

INSIDE THIS PUBLICATION:

Auditors develop early plans for auditing blockchain

New coalition forms to wrestle blockchain accounting issues

Is blockchain technology FinTech's magic bullet?

PwC: Governance in the Age of Blockchain Distributed Ledger Technology

FINRA tackles blockchain

CFTC Commissioner: Regulators should 'do no harm' to blockchain

Three ways blockchain can establish best practice

The benefits and challenges of **Blockchain**

About us

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Inside this e-Book

Auditors develop early plan for auditing blockchain	4
New coalition forms to wrestle blockchain accounting issues	6
Is blockchain technology FinTech's magic bullet?	7
PwC: Governance in the Age of Blockchain Distributed Ledger Technology	10
FINRA tackles blockchain	19
CFTC Commissioner: Regulators should 'do no harm' to blockchain	20
Three ways blockchain can establish best practice	22

Auditors develop early plans for auditing blockchain

Blockchain is evolving rapidly from enigma to imperative in financial reporting circles, and one audit firm has even introduced an audit approach. **Tammy Whitehouse** has more.

Blockchain is evolving rapidly from enigma to imperative in financial reporting circles, and one audit firm has even introduced an early audit approach.

PwC recently unveiled a “blockchain validation solution” that combines a patent-pending risk framework with proprietary continuous auditing software. “It is currently the only standard that exists for risks and controls in the blockchain space for private business blockchain processes,” the firm says.

The blockchain validation software that PwC says it is now deploying in a limited number of use cases provides real-time testing for anomalies covering a full population of transactions. It is meant to be built into client systems so that it becomes part of the client’s data processing system. The firm says it will find longer-term patterns of indicators that are not evident to humans, is immediate and predictive, and provides objective results.

A. Michael Smith, internal technology audit services leader at PwC, says the solution is operating now in a large, financial services setting, and a number of other projects are in the pipeline. “It’s all real, tangible,” he says. “It is, in fact, in production.”

Blockchain entered the capital market scene with bitcoin, the first cryptocurrency that gained traction as a huge potential disrupter of traditional currencies and payment processes. Blockchain is the technology that powers bitcoin trading.

A digital ledger, essentially, blockchain is a peer-

to-peer, internet-based, network that brings buyers and sellers into a seemingly secure digital marketplace with no intermediaries, like banks or payment processing centers, and no standards. It records transactions in a ledger that’s freely accessible to all parties, and its entries cannot be deleted or altered.

“At its very core, blockchain is another type of database technology,” says Will Bible, a partner at Deloitte & Touche. “Many different companies share access to a common database, so it keeps multiple redundant copies of the database in sync at all times.”

Today, companies each keep their own databases recording their own transactions, and accountants spend a good deal of their time reconciling databases, says Bible. “A blockchain pivots that,” he says. “It records all the information to the same place in the same way, so the reconciliation effort on the back end goes away.”

That makes the financial reporting and audit implications intriguing, says Ami Beers, director at the Association of International Certified Public Accountants. “It’s transparent technology,” she says. “It can reduce cost; it can transact faster and cheaper. And it gives you an immutable record of all transactions that cannot be changed, so that’s automating the audit trail. No one party controls it. We look at it as an opportunity to make audits more efficient in the future.”

Pilot testing is occurring in many settings, says Beers, especially in the financial services sector, where blockchain could provide a powerful new way

to track asset trades and settlements. That's already happening with digital currencies, so banks are exploring how it could be deployed for transactions involving traditional currencies.

Supply chain management is another strong potential use case for blockchain, says Brian Wolohan, national partner at Grant Thornton. Food producers, for example, may want or need to establish proof of origin for certain ingredients, he says, and blockchain technology can help enable that.

Whether for food product or other materials in other sectors, blockchain as a way to manage supply chain activities would address a host of documentation and logistics issues, says Wolohan. "Think about the investment that occurs in terms of managing the process of moving goods and checking them at different points, confirming, invoicing, payments. All of that is cost, and time is money."

Smart contracts are another compelling use for blockchain, says Maurice Liddell, managing director in technology at BDO USA. They are essentially digital agreements in a blockchain that can bring together any number of parties in any number of jurisdictions with terms and conditions established in the same trackable, irreversible digital fashion.

Despite the upside potential, there are still plenty of risks associated with blockchain to be sorted out, says Liddell. "How do you go about getting assurance that the information is accurate?" he asks. "Can a third party get in and play with it?"

To pass muster with auditors, blockchains that produce data feeding into financial reporting will need strong processes and controls over who can access the blockchain and what they can do, says Jeff Ward, a partner at BDO USA. "Just because everything is in a blockchain, that doesn't make it legitimate. We still have to look for unauthorized, fraudulent, illegal activity. There's more to it than just determining that a transaction exists."

Blockchain is not seen at this point as a way of automating the preparation of financial statements or the financial reporting process, but as a new source of data that would roll into accounting processes and financial statements. "You might create

a blockchain for a supply chain purpose that generates immutable, time-stamped information that can be utilized by the financial reporting process and potentially relied on by the auditor," says Wolohan.

But auditors are just scratching the surface in terms of identifying the uncertainties about how to audit the information that comes from a blockchain, says Beers. "The open question is whether the information and transactions that are being conducted in the block chain can be constituted as audit evidence in itself or if an auditor needs to perform procedures," she says. "We think skills are going to have to evolve in terms of being able to understand blockchain."

Erich Braun, a partner at KPMG and the firm's audit blockchain lead, says auditors will have to comply with auditing standards regardless of technology changes. "There are still basic requirements, and we have to figure out a means of getting there," he says.

Auditors will need to see plenty of access controls and will need a means of checking triggering events via use of smart contracts in the blockchain, says Braun. They'll also need to assess codes to be sure the technology is operating as intended. "A lot of auditing today is auditing around the technology, getting hard-copy records," he says. "Blockchain will require auditing through the technology, not auditing around the technology."

PwC claims to have worked through some of those issues, at least for its first pass at an audit solution that is not being relied upon yet for any financial reporting purpose.

The challenges in auditing blockchain for financial reporting purposes are numerous, says Smith. "The way the underlying database is architected and processes data, there's no practical or efficient way to do traditional audit activity against that," he says.

Further complicating matters, blockchain is not a single product or application. "It's a form of computer science with little to no standardization," Smith says. "If we go to 20 different clients that are using blockchain, we might see 16 different types of software and a half dozen architectures. When you think about audit and compliance and regulatory activities, it's all about standardization." ■

New coalition forms to wrestle blockchain accounting issues

Accounting and tax professionals have formed a grassroots coalition to tackle blockchain, writes **Tammy Whitehouse**.

A group of accounting and tax professionals has established a grassroots coalition to get their arms around blockchain and what it will mean for the accounting profession.

Representing accounting, tax, law, technology, and academia, the Accounting Blockchain Coalition has formed to figure out and educate the profession on digital assets and distributed ledger technology, including blockchain, and its accounting and audit implications. The Coalition wants to serve as a knowledge-sharing platform as companies address the changes and opportunities created by the adoption of blockchain technology.

