Cross-border Payments for The Bahamas: To Interlink Through a Fast Payments System or the Central Bank Digital Currency?

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Abstract

The current correspondent banking model utilized in cross-border payments has been lamented as costly, slow, and inefficient. Given the swift development of the digital payments landscape in recent years, international transactions are the new frontier for budding payment infrastructures, such as Central Bank Digital Currencies (CBDCs) and Fast Payment Systems (FPSs). This paper compares the prospect of interlinking a FPS or the CBDC internationally to globalize the Bahamian financial market. The Faster Payments Effectiveness Criteria (Federal Reserve Banks, 2016) was modified and utilized to assess each system on its cross-border functionality, ubiquity, security, speed, legislation, governance and cost. Each system received a base score and a weighted score that represented the demands of the average Bahamian user. Ultimately, a cross-border FPS was recommended for The Bahamas, owing in part to the growing prevalence of FPSs worldwide, widespread adoption rates and the opportunity to learn from international examples.

JEL Classification: E42, G28
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Introduction

The global payment space is constantly evolving, as countries around the world employ new technological innovations and advancements to modernize systems to align with global standards and facilitate faster clearing and settlement times of payments. Not only are financial institutions aiming to achieve modernized digital payments, but regulators and policymakers are seeking the same for both domestic and cross-border payments. Over the years, the demand for seamless and inexpensive cross-border payments has grown in parallel with the intensive modernization of payment services worldwide (CPMI, 2021). Digital financial services help expand financial inclusion, foster economic development, enable a digital economy, and support financial stability.

The advancement of the national payments infrastructure in The Bahamas began in the late 1990s, with the Central Bank's push to modernize the domestic payments system to not only align with international standards, but also to serve the development needs of all sectors of the economy (Branch, et al., 2023). Following this inceptive initiative, the Bahamian Payments Systems Modernization Initiative (PSMI) was established in 2003 by the National Payments Council to improve financial inclusion and access, thereby making the domestic payments systems more efficient and non-discriminatory in access to financial services across the entire country. The Central Bank of The Bahamas, in tandem with monetary policymakers, are now tasked with providing means for inexpensive, fast, reliable, and efficient cross-border payments for which the Central Bank Digital Currency (CBDC), the SandDollar, or the implementation of a Fast Payments System (FPS) can facilitate. However, tackling the task of effective payment transformation begins with identifying the challenges of a legacy payments environment.

The current framework of the payment system's high fees associated with banking services increases the barrier to financial services access, which can exacerbate the issue of financial exclusion in The Bahamas. An objective of the PSMI is to use technology to achieve more inclusive, cost-affordable, and even access to financial services across all islands of The Bahamas i.e., access without discrimination, specifically regarding immigration or residency status. The current domestic financial system can struggle to provide access due to official policies and the in-house practices of licensed

financial institutions. In more recent years, anti-money laundering (AML) and customer due diligence standards have tightened, as commercial banks respond to more demanding terms placed by their correspondent banking relationships (CBRs), which has also had an adverse impact on inclusion.

Additional evidence on financial inclusion was obtained from a baseline survey conducted by the Central Bank (Central Bank of the Bahamas, 2018). In cases where individuals reported not having a bank account, some indicated that it was due either to the inability to, or the inconvenience of satisfying Know Your Client (KYC) documentary requirements. Meanwhile, in the case of businesses, the survey uncovered evidence of exclusion from electronic banking services, mainly due to the high associated costs. Although the financial system within The Bahamas ranks highly among international standards[2], many rural Family Island communities have limited or no access to these physical modes of delivery, with services being unavailable, or only through electronic channels. The branch network has been scaled back in response to the rising costs of maintaining such operations. These pockets of the Bahamian population therefor remain solely reliant on cash transactions, with consequent exposure to opaque or illicit activities that thrive in such settings, and pose elevated costs—particularly to the public sector—to the delivery of cash-based assistance or payments. With the underlying theme being an exorbitant amount of fees and bureaucratic red tape, policymakers sought to launch a CBDC to provide the unbanked and underbanked communities access to fast and inexpensive payment services.

In October 2020, The Bahamas leapfrogged into the digital vanguard with the launch of the world's first national retail central bank digital currency, the SandDollar, with the broad objectives to i) increase the efficiency of the Bahamian payments system through more secure transactions and faster settlement; ii) provide non-discriminatory access to payment systems without regard for age, immigration or residency status; iii) achieve greater financial inclusion and cost-effectiveness, and provide greater access to financial services across all of The Bahamas; and iv) strengthen national defences against money laundering, counterfeiting and other illicit ends by reducing the ill effects of cash usage (Branch, et al., 2023).

[2] Relative to the size of the population, The Bahamas has the 35th highest density of bank branches in the world and the 15th highest density of automated banking machines (IMF, 2023).

Since its launch, the adoption of the CBDC has been steadily increasing amongst both consumers and merchants, as transactions, such as social assistance disbursements and company salaries are now being distributed in SandDollar. With the ongoing adoption of the CBDC within the domestic payments system, policymakers are thinking of ways to mimic the same level of efficiency, faster settlement periods, and low costs for international transactions. The Central Bank has also committed to collaborating with commercial banks, credit unions, and Payment Service Providers (PSPs) to cultivate a real-time, fast payments network, to allow instant settlements across both digital wallets and deposit accounts to ensure that The Bahamas is sufficiently prepared to benefit from the G20 countries' roadmap[3], by 2027, to lower cost and improve speed, transparency and access to international payments (Central Bank of The Bahamas, 2024).

Cross-border payments are vital for economies, especially transactions underpinning tourism, e-commerce, and remittances (Auer, et al., 2021). Numerous countries globally have established Fast Payment Systems (FPS) to increase payment efficiency. The interlinking of FPSs, meaning the connection of payment systems in different jurisdictions that allows consumers to transact seamlessly with other entities across borders, is one of the most promising solutions for enhancing cross-border payments, offering the prospect of significantly faster, cheaper, more accessible, and transparent cross-border payments; this is especially true when the interconnected payment systems provide real-time and 24/7 operational capabilities (CPMI, 2023). However, in other jurisdictions, including The Bahamas, cross-border payments continue to be largely based on the old correspondent banking model and have not quite benefited from the same flow of innovations as domestic payments have over recent decades (World Bank, 2021b).

For The Bahamas, interlinking the current technology-based framework of the SandDollar with international systems is an option; however, it may be difficult to make such additions to an already established system. Therefore, this paper compares the prospect of interlinking an FPS or the CBDC

[3] This is referring to the G20 countries' Roadmap for Enhancing Cross-border Payments. [Citation? Bibliographic reference?]. The Group of Twenty (G20) comprises 19 countries: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Türkiye, United Kingdom and United States and the European Union.

internationally to globalize the Bahamian financial market and facilitate cross-border payments. The assessment made qualitatively in this paper was based on previous literature, consultation within the Central Bank, and ultimately, the authors' 'expert judgement' as professionals working in the payments field. The paper adapts the Faster Payments Effectiveness Criteria (Federal Reserve Banks, 2016) to the needs of The Bahamas and then utilizes it to evaluate both methods according to performance in its cross-border functionality, ubiquity, safety and security, speed, legislation, governance, and cost. The paper concludes with a recommendation to policymakers, regulators, and other stakeholders in the financial system on which infrastructure befits the country's current payments landscape.

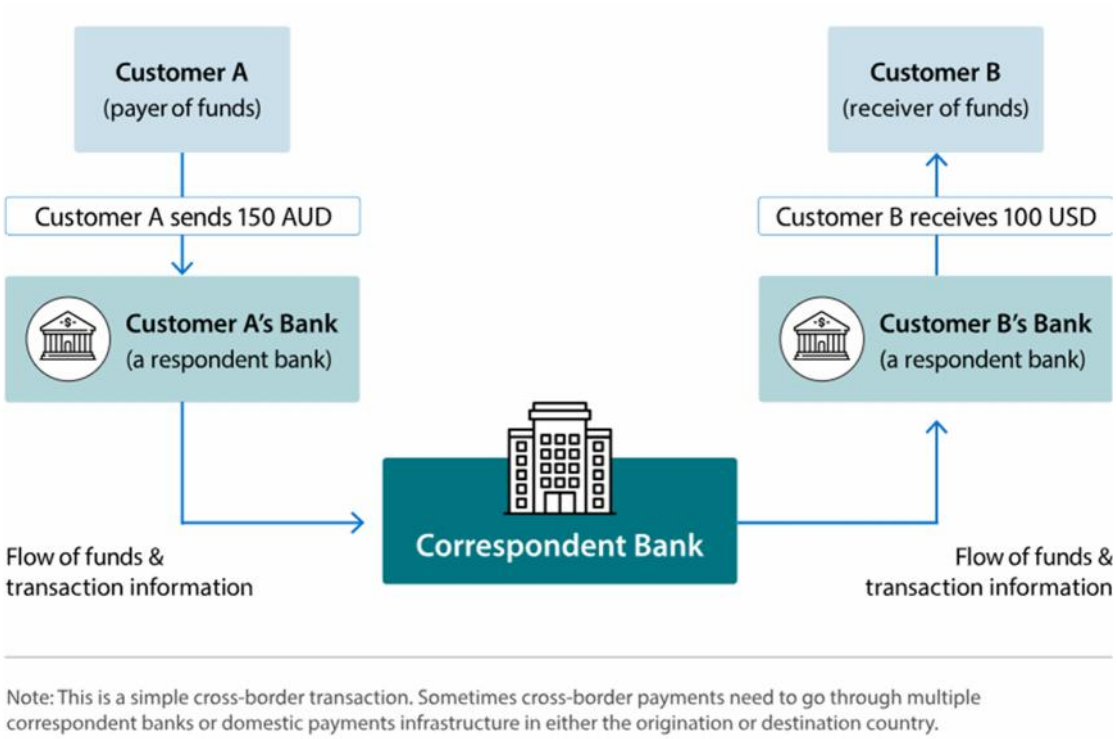
Literature Review

Correspondent Banking

As of today, correspondent banking relationships (CBRs) facilitate the majority of financial institutions' cross-border services. The formation of connections between financial institutions referred to as either correspondent banks or respondent banks, allows for the execution of cross-border payments by one financial institution on another financial institution's behalf, that is not present in the foreign jurisdiction (World Bank, 2021b). An example of cross-border payment conducted via a correspondent bank can be seen in Figure 1. Most often, a correspondent institution undertakes the role of a settling agent between two institutions, bonded by a direct bilateral agreement to complete a transaction (European Central Bank, 2015).

Figure 1

Simple Cross-border Payment Using a Correspondent Bank



Note. A simple example of a cross-border payment using a correspondent bank. From *Correspondent Banking in the South Pacific* by M. Davies, 2023, Global Economy Bulletin – June 2023.

Correspondent banking 1.0 was introduced in the mid-1970s, with the automation of the telex via connections between a large network of banks, followed by a more efficient 2.0 in the late 1990s, which was based on centralised global transaction processing that used fewer but deeper relationships and tighter performance management (SWIFT, 2012). Correspondent banking 3.0 then emerged in the early 2010s, where customers acted as the initiator for banking services, and banks linked the strongest components to provide a consistent and seamless customer experience (SWIFT, 2012). Although correspondent banking has supported cross-border payments over the past several decades, customers, financial institutions, and governments alike have identified several issues with the current state of correspondent banking systems.

