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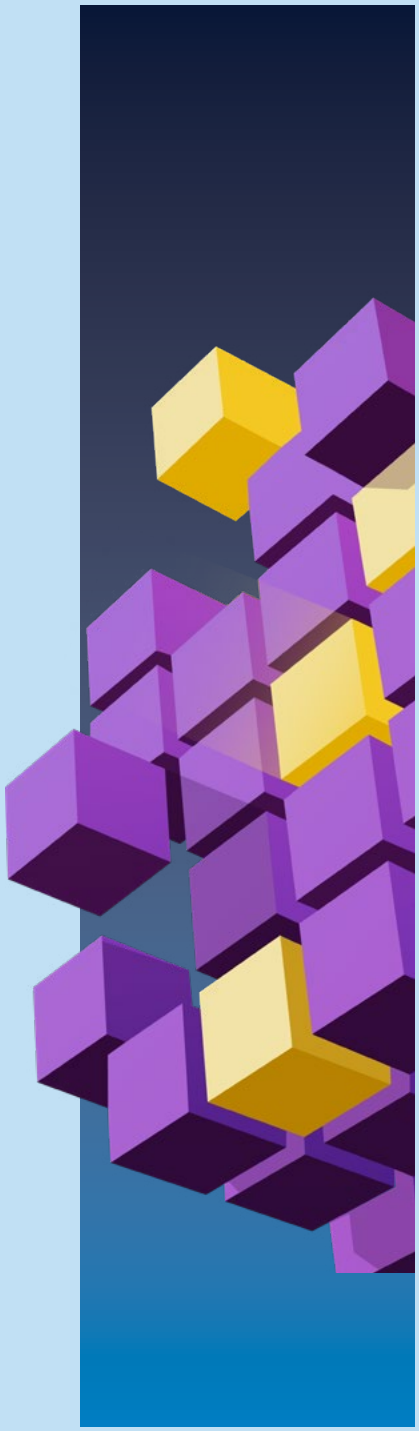

GUARDIANS OF THE CHAIN:
ARE TRUSTEES THE MISSING LINK?

Abstract

Blockchain technology presents a game-changing opportunity for all the financial intermediaries involved in asset management markets. As exchanges and financial institutions adopt blockchain for bond issuance, tokenization, and trading, traditional fee structures and intermediary functions are being reshaped. This paper examines how blockchain technology is transforming capital markets, with a focus on the evolving roles of trustees and custodians. It outlines a strategic blueprint for trustees, evaluates emerging revenue models, and compares trustee-operated versus custodian-operated blockchain networks. Through trade execution and asset holdings workflows, the paper illustrates how blockchain can enhance market liquidity, improve data flows between issuers and investors, and drive significant efficiency.

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Part 1: The Opportunity

Blockchain today is reshaping capital markets. From bond issuance to asset tokenization, key players are building blockchain-based ecosystems for greater efficiencies. Deutsche Börse has launched a private blockchain network for issuing and trading government bonds, leveraging its existing market infrastructure services.[1] Not to be outdone, Broadridge has introduced Distributed Ledger Repo (DLRepo), a platform that seeks to transform the repo market.[2] Meanwhile, the Monetary Authority of Singapore (MAS) is tokenizing assets on its Global Layer One (GL1) blockchain.[3] Similarly, Hong Kong Exchanges and Clearing Limited (HKEX) has announced plans to issue securities on its own blockchain network.[4] These initiatives herald the evolution of a growing ecosystem of stakeholders seeking more efficient markets.

In these blockchain networks, platform, transaction, and subscription fees replace traditional trustee, custodial, brokerage, and clearing fees. This shift trims costs and reduces risk while potentially boosting liquidity.[5] Blockchain is automating core financial functions and reshaping the roles of key intermediaries. Trustees, who are primarily responsible for debt agreement compliance, and custodians, who safeguard assets and facilitate transactions, now face disintermediation risks along with clearing houses, brokerages, and exchanges. The Presidential Working Group on Digital Asset Markets, along with trade association coalitions, is pushing for rapid regulatory updates to fast-track crypto/digital-asset adoption. Initiatives like the Financial Innovation and Technology for the 21st Century (FIT21) Act are introducing profound changes like interest-bearing stablecoins that could accelerate this shift and transform the market.[6]

