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FINANCIAL TECHNOLOGY AND DIGITAL PAYMENTS

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Original Article

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Abstract

The study explores the potential that blockchain technology holds for the FinTech space and gives a detailed examination of how blockchain is transforming the digital payment landscape, that of cross-border digital payments. With digital payments gaining traction globally, blockchain has grown to be one of the buzzwords talked about which can offer solutions to the inefficiencies inherent in cross-border transaction systems.

The global value of the FinTech market stands at USD 340 billion and is anticipated to hit a value of USD 1,126.64 billion by 2032 (CAGR: 16.2%) and the value of digital payments is expected to reach USD 361.3 billion by 2030 (CAGR: 21.4%). Firms connected to blockchain are expected to grow to USD 393.42 billion in 2032 from USD 20.16 billion, with the market's CAGR at 43.6% with growing relevance in financial services.

This study follows a qualitative comparative approach grounded in secondary data analysis by introducing the Institutional Payment Efficiency Framework (IPEF) – a structured evaluation built upon the four core dimensions: settlement speed, cost efficiency, transparency and traceability, and liquidity and intermediation structure. A review of the publicly available institutional reports, investor disclosures, industry white papers and peer-reviewed literature of the three institutional blockchain implementations (JPMorgan Chase's Kinexys, the One Pay FX system from Banco Santander and Visa B2B Connect) examined in the study was conducted between 2018 and 2025. Note that the data presented here in relation to performance (such as settlement time, cost savings, number of transactions) comes from institutions' disclosures and from a range of secondary sources as against independent primary data collection. Under these conditions, the comparative analysis is said to show that settlement time can be cut by more than 90%, transaction costs by 30-80% and that unconventional settlement steps are avoided in comparison to legacy SWIFT or correspondent banking systems.

This study also provides conceptual inputs for financial institutions, fintech and policymakers, highlighting elements for the implementation of blockchain and working out regulatory aspects of digital currencies and cross-border transactions. From a theoretical perspective, it can contribute to the understanding of blockchain as a potential paradigm change in the field of financial intermediation. The study's unique angle is that it performs a secondary analysis of blockchain against conventional payment platforms, instead of just cryptocurrency applications, at the institutional level.

Keywords: Blockchain Technology; Cross-Border Transactions; Digital Payments; Financial Technology; Financial Inclusion

Introduction

FinTech — a blending of the financial and technological sectors — is revolutionizing banks, businesses, and individuals' relationship with money. FinTech has changed the dynamics of the financial sector, be it in the banking, lending, wealth management, or insurance sectors. The global FinTech market is currently estimated to be USD 340 billion and is expected to reach USD 1,126.64 billion by 2032 with a growth rate of 16.2 per cent. With such a high growth rate, it is a clear indication of the underlying value of "FinTech" in the development of efficiency, transparency and financial

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inclusion in the financial and banking services industry. Indeed, FinTech is taking the lead in the financial revolution that is unfolding in the whole world because of the financial system's digitalisation [1].

Digital payments have emerged as the most disruptive and transformative area of the various verticals in the FinTech sector. Digital payments have been a key financial innovation staple, given the ease and rampant growth of the smartphone trend, e-commerce, and the proliferation of real-time payment methods. The revenue of the global digital payments market is projected to reach USD 361.3 billion by 2030 with a CAGR of 21.4% till 2030 from USD 114.41 billion in 2024. Domestic payments have been made easy and fast due to the emergence of digital wallets, QR code payments, and contactless transactions. However, to apply these solutions in international contexts is not easy. The lack of certain elements and conventional financial intermediaries that complicate the internationalisation of digital payments have limited international transactions [2].

True digital payments is an industry that has made massive inroads, particularly concerning cross-border transactions that are fast, transparent and secure, but it is a problem yet to be solved. Most cross-border transactions, at 90%, are conducted via traditional systems like SWIFT and the associated banking networks, and for a large amount of these transactions, there are various intermediaries involved which led to delays, high transaction fees and lack of transparency. On average such transfers can take up to 2-5 business days to complete and transactions costing over 6% of the value of the transaction are a significant obstacle to global financial inclusion and international trade in large volumes. This not only has an impact on small businesses, freelancers, or immigrants relying on remittances, but also on foreign nationals working in mainland China. In 2024, the remittance market was worth $843 billion, reflecting its huge size and the necessity for new and innovative solutions to incentivizing more efficient, cost-effective, and transparent international money transfers. The problem space that blockchain technology has been introduced to solve is these inefficiencies.

Blockchain is based on the concepts of decentralisation, immutability, and transparency, which allow participants to make peer-to-peer transactions in the absence of intermediaries. The blockchain market is estimated to grow to USD 20.16 billion currently and is expected to grow to USD 393.42 billion in 2032, respectively, with a CAGR of 43.6%. The decentralised registry system provides the authentication of transactions by means of the parties' consensual systems and thus the probability of fraud, error and manipulation is lowered. Finances are made more efficient, secure and quick with blockchain technology that leverages smart contracts and tokenises transactions [3].

Two hurdles of intermediaries and settlement time are cleared in international transactions with Blockchain. It is P2P based, thus low-cost secure transfers are available. Transparency also means that all transactions can be followed in real time, the accounting is clear and there is less risk of fraud. Financial details are encrypted and smart contracts ensure that they are tracked and automated to verify the transactions. blockchains have already proved beneficial for faster cross-border payments and cheaper transaction fees and are already home to blockchains that are already playing a significant role in the blockchain payment space, including RippleNet, Stellar, and JPMorgan Liink. Moreover, blockchain fosters financial accessibility, and renders payment solutions to people in underbanked regions that lack traditional banking frameworks [4].

Recent research highlighted how blockchain has been utilised in the transformation of cross-border payments and other financial processes, offering the speed, lower costs, and decentralisation and automation that boost security. The results of the pilot and the implementation of the technology in institutions have shown it to be possible to improve the functionality of the system traditionally used, make it more efficient, transparent and trustworthy. However, it still has its challenges- regulatory uncertainty, scale, interoperability, and using the existing financial networks are still significant barriers to extensive adoption.

While there has been recognition of blockchain's potential (in the existing literature), little empirical work has been conducted to examine the comparison between blockchain-based and traditional cross-border payment systems. Many of the studies are theoretical or descriptive, and there is a lack of quantitative assessment of real-life performance. The opportunity provides an impetus for further studies, which must account for the measurable impact of blockchain on the financial function and policy implications in the rapidly evolving global FinTech landscape.

Therefore, the aim of this paper is to look at the influence of the blockchain technology on the FinTech ecosystem and to examine the influence on the cross-border digital payments. It discusses the effectiveness, cost effectiveness and reliability of the blockchain as per institutional case studies and reports. The research process has been systematic, consisting of a detailed analysis of the existing literature and data, and it's a contribution to the understanding of the importance of blockchain in the context of redefining the world's payment systems and the process of the digitalisation of financial services. To ensure a consistent evaluation across institutional contexts, the study builds and adapts the Institutional Payment Efficiency Framework (IPEF), which is further described in the methodology.