Following the 2007-2008 global financial crisis, banks have vastly reduced activities in areas that they perceive as either less profitable or, detrimental to their risk tolerance, and this includes correspondent banking (Alleyne, et al., 2017). In some instances, jurisdictions that are perceived to be of higher risk are unable to provide the essential customer information to perform anti-money laundering (AML) and countering the financing of terrorism (CFT) verifications, resulting in difficulties in maintaining CBRs (CPMI, 2015). Smaller emerging markets and developing economies in Africa, the Caribbean, Central Asia, Europe, and the Pacific, as well as countries under sanctions, were the most affected by de-risking (Erbenová, et al., 2016). De-risking refers to the phenomenon of financial institutions terminating or restricting business relationships with clients or categories of clients to avoid risk (United States Department of State, n.d.). At least five financial institutions in The Bahamas, representing almost 20% of the assets in the banking system, have lost one or more CBRs due to this increased scrutiny (Erbenová, et al., 2016). With the decreased access to CBRs, Caribbean countries have become susceptible to subdued economic activity as commercial banks search for alternative means to settle their cross-border transactions (Griffin & Martin, 2023).

The correspondent banking system presents consumers with a host of limitations, such as low speed and restricted operating hours, high cost, lack of convenience, limited coverage, and limited accessibility (Arf, 2021). In this system, the length of time that a transaction takes depends on varying factors, including whether a direct relationship between sending and receiving institutions exists or if

an intermediary currency has to be involved (Herrera-Harrington, et al., 2024). Costs and fees for users can compound in cross-border payments conducted in the correspondent bank model, as transaction fees can be charged by each bank in the chain (Casu & Wandhöfer, 2018). Customer opinion is that there is a lack of visibility of transaction-related costs, i.e. who pays which fees to whom for the validation of AML/CTF, counterparty risk, liquidity reporting, and credit limit (Casu & Wandhöfer, 2018).

Methods of Interlinking Systems Across Borders

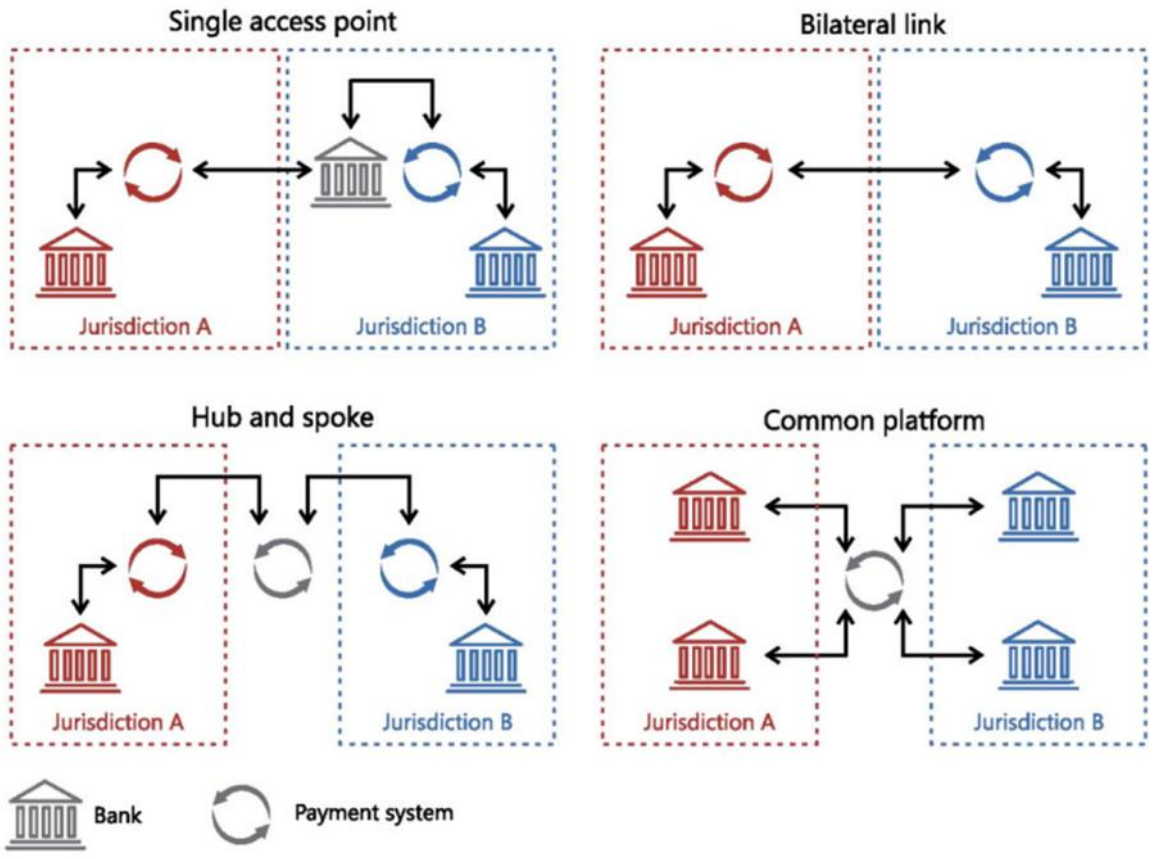
In this sub-section, how each system would interlink to others globally was explored. The Committee on Payments and Market Infrastructures (CPMI) define interlinking arrangements for cross-border payments as a "set of contractual agreements, technical links and standards, and operational components between payment systems of different jurisdictions, allowing their respective participating PSPs to transact with one another as if they were in the same system" (CPMI, 2022a). It is important to note that while interoperability between both systems is an interest of those creating payment systems internationally, the interlinking discussed in this paper is homogenous, with CBDCs linking with neighbouring CBDCs and FPSs linking with other FPSs. For both systems, there are three common ways of interlinking with other countries' systems: via interoperability of systems, direct country-to-country connections, or a hub.

Fast payment systems can be connected across borders through four different models, as seen in Figure 2 (CPMI, 2022a). The first model is a single access point model, where participants in one domestic payment system can transact with a participant in a foreign system through a single gateway entity that is directly present in the foreign system. This model is similar to correspondent banking but requires common rules, service-level agreements, and access criteria. A second model, the bilateral link model, allows for two payment systems to be directly connected. Bilateral links can be cost-effective, but as more links are formed the model becomes more and more complex as more interoperability arrangements must be maintained. The hub and spoke model, a third model, is a multilateral interlinking arrangement that utilizes a common intermediary, the hub, to conduct inter-system accounting and

clearing. In the fourth model, PSPs in different jurisdictions can be connected in a common platform model, where PSPs transact on a common payment system run on a single integrated technical platform.

Figure 2

Fast Payment Systems Models for Interlinking



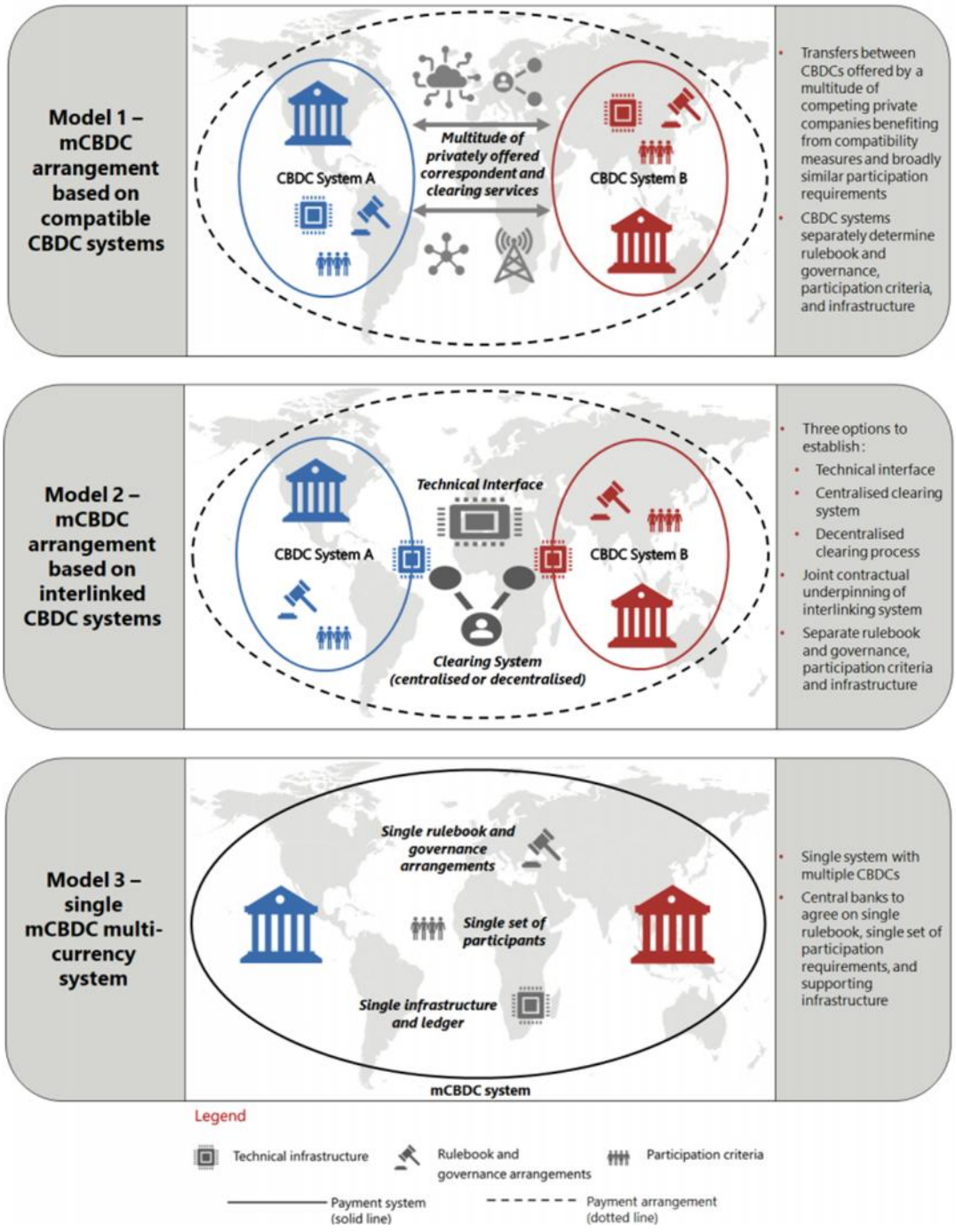
Note. From *Interlinking payment systems and the role of application programming interfaces: a framework for cross-border payments* by CPMI, 2022a, Bank for International Settlements.

Central bank digital currencies (CBDCs) can be interlinked in similar ways, as seen in Figure 3. Separate CBDC systems can be joined through common international standards, including collective message formats, cryptographic techniques, data requirements, and user interfaces, which would allow for the interoperability of systems across borders (CPMI, 2021). Transfers between CBDCs can be offered by competing private companies that provide correspondent and clearing services. An alternative model proposes interlinking through a shared technical interface or common clearing mechanism. A shared technical interface would be supported by contractual concords between systems

and allow participants in a domestic system to make payments to those in a different country's system, whereas a common clearing mechanism would link systems through designated settlement accounts. Finally, a single multi-CBDC system would have central banks abide by one set of rules, one technical system, and one set of participants, under which international transactions would be processed.

Figure 3

Interlinking Arrangements for CBDCs



Note. From *Multi-CBDC arrangements and the future of Cross-border Payments* by Auer, R., Haene, P., & Holden, H., 2021, BIS Papers No. 115.