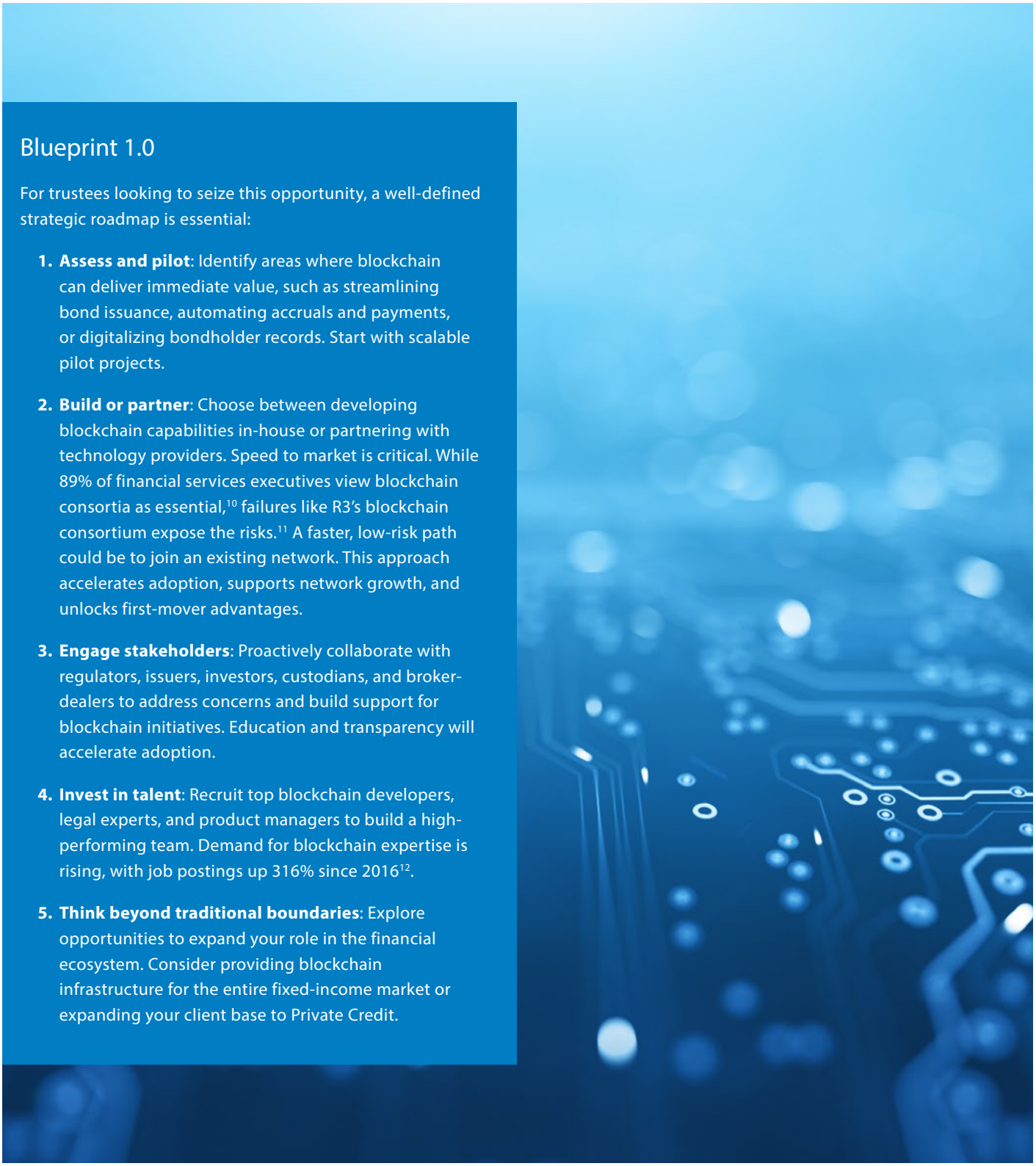
Trustee Leadership

Trustees have long played a crucial role in asset management. They act as intermediaries between issuers and investors to ensure compliance with debt agreements.[7] Their role, mandated by the Trust Indenture Act of 1939, remains central to maintaining market integrity.[8,9] As the cashflow administrator between issuers and investors, trustees are uniquely positioned to drive blockchain adoption because they control the cashflows and associated data. Those accruals, payments, and other reference data are independently recorded by investors, various intermediaries, and issuers, which is redundant (costly) and contributes to reconciliation differences (risk).

