

2.4. The Structural Solution

A key challenge for South Africa's micro lending sector is liquidity. The National Credit Act (NCA) imposes significant compliance burdens on secondary loan markets, discouraging lenders who prioritise flexibility and making it difficult to diversify risk (Financial Regulation Journal, 2021). This lack of a liquid secondary market locks in capital and limits the availability of funds for new lending opportunities.

Decentralised Finance (DeFi) offers a structural alternative through liquidity pools. In this model, lenders deposit capital into a collective pool rather than funding individual borrowers directly. Smart contracts then allocate these pooled funds to borrowers who meet the platform's criteria. This approach diversifies investor risk across a portfolio of loans and creates a more liquid, scalable source of capital, directly addressing the rigidity of traditional lending structures.

2.5. The Trust Solution

South Africa's debt collection processes have been noted as fragmented, costly, and opaque, often leading to predatory practices (SAHRC, 2017). This weak enforcement framework highlights the need for transparent, automated lending mechanisms.

Blockchain technology, through smart contracts, introduces a programmable layer of trust that automates the core functions of lending. These contracts execute and enforce loan agreements automatically releasing funds to borrowers and reclaiming repayments based on pre-defined conditions, such as repayment schedules.

This removes the need for manual oversight and reduces reliance on intermediaries. Each transaction recorded on-chain is immutable and auditable, providing a transparent and tamper-proof record that enhances accountability for all participants. Built on efficient public blockchains like the XRP Ledger EVM Sidechain, such systems enable low-cost, high-speed settlements, with confirmations occurring in seconds for fractions of a cent (XRPL.org, 2024). In this way, blockchain ensures efficient loan execution and repayment enforcement.

2.6. The Stability Solution

While blockchain improves efficiency, price volatility remains a fundamental challenge for blockchain-based lending. Denominating loans in volatile cryptocurrencies exposes participants to speculative risk, undermining the reliability of credit contracts.

Stablecoins, which are cryptocurrencies pegged to fiat currencies, offer a solution by combining the efficiency of digital currencies with relative stability. By using a stablecoin as the unit of account, platforms can maintain loan value consistency, shielding both borrowers and lenders from market fluctuations (Díaz et al., 2023). Stablecoins act as programmable digital cash that can be moved, locked, or redeemed instantly across systems, aligning with the ideals of Open Banking and providing a reliable medium of exchange for financial contracts (Visa, 2025).

2.7. Synthesis

The convergence of Open Banking, pooled lending models, blockchain, and stablecoins represents a fundamental shift in how credit can be extended to the underserved. Nkadime embodies this integrated approach by addressing the structural, informational and trust

inefficiencies in the South African credit landscape. Nkadime uses Open Banking APIs to retrieve verified financial data that can be used as alternative data in a credit assessment

Through smart contracts, loan agreements on the platform are executed transparently and autonomously. Nkadime's use of liquidity pools ensures that capital remains available continuously. The platform uses stablecoins, which provide stability and predictable repayment values. Nkadime aims to restore financial dignity and opportunity to millions excluded from the formal credit system.

3 Target Market and Market Size

South Africa's high bank account penetration coexists with persistent credit invisibility; many adults are banked but excluded from affordable credit due to thin or irregular records.

On the supply side, institutional and high-net-worth investors increasingly seek transparent, compliant, and impact-driven investment vehicles that provide exposure to non-correlated yields. Nkadime bridges these market inefficiencies by channelling this capital into diversified micro-credit portfolios through a regulated, data-driven platform.

This section outlines Nkadime's dual-sided market of borrowers who require affordable, data-driven credit and lenders who provide transparent, compliant capital. The scale of both groups is estimated using Total Addressable Market (TAM), Serviceable Available Market (SAM), and Serviceable Obtainable Market (SOM) frameworks.

3.1. Borrower Segment

Digitally reachable, financially active, but credit-invisible adults form Nkadime's primary borrower base. These include informal, gig, and early-career workers with bank or mobile-wallet histories but limited bureau files. They value fair pricing, clarity, and fast, mobile-enabled credit decisions.

The market size is framed by South Africa's estimated 2025 population of approximately 62 million people (Stats SA, 2025). Of this, the working-age population (15–64 years) comprises roughly 66%, or over 40 million adults, who are potentially economically active (World Bank, 2025). Approximately 19.93% of all employed persons operate within the non-agricultural informal sector, representing millions of workers (Stats SA, Quarterly Labour Force Survey, 2025). This is compounded by the official unemployment rate, which remained critically high at 32.9% in early 2025 (Stats SA, Quarterly Labour Force Survey, 2025). These official figures confirm that a significant share of working-age adults generate income outside of formal, documented employment, which strongly supports the assumption that 18–25 million individuals fall within the target group of financially active but credit-invisible adults forming the foundation of Nkadime's demand-side market, as summarised in Table 1.

Table 1: Demographic and Economic Profile of South Africa's Financially Active but Credit-Invisible Population

Category	Description	Average Size
Age	Focusing on the 18–45 years age group, spanning from young adults entering the credit market, as well as mid-career income earners seeking lower-cost credit.	22-25 million individuals
Income Level	Low to middle-income earners, typically earning between R3 000 and R25 000 monthly, are often self-employed, informally employed, or working in small businesses.	18-20 million individuals
Employment Type	The first phase will take into account recently earning individuals (recently graduated individuals), gig economy earners (ride-hailing drivers and food delivery couriers), micro-enterprise owners (spaza shop and hair salon owners), freelancers (graphic designers and online tutors), labour and semi-skilled workers (domestic workers, security guards, and construction workers), and informal workers without pay slips or formal credit history (street vendors)	12-16 million individuals
Geographic Distribution	Focus on densely populated urban and peri-urban regions such as Gauteng, Western Cape, and KwaZulu-Natal, where digital and banking access are highest.	30-35 million individuals
Digital Access	Over 80% smartphone penetration and heavy usage of low-data mobile apps such as WhatsApp, Telegram, and mobile banking.	45-50 million individuals

Based on these figures, the borrower-side market model is estimated as follows:

- TAM: 13 million credit-invisible adults, representing R260-R390 billion in potential lending.
- SAM: 9 million banked/mobile users with transaction data, R135-R225 billion.
- SOM: 1-2 percent early adoption (90,000–180,000 borrowers), R1.3–R4.5 billion in initial loans.

3.2. Lender Segment

On the supply side, Nkadime targets institutional and high-net-worth (HNW) lenders seeking transparent, impact-aligned exposure to South Africa's alternative credit market. These investors are professionally experienced, compliance-driven, and focused on stable, non-correlated returns with measurable Environmental, Social, and Governance (ESG) outcomes. They value operational efficiency, regulatory clarity, and real-time visibility into portfolio performance.

The proposed asset ranges for Nkadime's prospective lenders, approximately R10 million to R100 million for high-net-worth individuals (HNWIs) and R5 billion to R50 billion for institutional investors, serve as indicative benchmarks drawn from South Africa's wealth-management and asset-management sectors. These ranges are not statistical averages but rather contextual estimates reflecting the capital capacity typical of investors positioned within the upper-wealth and institutional segments of the domestic financial ecosystem. According to PwC's *Global Family Office Deals Study 2025*, family offices operating in Africa manage an average of approximately US$1.8 billion in assets under management (AuM), reflecting the growing concentration of private wealth across the continent (PwC, 2025). Similarly, the Financial Sector Conduct Authority (FSCA, 2024) reports that South Africa hosts over 100 licensed asset managers, many of which are boutique firms with AuM below R50 billion, while larger firms such as Ninety One and Coronation Fund Managers each manage in excess of R800 billion, according to their 2024 annual reports. Furthermore, the Knight Frank *Wealth Report 2024* identifies more than 37000 HNWIs (individuals with a net worth above US$1 million) in South Africa, collectively controlling substantial investable capital. Taken together, these figures justify targeting institutional and high-net-worth investors with multi-million-rand portfolios as Nkadime's core lender segment, as summarised in Table 2.

Table 2 - Profile of Institutional and High-Net-Worth Lenders in South Africa

Category	Description
Age Group	35 +
Occupation	CIOs, Portfolio Managers, Principals of Family Offices, DFIs, or Alternative-Investment Leads
Income/ Assets	Typically manage or control portfolios between R5 billion – R50 billion (institutional) or R10 million – R100 million (HNWI)
Investment Objectives	Generate stable, non-correlated yield; achieve measurable ESG/impact outcomes; maintain governance and compliance integrity
Motivations	Access new impact-aligned alternative asset classes; reduce intermediary costs; diversify beyond equities and bonds
Pain Points	Opaque borrower data, fragmented origination, weak enforcement, manual reporting, and small ticket-size inefficiency
Preferred Features	Behaviour-scored loan pools, on-chain performance dashboards, POPIA-aligned compliance, automated reinvestment, stablecoin-based settlements
Digital Behaviour	Comfortable with API dashboards, digital custodians, and real-time analytics; prefer verifiable on-chain data to static PDFs

The lender-side market model reflects these pools:

- TAM: Full institutional/HNWI ecosystem (~ R6 trillion AUM).
- SAM: Impact-aligned and alternative-credit allocators (~R40–R45 billion in reachable capital).
- SOM: 1–2 percent early participation (~R400–R900 million in active lending capital).

4 Market Analysis

This section examines Nkadime's strategic position in South Africa's fintech landscape through a SWOT and PESTEL analysis. As a platform that connects private capital to an underserved market, Nkadime's strategy must consider both sides of its ecosystem: financially excluded borrowers seeking access to affordable credit, and the institutional and high-net-worth investors providing capital to the platform's stablecoin-based liquidity pool.

4.1. SWOT Analysis

Strengths

- The use of a proprietary, Rand-pegged stablecoin eliminates cryptocurrency price volatility, providing a compliant and low-risk digital asset structure that appeals to institutional investors.
- A smart contract-driven liquidity pool lowers intermediation costs, enhances scalability, and ensures transparent fund allocation and repayment.
- Behaviour-linked Credit Trust Tokens create measurable, on-chain credit reputations that encourage responsible borrowing.
- Blockchain and open-banking integration enable auditable, data-driven credit scoring and automated disbursements.
- Strong alignment with the South African Reserve Bank's Vision 2025 and the FSCA's Open Finance framework reinforces policy credibility.

Weaknesses

- Dependence on a small number of large anchor investors in the early stage could limit liquidity and slow scaling if these investors do not commit sufficient funds.
- The creation and management of a proprietary stablecoin introduce additional regulatory and technical complexities that require ongoing supervision and specialised expertise.

- Establishing robust compliance and custodial frameworks for institutional funds increases operational overhead during the launch phase.
- Broader public understanding of digital-asset-based lending remains limited, necessitating education and awareness initiatives.

Opportunities

- Growing demand from institutional investors for alternative, ESG-aligned asset classes that deliver stable, non-correlated returns.
- Expansion potential through partnerships with banks, fintechs, and development-finance institutions seeking regulated exposure to inclusive-finance assets.
- Opportunity to position Nkadime as one of South Africa's first compliant, impact-driven liquidity-pool models connecting capital markets to underserved borrowers.
- Regional scalability into the Southern African Development Community (SADC) market as regulatory clarity improves.

Threats

- Competition from established digital lenders and alternative-scoring institutions such as TymeBank, Capitec, Lula, and TransUnion Africa.
- Possible regulatory tightening around crypto-assets or stablecoins could delay licensing or require structural adjustments.
- Cybersecurity and data privacy risks are inherent in managing financial data and digital tokens.
- Reputational risk if decentralised finance models are associated with volatility or fraud, though Nkadime mitigates this through its Rand-pegged stablecoin and transparent governance model.

4.2. PESTEL Analysis

Table 3 - PESTEL Analysis

Factor	Key Considerations
Political	Vision 2025 and the National Development Plan prioritise innovation-led inclusion. The Intergovernmental FinTech Working Group (IFWG) sandbox supports pilot testing of digital-asset platforms and decentralised finance models that expand access to credit (SARB, 2018; IFWG, 2025).
Economic	Persistent unemployment and a large informal economy sustain unmet demand for small-loan credit (South African Government, 2025). Inflation rate volatility affects borrowing trends, while a rising savings and institutional-investment culture increases demand for stable, yield-bearing digital instruments.
Social	A growing social emphasis on ESG and impact investing is driving demand from institutional and private investors for opportunities that deliver both financial returns and measurable social outcomes (Villegas, 2025). Nkadime's mission to fund financial inclusion aligns directly with this trend.
Technological	Advancing open-banking standards and blockchain adoption enable secure data sharing, automated smart-contract execution, and transparent capital flows between investors and borrowers (Adams, Van Belle & Oosterwyk, 2023; Gubihama, 2025).
Environmental	Digital financial innovation supports sustainable development objectives by reducing paper-based processes and physical branch infrastructure (Luo & Liu, 2024).

Legal	Increasing regulation under the FSCA, POPIA, and the IFWG crypto-asset framework governs the development of digital-asset ecosystems (Itzikowitz & Gunning, 2021; Tibane & Kern, 2022; Milne & Lawack, 2024). Compliance with financial-market and data-protection laws is essential to attract institutional capital.

The PESTEL analysis confirms that South Africa offers a supportive environment for financial innovation. Favourable policies for pilot testing and a clear demand for inclusive yet compliant solutions strengthen Nkadime's strategic position. By deploying a stablecoin-based liquidity pool, Nkadime can adapt to economic cycles while providing a secure, transparent channel for institutional capital to fund the underserved credit market. Success depends on adherence to data-protection and digital-asset regulations, but the convergence of regulatory openness and investor appetite for impact-aligned assets positions Nkadime to bridge the gap between sophisticated investors and financially excluded borrowers.