Literature Review

Immediate synthesis and a gap analysis. There is a consensus from reviewed literature that blockchain technology can enhance the speed of transactions, increase transparency, and provide significant cost savings regarding cross border payments, however the nature and quality of the evidence is widely different. Conceptual and review studies [5, 6] in general suggest that blockchain is a transformative technology for addressing inefficiencies in the existing payment system, but findings are often based on second-hand research, and illustrative cases are used to demonstrate the concept. As such, these studies offer a strong theoretical basis for blockchain use, but do not necessarily offer much practical information on the actual deployment of blockchain benefits in various institution types.

Empirical and technical studies, on the other hand, provide more rigorous evidence, embodying important methodological limitations. While Johnson and Lee [7] based on survey data from financial institutions report on considerable performance gains, Owolabi et al. [8] suggest that blockchain-based remittance systems are technically feasible by using simulation modelling. Simulations, however, might not necessarily simulate the complexities of financial production scale, or self-reports of institutions may have reporting bias and lack verification. Consequently, the empirical research on the ground effects of blockchain technology on cross-border payments is still scattered and makes it hard to come to broader conclusions about the blockchain's actual effects on cross-border payments.

A second theme that became clear from the literature was that technological capability and institutional adoption have been seen to be abnormally distant particularly in the education sphere. In both conceptual and technical and policy-oriented research, regulatory fragmentation, interoperability issues, scalability and integration with legacy banking systems remain as significant and pervasive barriers for widespread implementation. These obstacles are recognised by scholars, but few academic studies attempt a systematic analysis of how the major financial institutions have tackled them. Furthermore, the bulk of the literature is focused on the study of cryptocurrencies, central bank issued digital currencies (CBDC) or only one blockchain platform instead of comparing different production-grade deployments.

Methodological aspects, however, there are still fewer peer-reviewed comparative analyses about operational payment systems based on Blockchain technology. While industry reports and institutional disclosures continue to form the core of the evidence base, there is a need for studies as a type of synthetic evidence by critically integrating information from different real-world implementations and being open and transparent about the limitations of secondary-source evidence. To fill that void, this study aims to compare, in a structured manner, three operational blockchain payment solutions – out of the three payment products studied, JPMorgan Chase's Kinexys for wholesale banking, Banco Santander's One Pay FX for retail remittances, and Visa B2B Connects for corporate cross-border payments.

Objectives

- To investigate the potential of leveraging blockchain technology to improve the effectiveness of cross-border payment mechanisms, specifically by increasing settling speed, operational cost savings and bolstering security measures.
- To examine how payment in the blockchain can and could be compared to and contrasted with traditional payment systems like SWIFT and correspondent banking, thus including insights and practices of banking and financial institutions in the actual world.

- To list out the key challenges such as regulatory, technical, interoperability, in the domain of blockchain and suggest some way and means to tackle and mitigate them.

Overview Of Fintech and Blockchain

The convergence of technology and finance in the field of FinTech has led to innovative solutions for meeting user needs, making it much more accessible and efficient. The key verticals include digital banking and mobile payments, peer-to-peer lending, and wealth management platforms and insurance technology. Innovating the financial ecosystem with technology, from AI to Data Analytics: Blockchain.

Fintech enhances financial inclusion by providing a fee-friendly and technological solution to the financial inclusion challenges of unbanked and under-banked communities. It can be helpful for service providers and/or customers, by providing additional convenience and transparency in transactions and reducing operational costs on both sides. Fintech as it continues to digitise financial networks is changing the way the finance industry works and is bringing traditional finance closer than ever to cutting-edge technology applications such as blockchain.

Blockchain is an encrypted, transparent, no-forgetting data registry system, which works on distributed and decentralised principle. It removes middlemen, streamlines financial operation and speeds up time, reduces corruption and further prevents frauds. That's what makes it convenient for applications such as cross-border payments, where trust and speed is so vital to cost-effectiveness of an efficient payments system.

The key features of blockchain include decentralisation (no single entity would control the network), immutability (that the information recorded and stored cannot be modified), transparency (that users can view the transactions in real-time) and security (through cryptographic encryption and consensus). The two widely used approaches, i.e., Proof of Work (PoW) and Proof of Stake (PoS), instil wholeness in the blockchain by only validating real transactions. All these have worked nicely to make blockchain appear a cost-effective and fruitful method to re-construct international financial systems.

Methodology

This study is qualitative with multiple cases comparative research design by systematically analysing secondary data. Multiple-case study analysis, as presented by Yin [9] in his book Multiple Case Study, was used in the design, where the cases were analysed as individual analytical units and patterns converging and diverging from one case to the next were looked for. The study falls under an interpretivist paradigm as the goal of the study is to understand the implementation and reporting of the blockchain in specific institutional settings and not to know if there is a statistical generalisation. Whereas primary collection of transaction-level banking information is not possible, a secondary data approach (generally not a preferred option) is deliberately chosen. Similarly, in institutional finance and information-systems studies, emphasis is placed upon using disclosures, archival records, and documentary evidence, which is part of their traditional practices [9, 10]. The unit of analysis is institutional blockchain payment platform, with the three cases being selected through purposive sampling (based on theory) to represent three separate clusters in cross-border payments market.

The research is based on quantitative parameters: settlement time, transaction cost, liquidity efficiency and volume of transactions, as well as qualitative ones, like institutional changes in operations, implementation methods, and regulation adaptations. The information has been gathered from publicly available institutional reports, industry publications, white papers, peer reviewed academic papers and other similar sources. The study seeks to understand how blockchain-based payment networks have been claimed to be more efficient, more transparent, faster and more cost-effective on comparison to the traditional cross-border payment systems.

Case Selection

Three blockchain-enabled payment platforms were selected as representative case studies of different segments within the international payments' ecosystem:

a) JPMorgan Chase — Kinexys Digital Payments (Wholesale Banking)

b) Banco Santander — One Pay FX (Retail Remittances)

c) Visa — Visa B2B Connect (Hyperledger Fabric) (Corporate Cross-Border Payments)

The selected institutions satisfy four key criteria:

1. Operational diversity across distinct payment segments.
2. Deployment of production-grade blockchain infrastructure.
3. Global operational reach across multiple countries and regions.
4. Significant payment activity, collectively processing more than USD 1.5 trillion in transaction volume.

Data Collection and Analysis

To ensure reliability and credibility, data were gathered from several secondary sources, including institutional reports, investor presentations, annual reports, regulatory publications, white papers, press releases, and peer-reviewed academic articles. The quantitative aspect includes indicators which include settlement duration, transaction costs, liquidity requirements, annual transaction volumes, and processing efficiency. These metrics are compared to pre-blockchain performance levels wherever available. The quantitative analysis focuses on the organisational implementation strategies, operational changes, customer impact, transparency enhancement, and reported business outcomes of blockchain adoption.