“Our mission is to educate businesses and organizations on accounting matters as this new digital asset class emerges,” says Dave Deputy, president of the ABC board and director of strategic development and emerging markets at tax services firm Vertex. “We are a membership organization to contribute knowledge, expertise, and provide resources to the industry.”

Board members for the upstart group hail from audit firms like BDO USA, Crowe Horwath, and RSM, and technology firms Microsoft and ConsenSys, plus Vertex and Michigan State University. The group has divided its work into four primary focus areas — audit and accounting, internal controls, regulatory and external compliance, and taxation.

“This new asset class has a lot of gray areas,” says

Deputy. Given the fast pace of emergence of blockchain technology, coalition founders say they are already seeing different accounting and tax treatments, suggesting the need for experts to put their heads together and come to some consensus. “These are currently volatile assets that need to be accounted for, so where is that asset and where is that liability? The rapid change has necessitated a group getting together that can publish best practices and disseminate materials.”

So far, the non-profit group has met via monthly calls to membership and it met live in May as part of a “Blockchain Week” event in New York. The group is held a series of talks and presentations from accounting firms, enterprise users, technology experts, and regulators to address accounting, audit, and tax issues.

The group also plans to release deliverables by the end of the year, Deputy said, to try to address some areas where uncertainty is already apparent. A notable example includes questions surrounding custodianship of digital assets, with distributed ledger technology eliminating the traditional intermediaries, like brokers and financial institutions.

“The owners of accounts have control directly,” says Deputy. “The exchange doesn’t take custody of that. How do you account for that? How do you reflect the reality of that distributed business model?” ■



Is blockchain technology FinTech's magic bullet?

While, bitcoin, the much-hyped virtual currency, is hardly ready to fade into oblivion, blockchain is poised to become the hottest technology to hit the financial world in years. **Joe Mont** has more.

Bitcoin is dead; long live blockchain. To be fair, bitcoin, the much-hyped virtual currency, is hardly ready to fade into oblivion. The technology underlying those online exchanges, however, is poised to, on its own, become the hottest technology to hit the financial world in years, albeit not without significant business and regulatory challenges.

Blockchain technology is basically a peer-to-peer, distributed "open ledger." Rather than a traditional, centralized server or clearing process, blockchain relies upon decentralized, consensus-based authentication protocols. Any item that can be securitized or represented as an item of value can be transferred

with an immediate settlement process.

Among those heralding its potential is J. Christopher Giancarlo, a member of the Commodity Futures Trading Commission. "The 20th century underpinnings of the current 'closed ledger' financial system are inefficient and unstable," he said during a December speech, describing a process where third parties authenticate financial information in three-day settlement timeframes that "add undue risk, cost, and volatility to the marketplace. The 2008 financial crisis revealed that "a portion of the recordkeeping infrastructure of the multitrillion dollar swaps market was recorded on handwritten tickets faxed nightly to the

back offices of market counterparties.”

Distributed open ledgers “have the potential to revolutionize the modern financial ecosystem,” Giancarlo said. “Distributed ledgers will have enormous implications for financial markets in payments, banking, securities settlement, title recording, cyber-security, and the process of collateral management that is made infinitely more complex by new regulations.” His bold prediction: new “smart” securities and derivatives that can value themselves in real time, automatically calculate and perform margin payments, and even terminate themselves in the event of a counterparty default.

Giancarlo is not alone in his enthusiasm. The Bank of England has called blockchain the “first attempt at an ‘internet of finance.’” More than 40 global banks formed a consortium, R3CEN, to develop a framework for its use. The Securities and Exchange Commission recently approved Overstock.com’s registration statement to sell securities using blockchain technology. JPMorgan Chase is experimenting with blockchain transactions for international monetary transfers. D+H, a leading provider of technology solutions to financial institutions globally, has successfully integrated blockchain-distributed ledger technology into its global payments services hub and is in active discussions with banks to implement it.

Late last year, NASDAQ announced that an issuer was able to use its in-house blockchain ledger technology to, for the first time, successfully complete a private securities transaction. It has also worked with the Republic of Estonia to facilitate a blockchain-based e-voting service for companies listed on that country’s Tallinn Stock Exchange.

“Banks aren’t necessarily known for being early adopters of new technologies. There is a lot of risk involved in switching over a system,” says Stephen Quinlivan, a partner with the law firm Stinson Leonard Street. Nevertheless, in a world of increasing regulation, cross-border transactions, and demands for a faster, more secure settlement process for payments and stock transfers alike, blockchain has intriguing potential for them. “You can use it for anything you can transfer title to,” he says. “You can use

it for a car; you can use it for real estate. People talk about using it for artwork and music royalties.”

Blockchain could enable business models that were not previously available, according to Angus Champion de Crespigny, a financial services consultant for EY. As blockchain decouples from virtual currency, the million-dollar-question is what else it can do, do well, and do safely. The real strength of the technology is establishing trust in an untrustworthy environment. “We see huge opportunities in the ability of this technology for integrating finance directly into devices and essentially getting to the point where if you can digitize it, you can securitize it.” Champion de Crespigny says. “Think about financing cars directly rather than financing the people who buy these cars. Think about digital rights for music and films and being able to securitize and sell those off, being able to fund intellectual property directly, and funding decentralized energy markets.”

There are, however, unprecedented regulatory implications, Champion de Crespigny warns. How do you file a Suspicious Activity Report on a car? “The regulators will regulate, and should regulate, products,” he says. “But what blockchain is, at the moment, is a technology; and for them to develop a regulatory framework around it— is the same as expecting them to regulate around relational databases. It is difficult to say the least.”

The technology must get certain things right in order to deliver on its transformative promise, says Moti Porath, executive vice president, global pre-sales, for D+H. “One of the things with bitcoin was anonymity, and we know in the banking world anonymity is not a very good trait. You can maintain privacy, but not anonymity,” he says.

The challenge is achieving regulatory compliance, without necessarily direct regulatory oversight. “You can do Know Your Customer and sanctions screens. You can do liquidity limits monitoring,” he says. “You can restrict the types of operations that you allow an entity to do. Once you add a layer of regulatory compliance without strict direct oversight, you have the best of both worlds.”

Blockchain has entered the “Wall Street phase,”

where banks and other financial institutions form consortiums and partnerships to explore its possibilities and upsides,” says Robert Henry a director for business change and technology consultant GFT’s North American finance business consulting practice. “They cannot sit on the sidelines, but I would never say they are not cautious.”

Henry says, “The proxy voting process is pretty archaic. You get this big package in the mail, and you have to go through reams of paper before you can actually cast a vote. This information should be shared instantaneously and the blockchain, the distributed ledger, will allow you to do that.” Blockchain can also mean instantaneous vote tallies. Financial statements could also benefit from a distributed, shared ledger.

Regulators, Henry hopes, will tread into this new arena carefully. “The regulators should embrace the potential opportunities and utilize the rules they currently have in place for banking and financial ser-

vices, but adjust, revise, or create new rules to mitigate the risks of this new technology,” he says. “This is an opportunity where the regulators will not have to be reactive because they see it as an emerging technology and can instead partner with businesses. You don’t want to put a heavy hand on it and stifle innovation.”