5 Competitors and Benchmarks

South Africa's alternative lending landscape has evolved rapidly, driven by advances in data analytics, mobile penetration, and open banking regulations. This section benchmarks Nkadime against the country's leading innovators in credit scoring, lending infrastructure, and conversational finance to clarify where its institutional liquidity-pool model fits within the broader market trajectory.

5.1. Alternative Credit Scoring and Emerging Lending Models

South Africa's fintech credit-scoring sector is expanding quickly as innovators address the gap faced by borrowers excluded from traditional systems.

JUMO is a key player, providing data-driven financial infrastructure that leverages mobile wallet behaviour and transaction data to assess creditworthiness. Through partnerships with MTN MoMo, JUMO uses AI-based instant lending to offer short-term loans to unbanked and underbanked individuals, managing risk through alternative data models.

Lula (formerly Lula Lend) focuses on small- and medium-sized enterprises (SMEs) and offers working-capital loans based on real-time cash flow data rather than collateral. Its algorithmic approach accelerates approval for early-stage businesses outside traditional lending scopes.

M-KOPA gives cash-flow-strained households access to products that they otherwise couldn't afford. These products include smartphones and solar systems. The customer chooses the product and then makes small daily payments until they own it. The repayment schedule is a pay-as-you-go plan. As users pay regularly, M-KOPA builds a credit profile for them, unlocking other financial services. Maple Finance is a blockchain marketplace that connects lenders and borrowers. It uses liquidity pools and has its own native token used for governance and staking. The platform uses over-collateralised pools, meaning the borrower must lock up more collateral than the amount they borrow. It is important to note that Maple hasn't fully captured the underserved customer and that it targets institutional borrowers.

Optasia, an emerging-markets-focused credit-vetting fintech, reflects rising institutional confidence in AI-driven credit infrastructure. In October 2025, FirstRand Group invested R4.7 billion for a 20.1% stake ahead of Optasia's JSE listing, valuing the company at R19-

23 billion. Using proprietary AI algorithms, Optasia assesses microloan eligibility through MTN MoMo and Vodacom M-Pesa, leveraging licensed banks' balance sheets for disbursements and underwriting default risk. Proceeds from its R1.3 billion IPO will fund expansion into Kenya, Egypt, and Indonesia. FirstRand's investment signals institutional validation of AI-based credit underwriting across emerging markets.

Juma, M-KOPA, Lula, Optasia demonstrate the viability of alternative credit scoring and real-time underwriting in South Africa's high-demand credit ecosystem.

Nkadime differentiates itself through a B2B2C model that serves both borrowers and institutional lenders. While competitors like JUMO and Lula solve the borrower-side credit-assessment problem, Nkadime extends this innovation to the capital side by offering a compliant, stablecoin-based liquidity pool that enables institutional and high-net-worth investors to gain exposure to an inclusive credit asset class. The platform thus bridges financial inclusion with institutional-grade investment infrastructure, combining real-time borrower analytics with regulated capital-pool management.

5.2. Institutional and Blockchain-Based Lending

RainFin, launched in 2012, was South Africa's first regulated peer-to-peer lending platform. It proved that compliant, technology-enabled direct-lending relationships could operate within the country's financial services framework. RainFin demonstrated that digital platforms can connect borrowers and investors transparently, though its architecture remained suited primarily to individual lenders and retail participants.

Nkadime represents the next evolutionary step beyond first-generation peer-to-peer systems. Instead of facilitating one-to-one lending, it aggregates capital through a smart-contract-driven, stablecoin-denominated liquidity pool. This model provides institutions and sophisticated investors with scalable exposure to diversified loan portfolios rather than individual borrowers.

By integrating Open Banking APIs and a Rand-pegged stablecoin, Nkadime addresses two limitations that constrained earlier models: risk concentration and currency volatility. The stablecoin structure ensures predictable value retention, while automated liquidity management enhances transparency, compliance, and scalability.

5.3. Conversational and Chat-Based Financial Services

Mobile-first, low-data interfaces have redefined how South Africans interact with financial products. ABSA's ChatWallet on WhatsApp allows users to send money and purchase

airtime directly through messaging, building on the bank's earlier ChatBanking initiative. TymeBank's USSD service offers similar access via feature phones, expanding low-data banking reach. These examples confirm the effectiveness of conversational platforms in serving mass-market consumers.

Nkadime extends this proven concept by pairing a simple conversational frontend with a sophisticated, institutional-grade backend. Through Telegram, borrowers engage in familiar, low-friction chat interactions to apply for credit, while the underlying system executes transactions via smart contracts linked to the stablecoin liquidity pool. This dual architecture combines borrower accessibility with investor-level compliance, security, and efficiency.

The result is a hybrid model: intuitive and inclusive on the surface but supported by a robust financial infrastructure that meets institutional due diligence and governance requirements.

5.4. Market Insight Conclusion

South Africa's fintech ecosystem continues to mature across credit scoring, digital lending, and conversational finance. While early players like JUMO, Lula, and RainFin demonstrated that data-driven and mobile-enabled credit systems can thrive, Nkadime advances the model further by institutionalising inclusion. Through its stablecoin-based liquidity pool, smart-contract automation, and ESG-aligned investment framework, the platform creates a transparent channel for private capital to fund underserved borrowers at scale.

In an environment marked by regulatory openness, digital readiness, and rising demand for impact-driven investments, Nkadime stands positioned as the bridge between South Africa's excluded borrowers and its institutional investors seeking compliant, socially conscious financial innovation.

6 Rollout and Go-to-Market Strategy

Nkadime's rollout and growth strategy is designed for disciplined, data-driven expansion. The plan prioritises regulatory readiness, technological reliability, and evidence-based scaling through controlled pilots and institutional partnerships. It integrates two key pillars: a phased rollout roadmap and a targeted go-to-market (GTM) strategy.

Figure 1: Nkadime's Roll Out Phases

Nkadime's go-to-market strategy prioritises strategic partnerships. We will acquire borrowers by integrating with partner institutions, beginning with a UCT pilot, while a direct sales pipeline engages our initial capital partners (impact investors and HNWIs). Post-pilot, growth will be scaled using digital channels and user referrals. The full GTM strategy and KPI dashboard are in Appendix D.

7 Risks and Compliance

7.1. Business Risk

Nkadime's mission to expand financial inclusion through a stablecoin-based liquidity pool introduces both transformative potential and a new layer of regulatory, operational, and liquidity-related risks. The following analysis identifies key risk categories and outlines mitigation strategies designed to preserve trust, compliance, and financial resilience

Table 4 - Enterprise Risk Matrix and Mitigation Measures

Risk Category	Risk Level	Risk Description	Mitigation Measures
Regulatory & Compliance Risk	High	South Africa's regulatory framework for digital assets and lending is complex and evolving, with ambiguity around classifying a Rand-pegged stablecoin, potentially delaying rollout or causing penalties.	• Obtain legal opinion on classification. • Engage with SARB and FSCA for alignment. • Conduct audits with RegTech. • Maintain transparent reserve reporting.
Operational, Technological & Cyber Risk	High	Success hinges on gaining trust from institutional investors through credibility and governance; failure delays capital access.	• Form governance board with experts. • Appoint third-party custodian. • Offer institutional reporting. • Obtain audits and certifications (e.g., ISO 27001).
Financial & Liquidity Risk	High	Pooled model risks "bank run" withdrawals, disrupting lending and trust.	• Use dynamic fees/lockups. • Keep liquidity buffer. • Deploy auto-management algorithms.

			• Diversify capital sources. • Run stress tests.
Credit & Pricing Risk	Medium	Pricing tied to behavioural scores leads to higher rates for high-risk borrowers, increasing defaults and affecting investor confidence as volumes scale.	• Refine machine learning models for better prediction. • Use tiered structures for loans. • Maintain loss reserves. • Diversify revenue via APIs and partnerships.
Macroeconomic	Medium	Volatility in rates and inflation impacts borrower affordability and investor appetite, affecting repayments and liquidity.	• Monitor indicators and adjust rates. • Hedge with liquid assets. • Diversify funding. • Include sensitivity analysis in planning.
Competitive & Market Risk	Medium	Intense fintech competition from lenders and neobanks targeting similar segments.	• Emphasize unique B2B2C proposition. • Innovate with API integrations. • Build brand through compliance and impact focus.
Human Capital & Governance Risk	Low	Lean team vulnerable to key-person loss, interrupting operations.	• Define governance framework. • Offer equity incentives. • Create succession plans. • Partner for talent pipelines.

7.2. Regulatory & Compliance Summary

This section serves as the mandatory regulatory and governance specification for Nkadime. Given the platform's hybrid nature involving credit provision, crypto assets, and personal financial data, it triggers oversight from multiple South African regulatory authorities. The platform must comply with the National Credit Act (NCA), the Financial Sector Conduct Authority (FSCA) for a CASP license, the Financial Intelligence Centre Act (FIC Act) for AML/KYC, and the Protection of Personal Information Act (POPIA) for data governance. This mandates a hybrid operational model, including a Centralised Legal Entity (CLE), to ensure legal accountability and consumer protection while interacting with the platform's decentralised smart contracts.

Core Obligations:

- National Credit Act (NCA): The platform must register as a Credit Provider with the NCR. It must perform mandatory, robust affordability assessments using the Open Banking data before issuing any loan, adhere strictly to all prescribed interest rate caps, and provide borrowers with plain-language contracts and 5-day valid pre-agreement quotes.

- FAIS Act (CASP): Because the platform facilitates investments and issues the CreditTrust Token, it must apply for an FSCA Crypto Asset Service Provider (CASP) license. This requires that the company and its key individuals meet all Fit and Proper requirements and obtain a formal legal opinion on the token's classification (ideally as a Utility Token).

- FIC Act (AML/KYC): The platform is a Reporting Institution and must register with the FIC. This mandates implementing a formal Risk Management and Compliance Programme (RMCP) and conducting robust Customer Identification and Verification (KYC/CDD) for all borrowers and Enhanced Due Diligence (EDD) for all lenders. All transactions must be monitored, and any Suspicious and Unusual Transactions (SUTRs) must be reported to the FIC.

- POPIA (Data Governance): The platform must obtain explicit, informed, and written consent from borrowers to access and process their bank's Open Banking data. It must adhere to strict data security (e.g., encryption) and data minimisation principles, appoint an Information Officer, and comply fully with their bank's API Terms of Service.

Compliance Summary:

The platform's activities trigger multiple mandatory registrations, as summarised below:

Table 5 - Regulatory Compliance Overview for Core Business Activities

Activity	Regulatory Classification	Governing Act	Regulator	Mandatory Registration / Obligation
Credit Provision	Credit Provider (Micro-lender)	National Credit Act (NCA)	National Credit Regulator (NCR)	Mandatory NCR Registration
Investment / Intermediation	Crypto Asset Service Provider (CASP)	FAIS Act / FSR Act	Financial Sector Conduct Authority (FSCA)	Mandatory FSCA License (CASP endorsement)
Financial Transactions	Accountable Institution	Financial Intelligence Centre Act (FIC Act)	Financial Intelligence Centre (FIC)	Mandatory FIC Registration
Data Processing	Responsible Party / Information Officer	Protection of Personal Information Act (POPIA)	Information Regulator	Mandatory Designation of Information Officer

8 Revenue Model

8.1. Vision and Positioning

Nkadime envisions a South Africa where financial inclusion is built on fairness, transparency, and trust rather than credit history. The platform bridges the gap between informal and formal finance by using Open Banking data and blockchain technology to turn everyday financial behaviour into opportunity. By linking responsible borrowing with earned digital trust and real-world capital, Nkadime positions itself as the first decentralised credit ecosystem that rewards good financial conduct and connects excluded borrowers with institutional capital in a safe, compliant, and scalable way.

8.2. How Loans are Priced

Nkadime's pricing engine uses a hybrid trust-scoring model that blends off-chain financial behaviour with on-chain repayment performance.

When a borrower requests a loan, the system retrieves six months of Open Banking transactions, normalises them, and calculates a credit score based on income stability, affordability, spending consistency, and savings buffer.

This score is then combined with the borrower's CreditTrust token balance, which reflects their past on-chain repayment record, to form a combined trust score:

$$combined\_score = 0.6 \times credit\_score + 0.4 \times token\_score$$

where token_score represents the borrower's CreditTrust token balance, scaled from 0 to 100 and capped at 100.

This combined score determines both the borrower's Annual Percentage Rate (APR) and their maximum credit limit according to a fixed tiered gate defined in the scoring service. See Appendix C for more details on the pricing bands.

8.3. How Nkadime earns Revenue

Nkadime's primary income stream is the interest-rate margin between the borrower's APR, and the return distributed to liquidity-pool lenders.

- Borrowers pay an interest rate that depends on their Trust Band.
- Lenders earn returns on the pooled funds based on the liquidity pool's weighted-average performance.
- Nkadime keeps a 3% spread on the interest collected to cover operations and growth.

All of this happens automatically through smart contracts, so there are no hidden or manual fees.

8.4. Other Small Fees

- Origination Fee: a small one-time charge of 1% added to the loan to cover KYC and API costs.
- Early withdrawal fee: for lenders who exit the pool before their lock-in period ends.

8.5. Future Opportunities

After the POC proves stable, Nkadime can explore the following revenue opportunities:

- B2B2C partnerships with banks, employers, and fintechs that want to use the Trust Token system.
- API licensing for our Open-Banking scoring engine.
- Financial-wellness tools and micro-insurance products for borrowers.
- Fees from a fully P2P lending platform:
- Subscriptions from lenders for priority loans and in-depth data dashboard.

