HONG KONG MONETARY AUTHORITY
香港金融管理局

e-HKD Pilot Programme
Phase 2 Report

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Foreword

In recent years, money has undergone a gradual yet profound transformation, from physical notes and coins to various forms of digital money, driven by the emergence of transformative technologies such as distributed ledger technology (DLT). These technologies are reshaping how financial systems operate, enabling payments to become faster, cheaper, and more efficient.

This transformation has given rise to a new landscape of digital money, encompassing both public and private forms. Public money includes central bank digital currencies (CBDCs), while private money comprises tokenised deposits and stablecoins. Building on this landscape, the HKMA has charted a strategic blueprint to advance these future-oriented initiatives over the past few years. Together, these new forms of digital money lay the groundwork for tokenisation in Hong Kong, creating new possibilities for asset settlement and connecting financial systems to the evolving Web 3.0 world.

As central banks around the world navigate this new era of digital money, CBDCs have drawn increasing attention in the past few years. The HKMA, as Hong Kong's central banking institution, is likewise exploring how an e-HKD, Hong Kong's CBDC, could offer potential benefits to financial institutions and the general public in both wholesale and retail scenarios by harnessing new technologies such as DLT.

In the retail space, the HKMA launched the e-HKD Pilot Programme three years ago to assess potential use cases for an e-HKD for individuals and corporates. The programme has served as a valuable testing ground for collaboration with the industry, exploring how an e-HKD can support different innovative use cases such as serving as the settlement medium for tokenised assets like tokenised money market funds. New forms of programmability in payments may also lead to new business models, enabling automated transactions and conditional payments that greatly enhance efficiency in areas such as supply chain finance and e-commerce.

While an e-HKD may be a new form of digital money for the general public, our exploration takes place within a broader perspective, one that considers how different types of digital money can coexist and complement each other. Building on the success of the first phase of the e-HKD Pilot Programme, the second phase broadened the scope of study to compare an e-HKD with other emerging forms of digital money, such as tokenised deposits. In collaboration with industry participants, this second phase examined potential retail use cases, assessing not only technical feasibility but also the commercial models and other related considerations.

Phase 2 of the e-HKD Pilot Programme has yielded concrete insights into how digital money can function effectively within Hong Kong's financial ecosystem. The findings offer a strong foundation for the HKMA's continued exploration of CBDCs, tokenisation, and the broader digital money landscape. I trust these learnings will also contribute to the global dialogue among central banks and industry stakeholders, helping to shape the next generation of money and payments, a future that is more connected, efficient, and innovation-driven.

Howard Lee
DEPUTY CHIEF EXECUTIVE
HONG KONG MONETARY AUTHORITY

Executive Summary

The payments landscape in Hong Kong and globally is undergoing a profound transformation, driven by evolving consumer behaviour and new technological advancements. With an increasing share of transactions occurring online, the use of digital money becomes part of daily life. The emergence of new technologies like distributed ledger technology (DLT) challenges us to reimagine how the payment system could better support the future digital economy.

Since 2017, the HKMA has been at the forefront of pioneering research into an e-HKD, Hong Kong's central bank digital currency (CBDC), as a complement to existing forms of money. Such research covers an e-HKD's applications in different wholesale and retail scenarios. At the wholesale level, financial institutions have already begun utilising the e-HKD for wholesale interbank cross-border transactions. More studies and pilots will be conducted both within and outside Project Ensemble.

In parallel, under Project e-HKD+, the HKMA has been exploring how an e-HKD and other new forms of digital money, such as tokenised deposits, could be used by individuals and corporates. The e-HKD Pilot Programme is a core element of the project for the HKMA and the industry to collaboratively explore and evaluate the usability and usefulness of different innovative e-HKD use cases.

Building on the insights from Phase 1 of the e-HKD Pilot Programme, Phase 2 of the e-HKD Pilot Programme assessed the commercial viability and scalability of the use cases under real-world conditions. Eleven groups of firms from the financial, payment, and technology sectors conducted in-depth pilots across three themes: settlement of tokenised assets, programmability and offline payments. These efforts highlighted the potential of new forms of digital money in reimagining financial intermediation.

Hong Kong's mature, efficient and diversified retail payment ecosystem, underpinned by robust regulation and high public trust in its banking system, provides a solid foundation for digital money to thrive. The pilots showed that an e-HKD could make the existing payment processes more efficient and unlock new types of economic transactions. Nevertheless, other privately-issued digital money like tokenised deposits may offer comparable benefits. Commercial banks also showed a slight preference for tokenised deposits over an e-HKD. This is because commercial banks could potentially benefit from a lower cost of capital for tokenised deposits under the fractional banking system, enjoy more flexibility to drive the design of tokenised deposits resulting in a shorter time-to-market, as well as leverage tokenised deposits to create strong customer stickiness. All these indicate diverse pathways for digital money adoption.

Drawing on the learnings from both phases of the e-HKD Pilot Programme, the HKMA will prioritise the development of the e-HKD for financial institutions in wholesale scenarios. In the meantime, the HKMA will maximise Hong Kong's readiness in extending the use of the e-HKD to retail scenarios by laying the policy, legal, and technical groundwork by the first half of 2026, taking into account the design considerations outlined in the report. The HKMA will regularly review the decision to proceed with such an extension, subject to various factors such as market demand, international developments, and evolvement of technologies.

The e-HKD Industry Forum also undertook extensive discussions in the past year and is developing a set of common token standards to facilitate the implementation of cross-institution programmability, if an e-HKD is implemented in retail scenarios in the future. Such standards have been tested on various blockchains to ensure their technical robustness.

This public-private partnership underscores the power of collective innovation and helps shape the long-term vision for the e-HKD. The HKMA will continue the dialogue with the industry to ensure that the e-HKD aligns with real-world needs, and together shape a visionary future for Hong Kong's financial landscape.

1. Introduction

The HKMA has been advancing the exploration and development of a central bank digital currency (CBDC) for Hong Kong, i.e., an e-HKD, since 2017, in line with the growing global interest in CBDCs.

In its early years, the HKMA focused on examining potential wholesale applications of an e-HKD, such as facilitating large-value payments and delivery-versus-payment (DvP) settlements. This work was carried out under Project LionRock, which gradually evolved into Project Inthanon-LionRock and subsequently Project mBridge. The HKMA also launched Project Ensemble in 2024 to explore the potential use of the e-HKD for interbank settlement of tokenised deposits[1].

Expanding beyond wholesale use cases, the HKMA launched Project e-HKD in June 2021 to assess the feasibility of adopting an e-HKD[2] for individuals and corporates in a broader range of retail use cases. In September 2022, the HKMA published a position paper outlining its policy stance and a three-rail approach for the potential implementation of an e-HKD in retail use cases[3]. This approach includes collaborating with industry participants to conduct in-depth studies of practical applications through the e-HKD Pilot Programme.

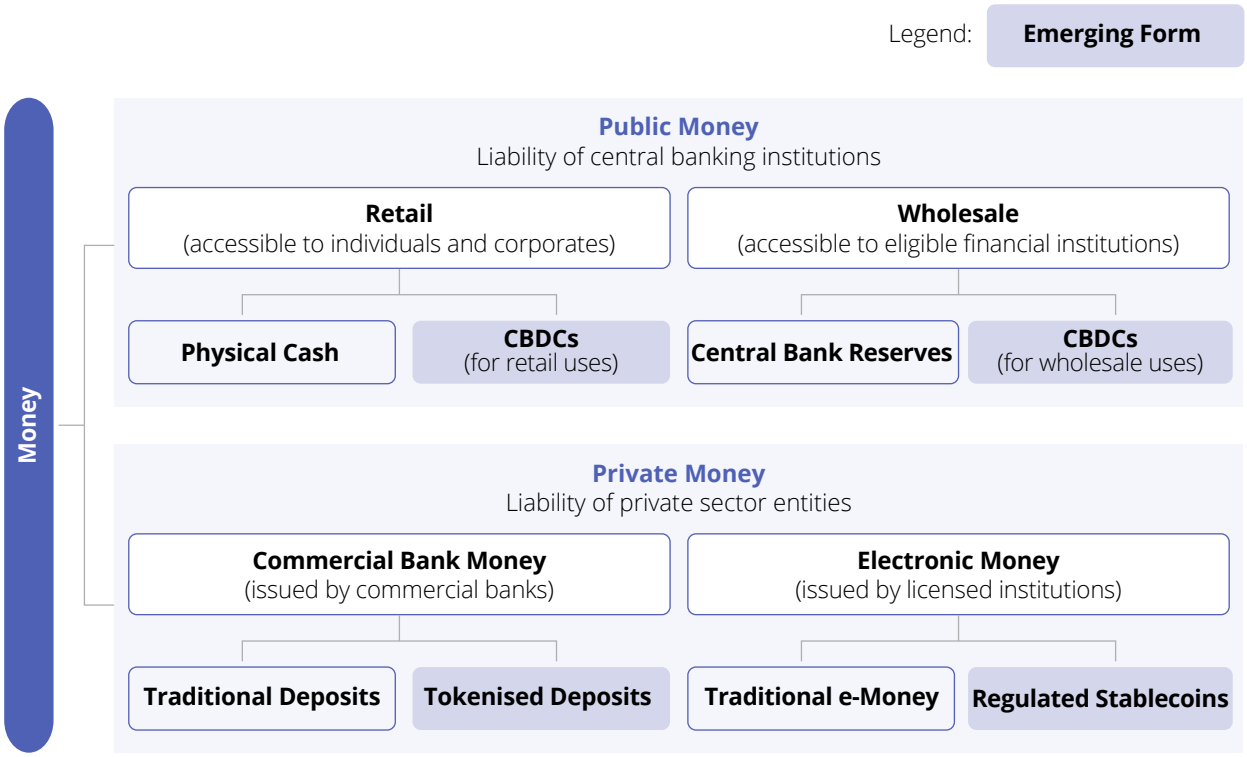
Phase 1 of the e-HKD Pilot Programme (Phase 1) brought together the HKMA and 16 pilot participants. Completed in October 2023, Phase 1 identified three key areas where an e-HKD could potentially add unique value[4]:

- **Programmability:** Enabling automated, condition-based transactions that streamline business processes and foster innovation.
- **Tokenisation:** Supporting the digital representation and transfer of assets, including fractional ownership and new forms of value exchange.
- **Atomic Settlement:** Facilitating instant, final and simultaneous settlement of transactions, thereby improving operational efficiency and reducing counterparty risks.

Although Phase 1 demonstrated several potential benefits of an e-HKD, the findings were based on several assumptions. To build on this work, the HKMA launched Phase 2 of the e-HKD Pilot Programme (Phase 2) in 2024, which focused on areas requiring deeper analysis. These included comparisons between an e-HKD and other traditional and emerging forms of money (see Box A) and an assessment of the distinctive value an e-HKD could bring relative to these alternatives. Phase 2 also provided participants with the opportunity to evaluate commercial viability and identify practical constraints in implementing an e-HKD at scale in real-world environments.

1. **Tokenised deposits**, in this report, refer to the digital representation of traditional bank deposits that exist on DLT networks. Phase 1 of the e-HKD Pilot Programme, which was completed in October 2023, examined the use of an e-HKD for individuals and corporates, and its potential application in wholesale settlement of tokenised deposits.
2. Although an e-HKD can be used in both wholesale and retail contexts, "e-HKD" in this report refers to the tokenised form of HKD for retail use by individuals and corporates, unless otherwise specified.
3. See *e-HKD: Charting the Next Steps (September 2022).*
4. See *e-HKD Pilot Programme Phase 1 Report (October 2023).*

Box A: Classification of Contemporary Forms of Money



The classification of money pivots on the distinction between public and private money.

Public money includes physical cash (banknotes and coins), central bank reserves, and CBDCs. It is issued by, and constitutes a direct liability of, a central banking institution[5]. Physical cash is accessible to the public and carries legal tender status within the jurisdiction, making it a widely accepted means of payment. By contrast, central bank reserves exist only in digital form and are accessible exclusively to financial institutions. CBDCs, depending on the specific use case, can be accessible either to the public (including individuals and corporates) or limited to financial institutions. Whether a CBDC carries legal tender status is also a policy choice. Public money is generally characterised by a high degree of stability in value.

Private money, on the other hand, includes commercial bank deposits, electronic money (e-money)[6] and regulated stablecoins, all of which are issued by private sector entities. Although private money can serve as a medium of exchange and encourages innovation in payment products, its stability in value is closely linked to the financial soundness of the issuer and the level of trust in the market. For regulated stablecoins, the effectiveness of the reserve management framework, along with the quality and composition of the underlying reserve assets, also play a significant role.

5. In Hong Kong's case, the HKMA is the direct issuer of currency notes (i.e., HK$10 notes) and coins, and the three note-issuing banks are the issuers of bank notes (i.e., physical notes other than HK$10 notes) (which are a direct liability of commercial banks and technically an indirect liability of the HKMA through the Certificate of Indebtedness).
6. **Electronic money (e-money)** is a stored value or prepaid product in which a record of the funds or value available to the consumer is stored on an electronic device in the consumer's possession. This includes both prepaid cards (sometimes called electronic purses) and prepaid software products which use computer networks such as the internet.

As different forms of money continue to circulate in today's economy, technological advances such as tokenisation[7] and distributed ledger technologies (DLTs)[8] are accelerating the emergence of new forms of digital money[9]. In Hong Kong, a diverse range of market initiatives is underway to harness these opportunities and strengthen Hong Kong's role as a leader in digital finance. Notable developments include ongoing exploration of an e-HKD, the introduction of tokenised deposits and the implementation of the regulatory regime for issuers of fiat-referenced stablecoins (FRS)[10].

In September 2024, recognising the importance of exploring the broader digital money ecosystem, the project was renamed Project e-HKD+. The scope of the project was expanded to delve deeper into innovative use cases for new forms of digital money that can potentially be used by individuals and corporates, including an e-HKD and tokenised deposits.

Following a rigorous open application process, eleven groups of firms from various sectors were selected to participate in Phase 2 of the e-HKD Pilot Programme. This phase focused on evaluating the commercial viability of various use cases and the scalability of extending the e-HKD to real-world retail settings, with pilots structured around three study themes: (i) settlement of tokenised assets, (ii) programmability, and (iii) offline payments.

