

PROJECT KHOKHA 2

*Exploring the implications of tokenisation in
financial markets*

SUMMARY PROJECT REPORT



CONTENTS

1	Overview of Project Khokha 2	5
2	Project approach	6
3	Technical observations	10
4	Business and operational implications	11
5	Policy and regulatory implications	14
	Wholesale central bank digital currency considerations	14
	Wholesale digital settlement token considerations	14
	Security token considerations	15
	Decentralised DLT-based token trading platform considerations	15
6	Conclusion	16
7	Next steps	17



INTRODUCTION

The first phase of *Project Khokha* was launched in 2018, published as *Project Khokha: Exploring the use of distributed ledger technology for interbank payments settlement in South Africa* – now referred to as PK1. The project explored the implications of distributed ledger technology (DLT)-driven innovation in financial markets by successfully replicating some functions of the South African real-time gross settlement (RTGS) system on distributed ledger. The results of PK1 provided the foundation for further exploration of the implications of DLT in other use cases. Digital financial innovation has, however, progressed since the finalisation of PK1, and developments related to tokenisation of money and securities by the public and private sector have underscored the need for further exploration. DLT represents a new type of innovation that allows securities and money to be recorded as a digital representation of value and recorded on a shared ledger, potentially reducing inefficiencies and enhancing transparency in financial markets.

The second phase of Project Khokha (PK2) explored the impact of DLT on trading, clearing and settlement in a limited proof-of-concept (PoC) environment. The PoC has been limited to the issuance of a South African Reserve Bank (SARB) debenture on DLT and enabling two DLT-based payment options in the form of a wholesale central bank digital currency (wCBDC) token and a wholesale digital settlement token (wToken). As an experimental project, PK2 does not reflect any specific policy stance. PK2 serves as an opportunity to explore the future of financial markets innovation in order to inform future policy and regulatory approaches.

PK2 was a collaborative initiative, and stakeholders included members of the Intergovernmental Fintech Working Group (IFWG) and the industry. The project was driven by the SARB, and the other core team members included the technical service providers, Accenture and Block Markets Africa (BMA), and Deloitte as the support partner. Active participants included Absa, FirstRand, Nedbank, Standard Bank and JSE Limited (JSE). The broader stakeholder group involved other members of the IFWG, industry and several observers.



“Several central banks are exploring wCBDC and the impact of DLT on financial markets in a manner that supports tokenisation.”

OVERVIEW OF PROJECT KHOKHA 2

Exploration around the issuance of both public and private ‘money’¹ has shifted greatly since the SARB published the PK1 report in 2018. Several central banks are exploring wCBDC and the impact of DLT on financial markets in a manner that supports tokenisation. In the context of PK2, tokenisation refers to the growing trend of issuing financial assets in the form of a DLT-based token, with DLT as the supporting technical infrastructure. Against this background, PK2 aims to further broaden the existing body of knowledge by exploring issuing multiple assets on DLT and their interoperability as part of the third wave of wCBDC-focused central bank innovation.

PK2 was formally launched during February 2021 as an IFWG Innovation Accelerator project, and this was led by the SARB.

The PoC sought to explore the following primary opportunities:

- Lowering the barrier to entry for new market entrants by using DLT to reduce the minimum infrastructure requirements, systems costs and operational requirements for participation.
- Simplifying the reconciliation requirements in the settlement processes of all parties, including new capacity such as transparent visibility of market liabilities against a trading member or specific security held by a trading member, by consolidating several current market infrastructure components onto a single shared ledger.
- Enabling innovation opportunities through DLT-based securities trading and helping to prepare local markets for growing global adoption of wCBDC and other tokenised securities. This would lay the foundation for interoperability between DLT networks (private, permissioned and even public) and their applications – especially in expanding the utility of wCBDC on multiple networks.

¹ In the South African context, ‘money’ is defined in the National Payment System Act 78 of 1998 as “a banknote or coin issued by the [South African] Reserve Bank in terms of section 10 (1)(a) (iii), read with section 14 of the South African Reserve Bank Act 90 of 1989”. The reference here, particularly to private ‘money’, is therefore money in the broadest sense of the term and denotes non-central bank issued instruments that aim to function as payment instrument.

PROJECT APPROACH

As an experimental research project, an exploratory approach was followed in the design of the PK2 PoC, with the current debenture issuance process serving as the basis upon which specific design options were discussed.