9 Technical Specification

The Nkadime platform integrates traditional fintech infrastructure with blockchain-based smart contracts to enable transparent, compliant, and inclusive lending for underserved markets. Its architecture ensures end-to-end automation from user onboarding and credit scoring to loan disbursement, repayment, and reporting while maintaining alignment with FSCA sandbox requirements and POPIA standards.

9.1. System Architecture Summary

Nkadime follows a four-layer hybrid architecture that balances user accessibility with robust backend controls and decentralised finance logic (see Appendix E for detailed specifications).

Table 6 - Overview of Nkadime Platform Architecture

Layer	Core Functions
Presentation Layer	Telegram bot (Python Telegram API) providing mobile-first access for onboarding, KYC, loan applications, and repayment updates.
Application Layer	Django REST Framework backend with Celery task queues and Redis for asynchronous operations, handling credit scoring, payment scheduling, and blockchain synchronization.
Data Layer	PostgreSQL for relational storage and Redis caching for performance, storing transaction histories, scores, and loan records.
Blockchain Layer (XRPL EVM Testnet)	Smart contracts in Solidity managing loan escrows, liquidity pools, and revenue distribution using a synthetic stablecoin (FTCoin).
External Integration Layer	Mock Open Banking API (sandbox) for transaction data, mock KYC provider, and mock payment gateway for ZAR deposits and withdrawals.

]

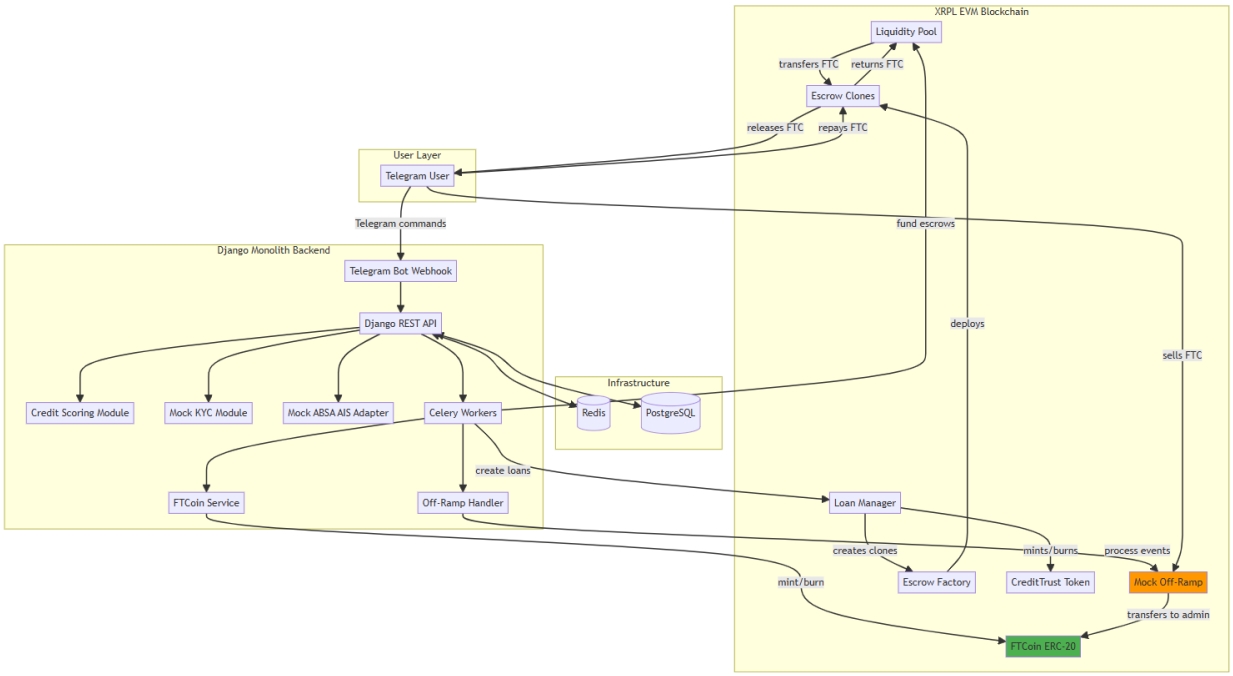


Figure 2:System Architecture

9.2. Data & Transaction Flow

The platform automates the full lending cycle via secure, event-driven workflows (see Appendix C for detailed flow diagrams):

1. Loan Origination: Borrowers request loans via Telegram. The backend retrieves six months of bank data via the mock API, computes a behavioural credit score, and if approved deploys a blockchain escrow smart contract.

2. Repayment: Borrowers repay in FTCoin; upon completion, smart contracts automatically allocate funds to liquidity providers, platform revenue, and reputation tokens.

3. Off-Ramp Simulation: Withdrawals trigger mock ZAR transfers and token burns to emulate fiat settlements within the proof-of-concept sandbox.

9.3. Core Platform Components

- FTCoin Stablecoin: A Rand-pegged ERC-20 token eliminating crypto volatility, minted/burned under admin control, with on-chain audit trails.

- Alternative Credit Scoring Engine: Python-based model (scikit-learn) analysing income stability, spending behaviour, and financial stress from open-banking data to classify borrowers into risk tiers.
- Smart Contract Suite:
    - LiquidityPool: Manages investor deposits and loan funding.
    - LoanManager / Escrow Contracts: Automate loan creation, repayment tracking, and defaults.
    - CreditTrustToken: Issues non-transferable "reputation" tokens for successful repayments.

9.4. Security and Compliance Framework

Nkadime employs a multi-layered security architecture aligned with POPIA and FSCA sandbox principles:

- Authentication: Telegram user ID and JWT tokens (24-hour expiry).
- Data Protection: SHA-256 hashing for bank accounts, AES-256 encryption for personal data, and HTTPS/TLS 1.3 across APIs.
- Smart Contract Security: Access-control modifiers, re-entrancy guards, overflow protection, and emergency pause functions.
- Governance: Hardware wallet for admin operations, multi-signature approval for sensitive actions, and role-based Django admin control.

9.5. Production Upgrade Roadmap

Future enhancements (see Appendix C for full roadmap) include:

1. Decentralisation of FTCoin governance via multi-sig and DAO structure.
2. Integration with licensed stablecoin issuers and real-time proof-of-reserves.
3. Partnerships with payment providers (e.g., Yoco, Ozow) and additional banks under Open Banking.
4. FSCA and NCA licensing, with RegTech audits for compliance.

5. Machine-learning credit model refinement using live default data and fairness testing.

The Nkadime architecture merges conventional financial infrastructure with blockchain-based automation to achieve transparency, compliance, and scalability. This hybrid design supports both financial inclusion objectives and institutional-grade governance, providing a foundation for secure, data-driven lending and ESG-aligned impact measurement.

References

Adams, C., Van Belle, J. & Oosterwyk, G., 2023. *Open Banking and Blockchain Integration in South African Fintechs: A Technical Review.* University of Cape Town Working Paper, Cape Town.

Berkowitz, L. & Mutsonziwa, K., 2025. *South Africa's inclusion story: Two decades of financial progress amid economic challenges.* Center for Financial Inclusion. Available at: https://www.centerforfinancialinclusion.org/south-africas-inclusion-story-two-decades-of-financial-progress-amid-economic-challenges/

Díaz, M., Muns, J. & Rodríguez, E., 2023. *Stablecoins: Beyond Payments – On-Chain Lending Opportunities.* Bank for International Settlements (BIS) Discussion Paper No. D187. Available at: https://www.bis.org/cpmi/publ/d187.pdf

Financial Regulation Journal, 2021. *First Step Analysis: Fintech Regulation in South Africa.* Financial Regulation Journal. Available at: https://financialregulationjournal.co.za/2021/05/14/first-step-analysis-fintech-regulation-in-south-africa/

Financial Sector Conduct Authority (FSCA), 2024. *Open Finance Position Paper.* Pretoria: FSCA. Available at: https://www.fsca.co.za/Regulatory%20Frameworks/FinTechDocuments/2024%20Open%20Finance_FSCA%20Position%20Paper.pdf

Gubihama, N., 2025. *Digital Financial Ecosystems in Africa: Blockchain and Open Finance Synergies.* University of the Witwatersrand Fintech Review, 12(1), pp. 55–73.

Itzikowitz, A. & Gunning, J., 2021. *Legal Aspects of Crypto Asset Regulation in South Africa.* Financial Regulation Journal, 4(2), pp. 15–27.

Karlan, D. & Morduch, J., 2010. *Access to Finance.* In: D. Rodrik & M. Rosenzweig (eds.) *Handbook of Development Economics*, Vol. 5. Amsterdam: Elsevier, pp. 4703–4784. DOI: 10.1016/B978-0-444-52944-2.00009-4.

Kazimoto, P., 2023. *Alternative Data and Credit Scoring in Emerging Economies.* Journal of Financial Innovation, 9(2), pp. 114–127.

Knight Frank, 2024. *The Wealth Report 2024.* London: Knight Frank LLP. Available at: https://content.knightfrank.com/resources/knightfrank.com/wealthreport/the-wealth-report-2024.pdf

Kreiswirth, V., Mbatha, T. & Mothobi, O., 2017. *Credit Scoring Barriers in Emerging Markets.* FinMark Trust Research Paper, Johannesburg.

Luo, H. & Liu, X., 2024. *Digital Financial Innovation and Environmental Sustainability.* Journal of Sustainable Finance and Investment, 14(3), pp. 250–267.

Milne, T. & Lawack, V., 2024. *Crypto Asset Policy and Compliance under the IFWG Framework.* South African Law Journal, 141(2), pp. 189–211.

Nanziri, L.E. & Gbahabo, P.T., 2025. *Financial Inclusion in South Africa: Challenges and Prospects.* South African Reserve Bank Working Paper No. 11075. Available at: https://ideas.repec.org/p/rbz/wpaper/11075.html

PwC, 2025. *Global Family Office Deals Study 2025.* PwC Global Family Business Services. Available at: https://www.pwc.com/gx/en/services/family-business/assets/global-family-office-deals-study-2025.pdf

South African Government, 2025. *National Development Plan 2030: Annual Review 2025.* Pretoria: The Presidency.

South African Human Rights Commission (SAHRC), 2017. *Report on Human Rights and Business: Debt Collection and Financial Practices.* Johannesburg: SAHRC. Available at: https://www.sahrc.org.za/home/21/files/SAHRC%20BHR%20RA%203%20-v3.pdf

South African Reserve Bank (SARB), 2018. *Fintech and the Future of Financial Services: Vision 2025.* Pretoria: SARB.

Stats SA, 2025. *Quarterly Labour Force Survey: 1st Quarter 2025.* Pretoria: Statistics South Africa. Available at: https://www.statssa.gov.za/publications/P0211/P02111stQuarter2025.pdf

TransUnion South Africa, 2021. *Consumer Pulse Study: Q3 2021*. Johannesburg: TransUnion. Available at: https://www.transunion.co.za/consumer-pulse-study/reports/q3-2021

Visa, 2025. *Stablecoins Beyond Payments: On-Chain Lending Opportunities*. Corporate Visa Research Report. Available at: https://corporate.visa.com/content/dam/VCOM/corporate/solutions/documents/stablecoins-beyond-payments-onchain-lending-opportunity.pdf

Villegas, M., 2025. *ESG Investing in Emerging Markets: Trends and Drivers*. Impact Finance Journal, 7(1), pp. 33–49.

World Bank, 2025. *South Africa Financial Inclusion and Access Project Report*. Washington, D.C.: The World Bank. Available at: https://documents1.worldbank.org/curated/en/099031325132018527/pdf/P179614-3e01b947-cbae-41e4-85dd-2905b6187932.pdf

XRPL.org, 2024. *Evolving the XRP Ledger*. Ripple Foundation. Available at: https://xrpl.org/blog/2024/evolving-the-xrp-ledger

10 Appendices

A. Regulatory information

This section serves as the mandatory regulatory and governance specification for Nkadime. Given the hybrid nature of the platform involving credit provision, crypto assets, and personal financial data processing, it triggers oversight from multiple South African regulatory authorities. This specification details the non-negotiable compliance requirements across the National Credit Act (NCA), the Financial Sector Conduct Authority (FSCA) (specifically concerning CASP licensing), the Financial Intelligence Centre Act (FIC Act) for AML/KYC, and the Protection of Personal Information Act (POPIA) for data governance. It mandates a hybrid operational model, including a Centralised Legal Entity (CLE), to ensure legal accountability, licensing, and consumer protection while interacting with the platform's decentralised smart contracts.

Compliance under the National Credit Act (NCA)

Since the platform facilitates loans at a competitive interest rate, all transactions are subject to the NCA, which governs the relationship between the borrower (consumer) and the actual credit provider (individual/institutional lender).

Registration Requirements

The entity operating the Web Platform and Telegram Bot (the DAO or managing company) must register as a Credit Provider with the NCR, as it facilitates the credit agreement and collects related fees.

Responsible Lending (Reckless Lending Prevention)

This is the most critical NCA requirement. The use of ABSA Open Banking data must be strictly applied for this purpose.

- Affordability Assessment: Before any loan is executed, the platform must perform a mandatory affordability assessment as per NCA regulations. This assessment must consider the borrower's (1) Net Income, (2) Existing financial obligations, and (3) Repayment history (if available).
- ABSA Open Banking API: Data sourced via the ABSA API constitutes "alternative credit scoring" data. The methodology for converting this data into a quantifiable

affordability score must be robust, auditable, and non-discriminatory, ensuring compliance with Section 62 of the NCA (no discrimination in credit granting).