This report presents the key outcomes and insights gained from Phase 2. It is structured as follows:

Section 2: Programme Structure and Pilot Use Cases. This section introduces the three study themes and explains the structure of Phase 2. It sets out the context and objectives for each theme and provides an overview of the pilots. It also discusses the setup of the e-HKD Sandbox and the e-HKD Industry Forum.

Section 3: Findings and Evaluation. This section presents the HKMA's key takeaways and comprehensive assessment of the pilots. It compares the application of an e-HKD and tokenised deposits across the proposed use cases, examines their commercial viability and discusses the practical benefits and challenges in scaling up the use of an e-HKD.

Section 4: Design Considerations. This section highlights the key design considerations for an e-HKD and sets out possible design choices should it be rolled out to individuals and corporates, with a view to supporting effective implementation and scalable adoption.

Section 5: Path Forward. This section sets out the latest policy stance of the HKMA on extending the use of the e-HKD to retail scenarios and details the findings from Phase 2 which informed this stance.

7. **Tokenisation** refers to the process of converting the ownership rights of traditional assets, such as securities, real estate or commodities, into digital tokens which can be recorded, managed and transferred on programmable platforms like DLTs.
8. **Distributed ledger technologies (DLTs)** refer to a technology architecture where a ledger is replicated across multiple entities, allowing records to be simultaneously accessed, validated and updated. Blockchain, where data is structured in linked blocks and secured with cryptographic techniques, is a prominent DLT.
9. For this report, "new forms of digital money" refers to monetary instruments that are digitally represented and enabled by new technological infrastructures, such as DLTs and programmable platforms, beyond conventional account-based systems. This includes CBDCs, tokenised deposits and stablecoins.
10. **Fiat-reference stablecoins (FRS)** is a type of crypto asset which purports to maintain a stable value with reference to one or more official currencies, such as the HKD.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2. Programme Structure and Pilot Use Cases

2.1 Overview

Phase 2 of the e-HKD Pilot Programme (Phase 2) explored use cases to demonstrate how new forms of digital money, such as an e-HKD and tokenised deposits, can offer capabilities beyond those of traditional money and improve the payment experience for customers.

Eleven groups of firms developed innovative use cases for an e-HKD and tokenised deposits across three main study themes (see Table 1)[11]. Further details of each pilot are provided in the fact sheets and supplementary reports prepared by the pilot participants, which can be accessed through the links in Appendix A.

Table 1: Summary of Pilots by Study Theme and Pilot Consortiums / Groups

Study Theme	Pilot Consortiums / Groups
Settlement of Tokenised Assets	Aptos Labs Boston Consulting Group Hang Seng Bank Limited
	Standard Chartered Bank (HK) Limited BlackRock Asset Management North Asia Ltd. Mastercard Asia/Pacific Pte. Ltd. Libeara (Singapore) Pte. Ltd.
	The Hongkong and Shanghai Banking Corporation Limited
	Visa Inc. Australia and New Zealand Banking Group Limited FIL Investment Management (Hong Kong) Limited China Asset Management (Hong Kong) Limited
Programmability	Bank of China (Hong Kong) Limited Sanfield (Management) Limited[12]
	China Construction Bank (Asia) Corporation Limited
	DBS Bank (Hong Kong) Limited
	Hang Seng Bank Limited
	Mastercard Asia/Pacific Pte. Ltd. KASIKORNBANK Public Company Limited Airstar Bank Limited
Offline Payments	Bank of Communications (Hong Kong) Limited China Mobile Hong Kong Company Limited
	Industrial and Commercial Bank of China (Asia) Limited

11. The activities undertaken in certain pilots may contribute to multiple themes, reflecting the multidisciplinary and interconnected nature of their efforts in the context of the programme.
12. Sanfield (Management) Limited is a wholly-owned subsidiary of Sun Hung Kai Properties.

2.2 Study Themes

2.2.1 Settlement of Tokenised Asset

Tokenisation has recently attracted significant attention across global financial markets. By leveraging both public and private distributed ledger technologies (DLTs), tokenisation enables assets to be represented digitally in a secure and programmable form. The availability of on-chain digital money is crucial for such markets to operate efficiently. Potential mediums such as an e-HKD, tokenised deposits, and stablecoins are among the critical pre-requisites for achieving atomic settlement, where the transfer of assets and payments occurs simultaneously and irrevocably.

Tokenised Assets on Blockchain

Retail-accessible tokenised assets on blockchain, including those on public blockchains, such as money market funds (MMFs), bonds, loans and private credit, are rapidly gaining traction and reshaping the investment landscape. Tokenisation offers investors greater flexibility, including the ability to trade fractional interests of assets and expand beyond traditional asset classes.

More broadly, these digital assets appeal to a tech-savvy generation which values innovation, thereby broadening participation in investment markets. Among various asset classes, tokenised funds have become particularly popular. An industry whitepaper projects that assets under management of tokenised funds could exceed US$600 billion by 2030[13].

The HKMA launched Project Ensemble in March 2024 to support the development of the tokenisation ecosystem in Hong Kong. Among its initiatives is the exploration of using the e-HKD for interbank settlement of tokenised deposits. The project also aims to promote the adoption of tokenised assets, including financial instruments and real-world assets (RWAs)[14]. In 2025, the industry introduced the first tokenised deposit product and the first retail tokenised MMF in Hong Kong.

Emergence and Development of New Forms of Digital Money

Reliable and widely accepted on-chain payment methods are essential for tokenised asset markets to function efficiently. To date, stablecoins have emerged as the dominant medium for settling tokenised assets, especially on public DLTs, given stablecoins' accessibility and compatibility.

However, regulators have highlighted the inherent risks of unregulated stablecoins arising from their private issuance[15]. These risks include potential volatility in value, failure to meet redemption requests, and operational vulnerabilities, all of which could undermine user protection and market integrity.

To address these concerns, international standard-setting bodies, such as the Financial Stability Board, have issued high-level recommendations for regulating and supervising global stablecoins. Meanwhile, national regulators are strengthening oversight frameworks to mitigate risks and reduce regulatory arbitrage. In Hong Kong, the Stablecoins Ordinance (Cap. 656), which came into effect on 1 August 2025, established a licensing regime for fiat-referenced stablecoins (FRS) issuers. This regime adheres to the "same activity, same risks, same regulation" principle and is in line with international regulatory requirements, further enhancing Hong Kong's regulatory framework on digital asset activities to foster financial stability and encourage financial innovation.

Alongside these regulatory efforts, market participants are exploring the use of alternative digital money[16], such as an e-HKD and tokenised deposits, to further foster the growth of the tokenised asset market.

Frictions in the Traditional Settlement Process

Conventional settlement processes are often hampered by fragmented data across siloed systems, extensive manual reconciliation, and reliance on multiple intermediaries.

13. See *Tokenised Funds: The Third Revolution in Asset Management Decoded (October 2024),* co-developed by Invesco, BCG and Aptos Labs.
14. The HKMA has explored bond tokenisation and, following the completion of Project Genesis and Project Evergreen, issued two batches of tokenised green bonds: HK$800 million in February 2023, around HK$6 billion in February 2024.
15. See, for example, *Chapter III. The next-generation monetary and financial system (June 2025),* in the Bank for International Settlements' (BIS) Annual Economic Review.
16. See *e-HKD Pilot Programme Phase 1 Report (October 2023)* for more information comparing different forms of digital money.

These frictions are especially pronounced in fund settlement, which involves numerous stakeholders, diverse asset classes and complex workflows. Common pain points include processing delays, increased operational and settlement risks, and liquidity being locked up during settlement cycles.

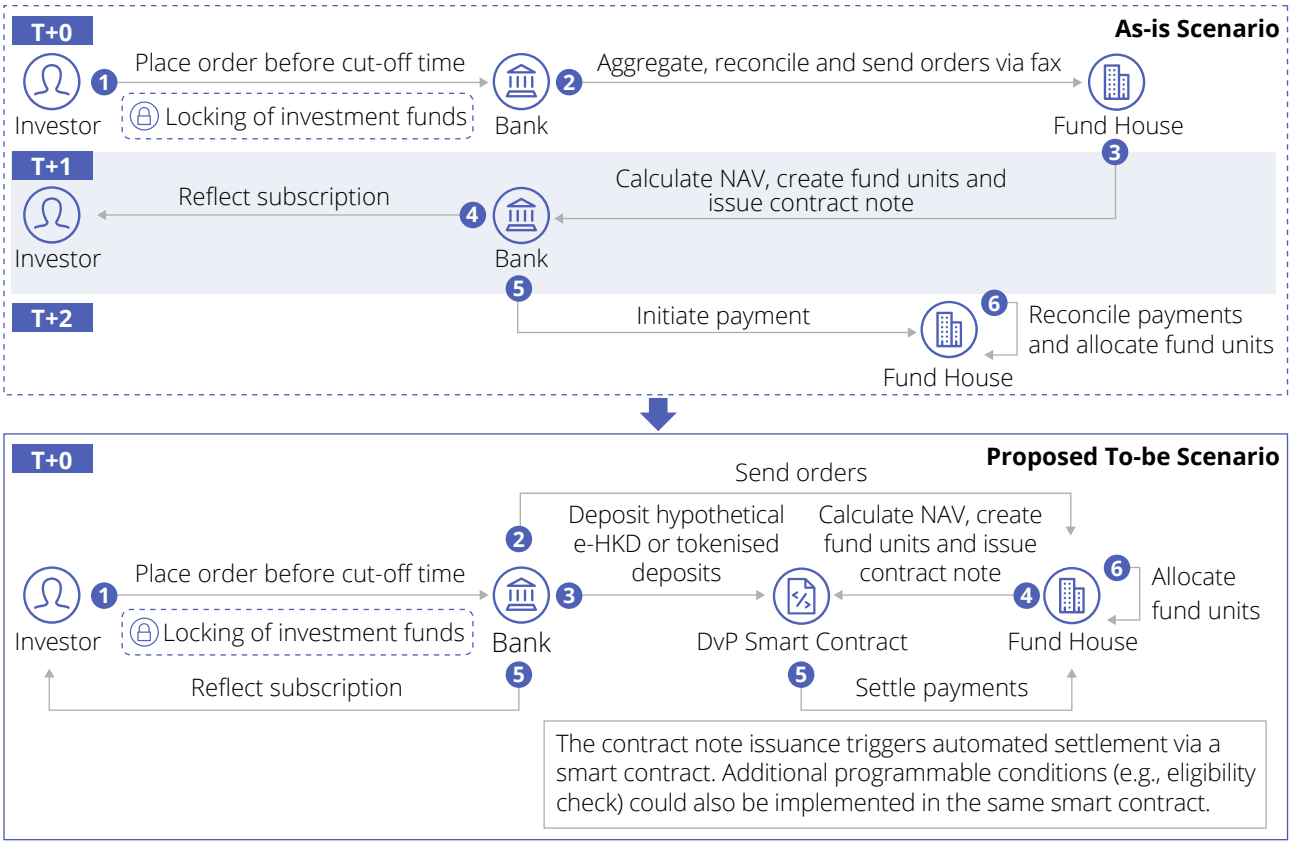
Smart contracts[17] on DLTs allow atomic delivery-versus-payment (DvP) settlement, synchronising asset and payment transfers under predefined conditions, and recording transactions on a shared, tamper-resistant ledger. This approach streamlines settlement, enabling near real-time 24/7 processing. By ensuring obligations are met simultaneously and transparently, it reduces settlement and counterparty risks and strengthens market confidence.

Several pilots have explored how smart contracts can be implemented in practice.

Aptos Labs, BCG and Hang Seng Bank collaborated to test the commercial viability of using a hypothetical e-HKD to settle tokenised fund transactions on a public permissioned DLT with secondary trading capabilities. The pilot also explored the potential for Mainland investors to use a ringfenced e-HKD for approved funds under mutual market access schemes, which would streamline cross-border investment between Hong Kong, Macao and the Mainland.

Separately, **Standard Chartered, BlackRock, Mastercard and Libeara** partnered to study an end-to-end tokenised MMF subscription process using a hypothetical e-HKD. The pilot demonstrated how settlement cycles could potentially be reduced from T+2 to T+0 through atomic settlement, with collaboration across distributors, asset managers and fund tokenisation providers.

Figure 1: Comparison of "As-is" and "To-be" Fund Transactions[18]



17. A **smart contract** is a self-executing computer program that automatically enforces the terms and conditions of an agreement when predefined conditions are met. Smart contracts run on DLT networks, making them transparent, secure and tamper-resistant.

18. The proposed to-be scenario assumes a degree of process re-engineering with the adoption of DLTs, smart contracts and new forms of digital money. This involves enabling the atomic purchase and settlement of underlying fund securities and performing order aggregation on-chain. Consequently, the net asset value (NAV) can be calculated by the end of T+0 and made accessible on-chain for discovery, in addition to the standard NAV publishing channel.

Cross-Border Potential and Implications

Tokenisation also holds strong promise for enhancing cross-border trading and settlement efficiency. As Hong Kong is a leading financial centre, the extension of the e-HKD to retail investors, if implemented, should ideally include accessibility for overseas investors, many of whom would require efficient foreign exchange (FX) channels to convert their domestic currencies into an e-HKD. This would support the issuance of assets denominated in the Hong Kong dollar (HKD) and strengthen Hong Kong's attractiveness as a global investment hub.

Aligned with this vision, **Visa, ANZ, Fidelity International and ChinaAMC (HK)** partnered to explore the practical use of an Australian dollar (AUD)-referenced stablecoin which investors could exchange for a hypothetical e-HKD or HKD tokenised deposits to acquire tokenised funds from asset managers in Hong Kong. This pilot demonstrated the potential of atomic DvP settlement using smart contracts and new forms of digital money to improve settlement efficiency, reduce counterparty risk and facilitate the cross-border distribution of digital assets. It also assessed technical requirements for interoperability[19] across multiple blockchain networks.

Privacy and Compliance Challenges on Public DLTs

Most tokenised asset settlement use cases today are built on public DLTs. However, the inherent transparency of these platforms raises substantial privacy concerns and creates compliance challenges for financial institutions. Addressing these issues is crucial if digital money, such as an e-HKD and tokenised deposits, is to be scaled for tokenised asset settlement on public blockchains.