“You have to look at the natural next steps,” says Alan Morley, GFT’s compliance and AML practice lead for North America. “What products or businesses are a natural first step? Who is going to be the first mover and what do they expect to get out of it? That is when the regulators will really start to take notice. As soon as it moves out of its niche play of the moment, where it is still very much in an incubator, that’s when the attention will be exponential and accelerate. We are not there yet. This is going to take time, but that doesn’t mean it is not going to happen, nor does it mean that when it does happen adoption is going to continue being slow. Each step will accelerate the curve.” ■

Comments from CFTC Commissioner Christopher Giancarlo

Distributed open ledgers have the potential to revolutionize modern financial ecosystems. Unlike current settlement processes, distributed ledgers use open, decentralized, consensus-based authentication protocols. They allow people “who have no particular confidence in each other [to] collaborate without having to go through a neutral central authority.” Distributed ledgers will have enormous implications for financial markets in payments, banking, securities settlement, title recording, cyber security and the process of collateral management that is made infinitely more complex by new regulations. Open ledgers may make possible new “smart” securities and derivatives that can value themselves in real time, automatically calculate and perform margin payments and even terminate themselves in the event of a counterparty default.

Enormous resources are being invested in developing the distributed open ledger known as the blockchain. Over two dozen major global banks have joined together in a consortium to build a framework for using blockchain technology in markets. The London Stock Exchange, CME Group, Euroclear, Societe Generale and UBS have set up the Post Trade Distributed Ledger Working Group to look into how blockchain technology can be used in clearing, settlement and reporting of trades.

... blockchain will help reduce some of the enormous cost of the increased financial system infrastructure required by new laws and regulations, including Dodd-Frank..

Source: Christopher Giancarlo



Governance in the Age of Blockchain Distributed Ledger Technology

Blockchain is an exciting and dynamic technology that promises to enhance, transform — and, yes, disrupt — industry. In fact, it’s one of what we at PwC refer to as the “Essential Eight” among [more than 150 emerging technologies](#) we expect to make significant global impact.

Blockchain has rapidly grown from curiosity to investment. In PwC’s recent [Global Blockchain Survey](#) of 600 business and technology leaders in 15 countries, over half reported blockchain R&D in progress and 15 percent noted live blockchain implementations.

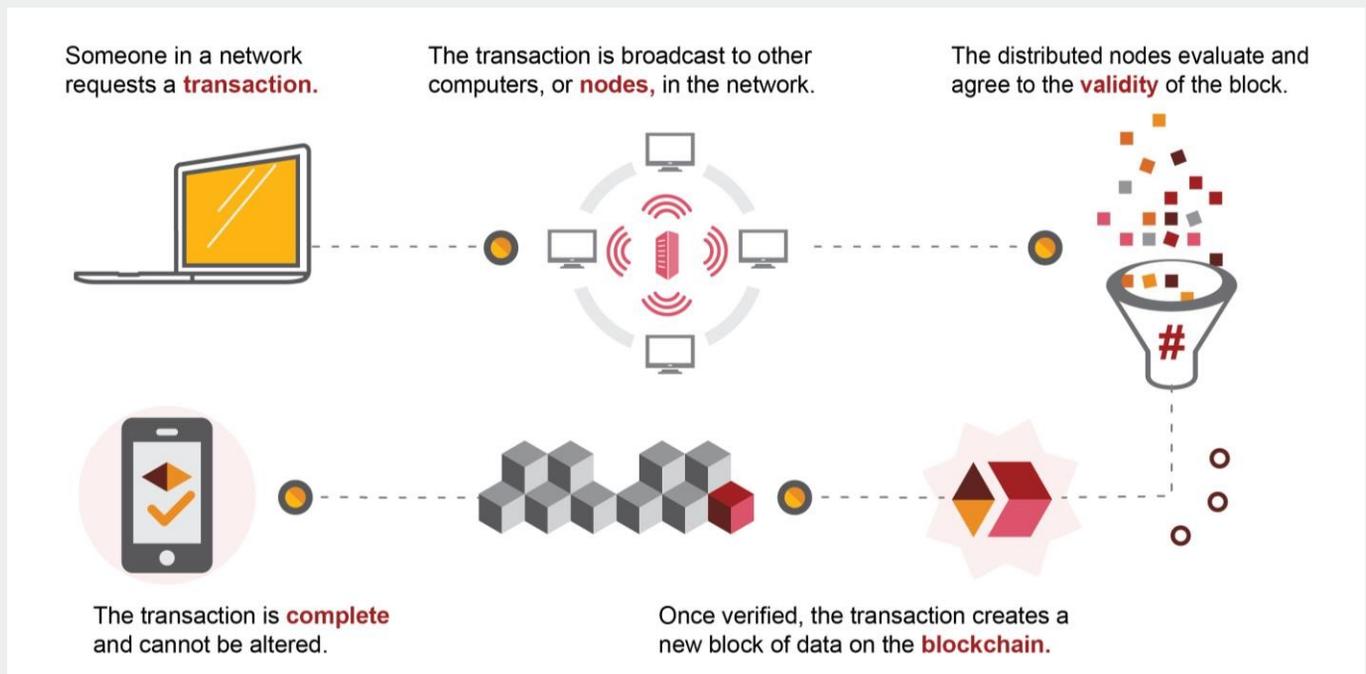
As all risk and governance professionals know, any new technology has trust implications. Blockchain is no different. In this paper, we explore how our profession is evolving to accommodate emerging technologies and share our perspective on a risk and controls framework that can help enable crucial governance and validation while establishing trust in blockchain business applications.

Governance in the age of blockchain

Blockchain applications have gone live in some organizations. But before companies can deploy blockchain applications at scale, they will have to learn to navigate a new world of digital risk. One little-talked-about but critical factor in blockchain's widespread adoption is governance — and **bridging the gap** among innovators, technologists, regulators, business leaders, and governance teams remains a challenge. Enterprises need a comprehensive controls framework for blockchain to ensure their deployments will meet governance, risk management, and controls requirements.

Blockchain is a data structure that **uses a distributed system of databases (called “ledgers”)** instead of a traditional central database. Everyone in a blockchain network is considered a “node,” and each has a copy of the ledger. All nodes are connected via peer-to-peer networks and everyone checks each other for consistency. Each individual use case determines the ledger's records (or “blocks”), which are “immutable,” meaning that blocks cannot be changed once verified and added to the chain. Many types of transactions can be conducted and confirmed on a blockchain.

How Blockchain Works



Take, for example, blockchain used to manage a supply chain. In pre-blockchain supply chains, products are tracked using a patchwork of barcodes, radio frequency identification (RFID) tags, and relational databases that must be constantly checked and updated. This method was groundbreaking a decade ago, but it looks primitive next to the capabilities that blockchain-based solutions could bring. Today's inventories are managed by periodic spot checks, manual counts, and other time-consuming, error-prone methods. When products and services come together in a region with a complex tax structure, such as Europe's VAT system, managing the supply chain and ensuring compliance becomes even more complicated — and the chances of inventory mistakes and financial errors increase.