- Record Keeping: All underlying data used for the affordability calculation, the resulting score, and the final loan agreement must be stored securely for a minimum of three years and be readily available for NCR inspection.

Consumer Protection and Disclosure

- Interest Rate Caps: All loan charges, including interest, initiation fees, and service fees, must strictly comply with the maximum prescribed interest rate caps set by the Minister of Trade and Industry for unsecured credit transactions and/or short-term credit transactions (as applicable to the micro-loan category).

- Plain Language Contracts: The smart contract terms (XRPL Smart Contracts) that govern the loan, repayment schedule, and default procedures must be clearly translated into a plain, understandable language legal agreement provided to the borrower before execution, as required by Section 93 of the NCA.

- Pre-Agreement Disclosure: The borrower must receive a detailed quote, valid for 5 business days, outlining the total cost of credit (interest, fees, insurance).

Compliance under the FAIS Act, FIC Act, and Crypto Asset Regulation

The platform operates as a hybrid financial service involving tokens and investments, triggering oversight from the FSCA and FIC.

FSCA Licensing as a CASP

The platform facilitates the acquisition and disposal of the CreditTrust Token and provides an investment avenue (yield seeking) for lenders.

Crypto Asset Service Provider (CASP) Status: The entity managing the platform interfaces (Web Platform, Telegram Bot) must apply for a CASP license under the FAIS Act. This is mandatory for any entity providing advice or intermediary services regarding crypto assets (the CreditTrust Token).

Fit and Proper Requirements: The key individuals and the operational structure must meet the FSCA's Fit and Proper Requirements (operational ability, competence, honesty, and financial soundness).

General code of conduct: The CASP licensed entity managing the platform must meet the requirements set out in the General Code of Conduct for Authorised Financial Services Providers and Representatives (General Code). The General Code requirements are comprehensive and include general duties on the CASP to act honestly, fairly, with due skill, care and diligence, and in the interests of clients and the integrity of the financial services industry. Furthermore, it sets out specific duties in respect of representations made to clients and, amongst others, provisions relating to conflict of interest, risk management, and complaints.

Security Classification

- The CreditTrust Token must be assessed to determine if it constitutes a "security" under the Financial Markets Act (FMA). Given its use for "reputation building" (utility) and potential use for yield generation/governance, a formal legal opinion is required.
- Recommendation: Structure the CreditTrust Token primarily as a Utility Token for reputation/governance to minimize security law entanglement, while acknowledging its status as a FAIS "Financial Product" due to the CASP declaration.

AML/KYC Requirements (FIC Act)

- The entity is classified as a Reporting Institution under the FIC Act due to its CASP status.
- KYC/CDD: The platform must implement Customer Identification and Verification (CIV) procedures for both Borrowers (thin file) and Lenders (individuals and institutions).
- Borrowers (Mobile-first, thin-file): KYC must be integrated into the Telegram Bot/Web App flow. Must collect and verify identity documents, proof of address, and PEP/Sanction screening.
- Lenders (Investors): Enhanced Due Diligence (EDD) required for institutional investors and high-volume individual investors.

- Risk Management and Compliance Programme (RMCP): A formal RMCP must be established, documenting procedures for:
- Continuous monitoring of transactions (especially large deposits/withdrawals from liquidity pools).
- Identification and reporting of Suspicious and Unusual Transactions (SUTRs) to the FIC.
- Screening against local and international sanction lists.

Data Governance and POPIA Compliance

The use of the ABSA Open Banking API brings the platform under strict data privacy obligations.

POPIA Principles

The platform is the Responsible Party (or an Operator acting on behalf of the Lenders/Credit Providers) regarding the borrower's personal financial information.

- Lawful Processing: Processing of financial data must be lawful. The borrower's explicit, informed, and written consent is mandatory for accessing, processing, and retaining their ABSA Open Banking data. The consent form must be in plain language, detailing exactly which data points are accessed, for how long, and for what purpose (credit scoring).
- Security Safeguards: Data security standards must align with the ABSA API requirements and POPIA (Section 19). Data must be encrypted in transit (TLS) and at rest.
- Data Minimisation: Only necessary data for the alternative credit score should be collected. Data must be destroyed or de-identified once its specified purpose (the credit scoring for that loan application) is fulfilled, unless legally required for NCA record-keeping.
- Accountability: An internal governance structure must be implemented in compliance with POPIA that includes designating a data protection officer or information officer, maintaining a compliance register and conducting regulator audits and risk assessments (Section 8 of POPIA).

- Openness and transparency: When collecting personal information from borrowers, they must be provided with a comprehensive privacy notice which includes, among other things: the identity and contact details of the responsible party, types of data collected, purpose of collection and borrowers' rights under POPIA (Section 18).

- Cross-border data transfers: If any data is processed or stored outside South Africa, it must be ensured that the receiving country has adequate data protection laws or obtain explicit consent from the borrower for such transfers.

ABSA Open Banking API Compliance

- Terms of Service: The platform must enter into a formal agreement with ABSA (or the relevant Open Banking intermediary) and adhere strictly to their API Terms of Service, technical standards, and data security protocols.

- Third-Party Provider (TPP) Registration: As data sharing moves towards a regulatory-led model (FSCA Open Finance guidance), the platform must monitor for and comply with any upcoming TPP registration or certification requirements mandated by the SARB or FSCA.

Regulatory Classification and Licensing

The core platform activities trigger multiple regulatory obligations. The ultimate legal structure must be registered to fulfil these centralized requirements.

Activity	Regulatory Classification	Governing Act	Regulator	Mandatory Registration
Credit Provision	Credit Provider (Micro-lender)	National Credit Act (NCA), 34 of 2005	National Credit Regulator (NCR)	Mandatory NCR Registration (Form 2)
Intermediation/ Investment (Connecting Lenders/Institutional Investors)	Crypto Asset Service Provider (CASP) / Financial	FAIS Act, 37 of 2002; FSR Act, 9 of 2017	Financial Sector Conduct Authority (FSCA)	Mandatory FSCA License (Category I or II FSP with

	Services Provider (FSP)			CASP endorsement)
Financial Transactions (Funds movement, Token issuance)	Accountable Institution	Financial Intelligence Centre Act (FIC Act), 38 of 2001	Financial Intelligence Centre (FIC)	Mandatory FIC Registration
Data Processing (ABSA Open Banking data)	Responsible Party/ Information Officer	Protection of Personal Information Act (POPIA), 4 of 2013	Information Regulator	Mandatory Designation of Information Officer (IO)

Governance and Operational Structure

The "Decentralised" nature conflicts with legal accountability under SA law. A hybrid governance model is mandatory for compliance.

Centralised Legal Entity (CLE)

- A registered South African company or trust must serve as the CLE to hold the required licenses (NCR, FSCA, FIC) and bear regulatory liability.
- Maintain the regulatory licenses and report to the NCR/FSCA/FIC.
- Execute the KYC/AML process and SUTR reporting.
- Act as the Information Officer under POPIA.
- Administer the fiat on/off-ramps and custodian duties (if any).
- Decentralisation Interface: The CLE serves as the legally accountable interface between the regulated South African financial system and the immutable XRPL Smart Contracts.

XRPL Smart Contract Governance

- Off-Ramp Validation: Smart contracts must be designed to only interact with addresses/wallets that have passed the CLE's KYC/AML screening, enforced by a central whitelist mechanism controlled by the CLE.
- Code Audit: The XRPL Smart Contract code governing loan execution and token distribution must undergo a rigorous, independent security and financial audit. This audit must be provided to the FSCA/NCR to demonstrate responsible operation and adherence to disclosed terms.
- Dispute Resolution: While smart contracts are trustless, the CLE must establish an NCA-compliant internal complaints procedure and mechanism for dispute resolution, providing a clear path for consumers to access the Ombudsman for Banking Services or the National Consumer Tribunal (NCT) if required.

Compliance Implementation Checklist

This checklist summarises the mandatory steps for regulatory compliance across all governing Acts.

Legal & Licensing Mandates

☐Establish Centralised Legal Entity (CLE) in South Africa (Section 5.1).

☐Register CLE as a Credit Provider with the NCR (Section 2.1).

☐Apply for FSCA CASP License (FAIS Act compliance) (Section 3.1).

☐Register CLE as a Reporting Institution with the FIC (Section 3.3).

☐Appoint and register the Information Officer (IO) under POPIA (Section 1).

Credit & Consumer Protection (NCA)

☐Implement mandatory Affordability Assessment logic prior to loan execution (Section 2.2).

☐Develop and audit the alternative credit scoring methodology using ABSA API data (Section 2.2).

☐Disclosure Requirement: ensure all loan pricing (interest, fees) adheres strictly to NCR-prescribed Interest Rate Caps (Section 2.3).

☐Ensure disclosure of the cost of credit to the consumer, including the principal debt, interest, initiation fee, service fees and credit insurance if applicable.

☐Draft Plain Language Legal Agreements for all Smart Contract terms (Section 2.3).

☐Implement the issuance of 5-day valid Pre-Agreement Disclosure Quotes to borrowers (Section 2.3).

☐Establish and publish the internal NCA-compliant Complaints and Dispute Resolution procedure (Section 5.2, Code of Conduct of the FAIS Act).

☐Implement secure data storage and retention policy for all loan records (min. 3 years) (Section 2.2).

☐In terms of over-indebtedness protection, it requires enhanced affordability assessments with behavioural and transactional analytics to detect signs of financial distress (Section 81). Also requires systems and/or processes to flag repeat borrowing patterns and implement cooling-off periods or referral to debt counselling services where appropriate.

☐Allow borrowers a 5-business-day cancellation window after signing a credit agreement, with clear instructions on how to exercise this right. (Section 16 CPA).

☐Provide borrowers with accessible educational materials explaining credit agreements, interest rates, fees, and their rights (CPA Section 3).

Financial Crime & Digital Asset (FIC & FSCA)

☐Establish and maintain a formal Risk Management and Compliance Programme (RMCP) (Section 3.3).

☐Implement robust KYC/CIV procedures for all Borrowers (integrated into Telegram Bot/Web App) (Section 3.3).

☐Implement Enhanced Due Diligence (EDD) for all Lenders (Individual/Institutional) (Section 3.3).

☐Implement continuous transaction monitoring for SUTR reporting (Section 3.3).

☐Obtain formal legal opinion on CreditTrust Token security classification (Financial Markets Act) (Section 3.2).

☐Ensure all key individuals meet FSCA Fit and Proper requirements (Section 3.1).

Data & Open Banking (POPIA & SARB)

☐Integrate explicit, informed, and written consent capture for Open Banking data (Section 4.1).

☐Formalise adherence to ABSA Open Banking API Terms of Service and technical standards (Section 4.2).

☐Implement POPIA-compliant data security (encryption in transit/at rest) and Data Minimisation protocols (Section 4.1).

☐Monitor and prepare for compliance with anticipated TPP Registration requirements (Section 4.2).

☐Implement and maintain systems and processes to ensure accurate, complete and timeous processing of data, reporting of information and the assurance of data integrity (Section 37 Fit and Proper Requirements).

Technology & XRPL Governance

☐Conduct an independent security and financial audit of the XRPL Smart Contract code (Section 5.2).

☐Implement a CLE-controlled central whitelist mechanism for all wallet interactions (Off-Ramp Validation) (Section 5.2).

☐Implement a governance framework proportionate to the nature, scale, risks and complexity of the business (Section 37 Fit and Proper Requirements).

☐Maintain systems and procedures that are adequate to safeguard the security, integrity, and confidentiality of information.

☐Regular monitoring and evaluation of the adequacy and effectiveness of its systems, processes, and internal control mechanisms and measures to address any deficiencies.

B. Pricing and yields

Trust Token Bands and Pricing Details

Table B.1: Trust Token Bands and Pricing Details

Band	Behaviour Rating	APR	Max Loan Limit
Foundation	Very High Risk	19-26%	R1 500
Bronze	High Risk	13-19%	R3 000
Silver	Moderate Risk	8-13%	R5 000

Lender Returns

$$Avg\ Returns = \frac{(\Sigma(Loan\ Amount \times Interest\ Collected) - Defaults\ - Nkadime\ Spread)}{Total\ Pool\ Capital}$$

Loan Cap Calculation

The platform performs a mandatory affordability assessment using verified income and expense data from the borrower's bank account.

The affordability limit is defined as:

$$affordability\_cap = 3 \times average\_monthly\_net\_inflow$$

where:

- average_monthly_net_inflow = average of (monthly income − monthly expenses) over the most recent three months of Open Banking data.

This represents the maximum sustainable amount the borrower can manage, based on recent cash flow performance.

Final Loan Cap Determination

The final approved loan cap is the lower of the score-based limit and the affordability limit:

$$final\_loan\_cap = min\,(provisional\_limit, affordability\_cap)$$

This ensures that loans remain both reward-based and responsible.

The APR remains tied to the borrower's combined trust score tier, even if the affordability cap reduces the loan amount.

C. Go To Market Strategy GTM details

Go-to-Market (GTM)

Nkadime's GTM strategy moves beyond mass marketing, focusing on B2B2C partnerships to acquire borrowers and a high-touch sales pipeline to secure capital, with referral programs to amplify post-pilot growth.

