Getting Ahead with Blockchain in Financial Services

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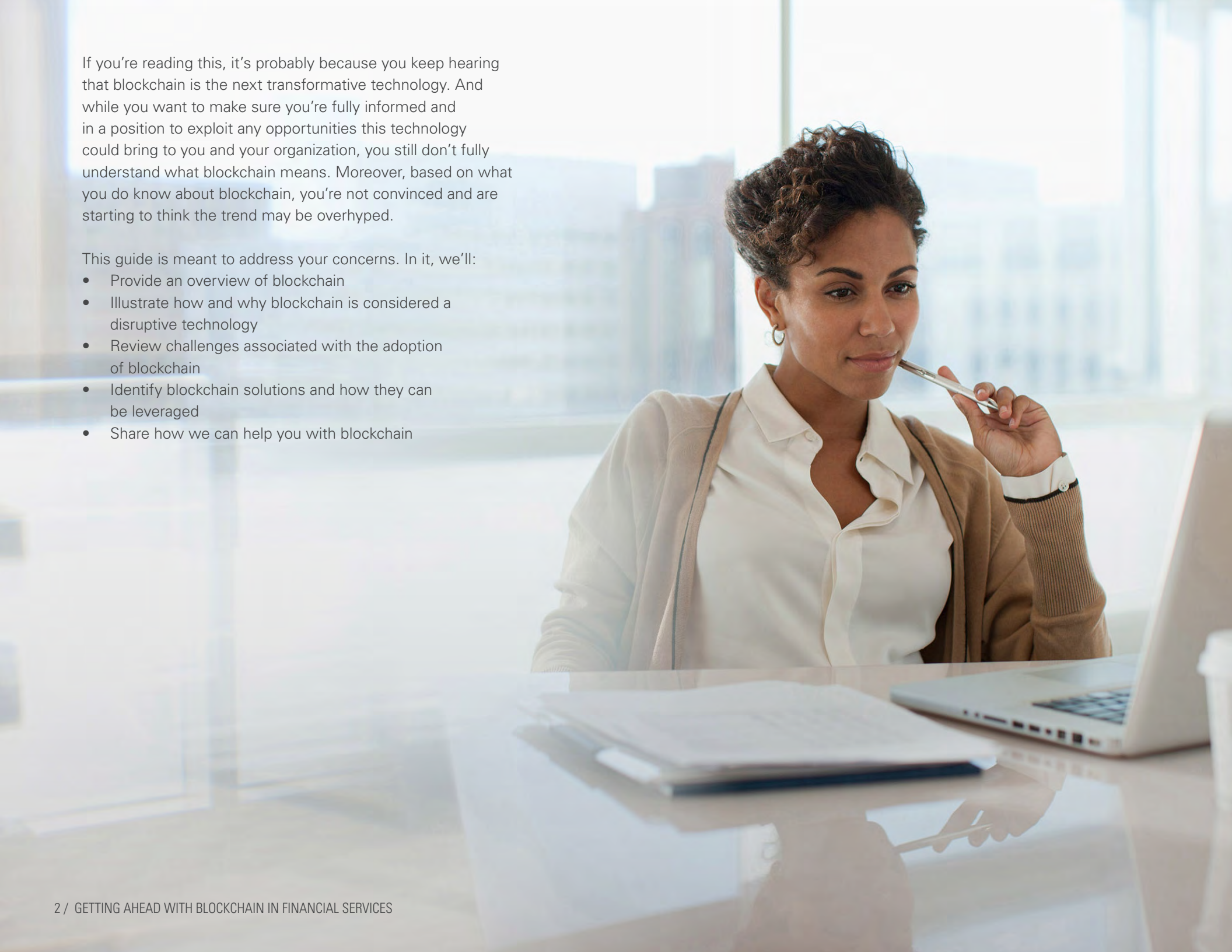
If you're reading this, it's probably because you keep hearing that blockchain is the next transformative technology. And while you want to make sure you're fully informed and in a position to exploit any opportunities this technology could bring to you and your organization, you still don't fully understand what blockchain means. Moreover, based on what you do know about blockchain, you're not convinced and are starting to think the trend may be overhyped.

This guide is meant to address your concerns. In it, we'll:

- Provide an overview of blockchain
- Illustrate how and why blockchain is considered a disruptive technology
- Review challenges associated with the adoption of blockchain
- Identify blockchain solutions and how they can be leveraged
- Share how we can help you with blockchain