The brief to the technical teams included building three prototypes in the PK2 PoC, namely:

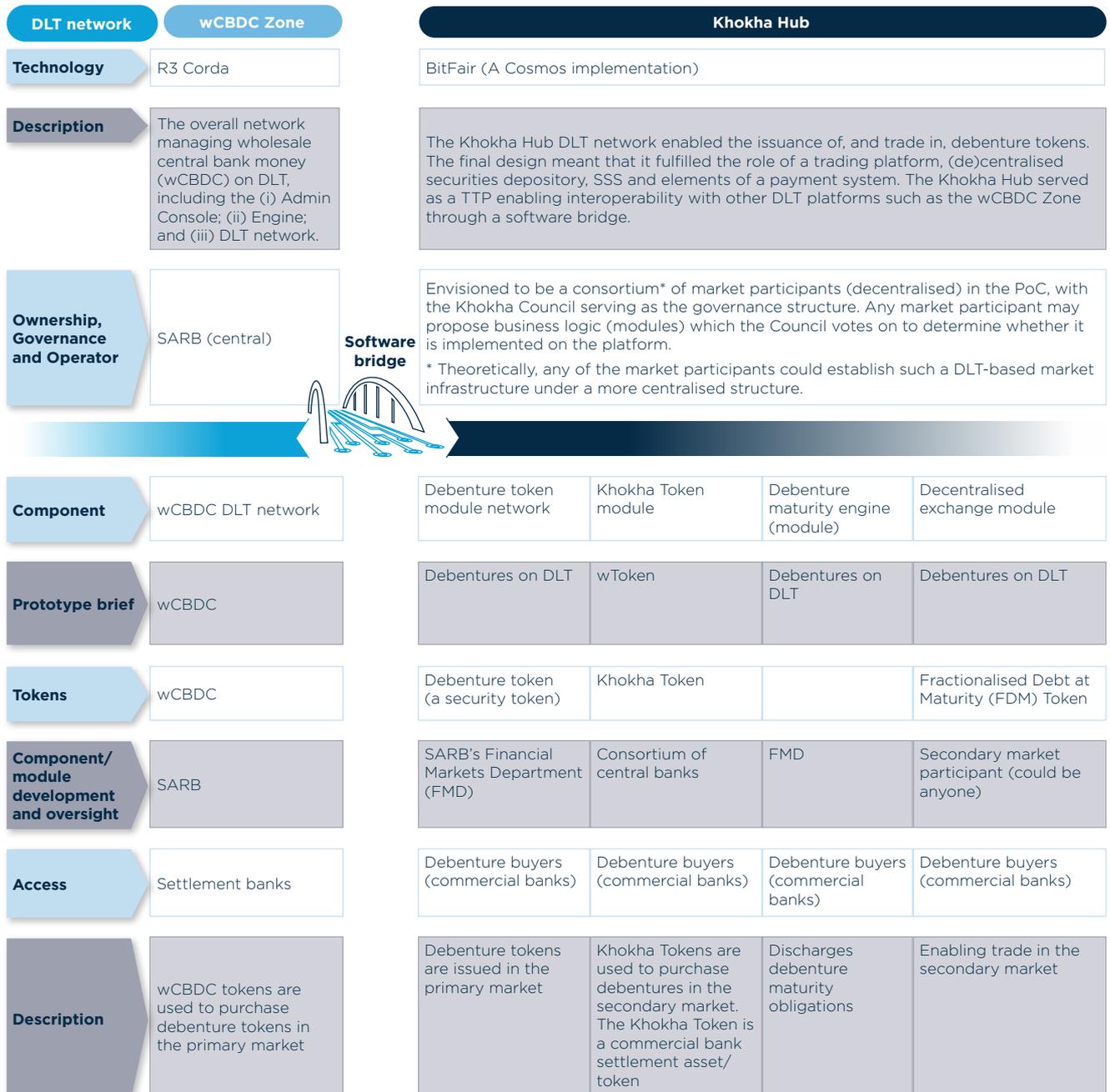
A wCBDC as a liability of the SARB to serve as an alternate form of central bank money, similar to money in reserve and settlement accounts with the central bank.

A DLT-based SARB debenture, which crucially had to be designed specifically for DLT and not merely move the existing process onto DLT.

A wToken as a commercial arrangement (i.e. not a liability of the SARB). The wToken had to be a settlement asset used in the settlement of wholesale transactions (CPMI, 2019), and could be considered as a stablecoin as it derives its value from the asset(s) backing it.

