Phase 2 of e-HKD Pilot Programme

High-Level Summary

In September 2024, the Hong Kong Monetary Authority (HKMA) commenced Phase 2 of the e-HKD Pilot Programme to delve deeper into innovative use cases for new forms of digital money that can potentially be used by individuals and corporates.

As part of its commitment to supporting central banks in exploring CBDCs and digital money, The Hongkong and Shanghai Banking Corporation Limited (HSBC) joined Phase 2 to explore use cases under the theme of settlement of tokenised assets.

Leveraging our deep financial expertise, participation in Phase 1 and ongoing research findings, we focused on assessing the feasibility of e-HKD in digital asset transactions and addressing practical issues that maybe encountered in designing, implementing and operating a digital money ecosystem. These include privacy and security considerations, as well as exploring how e-HKD can securely operate at scale on public and private distributed ledger technology (DLT) environments.

Our research framework incorporated quantitative and qualitative data, with experiments simulating e-HKD transactions on various DLT environments, and a survey assessing customer awareness and attitudes towards e-HKD, which took place between March to April 2025.

HSBC conducted three experiments to identify further opportunities and challenges if e-HKD is to be extended for the use of individuals and corporates.

Problem Statement 1:
Limited on-chain settlement utility options

Experiment

Investigate whether e-HKD could securely operate on permissioned protocols on public DLT environments, as an alternative to Stablecoins and cryptocurrency, **for storing and transferring value and serving as a settlement utility for tokenised assets.**

Findings

- Validated the atomic settlement capability of e-HKD, minimising counterparty risks.
- Efficiency enhanced with real-time settlement.

Problem Statement 2:
Potential privacy and security concerns with using e-HKD

Experiment

Address privacy and security concerns related to e-HKD, as these are important to widen public adoption. Investigate whether these concerns could be mitigated by using **Privacy Enhancing Technology (PET)**, **Decentralised Identity (DID)** and a **deny list**.

Findings

- Validated identity and privacy controls, using DID and PETs to settle hypothetical tokenised assets with e-HKD, maintaining security and privacy.
- Validated deny list capabilities, which would freeze wallets and block transfers.
- Protection at a cost: transactions with DID and PET cost apprx. 12x and 80-320x more, respectively.

Problem Statement 3:
Operating e-HKD at scale

Experiment

Identify the unique benefits and constraints across a **sample of public and private DLT networks** for the potential adoption of e-HKD.

Findings

- Both Public and Private DLTs selected for experiment are facing capacity challenges during high traffic load.
- Batch processing functionality reduced operational time and complexity.

Summary

e-HKD can be scaled on both public and private DLTs each with its own benefits and constraints, while leveraging permissioned protocols and solutions like PET, DID and Deny List to manage security and privacy concerns. At the same time, e-HKD enables a new settlement utility for tokenised asset transactions.

"It is important to recognise that HSBC's results and findings from Phase 2 should be interpreted within the context of the experiments and the inherent limitations of the surveys. The experiments were conducted using HSBC wallets with hypothetical e-HKD and tokenized TWA assets. Experiment 1 leveraged public DLTs, while Experiments 2 and 3 were performed on private DLTs and 'testnet' public DLT environments. Despite these limitations, the findings and principles are intended to support ongoing discussions and experimentation around CBDCs and digital money. The insights and lessons learned are provided for educational purposes only and do not reflect HSBC's policy stance on digital money implementation in Hong Kong."

Key Findings and Learnings

Hypothesis 1: e-HKD can securely operate on permissioned protocols on public DLT environments as an alternative for storing and transferring value and serving as a settlement utility for tokenised assets.

- **Atomic settlement capabilities with e-HKD, minimizing counterparty risks and enhancing real-time settlement:** Our research confirmed that e-HKD performs reliably in settling hypothetical tokenized assets, with atomic settlement and transaction finality achieved. Its atomic settlement capabilities also allow e-HKD to handle regular and fractional transactions efficiently. This feature is particularly beneficial in reducing settlement times and minimizing counterparty risk, thus optimizing the overall user experience.