To address these concerns, **HSBC's** pilot explored the use of privacy-enhancing technologies (PETs), decentralised identity[20], and allowlists/denylists to mitigate risks related to privacy, security and illicit activity. In a separate experiment, HSBC also evaluated the performance and scalability of private and public permissionless DLTs to assess how an e-HKD might support transactions in these environments.

2.2.2 Programmability

Programmability, although not yet uniformly defined, generally refers to the ability to embed rules, conditions or logic directly into digital money or transactional processes. This allows actions to be executed automatically or restrictions to be enforced based on predefined criteria.

Limitations of Today's Financial Systems

Although current financial infrastructures offer some programmable capabilities, such as recurring payments and escrow services[21], the use of these features is usually restricted to large institutions. Legacy systems typically lack the flexibility to support customisable, automated logic at scale. As a result, conditional payments remain costly, slow, and reliant on human oversight, rendering them impractical for most retail scenarios.

Fragmentation across platforms and protocols further limits scalability. With most systems operating in siloed environments, automating complex payment structures involving multiple conditions or ecosystems is difficult. Consequently, conditional payments are mostly confined to simple arrangements with a small number of parties.

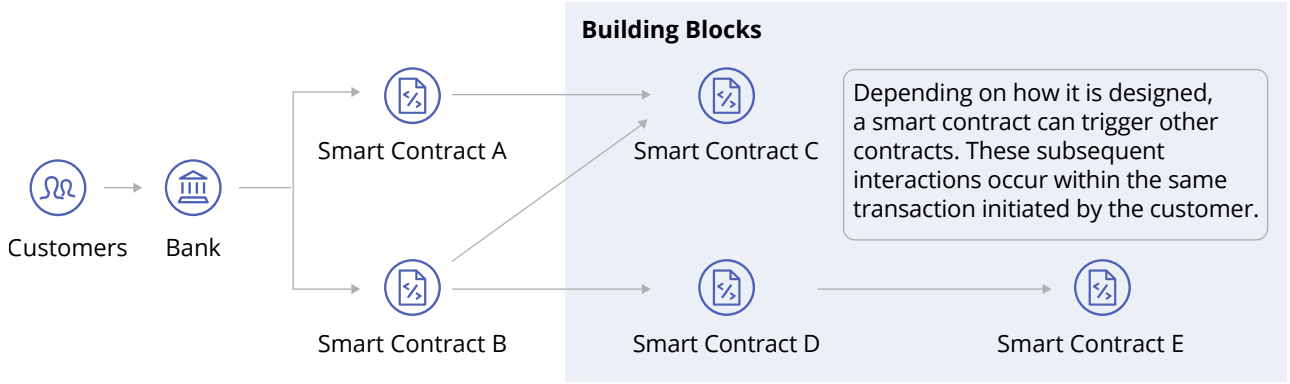
These limitations present appealing opportunities for innovation. By enhancing programmability and interoperability, the financial sector could unlock the broader potential of conditional payments, making them more accessible to individuals and corporates with diverse needs.

Programmability at Scale

Findings from Phase 1 of the e-HKD Pilot Programme (Phase 1) showed that programmability implemented through smart contracts and supported by an e-HKD could address many of these constraints and enable wider adoption of retail conditional transactions.

19. **Interoperability** is the ability of different systems, devices, applications or organisations to work together and exchange information effectively, even if they were developed independently or used different technologies.
20. **Decentralised identity** uses cryptography, digital wallets, and related technologies to enable multiple entities to contribute credentials and empower individuals to manage their data.
21. An **escrow service** is a financial agreement where a trusted agent of parties to a transaction holds assets (such as funds or securities) and only releases them when conditions have been met.

Figure 2: Enabling Programmability at Scale with Modular and Composable Smart Contracts



Smart contracts, due to their composable and modular nature, allow developers to construct reusable components that can interact seamlessly with one another. This "building block" approach accelerates the development of new payment functionalities and business models, supporting more efficient and self-service solutions.

However, Phase 1 also revealed challenges in real-world implementation. Verifying external conditions and coordinating interactions among multiple parties across different systems remains complex. Further exploration of these interoperability and integration issues became a key focus of Phase 2.

Phase 2 also examined the commercial viability of programmable transactions. Since large-scale adoption requires substantial investment, it is vital to understand market demand before funding the investment. The analysis compared the programmability potential of an e-HKD and tokenised deposits, assessing whether an e-HKD could deliver unique advantages at scale.

As highlighted in the Phase 1 report, unlocking the full value of an e-HKD in retail contexts depends on selecting the most effective implementation model. Accordingly, this phase piloted several approaches to programmability, including programmable payments and purpose-bound money (PBM)[22].

Prepayment and Subscription

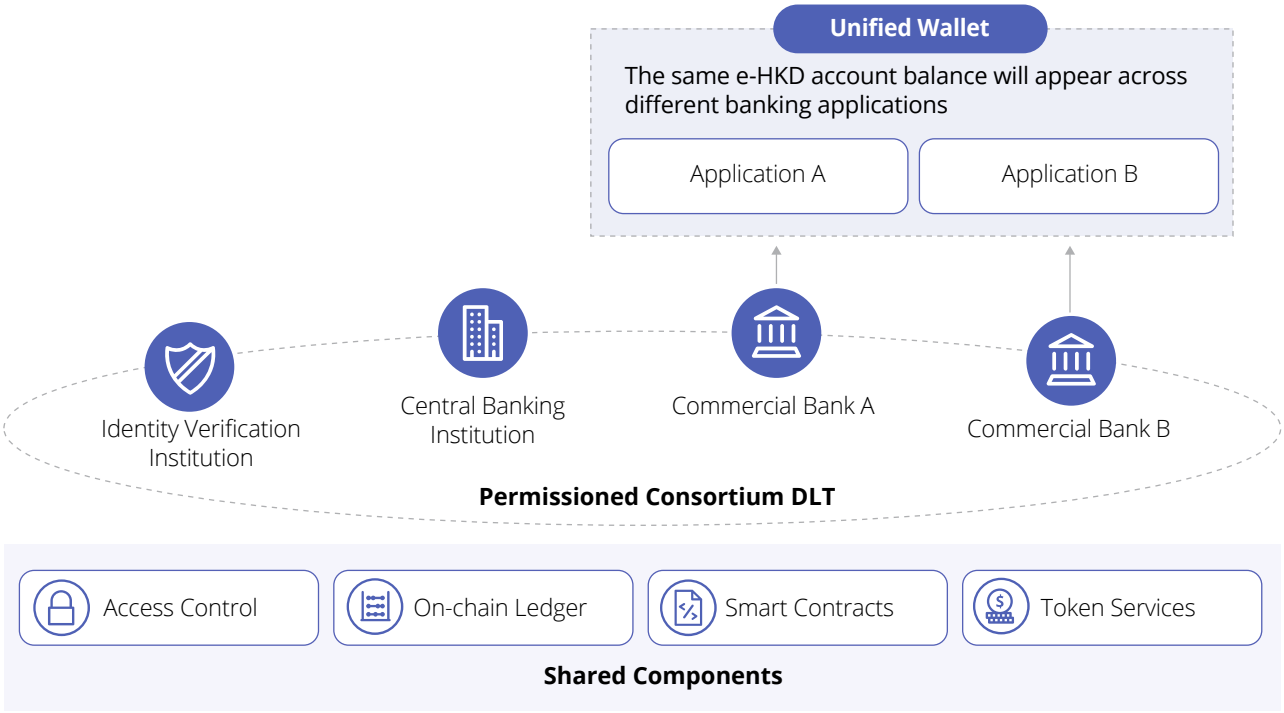
BOCHK and **CCB (Asia)** each built on their Phase 1 work by piloting prepayment and subscription solutions using programmable payments. Prepaid funds were held in the form of a hypothetical e-HKD within an escrow smart contract.

More specifically, **BOCHK** proposed a "unified wallet" concept on a permissioned consortium DLT[23] model to enhance payment security. It integrated Web3-native identity features[24] with bank applications, enabling seamless e-HKD management across multiple wallets. Dual-signature authentication[25] and smart contracts safeguarded prepaid funds. The pilot also examined user experience, data protection, and consortium governance models.

CCB (Asia) focused on testing different DLT infrastructure designs to enable programmability at scale. It compared single-chain and multi-chain approaches, and in partnership with another bank, explored cross-bank programmable transactions in a multi-chain environment, aiming to create a more dynamic retail ecosystem.

22. **Purpose-bound money (PBM)** refers to the use of a "wrapper" to specify conditions while leaving the underlying store of value intact.
23. **Permissioned consortium DLT** is a DLT where the ledger is maintained and operated by a group of pre-selected, trusted organisations (the consortium), and access to the network is restricted.
24. **Web3-native identity** refers to a digital identity system designed for DLT (Web3) environments.
25. **Dual-signature authentication** refers to a security mechanism that requires two separate signatures, often from two distinct parties or entities, to authorise an action, transaction, or access to information. This approach is often used in contexts where additional security and verification are necessary to prevent fraud or unauthorised activity.

Figure 3: Implementing Unified Wallet Based on a Permissioned Consortium DLT Model



Reward and Loyalty Programmes

DBS Hong Kong piloted the use of PBM to issue hypothetical e-HKD vouchers on a rewards platform for green actions undertaken by corporates. These vouchers carried spending conditions that were verified automatically on redemption. Merchants could accept payments instantly at the point-of-sale (POS) and receive daily settlement rather than monthly. The pilot also streamlined off-ramping[26], enabling merchants to receive funds directly into their bank accounts via the Faster Payment System (FPS).

Hang Seng Bank tested a similar approach, using PBM to issue digital vouchers backed by a hypothetical e-HKD on their rewards platform. Distinctively, it adopted a hybrid model that combined the use of private and public permissioned DLT networks. The hypothetical e-HKD was securely managed within the private network, while the public permissioned network facilitated an open marketplace, enabling merchants and customers to redeem or trade vouchers in a secondary market.

Supply Chain Management

In addition to the prepayment solution, **BOCHK** and **Sanfield** piloted programmable payments for construction projects, using a hypothetical e-HKD to strengthen fund control. Payments were directed to designated recipients for predefined purposes, strengthening oversight of allocations. The pilot also examined practical challenges in designing, implementing and adopting smart contracts in construction financing.

Similarly, **Mastercard, KBank** and **Airstar Bank** experimented with programmable payments using a hypothetical e-HKD and tokenised deposits for deep-tier supply chain financing[27]. Smart contracts automated and validated financing terms before funds were released, enhancing efficiency and providing financiers and buyers with greater assurance when extending credit to smaller suppliers further down the chain.

26. **Off-ramping** is the process of converting digital assets such as an e-HKD, tokenised deposits or stablecoins into traditional fiat money (physical cash or conventional bank deposits). Conversely, on-ramping refers to converting traditional fiat money into digital assets.
27. **Deep-tier supply chain financing** enables financial support to reach smaller, upstream suppliers who are not in direct contact with the anchor buyer, but who are vital to the overall supply chain's functioning.

2.2.3 Offline Payments

Digital payments have become increasingly prevalent, driven by rapid technological innovation and the rise of a more technology-savvy generation. In advanced economies such as Hong Kong, digital payments now account for a substantial share of retail transactions.

Although digital payments provide convenience and efficiency compared with physical cash, most of them rely heavily on stable internet connectivity. Disruptions caused by power outages, system failures or natural disasters can halt even basic transactions. Moreover, individuals without access to digital devices or the internet, despite being a minority in Hong Kong, risk being excluded from participating in the financial system, underscoring ongoing challenges in financial inclusion.

Central Bank Digital Currency as "Digital Cash"

To address these concerns, many jurisdictions are designing central bank digital currencies (CBDCs) with offline payment capabilities. Such CBDCs can emulate defining features of physical cash, including offline usability, instant settlement and a degree of anonymity, while offering the added convenience and security of digital payments. In this sense, a CBDC could serve as "digital cash".

By combining the familiarity and reliability of physical cash with the efficiency of modern payment systems, CBDCs with offline functionality could potentially enhance resilience, privacy and inclusivity in payments while also strengthening public trust and confidence in the financial system.

Hong Kong's Unique Payments Landscape

Hong Kong's unique context sets it apart from many other jurisdictions. As noted in the Phase 1 report, Hong Kong benefits from remarkably high internet penetration, strong digital literacy among its population and a record of rare connectivity disruptions. Additionally, Hong Kong is largely free from the impact of natural disasters. The city also has a mature retail payment ecosystem which already includes multiple widely adopted offline-capable instruments, making the overall payment infrastructure highly resilient.

As a result, the immediate need for additional offline payment options might be less pressing in Hong Kong than it is elsewhere. Nevertheless, it remains prudent to continue exploring solutions to ensure preparedness for contingencies. In this regard, the HKMA has been actively participating in Project Polaris, led by the Bank for International Settlements (BIS) Innovation Hub, which focuses on designing secure and resilient offline CBDC systems.