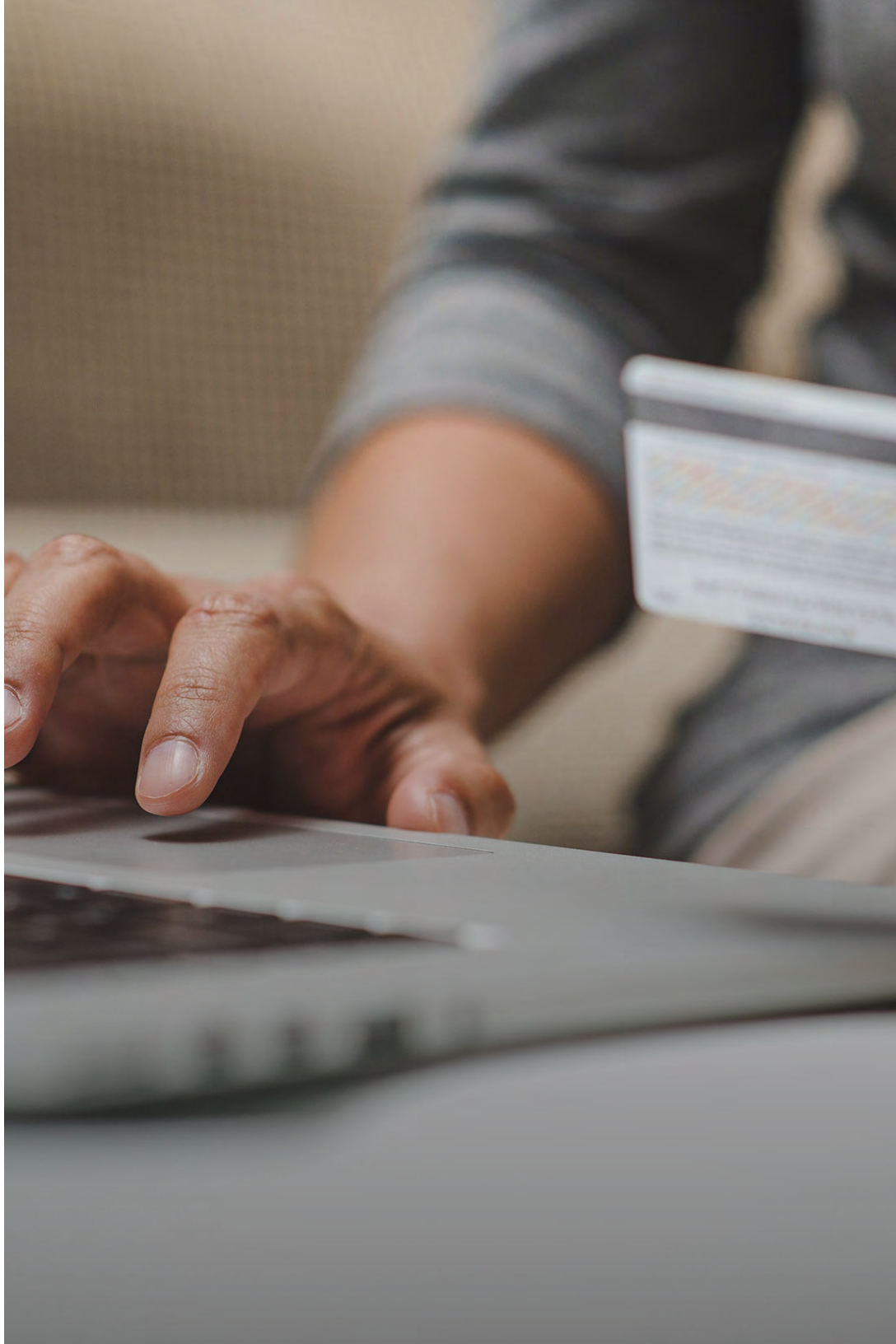


What is blockchain?

In simplest terms, blockchain is a technology that enables value to be transferred using only software; that is, without the need for trusted intermediaries. It is a record-keeping system where transactions are executed, validated, and recorded publicly.

Let's break it down.

1. Blockchain is the technology behind bitcoin, the electronic currency. It is not the currency itself.
2. A transaction that is blockchain-enabled can be a payment asset or any asset that can be stored, distributed, or transacted.
3. The blockchain technology is based on cryptographic mathematical equations, making transactions virtually un-hackable.
4. Transactions are recorded on each 'node' or computer on the network, making it a decentralized ledger.
5. Each transaction is added to the previous transaction, as well as the next transaction in the decentralized ledger that everyone in the network can see, making the transaction immutable (i.e., it cannot be changed).
6. Groups of transactions are stored in information blocks, and each block is "chained" to the previous and next group of transactions in the ledger.
7. A network that is blockchain-enabled eliminates the need for intermediaries in a transaction. This is the heart of the opportunity (or some may say the threat) that is blockchain.