With blockchain, tracking and monitoring raw materials as they go into production becomes easier and more accurate. A new record (block) is created in the blockchain ledger for each new piece of raw material. This block can track the source, price, location of the item, quality, and any other identifying information. As the item works its way through the production process and becomes part of a finished product, new blocks are created that accounts for these changes.

When you combine a blockchain-based supply chain management system and high-performance computing tools that can analyze all the data quickly, everyone in the process, including producers, vendors, and customers, can have visibility into the

product at every point in the production process — from raw materials and production to distribution and retail. This makes it easy not only to track and measure inventory, but also to calculate taxes, initiate product recall processes, and so on. Lifecycle management becomes easier and more accurate.

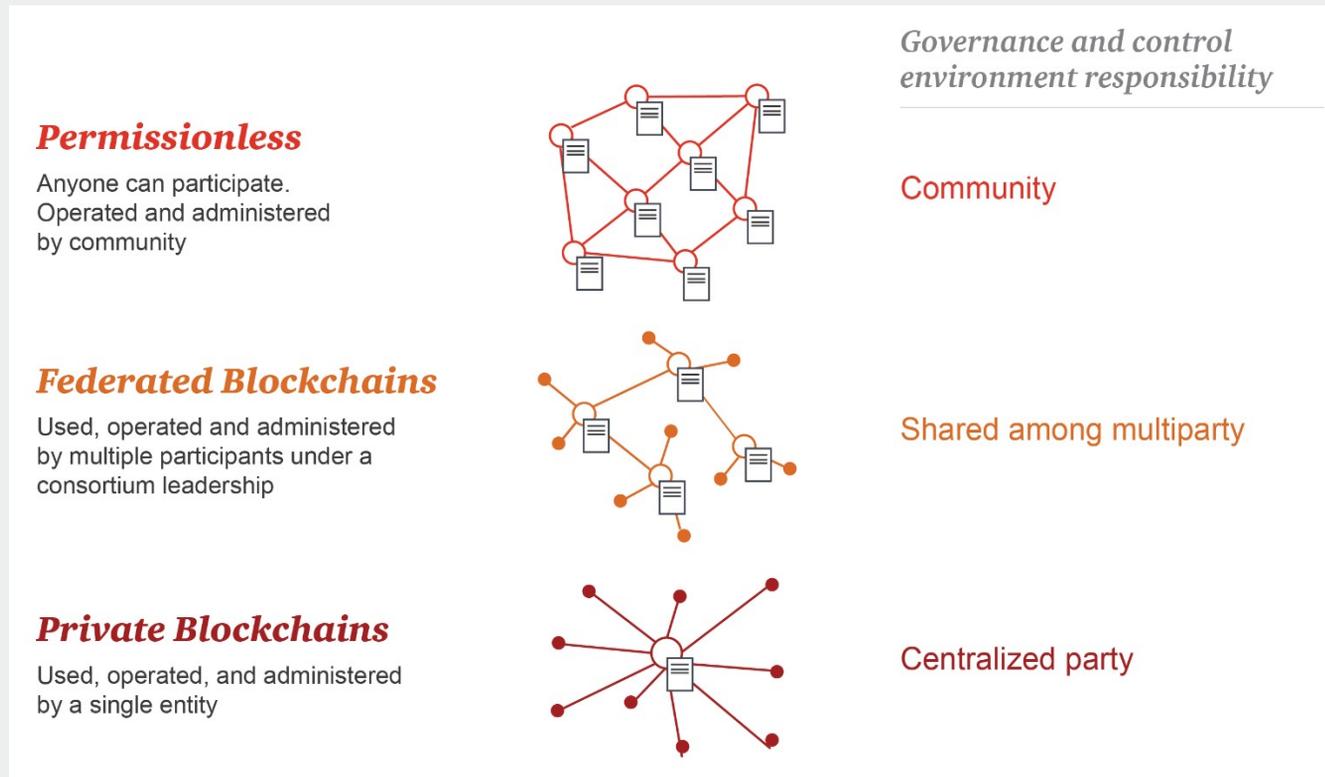
One of blockchain's key features is that the ledger is both distributed *and* shared — in this case among the various parties in the supply chain. Both the producer and the receiver of an item share access, and are thus kept up-to-date on the location and condition of any product in real-time, allowing for more accurate business decision making. Every record in the blockchain is cryptographically linked with the one prior. Information recorded in the chain can never be altered (even by a system administrator), significantly reducing the possibility of fraud. This becomes crucial in cases where raw materials are especially susceptible to counterfeiting. Blockchain ultimately gives manufacturers a higher level of confidence in the origin, authenticity and quality of their products.

Supply chain is just one example of many potential blockchain use cases. Companies are exploring its use for settling financial transactions, managing real estate and land registrations, ensuring the reliability and completeness of healthcare records, and developing self-executing legal documents called “smart contracts” that could be managed without third-party oversight. No matter the use case, however, governance challenges are consistent.



Blockchain environments

Before we dive into blockchain governance, it's also useful to understand the environment that the blockchain will operate in. In general, there are three types of blockchain implementations, each of which impacts governance and control.



1. **Permissionless:** This is an open blockchain network that anyone can join and participate in. The community operates and administers the blockchain, and one or more participants can provide consensus. Any user can join a permissionless network, i.e., exchanging digital currency on a public currency exchange.

2. **Federated (Permissioned):** Since this blockchain model requires permission to join, read, write to, operate and administer, it's also called "permissioned." Multiple participants administer the blockchain under consortium or group leadership. There may be restrictions on how participants can contribute to the system state or consensus of transactions.

3. **Private:** In a private blockchain, only a centralized entity or single participant has permission to write to the blockchain. Platform architects must decide how to assign permissions to participants based on certain criteria.

Today, as companies begin to embrace blockchain, most start with permissioned or private blockchains, where they know all of the participants and can better manage the rollout of new emerging technology-based applications. Their governance approach needs to be tailored accordingly - something that is more manageable given they are working with known trading partners. As they grow into public, permissionless blockchains, the governance model can evolve to address the new risks that are more specific to working with anonymous partners.