This study is conducted over seven years after adoption, starting in 2018. The data analysis was based on a convergent parallel method, which enabled the simultaneous analysis of quantitative and qualitative data at the same interpretational level. The performance metrics in this study are secondary data that are publicly published. In cases where different figures were reported, conservative figures were used, and the sources for the same were mentioned.

Analytical Framework

For comparison, this research proposes and adopts the Institutional Payment Efficiency Framework (IPEF) to assess the performance of every blockchain implementation in comparison with the traditional systems replaced by it. The IPEF is a within-case "before and after" analysis, with a thematic evaluation across cases and with a structure that is based on four dimensions, all of which provide an answer to the first two goals of the study. The first is the settlement speed, which refers to the time from when a payment is started to when it is settled. Cost efficiency has to do with transaction fees, intermediary fees, and foreign exchange premiums, the second dimension. Transparency and traceability are the third dimension, which is characterised by transaction visibility and price visibility to the stakeholders. The fourth dimension, liquidity and intermediation structure, is about capital lock-up, the number of intermediaries, and impacts on working capital.

The evaluation of each dimension is carried out by numerical indicators (such as duration of settlement, percentage reduction in costs, number of transactions) and qualitative indicators (such as implementation strategy, adaptation to regulations, impact on customers), using a convergent parallel methodology. All four dimensions of IPEF are applied throughout the three cases, enabling comparisons to be made between the cases, not just a description within each case. Triangulation of sources was used to strengthen internal validity, including the use of institutional reports, peer-reviewed studies, industry publications, and data from sources like the World Bank and the Bank for International Settlements. A single use of the framework for the cases is shown in Table 4.

Institutional Background of Selected Cases

JPMorgan Chase & Co. – Kinexys Digital Payments

JPMorgan Chase & Co. is the largest financial services firm in the U.S. and handles about USD 7 trillion in global payments per year. One of the first major financial institutions to adopt a large-scale settlement for blockchain, the bank launched its Kinexys Digital Payments platform in 2020.

Banco Santander – One Pay FX

Based in Madrid, Spain, Banco Santander has around 146 million customers worldwide. In 2018, the bank introduced One Pay FX, which is one of the first major international banks to provide blockchain-based retail cross-border payment services via Ripple's xCurrent solution.

Visa Inc. – Visa B2B Connect

Visa B2B Connect is a new payment network launched by Visa Inc., the world's largest payment processing network, in 2019. It's built using Hyperledger Fabric technology, allowing cross-border payments directly between institutions and available in over 200 countries and territories.

Limitations

There are several caveats to note.

The first is that there is limited access to fine-grained transaction data since most operational information is proprietary. As a result, reported performance indicators are based mostly on publicly available institutional data that can include institutional reporting biases.

Secondly, the study had a limited focus on large, multinational financial institutions. The results are then not necessarily representative of smaller financial institutions, fintech companies, or financial institutions in emerging markets.

Thirdly, the legal landscape has been changing regarding blockchain technology and electronic payments. The long-term effectiveness and scalability of platforms explored have the potential to be affected by future regulatory developments.

However, the multi-source longitudinal design and comparative analytical approach offer a strong basis for the assessment of the reported impact of blockchain technology on institutional cross-border payment systems, despite these limitations.

Case Study

The following institutional examples highlight the practical impact of blockchain technology on cross-border digital payments. This will provide the authors with valuable insights that help the authors understand the practical impact before and after implementing blockchain, which helps paint a clear picture and concluded.

Case Study 1: JPMorgan Chase - Kinexys Digital Payments

Conventional Cross-border payment systems (pre-Blockchain)

Before ensuring the use of blockchain technology, JPMorgan, like most financial institutions, used the SWIFT (Society for Worldwide Interbank Financial Telecommunication) network and correspondent banking relationships to conduct international transactions. In this classical arrangement, there were several major inefficiencies in institutional payments across borders. Settlement windows are 1-2 business days to settle, and capital is being transported and as a result it exposes more risk and creates an operational bottleneck.

The correspondent banking arrangement meant that one transaction would go through several intermediary banks, each of which would charge fees, and this complicated and made the process of making payments obscure. The average

processing time in traditional SWIFT transfers was about 18 hours and 18 minutes, although other transfers had an average of 1-5 business days depending on the number of middlemen. When intermediate banks were used (as was the case in 75 percent of transactions), the time of transfer increased to 1 day, 11 hours, 15 minutes when intermediate banks were used, and 15 hours, 9 minutes when middlemen were not involved.

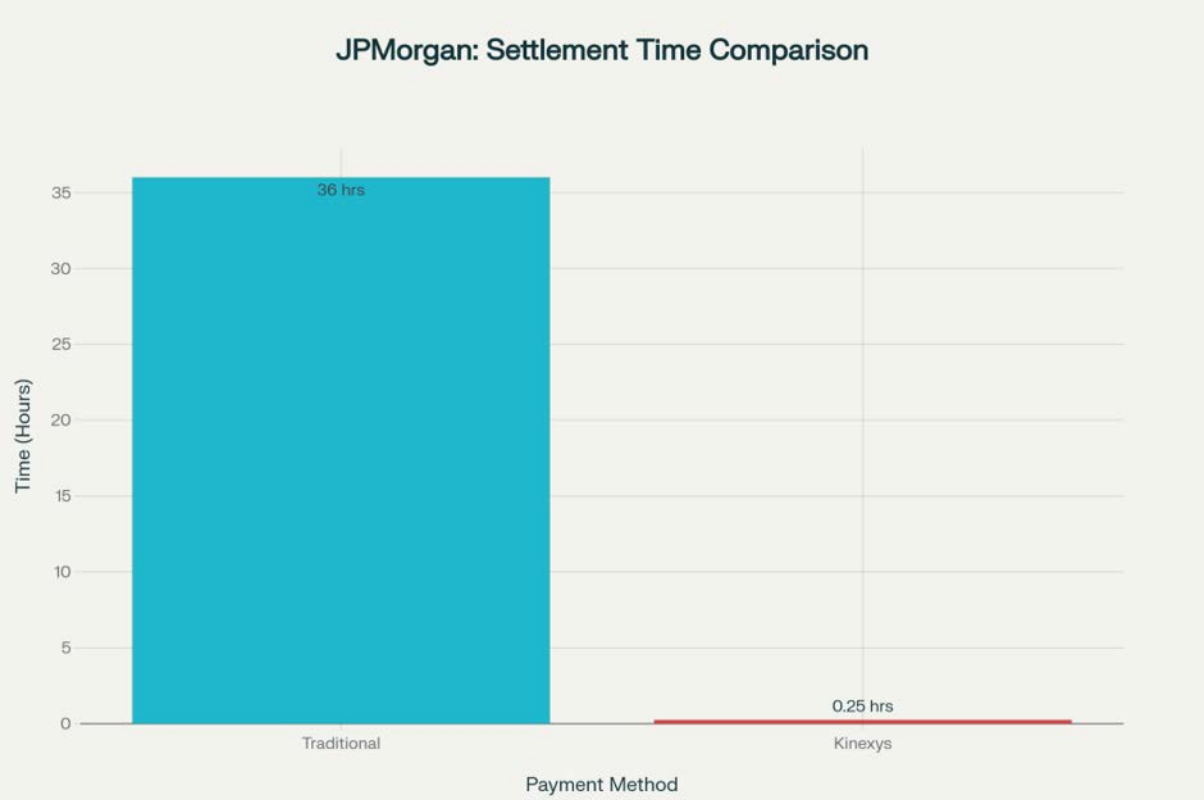
The international payment cost's structure was also a problem. Banks had fees to senders (domestic: $20-35, international: $35-50), and the intermediary banks charged them extra fees (10-30 each), SWIFT fees, and fees on the receiving bank up to 16 percent. There was a money conversion markup fee of as much as 1-3 percent, and the total cost of the remittance payment across borders may amount to as much as 6 percent of the transaction amount.

