





Regulatory review toward implementing and adopting CBDC in the context of supply chain finance

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Executive Summary

This report focuses on the financial and legal foundation behind a new supply chain finance system based on Central Bank Digital Currency (CBDC). We specifically address the challenges associated with their regulation.

CBDC combines the technological advantages of digital currencies and the state's authority to use its centralised financial system. the central bank can use its unique risk-free central bank liability, which is bank notes in physical form but CBDC in electronic form. In contrast to cryptocurrencies, CBDCs are not volatile due to their alignment with the country's fiat currency exchange rate. Existing cases report on improved accessibility of digital forms of money, which can enhance supply chain transaction speed and SC liquidity.

CBDC can revolutionise supply chain finance. Yet, it is still a concern what the obstacles to tokenising assets, bonds, securities, and smart contracts with SMEs are and, hence, how fast the transformation can happen[1]. We conclude that to succeed with a technological innovation like CBDC in mass adoption, it is necessary to explain the benefits (such as minimising payment delays) and the risks of existing CBDC transactions (data privacy).

^[1] Cao, H. H., Huang, Y., Huang, Y., Yeung, B., & Zhang, X. (2023). Fintech, financial inclusion, digital currency, and CBDC. *The Journal of Finance and Data Science*, 9, 100115.

Motivation

The digital transformation has spurred interest in alternative ways of payment. The mainstream literature discusses the application of blockchain technologies with distributed mining, such as cryptocurrencies. However, they were usually avoided in traditional supply chains due to their volatility and lack of regulation. Digital currencies are an emerging area of digital payments. According to recent reports, the application of digital currencies for large enterprises is growing with a CAGR of 52.0%, and the SME segment has a 65.6% CAGR until 2033. Many countries seek to capture gains from this innovation, which are expected to improve working capital, cash accessibility, and funding beyond the traditional banking system [2].

Central banks worldwide-explore new ways to provide their citizens with a safe and reliable digital form of central bank money, which could be universally accessible and acceptable as a means of payment and storage of value. Emerging industrial CBDC firms, such as Portdex, call CBDC as a central bank liability, an element of trust between primary and secondary markets. Once it's processed, CBDC supports delivery versus payment or payment versus payment by the trust created by the Central Bank[3].

^[2] https://www.globenewswire.com/news-

release/2024/08/08/2927112/0/en/FinTech-Blockchain-Business-Research-Report-2023-2030-with-Coverage-of-80-Select-Players.html (accessed 21st Aug 2024)

^[3] based on the position of Portdex, the industrial partner of the project announced during the impact event in November 2024.

Goals of the study

1/ to explore the legal and financial aspects of using CBDC for supply chain finance.

2/ to outline the opportunities and challenges of creating a CBDC infrastructure to support supply chain finance and as settlement for the transactions between SMEs.



Methods

- An extensive literature review of academic, industrial, and consultancy papers has been completed to highlight the known organisational challenges with CBDC adoption.
- As the volume of available evidence is relatively scarce, we interviewed 15 professionals about CBDC. These respondents come from various industries, including fintech startups, aerospace engineering, control systems, financial technology, and the Central Bank of one of the G7 countries.
- We organised a panel discussion involving four experts between July and November 2024. Most participants hold top or mid-level management positions, with experience ranging from 5 to 25 years.
- We organised a workshop on "Building trust: bridging technology with social interactions" in Bristol on the 27th of March 2025, where the results of the project were discussed with an interdisciplinary group of attendees.



Early regulations

Currently, there is no universally accepted regulatory framework governing the issuance and distribution of CBDCs. The Sand Dollar (https://www.sanddollar.bs/), launched in October 2020, is the world's first fully operational and regulated CBDC, was developed to address financial exclusion in the Bahamas, a nation of over 700 islands where traditional banking services are often inaccessible due to geographic challenges. The Sand Dollar operates through mobile wallet platforms and includes features like tiered transaction limits to accommodate different user needs.

Jam-Dex (Jamaica - https://boj.org.jm/corefunctions/currency/cbdc/) and eNaira (Nigeria https://enaira.gov.ng/) aimed to expand access to formal financial services for the unbanked and underbanked populations. However, it faced challenges like low digital literacy and limited merchant adoption. JAM-DEX represents a broader effort in developing countries to use CBDCs as tools for economic empowerment

Future CBDC will support new inter-bank payment systems (https://www.bis.org/publ/bppdf/bispap151.htm), supporting international supply chains with alternatives to the SWIFT international payment system.