Implications for risk functions

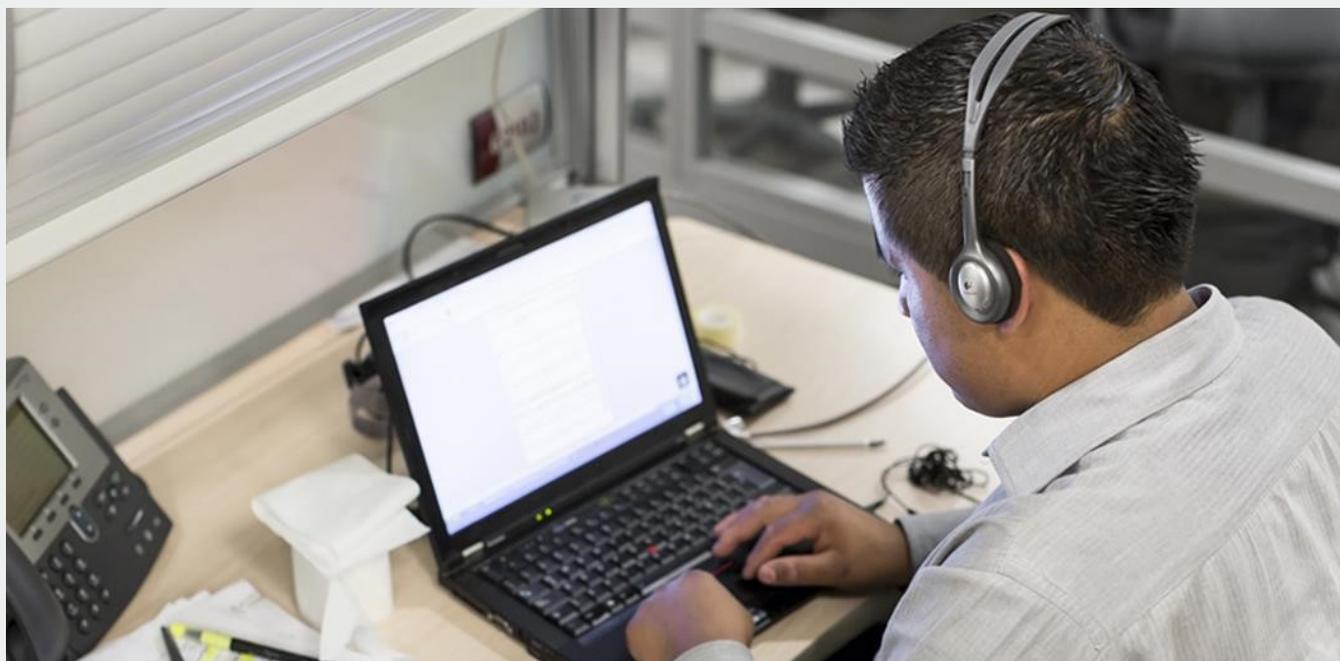
Our blockchain-enabled supply chain might sound like an executive's dream come true. But it's an uncharted way of doing business that will bring new challenges. Primarily, issues revolve around the fact that blockchain was never designed with an audit trail or control environment in mind — it was built as a pure technology solution. As a result, enterprises have to build in governance if they want to validate blockchain applications from a risk management point of view. There is a common misperception that immutability of the blockchain means there is no need for governance or internal audit. This is not true. The blockchain itself may be sound, but the entire workflow that runs on top of the blockchain still requires governance and validation just like any other business process. There are several variants of blockchain technology that organizations can choose to enable a specific use case, which will dictate the platform, protocol, consensus and encryption mechanisms that each have a distinct set of risks.

Traditional audit approaches don't work with blockchain. Why? Blockchain does not lend itself to point-in-time, retrospective, sample-based analysis. Applying these traditional audit approaches to blockchain applications requires an exponential increase of both resources and time, simply because

“crawling” through the distributed chain of information would be tremendously tedious. In addition, the exponential increase in transaction volume blockchain enables renders a traditional sample-based analysis ineffective and impractical. Lastly, it is necessary to audit blockchain to validate the technology's strengths and whether it is functioning as intended.

We see three key issues that impact governance for blockchain applications: transparency, risk, and controls. One or all of these issues could stall your blockchain innovation efforts. There is neither workflow **transparency** nor a standard audit trail in a blockchain. From a **risk** perspective, no industry or enterprise consortium has widely explored or adopted a framework for evaluating risk. And, when considering **controls**, lack of knowledge of the technology creates a skills gap that may lead some to believe that auditing a blockchain environment is impossible.

PwC has spent a lot of time considering how to address these challenges. We believe blockchain governance can only be achieved through continuous audit using a risk framework specifically designed for blockchain.

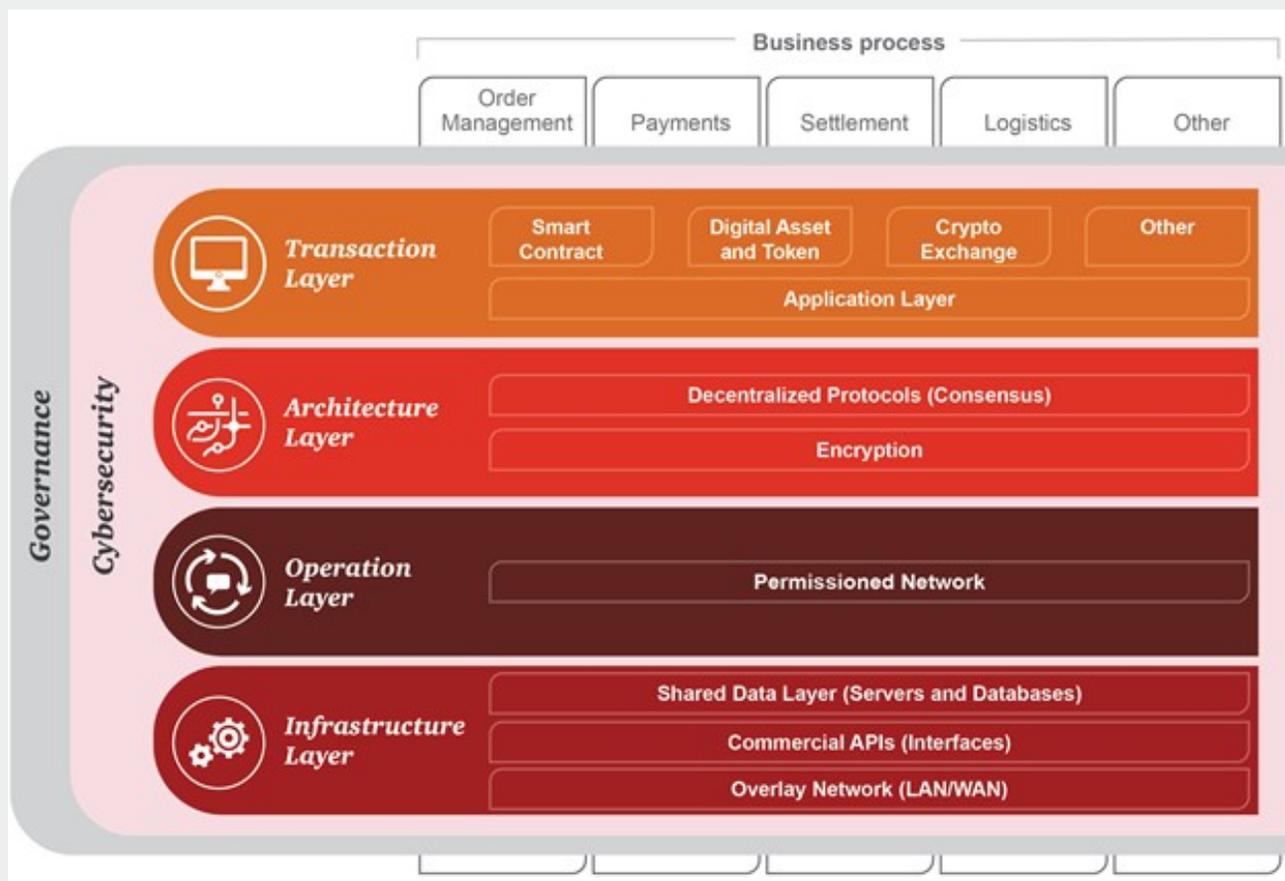


PwC Blockchain Risk and Controls Framework

We designed a Blockchain Risk and Controls Framework to help address risk expectations across three lines of defense: operations, enterprise risk management, and internal audit. The framework aligns with blockchain technology stacks to help companies evaluate risk position and monitor and communicate effectively, keeping stakeholders – including executive boards and risk, audit, operational, and other committees – informed, engaged, and confident. The framework can be applied across all industries, blockchain implementation type, or transformation phase.