Blockchain Adoption and Implementation: Kinexys (2020)

JPMorgan identified limited transparency as a key source of these inefficiencies, and initiated these inefficiencies was a lack of transparency in its operations and has therefore embarked on a blockchain project, JPM Coin, in 2019 and later launched Kinexys (previously Onyx) in 2020 as a blockchain-based wholesale payment and settlement system. Kinexys represents a significant change in institutional payment infrastructure, an implementation of distributed ledger technology that directly enables transactional, near-instant transactions that remove friction and cost reduction to the limit.

The platform settles in tokenised deposits and stablecoins (digital assets that are pegged to traditional currencies such as USD) as the medium of exchange over blockchain rails. Instead of messages being transferred over the SWIFT networks and capital transfer being done over a different set of correspondent banking, Kinexys allows information and capital to be transferred concurrently on the same blockchain network. This architectural difference eliminates the multi-day settlement process and the asynchronous process (Refer to Figure 1).

Figure 1: JPMorgan Chase Settlement Time Comparison - Traditional vs. Kinexys Blockchain



Source: Bastion [11] and JPMorgan Chase [12].

Technology Infrastructure

Kinexys uses a permissioned blockchain model, i.e., JPMorgan determines who may see the transactions and which transactions may be approved or rejected via a consortium of registered financial institutions instead of a public/decentralised network. The platform has APIs (Application Programming Interfaces) integrating with the current systems of financial institutions, making it easy to have interoperability without having to restructure the old infrastructure within institutions.

The system also allows 24/7 transaction processing (except during short Saturday maintenance windows) compared to the traditional banking system of limited settlement windows during business hours. The JPMorgan Coin transactions are settled in minutes instead of days, and the transaction fee is in fractions of a penny, which is a 60-80 percent reduction in costs as compared to traditional correspondent banking charges.

Findings and Statistics (Post Blockchain)

Since its launch, Kinexys has reported substantial adoption and growth across the four analytical dimensions. In terms of volume, the platform is reported to have settled more than USD 1.5 trillion in notional value, with average daily transaction volume exceeding USD 2 billion and year-on-year payment transactions growing roughly tenfold. Settlement speed is said to be fast, in near real time, with foreign-exchange conversion taking under 30 seconds. On cost, transaction fees are said to be as low as a few cents compared to the fees charged for traditional correspondent banking transactions, which are 60–80 percent lower. Lastly, on the liquidity front, accelerated settlement frees up cash that was previously trapped in the settlement process and that takes between one and two days, which benefits the working-capital efficiency of institutional clients. From an IPEF perspective, Kinexys illustrates gains in all four dimensions, notably in settlement speed and intermediation structure.

Practical activities are based on impact. Corpay Cross-Border acquired Kinexys Digital Payments to facilitate the conversion of an FX between a corp client of Corpay Cross-Border to convert USD to GBP after the market closed on Fridays, and to have it settled within a few minutes, which would have otherwise taken days in the traditional system (Refer to Table 1).

Table 1: JPMorgan Chase Kinexys — Comparison Before and After Analysis.

Metric	**Conventional SWIFT/Correspondent Banking.**	**Kinexys Blockchain**	**Improvement**
Settlement Time	1-2 business days	Minutes (near real-time)	99%+ faster
Intermediary Banks	1.31 average (75% of transactions)	Direct point-to-point	Elimination of intermediaries
Transaction Costs	$35-$50 per transfer + 40-80% hidden fees	Fractions of a penny	60-80% cost reduction

Processing Hours	1-5 business days	24/7 operations	24/7 availability vs. business hours
Capital Lock-up	1-2 days	Eliminated	Improved liquidity position
FX Settlement	Hours to days	<30 seconds average	Near-instant conversion

Source: JPMorgan Chase [12, 13]. Bastion [11], and Wise [14].

Benefits and Impact of Blockchain Adoption

Adopting blockchain at JPMorgan had several interconnected positive impacts. The operational benefits of smart-contract automation were the lack of manual reconciliation and intermediaries, as well as the direct point-to-point transfers, which also eliminated third-party and SWIFT fees, accounting for reported cost savings of 40-80 percent. Accelerating settlement helped to lower counterparty risk, currency risk, and cryptographic security lowered fraud. The freed capital resulted in the enhanced efficiency of treasury and access to working capital, while the platform's continuous (24/7) operation provided the opportunity for transactions to take place outside of the regular banking hours. The volume of adoption (over USD 1.5 trillion processed and around tenfold growth per year) is a testament that such benefits are not just realised in pilot situations, but in institution-setups as well.

Case Study 2: Banco Santander - One Pay Fx (Ripple X Current)

Conventional Cross-border payment systems (pre-Blockchain)

Before launching One Pay FX in 2018, Santander, like all traditional banks, relied on SWIFT messaging combined with correspondent banking networks for international money transfers. With this system, the retail customers who were making cross-border payments had to undergo high delays and unreliable costs.

The transfers across international boundaries using traditional channels were settled after 3-5 business days. It was done through several intermediate banks, each with its processing time and regulatory checks as well as fee structures. A transfer of money between a customer in the UK and Brazil would be directed through a series of relationships of a correspondent, with each participant applying their own compliance practices and charges.

The cost system was non-transparent and ineffective. Traditional banks charged 2-6% markups of the exchange rate above the mid-market, intermediary banks withdrew $10-30 each, and receiving banks levied extra fees. To transfer funds between countries in the Eurozone, an average of $0.34 costs were incurred, whilst a transfer to an emerging economy such as Brazil and Poland might cost 0.5-1 percent or even higher. This implied that a customer who moved 1,000 Euros may lose €10 - €15 of this money in non-obvious expenses alone.