An important decision for the entities introducing either payment system is whether to use a single currency or multiple currencies for settlement, and the context of the goals and uses of the payment system should be considered. FPSs and CBDCs could theoretically facilitate both types of settlement. Factors such as the goal of promoting the use of local currency, currency unions, and whether there is a dominant currency in the region would inform the verdict (World Bank, 2021b). As governing bodies set the objectives and purpose of implementation during the process of interlinking, settlement currency(s) can be determined simultaneously during collaboration.

Case Studies

Finally, in this paper's effort to compare the aptness of a CBDC or an FPS to be the novel preferred model for cross-border payments in The Bahamas, previous literature regaling examples of interlinked FPSs and CBDCs, as well as pilot projects currently underway were investigated. Whilst there appear to be no internationally linked CBDCs available to the general public, numerous projects and experiments have taken place to gauge the feasibility of such a system. The BIS Innovation Hub (2024) has embarked on Project mBridge to investigate a multi-central bank digital currency platform that would be shared among participating central banks and commercial banks and built upon distributed ledger technology (DLT) to support instant cross-border payments and settlement. The project plans to address the high costs, low speed, and operational complexities of cross-border payments today, and encourage financial inclusion as a bank account would not be needed for users (BIS Innovation Hub, 2024). The Multi-CBDC arrangement will link jurisdictions in a single common technical infrastructure to improve the current system and allow cross-border payments to be immediate, cheap, and universally accessible with final settlement (BIS Innovation Hub, 2024). Project mBridge has reached the minimum viable product stage as of June, 2024 and is now inviting more international participants to join the endeavour.

Project Jura, which explored the direct transfer of Euro and Swiss Franc wholesale CBDCs between French and Swiss commercial banks on a single DLT platform operated by a third party, was led by the Banque de France, the BIS Innovation Hub Swiss Centre, the Swiss National Bank, and select private sector representatives (BIS, 2021). The experiment took place in a near-real setting, using real-value transactions, and complied with the present regulatory requirements (BIS, 2021). The project tested a new approach that consisted of sub-networks and dual-notary signing, to attempt to ease central banks' reservations (BIS, 2021). It was noted, however, that complicated policy issues arise when wholesale CBDCs are distributed on a third-party platform where non-resident financial institutions are given direct access to central bank money.

Similarly, Project Cedar x Ubin+ is a research project delving into prospective enhancements for multi-currency wholesale cross-border payments undertaken by the Project Cedar team of the Federal Reserve Bank of New York's New York Innovation Center, and Ubin+ of the Monetary Authority of Singapore (NYIC & MAS, 2023). The project examines whether wholesale CBDCs developed using DLT could increase efficiency and transparency in cross-border payments involving one or more vehicle currencies. The project's three hypotheses—which are: the ability to establish interoperability and multi-network connectivity, to significantly reduce foreign exchange settlement risk, and to significantly reduce the time required to clear and settle cross-border payments—were all successfully validated in the second phase of the experiment (NYIC & MAS, 2023).

The Universal Digital Payments Network (UDPN) has proposed a global payments network intended for regulated digital currencies across all technical platforms through which any financial institution or enterprise can transact directly with all the digital currencies on-boarded via a business node (UDPN, 2024). The UDPN has a decentralised governance model that involves six (eventually 24) UDPN Alliance members with equal voting and revenue-sharing rights (UDPN, 2024). SWIFT, a private sector messaging provider for payments, has also tested a beta CBDC connector solution in cooperation with three central banks, who have integrated the solution with their infrastructure, and

numerous financial institutions after conducting successful sandbox[4] experiments in the first phase (SWIFT, 2023). It has also initiated a second phase of sandbox testing in which commercial banks, central banks, and financial market infrastructures are exploring additional use cases, including trigger-based payments for digital trade platforms, delivery versus payment, and liquidity-saving mechanisms (SWIFT, 2023).

Fast Payment Systems boasts several real-world examples of cross-border linkages, along with experimental projects. The BIS Innovation Hub is conducting Project Nexus, the exploration of a standardized method of connecting domestic FPSs internationally through a single connection to the Nexus platform to improve speed, cost, and transparency in cross-border payments. In the next phase of development, the BIS Innovation Hub Singapore Centre will collaborate with the central banks of Indonesia, Malaysia, the Philippines, Singapore, and Thailand to connect their domestic payment systems (BIS Innovation Hub, 2023).

A bilateral linkage between Singapore's FPS, PayNow, and Thailand's FPS, PromptPay, was created in 2021 to provide a convenient regional cross-border retail payment solution employing Quick Response (QR) code technology (Hingel et al., 2023). The link allows users to make instant, 24/7, low-cost mobile transfers between the two jurisdictions via the recipient's phone number (World Economic Forum, 2023). It was also designed to encourage settlement in their respective local currency, prompting the need for a multicurrency settlement system (World Bank, 2021b). The cross-border FPS link has provided abundant gains to both economies, as the transactions facilitated via the linked systems contributed to a combined GDP of $3.6 trillion in 2022 (Hingel et al., 2023). PayNow and PromptPay's connection required open communication between the two states to establish common agreements between operational differences and address any potential failures (Hingel et al., 2023).

Major commercial banks in the Nordic region introduced P27 in 2021, a real-time cross-currency payment system that enables users to make direct payments between different currencies

[4] A regulatory sandbox is a framework set up by a financial sector regulator to allow small scale, live testing of innovations by private firms in a controlled environment, i.e. operating under a special exemption, allowance, or other limited, time-bound exception, under the regulator's supervision (Jenik & Lauer, 2017).

across national borders (Holmgren, 2022). The banks Danske Bank, Handelsbanken, Nordea, OP Financial Group, SEB and Swedbank intended for the new platform to replace the nine different FPSs present in each country to create faster, safer, and cheaper direct payments between the Nordic countries (Holmgren, 2022). The platform's architecture consists of three layers: a core platform that provides pan-Nordic, multicurrency clearing based on ISO 20022[5], a second layer that allows for the development of a proxy registry that allows for the development of a range of overlay services such as onboarding, request-driven bill payments and e-invoicing, enhanced transaction-fraud management and transaction-screening services, digital receipts, and a third layer on which individual banks and FinTechs can develop new payment products and services (World Bank, 2021b).

The TARGET Instant Payment Settlement (TIPS) is a market infrastructure service launched by the European Union member states that adopted the euro as their sole official currency in 2018. The infrastructure permits PSPs to offer payment transfers to their customers in real-time 24/7/365, which are settled either in euro or the Swedish kronor (European Central Bank, 2024). The system operates on a full cost-recovery and not-for-profit basis, thus the price per instant payment transaction is fixed at €0.002, which is shared equally between the sending participant and the receiving participant (European Central Bank, 2024). TIPS can process 500 payments per second, 2,000 at peak rate, or 43.2 million payments a day, and volumes averaged roughly 500,000 transactions per day as of late 2020 (World Bank, 2021b).

The Pan-African Payment and Settlement System (PAPSS) is a cross-border financial market infrastructure developed by the African Export-Import Bank that supports payment transactions across the African continent. The technology behind the system connects African banks, PSPs, and other financial market intermediaries to enable near-instant payments in local currencies, enhance financial inclusion, and improve economic growth through intra-African trade (PAPSS, 2024). Financial institutions have access to a simplified process that reduces the costs and complexities of foreign

[5] ISO 20022 is a flexible standard for financial messages that enables interoperability between financial institutions, market infrastructures, and customers; the new standards supports more and better structured transaction data in payments messages, and requires less manual intervention, more accurate compliance processes, higher resilience, and improved fraud prevention measures (HSBC, 2024).

exchange for cross-border transactions between African markets and fast and secure cross-border payment capability (PAPSS, 2024). This cross-border FPS infrastructure was also adopted by eleven Caribbean central banks as the preferred system for processing the settlement of intra-regional trade transactions (PAPSS, 2023).

Supported by Arab central banks and fully owned by the Arab Monetary Fund, Buna is a cross-border payment system that allows financial institutions and central banks intra- and extra-regionally to make payments in Arab currencies, in addition to certain international currencies, in a safe, cost-effective, risk-controlled, and transparent environment (Buna, 2022). The system offers users fast, accessible, and safe cross-border currency payment services and supports the processing and settlement of payments in real time (Buna, 2022). Buna's core platform architecture is based on a multi-layer service-oriented framework where each layer in the platform has its scope of functionality and is customized to fit the requirements of cross-border payment best practices, e.g. the system supports ISO 20022 (Buna, 2022).

Even though correspondent banking has presided over the global economy in past decades, a new cross-border payment solution that effectively lessens settlement times, liquidity issues, and risk management challenges is on the horizon. Internationally interlinked FPSs and CBDCs both have exhibited potential to be the subsequent go-to system for international transactions, due to their ability to fully embrace the strengths of digitalization in the payments space. Previous literature on cross-border payment systems has underlined the potential for growth and innovation in this area, but the relevant decision-makers must determine what novel system is most suitable to their constituents, to make the necessary changes to the current payments infrastructure.

Methodology

Each payment system was scored against the Federal Reserve Banks' (2016) Faster Payments Effectiveness Criteria, which outlines critical standards for successfully implementing a Faster Payments System to assess potential solutions to the frictions present in today's arrangements in the United States. This particular list of criteria was chosen because structure was needed to fairly and holistically compare the two systems, and the source provided a comprehensive outline that suited The Bahamas fairly well as a starting point. Each score was justified either through past literature on payments, internal consultation with the SandDollar team, and/or logical reasoning, and so the scoring is based on authors', albeit limited, knowledge. The rubric was amended to better suit the goals of the paper, i.e., some of the criteria were revised within the context of The Bahamas. Specifically,

1. The Cross-Border Functionality criterion was initially a single aspect of ubiquity but was given higher prominence as a main criterion in this evaluation. The sub-criteria interoperability, advanced disclosure, and currency conversion were provided in the summary descriptions outlined by the Federal Reserve Banks (2016). The compatible neighbouring payment systems sub-criterion was included in the cross-border functionality criteria, due to cross-border payments being driven by global trade, and because it would make a payment system more attractive for The Bahamas if neighbouring[6] countries utilized a system compatible for interlinking.
2. Ubiquity, a main criterion, in this case, indicates the capability of the system to allow any entity, be it a consumer, business, government agency, or financial institution, to conduct transactions via their platform anytime, anywhere, and with any device. The sub-criteria for this item were accessibility, usability, predictability, contextual data capability, and applicability to multiple use cases.

[6] Neighboring countries include countries that are in close geographic proximity, and those whom The Bahamas has the strongest ties to trade-wise.

3. The subsequent criterion, Efficiency, encompasses competition, capability to enable value-added services, implementation timelines, payment format standards, comprehensiveness, scalability and adaptability, and the exceptions and investigations process in payment systems.
4. The Safety and Security criterion prioritizes the welfare of those conducting transactions through the payments system, and so both structures were evaluated in the following sub-categories: risk management, payer authorization, payment finality, settlement approach, handling disputed payments, fraud information sharing, security controls, resiliency, end-user data protection, end-user/provider authentication, and the participation requirements.
5. The category Speed was self-explanatory and consisted of the sub-criteria fast approval, fast clearing, fast availability of Good Funds[7] to the payee, fast settlement among depository institutions and regulated non-bank account providers, and prompt visibility of payment status.
6. The Legislation criterion pertained to the presence or development of a legal framework that effectively and holistically outlines the law(s) that rule these novel systems.
7. Governance as a category encompassed the active oversight of the payment systems, with two sub-criteria: effective governance and inclusive governance. The sub-criteria comprised of the legal framework, payment system rules, consumer protections, data privacy, and intellectual property.
8. Finally, Cost was added as a category due to the importance of price, both to the operators of payment systems and their consumers, in the decision-making process of which option to select. A comparatively cheaper system would be able to pass on greater savings to its users, and thus encourage widespread adoption and benefit from network effects. The sub-criteria for Cost include affordability, initial investment, operational expenses, and responsibility.