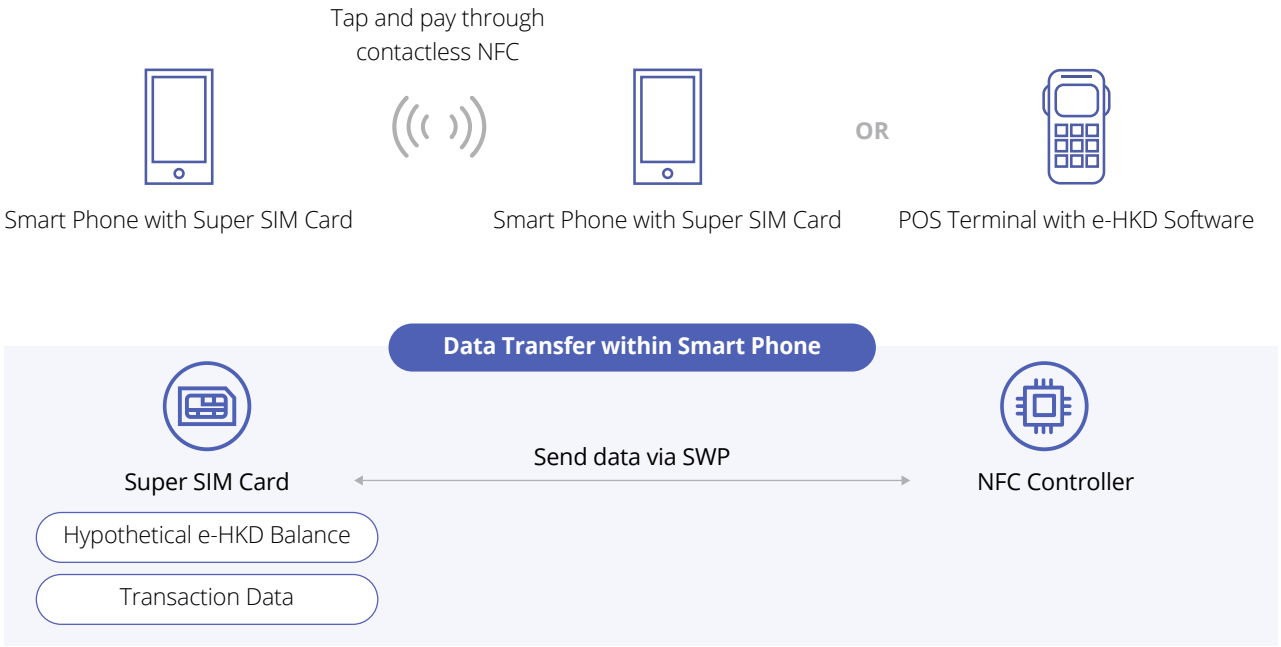
Mediums to Enable Offline Payments

In Phase 1, offline e-HKD payments were tested using hardware devices such as physical smart cards. Payments were conducted via near-field communication (NFC) technology[28] in dual-offline scenarios, where neither the payer nor the payee was connected to the internet.

In Phase 2, in addition to delving deeper into the commercial viability and scalability of retail offline payment applications, "Super SIM" cards were explored as an alternative medium for dual-offline payments. Unlike conventional SIM cards, Super SIM cards support the Single Wire Protocol (SWP)[29] and offer greater memory storage and computing power. This enables mobile phones equipped with Super SIM cards to make secure, contactless payments by tapping against another phone or a POS terminal, even when both devices are offline.

28. **Near-field communication (NFC)** is a short-range wireless communication technology which allows for contactless communication between devices over short distances and is often triggered by holding the NFC readers of two devices closely together.
29. **Single Wire Protocol (SWP)** is a standardised communication protocol that enables secure, high-speed data exchange over a single electrical wire between a mobile phone's SIM card and its NFC controller.

Figure 4: Performing Offline Payments Using a Super SIM Card



BOCOM (HK) and **China Mobile (HK)** partnered to evaluate the technical trade-offs between account-based and unspent transaction output (UTXO) models[30]. They also assessed the associated risks and design requirements necessary to ensure technical and operational soundness.

ICBC (Asia) studied the commercial viability of offline payment solutions by assessing demand in scenarios where internet connectivity is unreliable or unavailable, and by comparing these solutions with existing offline payment methods.

Both pilot groups recognised that cross-bank coordination is a key challenge in implementing offline solutions at scale. Accordingly, they collaborated beyond their individual pilots to study the technical architecture and define standards and protocols to enable seamless transactions across banks in dual-offline scenarios.

30. An **account-based model** tracks balances for each user, similarly to a bank account, whereas an **unspent transaction output (UTXO) model** records and transfers individual units of digital money, much like passing specific coins or notes from one person to another. See *e-HKD: A Technical Perspective (June 2021)* for further comparison of these models.

2.3 e-HKD Sandbox

To foster experimentation, an e-HKD Sandbox was made available to pilot participants to accelerate the prototyping, development and testing of potential e-HKD use cases. The sandbox is a DLT-based platform built on Hyperledger Besu. Leveraging this technical environment, participants could trial e-HKD functionalities in their planned retail use cases.

Notably, although most pilots in Phase 2 adopted DLTs and the e-HKD Sandbox itself is DLT-based, the use of DLT is not a prerequisite for an e-HKD. The sandbox does not necessarily represent the eventual technical architecture of the e-HKD infrastructure.

2.4 e-HKD Industry Forum

In response to market feedback highlighting the need for broader industry coordination, the HKMA established the e-HKD Industry Forum under Project e-HKD+ in December 2024. The industry-led forum is a collaborative platform to foster dialogue among key industry participants and to address shared challenges in scaling up the adoption of new forms of digital money.

Within the forum, a Programmability Working Group comprising nine participating firms (see Table 2) was formed to study and make recommendations on commonly identified issues related to programmability. The detailed findings of their work, including a set of common token standards, will be made available separately by the first half of 2026.

Table 2: Composition of e-HKD Industry Forum's Programmability Working Group

Role	Name of Entity
Co-Lead	Bank of China (Hong Kong) Limited
	DBS Bank (Hong Kong) Limited
	The Hongkong and Shanghai Banking Corporation Limited
Member	Aptos Labs
	Boston Consulting Group
	China Construction Bank (Asia) Corporation Limited
	Forms Syntron Information (HK) Limited
	Hang Seng Bank Limited
	Mastercard Asia/Pacific Pte. Ltd.
Facilitator	Hong Kong Monetary Authority

3. Findings and Evaluation

This section assesses the findings from Phase 2 of the e-HKD Pilot Programme (Phase 2) across commercial, legal and technical dimensions, and the HKMA's evaluation. While Phase 1 of the e-HKD Pilot Programme (Phase 1) focused more on exploring whether an e-HKD could be technically "usable", Phase 2 placed greater emphasis on whether proposed solutions could also prove that an e-HKD is "useful" in terms of commercial viability and scalability in Hong Kong's competitive retail payments environment.

Extending the e-HKD to retail scenarios would introduce an additional payment instrument into an already mature retail market. In wholesale settlement, the e-HKD's lack of credit risk offers clear advantages over privately-issued digital money. The pilots indicated that there is a high level of trust in Hong Kong's stable banking system, which is underpinned by a well-established supervisory regime and robust financial safety nets, such as the Deposit Protection Scheme. The findings showed that this trust tends to lessen retail stakeholders' sensitivity to differences in credit risks in privately-issued digital money.

Moreover, Hong Kong's robust and diversified retail payment landscape is generally well-served by numerous private-sector providers, making the case for an e-HKD contingent on its delivery of clear, substantial and unique advantages that could not be provided by existing payment options.

It is also important to consider whether real-world constraints could limit the incremental value observed in the pilots. Such constraints include ecosystem readiness, user adoption, costs of implementation, and integration with existing infrastructure. Without a viable business model, it would be commercially challenging to encourage the use of, not to mention to scale the adoption of, an e-HKD by the public.

Phase 2 therefore critically evaluated not only technical feasibility but also the commercial viability of use cases and their operational soundness. The assessment also considered how an e-HKD compares with other new forms of digital money which can be used by individuals and corporates, particularly tokenised deposits. Together, these learnings are critical in determining whether, and under what conditions, an e-HKD could deliver meaningful value to Hong Kong's financial system and the wider community.

3.1 Pilot Learnings

The pilots examined in great detail a range of external factors that could influence the effective scaled use of an e-HKD in real-world settings. As a payment instrument, an e-HKD has the potential to enhance efficiency and reduce settlement risks. Realising such benefits will involve aligning enhancements across the broader ecosystem. This section highlights the latest observations from the Phase 2 pilots, which contribute to the HKMA's overall assessment of extending the e-HKD to retail use and offer insightful learnings for other tokenisation projects.

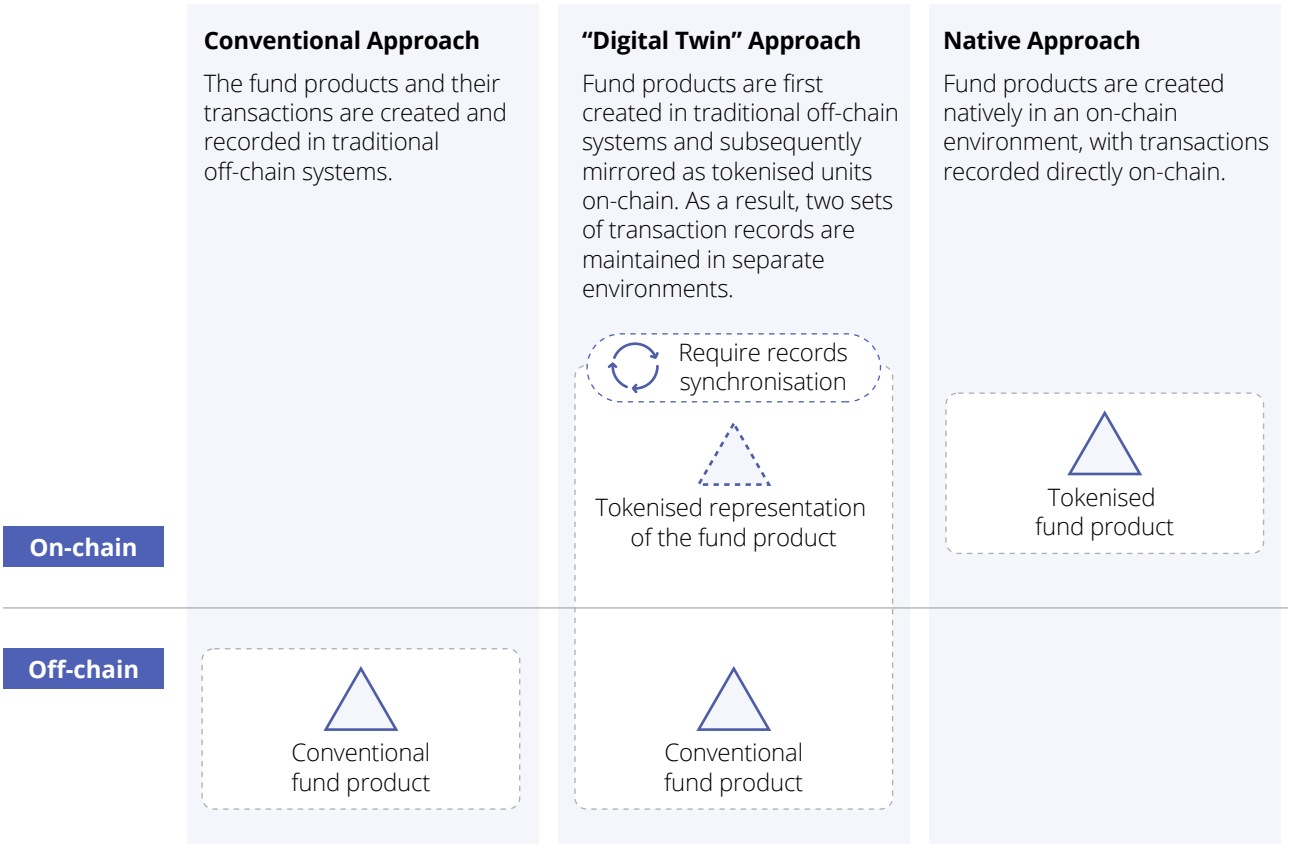
3.1.1 Settlement of Tokenised Assets

Real-time On-chain Access to Net Asset Value

Enhancing liquidity is central to the healthy development of financial markets, with shortening settlement cycles widely regarded as a key enabler. Several advanced economies have already moved to shorten the standard settlement cycle from two business days (T+2) to one business day (T+1). These initiatives are largely independent of whether new forms of digital money are adopted.

Building on these international developments, several pilots explored whether settlement could be accelerated further, from T+1 to same-day (T+0) or near-instant settlement, by leveraging an e-HKD and tokenised deposits. These pilots tested the creation of tokenised representations of traditional deposits and HKD to enable atomic, on-chain settlement, facilitating simultaneous price discovery and value transfer. Such advancements could empower investors to redeem and reinvest funds almost immediately, increasing capital turnover and freeing liquidity otherwise tied up during traditional settlement periods.

Figure 5: Approaches to Issuing Tokenised Fund Products



The findings from these pilots indicate that while the ambition for T+0 or near-instant settlement is encouraging, achieving it involves more than using the tokenised representations of deposits or an e-HKD. Settlement involves multiple processes and stakeholders, and the pilots identified the availability of a near real-time on-chain net asset value (NAV) as a crucial requirement. NAV provides the foundation for price discovery of underlying investments and is indispensable for atomic settlement.

This requirement applies across asset classes, including asset-backed securities. Portfolios and structured products often comprise a diverse basket of assets, denominated in different currencies and traded across multiple global exchanges. Time zone differences currently delay the calculation of NAVs for funds and asset-backed securities, but these challenges are expected to be gradually overcome, driven by the industry's substantial interest in tokenisation. Ensuring timely NAVs will enable the full realisation of the benefits which an e-HKD and tokenised deposits can offer to retail investors, such as instant settlement.

A "Digital Twin" for Tokenisation

The industry's implementation of a "digital twin" approach, where conventional fund products are created first and subsequently mirrored as tokenised units on a blockchain, could serve as an interim solution in the transition to tokenisation.

This model, however, also presents opportunities for enhancement. The requirement to maintain and reconcile both on-chain and off-chain records demands additional resources, which could introduce operational complexity. These observations from the pilots are relevant to other tokenisation projects of the HKMA. Through collaborative industry efforts, reconciliation tasks can be minimised with processes streamlined, facilitating the complete realisation of the intended benefits from tokenisation initiatives.

A Major Revamp of Core Banking Infrastructure is Required

Core banking systems, first introduced in the late 1970s, have been incrementally upgraded over time to accommodate evolving financial product offerings and regulatory requirements. As financial markets continue to advance,

particularly with the emergence of technologies such as tokenisation and distributed ledger technology (DLT), the need to adapt these systems to support new capabilities has become more apparent.

Although the use of disparate trading and settlement platforms across multiple asset classes has created operational silos, it presents a unique opportunity for integration and efficiency improvements. This is particularly relevant in multi-asset transactions, such as those that involve mutual funds, where the current fragmented settlement systems and data sources highlight the potential for streamlined processes through enhanced automation and reduced manual validation.

To fully harness the benefits of emerging technologies, including 24/7 trading and atomic settlement, financial institutions are required to progressively upgrade their core banking system infrastructure and workflows. Legacy and modern systems would likely need to operate in parallel during this transition.