Now imagine future issuances with the capability to settle transactions intraday after netting and financing, where payments of interest and principal are automated, and a transparent real-time view of accrued principal and interest and other terms is synchronized across all parties.[1] These efficiency gains could save the industry billions annually while increased liquidity could unlock new opportunities, including fractional bond distribution, and real-time treasury management tools including tokenized money market funds and interest-bearing stablecoins. All of the stakeholders in this corner of the capital markets have an interest in such a future. Due to their unique control of the cashflow data, it is perhaps the trustee who is best positioned to lead the formation of the blockchain network that will bring it about.

The First-mover Imperative

Early adopters can set industry standards and emerge as preferred partners in new deals. Tokenized bonds could expand access to fixed-income markets through transparency, lower investment thresholds, and higher trade volumes powered by real-time payments.[5] Moreover, first movers will drive as well as benefit from industry consolidation. Smaller players may struggle to compete, while blockchain leaders will be poised to dominate through superior capabilities and economies of scale. Those who act now will share the future while the rest risk irrelevance.



Blueprint 1.0

For trustees looking to seize this opportunity, a well-defined strategic roadmap is essential:

1. **Assess and pilot**: Identify areas where blockchain can deliver immediate value, such as streamlining bond issuance, automating accruals and payments, or digitalizing bondholder records. Start with scalable pilot projects.
2. **Build or partner**: Choose between developing blockchain capabilities in-house or partnering with technology providers. Speed to market is critical. While 89% of financial services executives view blockchain consortia as essential,[10] failures like R3's blockchain consortium expose the risks.[11] A faster, low-risk path could be to join an existing network. This approach accelerates adoption, supports network growth, and unlocks first-mover advantages.
3. **Engage stakeholders**: Proactively collaborate with regulators, issuers, investors, custodians, and broker-dealers to address concerns and build support for blockchain initiatives. Education and transparency will accelerate adoption.
4. **Invest in talent**: Recruit top blockchain developers, legal experts, and product managers to build a high-performing team. Demand for blockchain expertise is rising, with job postings up 316% since 2016[12].
5. **Think beyond traditional boundaries**: Explore opportunities to expand your role in the financial ecosystem. Consider providing blockchain infrastructure for the entire fixed-income market or expanding your client base to Private Credit.

Part 2: Trust and Tokenomics The Revenue Model

The integration of blockchain technology into the securities industry is inevitable. As blockchain networks expand across industry segments, pressure on market infrastructure fees is bound to increase. Trustees, custodians, clearinghouses, and exchanges will feel the squeeze as trade volumes shift away from legacy systems, causing traditional roles and revenue streams to shrink.[1] While disruption is not yet widespread, early adopters can capture new revenue opportunities. While their default management role remains, trustees can pivot to validation, governance, security audits, and compliance services. Those who merely automate legacy processes risk losing ground.

Chain Reaction

Comparing trustee- versus custodian-operated blockchain networks reveals a strategic dilemma: defensive adaptation or growth-oriented innovation. Each approach presents distinct implications.

By acting as pioneers in this space, trustees can benefit from enhanced data services and participation in a collaborative network. This network provides a single source of truth, ensuring that all participants—from issuers and investment banks to investors—have real-time access to verified transaction information.

Looking forward, leveraging a networked ledger as a "data rail" offers intriguing possibilities for seamlessly intermixing traditional currencies, stablecoins, and digital assets. Such a ledger would serve as an extension of the trustee's natural network, including investment banks, borrower banks, paying agents, custody banks, brokers, and various investors. As "nodes" within the network, all participants would benefit from precise, real-time data that enhances operational efficiency and decision-making.

Evolving Revenue Streams

A trustee's revenue traditionally comes from trustee fees and various other sources, including administration, custody, income distribution, settlement and clearing, corporate action, regulatory compliance and return on cash equivalents or short-term investments.[t] However, integrating blockchain capabilities will reshape these income sources:

- **Trustee fees**: Automation may reduce traditional trustee fees, but blockchain enables monetization of transaction integrity, real-time oversight, and smart contract services.[14]

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- **Trustee fees**: Automation may reduce traditional trustee fees, but blockchain enables monetization of transaction integrity, real-time oversight, and smart contract services.[14]
- **Administration fees**: Manual process fees will be replaced by blockchain-based reporting and analytics fees.
- **Custody fees**: As tokenized assets migrate to blockchain, traditional custody fees will shift to blockchain infrastructure, digital security, and wallet services fees, though the demand depends on tokenization adoption.
- **Income distribution fees**: Smart contracts and networked ledger entries tracking obligations will automate principal and interest payments; trustees can generate revenue by developing and maintaining code that makes them work.
- **Settlement and clearing fees**: Instant settlements may reduce traditional fees, but trustees can charge for high-speed transactions and complex settlements.[15]