The legal perspective of CBDC adoption (1)

CBDC	Legal Foundation & Issuance	Regulatory Framework	Privacy Considerations	Cross-Border Implications	References
Sand Dollar	Issued by the Central Bank of The Bahamas under the Central Bank of The Bahamas Act.	Regulated by the Central Bank of The Bahamas, focusing on AML/CFT compliance, data protection, and cybersecurity.	Tiered system allows for varying degrees of KYC/AML checks; lower- tier wallets offer greater anonymity but have transaction limits.	Limited cross-border functionality currently; focus is on domestic use within the Bahamas.	Central Bank of The Bahamas Act, official statements from the Central Bank of The Bahamas (https://www.cen tralbankbahama s.com/)
e-CNY	Issued by the People's Bank of China (PBOC) as a digital form of sovereign currency.	Framework is being developed by the PBOC, emphasizing control, financial stability, and innovation; AML/CFT is a major consideration.	PBOC emphasizes "manageable anonymity"; user data is closely monitored; aims to balance privacy with regulatory oversight.	Designed to facilitate cross- border payments and reduce reliance on traditional international payment systems (e.g., SWIFT).	People's Bank of China statements, reports from think tanks analyzing China's CBDC (https://www.atla nticcouncil.org/)
Digital Euro	To be issued by the European Central Bank (ECB); legal basis is under development, likely involving amendments to existing EU treaties and regulations.	Subject to EU financial regulations, including GDPR, AML directives, and potential new regulations specific to digital assets.	ECB emphasizes privacy as a key design principle; considering various privacy- enhancing technologies.	Designed with potential for cross- border payments within the Eurozone and possibly beyond, interoperable with existing payment systems.	European Central Bank publications on the digital euro (https://www.ecb. europa.eu/), European Commission legislative proposals (when available)
Digital Rupee	Issued by the Reserve Bank of India (RBI) under the RBI Act; pilot projects underway.	Regulated by the RBI; aims to enhance payment efficiency, reduce costs, and promote financial inclusion; AML/CFT compliance is crucial.	Focus on balancing user privacy with financial stability and regulatory requirements.	Potential for cross- border payments with partner countries; interoperability with existing payment systems is a key consideration.	Reserve Bank of India publications on the digital rupee (https://www.rbi. org.in/), reports on India's CBDC initiatives
Digital Ruble	Project led by the Central Bank of Russia (CBR); legal framework is under development.	Regulated by the CBR; aims to improve payment system efficiency, reduce costs, and promote financial innovation; focus on financial stability and security.	Aims to balance user privacy with regulatory oversight; potential for tiered KYC based on transaction limits.	Designed to facilitate cross- border payments with partner countries and reduce reliance on traditional international payment systems.	Central Bank of Russia publications on the Digital Ruble project (<u>https://www.cbr.</u> <u>ru/</u>), reports on Russia's CBDC initiative

The legal perspective of CBDC adoption (2)

CBDC	Legal Foundation & Issuance	Regulatory Framework	Privacy Considerations	Cross-Border Implications	References
JAM-DEX	Issued by the Bank of Jamaica; legal tender under Jamaican law.	Regulated by the Bank of Jamaica; focus on financial inclusion, reducing transaction costs, and enabling digital commerce.	Aims to balance user privacy with AML/CFT requirements; potential for tiered KYC based on transaction limits.	Primarily focused on domestic use; potential for cross- border remittance solutions within the Caribbean region.	Bank of Jamaica statements on JAM-DEX (https://boj.org.j m/), reports on the implementation of JAM-DEX
eNaira	Issued by the Central Bank of Nigeria (CBN) under the CBN Act.	Regulated by the CBN; aims to improve financial inclusion, facilitate remittances, and enhance payment efficiency; AML/CFT compliance is a priority.	Designed to comply with KYC/AML regulations; different transaction limits based on verification levels.	Limited cross- border functionality currently; potential for use in trade and remittances with other African countries.	Central Bank of Nigeria guidelines on eNaira (https://www.cbn .gov.ng/), reports on Nigeria's CBDC implementation
e-Krona	Project led by the Swedish Riksbank; legal framework and issuance model are under development.	Focus on maintaining financial stability, ensuring payment system efficiency, and complying with EU regulations (e.g., GDPR).	Aims to balance user privacy with AML/CFT requirements; considering different approaches to data protection.	Potential for cross- border payments within the Nordic region and the EU; interoperability with existing payment systems.	Sveriges Riksbank publications on the e-Krona project (https://www.riks bank.se/), reports on Sweden's CBDC initiatives
Digital Baht	Project led by the Bank of Thailand (BOT); legal framework is being developed.	Regulated by the BOT; aims to enhance payment system efficiency, promote innovation, and support financial inclusion; focus on cybersecurity and data protection.	Focus on balancing user privacy with regulatory requirements; considering different approaches to KYC/AML compliance.	Potential for cross- border payments with neighboring countries; interoperability with existing payment systems.	Bank of Thailand publications on the Digital Baht project (<u>https://www.bot.</u> <u>or.th/</u>), reports on Thailand's CBDC initiatives
e-Hryvnia	Project led by the National Bank of Ukraine (NBU); legal framework is under development.	Regulated by the NBU; aims to improve payment system efficiency, reduce costs, and promote financial innovation; focus on cybersecurity and data protection.	Focus on ensuring user privacy and data security while complying with regulatory requirements.	Designed with potential for cross- border payments and integration into international payment systems, particularly in the context of Ukraine's integration with the European financial system.	National Bank of Ukraine publications on the e-Hryvnia project (https://bank.gov. ua/), reports on Ukraine's CBDC initiatives