Also, buyers were not confident about what they would get. Cash flow planning was not easy for businesses and families because exchange rates could not be planned beforehand unless they started the transfer. The period of 3-5 days' settlement also implied that funds were illiquid during the period, posing a challenge to working capital among businesses.

Blockchain Implementation: One Pay FX Launch [15]

After realizing such inefficiencies and the possibility of distinguishing its retail payments offering, Banco Santander said in April 2018 that it would launch Santander One Pay FX, which is based on Ripple xCurrent blockchain technology. This resulted in making Santander the first bank to publish a blockchain-based international payments service to consumers in several countries all at the same time.

The first markets where One Pay FX was launched were in Spain, the UK, Brazil, and Poland, and it was announced by the bank that it was going to launch the product in other countries and currency corridors in later months.

Technology Infrastructure

One Pay FX uses the xCurrent protocol of Ripple, which is a blockchain-based messaging protocol, and is an alternative to SWIFT. Rather than separating the flow of information (SWIFT messages) and the flow of capital (correspondent banking), xCurrent enables real-time currency exchange and real-time bank-to-bank transfer.

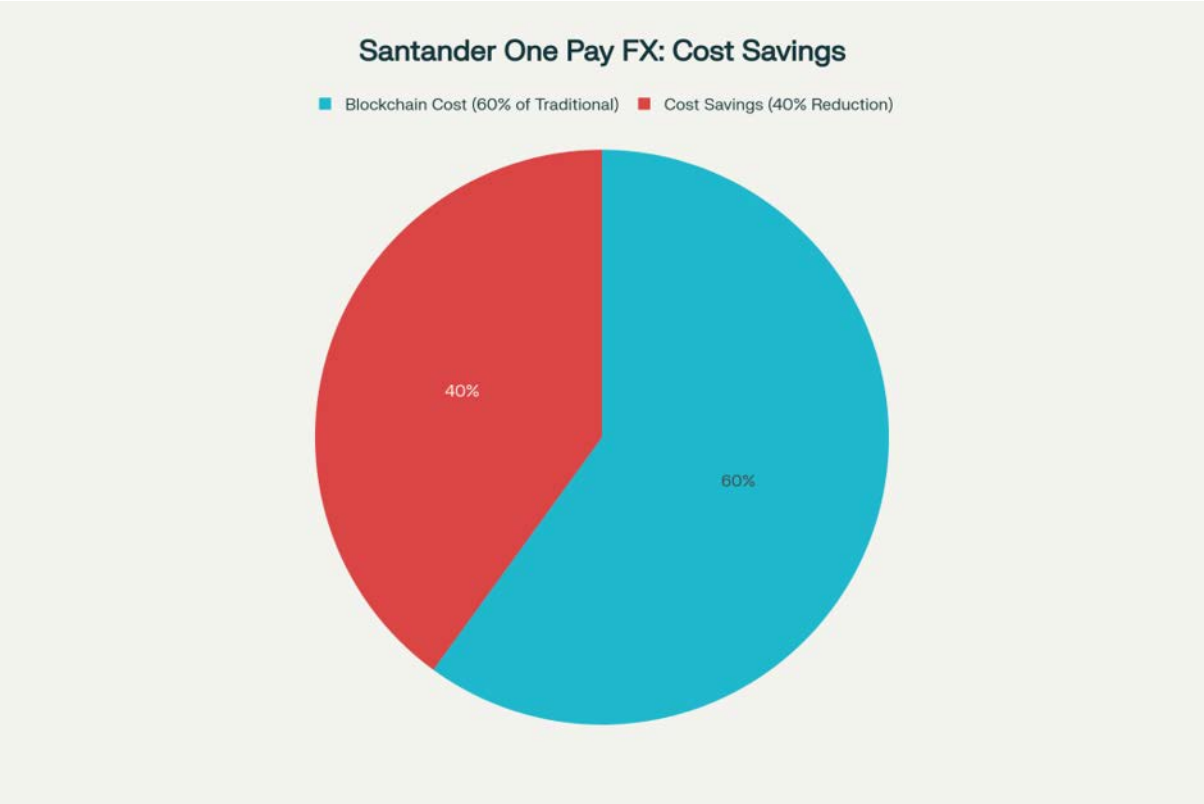
The system uses blockchain rails on which involved banks keep accounts and can make transactions directly with each other. Ripple is not a financial institution but a technology provider, which allows banks to retain their relationship with regulators without losing the benefits of blockchain infrastructure. The technology uses cryptographic protection and transaction irreversibility to deliver compliance and auditability.

Most importantly, One Pay FX will allow customers to know the precise amount they will get prior to making the transfer. This openness is facilitated by real-time FX rate feeds and direct bank-to-bank settlement paths made possible by blockchain, which eliminates uncertainty found in the multi-mediary correspondent banking.

Banco Santander One Pay FX: Cost Structure - Traditional vs. Blockchain

This pie chart disaggregates the cost structure with the traditional cross-border payments (30 percent), intermediary fees (40 percent), and FX markup (30 percent) cost allocation, representing a total cost of 100 versus blockchain One Pay FX cutting total cost to 60 which equates to a 40 percent cost reduction (Refer to Figure 2).

Figure 2: Banco Santander One Pay FX — Cost Structure: Traditional vs. Blockchain.



Source: Ripple Insights [15] and Banco Santander [16].

Findings and Figures (Post-blockchain)

The IPEF perspective highlights One Pay FX's retail-remittance nature with the greatest retail transparency and cost efficiency. The platform was launched in 2018, and since that time it has been reported that there have been meaningful improvements in all four dimensions. For settlement speed, international transfers previously took 3 to 5 business days but are now said to be settled 'on the same day or next day,' and the bank aims to make on-ledger settlement in several markets instantaneous, reportedly taking around 2 seconds. About cost, transaction fees are said to be significantly reduced, more than 40 percent compared to the bank's prior transfer fee. The transparency advantage is unique: the customer is told the exact amount that will be given to the recipient before he or she sends the money, eliminating foreign-exchange uncertainty associated with multi-intermediary correspondent banking. One Pay FX was said to represent nearly half of Santander's international-payment markets in terms of reach and adoption, and initially launched in Spain, the United Kingdom, Brazil, and Poland to then be rolled out to more corridors.

Implications in the Real World and Customer Views.

A client in the UK who sends money to Poland via One Pay FX is awarded his or her exact GBP to PLN rate in advance and within hours, instead of the normal 3-5 days; the transaction is accomplished. To businesses, this is a direct improvement of working capital since the float period on foreign payments is shortened (Refer to Table 2).

Table 2: Banco Santander One Pay FX — Comparative Analysis: Before vs. After.