- **Corporate action fees**: Automation may reduce fees, but trustees can charge for smart contract development and hosting.
- **Accounting and regulatory compliance fees**: Blockchain simplifies compliance, but trustees can offer audit and certification services.
- **Other revenue opportunities**: New income streams may include blockchain hosting, consultancy, education, development, conversion services, premium data services, and strategic insights into transaction flows and investment behaviors.[16]

Interest Income Transformation

Blockchain technology will transform a key trustee revenue stream: interest income. Trustees generate substantial revenue not from settlement "float," but from administering investor cash awaiting deployment by issuers. This is especially significant in complex structures like syndicated construction loans, where funds remain in accounts until milestone-triggered disbursements.[23]

Currently, trustees earn revenue through 12b1 fees and similar arrangements from money market funds where these undeployed funds are placed. This represents a crucial revenue stream, particularly for trustees servicing structured finance transactions.

Blockchain-based networked ledgers will revolutionize how these funds are managed and optimized. The tokenization of cash positions and programmable fund deployment through smart contracts will fundamentally alter undeployed capital management across financial structures.

Interest-bearing stablecoins offer strategic opportunities in this transformation, potentially providing competitive yields while maintaining necessary liquidity and compliance requirements. Trustees can develop new income models that leverage blockchain's real-time monitoring and programmatic fund deployment capabilities.

Trustees who develop expertise in digital asset yield optimization will offer valuable services to clients navigating tokenized financial products. By leveraging their position at the nexus of capital flows, trustees can develop sophisticated yield optimization strategies that span traditional and digital assets.

This transformation demands strategic foresight before widespread blockchain adoption. Trustees who proactively develop capabilities in optimizing yield on undeployed capital within blockchain ecosystems will preserve this critical revenue stream as traditional models evolve.