The blockchain process

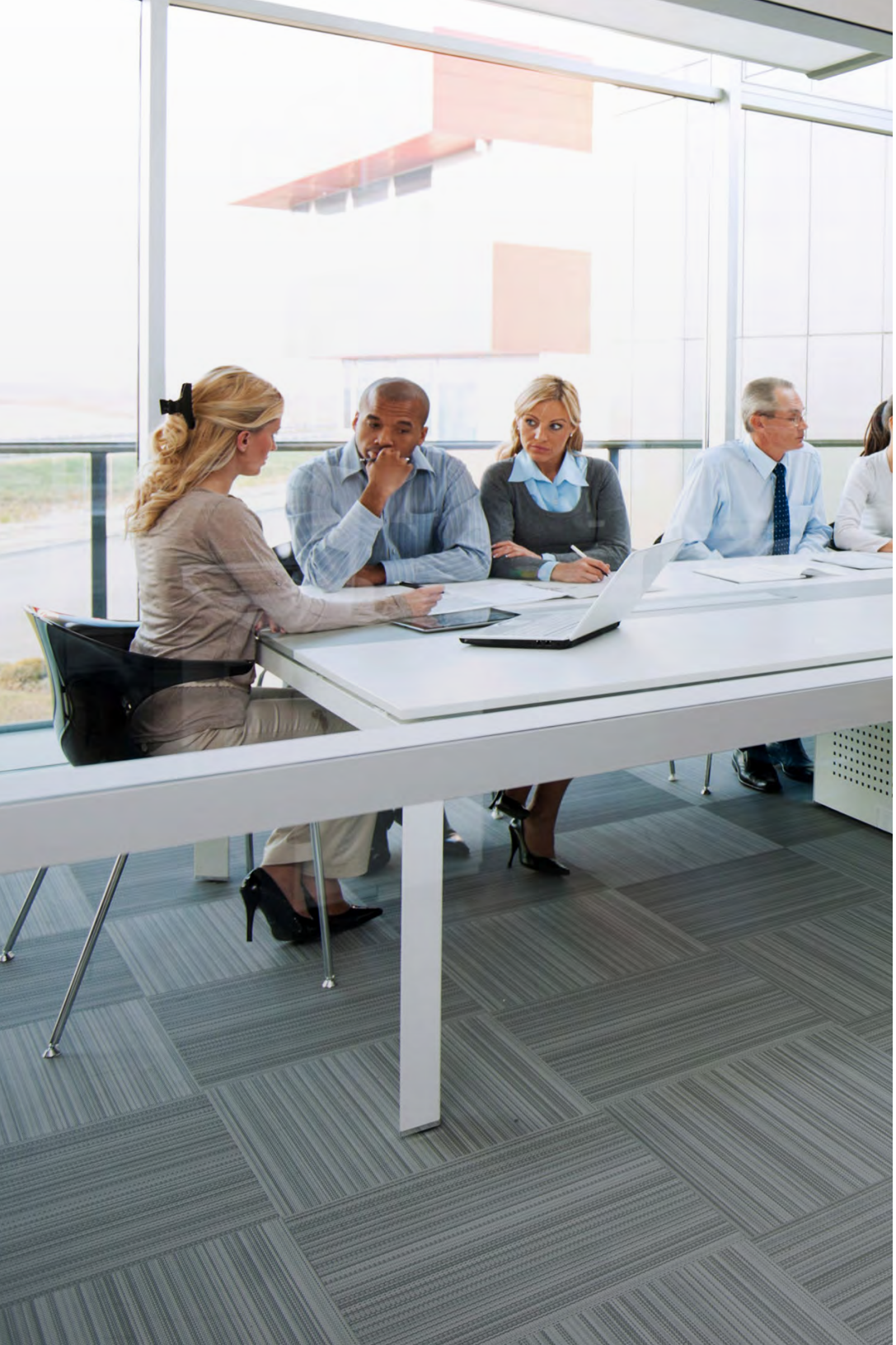
Current transaction processing requires trusted intermediaries to store assets, verify the legitimacy and solvency of each party in a transaction, validate each asset being transacted, complete the transfer of ownership of the asset, and record the transaction in a centralized ledger. Once a transaction is initiated, the initiating party has no visibility of each stage of the transaction until final ownership is confirmed.

In a blockchain-enabled transaction, each party has access to a blockchain network. This network is a private or public community of parties that have subscribed to the network and are using blockchain technology.

When a transaction is initiated, it is recorded on each computer in the network and each record has a unique key. Data "miners" in the network compete to validate that the transaction is authentic. The winning miner confirms the authenticity of the transaction and notifies everyone in the network. Everybody's ledger is updated accordingly, and transactions are grouped into blocks for processing. Each participant holds a complete copy of the chain.

The unique key for each record is an encrypted public key cryptography. This method of cryptography uses two types of keys. The first is a public key of which all parties are aware, and the second is a private key known only to its recipient. Each key is associated with an address on the system. This address is used to send and receive transactions and changes each time. Entities transferring the asset are anonymous, and at the same time completely transparent: anyone can see the addresses involved, but nobody necessarily knows to whom they belong.

This shared, distributed ledger is an anonymous, self-verifying, and completely reliable register of transactions. It is banking without banks.



Public and private blockchain

Leveraging blockchain technology requires access to a blockchain platform. Public or permissionless blockchain platforms, however, have limitations for financial enterprise transactions, creating privacy concerns by enabling everybody on the blockchain to have visibility of all transactions.

Additionally, the sheer vastness of potential transactions requires a substantial amount of computational power, which can slow transaction processing times. To address these limitations, private and permissioned blockchain platforms were developed by financial technology companies. A private, single organization blockchain has limitations outside that organization, but can be used to enhance internal transaction processing.

Realizing these limitations, larger organizations have developed cooperative networks or consortiums that leverage a shared blockchain platform, but that is not public to any entity outside the consortium. These consortiums are comprised of organizations with similar or complementary services with the objective of optimizing processes with known entities. This provides many of the same benefits affiliated with a single organization private blockchain—efficiency and transaction privacy, for example—without consolidating power with only one company.

The first bank-backed consortium, R3CEV, was established in September 2015. There are now more than 100 types of consortia in the blockchain area.