Such transformation will also require substantial investment by the financial institutions. Although the complexity and cost of this undertaking could deter many institutions from committing the necessary investment, the growing maturity of the tokenised asset market and predicted increase in demand from customers are likely to prompt financial institutions to reassess their decisions on whether to commit to these necessary investments.

System transformation would be needed for enabling transactions using an e-HKD and tokenised deposits. However, less system overhaul would be required for banks to implement tokenised deposits, as banks could leverage some of the infrastructure they have established for other deposit products.

To transition to T+0 settlement, a comprehensive effort will be necessary, one that goes beyond simply extending the e-HKD to retail use cases. Success will depend on three enablers: near real-time on-chain access to NAV for atomic settlement, broader adoption of native on-chain tokenisation and a substantial overhaul of core banking infrastructure.

Although the above constraints should be valid for the time being, market participants' increasing interest in tokenisation implies that these challenges will be progressively addressed. Since an e-HKD is not the only viable settlement medium for tokenised assets, a comparative study was conducted under Phase 2 to understand market interest in adopting different forms of digital money. Further details regarding this comparison are available in Section 3.2.

3.1.2 Programmability

Programmability Is Driven by Smart Contracts, Not by The Settlement Medium

The Phase 1 report discussed how an e-HKD can be "programmable" and how a "programmable money"[31] could undermine the public's trust in money. Therefore, under Phase 2, the HKMA has focused on experimenting with programmability by attaching conditions to the money through a "wrapper" or by using smart contract functionality to automate payment execution upon the fulfilment of pre-determined conditions.

Further analysis showed that the choice of settlement medium had only a negligible impact on realising these benefits. The efficiency gains stemmed primarily from the use of smart contracts, not from whether the payment instrument was an e-HKD or tokenised deposits. For example, the pilots showed that the advantages of smart contract-enabled loyalty platforms applied regardless of the settlement medium.

Furthermore, an e-HKD does not provide distinct value in programmability that cannot equally be achieved through other forms of digital money combined with smart contract functionality. In some pilots, Application Programming Interfaces (APIs) were also used to link programmable transactions with the FPS, and this integration could also deliver an experience broadly comparable to an e-HKD with programmable features.

Lack of Commercially Viable Business Model

In addition to examining the potential role of an e-HKD in enabling programmable transactions, Phase 2 pilots assessed the willingness of key stakeholders to adopt an e-HKD in retail programmable transactions and to examine business model feasibility.

31. **Programmable money** involves embedding the predefined conditions into the money itself, meaning that it will retain its predefined conditions regardless of who it is transferred to.

Figure 6: Implementing Smart Contract-enabled Loyalty Platform

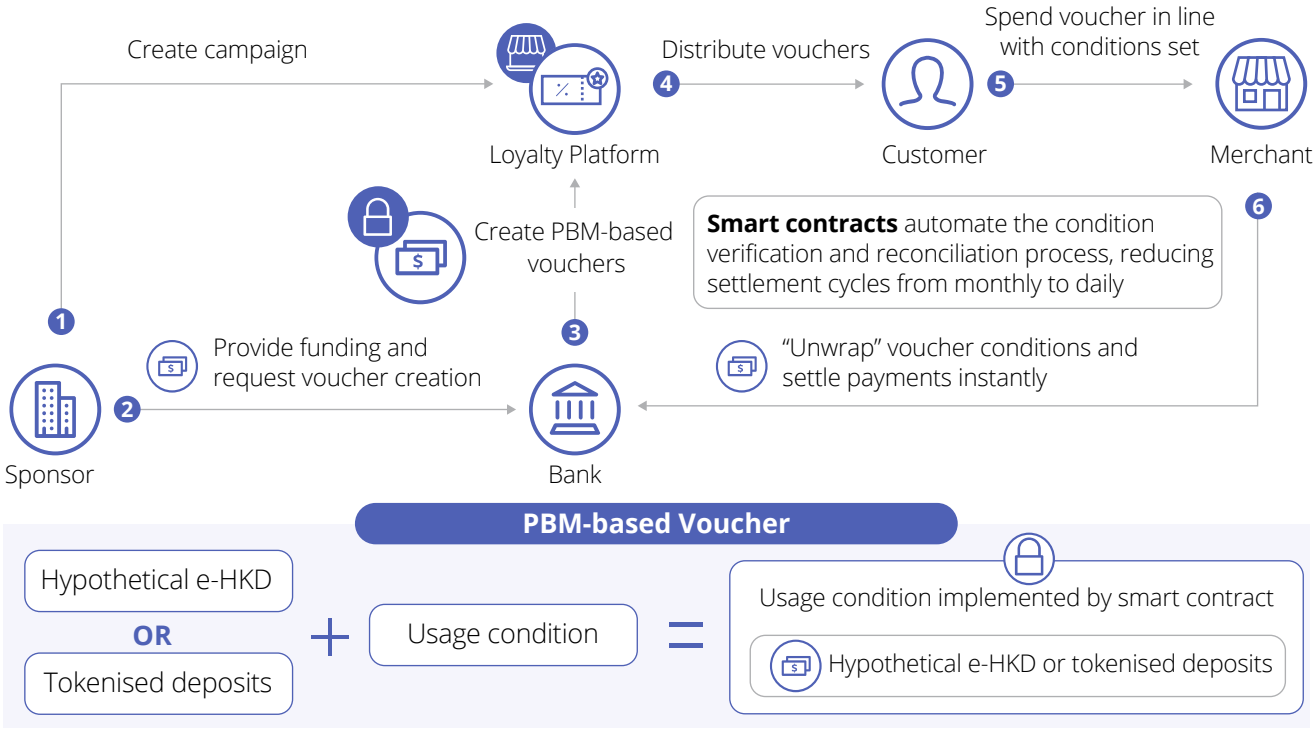
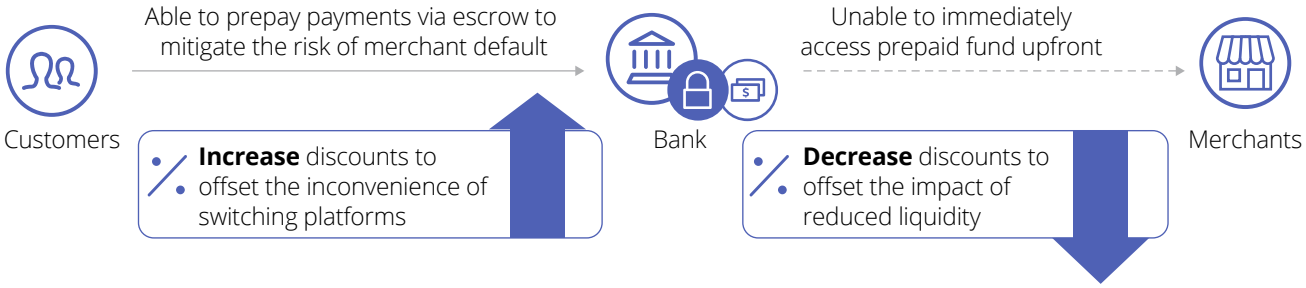


Figure 7: Divergence between Consumer and Merchant Expectations



Phase 1 demonstrated that an e-HKD, if programmed using a conditioned "wrapper", could facilitate phased payments for goods and services under a prepayment scheme using smart contracts. This mechanism ensures that funds are only released if merchants deliver on their obligations, thereby mitigating risks such as bankruptcy or malpractice.

Phase 2 extended this work by examining the commercial model in greater detail. Survey findings revealed notable divergences between consumer and merchant expectations. For consumers, discounts remain the primary incentive of subscribing to prepayment schemes. Almost half of the consumers surveyed prioritised savings over value-added features such as escrow-based protection.

Merchants, particularly small and medium enterprises (SMEs), expressed concerns about liquidity constraints under an escrow model, whereas prepayment schemes currently provide them with immediate working capital. If funds are locked in escrow and unavailable upfront, merchants suggested that the discounts offered to consumers would need to be reduced.

A notable imbalance between the interests of merchants and consumers emerged from this study, which could be useful for other jurisdictions as a reference. The study revealed that consumers anticipate receiving greater monetary incentives to adopt a new system, whereas merchants are inclined to offer fewer incentives. This difference in expectations, if addressed with a mutually beneficial solution, could enhance the commercial viability of scaling programmable prepayment schemes, regardless of the underlying settlement instrument.

A similar gap was observed in loyalty programme use cases. Smart contracts allow merchants to design more complex reward conditions and, in theory, enable open networks where rewards can be accumulated across merchants and redeemed flexibly. The surveys, however, revealed different priorities: consumers favoured greater utility through cross-platform or transferable points, whereas merchants were reluctant to collaborate with other merchants, citing fears of customer loss and competitive erosion. If these differences can be resolved to mutual benefit, stakeholders could unlock the full potential of loyalty programmes in the evolving digital landscape.

Overall, many of the benefits attributed to programmability are not dependent on an e-HKD and can already be achieved using existing payment instruments. The absence of a commercially viable business model remains a major barrier to scaling programmability use cases. Without addressing this structural challenge, programmability is unlikely to deliver its intended value at scale.

3.1.3 Offline Payments

According to a survey by the Bank for International Settlements (BIS), financial inclusion, cash-like features, and resilience are the objectives most cited by central banks for offline central bank digital currency (CBDC) payments[32].

In Hong Kong, the case for an offline e-HKD is less compelling. Hong Kong has near-universal broadband and mobile network coverage, high smartphone penetration and a mature digital payments ecosystem with long-standing offline solutions. These factors reduce the applicability of introducing an offline e-HKD for the purpose of inclusion or resilience.

The pilots examined whether an offline e-HKD would fill gaps not already addressed by private-sector solutions. Under Phase 2, pilots were conducted to assess the potential demand for an offline e-HKD, the commercial viability of such a model and the optimal implementation design of an offline e-HKD for retail transactions.

Limited Improvement to Overall Resilience

For nearly 30 years, Hong Kong's offline payment system has played a vital role in the jurisdiction's retail payment landscape. Initially introduced for public transport payments, the system then gradually expanded to include payment for retail purchases, government tolls, parking, building access and self-service applications. The physical medium that houses the wallet has also evolved from physical cards to include a range of virtual options, such as mobile wallets. Today, this system serves about 98% of the population.

This well-established ecosystem creates a high barrier to entry for new solutions. Pilot survey results support this: nearly half of the respondents saw no unique benefit after experiencing an offline e-HKD, with 48% saying existing offline payment solutions already meet their needs, expressing little interest in switching to an offline e-HKD.

Even if an offline e-HKD were to match current functionality, the surveys indicate it would likely provide only limited incremental resilience, serving primarily as a backup during the rare disruptions of the existing system. Low adoption also raises operational concerns as the effectiveness of the system as a viable alternative during a black-swan event could be compromised if users and operators are not sufficiently familiar with the system.

Significant Investment Requirement

The pilots also explored the scale of investment required to build and operate an offline e-HKD. While the HKMA is envisaged to provide the core infrastructure, wallet operators would have to integrate back-end systems, develop user-friendly applications, and manage the distribution of offline wallets, regardless of the final design adopted for the offline payment solution.

It became evident during the pilots that extensive investment, including from private sector service providers, would be needed to scale a new offline payment solution. The key components will include upgrading point-of-sale (POS) software or devices, conducting manual know-your-customer (KYC) checks for merchants and consumers and deploying the necessary update to the payment gateway.

32. See *Project Polaris Part 4: A high-level design guide for offline payments with CBDC (October 2023).*

Ensuring public readiness would also require education campaigns and periodic drills so users remain familiar with the system, particularly for rare emergency scenarios. Importantly, these costs would be additional to the e-HKD infrastructure already in place. Careful cost-benefit evaluation will therefore be essential before committing to further investment.

Absence of A Viable Charging Model

Developing an offline e-HKD for individuals and corporates requires substantial investment, yet the survey found that most retail users expect it to be free of charge for both online and offline transactions, given the numerous convenient payment options available in Hong Kong.

To encourage adoption, monetary incentives might be necessary to persuade users to switch from existing offline payment solutions. This makes cost recovery from retail users challenging for intermediaries which facilitate offline e-HKD payment. An alternative cost-recovering strategy would be to levy service fees on merchants for the settlement and crediting of an e-HKD into their accounts, similar to the merchant fee that is applied by existing offline payment providers.

The success of this cost recovery model is contingent upon merchants' willingness to pay. The survey found that 68% of merchants would expect a fee structure that aligns with their current merchant fee. This makes cost recovery difficult and raises concerns about the long-term sustainability of an offline e-HKD. It will be essential to have a comprehensive assessment of financial implications, alongside the development of a business model which balances investment costs with the expectations of both users and merchants.

Technical Findings of An Offline e-HKD

The exchange of data is fundamental to payment processing, but this process becomes much more complicated in offline environments. To enable offline transactions, data must be stored locally on a device before the transaction can be executed. This highlights the importance of sufficient memory capacity, as it directly influences the number of transactions a device can process offline, impacting system efficiency and user experience.

Phase 2 pilots tested two distinct approaches for representing balances in offline payment systems: the account-based model and the unspent transaction output (UTXO) model (see Box B). These models differ in their data storage and synchronisation requirements, with implications for their suitability in offline retail payment systems.

The pilots showed that the account-based model requires recording only essential transaction details, including the payer, payee, transaction amount, transaction identifier and digital signature. This streamlined approach results in lower data storage demands, making it well-suited for devices with limited memory capacity.