The framework identifies six risk domains with supporting subcategories that outline blockchain system considerations in light of best practices and any applicable internal and external stakeholders' requirements. It addresses overarching governance and cybersecurity concerns, illustrating the need to assess any blockchain implementation in context with the rest of the enterprise.

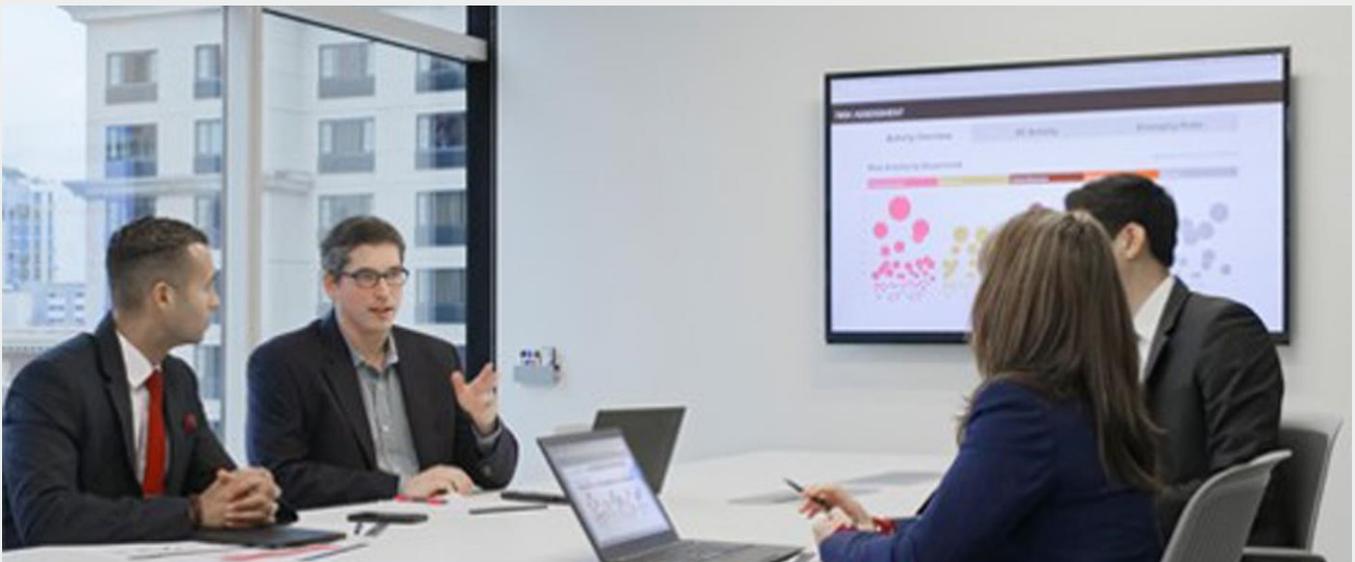
PwC Blockchain Risk and Controls Framework



The following describes each domain, including considerations that should be addressed in each:

- **Governance & oversight:** Explore the blockchain technology best suited to your needs. Agree on why blockchain fits the use case, and how you will establish a control environment and achieve governance.
- **Cybersecurity:** Consider how to address participants' data security and privacy needs. How will cyber threats be detected, managed, and contained?
- **Infrastructure layer:** Evaluate risks associated with core components of the environment in which your blockchain will operate. How will you scale supporting infrastructure? Can you effectively protect interfaces and APIs?
- **Architecture layer:** Focus on risks specific to the blockchain technology you're using. For example, how will you define and achieve consensus? What type of encryption will you use? Will it scale?
- **Operational layer:** Introducing additional parties or users can introduce new operational risks. How will participants be invited, onboarded, managed, and retired on your blockchain network?
- **Transactional layer:** You may deploy decentralized applications (dApps) on your blockchain to enable select business processes. How will you assess the dApp-enabled workflow, validate transaction procedures and address any relevant regulatory requirements?

Taken together, these six areas form a foundation that can support the strategic development, design, build, and implementation of blockchain use cases



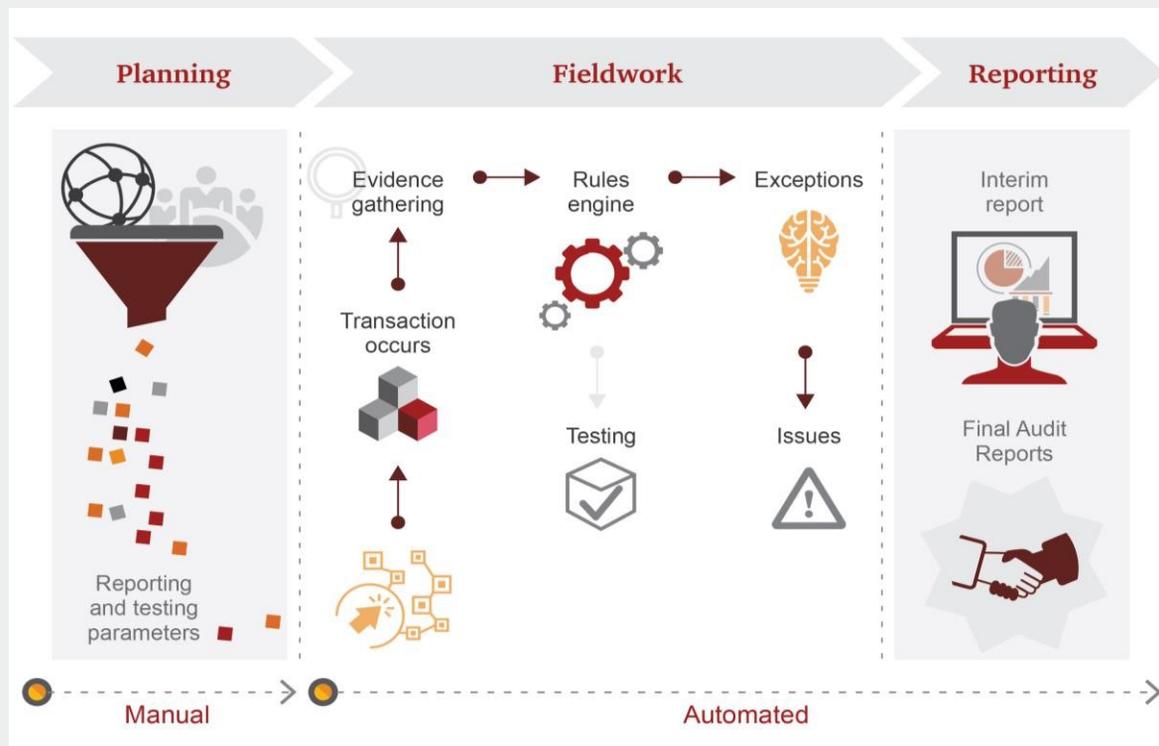
Blockchain in practice – digital continuous audit

In the past, traditional audit techniques have been used widely to validate business processes and instill confidence and trust. For years, auditors have managed risk and offered opinions on internal controls based on manual, point-in-time (typically annual), sample-based auditing techniques. As technology has progressed, computer-assisted audit technologies have improved audit efficiency. With continued advancement, new approaches have emerged to improve the process further, allowing auditors to review a full population of data continuously. We see industry continuing to move toward continuous audit, a real-time auditing technique that relies on machines to monitor and test for anomalies in the transactional flow and provide a mechanism to report and issue opinions on processes and subprocesses. The combination of continuous audit with a blockchain risk and controls framework is moving us toward digital continuous audit, which will provide unlimited potential to manage risk and ensure governance.