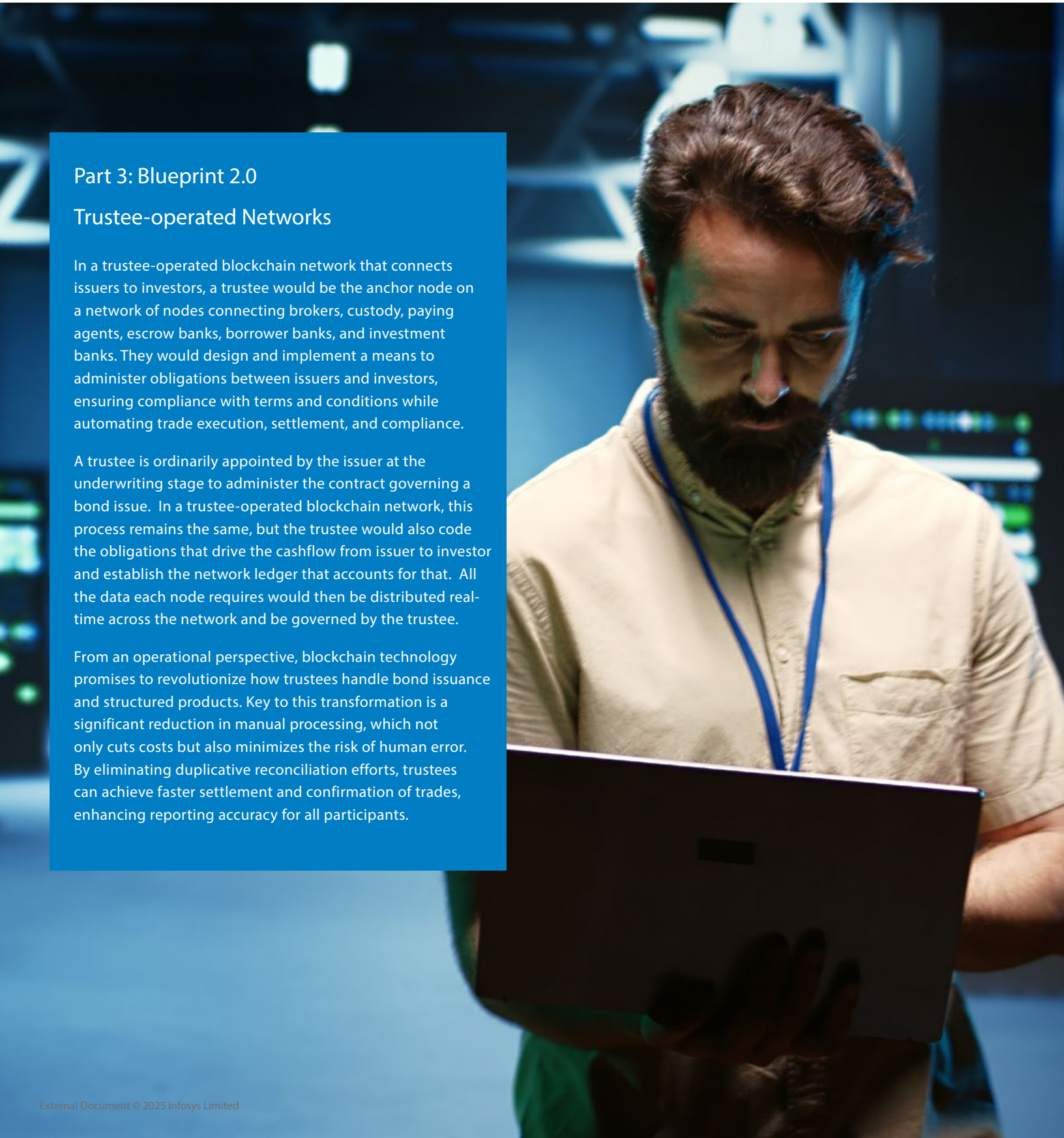
Custodian-run Network Implications

If custodians operate blockchain networks, trustees may face revenue shifts and distintermediation:

- **Trustee fees**: Reduced oversight may erode traditional trustee fees as blockchain technology automates assurances.
- **Administration fees**: Custodian-led automation may reduce the demand for trustee-led administrative services.
- **Custody fees**: Primary custody-related services and fees will shift to the custodian.
- **Income distribution fees**: The custodian's smart contracts may automate income distribution, cutting into fees traditionally collected by the trustee, but the trustee will retain control of the future cashflow and obligation data.
- **Settlement and clearing fees**: Automated settlement on the custodian's blockchain may reduce the trustee's earnings from settlement fees.
- **Corporate action fees**: Corporate actions may be automated within the custodian's network, diminishing the trustee's role and associated fees.
- **Accounting and regulatory compliance fees**: Blockchain improves accounting and compliance reporting, but the custodian's control could significantly restrict the trustee's ability to offer these services directly.
- **Other challenges**: Trustees may incur charges for network access, smart contract deployment, data storage, compliance and audit, advanced analytics, reporting, and application programming interface (API) integration.

Owning versus Joining an External Network

Trustees must decide between running their own blockchain network or using an external one. Owning a network offers more control and revenue potential but comes with higher costs and risks. Using an external network is cheaper and less risky but limits earning opportunities. The right choice depends on a trustee's strategy, market position, risk tolerance, and long-term goals. Regardless, a first-mover trustee stands to gain market share advantage in a market that has had static market dynamics for many years.



Part 3: Blueprint 2.0

Trustee-operated Networks

In a trustee-operated blockchain network that connects issuers to investors, a trustee would be the anchor node on a network of nodes connecting brokers, custody, paying agents, escrow banks, borrower banks, and investment banks. They would design and implement a means to administer obligations between issuers and investors, ensuring compliance with terms and conditions while automating trade execution, settlement, and compliance.

A trustee is ordinarily appointed by the issuer at the underwriting stage to administer the contract governing a bond issue. In a trustee-operated blockchain network, this process remains the same, but the trustee would also code the obligations that drive the cashflow from issuer to investor and establish the network ledger that accounts for that. All the data each node requires would then be distributed real-time across the network and be governed by the trustee.

From an operational perspective, blockchain technology promises to revolutionize how trustees handle bond issuance and structured products. Key to this transformation is a significant reduction in manual processing, which not only cuts costs but also minimizes the risk of human error. By eliminating duplicative reconciliation efforts, trustees can achieve faster settlement and confirmation of trades, enhancing reporting accuracy for all participants.

Basic Bonds

For a standard bond issue tradable across multiple execution venues, the trustee plays a central role in the trading workflow. Table 1 outlines the possible functioning of trade flow interaction with the trustee's blockchain network.