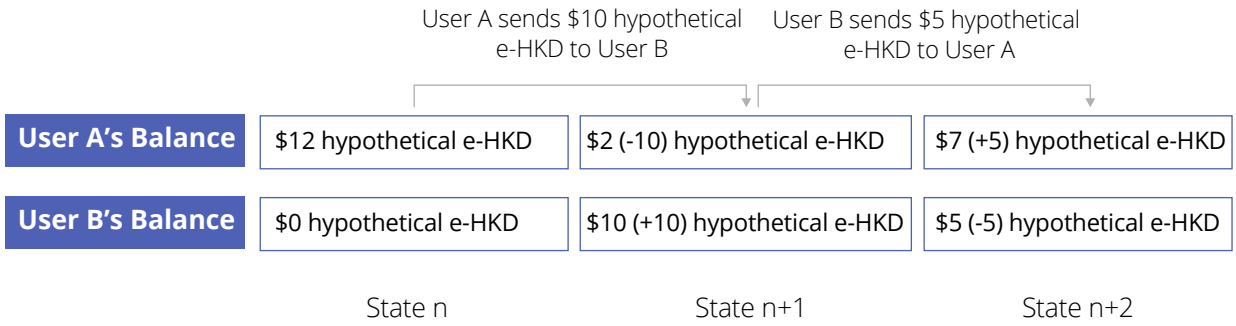
In contrast, the UTXO model entails higher data storage requirements due to its need to record the entire transaction history to ensure traceability and validate unspent outputs. Additionally, the model's "splitting" mechanism, where balances are divided into smaller units with each transaction, leads to increased data fragmentation. This results in larger and less predictable data sizes, particularly as users' balances become fragmented over multiple transactions. Synchronisation in the UTXO model is also more resource-intensive, as it requires transmitting the full transaction history to identify unspent units, leading to longer synchronisation times and a heavier reliance on broadband signals.

The account-based model will therefore be more suitable for implementing an offline e-HKD, were one to be introduced. The efficiency of this model's local data storage and synchronisation time is particularly important in Hong Kong's retail environment, where low-cost terminals and embedded devices are commonly used. The valuable knowledge gained from experimenting with offline payments using an e-HKD will also serve as a useful reference for other jurisdictions with similar contexts to Hong Kong as they explore their own path to the use of CBDC in offline transactions.

Box B: Account-based Model and Unspent Transaction Output Model

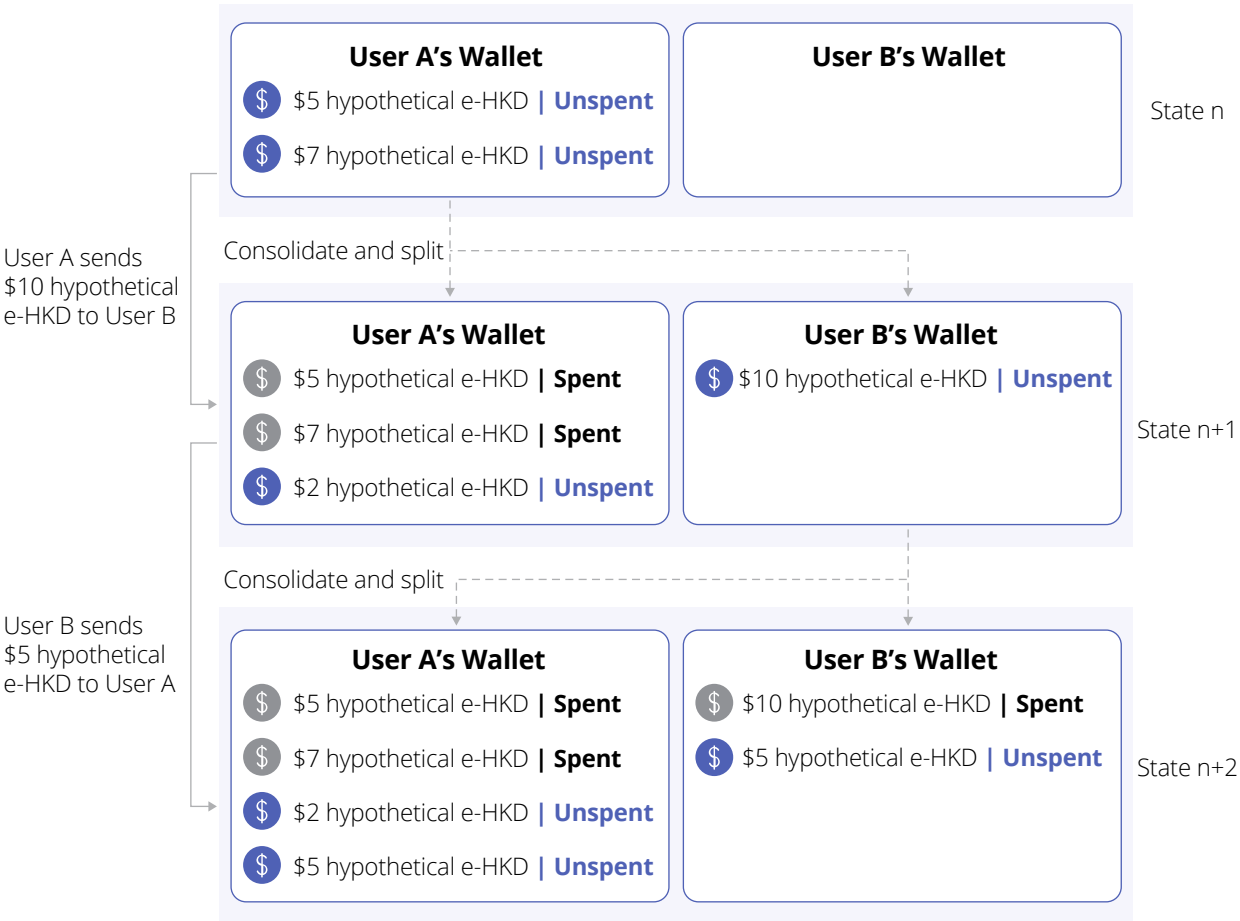
The **account-based model** is like a traditional bank ledger, where each user maintains a running balance. When a transaction is executed, the movement of funds is recorded from one account to another sequentially, with each transaction labelled and digitally signed to prevent double spending.

Account-based Model



In contrast, the **UTXO model** resembles cash-based transactions, with a user's balance consisting of individual units of value, akin to digital versions of banknotes and coins. To make a payment, these units of value must be consolidated. If a unit exceeds the payment amount, the excess is "spilt" and returned to the user as a new unit, much like receiving change in a cash transaction.

Unspent Transaction Output Model



3.2 e-HKD and Tokenised Deposits in Retail Usage

When assessing the potential role of an e-HKD in retail use cases, it is important not to consider this in isolation. An e-HKD, which might leverage DLT to settle tokenised transactions, would exist alongside other forms of privately-issued digital money, such as tokenised deposits, which could serve similar purposes.

The pilots conducted detailed interviews and surveys with various key stakeholders, including merchants, consumers, asset managers and financial institutions. The objective was to assess the relative merits of a tokenised money compared with conventional forms, and to evaluate whether an e-HKD offers any distinct advantages across different retail use cases.

3.2.1 Retail End Users

For retail end users, including merchants, consumers and individual investors, the difference between an e-HKD and tokenised deposits is not immediately clear, particularly in the context of routine payment transactions. The pilots highlighted several reasons for this.

First, the user interface with retail consumers, businesses and investors remains largely uniform across both conventional money and new forms of tokenised money. Retail users continue to rely on banks as intermediaries for handling deposits and transactions, with banks responsible for converting these deposits into an e-HKD or tokenised deposits and tasked with their subsequent custody. As a result, the underlying form of digital money has minimal impact on the day-to-day retail user experience.

Second, Hong Kong citizens and corporates tend to have strong trust in commercial banks. This trust is underpinned by the robust regulatory framework and financial safety net, including the Deposit Protection Scheme. Importantly, this confidence extends beyond low-value transactions. For instance, a survey on tokenised fund purchases, which typically involve larger sums than daily transactions, showed that retail investors did not place substantial weight on the credit risk differences between an e-HKD and tokenised deposits when choosing a settlement medium.

Overall, the retail experience with an e-HKD and tokenised deposits is broadly similar. However, privacy concerns were raised in several pilots. In one survey on tokenised asset settlement, around 35% of respondents indicated they would be less likely to use an e-HKD for routine payments, citing concerns about the central bank's potential access to personal and transactional data. Addressing such privacy concerns was a key motivation for Project Aurum 2.0, an HKMA and BIS Innovation Hub project.

3.2.2 Asset Managers

Asset managers' key concern is the legal status of digital money, given the large volumes of investor funds they process each day. Their priority is ensuring that the digital money they receive, whether an e-HKD or tokenised deposits, is legally recognised and regulatory compliant.

Settlement finality is another important consideration for asset managers. This depends both on legal recognition and on the technical capability to ensure irrevocable transfers of assets and money. In Hong Kong, clearing and settlement systems are designated under the Payment Systems and Stored Value Facilities Ordinance (PSSVFO) (Cap. 584) and are issued with a certificate of finality under that Ordinance. The law provides statutory backing to the finality of settlement of transactions made through such systems by protecting settlement finality from insolvency and bankruptcy laws.

For tokenised deposits, which are maintained within commercial banks' infrastructures not designated under the PSSVFO, asset managers have also noted that when settlement allows reliable, seamless conversion between tokenised deposits and central bank money, the time it takes to settle transactions is similar, regardless of whether an e-HKD or tokenised deposits are being used. As a result, they have shown no strong preference for an e-HKD or tokenised deposits in their pilots.

3.2.3 Commercial Banks

Cost of Capital

For banks, the potential higher cost of capital associated with an e-HKD as compared to tokenised deposits is a key consideration. The issuance of an e-HKD, modelled after the issuance of legal tender, must be fully backed by United States dollar (USD) assets held in the Exchange Fund, in accordance with the Currency Board principles under the Linked Exchange Rate System (LERS). On the contrary, under the fractional banking system, much less capital is required to be put aside to support the issuance of tokenised deposits. As a result, banks, which operate under the fractional banking system, have additional liquidity that can be used to support lending activities, thereby fostering economic development in the modern economy.

Customer Loyalty

Additionally, commercial banks typically favour tokenised deposits for their ability to enable stronger customer stickiness. In contrast, the role of commercial banks in the design of an e-HKD would be more restricted, as an e-HKD would be issued by the central banking institution. Nevertheless, the integration of the banks' infrastructure with that of an e-HKD would require substantial work. Work to enable tokenised deposits to function within banks' product ecosystem should be more straightforward because banks would have more flexibility to drive the ultimate design.

Furthermore, there is a noteworthy emerging trend of incorporating regulatory controls into tokenised transactions. One of the Phase 2 pilots tested the implementation of a whitelisting mechanism[33], where smart contracts were used to permit access to specific investment products, a process previously carried out manually by intermediaries.

In this context, Phase 2 involved multiple tests, which revealed that integrating regulatory conditions into the design of digital money is the most efficient implementation method. Banks, as the issuers of tokenised deposits, have full authority to create such functions when issuing tokenised deposits and can prioritise this development. In comparison, an e-HKD, which would be issued by the HKMA, requires that any changes be routed through the issuer. This additional layer can slow down implementation and limit the ability to respond quickly to market demands, making it less preferred by commercial banks.

Potential Deposit Outflow

Moreover, the extension of the e-HKD to retail use might raise concerns about potential deposit outflows. Depositors could choose to reallocate a portion of their bank deposits into an e-HKD, reducing banks' liquidity and limiting their capacity to extend credit. Although Hong Kong's banking system has been robust, with no bank run in recent history, even during the Global Financial Crisis, the extension of the e-HKD could still theoretically increase such a risk during times of financial stress.

To mitigate these risks, banks might need to rely more heavily on alternative funding sources such as interbank loans, which are usually costlier than retail deposits. This could compress banks' net interest margins and increase their funding costs. Accordingly, design features such as holding limits on the e-HKD balances could reduce the risk of large-scale deposit migration and preserve monetary stability.

The international central banking community has also emphasised the importance of designing CBDCs as non-interest-bearing instruments. This prevents CBDCs from competing directly with commercial bank deposits as a store of value, thereby reducing the risk of deposit substitution and potential bank runs. Such a design choice would reinforce an e-HKD's role in retail scenarios as a means of payment rather than a savings instrument.

33. A **whitelisting mechanism** is a KYC process which determines a list of customers who are eligible to access certain structured products. It is an investor protection requirement for financial institutions.


Beauty Saun Salon

4. Design Considerations

In addition to validating the distinct values an e-HKD can bring and the commercial viability of its use cases in various retail scenarios, the pilots identified several design considerations of an e-HKD which are vital for its widespread adoption. Given the characteristics of Hong Kong's payment landscape and retail payment needs, several key considerations have emerged as particularly crucial, including interoperability, programmability, privacy, identity, convertibility with conventional money, and reliability and performance. This section provides a detailed examination of the rationale behind these considerations and explores potential design options to address them.

Interoperability

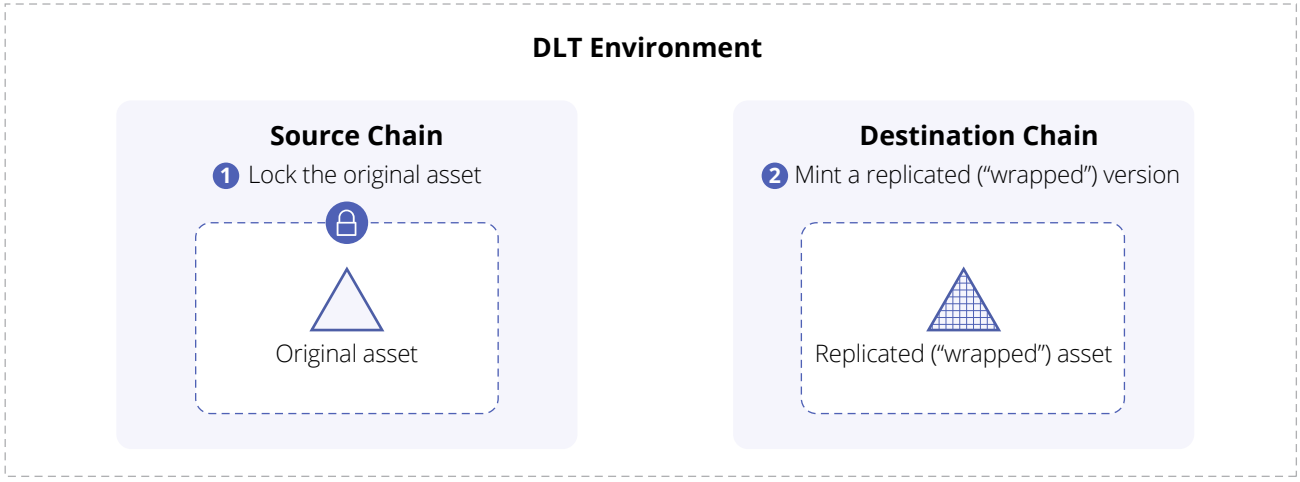
The financial landscape is undergoing rapid transformation, shaped by advances in Web3, decentralised finance (DeFi)[34], and the growing availability of tokenised products for retail distribution. As tokenised assets gain traction and more such assets are issued by different institutions, settlement will increasingly occur across heterogeneous distributed ledger technology (DLT) networks.