Our approach to continuous blockchain audit and monitoring is designed to help manage risk in real time. This is particularly important in light of the scale of transactions that blockchain enables. It establishes a proper governance model that can ultimately be automated to build continuous trust.

Providing transparency in a blockchain requires a fundamental shift in how we think about audit and control. It must go from retrospective (forensic, point-in-time) efforts to real-time auditing where the underlying foundations of audit and control become embedded in each discrete transaction.

A Continuous Auditing Approach for Blockchain



We advocate a continuous auditing methodology for blockchain, comprised of the following key activities:

- **Planning:** During planning, you should assess the overall blockchain system and control environment relative to all stakeholders' needs using the framework described above. This assessment will help establish the scope of the continuous audit by aligning the controls you've identified to each of the framework categories, including the frequency, approach, and testing method. You should define testing and reporting parameters for continuous testing and reporting at the workflow and process level to validate transactions as they occur.
- **Fieldwork:** Once the system is operationalized and deployed, transactional information must be sent through a rules engine that hosts and applies the test procedures as transactions are occurring in a continuous fashion. Testing results are classified into either observations or passed categories. The auditor uses continuous audit

workflows to further classify observations as either an exception/deviation or no exception/deviation. For the exceptions noted, the auditor uses another set of workflows to raise an issue.

- **Reporting:** Once the audit testing and other fieldwork activities are concluded, the auditor can produce an interim audit report that includes rating and details at the process and subprocess level to achieve continuous reporting and monitoring, depending on the desired cadence. After the interim reporting cycle is complete, the auditor produces a final audit report that includes ratings and opinions at the process and subprocess levels.

Continuous auditing practices applied within our blockchain risk and controls framework can help you establish robust governance for blockchain and achieve significant increases in efficiency, effectiveness and levels of confidence.

Summary

Blockchain is coming. In fact, in a growing number of industries, blockchain is already here. As blockchain matures and even more creative uses of the technology emerge, the issue of governance and trust comes to the forefront. To establish an effective, efficient governance model for blockchain, implement an audit methodology and framework, often with supporting continuous audit software, specifically designed for this groundbreaking technology. We designed the PwC Blockchain Risk and Controls Framework with this in mind.

To learn more about PwC's Blockchain Validation Solution, visit www.pwc.com/blockchain-validation.



FINRA tackles blockchain

Joe Mont explores FINRA's foray into blockchain.

A report from the Financial Industry Regulatory Authority provides an overview of distributed ledger technology, highlights key applications being explored in the securities industry and potential impact of the technology, and discusses key implementation and regulatory considerations for broker-dealers.

"Technological innovations in the industry, operating in accordance with these core principles, have the potential to provide investors with greater access to services and enhanced experiences, offer firms increased operational efficiencies and enhanced risk management, and enable further transparency in the marketplace," the self-regulatory organization said in a statement. The report is intended to be an initial contribution to an ongoing dialogue with market participants about the use of DLT in the securities industry.

Distributed Ledger Technology (DLT) (also known as blockchain technology or distributed database technology) has attracted significant interest and funding in the financial services industry in recent years. Several large financial institutions have established dedicated teams to explore the technology, and some market participants have formed consortia to create industry standards.

According to a 2016 report by the World Economic Forum, over the past three years more than \$1.4 billion has been invested in this technology to explore and implement uses in the financial services industry.

"There are varying views in the securities industry on the magnitude of disruption DLT may cause," the report says. "Some have argued that DLT has the potential to revolutionize the operations of the securities industry, while others have debated that any changes resulting from the use of DLT in the secu-

rities industry are likely to be incremental and take many years to develop. However, most agree that the technology has the potential to bring additional efficiencies and increased transparency to the industry while also presenting some novel risks such as those related to data security and privacy."

Some analysts and research reports predict that we may start seeing adoption of the technology in limited market segments in a matter of months, with larger-scale industry-wide adoption potentially occurring after several years, the report adds.

Many FINRA rules, as well as those implemented by other regulators (including the Securities and Exchange Commission), are potentially affected by various DLT applications.

For example, a DLT application that seeks to alter clearing arrangements or serve as a source of recordkeeping by broker-dealers may implicate FINRA's rules related to carrying agreements and books and records requirements. The use of DLT may also have implications for trade and order reporting requirements to the extent it seeks to alter the equity or debt trading process.

FINRA rules such as those related to financial condition, verification of assets, AML, know-your-customer, supervision and surveillance, fees and commissions, payment to unregistered persons, customer confirmations, materiality impact on operations, and business continuity plans also may be impacted depending on the nature of the DLT application.

"FINRA welcomes an open dialogue with market participants to help proactively identify and address any potential risks or hurdles in order to tap into the full potential of DLT, while maintaining the core principles of investor protection and market integrity," the report says. ■

CFTC Commissioner: Regulators should ‘do no harm’ to blockchain

Joe Mont delves into CFTC Commissioner Christopher Giancarlo’s recent speech on the benefits of blockchain technology.

As regulators address the use of blockchain technology by financial institutions, the three words that should guide their efforts: “do no harm.” That was the message from Commissioner J. Christopher Giancarlo of the Commodity Futures Trading Commission during a speech delivered at the Depository Trust & Clearing Corporation’s 2016 Blockchain Symposium.

Blockchain technology is, in simple terms, a peer-to-peer, distributed “open ledger.” Rather than a traditional, centralized server or clearing process, blockchain relies upon decentralized, consensus-based authentication protocols. Any item that can be securitized or represented as an item of value can be transferred with an immediate settlement process.

Giancarlo, an outspoken blockchain booster, has described distributed ledger technology (DLT) as having “the potential to revolutionize the modern financial ecosystem” with profound implications for financial markets in payments, banking, securities settlement, title recording, cyber-security, and the process of collateral management. His bold prediction: new “smart” securities and derivatives that can value themselves in real time, automatically calculate and perform margin payments, and even terminate themselves in the event of a counterparty default.

Potential applications of the technology are being explored in ways that will benefit market participants,

consumers, and governments alike, he says. Distributed ledgers could allow “for the confirmation and ownership transfer of virtually anything from hockey tickets and magazine subscriptions to auto repair warranties and airline loyalty rewards or apartment leases.” Another potential use of DLT is better and more verifiable voting systems, whether for proxies by corporate shareholders, customer satisfaction surveys, or voting for political candidates.