Table C.1: Go-to-Market Channels and Messaging Strategy

Channel	Target Segment	Key Messaging & Tactics
Strategic B2B2C Partnerships	Borrowers (Pilot): UCT Postgraduate Students. Borrowers (Scale): Gig-economy platforms (e.g., SweepSouth) & their workers.	Secure a B2B2C pilot with UCT (e.g., via Financial Aid Office) to access our first 1,000 users. Message: "A financial wellness tool for UCT. Help your students build their credit score before they graduate." 2. Use the UCT pilot case study to secure a large-scale B2B2C partnership. Run targeted campaigns on Facebook, Instagram, TikTok etc. Message: ""Where every transaction builds your future"
Targeted B2B Sales (Lender Acquisition)	Lenders (Pilot): HNWIs, Family Offices, & Impact Funds. Lenders (Scale): Institutional Asset Managers	Use the successful pilot case study for hyper-targeted LinkedIn campaigns & industry event presentations. Events such as: Finnovex Southern Africa, FinTech Summit Africa, Wits Global Fintech Conference etc. Lender tagline: "Impact and returns aren't trade-offs. They're aligned.""

Referral & Incentive Programs	All activated users (Post pilot)	This tactic will be deployed after the pilot validates product-market fit. Double-sided reward structure with cash or fee discounts after successful loan cycles. Gamified leaderboards and tier bonuses encourage viral adoption.

Adoption Metrics and Key Performance Indicators

Nkadime evaluates progress across three dimensions: user engagement, platform financial health, and social impact, to ensure both commercial viability and inclusion outcomes.

User Growth and Engagement

- Active User Growth: Tracks daily and monthly active users (DAU/MAU) to monitor engagement.
- New User Acquisition Rate: Measures the inflow of new borrowers and investors, identifying which segment drives expansion.
- User Retention Rate: Assesses the proportion of users returning after their first loan or investment cycle. High retention reflects platform trust and value proposition strength.

Platform Financial Health

- Total Value Locked (TVL): Represents aggregate funds deposited by investors into the stablecoin liquidity pool, a measure of lender confidence and capacity.
- Loan Origination Volume: Total value of loans issued over time, indicating market penetration and operational throughput.
- Default Rate: The key risk metric. A low default rate demonstrates the efficacy of behavioural scoring and risk-management protocols.

Impact on Financial Inclusion

- Credit Trust Tokens Minted: Quantifies users who have built verifiable repayment histories, evidencing alternative-credit creation.
- First-Time Borrower Rate: Measures the proportion of borrowers previously excluded from formal credit systems.
- Average Loan Size and Term: Monitors whether loan amounts and durations remain suitable for micro-lending needs while fostering financial stability and upward mobility.

Through these KPIs, Nkadime continuously measures its ability to grow sustainably, protect investor capital, and expand equitable credit access, creating a transparent, data-driven credit marketplace that promotes financial mobility for all.

Table C.2: Nkadime Partner Ecosystem

Partner Category	Partner Type	Specific Examples	Strategic Role (Why We Partner)
Borrower Acquisition (B2B2C)	Universities & Colleges	• UCT (Pilot) • Wits • Stellenbosch University • UKZN • TVET Colleges (e.g., Elangeni)	Access a controlled, digitally-savvy, "thin-file" student and recent-graduate segment for the pilot.
Borrower Acquisition (B2B2C)	Gig-Economy & Informal Sector Platforms	• SweepSouth • Uber / Bolt • Mr D Food • Uber Eats • Upwork • MESH	Provides scalable B2B2C access to our core "gig worker" and "informal entrepreneur" market.
Capital & Strategic (B2B)	Financial Institutions (Banks)	• ABSA • Standard Bank • Nedbank • Capitec • TymeBank	(Multiple Roles): 1. Technical: Provide the core Open Banking APIs. 2. Lender: Their CSI or asset management arms can deploy capital into the lending pool. 3. Channel: Refer their "thin-file" (declined-for-credit) customers to our platform.

Capital Acquisition (B2B Lenders)	Impact Investors & Foundations	• Impact Investing SA (IISA) • Tshikululu Social Investments • STANLIB Khanyisa Fund • Symbiotics	Secure “patient capital” from investors with a specific mandate for financial inclusion and social returns.
Capital Acquisition (B2B Lenders)	VCs & Asset Managers	• Allan Gray • E-Squared • Knife Capital • Sygnia	Secure venture capital for growth and tap into broader institutional capital networks.

D. Financial Statements and Projections

D.1: Start Up Costs

START-UP COSTS

COST ITEMS	ONE-TIME COST	MONTHLY COST	ANNUAL TOTAL
Software & Infrastructure	5 000 000	300 000	8 600 000
Licenses & Legal Compliance	500 000	38 000	956 000
Office Rent & Utilities		10	120
Salaries		210 000	2 520 000
Marketing & User Acquisition		450 000	5 400 000
Regulatory Setup	600 000	42 000	504 000
Insurance & Admin		10 000	120 000
Travel & Miscellaneous		187 500	2 250 000
Liquidity Pool (Initial)	5 000 000		5 000 000
Working Capital Reserve	1 000 000		1 000 000
ESTIMATED START-UP BUDGET	12 100 000	1 237 510	26 350 120

E.2: Profit and Loss Statement

PROFIT AND LOSS

	(R'000)	(R'000)	(R'000)	(R'000)

REVENUE	BASE YEAR 2025	2026	2027	2028
Revenue from Loans	1 950	6 480	27 540	63 180
Origination Fees & Early Withdraw	975	3 240	13 770	31 590
Data Insights/ Analytics Sales			1 800	2 110
Total Revenue	2 925	9 720	43 110	96 880
COST OF SALES				
Transaction & Gas Fees	650	1 800	7 650	17 550
KYC/ Data Verification Fee	600	1 300	2 750	3 065
Payment Gateway Fees	988	2 736	11 628	26 676
Customer Support Costs	200	650	825	1 226
Referral & Incentives	1 950	1 620	1 530	1 755
Total Variable Costs	(4 388)	(8 106)	(24 383)	(50 272)
Expected Credit Loss/ Bad Debts	1 365	1 890	4 131	5 265
Staff Salaries	2 520	2 520	4 320	6 720
Marketing & Brand Growth	8 400	5 525	5 500	6 130
Tech Hosting & Maintenance	250	300	360	432
Regulatory Setup	400	230	-	-
Office & Utilities	70	81	93	106
Depreciation	100	100	100	100
Professional Services	120	120	105	75
Audit & Security Assurance	100	115	132	152
Data & Analytics Tools	53	61	70	81
Software Subscriptions	55	61	67	73
Travel & Entertainment	65	85	110	143
Legal & Licences	330	330	485	638
Contingency & Miscellaneous	160	176	194	213
Insurance & Compliance	105	165	207	213
Total Fixed Costs	(14 093)	(11 757)	(15 873)	(20 341)

Total Operating Expenses	(18 481)	(19 863)	(40 256)	(70 613)
GROSS PROFIT	(15 556)	(10 143)	2 854	26 267
Tax (27%)	-	-	771	7 092
Deferred Tax	(4 200)	(2 739)	1 889	(5 050)
Total Tax Expense	(4 200)	(2 739)	2 660	12 142
NET PROFIT AFTER TAX	(11 356)	(12 882)	194	14 125

E.3: Balance Sheet

Balance Sheet

	(R'000)	(R'000)	(R'000)	(R'000)
	BASE YEAR 2025	2026	2027	2028
CURRENT ASSETS				
Accounts Receivable	481	1 598	7 087	15 925
Restricted Liquidity Reserve	3 250	9 000	38 250	87 750
Platform Float	389	429	5 828	35 422
Prepaid & Other Expenses	203	365	658	1 019
TOTAL	4 323	11 392	51 822	140 117
NON-CURRENT ASSETS				
Property, Plant & Equipment	280	504	907	1 633
Intangible Assets - Software	5 000	4 900	4 800	4 700
Intangible Assets - IP	450	603	874	1 268
Deferred Tax	4 200	6 939	5 050	-
Long-term Investments	1 375	1 788	2 324	3 021
TOTAL	11 305	14 733	13 955	10 622

TOTAL ASSETS	15 628	26 126	65 777	150 739
CURRENT LIABILITIES				
Bank Overdraft	19 015	39 343	71 428	118 039
Accounts Payable	361	666	2 004	4 132
Accrued Expenses & Payroll Liabilities	1 092	805	982	1 285
Deferred Revenue	293	972	4 311	9 688
Short-Term Lease	70	81	93	106
Income Tax Payable	-	-	771	7 092
TOTAL	20 830	41 866	79 589	140 342
NON-CURRENT LIABILITIES				
Expected Default	1 365	1 890	4 131	5 265
Accrued Platform Costs	1 699	3 499	2 200	1 000
Long-term Lease	15	19	23	29
Deferred Tax	-	-	771	7 092
Long-Term Provisions	75	90	108	130
TOTAL	3 154	5 498	7 233	13 516
TOTAL LIABILITIES	23 984	47 364	86 822	153 858
EQUITY				
Share Capital	3 000	3 000	3 000	6 800
Retained Earning	(11 356)	(24 238)	(24 044)	(9 919)
TOTAL	(8 356)	(21 238)	(21 044)	(3 119)
TOTAL LIABILITIES + EQUITY	15 628	26 126	65 778	150 739

E.4: Cash Flow Statement

Cash Flow				
	(R'000)	(R'000)	(R'000)	(R'000)

	BASE YEAR 2025	2026	2027	2028
Cash Flow from Operating Activities:				
Net Profit After Tax	(11 356)	(12 882)	194	14 125
Adjustments for:				
Depreciation	100	100	100	100
Cash from Operations before Working Capital Changes	(11 256)	(12 782)	294	14 225
Increase in Trade and Other Receivables	(481)	(1 117)	(5 489)	(8 839)
Increase in Prepaid Expenses	(203)	(162)	(292)	(362)
Increase in Deferred Revenue	293	680	3 339	5 377
Increase in Payables	361	306	1 338	2 128
Increase/Decrease in Payroll	1 092	(288)	178	303
Increase Default Provision	(1 365)	(525)	(2 241)	(1 134)
Increase in Liquidity Reserve	(3 250)	(5 750)	(29 250)	(49 500)
Cash Generated from Operations	(14 810)	(19 639)	(32 124)	(37 802)
Income Tax Paid	-	-	-	(7 092)
NET CASH FROM OPERATING ACTIVITIES	(14 810)	(19 639)	(32 124)	(44 894)
Cash Flows from Investing Activities:				
Purchase of PPE & Software	(5 830)	(277)	575	(1 019)
Proceeds from Sale of PPE	-	-	-	-

NET CASH FROM INVESTING ACTIVITIES	(5 830)	(277)	575	(1 019)
Cash Flow from Financing Activities:				
Proceeds from Issue of Share Capital	3 000	-	-	-
Long-term Investments	(1 375)	(413)	(536)	(697)
NET CASH FROM FINANCING ACTIVITIES	1 625	(413)	(536)	(697)
NET INCREASE IN CASH & CASH EQUIVALENT	(19 015)	(20 328)	(32 085)	(46 610)
CASH & CASH EQUIVALENT - BEGINNING	-	(19 015)	(39 343)	(71 428)
CASH & CASH EQUIVALENT - END	(19 015)	(39 343)	(71 428)	(118 039)

E. Technical Specification

Technical specifications for the Nkadime platform, describing the system architecture, core components, data flows, and implementation approach that enable the financial inclusion objectives outlined in previous sections while supporting the revenue model and compliance framework.

System Architecture Overview

The Nkadime platform implements a hybrid architecture combining traditional backend services with blockchain infrastructure to balance accessibility, regulatory compliance, and decentralized trust mechanisms.

Table E.1: Architecture Layers

Layer	Components & Functions
Presentation Layer	Primary Interface: Telegram Bot (mobile-first, zero-installation) • Built using Python Telegram Bot API • Supports conversational flows for onboarding, KYC, loan applications, and account management • Push notifications for loan status updates, payment reminders, and reputation milestones • Inline keyboards for button-based user interaction
Application Layer (Django Monolith)	Backend Framework: Django REST Framework • Core API handling business logic • JWT-based authentication with refresh token rotation • Redis-backed sessions for stateful bot conversations • Celery task queue with Redis broker for asynchronous jobs • Credit score calculation (30–60 sec) • Scheduled payment reminders and late fee processing • Blockchain transaction monitoring and event sync • Daily revenue aggregation and reporting
Data Layer	Databases & Caching: PostgreSQL + Redis • PostgreSQL for user data, loans, and transaction history • Redis for caching and Celery message brokering • Cache ABSA API responses (24-hour TTL) • Store Telegram conversation state (multi-step flows) • Rate limiting for API endpoints
Blockchain Layer (XRPL EVM Testnet)	Smart Contracts: Solidity 0.8.20+ for loan escrow, token management, and revenue collection • Web3.py integration for backend contract interaction • Event listeners for blockchain state synchronization • Transaction management: nonce handling, gas estimation, and retry logic
External Integration Layer	Open Banking & Payment Services: • ABSA Open Banking API (sandbox): Account information services for transaction data retrieval • Mock KYC Provider: Simulated identity verification (placeholder for production integration) • Mock Payment Gateway: Simulated ZAR deposits and withdrawals for FTCoin operations

System Architecture Diagram

Table 4.2: High-Level System Architecture

USER LAYER Telegram User Interface
DJANGO MONOLITH BACKEND Bot Webhook | REST API | Credit Scoring | KYC Module ABSA Adapter | Celery Workers | FTCoin Service | Off-Ramp Handler
INFRASTRUCTURE LAYER PostgreSQL Database | Redis Cache
XRPL EVM BLOCKCHAIN FTCoin ERC-20 | Mock Off-Ramp | Liquidity Pool Loan Manager | Escrow Factory | Escrow Clones | CreditTrust Token

Table E.2: Data Flow Architecture

Flow	Process Steps
Loan Origination Flow	1. User initiates loan request via Telegram → Django backend validates request. 2. Backend retrieves 6 months of transaction data from the ABSA Open Banking API. 3. Celery task executes credit-scoring algorithm → stores score in PostgreSQL. 4. If approved, Django calls LoanManager smart contract to create escrow. 5. Smart contract emits LoanCreated event → Django listens and updates loan status. 6. FTCoin transferred from LiquidityPool to borrower's wallet. 7. User receives Telegram notification with loan terms and repayment schedule.
Repayment Flow	1. Borrower initiates repayment via Telegram → Django validates payment amount. 2. Backend calculates interest allocation using pro-rata formula. 3. Django calls Escrow contract's makeRepayment() function with FTCoin. 4. Smart contract distributes funds: principal + interest to LiquidityPool, platform margin to Revenue Manager.