Interoperability is therefore a critical requirement for an e-HKD, particularly if an e-HKD is used as a settlement instrument for tokenised assets. To operate effectively across multiple blockchain networks and DeFi ecosystems, an e-HKD would need an interoperable design which addresses the key challenge that is impacting the growing Web3 economy.

There are some bridging mechanisms to facilitate cross-chain transactions. For example, the "lock-and-mint" mechanism tested in several pilots enables the transfer of assets across blockchains by locking the original asset on the source chain and minting a replicated (or "wrapped") version on the destination chain. The locked asset remains untouched, guaranteeing its integrity and security during the transfer.

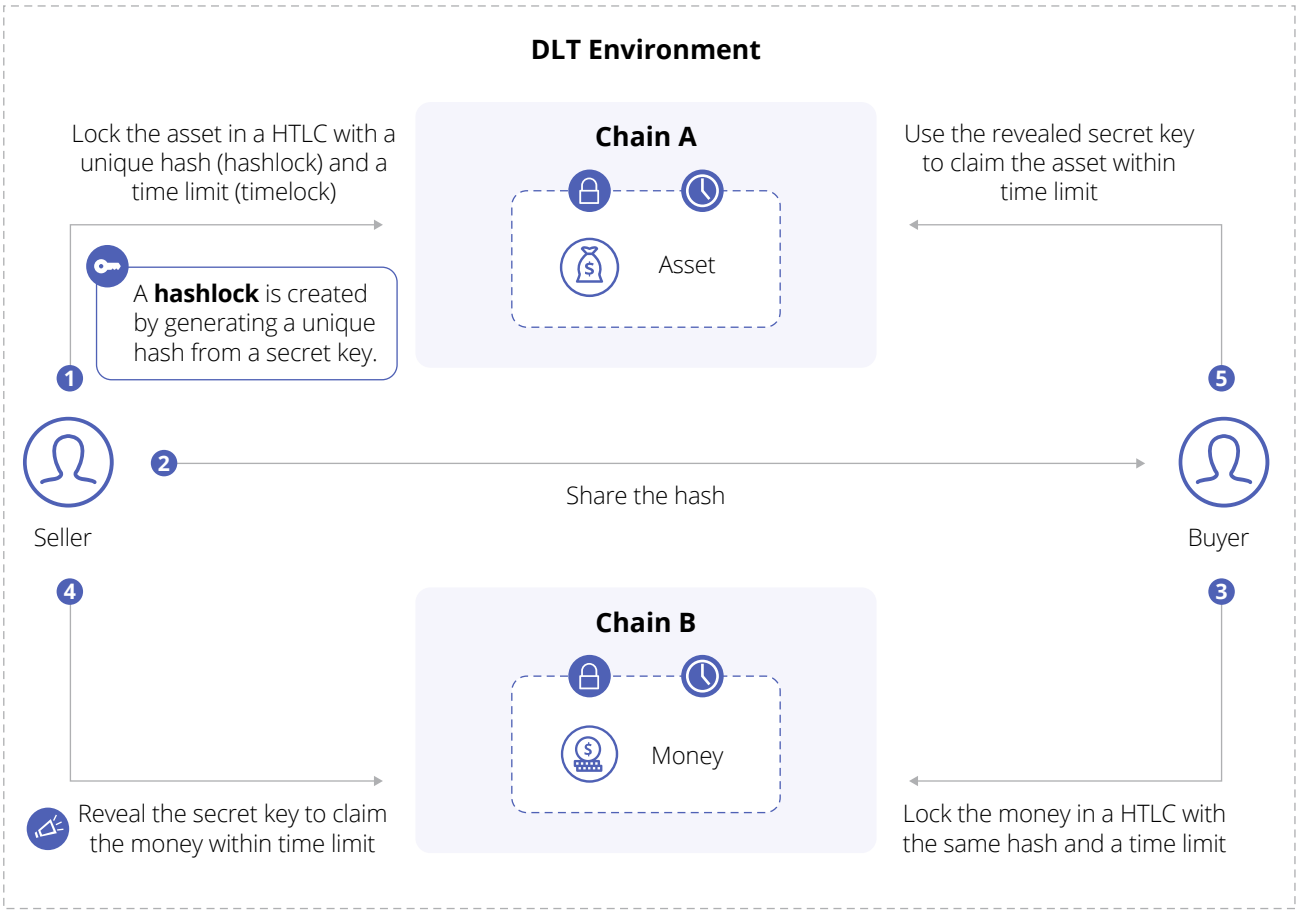
The Hashed TimeLock Contract (HTLC) was another mechanism explored. HTLCs use a hashlock function to escrow tokens until a proof is provided, and a timelock function to revert tokens to the sender if the proof is not delivered within a set time. This conditionality ensures that cross-chain transfers are atomic, secure, time-bound and free of counterparty risk.

Figure 8: Lock-and-mint Mechanism



34. **Decentralised finance (DeFi)** is a system of financial services which uses blockchain technology and smart contracts to enable open, peer-to-peer financial transactions without traditional banks or intermediaries.

Figure 9: Hashed TimeLock Contract Mechanism



The pilots demonstrated the feasibility of these mechanisms, showing that interoperability can enhance the security and integrity of asset transfers while positioning an e-HKD as a versatile settlement instrument within the expanding tokenised asset and DeFi landscape.

Programmability

To ensure its scaled adoption, an e-HKD should be designed to accommodate the growing demand for programmability through smart contracts. The pilots confirmed strong market interest in programmable use cases, but also revealed some important policy considerations.

A key finding is that a natively "programmable e-HKD" with explicit spending conditions, like the concept of "programmable money" presented in the e-HKD Pilot Programme Phase 1 Report, could render an e-HKD more akin to a voucher, rather than money. This might undermine fungibility and the "singleness of money"[35], diminishing the overall effectiveness of an e-HKD as a settlement medium. There are also policy implications around whether such an e-HKD could be considered as a legal tender, which could undermine public trust in central bank money.

To mitigate this risk, some pilots examined purpose-bound money (PBM) and programmable payments as alternatives which preserve fungibility of the underlying value. The concept of programmable payments and their potential was thoroughly examined in the Phase 1 report.

35. **Singleness of money** refers to the principle that money should be universally interchangeable and accepted at face value across an economy, regardless of its form or the platform on which it is held.

The pilots also explored two architectural approaches for enabling programmability. The first involves establishing a centralised platform managed by a neutral party such as a public sector entity. The centralised platform serves as a common utility which hosts all the smart contracts related to an e-HKD. This approach offers standardisation but raises governance challenges, including those related to the responsible entity which reviews and approves smart contracts before they are accessible by the public.

A decentralised approach leverages private-sector platforms, where commercial participants develop customised solutions. In this model, the central banking institution would primarily focus on designing the related functionalities of an e-HKD and providing APIs for external systems to interact with an e-HKD, with private actors innovating at the application layer.

A centralised model might ensure consistency, but certain critical tasks, such as reviewing smart contracts, require robust governance and specialised expertise which can fall beyond the purview of central banks. Determining the right party to conduct these reviews is essential to guarantee compliance, security and consumer protection. This warrants more research to determine the most suitable model before applying programmability to the use of an e-HKD in transactions.

Privacy

Privacy is a key built-in feature that facilitates user adoption of an e-HKD in retail payments. As highlighted in the previous section, pilot surveys indicated that a well-designed privacy framework is essential for influencing users to adopt an e-HKD. Participants expect privacy features that safeguard their personal information and transaction details.

Importantly, privacy risks are not limited to permissionless blockchains. Instead, these concerns also exist in permissioned networks, such as consortium chains, underscoring the need for robust privacy solutions regardless of the final design of the e-HKD architecture.

To address these privacy risks, privacy-enhancing technologies (PETs), including Zero Knowledge Proof (ZKP)[36] implemented in Zeto and Anonymous Zether (see Box C) were tested alongside an allowlist and denylist on four permissionless blockchains under the pilots. It was found that ZKPs improved privacy with similar settlement times but significantly increased gas fees[37], making them up to 320 times more expensive than transactions which do not use any PETs, due to their computational intensity. For context, the gas fee of a typical transfer of an ERC-20 token consumes costs roughly US$0.13[38].

This creates a fundamental trade-off: enhanced privacy often leads to higher costs and increased complexity. If transaction costs become too high, an e-HKD would become impractical for small, everyday purchases. Conversely, inadequate privacy protections could erode user trust and hinder adoption. Striking a careful balance between these two imperatives will be vital to ensuring an e-HKD is both trusted and widely used.

A balanced approach will therefore be essential. Privacy should be embedded from the outset, potentially through a tiered model: basic privacy for low-value, low-risk transactions, and advanced PETs such as ZKPs reserved for high-value or high-risk transactions. This ensures efficiency for everyday payments while maintaining strong protections where they are needed most.

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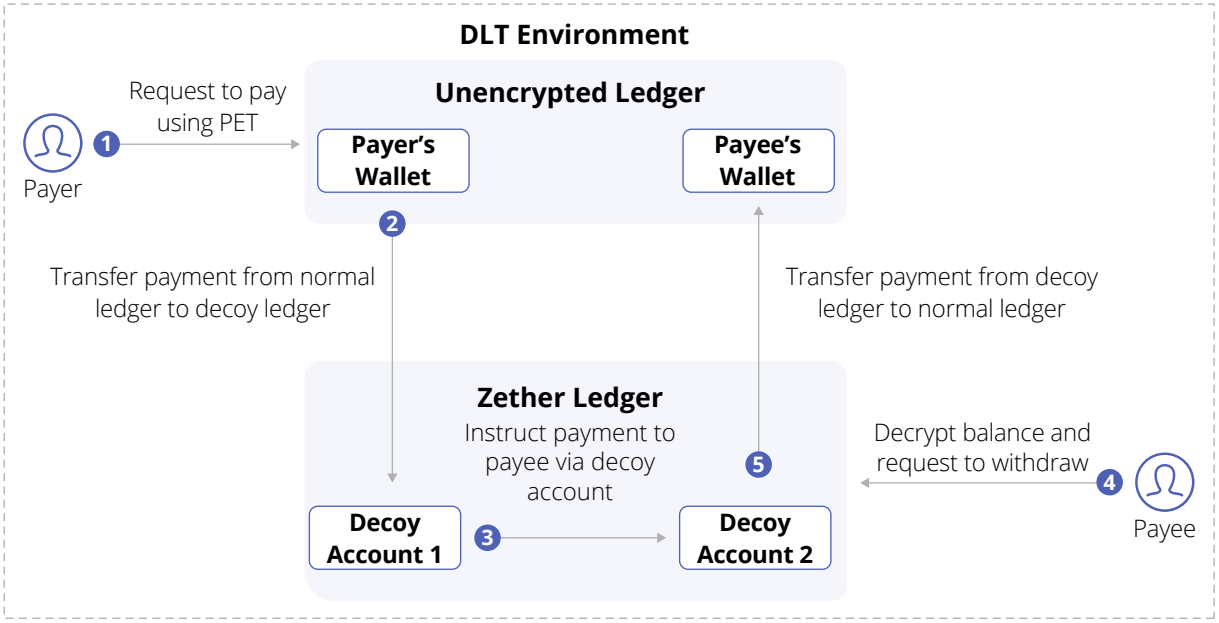
36. **Zero Knowledge Proof (ZKP)** is a cryptographic method that allows one party (the "prover") to demonstrate to another party (the "verifier") that a statement is true, without revealing any information beyond the fact that the statement is indeed true.
37. **Gas fee** is a commonly used term for the cost which certain blockchain protocol users pay to network validators each time they wish to perform a function on the blockchain.
38. Based on the latest average gas fee on 28 October 2025. The estimation of the gas fee was determined based on the following assumption and formula: *Gas fee = Units of Gas Used * (Base Fee + Priority Fee) * 10^{-9} * ETH price*. A specific example is provided where the gas fee was calculated using 45,000 units of gas, with the base fee and priority fee set at 0.675, and an ETH price of US$4,140.5.

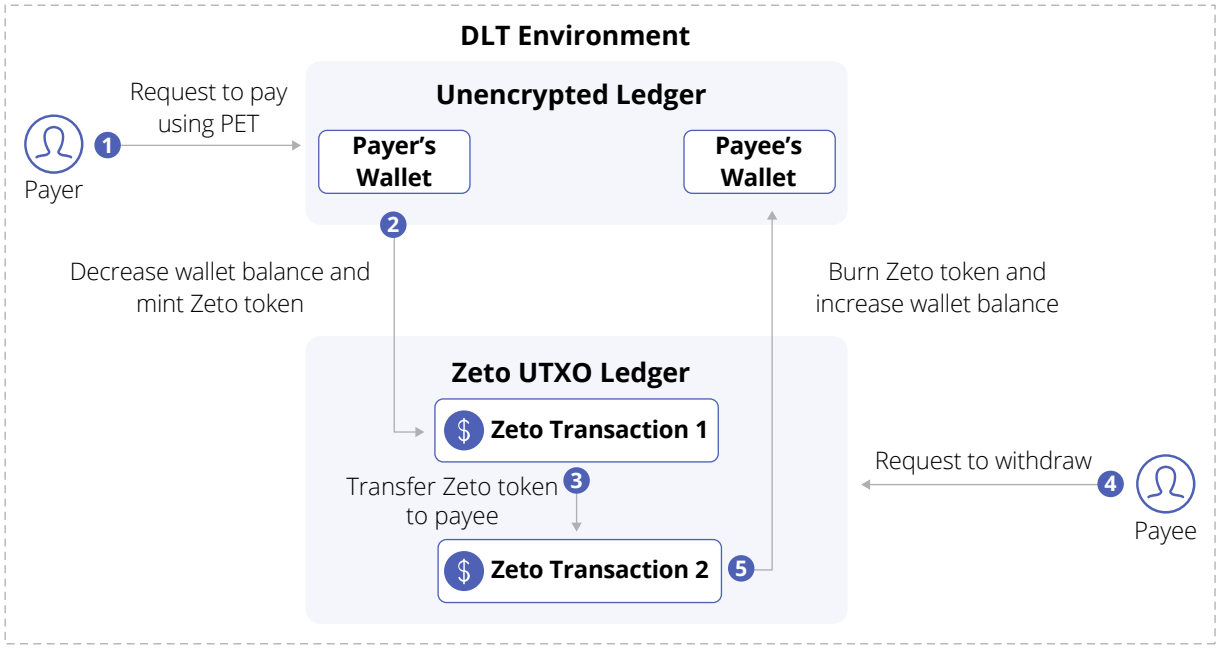
Box C: Privacy Enhancing Technologies

Two types of PETs were explored in the pilots: **Zeto** and **Anonymous Zether**. Both are open-source solutions designed for Ethereum-compatible DLTs.