“It will have profound implications for global financial markets by increasing settlement efficiency and speed, linking recordkeeping networks, reducing transaction costs, and increasing market access,” Giancarlo said.

The excitement, however, could be dampened, and momentum derailed, if regulators exercise too heavy a hand. “Innovators and investors should not have to seek government’s permission, only its forbearance, to develop DLT so they can do the work necessary to address the increased operational complexity and capital consumption of modern financial market regulation,” he said. “We can either follow a regulatory path that burdens the industry with multiple onerous regulatory frameworks, or one where we come together and set forth uniform principles in an effort to encourage DLT investment and innovation.”

Giancarlo made the case that regulators have the potential to help their own cause. “DLT may be able

“U.S. and foreign regulators must coordinate to create a principles-based approach for DLT oversight in order to provide the flexibility, certainty, and harmonization necessary for this technology to flourish.”

Christopher Giancarlo, Commissioner, Commodity Futures Trading Commission

to provide regulators with visibility into the trading portfolios of swaps counterparties that they lacked during the financial crisis and that Dodd-Frank mandated,” he said.

A case in point: the collapse of Lehman Brothers. If an accurate DLT record of all of Lehman’s transactions had been available in 2008, its prudential regulators could have used data mining tools, smart contracts, and other analytical applications to recognize anomalies in trade activity, divergence in counterparty exposure, widening credit spreads, and disruptions in short term funding. Regulators could have reacted sooner to Lehman’s deteriorating creditworthiness.

Even if prompter and better-informed regulatory intervention would not have been enough to prevent a run on Lehman, the records held by trading counterparties, and available to regulators, would have accurately shown its open positions. “Imagine if, instead of requiring countless legal actions spanning eight years, we could have known all of Lehman’s exposures within minutes of a bankruptcy filing,” Giancarlo said. “Accelerated settlement of open positions and accounts would have likely taken weeks, not years.”

DLT “may help market participants manage the enormous operational, transactional and capital complexity brought about by the legion of disparate mandates, regulations and capital requirements promulgated globally in the wake of the 2008 financial crisis,” Giancarlo added, referencing one study that estimates it could eventually allow financial institutions to save as much as \$20 billion in infrastructure and operational costs each year.

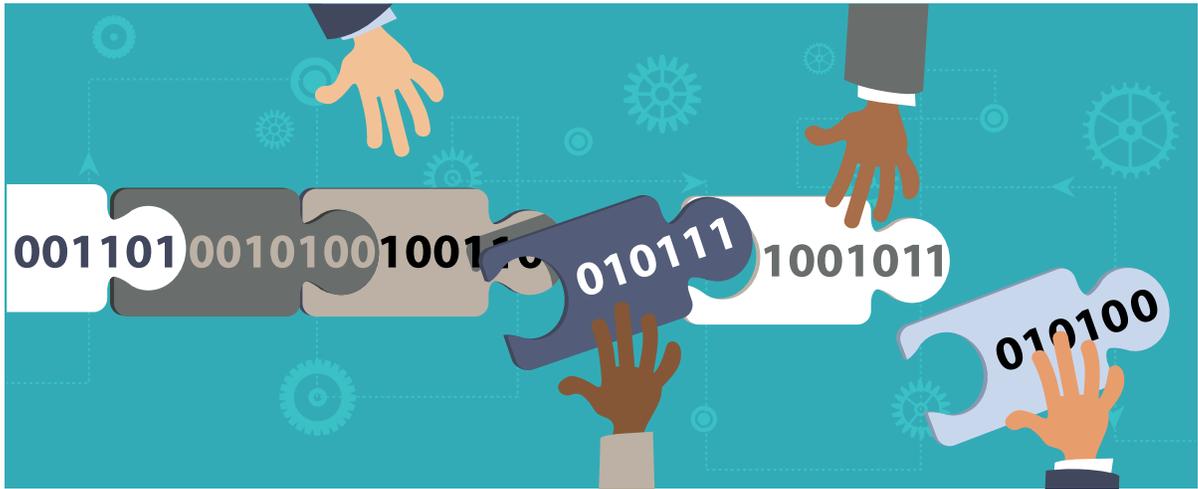
“Development is moving rapidly, certainly faster than underlying legal and regulatory frameworks,” he said. “Rules regarding DLT are currently unwrit-

ten and likely years away, leaving the industry with little clarity. Yet, this investment faces the danger that when regulation does come, it will come from a dozen different directions with different restrictions stifling crucial technological development before it reaches fruition.”

Regulators should look to the 1990s and efforts by government agencies to foster the growth and ubiquity of the Internet, Giancarlo said. The Federal Communications Commission, for example, agreed that Internet services “should exist in a minimal regulatory environment that promotes investment and innovation” and issued a series of orders affirming that Internet service providers would be governed under a comparatively relaxed framework.

“Protracted regulatory uncertainty or an uncoordinated regulatory approach must be avoided, as should rigid application of existing rules designed for a bygone technological era...U.S. and foreign regulators must coordinate to create a principles-based approach for DLT oversight in order to provide the flexibility, certainty and harmonization necessary for this technology to flourish,” Giancarlo said.

Regulators would also be wise to examine existing regulations to ensure that they don’t unintentionally harm blockchain adoption, Giancarlo said. For example, one of the CFTC’s recordkeeping rules requires all books and records to be kept in their original form or native file format. Another rule has requirements that certain records to be stored in either micrographic or electronic storage media. The CFTC should revisit these rules and make them technologically neutral “to accommodate DLT and other innovations that promote efficiency, accuracy and security in recordkeeping.” ■



Three ways blockchain can establish best practice

One of the most significant innovations in compliance will come through the incorporation of blockchain. **Tom Fox** explores which areas of compliance will be affected most by the technology.

One of the most significant innovations in compliance will be the incorporation of blockchain, and three specific areas in the compliance profession will be directly impacted.

1. Third parties. With blockchain, a business can maintain immutable records of its due diligence process for a specific third party or a specific regulatory review. Due diligence delays would be eliminated by providing immediate and real-time access to the data, collection of information from potential third parties, and analysis of the information. A compliance officer could then move the process forward through verification and validation.

2. Contracts (specifically around compliance terms and conditions). Blockchains certainly facilitate contracting from the compliance perspective. Through smart contracts, companies will be able to

automate the compliance terms and conditions of agreements. This means that if a company develops contract programs to run on blockchain, it can incorporate the required compliance terms and conditions and can trigger alerts. This could be expanded to include compliance training, annual certification, or another ongoing obligation.

3. Operationalizing compliance. Blockchain could help to integrate compliance and ethics into the very DNA of an organization, following the prescription of the Justice Department in its Evaluation of Corporate Compliance Programs.

Through smart contracts under blockchain, stakeholders will be able to enforce the commitments made. It will be interesting to see when the Justice Department or SEC will begin to comment on blockchain as a part of a best practices compliance program. ■

Transform risk and complexity to your advantage

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