The amended rubric outlining the criteria, sub-criteria, and weights can be seen in Table 1. The categories altered from the Federal Reserve Banks' (2016) categories are italicized. The amended rubric in its totality can be seen in Appendix A, along with definitions and considerations for each

[7] Good Funds are funds that are guaranteed to be available upon demand; Good Funds are immediately valid and usable and are accepted as full and immediate payment (Pronin, 2024).

of the sub-criteria, which were either adopted from the source, amended, or given by the authors. The scoring scale was also assumed from the original source. The payment systems received a score from 1 to 4, representing a range from not effective to very effective. The complete scale can be seen in Table 2.

Table 1

Amended Faster Payments Effectiveness Criteria Rubric

	Performance Criterion	**Weights**
Cross-border Functionality	*Interoperability*	5
	Advanced disclosure	5
	Neighbouring payment systems	5
	Currency conversion	5
Ubiquity	Accessibility	5
	Usability	5
	Predictability	5
	Contextual data capability	5
	Applicability to multiple use cases	5
Efficiency	Enables competition	3
	Implementation timeline	3
	Payment format standards	3
	Capability to enable value-added services	3
	Comprehensiveness	3
	Scalability and adaptability	3
	Exceptions and investigations process	3
Safety and Security	Risk management	5
	Payer authorization	5
	Payment finality	5
	Settlement approach	5
	Handling disputed payments	5
	Fraud information sharing	5
	Security controls	5
	Resiliency	5
	End-user data protection	5
	End-user/provider authentication	5
	Participation requirements	5
Speed	Fast approval	5
	Fast clearing	5
	Fast availability of good funds to payee	5
	Fast settlement among depository institutions and regulated non-bank account providers	5

	Prompt visibility of payment status	5
Legislation	Legal framework	2
	Payment system rules	2
	Consumer protections	2
	Data privacy	2
	Intellectual property	2
Governance	Effective governance	1
	Inclusive governance	1
Cost	*Affordability*	5
	Initial investment	5
	Operational expenses	5
	Responsibility	5

Table 2

Scoring Scale

Numerical Score	Effectiveness	Description
4	Very effective	The payment system fully satisfies this criterion
3	Effective	The payment system mostly satisfies this criterion
2	Somewhat effective	The payment system partially satisfies this criterion
1	Not effective	The payment does not satisfy this criterion

The implementation of a cross-border FPS and CBDC for The Bahamas was then evaluated against the altered rubric twice: once against the criterion unweighted to provide a baseline, and then again with the weighted criterion[8]. The criteria were not ranked during the determination of the weights because multiple criteria can have the same level of importance to consumers and many of the criteria interrelate and/or may have trade-offs. This resulted in several of the criteria being weighted with the same level of importance. The weights were representative of the attributes considered most important

[8] The weights were assigned at the criterion level rather than the sub-criteria level, because the latter are all effectively dependent upon each other to enable the wider umbrella term. For example, interoperability, advanced disclosure, similar neighbouring payment systems, and currency conversion are all needed collectively to achieve cross-border functionality.

to the average user on a scale of 1 to 5, as consumers are assumed to choose the payment method that facilitates fast, convenient, and secure transactions (Banked Team, 2023).

Consumer preference was chosen because the implementation of a new system for cross-border payments would only be successful if widespread adoption is achieved, meaning a system built with users' interests in mind is critical. In the event that other countries conduct a similar assessment of possible payment systems, the reasoning for the weights assigned must be reflective of the goals of a new payment system. The Cross-Border Functionality was assigned a weight of 5, as the paper is first and foremost assessing each system's ability to be interlinked with similar systems residing in different jurisdictions. Safety and Security, Speed, and Cost were all assigned the greatest weight as the objective behind cross-border payment innovation is to provide cheaper, faster, and safer payment options to the public. Further, Bahamian businesses have been deterred by offering payment options that have security risks, high bank fees, and slow settlement speed (Central Bank of The Bahamas, 2021b). Moreover, local companies have iterated the need to address the high fees charged by financial institutions, fraud, the security of the technology, and convenience to improve the current state of digital payments domestically (Central Bank of The Bahamas, 2021b). Ubiquity was the final criterion allocated a weight of 5, as it encompasses consumer experience when utilizing a payment system by assessing the level of convenience, flexibility, dependability, and approachability offered. Efficiency was assigned a weight of 3 because the sub-criteria described affect consumers indirectly; for example, a greater level of competition offers a wider variety of products for lower costs, rather than directly during the payment process. The criterion Legislation and Governance were weighted by 2 and 1, respectively, because of the justification previously provided. Legislation was weighted more heavily than Governance because legislation dictates data privacy and consumer protection, which have been cited as issues of importance for the public but are more directly addressed in the Safety and Security criterion. Whilst both categories do impact consumers significantly, they are not the main concerns outlined by the public.

Once the scoring was complete, totals for the baseline and weighted results were collected, along with summary statistics. These scores, along with the justifications that accompanied them, were

then used to inform the recommendation of a payment system for cross-border payments to policymakers, regulators, and other relevant stakeholders.

Results

Scores were allocated to each payment system according to their performance across eight performance criteria with forty-three sub-criteria from the amended Federal Reserve Banks' (2016) Faster Payments Effectiveness Criteria. The baseline and weighted scores can be observed in Table 3.

Table 3

Baseline and Weighted Results

	Performance Criterion	Weights	CDBC	FPS	Weighted CBDC	Weighted FPS
Cross-border Functionality	Interoperability	5	3	4	15	20
	Advanced disclosure	5	2	2	10	10
	Neighbouring payment systems	5	3	4	15	20
	Currency conversion	5	4	4	20	20
Ubiquity	Accessibility	5	4	4	20	20
	Usability	5	2	2	10	10
	Predictability	5	2	3	10	15
	Contextual data capability	5	2	2	10	10
	Applicability to multiple use cases	5	4	3	20	15
Efficiency	Enables competition	3	4	4	12	12
	Implementation timeline	3	2	1	6	3
	Payment format standards	3	2	3	6	9
	Capability to enable value-added services	3	1	4	3	12
	Comprehensiveness	3	3	3	9	9
	Scalability and adaptability	3	2	4	6	12
	Exceptions and investigations process	3	2	2	6	6
Safety and Security	Risk management	5	2	3	10	15
	Payer authorization	5	4	4	20	20
	Payment finality	5	4	4	20	20

	Settlement approach	5	3	2	15	10
	Handling disputed payments	5	2	2	10	10
	Fraud information sharing	5	2	2	10	10
	Security controls	5	3	2	15	10
	Resiliency	5	2	3	10	15
	End-user data protection	5	3	3	15	15
	End-user/provider authentication	5	4	4	20	20
	Participation requirements	5	3	2	15	10
Speed	Fast approval	5	2	4	10	20
	Fast clearing	5	4	4	20	20
	Fast availability of good funds to payee	5	4	4	20	20
	Fast settlement among depository institutions and regulated non-bank account providers	5	1	3	5	15
	Prompt visibility of payment status	5	1	3	5	15
Legislation	Legal framework	2	2	2	4	4
	Payment system rules	2	3	2	6	4
	Consumer protections	2	2	2	4	4
	Data privacy	2	2	2	4	4
	Intellectual property	2	2	2	4	4
Governance	Effective governance	1	3	2	3	2
	Inclusive governance	1	3	4	3	4
Cost	Affordability	5	4	4	20	20
	Initial investment	5	3	2	15	10
	Operational expenses	5	4	2	20	10
	Responsibility	5	3	4	15	20
Total Score			**117**	**126**	**496**	**534**

Discussion

Cross-Border Functionality

While CBDCs and FPSs have both proved their capability in linking across jurisdictions, the implementation of cross-border FPSs is at a more advanced stage, when compared to the former. In fact, several successful experiments were conducted using a cross-border CBDC to facilitate international transactions.

For example, SWIFT began testing a beta version of its CBDC connector solution in 2023 through a collaboration with three central banks, who have integrated the solution with their infrastructure, and a plethora of financial institutions following the success of its first phase of sandbox experiments, and SWIFT has initiated a second phase (SWIFT, 2023). Further, Project Jura explored the direct transfer of euro and Swiss franc wholesale CBDCs between French and Swiss commercial banks on a single DLT platform operated by a third party (BIS, 2021). The successful test was a public-private endeavour involving the Banque de France, the BIS Innovation Hub Swiss Centre, the Swiss National Bank, and several private sector stakeholders, and was conducted in a near-real setting, using real-value transactions, and complied with the current regulatory requirements (BIS, 2021).

Another example is Project Cedar x Ubin+, a partnership between the Federal Reserve Bank of New York and the Monetary Authority of Singapore, which explored cross-border multi-currency transactions with DLT (NYIC & MAS, 2023). As of May 2023, the experiment demonstrated that DLT can enhance interoperability, enabling 30-second settlement in cross-border multi-currency payments while reducing settlement times and risk. A cross-border FPS was deemed to be very effective in this sub-criteria because not only have fruitful trials been investigating the feasibility of linking FPSs, but several cross-border FPS arrangements are fully operational and available to the public. For example, Thailand's PromptPay and Singapore's PayNow linkage enables instant, 24/7, low-cost mobile transfers between the countries via the recipient's phone number (World Economic Forum, 2023). Further, the

six major economies of the Association of Southeast Asian Nations (ASEAN)[9] have solidified bilateral agreements or memoranda of understanding that introduce QR code payment linkages with other member countries to support cross-border e-wallet payments (Yulius, et al., 2023). Both systems have demonstrated interoperability; however, domestic FPSs have been linked across borders and are being utilized by consumers today, while cross-border CBDCs are at a more nascent stage. Currency conversion was conducted very effectively in the examples previously provided.

Regarding the advanced disclosure of fees, exchange rates, other end-user costs, etc., there appears to be no clear approach for either system in providing consumers with this information before initiating a transaction. Advanced disclosure is required in adherence to consumer protection best practices, and therefore must be implemented in any cross-border payment infrastructure. Both systems were assessed to be somewhat effective in this category, as one or two of the items may be disclosed ahead of initiation, but it is unlikely that consumers will be provided with all the information as of now.