Anonymous Zether protects transactor privacy by fully anonymising the sender and receiver using decoy accounts that obfuscate the payer's and payee's wallet addresses. It also employs encryption and ZKP to conceal the transaction amount and ensure transaction validity.



Zeto enhances privacy by hashing the token's value, public key and salt into a commitment, then uses ZKPs to validate transactions without exposing amounts or identities. By using an unspent transaction output (UTXO) model and nullifiers, Zeto ensures that when a token is spent or created, ownership is not revealed directly on-chain, and on-chain data remains confidential. Section 3: Evaluation has further details on the UTXO model.



Identity

The secure and trusted use of an e-HKD relies on permissioned and secured access with strong safeguards. To achieve this, there must be clear rules for compliant use of an e-HKD and rigorous security measures must be maintained at every operational stage. In practice, most transactions using an e-HKD should require verifiable credentials (VCs)[39]. Additionally, all e-HKD transactions should carry digital signatures to ensure authenticity and security.

Without a shared identity framework, each wallet provider would need to create its own system. These systems would inevitably adopt different technologies, data standards, or security protocols, leading to a fragmented e-HKD ecosystem made up of isolated networks, similar to the current state of the payment market.

To mitigate possible fragmentation, the pilots tested a digital identity framework within a consortium blockchain. The framework enables individuals to securely manage their digital identities, while enabling verifiers to authenticate credentials independently without contacting the original issuer. In the pilots, a trusted authority was assumed to centrally issue these credentials, assigning a unique identifier (UID) and a VC to each wallet holder. Before executing a signed transaction, the VC of each wallet holder will be verified cryptographically to ensure the identity integrity of transacting parties.

Establishing a common credential standard for the industry is also essential. This enables the effective implementation of the digital identity approach, which is supported by consent-based authorisation protocols, thereby guaranteeing secure, seamless and interoperable identity verification regardless of the wallet used.

Convertibility with Conventional Money

Several pilots also explored the potential of an e-HKD to serve as the settlement instrument which connects the traditional finance ecosystem with innovative applications, including the Web3 economy and programmable transactions. To achieve full integration into the economy, which encompasses both existing and emerging ecosystems and applications, it is crucial that different forms of money can be used interchangeably and seamlessly.

Near-instant conversion at a low cost between an e-HKD and traditional forms of money, such as commercial bank deposits and physical cash, is also crucial, particularly in the initial stages when an e-HKD might not yet be universally accepted. By ensuring easy interchangeability, an e-HKD can integrate smoothly into Hong Kong's broader financial system, encouraging adoption while minimising disruption.

Reliability and Performance

The increasing deployment of tokenised assets on public DLTs naturally prompts an investigation into the feasibility of issuing an e-HKD on public DLTs. The pilot outcomes highlight several key considerations which must be addressed before an e-HKD can be considered suitable for deployment on public DLTs.

The performance of public DLTs in handling high-volume retail transactions is a major issue. Not all public DLTs are designed to handle high frequency transactions. For instance, Ethereum, a Layer 1 network, can only process about 15-30 transactions per second. However, the pilots have shown that certain public DLTs can process high-frequency transactions more efficiently without encountering performance issues.

Gas fees are another challenge. They vary depending on computational demands and market conditions, creating uncertainty in costs and processing times. This unpredictability contrasts with user expectations shaped by existing financial infrastructure, where costs and service levels tend to be transparent and standardised.

Although the HKMA does not completely rule out the use of public DLTs for the e-HKD deployment, the pilots highlighted the need for further optimisation and identified market solutions to address these challenges. Further work with industry stakeholders will be required to explore technical solutions, ensuring that any public DLT-based model can meet expectations of cost, reliability and performance before its adoption is extended to retail use.

39. A **verifiable credential (VC)** refers to a digital representation of information or an identity that is securely issued by a trusted authority and can be verified independently.

5. Path Forward

The e-HKD Pilot Programme has been a collaborative effort between the HKMA and the industry in exploring what the future of money might look like. Both phases of the programme have provided invaluable insights that inform the HKMA's latest policy stance on the scenarios and approaches for extending the use of the e-HKD to retail users.

Following the successful deployment of the e-HKD in wholesale applications, Phase 2 of the e-HKD Pilot Programme focused on evaluating the unique value propositions of an e-HKD in retail scenarios. These pilots offered valuable perspectives on the feasibility of various business models and informed the HKMA about market interest in adopting an e-HKD for everyday retail transactions.

Importantly, each jurisdiction will have unique circumstances and requirements, and hence the decision to issue a central bank digital currency (CBDC) and its design must be guided by a thorough assessment of the local context and payment needs. Project e-HKD+ reflects this principle, as it aims to ensure that any potential extension of the e-HKD to retail use is well-informed and responsive to local needs.

The findings from the pilots demonstrated that an e-HKD can deliver substantial benefits, particularly as a settlement medium for tokenised assets, including real-world assets, investment funds and bonds. However, the pilots also showed that privately-issued digital money, such as tokenised deposits, could in some contexts achieve similar efficiencies.

Furthermore, the pilots indicated that the potential benefits of extending the use of the e-HKD to retail scenarios might not substantially outweigh the operational challenges. A sustainable business model has yet to be identified which would incentivise the private sector to implement an e-HKD in retail scenarios. Given Hong Kong's diversified, advanced, efficient and secure retail payment landscape, it remains uncertain whether an e-HKD in retail use cases would deliver the anticipated incremental benefits observed in the pilots.

Given these findings, the HKMA will prioritise the development of the e-HKD for financial institutions. As a CBDC, the e-HKD is free of credit risk, setting it apart from privately-issued digital money. This risk-free characteristic is particularly crucial for large-value wholesale transactions, where credit risk is more pronounced. It also allows the e-HKD to serve as a monetary anchor which secures the "singleness of money". This is vital for the wide adoption of other privately-issued digital money.

Although the motivations cited by jurisdictions that have issued or intend to issue a general-purpose CBDC currently have limited applicability in Hong Kong, the HKMA will continue to monitor international developments, as well as latest technological advancements, and regularly review its decision.

The HKMA is also committed to advancing the policy, legal and technical frameworks necessary to ensure Hong Kong is well-prepared to support the potential extension of the e-HKD to retail scenarios, should a compelling case arise. This preparatory work, informed by insights from the e-HKD Pilot Programme, is expected to be completed by 2026.

The HKMA extends its sincere gratitude to all participants in the e-HKD Pilot Programme for their dedication and contributions. These collaborative efforts have yielded tangible benefits, including invaluable insights that will shape the future of Hong Kong's digital money landscape in the years to come.

The pilots have also provided important learnings that can be used to facilitate constructive discussions with other central banks and inform the development of the HKMA's other tokenisation projects. Looking ahead, the HKMA will continue to partner with the industry on different CBDC and tokenisation initiatives to maintain Hong Kong's status as a leading international financial centre and a vibrant hub for digital assets.

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Appendix A: Fact Sheets / Supplementary Reports

Study Theme 1: Settlement of Tokenised Assets

Pilot Participants	QR Code / Link
Aptos Labs The Boston Consulting Group Hang Seng Bank Limited	Link
Standard Chartered Bank (HK) Limited BlackRock Asset Management North Asia Ltd. Mastercard Asia/Pacific Pte. Ltd. Libeara (Singapore) Pte. Ltd.	Link
The Hongkong and Shanghai Banking Corporation Limited	Link
Visa Inc. Australia and New Zealand Banking Group Limited FIL Investment Management (Hong Kong) Limited China Asset Management (Hong Kong) Limited	Link

Study Theme 2: Programmability

Pilot Participants	QR Code / Link
Bank of China (Hong Kong) Limited Sanfield (Management) Limited	Link
China Construction Bank (Asia) Corporation Limited	Link
DBS Bank (Hong Kong) Limited	Link
Hang Seng Bank Limited	Link
Mastercard Asia/Pacific Pte. Ltd. KASIKORNBANK Public Company Limited Airstar Bank Limited	Link

Study Theme 3: Offline Payments

Pilot Participants	QR Code / Link
Bank of Communications (Hong Kong) Limited China Mobile Hong Kong Company Limited	Link
Industrial and Commercial Bank of China (Asia) Limited	Link

Appendix B: Acronyms and Abbreviations

Acronyms or Abbreviations	Definition
API	Application Programming Interface
AUD	Australian dollar
BIS	Bank for International Settlements
CBDC	Central bank digital currency
DeFi	Decentralised finance
DLT	Distributed ledger technology
DvP	Delivery-versus-payment
e-money	Electronic money
FPS	Faster Payment System
FRS	Fiat-referenced stablecoins
FX	Foreign exchange
HKD	Hong Kong dollar
HKMA	Hong Kong Monetary Authority
HTLC	Hashed TimeLock Contract
KYC	Know-your-customer
LERS	Linked Exchange Rate System
MMF	Money market fund
NAV	Net asset value
NFC	Near-field communication
PBM	Purpose-bound money
PET	Privacy-enhancing technology
POS	Point-of-sale
PSSVFO	Payment Systems and Stored Value Facilities Ordinance
RWA	Real-world asset
SME	Small and medium enterprise
SWP	Single Wire Protocol
UID	Unique identifier
USD	United States dollar
UTXO	Unspent transaction output
VC	Verifiable credential
ZKP	Zero Knowledge Proof

Note: The definitions provided under footnotes in this report, in Appendix B and in Appendix C are solely for indicative purposes in the context of this report at the time of publication and should not be interpreted as definitive or conclusive.

Appendix C: Glossary

Terms	Definition
Account-based model	An accounting method which tracks balances for each user, similarly to a bank account.
Decentralised finance	A system of financial services which uses blockchain technology and smart contracts to enable open, peer-to-peer financial transactions without traditional banks or intermediaries.
Deep-tier supply chain financing	A form of supply chain finance which enables financial support to reach smaller, upstream suppliers who are not in direct contact with the anchor buyer, but who are vital to the overall supply chain's functioning.
Distributed ledger technology	A technology architecture where a ledger is replicated across multiple entities, allowing records to be simultaneously accessed, validated and updated. Blockchain is a prominent example of DLT, where data is structured in linked blocks and secured with cryptographic techniques.
Dual-signature authentication	A security mechanism which requires two separate signatures, often from two distinct parties or entities, to authorise an action, transaction or access to information. This approach is often used in contexts where additional security and verification are necessary to prevent fraud or unauthorised activity.
Electronic money	A stored value or prepaid product in which a record of the funds or value available to the consumer is stored on an electronic device in the consumer's possession. This includes both prepaid cards (sometimes called electronic purses) and prepaid software products which use communications networks such as the internet.
Escrow service	A financial agreement where a trusted agent of parties to a transaction holds assets (such as funds or securities) and only releases them when conditions have been met.
Fiat-referenced stablecoins	A type of cryptocurrency which purports to maintain a stable value with reference to one or more official currencies, such as the HKD.
Gas fee	The cost which certain blockchain protocol users pay to network validators each time they wish to perform a function on the blockchain.
Interoperability	The ability of different systems, devices, applications or organisations to work together and exchange information effectively, even if they were developed independently or used different technologies.
Near-field communication	A short-range wireless communication technology which allows for contactless communication between devices over short distances and is often triggered by holding the NFC readers of two devices closely together.
Off-ramping	The process of converting digital assets, such as an e-HKD, tokenised deposits or stablecoins, into traditional fiat money (physical cash or conventional bank deposits). Conversely, on-ramping refers to converting traditional fiat money into digital assets.

Terms	Definition
Permissioned consortium distributed ledger technology	A DLT where the ledger is maintained and operated by a group of pre-selected, trusted organisations (the consortium), and access to the network is restricted.
Programmable money	A form of money which involves embedding the predefined conditions into the money itself, meaning it will retain its predefined conditions regardless of who it is transferred to.
Purpose-bound money	The use of a "wrapper" to specify conditions while leaving the underlying store of value intact.
Single Wire Protocol	A standardised communication protocol which enables secure, high-speed data exchange over a single electrical wire between a mobile phone's SIM card and its near-field communication controller.
Singleness of money	A principle by which money should be universally interchangeable and accepted at face value across an economy, regardless of its form or the platform on which it is held.
Smart contract	A self-executing computer program which automatically enforces the terms and conditions of an agreement when predefined conditions are met. Smart contracts run on DLT networks, making them transparent, secure, and tamper-resistant.
Tokenisation	The process of converting the ownership rights of traditional assets, such as securities, real estate or commodities, into digital tokens which can be recorded, managed and transferred on programmable platforms like DLTs.
Tokenised deposits	The digital representation of traditional bank deposits which exist on DLT networks.
Unspent transaction output model	An accounting method which records and transfers individual units of digital money, much like passing coins or notes from one person to another.
Verifiable credential	A digital representation of information or an identity which is securely issued by a trusted authority and can be verified independently.
Web3-native identity	A digital identity system designed for DLT (Web3) environments.
Whitelisting mechanism	A KYC process which determines a list of customers who are eligible to access certain structured products. It is an investor protection requirement for financial institutions.
Zero Knowledge Proof	A cryptographic method which allows one party (the "prover") to demonstrate to another party (the "verifier") that a statement is true, without revealing any information beyond the fact that the statement is indeed true.

Note: The definitions provided under footnotes in this report, in Appendix B and in Appendix C are solely for indicative purposes in the context of this report at the time of publication and should not be interpreted as definitive or conclusive.