Table 1: Overview of trade flow interaction with the trustee's blockchain network

Process	Description
Order placement	The investor places order on a blockchain-integrated network trading platform
Trade matching	The platform matches buy and sell orders, confirming trade terms such as price and quantity
Trade confirmation	Both parties receive confirmation, finalizing the trade commitment
Trade match notification	The platform notifies the blockchain network of a trade match, including trade details and their settlement obligations.
Verification	Verification nodes validate trade details and ensure compliance with requirements
Digital ledger update	The blockchain ledger updates ownership records post-verification
Completion notification	Buyers and sellers receive confirmation of ownership transfer
Real-time reconciliation	Blockchain reconciles payments and ownership changes instantly, minimizing risk
Transaction recording	Trade details, timestamps, counterparties, and financials are recorded on blockchain for auditing
Regulatory reporting	The blockchain generates and submits necessary regulatory reports automatically for compliance
Obligation monitoring	Predefined conditions such as interest payments can be monitored and automated

The trustee's blockchain network in this scenario is designed to respond to real-time trade events and ensures that the entire bond lifecycle is managed within the blockchain infrastructure.[17,18] Through blockchain's immutable record-keeping, trustees can provide unmatched transparency and security, along with verifiable audit trails and better compliance support.

Structured Products

The inclusion of structured products, such as collateralized loan obligations (CLOs), asset-backed securities (ABS), and mortgage-backed securities (MBS), requires adjustments to the trade execution and administrative processes to accommodate their additional complexity. Table 2 lists the enhancements implemented in the trade execution process to address the complexities of structured products.

Table 2: Enhancements in trade execution to address structured product complexities

Process	Description
Contracting	Contract Terms and all direct and conditional obligations must be captured, configured and confirmed by all relevant parties
Additional data integration	Application programming interfaces (APIs) integrate real-time performance data
Enhanced verification	Rigorous verification steps enforce tranche-specific rules

A blockchain-enabled framework streamlines the complex trade cycles of structured products, ensuring accurate, efficient, and transparent execution that aligns with modern financial markets.[19,20]

The Evolving Role of Custodians

In a trustee-owned and operated blockchain network, custodians remain essential in ensuring asset safety and integrity, though their role evolves to leverage the benefits of blockchain technology. Table 3 describes how the custodian's role may evolve in a trustee-owned and operated blockchain network.

Table 3: Evolution of the custodian's role in a trustee-owned and operated blockchain network

Process	Description
Digital asset custody	Expansion from traditional asset custody to tokenized asset custody
Regulatory compliance	Ensure regulatory compliance while enhancing transparency and efficiency
Settlement and clearing	Oversee settlement, clearing, cross-border transactions, and integrate blockchain with traditional systems like fund accounting
Advisory and risk management	Offer advisory services and develop risk management protocols for digital assets in both primary and secondary markets

By embracing these evolving roles, in addition to collecting interest and principal on behalf of client, custodians can remain relevant in a blockchain-enabled financial ecosystem, bridging traditional asset management with the emerging digital landscape.

Custodian-operated Networks

Now, let us invert the scenario and consider a custodian-operated blockchain. As explained in Table 4, this model highlights the advantages of establishing rules and managing the network.

Table 4: Advantages of a custodian-operated blockchain model

Process	Description
Initial set-up and configuration	Build the blockchain network, configure assets and transactions, to align with bond terms
Order placement	Enable investors to place buy or sell orders on an integrated trading platform
Trade confirmation	Notify the blockchain network and trigger reissue transactions
Settlement process	Transfer bond ownership and facilitate cash settlement on the blockchain ledger (in primary and secondary markets)
Accounting and compliance	Manage accounting functions while ensuring real-time regulatory compliance and reporting
Post-trade reconciliation	Enable real-time reconciliation and minimize counterparty risk
Value-added services by custodians	Offer secure digital custody, cybersecurity measures, real-time updates, and comprehensive reporting

A custodian-operated blockchain model simplifies processes by combining secure digital custody with automated smart contracts. It enables real-time transaction execution and regulatory compliance, while reducing counterparty risk. Overall, it provides a foundation for advanced value-added services and operational efficiency.

Future Opportunities

As blockchain technology matures, the potential to include tokenized payments for complete automation becomes increasingly feasible, promising even greater savings and efficiencies. Additionally, there is a future prospect of utilizing stablecoins as an asset and using the network ledger as a "data rail" capable of supporting traditional currencies, stablecoins, and digital assets. This network ledger serves as an integral part of the trustee's extended network, automatically synchronizing key participants such as investment banks, borrower banks, paying agents, load custody and escrow banks, brokers, and diverse investors from asset managers to individuals.