Primary U.S.-centric Blockchain Consortia in Financial Services (August 2017)

Consortium	Number of Members	Premier Financial Services Members	Leader(s)	Start Date	Focus/Goal
R3CEV	84	DTCC, American Express, Bank of America Merrill Lynch, Wells Fargo, Citigroup, TD Bank, BBVA, Bank of New York Mellon, Northern Trust, HSBC, Barclays	R3, CEV	2014	General-purpose platform and technology to design and deliver advanced distributed ledger technologies to the financial services market.
Digital Asset Holdings	15	Deutsche Borse, J.P. Morgan, DTCC, ABN AMRO, Goldman Sachs, Santander, Citi, IBM	DAH	2014	Capital markets – post-trade settlement. Building distributed, encrypted straight through processing tools to improve efficiency, security, compliance, and settlement speed.
Hyperledger Project	142	J.P. Morgan, Barclays, Deutsche Bank, Wells Fargo, UBS, BBVA, Bank of New York Mellon	Linux Foundation, IBM, Cisco, Intel, SWIFT, DAH	2015	General purpose blockchain. Open source collaborative effort based on IBM's Fabric codebase, which was created to advance cross-industry blockchain technologies. It is a global collaboration that includes leaders in finance, banking, the internet of things (IoT), supply chain, manufacturing, and technology. The Linux Foundation hosts Hyperledger as a Collaborative Project under the foundation.
Ethereum	116	J.P. Morgan, Santander, BNY Mellon, BBVA, Bank of New York Mellon	Microsoft, Intel	2017	Considering a more distributed approach to self-management rather than the more traditional leadership structure adopted by competing blockchain consortia like R3CEV and Hyperledger. Offers smart contract features that contain a virtual machine, executing peer-to-peer contracts using a cryptocurrency known as Ether.
Ripple	75	UBS, Standard Chartered, Santander, CIBC, Sumitomo Mitsui Banking Corporation (SMBC), MUFG, Mizuho	Google, IDG Capital Partners	2012	Payments. A real-time gross settlement system (RTGS), currency exchange and remittance network by the company of the same name. The Ripple Transaction Protocol (RTXP) or Ripple protocol is built upon a distributed open-source Internet protocol, consensus ledger and native currency called XRP (ripples).
Kinakuta	35	Ethereum Foundation	Microsoft, ConsenSys	2016	Working group dedicated to improving smart contracts security.

Looking ahead as multiple versions of blockchain networks grow, standards for interoperability between blockchains will become increasingly important. Consortia that base their blockchain technology on public chains will adapt more easily to these standards.

How blockchain can disrupt aspects of the financial services industry:

SECURITY AND DIGITAL IDENTITY – COMPLIANCE (KYC)

Current Process: The Know Your Customer (KYC) regulation is an integral part of global anti-money laundering (AML) efforts. Compiling and maintaining these databases is expensive for financial services; this can lead to duplication of effort and can delay transactions.

Future Process: If digital identities are recorded on a blockchain shared ledger, an individual can add devices to their identity and add authorization to transact on their behalf. Verifiable and robust identities, cryptographically secured blockchain technology could provide a single digital source of ID information, allowing for the seamless exchange of documents between banks and external agencies. This would likely result in automated account opening and reduced resources and costs, while maintaining the legally required privacy of data.