The technical teams had the freedom to re-imagine the current debentures market and design for DLT. The PoC resulted in the development of a multi-DLT debenture token market consisting of two core DLT platforms, namely the wCBDC Zone and the Khokha Hub. The Khokha Hub served as a decentralised DLT-based token trading platform (TTP). The wCBDC was used in the primary market, whereas the wToken was used in the secondary market. Integration between the two DLTs was facilitated by a software bridge which enabled the transfer of the wCBDC between the wCBDC Zone and the Khokha Hub. Using DLT-based decentralised and modular design principles, the technical team built the Khokha Hub as a decentralised TTP, which effectively provided for the roles of a trading platform, central securities depository (CSD), securities settlement system (SSS) and elements of the payment settlement system. Having a composable financial system means that new markets may be built by combining modular blocks of financial services functions just like one would combine Lego blocks to build new market infrastructures.

Figure 1: Conceptual design of the PK2 proof-of-concept



Some consideration was given on whether the SARB debenture token also had to be issued on a SARB-specific DLT, like the wCBDC issuance. However, given that the current debentures environment involves multiple players, the project team was of the view that issuing the debenture token on a central bank DLT might prevent exploring how multiple role players may still play a role in a DLT-based infrastructure. The decision was therefore to collectively re-imagine existing roles, potentially within a shared DLT infrastructure.

DLT and the TTP enabled opportunities for innovation. For instance, the use of tokenisation allowed the team to create a fungible token which enabled trade in fractions of debentures thereby increasing liquidity in the secondary market. The exploration of interoperability between the Khokha Hub and other networks, such as the wCBDC Zone, led to further exploration with the industry participants on how their DLT-based networks interact with the TTP and potentially even public networks. The use of a single shared ledger with different levels of access - depending on the role of the participant - enabled greater oversight of what was happening across the network, making reconciliations easier and providing the SARB's FMD very useful real-time operational data. Having both the security and settlement tokens on DLT enabled delivery-versus-payment (DvP) on a single network. However, the porting of the central bank's settlement token across two platforms also introduced some challenges - for instance, in the separation between operational and legal settlement introduced by porting the wCBDC token to the Khokha Hub.

TECHNICAL OBSERVATIONS

In building a debenture token market, the following technical observations were made about the process and the implications of using DLT relative to traditional methods.

- Although it was possible to port the wCBDC, as central bank money, between the wCBDC DLT platform and the Khokha Hub, there were some complications, particularly creating a split when technical/operational and legal settlement took place. This was based on the understanding that legal settlement must take place in a designated settlement system, and the presumption that the wCBDC ledger may be declared as such in a future world. Allowing central bank assets to be ported would require due consideration, including determining how detailed transactions were integrated back to the wCBDC ledger.
- The wCBDC as a riskless settlement asset was fundamental to the debenture token market, since (i) it facilitated the payments leg of debenture purchases in the primary market; (ii) reduced liquidity risk in the redemption of wTokens; and (iii) the FDM Tokens² – created to facilitate debenture trade in the secondary – represented a claim against wCBDC thereby increasing its legitimacy.
- Porting of a token, depending on its nature, may be complicated by verifying the authenticity, value and potential actions linked to a token.
- Executing DvP for non-fungible tokens (NFTs) gets complicated by similar factors, since the more variables associated with it the more complicated the verifications are required to complete the transaction.

2 The FDM Tokens were created as a synthetic instrument. They were engineered to combine the principal value (debenture tokens locked in custodial wallets in the Khokha Hub) as well as the interest value (wCBDC linked to the debenture NFT using the FDM contract simulate maturity functionality in the current market) of a debenture before maturity in order to enable its trade in the secondary market. Interest for a particular debenture NFT is paid in wCBDC via the FDM contract, which executes maturity obligations.

BUSINESS AND OPERATIONAL IMPLICATIONS

Transitioning to a tokenised market will introduce new requirements for role players in the market. Operating a DLT-based financial system will require new capabilities on the part of all role players in the market as a basic requirement. The new DLT-based platforms will also need to be integrated with incumbents' legacy systems, and all market players will have to bear the cost of moving to DLT-based markets, which will have to be offset against the benefits of such a move. Standards will need to be developed, best practices established, and a supporting ecosystem will need to be put in place for DLT-based infrastructures. A transition to a DLT-based system requires careful planning and execution and may involve running a DLT-based system in parallel to the existing system for a while, perhaps indefinitely. Appropriate risk management would have to be implemented to ensure new systems are fully operational and secure. Further engagement and collaboration between policymakers, legislators, regulators and relevant industry players – particularly in regulated markets – would be required before any transition or incorporation of DLT-based systems can be realised.