[1] Nigeria among the catalysts of development and its obstacles - Afrika Hayat. https://afrikahayat.org/nigeria-among-the-catalysts-of-developmentand-its-obstacles/

CBDC Early Adopters

- Sand Dollar (Bahamas, 2020). The Sand Dollar, launched in October 2020, was the world's first fully implemented CBDC, introduced by the Central Bank of The Bahamas as a part of local digital public infrastructure. It was developed to address financial inclusion challenges in the archipelagic nation, improve payment system efficiency, and reduce reliance on physical cash. It proved particularly useful in facilitating transactions after Hurricane Dorian disrupted regular payment systems. The Sand Dollar offers Bahamian citizens and businesses access to digital wallets (eWallets) for secure, efficient transactions.
- **e-CNY** (China, 2020): A digital version of the Chinese Yuan (e-CNY) is designed as legal tender, functioning "as a medium of exchange, unit of account, and store of value". Concerns have been raised about increased government surveillance and control over the economy.
- **eNaira** (Nigeria, 2021) functions as legal tender, pegged at parity with the physical currency *naira*. Citizens can use mobile applications to access digital wallets. eNaira faced challenges, as fewer than 0.5% of Nigerians used the currency after its launch. The difficulties in achieving widespread acceptance included insufficient technological infrastructure, lack of training, data privacy, and ongoing electricity crisis.
- Jam-Dex (Jamaica, 2023) After two years of testing, the digital currency was officially rolled out in 2023, offering citizens a digital representation of the Jamaican dollar. The government incentivised the first 100,000 subscribers to encourage adoption and introduced 2% cash back on CBDC spending. Despite initial enthusiasm, the adoption has been slower than expected, with only 260,000 consumer wallets created out of a population of 2.8 million by the end of 2023, partly due to limited merchant participation and wallet availability.
- The Digital Rouble (Russia, 2023) aims to enhance payment efficiency, reduce transaction costs, and ensure economic sovereignty by reducing reliance on foreign payment systems. The Digital Rouble began its official launch on August 15, 2023, with a limited pilot involving 13 banks and select clients. By July 2025, the largest banks will be legally required to support the Digital Rouble, including opening accounts, facilitating transfers, and accepting the currency. Merchants with turnovers exceeding 30 million roubles (about \$320,000) must take it from the launch date, with smaller businesses given additional time to comply. The central bank anticipates that the Digital Rouble will not significantly impact monetary policy and is preparing a universal QR code system to facilitate its adoption.