Impacted: All financial services firms, payment card networks, regulators

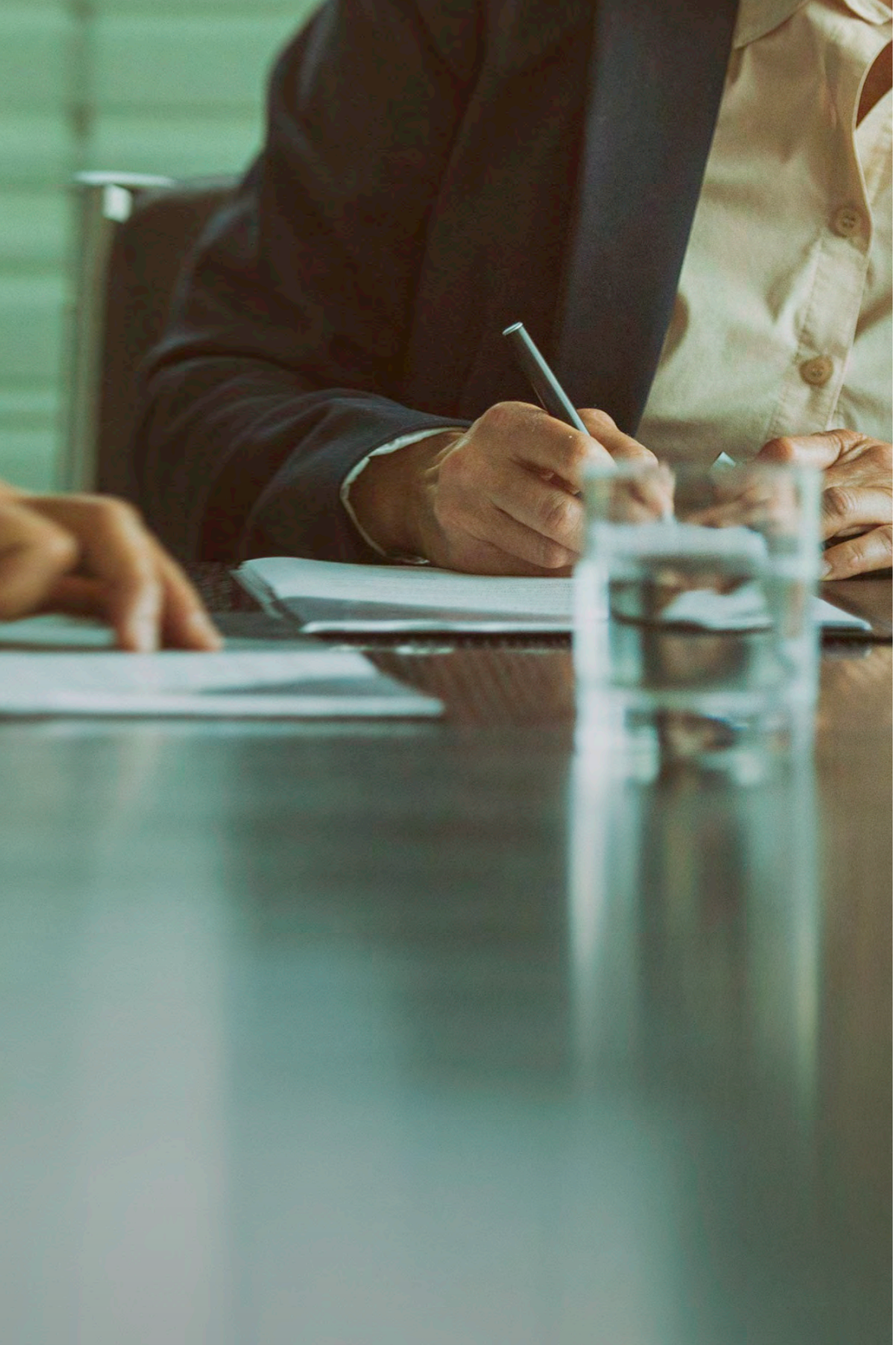
CROSS-BORDER PAYMENTS

Current Process: Cross-border payments use SWIFT messaging. Fees are leveraged by multiple intermediaries.

Future Process: BBVA cleared a real money transfer between Spain and Mexico in minutes. One-fee Smart contracts can be coded to reflect any data-driven business logic. For example:

- Cross-border transactions
- Digitalizing letters of credit
- Loan repayments

Impacted: Consumer banks, commercial banks



CLEARING & SETTLEMENT

Current Process: Centralized clearing and settlement for all financial instruments. Settlement can take from days to weeks, depending on the complexity of the transaction.

Future Process: Settlement can be done in minutes using blockchain. A fundamental advantage of a distributed ledger system, in which no single company has control, is that it resolves problems of disclosure and accountability between individuals and institutions whose interests are not necessarily aligned. It gives each member of the network far greater and timelier visibility of the total activity. DTCC has already proven that complex post-trade events inherent to credit default swaps (CDS) can be managed with distributed ledger technology in a permissioned, distributed, peer-to-peer network.

Impacted: Investment banking, asset management, corporate banking, hedge funds, forex trading, clearinghouses, central banks, regulators

TRANSFER OF OWNERSHIP (CONTRACTS, TITLES)

Current Process: Transferring title of a property or negotiating contractual terms for financing, funding and loads is a long and onerous process with multiple intermediaries, include the legal profession.

Future Process: Securities based on payments and rights that are executed according to predefined rules can be written as smart contracts. A smart contract is any contract that can automatically enforce itself without the need for a trusted intermediary. Any contract can be a smart contract if the terms of the contract can be automated. The blockchain assures that everybody is seeing the same thing at the same time, which negates the need for trust.

Impacted: All banks, legal profession, real estate industry, regulators

ASSET MANAGEMENT

Current Process: Each party in the trade lifecycle (e.g., broker dealers, intermediaries, custodians, clearing and settlement teams) currently keeps its own copy of the same record of a transaction, creating significant inefficiencies and room for error.

Future Process: Blockchain technology would provide an automated trade lifecycle in which all parties to the transaction would have access to the exact same data about a trade. This would lead to substantial infrastructural cost savings, effective data management and transparency, faster processing cycles, minimal reconciliation, and a reduced need for brokers and intermediaries.

Impacted: Asset management banks, broker-dealers, custodians

SMART ASSETS (SUPPLY CHAIN/TRADE FINANCE)

Current Process: Primary pain points for supply chain firms are: no visibility of payments, long payment schedules, demand management.

Future Process: Blockchain provides a system of trusted records that addresses all three. Digitizing letters of credit and bills of lading facilitates a smart asset tracking system. Tracking assets that are rich in data can be turned into information for corporate clients.

Impacted: Financing firms, supply chain industry

LENDING

Current Process: Multiple intermediaries and fees for bank loans, mortgages, credit card debt, government bonds, muni bonds, asset-back securities.

Future Process: Both loan and collateral can be stored in a blockchain. A smart contract can automatically revoke access to the collateral if the terms of the loan are broken. Debt can be issued, traded and settled on the blockchain. Improves small business lending and lending for the unbanked (Approx. 2bn – World Bank).

Impacted: Commercial banking, consumer banking, payment card network, money transfer services, telecommunications, regulators

FUNDING

Current Process: Funding and investing in an asset, IPOs, dividends, capital appreciation, rental income.

Future Process: Peer-to-peer financing, recording of corporate actions, automatic payment of dividends, smart contracts for title registries. Contracts that monitor the performance of digital or non-digital assets can also be used as futures, forwards, swaps, and options.