FPSs are also more prevalent among The Bahamas' close trading partners and regional neighbours. The Bahamas' main trading partners: the United States, China, and Spain all have endeavoured to introduce FPSs (BNSI, 2023). The United States recently announced a new system for instant payments in July 2023, called FedNow® (Board Of Governors of the Federal Reserve System, 2023). The Internet Banking Payment System is a real-time electronic fund transfer system that operates 24x7x365 and was developed by the People's Bank of China (World Bank, 2021a). Also noteworthy, China is the only other main trade partner with a CBDC that has undergone large-scale trials of the eCNY, or digital yuan, which could be linked, while Japan is still in the pilot phase of testing a CBDC[10]. Spain's FPS, Bizum, was a project taken on by the local banks in 2016 to provide simple, safe, and immediate payment services to customers (European Payments Council, 2020). Further, Canada intends to launch its Real-Time Rail system for fast digital payments as soon as 2026, with the clearing and

[9] The association is comprised of the following countries: Brunei Darussalam, Burma, Cambodia, Indonesia, Laos, Malaysia, The Philippines, Singapore, Thailand, and Vietnam. The six major economies mentioned are Indonesia, Malaysia, The Philippines, Singapore, Thailand, and Vietnam.

[10] The Bank of Japan completed their Proof of Concept Phase 2 in May 2023, which evaluated the processing performance and technical feasibility of additional functions of a CBDC to confirm technical issues in the possible event of social implementation. Additionally, the possibility of utilizing new technologies that had not been examined in Phase 1, such as data models and databases, were also evaluated. (BOJ, 2023).

settlement build taking place throughout 2024 (Montagner, 2024). Given that Canada has three large commercial banks in the Bahamas: Royal Bank of Canada, Scotiabank, and CIBC FirstCaribbean International Bank, even though the country is not the largest trading partner, it may be a more important jurisdiction to establish connections to its future FPS.

As a member state of The Caribbean Community (CARICOM), an intergovernmental organisation that is a political and economic union of 15 member states and five associated members throughout the Americas and the Atlantic Ocean, The Bahamas maintains a close relationship with the Caribbean region (CARICOM, 2024). The Eastern Caribbean Central Bank has piloted a CBDC, but that has been halted to transition to a more advanced and user-friendly version that will be released either in either 2025 or 2026 (DCash, 2024). Additionally, Jamaica introduced a CBDC referred to as JAM-DEX in 2022, to which the SandDollar could be linked. Barbados, Guyana, Trinidad & Tobago, and Suriname do not currently operate either payment system. Fast Payment Systems are slightly more prevalent among The Bahamas' trade partners and neighbours than CBDCs. It is also important to note that over 100 jurisdictions boast some version of a fast payments system, whereas there are only three countries that have fully launched a CBDC – The Bahamas, Jamaica, and Nigeria – and 36 ongoing pilots (Frost, et al., 2024; Atlantic Council, 2024). This indicates that it would be more fruitful to implement a cross-border FPS due to a higher number of similar systems currently available for interlinking. This can change over the course of the decade, however, as more than 40.0% of surveyed central banks plan to launch a CBDC by 2029 (OMFIF, 2023).

Ubiquity

Reaching ubiquity is a primary concern when introducing any new payment tool, system, and/or infrastructure, and often determines the success or downfall of such introductions. A payment service that is not used is not useful to the public. Both systems are fairly accessible, as they allow access without a traditional bank account or the ability to link a bank account to consumers. FPSs commonly allow users to sign up with just a name, email address, and/or phone number. In the case of the

SandDollar, users registering for a Tier 1 e-wallet[11] are not required to provide a government-issued identification. Both systems are often created with the intent to increase financial inclusion for the unbanked and under-banked populations and thus are built with fewer barriers to entry.

In terms of widespread adoption, FPSs have seen a higher level, both from countries' payment authorities and consumers. Further, the prevalence of FPSs would enable consumers to conduct transactions between more countries than with interlinked CBDCs. In this vein, FPSs were considered to be very effective regarding their accessibility, while CBDCs were determined to be effective in comparison. Currently, the SandDollar can only be accessed through a mobile phone with internet connectivity. This limits the usability of the payment solution, especially when cell service is not consistently provided across the islands at any given time. The CBDC's infrastructure could be updated to include multiple points of access for their users. Similarly, an FPS can be tailored to accommodate payments made through both a mobile and web-interface to allow customers to use the system on whatever device they choose. Payments could also be initiated through a PSP in person, which is already being done with the Bahamian CBDC. While there are limitations to the SandDollar's usability currently that could be addressed, and/or from which an FPS could learn, there is a wider issue of the country's inconsistent provision of electricity and cell service that must be addressed to make any system usable 24x7x365. Hence, the usability of both systems was considered to be somewhat effective.

The SandDollar is not currently standardized amongst the PSPs that distribute it, detracting from the system's predictability. The baseline features of sending and receiving SandDollars are maintained regardless of your provider, but the user interface can be entirely different depending upon the PSP selected, and this can be confusing and cumbersome for users. The lack of a standardized product fails to provide a straightforward and simple end-user experience. As each PSP has their own unique API (Application Programming Interface) with varying features and functions, it would be unlikely and expensive for these entities to adopt a uniform interface solely for the sake of facilitating SandDollar transactions, as it could potentially deter their existing customer-base. In the

[11] An individual's Tier 1 wallet has a $500 holding limit, a $1,500 monthly transaction limit, but cannot be linked to a bank account (SandDollar, 2024a).

implementation of an FPS, there is the benefit of learning from the difficulties posed by the lack of standardization of the CBDC. The Central Bank's commitment to payments modernization and financial inclusion indicates that the institution will be a key player in the implementation of an FPS, and therefore be able to offer key insights on the establishment of a new system. A singular platform with a straightforward user interface that accommodates individuals with disabilities, the elderly, and individuals with limited English proficiency, could be built for The Bahamas.

Both systems were considered to be somewhat effective in the contextual data capability sub-criteria, as the data being collected by the SandDollar is limited but transactions and their details are tracked, and a similar approach would likely be taken for an FPS. The information collected includes names, phone numbers, email addresses, and possibly a payment description, etc., and could be released depending on the use case. As financial inclusion was the impetus for the introduction of the CBDC, an FPS would certainly have a similar inspiration; thus, for both systems, there will likely be less information gathered in the underlying transactions. The CBDC is very effective in supporting multiple use cases, as the system has historically supported all kinds of transactions, such as person-to-person (P2P), business-to-business (B2B), person-to-business (P2B), and business-to-person (B2P) payments. These transactions are facilitated by the PSPs, recorded, reported, and monitored by the Central Bank. Any FPS implemented would likely be required to support the previously mentioned use cases, but as the SandDollar is already being used for these types of payments, the latter was deemed to be effective.

Efficiency

The pursuit of efficiency in payments safeguards the continued modernization of old and new systems alike to provide effective, competitive, and cutting-edge financial products. Fast Payment Systems promote competition among entities providing innovative payment products. The introduction of a cheaper, faster, and more accessible alternative to correspondent banking cross-border commerce would spur innovation in the digital payments space, similar to the rapid development of domestic payment systems since the introduction of FinTech. Moreover, FPSs nurture competition among PSPs, especially if the system is interoperable and enables consumers to transfer money across platforms with minimal to zero switching costs (World Bank, 2021c). In the wider financial market, FPSs heighten

competition among banks, reducing banks' market power, as they contribute to the growth of deposit markets and reduce the payment convenience gap between large and small banks (Sarkisyan, 2023). In the same vein, CBDCs can promote competition in e-payments, lessening the cost of fees for users (Lannquist & Tan, 2023). CBDCs also compete against other payment instruments, such as cash, commercial bank deposits, narrow finance solutions[12], and cryptocurrencies (Schwarz, 2023). As FPSs can increase competition provided that financial institutions, both banks and non-banks, can access the system's framework with relative ease, and so it was considered to be very effective. CBDCs also encourage competition and so, achieved an equal determination in this sub-criteria.

While neither system has an implementation timeline for a cross-border functionality feature, the SandDollar ecosystem is already live with the CBDC in circulation and is, therefore, one step ahead of any FPS that may be implemented in the future. The SandDollar ecosystem would need to be augmented to accommodate the inclusion of a cross-border payments capability, which would take less time and planning, versus building and rolling out an FPS, essentially from scratch, with the cross-border functionality embedded. The latter would be a much more time-intensive process, resulting in a longer implementation timeline.

Regarding the payment format standards, the SandDollar messaging standards would need to be updated from MT204 and MT205 to ISO 20022, which is currently considered to be the global standard for the exchange of electronic messages between financial institutions (World Bank, 2022). The new financial information standard offers standardized messages with the capacity to carry both structured and unstructured data. There is a deadline for financial systems globally to migrate to the updated standard. By November 2025, cross-border payments and reporting traffic must utilize the ISO 20022 format, and categories 1, 2, and 9 of MT messages will be retired (SWIFT, 2024). The Central Bank of The Bahamas, like many other countries' central banks, is in the process of updating the current state of payment format standards to meet SWIFT's deadline. The conversion, nevertheless, can be difficult, as SWIFT's MT and ISO 20022 are complex standards and the customizations that financial

[12]Narrow finance solutions can be defined as private money backed by central bank liabilities, either cash or reserves. Examples include stored value facilities such as AliPay and WeChat Pay (China), PayTM (India), and M-Pesa (Kenya).

systems have made to their MT formats to extend the messages, depending upon the market infrastructure or payment system being used, results in a higher level of difficulty in the process of migration (Gratacos & Revilla, 2021).

Currently, the CBDC is somewhat effective in delivering interoperability with current payment format standards and adaptability to future needs and standards, as it is in the process of migration to ISO 20022. As it is unlikely that an FPS would be launched before the deadline provided by SWIFT, due to the short timeframe, any new system can be released with the most up-to-date payment format standard rather than undertaking a tricky migration process. An FPS would therefore be effective in the payment format standards sub-criteria. While the Central Bank did allow PSPs to integrate with the SandDollar ecosystem, it is not within the Central Bank's jurisdiction to include value-added services for consumers. Such services include confirmation of payee, request-to-pay, proxy databases, payment debulking, payment file validation, and instalment payments for subscription use cases (Cosío, 2022). Any additional features have been spurred by the Central Bank, through the official SandDollar app, which then are adopted by PSPs' platforms. By contrast, value-added services are increasingly popular among FPSs and their providers, especially proxy databases to ease payment initiation and encourage adoption (Cosío, 2022). Further, the technology behind many Fast Payment Systems supports the creation and introduction of value-added functionalities and services to end users, which often stimulates adoption and regular usage of the system (World Bank, 2021c). Numerous value-added services can, however, contradict an easy-to-use and standardized interface, and compromise a system's ubiquity.

Both systems are effective in supporting all steps of the payment process[13] domestically and can either build on top of existing processes, as is the case with the SandDollar, or adapt such processes for a new system to facilitate cross-border payments.

A decision would have to be made by the governing bodies on how clearing and settlement would be executed: either via a single central bank, among multiple central banks, or by a commercial

[13] The payment process includes but is not limited to, initiation, payer authentication, approval by the payer's provider, clearing, receipt, settlement, and reconciliation.

bank; whether settlement will take place in a single currency or multiple; and if settlement would occur in real-time or in predefined intervals (World Bank, 2021c). Considerations for consumers' seasonal demand for cross-border payments, lessons from correspondent banking on whether multiple currencies would be needed for settlement, and the approach taken to interlink systems globally could inform these decisions.