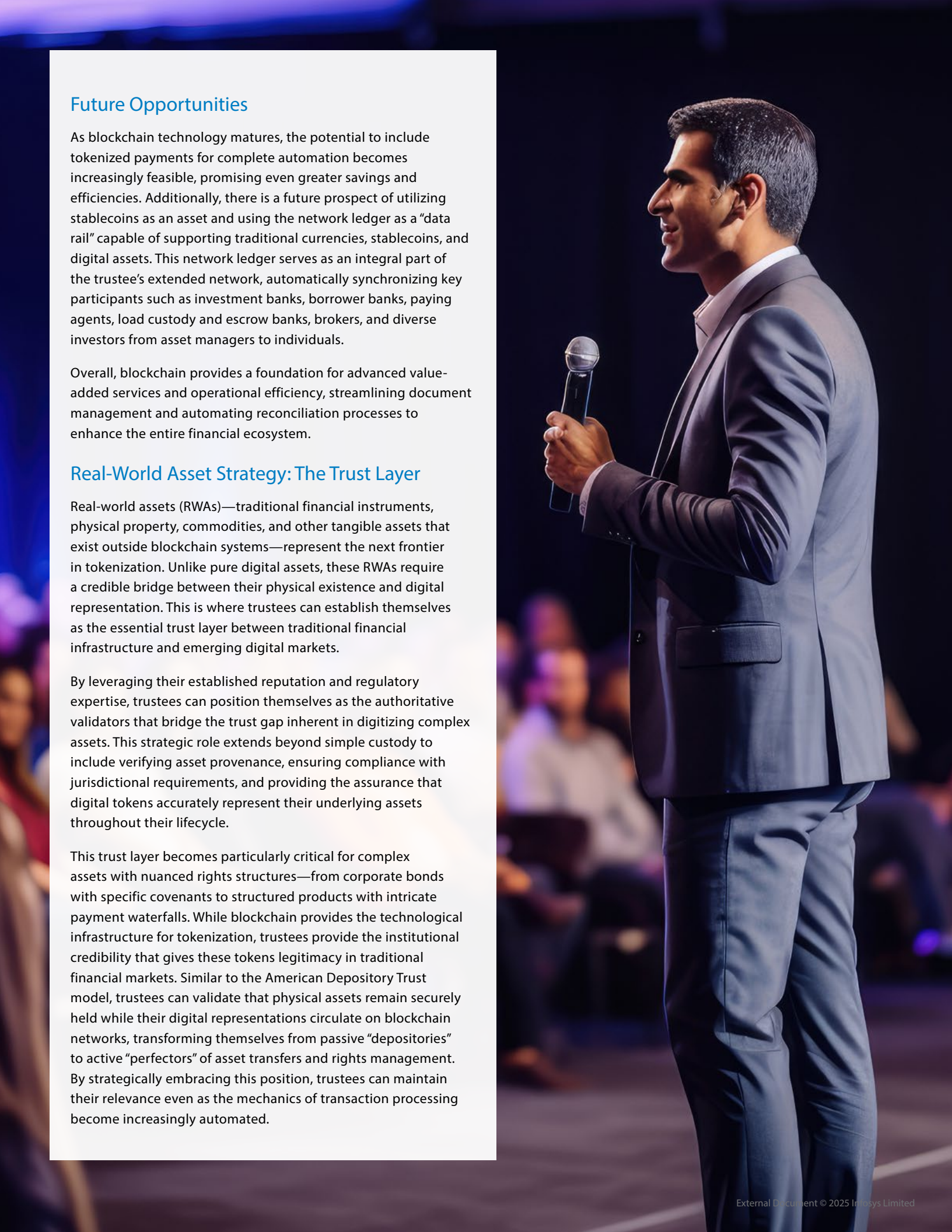
Overall, blockchain provides a foundation for advanced value-added services and operational efficiency, streamlining document management and automating reconciliation processes to enhance the entire financial ecosystem.

Real-World Asset Strategy: The Trust Layer

Real-world assets (RWAs)—traditional financial instruments, physical property, commodities, and other tangible assets that exist outside blockchain systems—represent the next frontier in tokenization. Unlike pure digital assets, these RWAs require a credible bridge between their physical existence and digital representation. This is where trustees can establish themselves as the essential trust layer between traditional financial infrastructure and emerging digital markets.