Impacted: Investment banking, corporate banking, real estate, legal

INSURANCE

Current Process: Managing risk, derivatives, insuring assets.
Future Process: Decentralized markets for insurance, more transparent derivatives.
Impacted: Insurance, risk management, brokerages, corporate banks, clearinghouses, regulators

GOVERNANCE

Current Process: Accounting for value.
Future Process: A distributed ledger will mean real-time audit and financial reporting capabilities. Transparency of the blockchain improves regulatory management.
Impacted: Audit, asset management, regulators, banks

RECORDING AND STORING
TRANSACTIONS AND CUSTODY

Current Process: Centralized recording and storage of financial assets, currencies, commodities for all types of accounts.
Future Process: Cryptographic mathematical equations and immutable blockchain secures recording and storing of all transactions. Will reduce need for typical financial services accounts (brokerage, checking, savings, etc.).
Impacted: Consumer banks, Investment banks, brokerages, asset management, regulators

Challenges for blockchain

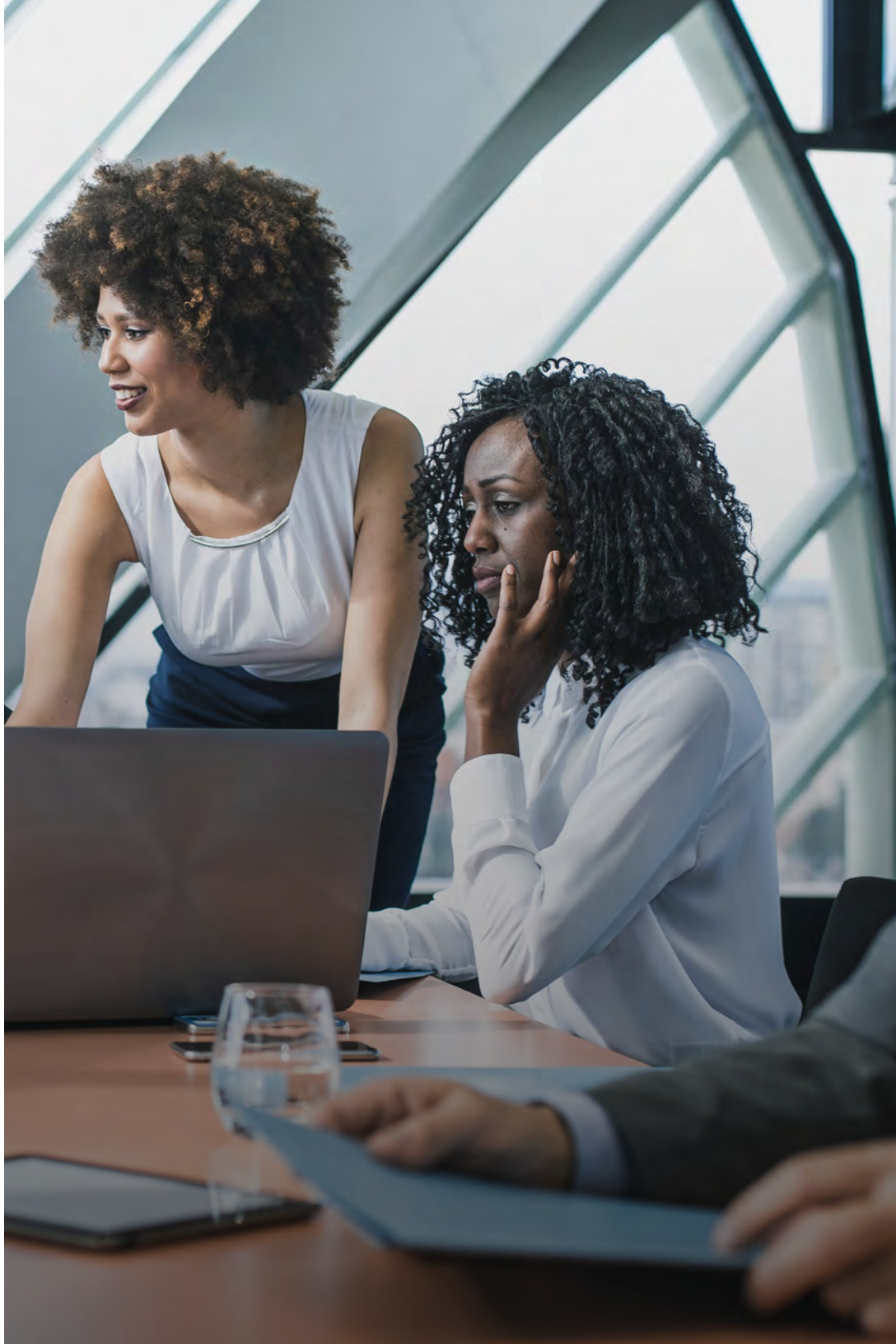
Blockchain is not a new technology; it has been available since the introduction of bitcoin in 2008. However, alternative applications in financial services have not yet achieved a critical mass of acceptance. There are some reasons for this, including the following.

REGULATORY APPROVAL

- There is currently no legal framework that regulates the application of blockchain technology for processing financial transactions. What's still missing is a stronger focus on governance principles and the network effect necessary to deliver the true benefit of blockchain-type or distributed ledger architectures.
- There is now a growing focus on security and other risk issues from regulators. It is expected that regulators will increasingly discuss and operate in collaboration with the industry to reach the best regulatory solutions for all parties involved. This will take time.

STANDARDS

- There are now a number of private blockchain networks with tailor-made ledger solutions. An overall open source distributed ledger with common standards and protocols will still be required.
- Acceptance of a standard architecture for smart contract architecture will be necessary.
- Scalability will be difficult without a standardized approach to the technology.



SECURITY

- Blockchain uses encrypted technology, which requires both a public and private key to process any transaction. While the encrypted technology itself is considered very secure, stringent policies and procedures will be needed when managing keys.