While the underlying principles applied remain mostly unchanged, governance of DLT-based token markets would be achieved in a different way from the governance arrangements in

respect of incumbent systems, which could potentially be partially replaced. Governance elements may, to some degree, be programmed into the design of tokens – in that they can be configured so that they are limited in their issuance and operation and can be linked to the segregated roles set up within the governance model. The roles fulfilled by different market infrastructures appear to be collapsible in some instance on a single DLT-based infrastructure thereby reducing the role players responsible for operating the new infrastructures. Similarly, supervision and regulation would have to adapt to a DLT-based paradigm.

Reducing incumbent operators and automating functions may lead to cost savings and may lower barriers to entering a DLT-based market. In addition, a pre-funded market³ may, for instance, simplify liquidity management and reduce the regulatory burden through automation. However, existing structures evolved over time to ensure the safety, efficiency and resilience of financial markets and it would be advisable to fully understand the function and purpose of a specific structure before such structure is potentially replaced.

Other potential implications include the possibility that actions affecting tokens could be automated, so conceivably things like corporate actions or interest rates could be applied to tokens by the relevant smart contracts. DLT-based markets could provide participants with improved data-transparency, which could improve the discovery mechanism when pricing assets and could provide participants with a more informed view of where collateral resides and how it moves through the system. A move to a DLT-based market effectively means a decision to move to a pre-funded market and participants will have to accommodate the operational and process implications of a T+0 settlement.

³ The reference here is to a market where trading, clearing and settlement happens immediately and is not to be confused with pre-funding settlement accounts where the funds have to be in the account for a transaction to settle, but this may only happen x number of days after the trade has been executed.

wToken

The wToken arrangement in the PoC was backed by central bank money earmarked in a settlement account in the SAMOS system. Additionally, the wToken was redeemable for wCBDC, which increased participants' options and further reduced (liquidity) risk. Other reserve asset options, such as bank deposits or commercial bank stablecoins, would again increase risk as dependence on third parties and other factors increases. In a market where both a wToken, such as the Khokha Token, and a wCBDC is available it is not likely that there is a business case for the wToken. The wToken does, however, provide a less-risk settlement option (i.e. it is not riskless, but depending on the reserve asset, may entail less credit and liquidity risk than relying on a settlement asset issued and backed by a private entity) that is worth considering where wCBDC is not available and/or where a settlement option more prone to enabling innovation may be required.

Interoperability between DLT platforms

In the PoC, wCBDC was exported to the Khokha Hub and imported back to wCBDC Zone utilising the bridge between the two DLT networks – a similar operation to what was used in decentralised finance (DeFi). Even though it is possible to port wCBDC between networks, there are several unanswered questions and risks, including technical risks related to the security and reliability of the bridge. The use of wCBDC on non-native networks should primarily be informed by a central bank's policy position with adequate technical controls put in place to enforce that position. Porting also enables the emigration and use of other central bank assets on non-native networks and the topic requires further future consideration, including which tokens may be imported to a particular platform.

POLICY AND REGULATORY IMPLICATIONS

Aside from having to justify its adoption from a return-on-investment perspective, having certainty of how the component parts of DLT-based markets would be treated from a legislative or regulatory framework perspective could aid in the use or adoption of DLT-based token markets. In South Africa, financial sector regulators follow an activity-based approach that seeks to regulate the underlying activity. This is common in most other countries in the world. Local regulators are also technology-neutral but not technology-blind. It is the actual activity that is regulated, irrespective of the technology platform it is delivered on. However, it is important to recognise that different technology platforms may affect how the activity is performed, thereby changing the risk that is involved, and therefore the technology cannot simply be ignored.

Wholesale central bank digital currency considerations

The issuance of a wCBDC on DLT raises several policy and regulatory issues. Further work is needed to unpack the legal status of the wCBDC token, the treatment of wCBDC wallets as accounts with the central bank and the feasibility of designating the wCBDC's DLT as a settlement system. The expectation is not that central banks would replace their existing RTGS systems with fully DLT-based systems, but that consideration be given to how such systems could co-exist with DLT-based systems. The project showed that it is possible to port wCBDC between its native network and a non-native network. However, it also highlighted challenges, including creating a split between legal and operational/technical settlement.