Hypothesis 2: The use of privacy enhancing technology (PET), Decentralisation Identity (DID) alongside a deny list and allow list may enhance privacy (and confidence around privacy) for retail users, mitigating the threat of illicit actors on a DLT ecosystem.

- **Validated PET, DID and deny/allow list capabilities helped maintain security and privacy, but with cost considerations:** Our research validated that the use of PETs, DID and allow/deny lists can address security and privacy concerns, potentially enhancing user trust while addressing the threat of illicit actors on a DLT ecosystem. However, these technologies and solutions result in increased transaction costs. As a result, there is a need for further refinement of PETs, DID and allow/deny lists to balance security and privacy with cost-effectiveness.

Hypothesis 3: Hypothetical e-HKD and tokenised asset transactions on private and public DLT environments have unique benefits and constraints on each kind of network.

- Both Public and Private DLTs selected for experiment are facing capacity challenges during high traffic load: the performance of public and private DLT environments that were used in our experiments varied, with public DLTs showing higher transactions per second (TPS) capabilities compared to private DLTs, which faced challenges under increased transaction pressure as the number of nodes increased. It is important to note that this observation is specific to the DLT environment tested during our experiment. It is, therefore, crucial to avoid generalisations regarding the capabilities of DLT environments. Public DLT networks may not inherently achieve higher TPS, as their performance is variable and contingent upon their specific features.
- Consequently, it is critical to consider capacity constraints when choosing a DLT platform. We also concluded that batch processing functionality and Merkle drop mechanisms can significantly reduce operational time and complexity, offering a viable solution for enhancing scalability especially in the retail context.

Through our customer surveys, we also gained the following insights:

1. **Willingness to use e-HKD is higher among individuals with awareness of e-HKD:** While overall willingness to use e-HKD is moderate, ranging from 17% to 31%, it increases significantly among individuals with experience in digital asset trading or awareness of e-HKD. Awareness of e-HKD is notably higher among younger and wealthier individuals, which correlates with a greater willingness to adopt it.
2. **Addressing privacy and security concerns is key to e-HKD adoption:** Around 70% of respondents are concerned about e-HKD's security, a perception driven partly by limited awareness rather than actual risk - underscoring the need to increase awareness to drive adoption. Privacy is also a critical issue, with 71% of our survey respondents identifying it as a key concern. A better understanding of privacy solutions (such as PET) may help relieve some of these concerns and promote e-HKD adoption.
3. **Few respondents are willing to pay additional cost for privacy:** Despite its importance, few respondents are willing to pay the additional costs associated with technologies that could enhance privacy and compliance. They expect such solutions to be part of any standard offering, as it is often the case with existing payment solutions.

Proposed Areas of Further Study

While our research findings offered key insights into the design and operation of e-HKD if extended into retail use cases, they also underscored the need for further study arising from the emergence of CBDCs and other forms of digital money. For example:

- Transaction Monitoring: Examine who should be responsible for monitoring digital money transactions. Consider whether and how central authorities, financial intermediaries, or other entities should manage surveillance, transaction limits, or freezing capabilities.
- Infrastructure Ownership and Cost Framework: Explore who owns and maintains the digital money infrastructure and covers related fees, including those required to embed and execute privacy and security-enhancing controls. In the case of a public DLT or hybrid environment, considers who holds cryptocurrencies and pays gas fees.
- PET: Continue investigating the use of PETs on DLTs, exploring acceptable use, participant controls, and policy considerations to enhance user privacy and compliance. Further explore new PET solutions, as they continue to evolve at pace.
- DIDs and Verified Credentials: Examine how can a reliance framework be built across the markets, aiding in KYC, customer due diligence and AML/CTF management. Identify who can issue and maintain DIDs and verified credentials, as personal information changes over time.
- Allow List and Deny List Management: Identify roles and responsibilities for updating allow and deny lists and handling disputes within the digital wallet ecosystem to maintain compliance.

For more information about HSBC's Hypothetical e-HKD pilot, please visit:
https://www.about.hsbc.com.hk/news-and-media/phase2-e-hkd-pilot-factsheet-en.pdf
For Chinese copy of this document, please visit:
https://www.about.hsbc.com.hk/zh-HK/news-and-media/phase2-e-hkd-pilot-factsheet-cn.pdf