Metric	Conventional SWIFT/Correspondent Banking.	One Pay FX (Ripple xCurrent)	Improvement
Settlement Time	3-5 business days	same-day/ next-day (with focus on instant)	90%+ faster
Processing Time	Hours to days	2 seconds on blockchain	Near instantaneous
Intermediary Banks	Multiple (2-4 typical)	Direct point-to-point	Elimination of intermediaries
Exchange Rate Markup	2-6% markup + hidden fees	Transparent, real-time rates	40%+ cost reduction
Costs (€1,000 transfer)	€10-€60 total	€6-€15 total	40%+ savings
Customer Visibility	No pre-transfer amount certainty	Exact amount shown upfront	Full transparency
Geographic Coverage	Global but slow routes	4 countries, expanding	Gradual expansion

Source: Banco Santander [16, 17], Computer Weekly [18], Coindesk [19], and Ripple Insights [15].

Benefits and Impact of Blockchain Adoption

Some of the key benefits of Santander's blockchain initiative include cost savings, faster transactions, and increased transparency. One Pay FX pushes transaction costs by more than 40 percent, said to be huge annual savings for families relying on remittances, by bypassing intermediary correspondent banks. Previously, businesses and retail customers

experienced settlement periods ranging from several business days, but this has now been reduced to same- or next-day settlement, providing a boost to their cash flow and working capital. No hidden fees – real-time pre-transfer pricing leads to higher levels of customer confidence and trust. Strategically, the early deployment helped the bank gain a competitive advantage, with the service handling a significant share of the bank's international transactions, and automation reducing the bank's operational costs and paving the way for market expansion. Last but by no means least, the platform helps to further financial inclusion by reducing the fees associated with cross-border transfers, making them more affordable for the underbanked population.

Case Study 3: Visa B2b Connect (Hyperledger Fabric)

Established Cross-Border B2B Payment Methods (Before Blockchain)

Before the implementation of Visa B2B Connect, B2B international payments were being done using the traditional correspondent banking methods that had been shown to be fraught with a lot of inefficiencies, especially when it comes to corporate clients.

Through the correspondent banking model, payment by a US company to an EU supplier had complicated and multi-layered procedures. This payment cycle normally took 2-3 days to be settled, and, in the process, the corporate treasurers never knew where the funds were within the payment chain. The correspondent relationship formed a series of channels in which Bank A (US) gave payment directives to Bank B (intermediary), which relayed the directives to Bank C (EU), with each step delaying and making deductions for fees.

Costing in relation to B2B cross-border payment was not predictable. In addition to the initial wire fee of the bank (between 35 and 50 dollars), fee cuts made by intermediary banks (between 10 and 30 dollars), conversion of currency incurred a 1-3 percent charge, and the receiving banks charged more. The total cost would be up to $3,000-$5,000 (3-5% of the transaction value) in the case of a $100,000 transfer, which would frustrate international trade.

There was intense restriction of transparency. There were no certain times of payments (corporate treasurers could estimate that they would take 2 days on a direct route, and 5 or more days on a route with several intermediaries). Locking of exchange rates only occurred after the initiation of transactions, making it impossible to forecast the cash flow. To multinational companies dealing with global payables and receivables, this uncertainty presented them with operational difficulties.

The relationships of the correspondent banking were diminishing. In the last 10 years, as the volumes of cross-border payments rose 61 percent, the count of correspondent banking ties plummeted by 29 percent. This fall was indicative of the unwillingness of banks to continue having costly correspondent relationships, and thus, payments made out of them were ironically sluggish and costly.

Blockchain Adoption: Visa B2B Connect (Launched 2019)

In response to such inefficiencies and competitive pressure against fintech businesses, Visa introduced Visa B2B Connect in 2019 based on Hyperledger Fabric, an enterprise-level blockchain framework built by the Linux Foundation. The platform was purposely created as a means of modernising B2B cross-border payments using blockchain infrastructure.

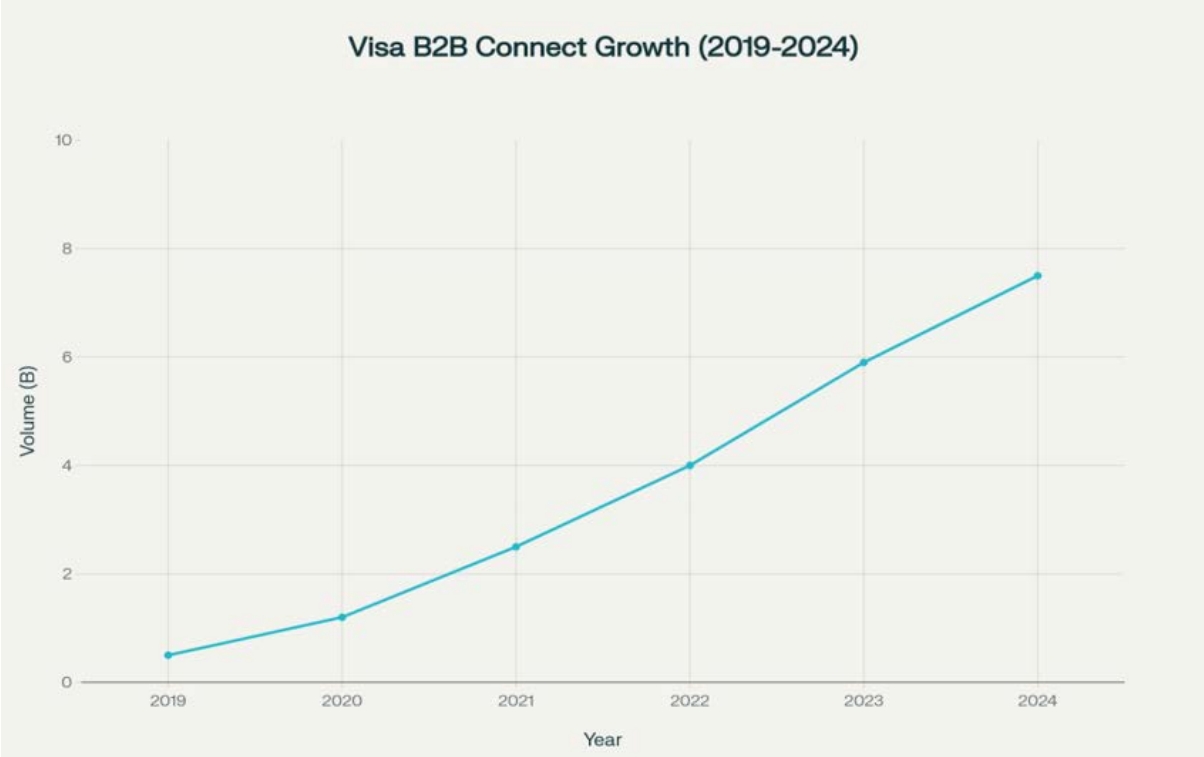
Technology Infrastructure

Visa B2B Connect is based on a permissioned blockchain network developed using Hyperledger Fabric, whereby the involved banks are vetted and approved instead of being anonymous participants seen in public blockchains. The structure of the architecture is radically different than correspondent banking:

Instead of B2B2C communication, Visa B2B Connect establishes a multilateral connection in which all the participating banks connect to a ledger. All payment instructions, compliance inspections, and settlements happen on a single blockchain, and there are no asynchronous messaging or distinct capital flows.