The SandDollar's technical design has shown that it can support large amounts of traffic, facilitating upwards of 400,000 transactions per year for all use cases, including large-value transactions between businesses along with small-value between individuals and merchants. It remains to be seen, however, if the system could handle widespread use rivalling cash usage, and if it can swiftly adjust to ongoing environmental developments in the digital payments space. Since the SandDollar was the first CBDC to be launched, the system's adaptability can only be observed through some form of trial and error over time. Live FPSs around the world have demonstrated an ability to handle massive amounts of traffic, for example, Brazil's FPS 'Pix' facilitated 3.9 billion transactions valued at over USD 300 billion in the third quarter of 2023 illustrating the capability of such a system (Netto, et al., 2024).[14] The technical design of FPSs continues to be developed and open to augmentation, which can be seen with the continued creation of auxiliary services, such as proxy databases for created aliases, and the adoption of ISO 20022 to standardize messaging standards for cross-border payments. This signals a high level of adaptability with the system.

In regard to the exceptions and investigations process, both systems are evenly matched and somewhat effective. The SandDollar queries are submitted directly to the PSP, and may then be escalated to the Central Bank, but there are no formal exceptions and investigation process publicly outlined. Many FPSs follow a similar procedure, and so this item would need to be developed in the conception of a cross-border payments function to ensure consumer satisfaction and the success of such a system. The process would only increase in complexity when international transactions are taking

[14] The Central Bank of Brazil has mandated that all banks in Brazil must offer the Pix system, resulting in very high usage.

place, and the procedure must therefore be clearly outlined, with jurisdictions determined, as the system minimizes, identifies, investigates and resolves exceptions.

Safety and Security

Both the Bank of International Settlements and the World Bank have released in-depth publications proposing frameworks with rules, policies, and procedures outlined to address legal, credit, liquidity, operational, and other risks across the end-to-end payments process for FPSs. CPMI (2023) released a consultative report that outlined ten initial considerations for governance and oversight of interlinked FPSs, along with some additional material for overseers. The report shared valuable insights on strategic alignment, objective and vision, design interdependencies, flexibility and scalability, business viability, stakeholder involvement, proportionate oversight, oversight expectations, oversight cooperation, and the interaction between governance and oversight. The World Bank (2021c) stated that some system operators have adopted an enterprise-wide risk-management framework to manage all identified risks, whereas others have opted to build their risk-management framework based on payment system-specific risks. The document provides insight into risk in the following areas: credit and liquidity, operational risk, compliance with AML and CFT guidelines, and designating fast payment arrangements as systemically important payment systems (World Bank, 2021c). Further, a white paper on Singapore's PayNow and Thailand's PromptPay linkage underlined technical, operational, commercial, and governance issues addressed by the participants in the PayNow-PromptPay (PPPN) linkage, including in the areas of anti-money laundering, sanctions screening, data usage, and redundancy practices. This was released to better aid countries in their pursuit of actualizing the future of cross-border payments (MAS & BOT, 2022). Seeing as there is guidance available from reputable multilateral institutions, as well as from real-world applications of the system, a well-constructed FPS can be considered effective in risk management.

CBDCs have received similar attention from the Bank of International Settlements, providing governments with considerations for the implementation of cross-border links (CPMI, 2022b; BIS Consultative Group on Risk Management, 2023). Unfortunately, CBDCs lack any live cross-border use cases that present a tested risk management framework, resulting in a somewhat effective designation

for the CBDC payment system in Table 2. Both systems have been very effective domestically and internationally regarding payment authorisation and finality. This can be observed in Singapore's PayNow and Thailand's PromptPay FPS linkage, as well as in Project Jura, Project Cedar x Ubin+, SWIFT's sandbox testing of wholesale CBDCs, and several other successful cross-border transactions experiments for both systems. Central Bank Digital Currencies have an advantage in determining a settlement approach for international payments, as it is likely that either the Central Bank itself would settle the payments or establish a designated settlement agent for banks and non-bank financial institutions.

Currently, SandDollar transactions are settled by the Central Bank of The Bahamas, which ensures the SandDollar is interoperable with the legacy Real-Time Gross Settlement (RTGS) and Automated Clearing House (ACH) systems. As a strong framework for settlement is already established for domestic payments, it would only be a matter of adding a layer of infrastructure for cross-border CBDC payments, which could come in the form of a bilateral link, or via a node connecting the domestic system to a global hub with its settlement agent (as proposed in Project Nexus), etc. While a decision has yet to be made on how cross-border SandDollar transactions are to be settled, the domestic framework is a solid base to build upon and could be maintained in some form in the launch of a cross-border function. As demand for cross-border CBDCs builds, the Central Bank could consider augmenting the settlement approach as previously mentioned. FPSs have similar options when considering a settlement approach, and can choose either the Central Bank, independent settlement agents, or an international hub to settle transactions conducted in the system. Since the system has not been yet constructed, there has been no decision on the settlement process for even domestic payments, much less for an internationally linked system. This places an FPS at a comparatively nascent stage.

SandDollar users today can submit complaints to their PSP concerning any unauthorized, fraudulent, erroneous, or otherwise disputed payments, which then must be reported to the Central Bank. Typically, PSPs should handle any complaints autonomously but where there is some concern regarding the resolution process, complaints may be escalated to the SandDollar team or the Financial

Services Ombudsman at the Central Bank of The Bahamas for assistance in resolution. At this present time, there are no specific rules or processes regarding disputed digital payments, the appropriate allocation of liability among, or the substantive liability limits for, all parties involved in the payment. Any proposed FPS can easily adopt a similar procedure, but it is only somewhat effective in addressing disputed payments, as the approach is far from comprehensive.

Transactions made with the CBDC in the domestic market are monitored for any fraudulent activity, both by the PSPs and the Central Bank, via monthly reports and submissions of customer complaints. Fraud information sharing takes place between these entities and would have to be maintained in an international market per global standards. FPS systems abroad collect and share similar information in regard to fraud to manage, monitor, and mitigate fraud along with any other evolving threats, so The Bahamas' FPS would likely be no different. For both systems, it could become exponentially more difficult to ensure that a high standard is maintained as foreign systems are interlinked. As it is probable that the Central Bank would play a significant role in the establishment of an FPS, fraud information sharing between the aforementioned entities would lean toward adopting similar processes, with like concerns in the face of international payments.

The domestic CBDC payment system is secure[15], having been equipped with multi-factored authentication, high-level encryption protocols, and enhanced KYC/AML standards (SandDollar, 2024b). While the national framework is effective in ensuring security, the risks that accompany linked systems have yet to be addressed and a risk management framework would need to be developed. FPSs typically boast a comparable level of security, including strong data encryptions and a vetting process for users, and so would be in a similar position as the SandDollar once launched.

On the other hand, fast payment processing makes it more challenging to detect financial crimes and would require in-depth and objective research before the construction of a carefully

[15] A SandDollar wallet can only be configured once multiple credentials have been authenticated; users are required to supply two passwords, one randomly generated, to authorize certain transactions. Further, all financial institutions providing SandDollar services, including the Central Bank of The Bahamas, are required to undergo a rigorous independent cybersecurity assessments to ensure that international standards are met (SandDollar, 2024b).

considered and comprehensive plan for implementation (World Bank, 2021c; PwC, 2024). Considering the low adoption rate of 0.4% as of June 2024[16], it has yet to be determined if the SandDollar system possesses mechanisms and systems to ensure high levels of end-to-end availability and reliability under normal and stressed operating conditions domestically, much less when international payments are then introduced. Alternatively, there is the advantage of being able to exhaustively stress-test an FPS preceding an official launch and therefore ensure a high degree of resiliency in the system.

SandDollar transactions effectively protect users' data with end-to-end encryption[17], and this technology could be easily adapted for an FPS. The level of end-user data protection would depend upon linked systems' consumer protection and data privacy requirements in the case of cross-border payments, which adds another layer of complexity for either payment system. In both cases, if systems are interlinked via a centralized hub, the domestic system would simply have to meet the standardized participant requirements, whereas bilateral links would require an agreed-upon threshold for data protection.

Robust identification and verification for enrolling and transacting in CBDC transactions is required, as previously mentioned, and this technology can be assumed for an FPS to ensure ample end-user/provider authentication. The Central Bank of The Bahamas has already established a regulatory framework that monitors compliance with mandatory transparency requirements to which PSPs must adhere if they wish to provide the CBDC, but they may need to be amended depending upon any agreement made with foreign jurisdictions. The participation requirements for an FPS may look markedly different, depending upon who owns, operates, and oversees the system, as well as how the system is linked overseas. Whilst a number of the participation requirements, specifically regarding security measures, AML and CFT international standards, and messaging formats, may be extracted

[16] Adoption rate represents the number of SandDollars in circulation as a percentage of total currency in circulation.
[17] SandDollar wallet owners can view their full transaction history, but back-office operators are blind to transaction details (SandDollar, 2021).

from the already employed SandDollar participant requirements, many areas would need to be tailored precisely to the FPS.

Speed

Speed is a key component for consumers in any new payment system, considering the lag observed in the correspondent banking system, and both systems deliver in this area. In BIS's mCBDC pilot scheme referred to as Project mBridge, an experiment demonstrated that cross-border transactions could be made in a few seconds, as opposed to the three to five days observed in correspondent banking, because CBDCs can circumvent the complicated web of CBRs (John, 2021). Correspondingly, due to the 24/7 nature of FPSs, interlinking arrangements enable cross-border payments to reach recipients in a matter of minutes[18] regardless of the time of day (Herrera-Harrington, et al., 2024). SandDollar transactions over a pre-established threshold require manual approval within the Central Bank, delaying large-value transactions, while transactions under the threshold follow straight-through processing (STP). The establishment of an FPS would require 24/7/365 operation, which would translate to real-time approvals for users. Both FPSs and CBDCs have proven to be very effective in fast clearing and fast availability of Good Funds to the payee.

As FPSs operate in real-time, cross-border payments are processed as they are initiated, regardless of time zones and business hours (World Bank, 2021b). The domestic SandDollar payment system functions similarly once the payment is approved, and that could be maintained in a linked system. While settlement amongst PSPs is conducted in real-time for transactions conducted in SandDollars, settlements amongst depository institutions[19] are quite slow, typically taking one business day to settle due to the Automated Clearing House (ACH). This issue can be remedied with the introduction of an FPS, as it can be mandated that large commercial banks[20] participate in the system, resulting in fast settlement amongst depository institutions for users. A mandate hypothetically could

[18] Observed in the linkage between Singapore's PayNow and Thailand's PromptPay FPSs (World Economic Forum, 2023).
[19] I.e. transactions between SandDollar accounts and commercial bank accounts.
[20] Banco Central do Brasil mandated large commercial banks' participation in Pix when the system was introduced (Frost, et al., 2024).

be issued for commercial banks' adoption of the SandDollar system, but considering the lack of enthusiasm towards onboarding from financial institutions over the past four years since the CBDC's launch in 2020 (only one authorized financial institution has come on board), a directive may not be appreciated or welcomed.

Legislation

The Payment Systems Act, 2012 governs e-money in addition to fiat currency, but would likely require an amendment in the implementation of any new payment system equipped with cross-border functionality. If an amendment turns out to be insufficient in the effort to holistically govern the new payment system, a new Act would need to be created to govern operations and impose any compliance obligations. Since the SandDollar environment is already live, it has the requirements, standards, protocols, and procedures that govern the rights and obligations of all end-users, providers, payers, and payees outlined in the payment systems rules. Similar to previous points, the rules would require augmentation to include cross-border functionality, but otherwise, the payment systems rules are already established. On the other hand, the payment system rules of an FPS have yet to be defined, but can be formed based on lessons learned from the CBDC, consultation with key stakeholders as well as the public, and knowledge based on published papers by experts in the field, e.g. BIS and World Bank.