	5. Contract emits Repayment Made event → Django updates loan balance. 6. On full repayment, CreditTrustToken contract mints reputation tokens. 7. User receives confirmation and updated reputation score.
Off-Ramp Flow (Simulated)	1. User requests withdrawal via /offramp command → Django validates balance. 2. Backend calls MockOffRamp contract with withdrawal amount. 3. Contract burns specified FTCoin and emits WithdrawalRequested event. 4. Django simulates bank transfer (3–5 second delay) and updates user balance. 5. User receives "funds transferred" confirmation *(demo simulation only).*

Core Components Specification

FTCoin Stablecoin System

Contract: FTCoin (ERC-20 Standard + Custom Extensions)

Purpose: Synthetic stablecoin pegged 1:1 to South African Rand, eliminating cryptocurrency volatility risk for borrowers and lenders.

Key Functions:

- `mint(address to, uint256 amount):` Admin-only function for creating FTCoin on user deposits
- `burn(address from, uint256 amount):` Admin-only function for destroying FTCoin on withdrawals
- `transfer(), approve(), transferFrom():` Standard ERC-20 functions for internal platform operations

Architectural Decisions:

- Admin-controlled supply: Platform wallet holds minting authority
- Event logging: All mint/burn operations emit events for audit trail and transparency
- No external trading: FTCoin not listed on exchanges, preventing speculative price discovery

- 1:1 ZAR reserve: For production, each FTCoin minted would be backed by 1 ZAR in reserve account (simulated in POC)

Production Upgrade Path:

Replace admin control with multi-signature governance (3-of-5 or DAO mechanism)

Integrate with licensed stablecoin issuer or regulated payment institution

Implement real-time reserve attestation and proof of reserves

Add circuit breakers for excessive minting (e.g., max 10M FTC/day)

Alternative Credit Scoring Engine

Technology: Python scikit-learn with custom feature engineering

Data Inputs (from ABSA Open Banking API):

- Transaction history: 6 months of bank statement data
- Account balance snapshots: End-of-month balances
- Income patterns: Regularity, source diversity, growth trends
- Spending behaviour: Essential vs discretionary, savings rate
- Financial stress indicators: Overdrafts, returned debits, low balance frequency

Scoring Algorithm (weighted composite model):

```
Credit Score = 0.30 × Income Stability Score
             + 0.25 × Balance Consistency Score
             + 0.20 × Spending Behaviour Score
             + 0.15 × Savings Discipline Score
             + 0.10 × Financial Stress Score
```

Component Scores:

- Income Stability Score (0-100): Regularity, source diversity, growth trajectory
- Balance Consistency Score (0-100): Average balance, volatility, minimum threshold
- Spending Behaviour Score (0-100): Essential vs discretionary ratio, savings rate, stokvel participation
- Savings Discipline Score (0-100): Percentage of income saved within statement period
- Financial Stress Score (0-100): Overdraft frequency, returned debits, low balance days

Output: Final credit score (300-850 scale, similar to FICO) + risk tier classification

Risk Tier Mapping:

A-tier (750-850): Prime borrowers, 8-12% APR, R5,000 max loan

B-tier (650-749): Standard borrowers, 13-18% APR, R3,000 max loan

C-tier (550-649): Subprime borrowers, 19-26% APR, R1,500 max loan

Below 550: Declined (insufficient creditworthiness)

Smart Contract Architecture

Table: Contract Suite (7 contracts deployed to XRPL EVM):

Contract	Purpose
FTCoin	ERC-20 stablecoin with admin mint/burn, event emissions, access control
MockOffRamp	Simulates fiat conversion, accepts FTCoin burn requests, emits withdrawal events

LiquidityPool	Holds institutional investor deposits, time-locked deposits (30/60/90 days), pro-rata interest distribution, early withdrawal penalties
LoanManager	Central orchestrator for loan lifecycle, creates escrow contracts, tracks loans and defaults, calculates dynamic interest rates
EscrowFactory	Deploys minimal proxy (EIP-1167) pointing to single implementation, gas-efficient (0.001 XRP vs 0.1+ XRP per loan)
Escrow Implementation	Master logic for loan escrows, handles repayments, calculates amounts due, checks defaults
CreditTrust Token	ERC-721 with soulbound properties (non-transferable), mints reputation tokens on successful repayment

Key Smart Contract Functions

LiquidityPool Key Functions

```
function deposit(uint256 amount, uint256 lockDays) external
function withdraw(uint256 amount) external
function disburseToLoan(address escrow, uint256 amount) external
function receiveRepayment(uint256 principal, uint256 interest) external
```

LoanManager Key Functions

```
function createLoan(
    address borrower,
    uint256 principal,
    uint256 interestBPS,
    uint256 termDays
) external returns (address escrowAddress)

function markDefault(address escrow) external
function getLoanDetails(address escrow) external view
```

Escrow Key Functions

```
function initialize(
    address _borrower,
    uint256 _principal,
    uint256 _interestBPS,
    uint256 _termDays
) external

function makeRepayment(uint256 amount) external
function calculateAmountDue() public view returns (uint256)
function checkDefault() public view returns (bool)
```

RevenueManager Key Functions

```
function collectSpreadRevenue(uint256 interestAmount, uint256 spreadBPS) external
function collectLateFee(address borrower, uint256 feeAmount) external
function collectWithdrawalPenalty(address provider, uint256 penaltyAmount) external
function getTotalRevenue() external view returns (uint256)
```

API Specifications

Internal REST API Endpoints

Authentication

```
POST /api/v1/auth/telegram
Body: { telegram_id, telegram_username, first_name }
Response: { access_token, refresh_token, wallet_address }
```

Credit Scoring

```
POST /api/v1/scoring/calculate
Headers: Authorization: Bearer {jwt_token}
Body: { bank_account_id }
Response: {
  score,
  risk_tier,
```

```
  component_scores: { income, balance, spending, savings, stress },
  calculated_at
}
```

Loan Management

```
POST /api/v1/loans/apply
Body: { amount, term_days, purpose }
Response: { loan_id, status, escrow_address, terms }
 GET /api/v1/loans/{loan_id}
Response: {
  principal,
  interest_rate,
  amount_due,
  next_payment_date,
  repayment_schedule
}

POST /api/v1/loans/{loan_id}/repay
Body: { amount, tx_hash }
Response: { new_balance, next_due_date, reputation_tokens_earned }
```

FTCoin Operations

```
GET /api/v1/wallet/balance
Response: { ftc_balance, zar_equivalent }

POST /api/v1/wallet/offramp
Body: { amount }
Response: { withdrawal_id, status, estimated_arrival }

POST /api/v1/wallet/buy-ftc
Body: { zar_amount, payment_reference }
Response: { ftc_minted, tx_hash }
```

Core Database Schema

The platform uses PostgreSQL as the primary relational database with the following core tables:

Table	Key Fields
users	id, telegram_id, wallet_address, phone_number, kyc_status, credit_score, risk_tier, reputation_tokens
loans	id, borrower_id, escrow_address, principal_amount, interest_rate_bps, term_days, disbursement_date, due_date, status, total_repaid
transactions	id, loan_id, tx_hash, tx_type, amount, timestamp, block_number, status
credit_scores	id, user_id, score, income_stability_score, balance_consistency_score, spending_behavior_score, savings_discipline_score, financial_stress_score
bank_accounts	id, user_id, bank_name, account_number_hash, consent_token, consent_expires_at, last_synced_at
revenue_events	id, revenue_type, amount, loan_id, tx_hash, collected_at

Security Architecture

Authentication and Authorization

Multi-Layer Security Model:

- Telegram Authentication: User verified via Telegram's built-in user ID system
- JWT Token Issuance: Upon first interaction, backend issues JWT with 24-hour expiry
- Wallet Association: User's wallet address linked to Telegram ID (one-to-one mapping)

- Transaction Signing: All blockchain transactions require user's private key (stored client-side, never on server)

Admin Access Control:

- Platform admin wallet uses hardware wallet (Ledger/Trezor) for production
- Multi-signature requirement for sensitive operations (2-of-3 threshold)
- Role-based access control (RBAC) for Django admin panel

Data Protection

Personal Information Handling:

- Bank account numbers hashed with SHA-256 before storage
- Transaction descriptions stripped of personally identifiable information
- Phone numbers encrypted at rest using AES-256
- POPIA compliance enforced: user consent required before data processing

API Security:

- ABSA API credentials stored in environment variables (never in code)
- OAuth 2.0 refresh tokens encrypted in database
- Rate limiting: 100 requests/hour per user IP
- HTTPS/TLS 1.3 for all API communication

Smart Contract Security:

- Access control modifiers (onlyOwner, onlyLoanManager) prevent unauthorized calls
- Re-entrancy guards on all state-changing functions
- Integer overflow protection via Solidity 0.8+ built-in checks

- Pausable contracts for emergency shutdown capability

Production Upgrade Pathway

1. FTCoin Decentralisation

- Replace single admin with multi-sig wallet (Gnosis Safe)
- Implement DAO governance for minting policy
- Partner with a regulated stablecoin issuer (e.g., USDC/USDT ZAR bridge)
- Real-time reserve attestation and proof of reserves

2. Real Fiat Integration

- Partner with South African payment processors (Paystack, Yoco, Ozow)
- Integrate with banks via Open Banking Standard (not just ABSA)

Implement KYC/AML with ID verification psrtner (Smile Identity, Onfido)

Obtain money transmitter license (if required by FSCA)

3. Regulatory Compliance

- Register as credit provider under National Credit Act
- FSCA licensing (Financial Services Provider)
- POPIA compliance audit and certification
- Consumer protection policy implementation

4. Infrastructure Scaling

- Migrate from monolith to microservices (if load requires)
- Implement load balancer and horizontal scaling
- Deploy to cloud infrastructure (AWS/GCP) with auto-scaling
- Database replication and backup strategy

- Mainnet migration: XRPL EVM Devnet → Mainnet

Credit Model Refinement

- Calibrate scoring algorithm with 6-12 months of real default data
- Implement machine learning model (Random Forest, XGBoost) for improved predictions
- Bias detection and fairness testing