The platform offers several functions that set it apart from correspondent banking. The participating banks get real-time liquidity in each currency, and they can settle the transactions immediately instead of waiting for payment queues. There is no intermediary between any two banks that are involved in settlements – they take place directly with one another, and regulatory and compliance requirements are embedded in smart contracts that can be automatically validated. The network is multilateral, not sequential, ensuring stable and predictable settlement times, irrespective of the payment route (refer to Figure 3).

Figure 3: Visa B2B Connect Network Growth — Transaction Volume 2019–2024.



Source: Visa Inc. [20] Visa Fiscal 2024 Annual Report and FXC Intelligence [21].

The transaction growth rate of Visa B2B Connect can be seen in this line graph, and its performance is in the range; the initial point of 0.5 billion transactions in 2019 (launch) is followed by 27% growth per annum up to 7.5 billion transactions in 2024 (scaling).

Findings and Data (Post Blockchain)

Assessed against the IPEF dimensions, Visa B2B Connect delivers its clearest advantages in settlement speed and liquidity structure, consistent with its corporate, high-value payment focus. On speed, cross-border B2B payments that conventionally required two to three days are reported to complete in under two hours, an improvement of more than 90 percent over correspondent banking. On cost, compliance and reconciliation expenses are reported to fall by at least 30 percent, aided by the removal of intermediary delays and fees through direct bank-to-bank settlement. The platform provides end-to-end visibility across the full payment cycle, addressing the transparency deficit of sequential correspondent routing. In terms of liquidity and intermediation structure, the multilateral network enables banks to rationalise correspondent relationships and reduce the cost of maintaining them. Adoption indicators reinforce these operational gains: the network was reported to grow by approximately 27 percent in 2024, processing on the order of 7.5 billion transactions, alongside a substantial expansion in network endpoints over the same period.

Real-World Implementation

In December 2024, Tietoevry Banking incorporated Visa B2B Connect into its Payment Hub, which will allow financial institutions in Nordic and European markets to provide blockchain-based cross-border B2B payments to corporate clients. The integration shows the level of production-grade deployment during non-pilot stages, and corporations save time when it comes to quicker and more open payment approaches to vendor billing, invoicing, and overseas commerce.

In October 2024, Standard Chartered, a large global bank, collaborated with Visa to expand its range of cross-border B2B transactions under Visa B2B Connect, indicating its interest in institutional customers (Refer to table 3).

Table 3: Visa B2B Connect — Comparative Analysis: Before vs. After.

Metric	**Traditional Correspondent Banking**	**Visa B2B Connect (Blockchain)**	**Improvement**
Settlement Time	2-3 business days	<2 hours	90%+ faster
Intermediary Banks	2-4 average per transaction	Direct point-to-point	Elimination of intermediaries
Processing Visibility	Limited (no real-time status)	End-to-end real-time visibility	Complete transparency
Compliance Processing	Review of every intermediary manually.	Automated smart contracts	Faster, more consistent
Exchange Rate Locking	Post-initiation	Pre-initiation with transparency	Customer certainty upfront
Reconciliation Costs	0.5-1% hidden in fees	30% reduction vs. traditional	Direct cost savings

Cost per $100K Transfer	$3,000-$5,000 (3-5%)	$2,000-$3,500 (2-3.5%)	25-40% savings
Liquidity Visibility	None (sequential settlement)	Real-time pool visibility	Improved working capital

Source: Visa Inc. [20,22], FXC Intelligence [21], Tietoevry [23], Standard Chartered [24], and World Bank [25].

Benefits and Impact of Blockchain Adoption

The advantages of Visa B2B Connect span operational, strategic, and inclusion-related aspects. By reducing settlement time from two to three days to less than two hours, businesses can free up considerably working capital, while having a defined settlement window enhances cash forecasting and treasury efficiency. The platform is said to reduce compliance and reconciliation costs by approximately 30 percent and remove the intermediary costs for every transaction. An in-depth view of transactions increases auditability and risk management. The network could help smaller banks operate as global B2B payments service providers without having to establish expensive correspondent banking relationships, and its expected growth — about 7.5 billion transactions in 2024, with an annual increase of about 27 percent — suggests that it is not in "pilot mode" but is approaching a production environment. Its partnerships with institutions, such as Standard Chartered and Tieto Évry, add to its standing. Lastly, the platform reduces cross-border settlement complexity and costs, promoting financial inclusion for SMMEs that are not well-served by the market and wish to engage in international trade.

Challenges

There is still a lack of global regulatory frameworks that would help govern blockchain and digital assets, with jurisdictions such as the EU (MiCA), UK (FCA), US (FinCEN), Singapore (Payment Services Act), Hong Kong (SFC/HKMA), India (FIU_IND) and Australia (AUSTRAC) having inconsistent requirements on compliance. This poses complicated and expensive AML/KYC requirements on companies, particularly smaller ones. The uncertainty surrounding regulations is reported as one of the major factors slowing down blockchain adoption, even by larger organisations such as JPMorgan that are not interested in investing and innovating in the long term.

Another challenge for blockchain networks is the fact that different institutions use different frameworks, like JPMorgan Kinexys, Santander's One Pay FX, or Visa B2B Connect. Such closed systems rely on intermediaries, and that's the very inefficient thing that blockchain is meant to fix. While these kinds of investments, such as ISO20022, are pushing to fill the void, no universal standards are yet to be offered.

Scalability and sustainability constraints also pose a challenge to payments on a large scale using blockchain. Compared to Visa's 65000+ transactions per second, public blockchains require a lot of energy and only 7 transactions per second. Proof of Stake systems and permissioned systems offer greater efficiency, but at the cost of decentralisation. The compromise between the two is efficiency vs security, which is why Proof of Stake systems and permissioned systems are more efficient.

The other significant challenge is integration with the legacy banking infrastructure. Many banks continue to use old-fashioned systems developed in COBOL and have few APIs and cryptographic features. Middleware to incorporate blockchain is expensive and takes years to develop, which is not economically viable for most institutions.

Lastly, consumer and institutional adoption is also low because of low awareness, perceived complexity, and lack of trust. Research shows that more than 60% of customers have no idea what blockchain is and a very small part of them trust it. Corporate indecisiveness, inconsistent user experiences and poor client education are also barriers to adoption.

These problems require a close coordinated effort between the regulators, developers, and financial institutions to enhance the level of interoperability, regulatory transparency, and user experience.