By leveraging their established reputation and regulatory expertise, trustees can position themselves as the authoritative validators that bridge the trust gap inherent in digitizing complex assets. This strategic role extends beyond simple custody to include verifying asset provenance, ensuring compliance with jurisdictional requirements, and providing the assurance that digital tokens accurately represent their underlying assets throughout their lifecycle.

This trust layer becomes particularly critical for complex assets with nuanced rights structures—from corporate bonds with specific covenants to structured products with intricate payment waterfalls. While blockchain provides the technological infrastructure for tokenization, trustees provide the institutional credibility that gives these tokens legitimacy in traditional financial markets. Similar to the American Depository Trust model, trustees can validate that physical assets remain securely held while their digital representations circulate on blockchain networks, transforming themselves from passive "depositories" to active "perfectors" of asset transfers and rights management. By strategically embracing this position, trustees can maintain their relevance even as the mechanics of transaction processing become increasingly automated.



To Tokenize or Not to Tokenize

In a tokenized asset scenario, several key elements could change how transactions are executed and managed. Table A highlights the material shifts introduced by tokenization.

Table A: Key shifts and changes from asset tokenization

Process	Description
Ownership and intermediaries	Enables assets to exist on the blockchain, redefines the role of intermediaries like trustees or custodians
Liquidity and accessibility	Fractionalizes tokenized assets, increasing liquidity and market accessibility
Settlement and counterparty risk	Automates transactions using smart contracts, minimizing counterparty risk (default risk does not go away)
Compliance and reporting	Streamlines compliance and auditing processes, with transactions transparently recorded on the blockchain
Security and custody	Enables custodians to provide digital security solutions to safeguard tokens from cyber threats (note: tokenized RWAs have minimal cyber threat compared to crypto currencies)
Enhanced market transparency	Improves market transparency and reduces fraud risks with blockchain's immutable ledger
Value-added services by custodians	Offer secure digital custody, cybersecurity measures, real-time updates, and comprehensive reporting

Tokenization introduces features like fractional trading that increase flexibility and accessibility in financial markets. Viewing asset tokenization as the end-state highlights its disintermediation effect.[21]

Unlocking Liquidity

Financial markets consistently seek to increase liquidity, benefiting investors and mitigating underwriter and issuer risk. While tokenization enhances market efficiency, it does not eliminate default risk. Tables B and C illustrate how the features of tokenization might work, while table D predicts the future potential of tokenization.

Table B: Features and benefits of asset tokenization

Process	Description
Fractional trading	Divides an asset into smaller units, allowing fractional ownership
Increased accessibility	Opens investor access to high-value assets
Enhanced liquidity	Simplifies transactions, improving market liquidity

Table C: New features enabled by tokenization

Process	Description
Programmable assets	Embeds logic to automate features such as dividends, voting and interest payments due
24/7 trading	Enables continuous trading, removing restrictions of conventional market hours
Increased transparency	Records all transactions publicly, enhancing transparency in ownership
Global reach	Eliminates geographical barriers for international investors
Rapid settlement	Automates clearing and settlement, reducing transaction processing time
Efficient compliance	Uses smart contracts to automate audits and reporting, ensuring continuous regulatory compliance

Table D: Innovation and future potential of tokenization

Process	Description
Real-world asset integration	Tokenizing physical assets to expand investment opportunities beyond traditional products
Interoperability	Enabling tokens to function across different blockchains for seamless asset transfers
Custom investment products	Offering personalized investment solutions through programmable tokens and composable assets
Data-driven insights	Leveraging blockchain data for advanced analytics and investment decision support
Rapid settlement	Automates clearing and settlement, reducing transaction processing time
Efficient compliance	Uses smart contracts to automate audits and reporting, ensuring continuous regulatory compliance

Conclusion

Blockchain is rapidly transforming capital markets. Trustees and financial intermediaries must act fast to stay ahead. First movers will define industry standards and unlock new opportunities. While blockchain adoption may disrupt traditional revenue streams, trustees can adapt by leveraging their expertise in compliance, oversight, and advisory services to create new revenue channels. Strategic positioning, whether operating a proprietary blockchain network or joining one managed by a custodian or an exchange, will depend on factors like control, flexibility, and cost. Realizing blockchain's full potential requires coordinated efforts among market participants. The future of asset tokenization and blockchain-based securities markets hinges on how effectively stakeholders collaborate to balance innovation, compliance, market stability, and growth.

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