Tech Spec Diagrams

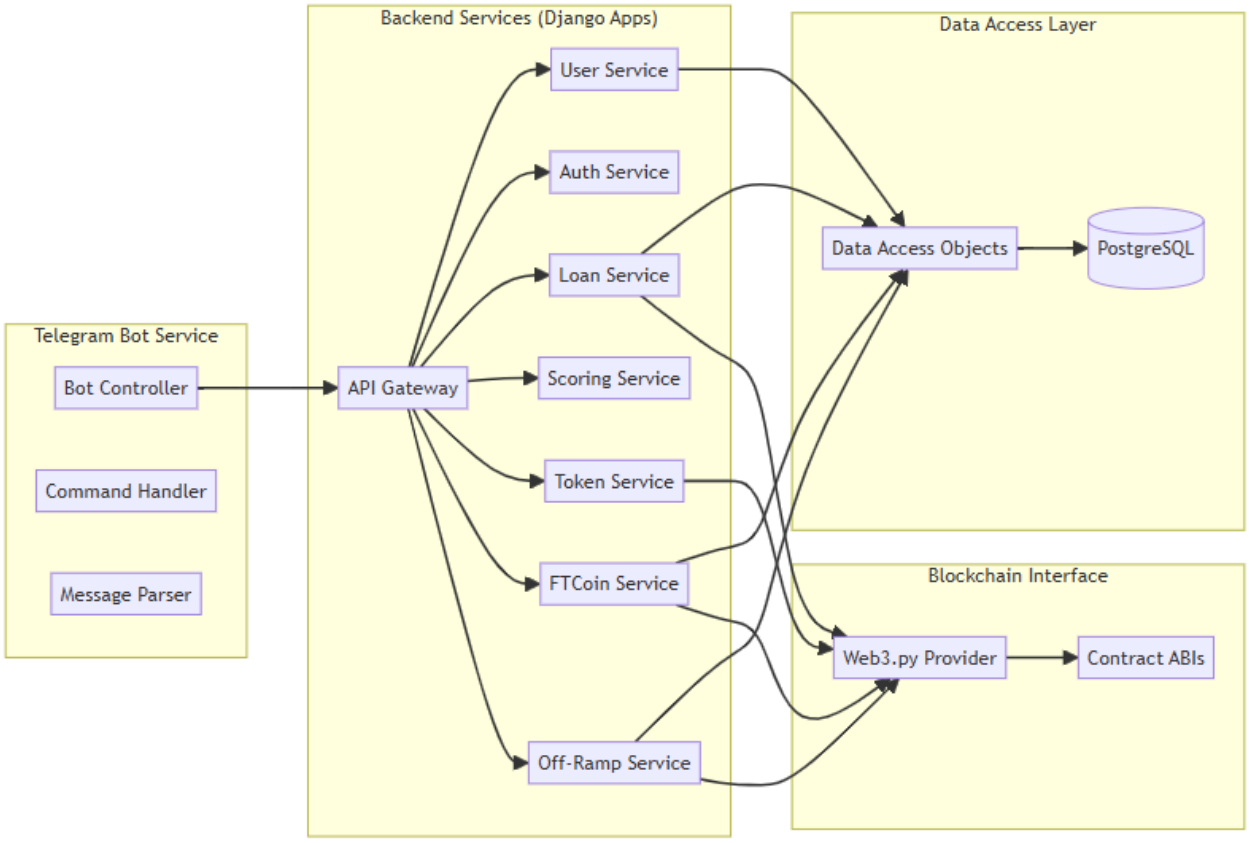
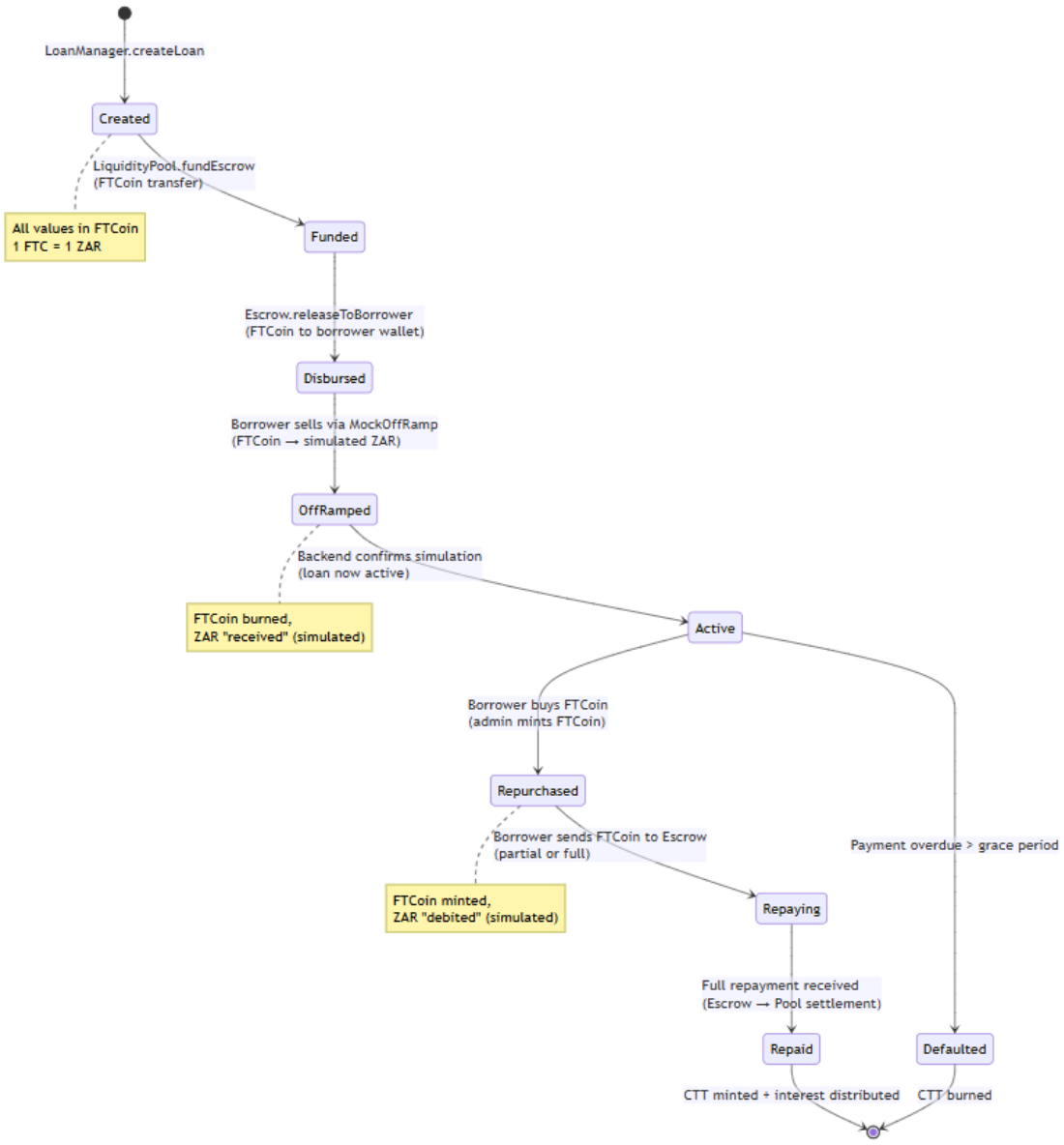


Figure 2: Backend Services Architecture



Loan Figure 3: State Machine

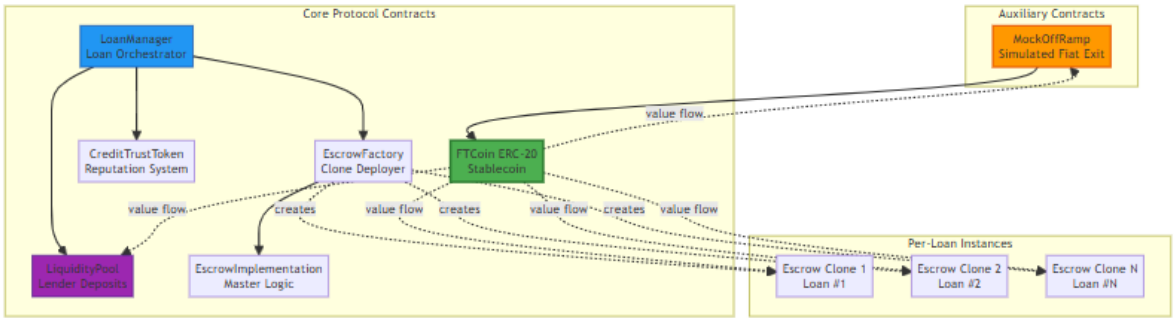


Figure 4: Smart Contract Architecture

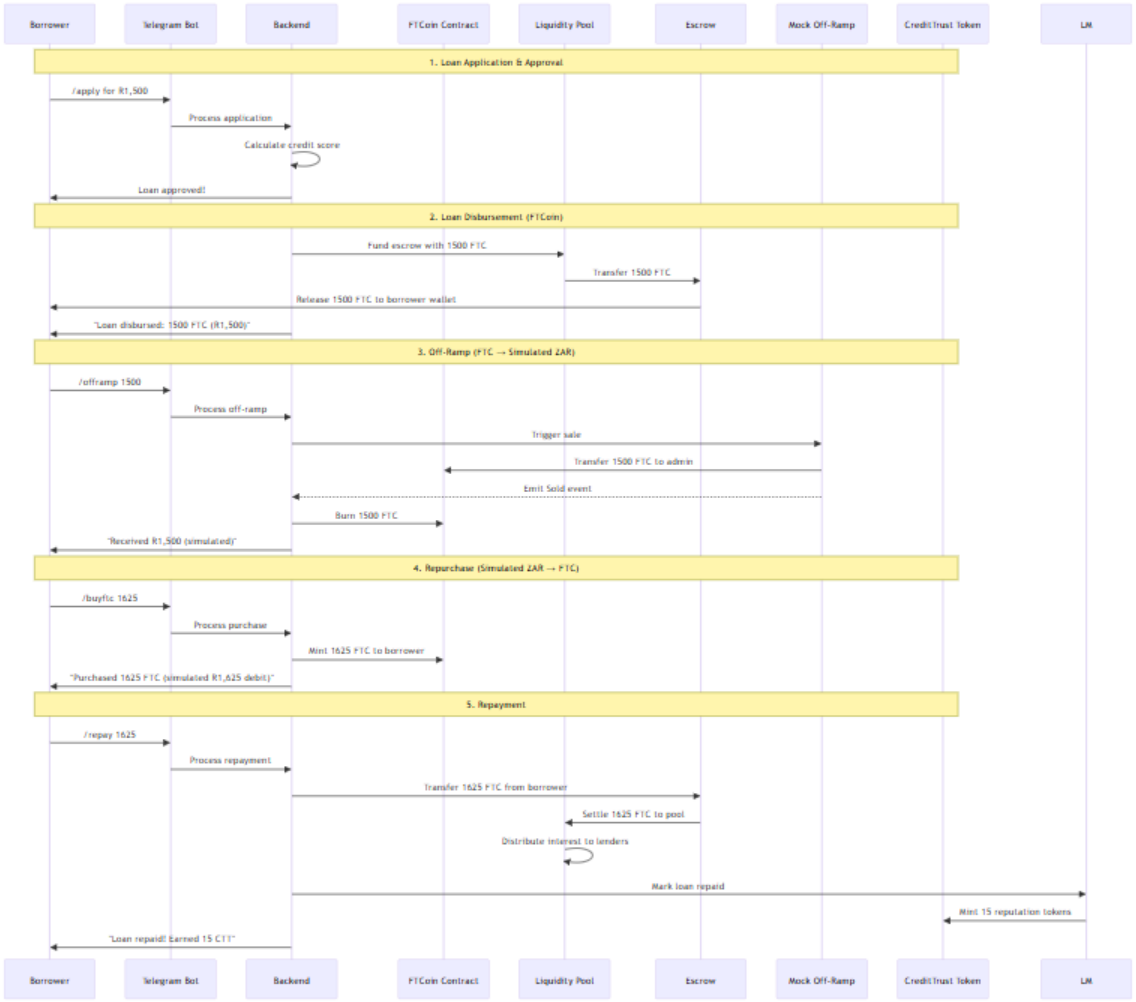


Figure 5: Loan Lifecycle Sequence

Mock-ups of Nkadime bot conversation flows

The following illustrates visual representations of the Nkadime bot and its conversational flows. The mock-ups are separated into 5 sections, namely Onboarding, Borrowing, Lending, Repayment and Credit building.

Onboarding

The onboarding process consists of Nkadime registration, the linking of the end users bank account and obtaining one's credit score.

Figure 7: User Registration

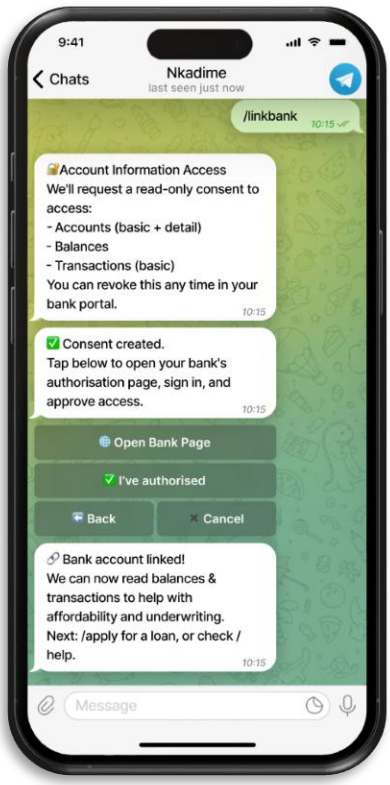


Figure 8: Bank Account Linking Score

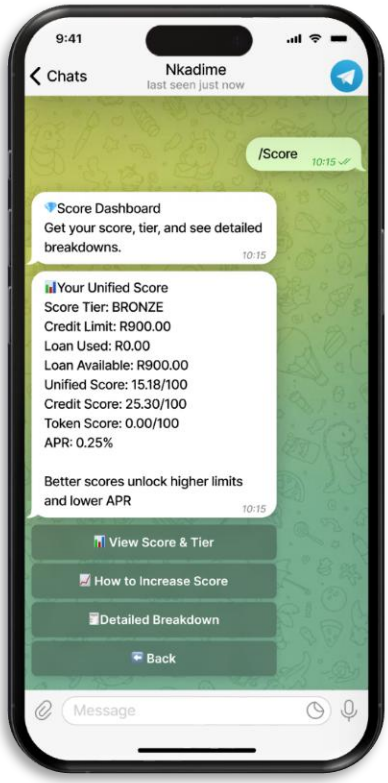


Figure 9: Getting a Credit

Borrowing

Loan Application

This section comprises of the conversational flows showcasing a loan application, a loan disbursement and the off ramping of FTCoin to Rands.