INTEROPERABILITY

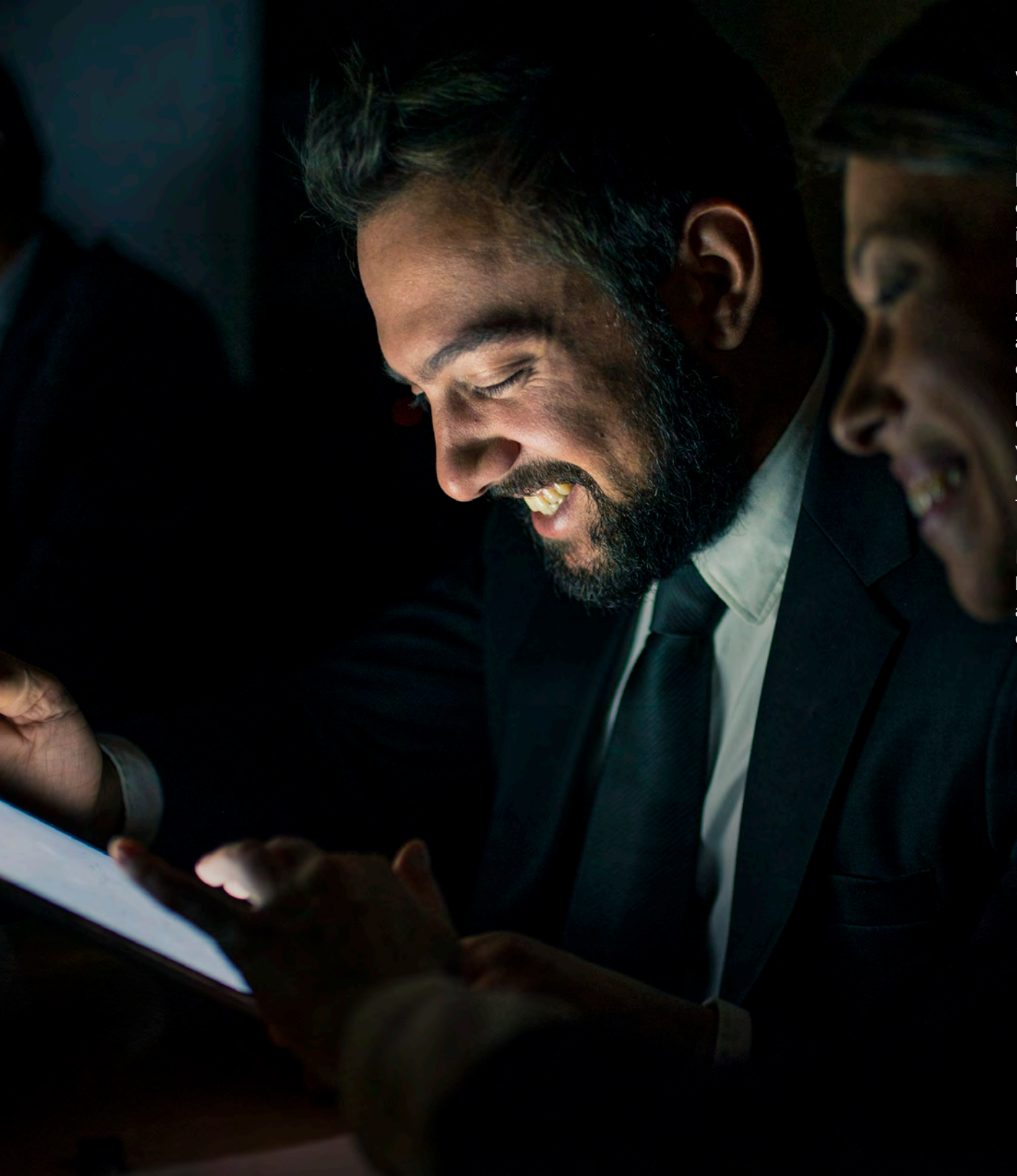
- To settle transactions, smart contracts must be connected to banking systems. This will require that blockchain be integrated into banking systems as well as their application program interfaces (APIs).

SCALABILITY

- The bitcoin blockchain process was designed to clear transactions within ten minutes. However, with every transaction needing to be recorded on the blockchain, the requirement of resources to process and store the information continuously increases.
- A large number of FinTech companies are working to solve the scalability issue. Options being discussed include increasing block sizes and scaled blockchains. A scaled blockchain would accelerate the process without sacrificing security and would be fast enough to power the internet of things (IoT). However, a solution to resolve the scalability issue has not yet been proven.

PRIVACY

- As the number of blockchain users grows, it will become increasingly imperative that security is able to guarantee the privacy and integrity of information stored in the ledger.



What's next?

In the mid-1980's, a nascent technology was leveraged to invent the World Wide Web. Few could have foreseen the ubiquity of the internet in 2017. Likewise, blockchain is a relatively new technology, and its full potential may not be realized for some years. In the interim, and as further research continues, a number of applications of the technology have already been deployed in the real world, with many others in pilot or proof concept phase. Just like TCP/IP and email, which eventually unlocked new economic value by dramatically lowering the cost of connections, blockchain could dramatically reduce the cost of transactions.

Every organization that could be impacted by blockchain technology should ensure they are at least fully informed and understand any developing opportunities.