Cross-border CBDC

- **DCash** (Eastern Caribbean, 2021) is a blockchain-based digital version of the Eastern Caribbean dollar designed to provide a faster alternative to physical cash for transactions. Initially rolled out in four of the eight Eastern Caribbean Currency Union (ECCU) member countries, DCash aims to increase financial inclusion, competitiveness, and economic resilience across the region.
- Project Sela (Bank of Israel and Hong Kong) is a collaborative experiment conducted by the Bank of Israel, Hong Kong, and the Bank for International Settlements (BIS) Innovation Hub to explore the feasibility of a secure and accessible retail CBDC. The project aims to test a novel approach that combines accessibility, competition, and preventative cybersecurity while retaining the desirable features of physical cash. It introduces a new type of intermediary called an Access Enabler (AE), which offers customerfacing retail CBDC services without holding end-users funds, thus reducing liquidity and settlement risks.
- Project mBridge (UAE, China) platform was designed to facilitate efficient, low-cost, and instant cross-border payments. Developed through collaboration between the BIS Innovation Hub and central banks of Thailand, UAE, China, and Hong Kong, mBridge uses a custom-built distributed ledger technology called the mBridge Ledger. The platform aims to address key challenges of cross-border payments, such as costs, the lack of speed, and operational complexities, while supporting the use of local currencies in international transactions. In 2022, mBridge conducted a successful pilot involving 20 banks across four jurisdictions, processing over 160 real-value transactions totalling more than HK\$171 million. The project has now reached the minimum viable product (MVP) stage. It is moving towards becoming a production-ready system with the potential to significantly improve international trade flows and cross-border business.

CBDC Pilots and R&D Prototypes

- 1. Project Jasper (Canada, 2016) was a pioneering collaborative initiative between the Bank of Canada, Payments Canada, and major Canadian banks. The project's purpose was to explore the potential of distributed ledgers for wholesale interbank payments. While the project confirmed the feasibility of settling wholesale payments, it highlighted considerable challenges in achieving the same efficiency as centralised systems.
- 2. Project Ubin (Singapore) is a multi-phase initiative launched by Singapore in November 2016 to assess distributed ledger technology (DLT). The project involved collaboration with the Singapore Exchange and major banks to explore the benefits of a digital ledger for the Singapore dollar to improve crossborder payments. The project progressed through several phases, each building on the findings of the previous one, and culminated in the development of Ubin+, an expanded collaboration with international partners to advance crossborder connectivity using wholesale digital currencies.

Supply chain finance challenges

Supply chain finance (SCF) is a *platform* that helps firms manage cash flow and liquidity by allowing buyers to pay suppliers later while suppliers receive early payment. This helps companies of all sizes to reduce the risk of cash gaps and reduce the need for additional loan allocation.

- 1. First, there is a significant imbalance of market power across industries, and the financial conditions and access to liquidity differ between large buyers, Tier-1 and SME suppliers.
- 2. Second, the existing projects involving a third party (financial company) to facilitate faster cash cycles show that if a supplier requests early payment, they pay the fee the finance company deducts, usually between 10% and 20%. This high fee could prevent a supplier from joining a supply chain finance agreement. Also, there are high order limits for a finance company. Hence, the intermediary usually helps cover the invoice values the agreement covers.
- 3. Third, the technological complexity of CBDC will inevitably complicate the regulation at the beginning.

A business purchases goods or services from a supplier The supplier issues an invoice to the buyer, which includes payment terms that specify when payment is due

Once the buyer approves the invoice, they upload it to a supply chain finance platform The supplier can then request early invoice using this platform from lender, who sends the payment back, deducting a fee based on the buyer's credit rating

When the invoice is due, the buyer settles the payment with the financing company according to the agreed-upon payment terms

The process of supply chain finance using a platform

Workshop November 2024



Views on CBDC regulation in the UK - regulator view

- The Bank of England is exploring ways to offer UK citizens a digital pound, which could be universally accessible and acceptable as a means of payment and storage of value [3,4]
- It would be an electronic form of the Central Bank's money that households and businesses could use, essentially like a digital bank note—this form of public funds with a stable value.
- It would not be a decentralised form of private money. It will not replace cash but exists alongside cash as a form of public money.
- The Bank of England would operate the core ledger, possibly through a platform model, guaranteeing broad access to retail central bank money in digital form, which is an anchor for money [4].

^[3] https://www.bankofengland.co.uk/explainers/what-is-a-central-bank-digital-currency

^[4] Based on the webinar organised by the University of Surrey and Portdex in November 2024

CBDC design and regulation – legal aspects for SMEs and individuals

1. Digital literacy and Design complexity of CBDC:

- The technological complexity of CBDC impedes understanding of its potential value
- Hence the application is limited, and the potential gains (e.g., financial inclusion and stability) are not achieved.

2. Legal Gaps and different jurisdictions for CBDC:

- The need to look at national versus international transactions
- The number of intermediaries in the supply chain finance has entities based in different jurisdictions.
- The implementation considers the national country and potentially touches upon further countries.

3. A need for more research for international experience in CBDC:

 Lack of evidence of functioning CBDC systems worldwide – with wholesale systems like mBridge being instead an exception rather than a rule.