Concerning consumer protection, both systems would fall under the Consumer Protection Act, 2006. The legislation, while it makes provisions for the greater protection of consumers and established a Consumer Protection Commission, is two decades old and may not comprehensively protect consumers in today's digitalized world. Bahamian regulators have made a similar realization, and have drafted modernized guidelines for the Bahamian market. The Consumer Protection Bill, 2023 has recently been proposed by the government to enact amendments that drive healthy competition, protect consumers, and promote customer satisfaction. The Utilities Regulation and Competition Authority (URCA) also published a consultation document containing revisions to the consumer protection regulations for the electronic communications sector to make necessary updates, clarify ambiguous parts of the regulations, and issue new measures in areas where consumers were not protected (McKenzie, 2023; URCA, 2023). These anticipated regulations will strengthen the present legal

framework, and implement procedures that allocate legal responsibility, allocate financial responsibility, and support error resolution for payments.

It is a parallel case for data privacy. The Data Protection (Privacy of Personal Information) Act, 2003 governs the protection of the privacy of individuals' data and regulates the collection, processing, keeping, use, and disclosure of persons' information. However, this also needs to be updated to sufficiently protect consumers in today's digitized society, especially in the case of cross-border payments.

Further, the Office of the Attorney General released a public consultation document on a framework to enhance intellectual property protection to incentivize those with innovations to obtain intellectual property protections for their creations and allow for the negotiation of contracts with international distribution platforms (Office of the Prime Minister, 2023). The prospective legislation is consistent with current international best practices that establish an efficient process for international and domestic protection of IP assets and creations and will provide protections for copyright, geographical indicators, integrated circuits, patents, trademarks, and new plant varieties (Office of the Prime Minister, 2023). In the coming years, before the introduction of a cross-border CBDC or FPS, The Bahamas must make progress on the necessary refurbishing of past legislation required for an innovative globalized digital payment system, or at the very least be better equipped for one.

Governance

The SandDollar system's governance arrangements have already been outlined and established since its launch, with the Central Bank taking on both an operator and a regulatory role to ensure efficient decision and rulemaking, and has determined clear lines of responsibility for all decision-makers. The current governance arrangements, as previously asserted, would require augmentation in the face of new cross-border linkages, as the Central Bank of The Bahamas would no longer be the sole governing body for the system. In the process of creating an FPS, governance arrangements would need to be considered, in consultation with various stakeholders, and clearly outlined upon the launch of the system. The Central Bank of The Bahamas will likely be the primary regulator for domestic payments

but would have to work in tandem with other international entities, e.g. clearing houses, settlement agents, and foreign regulators, to wholly oversee cross-border payments. Extensive reports on considerations for the governance of cross-border payments exist for both payment systems and can assist governmental and quasi-governmental agencies in the process of crafting effective governance arrangements (CPMI, 2023; World Bank, 2021c; MAS & BOT, 2022; UDPN, 2022).

There was an effort towards ensuring inclusive governance of the SandDollar system, as proposed legislation for the regulation of the provision and use of Central Bank-issued Electronic Bahamian Dollars was released for public consultation (Central Bank of The Bahamas, 2021a). Key stakeholders' feedback was also considered in the creation of the CBDC, such as the Central Bank, the general public via a pilot CBDC launched in Exuma, PSPs and MTBs (Money Transmission Businesses) during the process of integrating the SandDollar environment into their respective API, the public sector, and merchants. Commercial banks were not included on the list of key stakeholders, though they were consulted before the launch. Only one authorized financial system has been successfully onboarded despite the Central Bank's consistent urging. The SandDollar system, however, has been developed to allow all wallet holders to top-up their holdings from commercial bank accounts via online banking domestic transfers, in addition to enabling SandDollars to be exchanged back into fiat currency, illustrating some interest from and inclusion of the commercial banks. Therefore, mandating the participation of large financial institutions appears to be critical in ensuring the success of an FPS, as public ownership by itself may not be enough to foster end-user adoption, and large banks may have insufficient incentives to join a public FPS (Frost, et al., 2024). This was the tactic of the Brazilian central bank in its launch of Pix, which has become widely adopted. The FPS boasts the advantage of learning from the CBDC's missteps and can guarantee that a high level of input and representation from diverse stakeholders is gathered to create a system that supports the public interest. A similar consultation document presenting plans for an FPS's legislative framework can be circulated, in addition to a working group or committee that represents all stakeholders, including end-users, operators, providers, and regulators, to facilitate fully inclusive governance.

Cost

The cost of any new system is critical in the decision-making process for policymakers, regulators, and agents in the economy. A primary driver of innovation in the cross-border payments sphere is to provide end-users with greater savings than they are currently earning in the correspondent banking model, and both systems are very effective in delivering significant savings to consumers. In India, commercial banks are the most expensive cross-border remittance provider, costing consumers an average of 11.5% of a transaction each time, whereas the e-rupee, India's CBDC, can reduce the cost to a range of 2.0% – 3.0 % of a transaction (OPUS, 2024; Dalmia, 2024). Likewise, significantly lower fees are observed in the ASEAN cross-border FPS; the fixed cost per transaction is currently THB 150 (approximately 4 USD) in Thailand and there is only a small foreign exchange mark-up defined by the participating bank issuing the transfer in Singapore (World Economic Forum, 2023).

The initial investment towards building an FPS with cross-border functionality would be significantly costlier than investing in an additional layer to the CBDC framework to interlink with foreign jurisdictions because the domestic system would have to be built along with any technology needed to interlink the system across borders. To give additional context, the United Kingdom executed its Faster Payments Service at a cost of less than £200 million (307 million USD) over seven years, plus investment costs borne by each participating bank (Greene, et al., 2014). It should be noted, however, that the technological infrastructure developed for the SandDollar ecosystem can also serve as a basis for an FPS, diminishing a portion of the time and capital allocation required for building a system from scratch. The SandDollar system would need to be updated to facilitate any type of linkage, which would incur a significant cost as well, albeit less so.

An advantage of The Bahamas' CBDC is that operational costs are relatively low, especially in comparison to an FPS. Once the SandDollar ecosystem technological infrastructure was built, overhead costs were minimal, especially because all of the transaction process is automated for payments below a certain threshold. Aside from the initial investment into interlinking the system, low operating costs for an FPS could be kept consistent. Theoretically, labour costs would be significantly higher due to the 24/7/365 nature of an FPS, as the system would require operators, support staff, maintenance staff, etc.

to always be present. If the FPS achieves widespread adoption, the heavy traffic will likely further result in higher upkeep costs. It is a cause for concern that these operational costs will be passed onto users, reducing the comparative savings earned from switching from correspondent banking to the FPS. Over 90.0% of correspondent banking costs are suffered in banks' efforts to manage counter-party bank relationships, rather than from using or maintaining the technological framework (Denecker, et al., 2016). For both of the systems, the payment system itself would be interlinked, rather than individual relationships between financial institutions, therefore mitigating relationship-based costs.

Finally, the implementation of the CBDC prioritized collaboration to a degree but did not share the cost burden for the most part. PSPs faced an adoption cost when integrating the SandDollar framework into their APIs, but it appears that the Central Bank of The Bahamas bore the brunt of the development costs. The SandDollar was treated essentially as a public good[21] since its creation was spurred by the need to improve financial inclusion in the formal financial market and was therefore provided to the public by a quasi-governmental body, but this may have impeded crafting a truly competitive and efficient product for consumers as indicated by the low adoption rate. The development of an FPS still has the opportunity to be formed by a public and private sector agreement, as the system could allow for commercial banks to compete with PSPs and MTBs in the remittance market, to capture a larger share of the population rather than embarking on another regulator-led initiative. A participation mandate would guarantee private buy-in and cost-sharing from the banks, as well. Historically, government-led FPSs do not appear to have been more successful than privately run systems in terms of adoption. In addition, FPSs with some level of government involvement have seen an increase in users for countries where digital payments use, i.e. debit and credit card use, was already prevalent and was mounting at the time of the new system's inauguration (Suominen, 2024). The cost of building and maintaining a cross-border FPS could then be shared between the public and private sectors, along with minimal fee charges to users, to form a highly efficient and cost-effective system that would benefit all

[21] Payment systems tend to have the characteristics of a public good because the use is non-rival and non-excludable (Den Butter & Mallekoote, 2018). A good is non-excludable if one's consumption of it cannot practically be excluded; a good is non-rival if one's consumption does not reduce the benefits of another's consumption of the good, for example, street lighting (Deneulin & Townsend, 2007).

stakeholders. The ratio of who pays for what, and how much, will be decided in the cost-determination process dependent upon how much the Central Bank is willing to cover.

Limitations, Considerations, and Future Studies

There are, however, limitations to the decision-making process illustrated in this paper. Whilst each score was justified either through past literature from experts in the field, consultation with operators of the CBDC system, and/or logical reasoning, the scoring still only reflects the scope of the authors' knowledge. Further, cross-border FPSs and CBDCs were compared at a high level, as no decision has been made on how either system would be linked with other jurisdictions nor the actual costs of developing and implementing the cross-border payment capacity. This results in a less precise comparison of the systems, as different methods of interlinkage boast varying levels of complexity, risk, and cost, along with other important criteria. Comparing a hub-and-spoke modelled FPS with a bilaterally linked CBDC may bear diverse results to those reported in this study, but would be more useful for decision-makers.

This assessment would be better honed following an in-depth exploration of each proposed system to determine the preferred means of interlinking. Moreover, the motivation behind weighting the criteria will depend upon the goal of the new payment system's implementation and is therefore subjective. Whilst the weights were reasonably assigned with consumer preferences in mind, they may not be the perfect representation of every consumer's values as they can differ throughout the population depending upon factors like age, gender, level of financial education, income, and personal experiences with the financial system. Finally, the Federal Reserve Banks (2016) acknowledged that each criterion was developed to stand alone, foregoing the consideration of the interrelationships and/or trade-offs that exist, but the balance of trade-offs is better captured through a qualitative evaluation of the scores.

It should considered whether a global network of interlinked FPSs will one day face the same de-risking and AML/CFT challenges as correspondent banking, depending upon whether the same institutions being used for settlement in the current model will continue to be used for fast payment settlement. Future studies can explore the future risks of interlinked FPSs, as well as CBDCs, to

determine which system is safer for consumers, financial institutions, regulators, governments, etc. It was not included in the criteria examined in this paper but financial education and literacy may affect the plausibility of a FPS or a CBDC for cross-border use, as it is a determinant of adoption, but it may play a significant role in the success of a new payment system, and could be included in any future analysis. Key stakeholders undergoing a similar decision-making process would need to include the actual costs, timelines, and interlinking method to make a concrete decision. Further, a subsequent exploration should also consist of input from officials of close trading partner countries and relevant multilateral institutions (like the Bank for International Settlements) to determine feasibility. Finally, the issues that CDBCs currently face regarding cross-border payments could potentially be addressed through innovation and public policies or initiatives geared towards financial education, especially regarding digital payments and online banking, which may make the system a more attractive option in the future for The Bahamas. The results achieved in this exploration are not static, and this evaluation may be undertaken by countries several times to incorporate any new developments in the global payments sector and/or consider any new payments systems that have yet to reveal themselves.