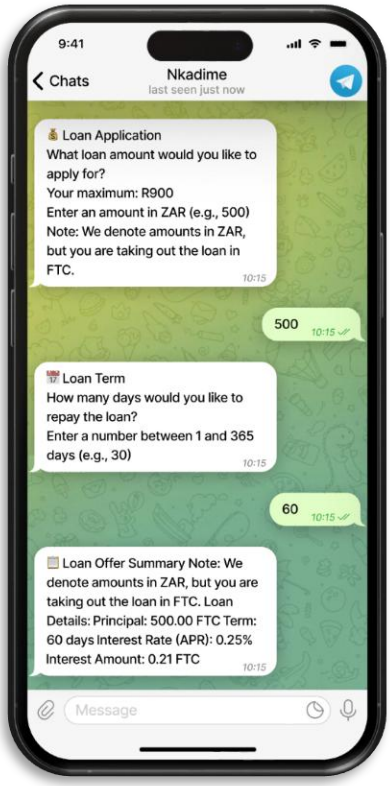


Figure 10: Loan Application

Figure 11: Loan disbursement

Off ramping

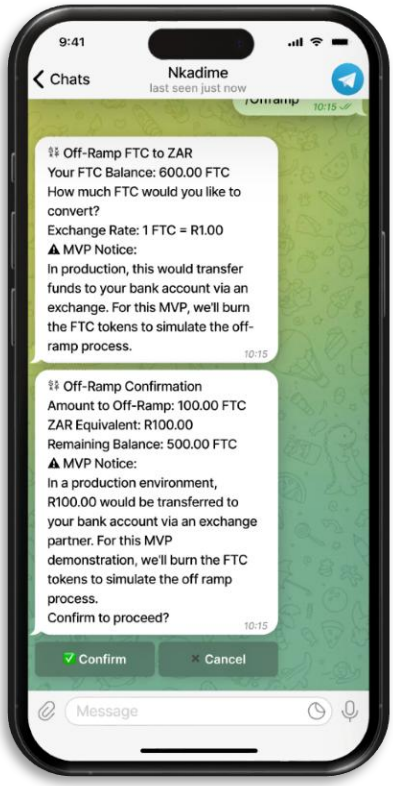


Figure 12: Off ramping (From FTCoin to Rands)

Figure 13: Off ramping continued

Lending

This section comprises of the bot conversational flows showcasing the lender depositing into the lending pool and withdrawing from the lending pool.

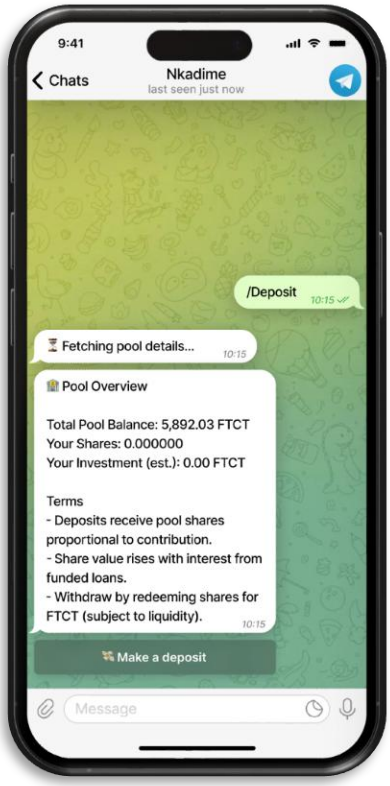


Figure 14: depositing to lending pool

Figure 15: Withdrawal

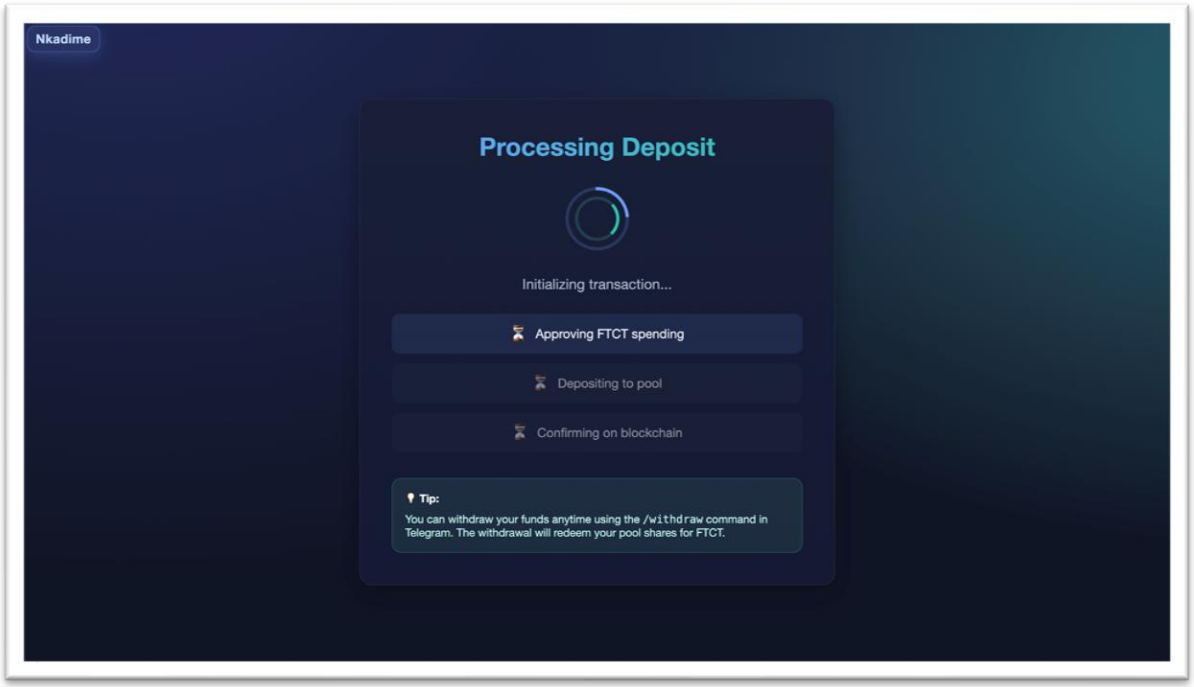


Figure 16: Processing deposit

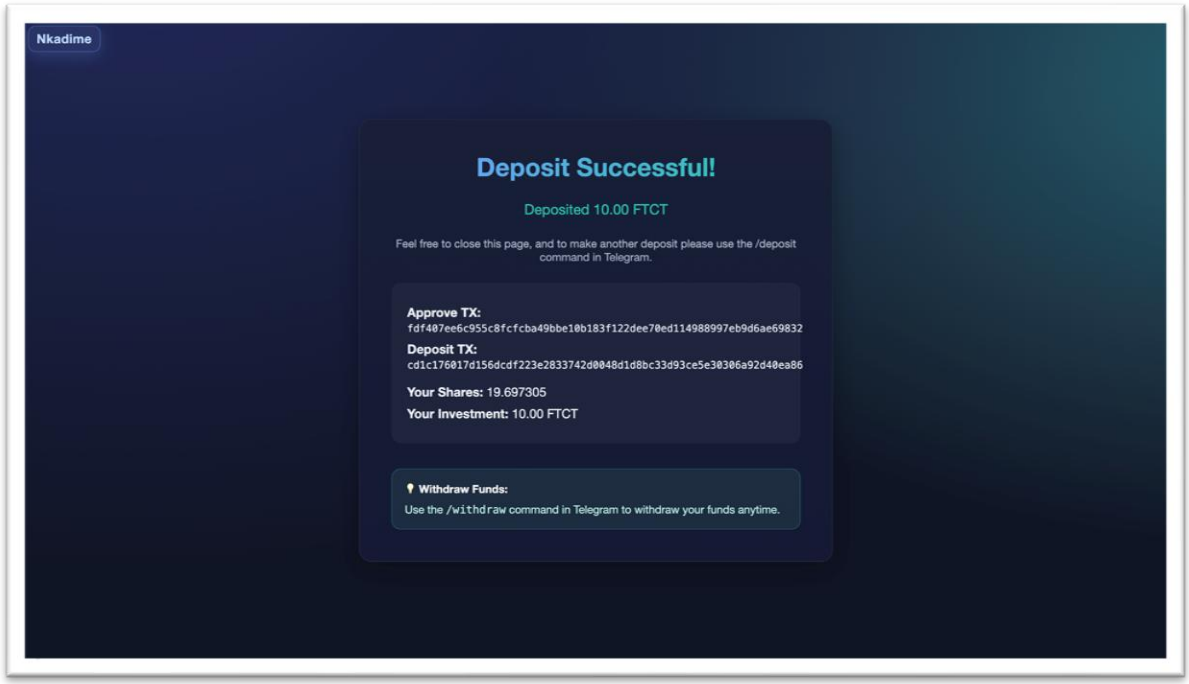


Figure 17: Deposit confirmation

Repayment

This section comprises of the conversational bot flows showcasing an end user buying FTCoin and making a repayment

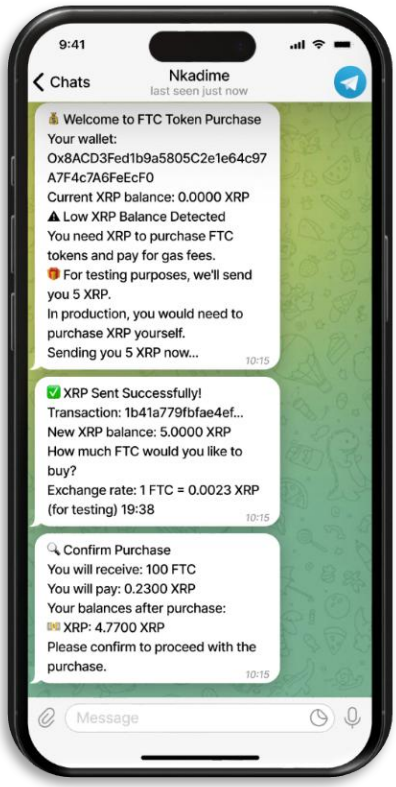


Figure 18: Buying FTCoin

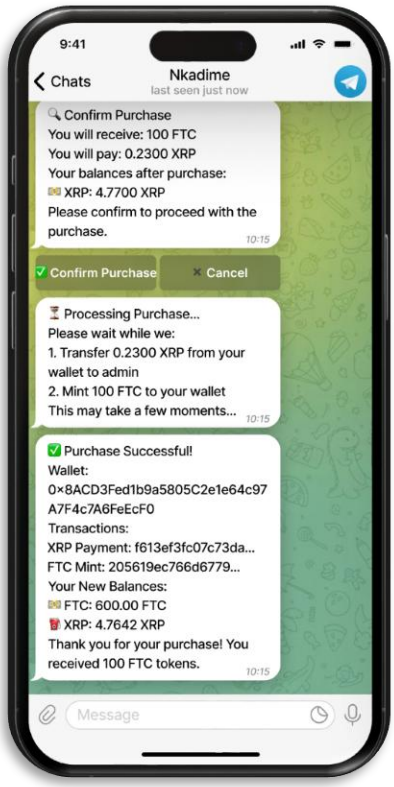


Figure 19: Buying FTCoin

Continued

Figure 20: Making Repayment

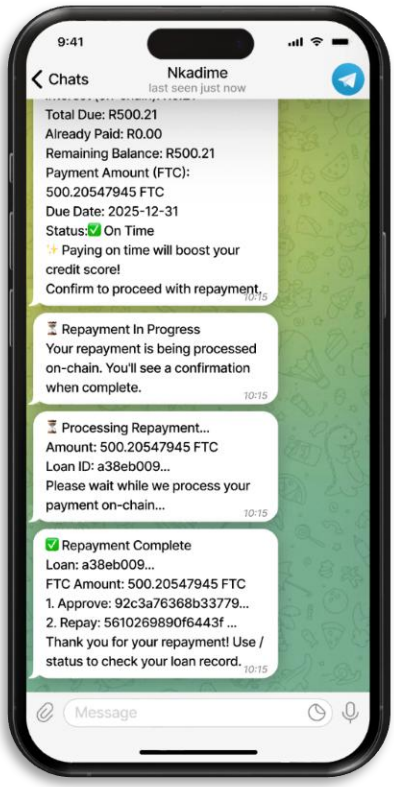


Figure 21: Making Repayment Continued

Credit Building

This section visualises the checking of token balance and the increase of the affordability scoring

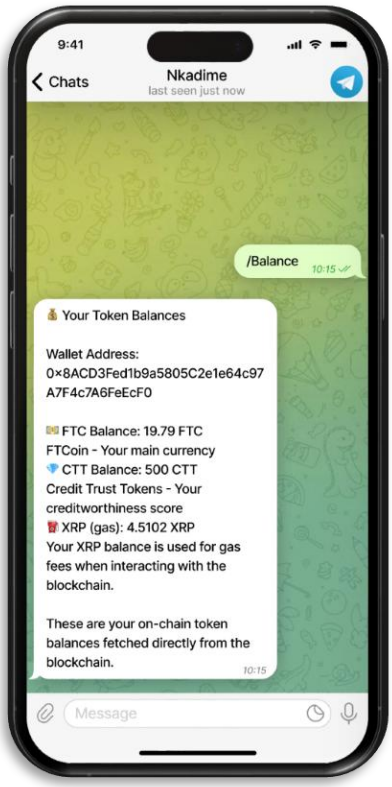


Figure 22: Checking of Token Balance

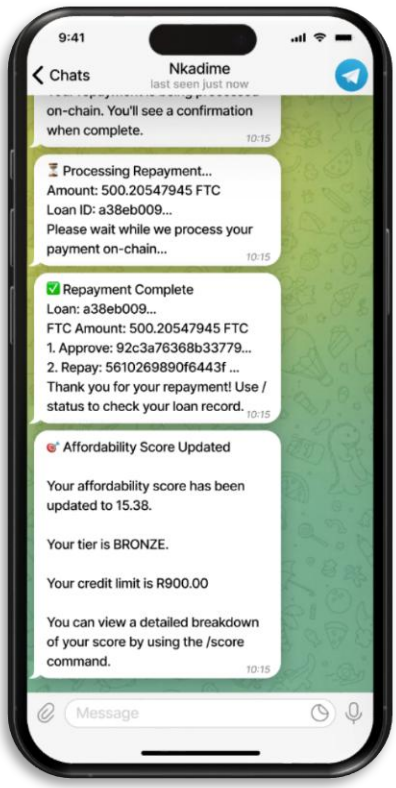


Figure 23: Update of affordability scoring