CBDC regulation – legal aspects for commercial companies [5]

- 1. CBDC as forward payment obligation, so buyers extend payment to suppliers, and then they suffer on the capital side
- 2. CBDC to improve SME access to more finance, responding to the poor access to capital due to credit complexity and payment delays

3. CBDC to enable interoperability of a multi-party environment :

- Different systems need to interact
- APIs or how the CBDC can play a role
- Liquidity assistance in the context of supply chain finance and a trusted CBDC digital network.

4. CBDC to enable Verifications and Trust-building:

- whether the actual money is there, and ensure there are no duplicate entries across the different databases. (e.g., the insurance if an invoice is processed of 1,000,000 and then 1,000,000 is there).
- Not all CBDCs will be tokens. But those tokens are digital representations backed by real money. In a trusted environment, we have a crash fault tolerance.

[5] Portdex

CBDCs regulation – legal aspects for supply chains

Can CBDCs enhance the efficiency of crossborder payments in SWIFT and correspondent banking in supply chain finance? Society for Worldwide Interbank Financial Telecommunications (SWIFT) is a global cooperative established in 1973 that provides a secure messaging network for financial transactions, connecting more than 200 countries. It facilitates international money transfers by enabling the standardised transmission of payment instructions through unique identifiers known as SWIFT codes.

- CBDC will settle transactions in seconds, while SWIFT require several days. Such fast crossborder settlement in CBDCs could require both countries having issued interoperable CBDCs, with an agreed settlement infrastructure for conversions. Hence, this shrinks latencies for businesses to receive payment for goods and services, improving cash flow and liquidity.
- 2. CBDC is widely accessible to everybody with a smartphone.
- 3. CBDC can support smart contracts, which will enable the automated execution of service delivery/payments based on pre-defined conditions. This can streamline supply chain processes and reduce costs.
- 4. CBDCs can facilitate faster, cheaper, and more transparent cross-border payments, reducing reliance on interim banking silos.

The existing SWIFT system relies on multiple intermediaries, which can lead to processing errors, delays and payment failures. In contrast, CBDCs could avoid intermediaries, high costs and hidden fees and foster a more efficient, cost-effective, and inclusive global financial ecosystem.

[4] Based on our interaction with the association of European aerospace SMEs in Northern Germany (see Table A2)

Two necessary legislations for CBDCs

1. The need for the legal framework for retail CBDCs.

Data privacy concerns are the central consideration. While current financial transaction data is distributed within the network of banks and payment systems, CBDC would centralise transactions. Hence, central banks would gain a massive dataset on citizen transactions. Hence, it would be necessary to address the data sharing regulation, i.e., what data on transactions would be kept and for how long.

2. The need for the legal framework for wholesale CBDC/ supply chains

A tailored legal framework is needed to support all supply chain members' readiness to accept new payment forms. Competition law must address the current market power imbalance and the responsibility of large buyers in reducing smaller firms' liquidity. International agreements or new laws may be required to govern the cross-border use and transfers of CBDCs. Smart contracts should highlight the malpractice of postponement of payments as a cash-to-cash cycle optimisation. Large buyers must be incentivized to embed the supply chain finance benefits as a whole .

Views on CBDC regulation the legal framework

- The Bank of England Act 1998 grants the BoE the authority to issue banknotes; this could be extended to include the issuance of a digital currency.
- All CBDC-related data processing must comply with the Data Protection Act 2018, which incorporates the General Data Protection Regulation (GDPR).
- Establishing common CBDC design and operation standards for cross-border transactions can simplify compliance and enhance interoperability between different national systems.
- Current invoices can be converted into digital assets, divided, and sold—potentially at a discount—on the financial trading platform. Implementing CBDCs can transform perceptions of smart contracts within traditional industries and facilitate asset tokenisation.



Conclusion

- The technical feasibility of implementing a new finance system based on Central Bank Digital Currencies (CBDCs) is promising, yet it presents considerable challenges that necessitate thoughtful consideration and strategic planning.
- This report highlights the urgent necessity for collaborative efforts among central banks, regulators, and industry participants to fully harness CBDCs' potential in contemporary finance.
- The challenges that small and medium-sized enterprises (SMEs) encounter in securing supply chain liquidity arise from systemic issues like delayed payment cycles and restricted access to affordable financing.
- CBDCs present a promising avenue to tackle these obstacles. By enhancing liquidity, improving access to funding, and streamlining transactions, CBDCs have the potential to significantly transform the supply chain finance landscape for SMEs, ultimately promoting greater economic resilience and growth.