How Perficient can help

- Give strategic advice on understanding the blockchain and distributed ledger technology environment
- Offer advice on potential blockchain and distributed ledger technology applications in the financial services industry such as cross-border payments, clearing transformation, smart contracts, etc.
- Vendor assessments of blockchain companies
- Impact assessments of blockchain and distributed ledger technologies, including the benefits of public blockchain applications versus private blockchains
- Development of strategic transition plans to blockchain and distributed ledger technology applications
- Research companies that show an interest in blockchain, but that have not yet partnered with any consortium or FinTech
- Evaluate blockchain solution providers and recommend a roadmap for implementation
- Provide expertise to assist with navigating the emerging regulatory landscape for blockchain
- Integration – full SDLC consulting services (requirements, development, implementation)
    - Financial institutions will have to integrate blockchain technology with existing systems, such as KYC, AML, data warehouses, customer record systems, and others
    - Third-party systems that are currently integrated into banking systems will also need to adopt and integrate their systems with the technology
    - Provide advisory consultancy to understand integration requirements initially
- Business process change support
    - Business processes in payments, clearing and settlement, legal, and risk will have to be updated because of the adoption of blockchain – a process that may take several years
- Organizational change support
    - Fundamental organizational changes, such as the back-office structure

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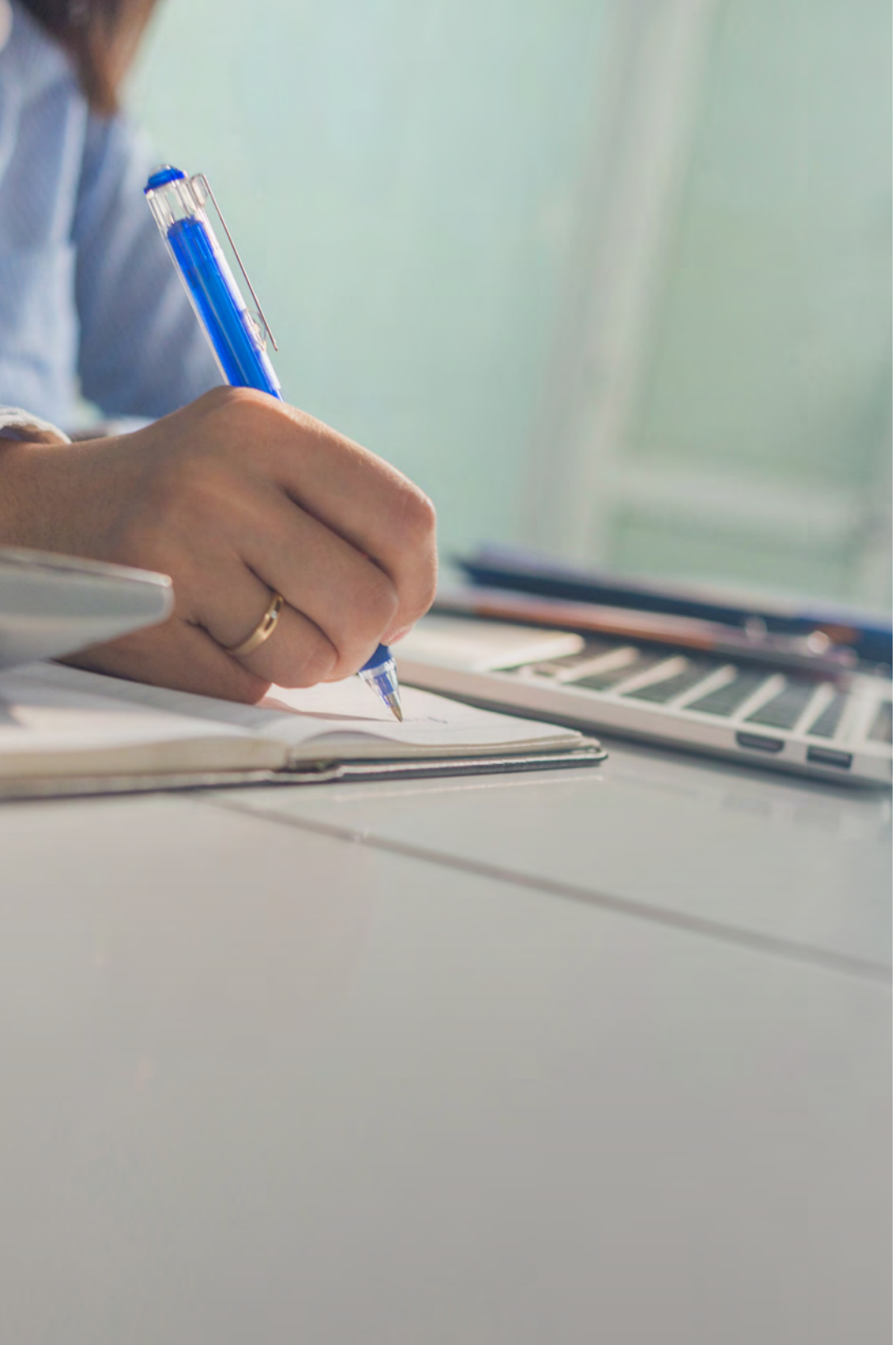

Meet the Author

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Maura Holland joined Perficient in 2013 via the acquisition of ForwardThink Group. Her areas of focus include program management, change management, business process redesign, and strategic operations. Maura has more than 25 years of experience in wealth management, investment banking and consumer banking, serving in corporate and consulting roles. She has successfully delivered projects for diverse clients, such as Morgan Stanley, Citigroup, and the Depository Trust & Clearing Corporation (DTCC).

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