Recommendation

Other central banks, governments, financial institutions, and/or independent entities that may choose to adopt this modified version of the Faster Payments Effectiveness Criteria (Federal Reserve Banks, 2016) designed for The Bahamas, with a focus on cross-border payments, are recommended to retrieve scores from key stakeholders[22] to achieve a more comprehensive assessment (if one payment system is being considered), or comparison (if more than one payment system is being evaluated) on how the proposed payment system(s) may enhance or replace their legacy framework. The assessment criteria have the strength of flexibility and can be further altered to better reflect the requirements of a new system by decision-makers. Additionally, the weights can be adjusted depending on the priorities and goals of the national payment system or waived entirely.

[22] Such as IT developers, policymakers, regulators, financial institutions, the public, etc.

Despite each system demonstrating strong potential for growth in the Bahamian payments infrastructure if implemented, a Fast Payments System equipped with a cross-border functionality ultimately superseded a cross-border Central Bank Digital Currency when evaluated with this paper's methodology. The major drawback of an FPS is the ample amount of initial resources, such as capital, labour, etc., needed to construct such a system, but the investment appears to be well worth it considering the ongoing low operating costs and high global adoption rates observed so far. Preference for FPSs can be seen in the sheer number of countries embracing a similar system domestically, as well as the high rates of adoption amongst consumers, observed in Brazil with 74.0% for Pix, Australia with 50.0% for New Payments Platform, and Thailand with 90.0% for PromptPay (CSIS, 2024). However, it is imperative to note that it may not just be a case of preference; key factors affecting system adoption include the payments demographics of a country (the concentration of commercial banks compared to the concentration of PSPs, size of the mobile/digital payments market, and the consumer preference profile of the population, etc.), and the country's political landscape (goals of an administration, the government's relationship with the financial sector, and a change in leadership, etc.). The international progression towards ISO 20022 messaging standards is also not a coincidence, as it is now well-known that interlinking FPSs is easier with standardized messaging formats.

Based on the scoring method and the corresponding justifications provided beforehand, the adoption of an FPS is recommended for The Bahamian financial system's new frontier: cross-border payments.

Conclusion

Motivated by the costly, opaque, and slow cross-border payments touted by today's correspondent banking model, this paper assessed the suitability of a cross-border FPS versus a cross-border CBDC for The Bahamas, against an adapted version of the Faster Payments Effectiveness Criteria (Federal Reserve Banks, 2016) in the following categories: cross-border functionality, ubiquity, safety and security, speed, legislation, governance and cost. A weighted score based on assumed consumer preferences in payments was determined for each system, in addition to a baseline score. An interlinked FPS scored higher than its competitor in both the unweighted and weighted scenarios due to its strong performance in the efficiency, cross-border functionality, speed, and ubiquity categories. Based on the in-depth comparison undertaken in this paper and the judgment of the authors, it is recommended that the relevant decision-makers construct a Fast Payments System that can be interlinked with similar systems in foreign jurisdictions, to provide more affordable and accessible cross-border financial services for consumers.

This paper recommends that decision-makers within the Central Bank, government and financial institutions introduce a public-private FPS created with up-to-date messaging standards to allow for interlinking across jurisdictions for The Bahamas. A participation mandate would ensure buy-in from the major commercial banks and benefit from the safety and stability promised by the presence of the Central Bank, both of which would foster adoption. Of note, 94.3% of survey respondents had access to some form of deposit facility in The Bahamas Consumer Payments Survey, illustrating the importance of commercial banks' adoption of an FPS, not solely PSPs (Central Bank of The Bahamas, 2021c). The inclusion of non-bank providers should also be prioritised to improve access for underserved customers, as non-bank PSP participation is associated with an increase of 3.5% in the number of FPS transactions per capita (Frost, et al., 2024). Even though it was not discussed in this paper, the integration of the SandDollar into an FPS could result in the best of both worlds, as it could foster adoption for the CBDC and ensure access to the FPS for the financially excluded population. The construction of the system must be carefully timed, as a reconstruction of the legislative framework where practices surrounding consumer protection, data privacy, and relevant payment systems

legislation are updated, is needed prior to the launch to encourage participation from private sector banks. International transactions can be facilitated with a small fee, to recover a portion of the initial investment, but the fee structure would ultimately be decided by the creators, operators, and regulators of the system to ensure that it remains a cheaper alternative to correspondent banking. What needs to be considered first and foremost, is that there proves to be little benefits to implementing a new cross-border payment system that has few countries to interlink with, and fails to be used by the public.

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Appendix A: Amended Faster Payments Effectiveness Criteria for The Bahamas

Performance Criterion		
Criterion	**Sub-criteria**	**Definition**
Cross-border Functionality	Interoperability	Allows for interoperability with similar payment systems in other countries
	Advanced disclosure	Providers are required to make advance disclosure, both prior to and at the time of the Payer initiating the payment, of fees, exchange rates, and other end-user costs, in tandem with the timing of Good Funds availability, and any risks with the payment
	Neighbouring payment systems	Countries who foster close ties with The Bahamas, trade-wise and geographically, have already implemented a similar payment system
	Currency conversion	Allows conversion from one currency to another as necessary for cross-border payments
Ubiquity	Accessibility	Enables any Entity to initiate and/or receive payments to/from any Entity consistent with applicable legal restrictions
	Usability	Provides a straightforward and simple End-User experience and be available anytime, anywhere, any way, using a variety of access points
	Predictability	Has a reliable and standard End-User experience for its baseline features, which are provided consistently, regardless of the End User's choice of channel, form factor, or Provider(s)
	Contextual data capability	Supports the transfer or association of relevant information needed by End Users. Contextual Data, depending on the use case, may include biller reconciliation information, extended remittance information, Payer and Payee names and locations (as recognized by other parties to the transaction), tax payment information, information to facilitate investigations of possible Fraud or error, loyalty/rewards information, and/or a short message to accompany payments
	Applicability to multiple use cases	Supports payments in multiple use cases (P2P, B2B, P2B, and B2P)
Efficiency	Enables competition	Allows Providers to compete with each other to offer services

	Implementation timeline	Demonstrates a credible plan by explaining how implementation of Cross-Border Functionality will be funded, what implementation and ubiquity hurdles might arise, what plans exist to overcome the hurdles, which Entities expect to adopt the system, what market share and growth projections are used, and how the projected timelines compare to similar historical examples
	Payment format standards	Interoperable with current payment format standards (e.g., ISO 20022) and adaptable to future needs and standards
	Capability to enable value-added services	Enables Providers to offer additional services beyond the Solution's defined baseline features, i.e. Providers can integrate with the Solution using open and accessible standards to offer value-added services to any Entity
	Comprehensiveness	Supports all steps of the payment process including but not limited to, Initiation, Payer Authentication, Approval by the Payer's Provider, Clearing, receipt, Settlement, and reconciliation
	Scalability and adaptability	Technical design readily supports projected transaction volumes, values, and use cases (scalability); The technical design is able to readily adjust to ongoing environmental developments (adaptability)
	Exceptions and investigations process	Provides End Users, Providers, and any other relevant parties with tools and protocols to minimize, identify, investigate and resolve exceptions
Safety and Security	Risk management	The system has a Framework with rules, policies, and procedures outlined to address (identify, measure, monitor, and minimize) legal, credit, liquidity, operational, and other risks across the end-to-end payments process
	Payer authorization	Requires payments to be initiated only with the explicit and informed consent of the Payer to the Payer's bank or non-bank financial institution
	Payment finality	Defines a point in time after which a payment is irrevocable
	Settlement approach	Determines when and how banks and non-bank FIs settle their obligations between each other, and the mechanisms to pro-actively manage any related credit and liquidity risks

	Handling disputed payments	Has rules, processes and timeframes for effectively addressing unauthorized, Fraudulent, erroneous, or otherwise disputed payments, and, for each of these, have an appropriate allocation of liability among, and substantive liability limits for, all Parties, including the Payer, the Payee, and the Providers involved in the payment
	Fraud information sharing	Requires and facilitates timely and frequent sharing of information among all Providers, operators and regulators to help them manage, monitor, and mitigate fraud and evolving threats in accordance with applicable law
	Security controls	Has layered and robust technical, access, operational, procedural, and managerial controls to address and foster security, including but not limited to the integrity and protection of confidential, private, and sensitive data
	Resiliency	Possesses mechanisms and systems to ensure high levels of end-to-end availability and reliability under normal and stressed operating conditions.
	End-user data protection	Has controls and mechanisms to prevent the unintended exposure of End-User data
	End-user/provider authentication	Require robust identification and verification for enrolling and transacting with End Users and Providers
	Participation requirements	Establishes and monitors compliance with transparent requisites that Providers must adhere to on an ongoing basis as appropriate
Speed	Fast approval	Requires and enables the Payer's Depository Institution or Regulated Non-bank Account Provider to assure Good Funds for each payment in a timely manner
	Fast clearing	Requires and enables the Payer's and Payee's Depository Institution or Regulated Non-bank Account Provider to exchange payment information in a timely manner
	Fast availability of Good Funds to payee	Requires and enables funds and contextual data to be received by the Payee, such that the funds can be withdrawn or transferred in a timely manner
	Fast settlement among depository institutions and regulated non-bank account providers	Requires and enables obligations between the Payer's and Payee's Depository Institution or Regulated

		Non-bank Account Provider to be discharged in a timely manner
	Prompt visibility of payment status	Enable mechanisms by which both the payment status Payer and the Payee can track the payment at various stages of the end-to-end payment process in a timely manner
Legislation	Legal framework	Describes the legal sources which will govern the operation of the payment system and/or impose any compliance obligations, and describe any contemplated changes or additions to existing laws necessary to support the system
	Payment system rules	Has requirements, standards/protocols and procedures that govern the rights and obligations of all End Users, Providers, Payers and Payees
	Consumer protections	Has a Legal Framework and procedures that allocate legal responsibility, allocate financial responsibility and support error resolution for payments made to or from natural persons for personal, family, or household purposes
	Data privacy	Has an approach to identify whether and how payment and related information can be collected and disclosed, consistent with applicable policy, law, and End-User preference, and how to secure information that should not be disclosed
	Intellectual property	Has an approach to address any risks arising from third-party rights related to patents, trademarks, copyrights, and trade secrets
Governance	Effective governance	The system's governance arrangements, e.g. policies and structure, ensures efficient decision making and rule making, including establishing clear lines of responsibility for all decision makers or decision-making bodies.
	Inclusive governance	Allows for input and representation from diverse stakeholders, such as End Users, operators, Providers, and regulators, and supports the public interest
Cost	Affordability	Enables cross-border payments for consumers at a significantly lower cost in comparison to correspondent banking's fees

	Initial investment	The initial investment made by stakeholders (including research and development, the building of infrastructure, any modernization of the current system that must occur, etc.) in implementing the payment system is relatively low
	Operational expenses	Boasts minimal to zero operating costs, e.g. rent, equipment, inventory costs, marketing, payroll, and insurance, once implemented
	Responsibility	Implementation of the payment system prioritizes collaboration, and the sharing of costs, between the public and private sectors to create a competitive and efficient product for consumers

Appendix B: Summary Statistics

	CDBC	FPS	Weighted CBDC	Weighted FPS
Mean	2.67	2.95	11.35	12.53
Standard Error	0.14	0.14	0.90	0.91
Median	3	3	10	12
Mode	2	4	15	20
Standard Deviation	0.89	0.92	5.92	5.94
Range	3	3	17	18
Minimum	1	1	3	2
Maximum	4	4	20	20
Sum	115	127	488	539
Count	43	43	43	43