Table 4: Cross-Case Application of the Institutional Payment Efficiency Framework (IPEF).

IPEF Dimension	JPMorgan Kinexys (Wholesale)	Santander One Pay FX (Retail)	Visa B2B Connect (Corporate)
Settlement speed	Days → minutes (near real-time); FX conversion <30 sec	3–5 days → same-/next-day; confirmation ~2 sec	2–3 days → <2 hours (90%+ faster)
Cost efficiency	Fees to fractions of a penny; 40–80% reduction	40%+ reduction; transparent FX rates	25–40% saving per transfer; ~30% lower compliance/reconciliation cost
Transparency & traceability	Concurrent value + data on one ledger	Exact received amount shown pre-transfer	End-to-end real-time payment visibility
Liquidity & intermediation structure	Capital lock-up eliminated; direct point-to-point	Float period shortened; intermediaries removed	Real-time liquidity pools; multilateral, no intermediaries

Source: JPMorgan Chase [12, 13]; Banco Santander, [16, 17]; Visa Inc., [20, 22]

If the authors look at the IPEF dimension(s) detailed in Table 4, it is easy to see that each of the three platforms enhances each of the dimensions of the traditional system, but in some cases more and in some other cases less, and in some cases in different ways. The most gains in speed and liquidity of wholesale settlements. The speed of retail improvement is primarily in terms of transparency and cost, while corporate improvement looks like it in terms of the structure of intermediation. This dissimilarity across segments (instead of across all segments) is the primary analytic finding of the study.

Discussion

The case studies in Kinexys by JPMorgan Chase, One Pay FX by Banco Santander, and Visa B2B Connect help to address the three objectives of this study. The average results from blockchain-based solutions are consistently improved with the timeliness of the transaction (up to 90% faster settlement times), on the cost side (30 to 80% reduction), and on the operational side (improved efficiency). Such results are based on disclosures on the part of the institutions and not independent testing; however, they confirm and support prior testing work. These performance gains have been witnessed and are corroborated by several studies from 2022-2025. Studies on blockchain in cross-border payments [5, 26] cite several advantages to blockchain technology, including fast settlement activity and huge savings on intermediaries. Permissioned blockchain models like Kinexys (and other major institutions) seem to be a compromise of security, regulation, and scalability. This helps overcome early criticisms of the public blockchain aspects.

There are recent developments that further bear out the transformative potential mentioned in this paper. Facing the challenge of 10% annual growth, JPMorgan's Kinexys platform is focused on achieving USD 10 billion in transactions per day and introducing more programmable payments and tokenised deposits capabilities. Likewise, the role of stablecoins, tokenised assets, and pilot projects with central banks, central bank partners, and other major corporations, such as JPMorgan's partnership with Ripple, illustrates how blockchain could fit into digital currency ecosystems [27]. These advances are a testament to the shift blockchain is experiencing, moving from pilots to establishing large-scale infrastructure in the wholesale, retail, and B2B spaces.

Theoretically, the results support the idea that blockchain is a disruptive innovation in financial intermediation. Blockchain reduces information gaps and the costs conventionally incurred by correspondent banking. The blockchain can eliminate information gaps and costs that are typically associated with correspondent banking [28, 29].

Practical and Policy Implications

The advantages for financial institutions seem to be increased competitiveness in the wake of better liquidity management, the care of live 24/7 business processes, as well as customer experience. Platforms provide opportunities for niche solutions for fintech companies, particularly for remittances and for cross-border deals with small and medium enterprises. Policymakers should aim to further promote the use of regulatory consistency (e.g., through the adoption of ISO 20022) and interoperability standards and tackle AML/KYC, data privacy, and system risk concerns [30].

Limitations and Future Research

The case study set is informative but primarily consists of examples of large, well-funded global banks. Learning is only based on secondary uses of information, which does not go as far as primary data. In the future, further research should be conducted on the issue of adoption, especially with smaller institutions, and in emerging markets, preferably through primary data collection (interviews, transactional audit, surveys, etc.). In-depth quantitative studies of the industry-wide impact and comparative studies between stablecoin and permissioned blockchain solutions would further enrich the literature. Further, the study of the environmental sustainability of the blockchain network on a large scale, and the socio-economic impacts on financial inclusion are essential.

To wrap up, this study has positive components to the ever-emerging proof that blockchain technology isn't improving the worldwide digital payment system in a minor way, but significantly. With the promise of technological interoperability and regulatory clarity, blockchain is poised to shape a more efficient, inclusive, and transparent global financial ecosystem.

Conclusion

The goal of this research was to investigate how FinTech, more broadly and cross-border digital payments, are being influenced by blockchain. By comparing JPMorgan Chase's Kinexys, Banco Santander's One Pay FX, and Visa B2B Connect, substantial evidence proves that blockchain-based payment solutions can offer significant benefits in terms of transaction speed, operational cost savings, and transparency over SWIFT and correspondent banking solutions. The institutions recorded better than 90% settlement time reduction and cost savings from 30 to 80% in each case, while also eliminating the need to deal with multiple intermediaries. If achieved at scale by independent verification, these would be major steps in global payment efficiency.

These results should be interpreted with caution. The performance indicators included in this study are presented from institutional disclosures and secondary sources; this can lead to reporting biases not having occurred in an independent data collection. Besides that, the selected cases include large resourceful worldwide banks that work in established markets. These results are unclear with respect to their applicability to smaller financial institutions, community banks, and payment providers in emerging markets, and further empirical study is needed. In addition, the research identifies

five current challenges that are stalling blockchain technology overall: The lack of common guidelines for interoperability of different blockchain platforms, the inconsistencies in regulatory frameworks across regions, the poor awareness of blockchain among institutions and among consumers, scalability and energy consumption issues, and difficulties in integrating blockchain with the traditional banking system. Although these issues have potential solutions, including trials of CBDC, integration with DeFi, and AI for fraud detection, they will likely diminish with time, but their solution is not guaranteed or imminent.

But the findings speak to the fact that blockchain is more than just a step in the evolution of existing payment options. The movement towards tokenised settlements, programmable payments, and direct financial institutions to financial institutions payments suggests a real paradigm change since financial institutions are convinced of how they evaluate intermediations and manage liquidity. How quickly it matures, stabilises, or hits regulatory roadblocks and alternative technologies is going to rely on coordinated wilfulness of policymakers, the financial sector, and tech vendors.

At last, there are valid insights into the possibility of blockchain infrastructure-based cross-border payments on an institutional scale, and the investment promises of leading financial institutions certainly carry weight. A more careful evidence-based research program to assess the comprehensive potential and constraints of the use of blockchain in the global financial system, including independent verification, long-term assessment, and multi-institutional settings, will be essential for capturing the potential and limitations of blockchain technology.

Conflict of Interests

The authors declare that they have no conflict of interests.

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