Wholesale digital settlement token considerations

The regulatory treatment of allowing commercial bank entities to issue wTokens in production should be cleared before permitting its use within regulated financial services. Considerations would include whether there is benefit to industry in its adoption (such as

providing a safer settlement option in markets where wCBDC is not available) and what the costs may be (including the implications should such a system fail). The wToken implemented in the PoC could be defined as a stablecoin used for wholesale settlement and the policy response to wTokens would therefore have to align with broader regulatory approaches to stablecoins. Should the central bank decide to allow wTokens into production, some of the practical considerations would be whether to designate such arrangements as an alternate settlement system and/or how such payment systems should interface with the RTGS system (for instance, through end-of-day settlement). Further considerations would include the potential systemic importance of the wToken and its governance and operating models.

A systemically important stablecoin arrangement, primarily used for making payments (transferring tokens between users), would be expected to adhere to all the relevant Principles for Financial Market Infrastructures (PFMIs) in line with the recommendations from relevant international standard setting bodies. From a national payment system perspective, allowing various alternative settlement system options may have an impact on liquidity in the SAMOS system, if money in settlement accounts is used to buy wCBDC and/or back wTokens. Similarly, introducing too many alternate options into the national payment system may fragment the national system, unless a multi-settlement asset system can be created where different options 'plug-and-play' into the overall system.

Security token considerations

The tokenisation of securities can take one of two forms: (i) security tokens, which as with the debenture tokens entail issuing the security directly on DLT where the token is the security; or (ii) tokenised securities, where an existing security is tokenised or encapsulated in a token wrapper. The implications between the two will differ – tokenised securities will have to provide verification of the legal right to the underlying asset, and it will be ring-fenced for purpose of tokenisation. Tokenisation enables different use cases such as fractionalisation, as with the FDM Tokens. The use of smart contracts would further enable the automation of actions linked to securities on DLT, such as the automatic settling of obligations at maturity.

Decentralised DLT-based token trading platform considerations

The establishment of the debenture token market, particularly the Khokha Hub, reflected the ability of DLT-based design to combine the components of financial markets in new and innovative ways. An initial policy response might be to allow such composition, provided the new market infrastructures meet the regulatory requirements for the different activities it performs. The composability of role players and market infrastructures may also result in an environment like the Khokha Hub, where the SARB issued its debenture tokens and a consortium of commercial banks issued its wToken. Such a structure would increase the complexity of determining who is accountable when things go wrong and would ensure the integrity and privacy of data and the continued stability of the system. In the PoC, it was envisioned that the Khokha Hub would be owned by a consortium of industry participants with a more decentralised governance model. However, any of the individual participants, such as a stock exchange or CSD could (theoretically) establish a TTP. The ownership and governance structure would affect the ability of the platform to comply with requirements such as those set out in the PFMI. These structures would have to define clear rules of the game on the platform – for instance, defining rules, obligations and accountability for token issuers on the platform in line with any further requirements as may be specified in relevant legislative requirements or as specified by regulatory authorities.

CONCLUSION

Being able to build a market for a specific tokenised security from different component pieces impacted the different role players and their roles in the market, and it was possible to reduce the number of role players onto a single platform. To the extent that role players perform similar roles and related functions, such functions could be regulated under existing frameworks. The challenge remains where current legislation does not cater for emerging innovation in its formulation of the market structure. The regulators are moving with caution in considering developments before implementing regulatory changes, fully appreciative that regulated entities are waiting for regulatory certainty before committing to enter DLT-based token markets. In the meantime, developments in unregulated markets continue to emerge. Careful consideration is required when developing interconnected frameworks to avoid unintended consequences, and it is envisaged that the policies, mechanisms and legal frameworks will continue to be developed through collaboration between policy makers, regulators and the industry.

NEXT STEPS

The PK2 PoC was completed successfully and led to some valuable insights on the technological capability, the initial legal and policy areas for further exploration and the potential interoperability challenges. Further work to unpack the learnings from PK2 is already underway to inform the policy and regulatory responses to tokenisation in the financial markets.

PK2 also allowed for deeper collaboration between regulatory agencies and the industry, which led to further technical collaboration with industry on decentralised TTPs, pointing to the following possible areas for further exploration:

- The creation of a DLT-innovation acceleration platform with industry for an extended period, allowing industry to explore DLT application with participation and oversight of regulators.
- Collaboration with other jurisdictions – for instance, building on the SARB’s participation in Project Dunbar through multi-wCBDC exploration with the Southern African Development Community.
- A new phase of Project Khokha may be initiated to build on the work in PK2, to perform live transactions in a sandbox environment in a different use case.

Overall, PK2 has continued to provide a collaborative space for experimentation with DLT within the industry, contributing to the continually growing body of knowledge in this area.



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