

# Technological Disruption of Capital Markets and Reporting?

**AN INTRODUCTION TO BLOCKCHAIN**



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# Preface

Chartered Professional Accountants of Canada (CPA Canada) identifies, explores, and analyzes the major issues and trends shaping the future of reporting in Canada. We monitor local and global accounting, regulatory and reporting developments in order to help support our members today and provide an outlook for tomorrow. We are committed to participating in and producing high-quality research and thought leadership that is focused, timely, relevant and useful to the Canadian accounting profession.

Awareness and understanding of the potential impact of emerging technologies are critical to the success of Chartered Professional Accountants (CPAs) as business leaders and trusted advisors in today's rapidly changing business environment. This paper is intended to familiarize CPAs with blockchain technology and its potential because evidence suggests that investment and innovation in this area may accelerate.

Blockchain originated as the technology underlying the digital currency Bitcoin but is currently receiving attention for its expanding applicability, particularly within capital markets and reporting. Blockchain-enabled automated processes could significantly affect the way business is conducted and the way information is exchanged and reported in the future if it is widely adopted.

The use of blockchain technology will bring about changes; whether a change is positive or negative depends on one's point of view. By embracing the potential of blockchain technology and using it to advantage, the technology could be transformative and innovative—a good thing. Widespread adoption of blockchain technology could also be disruptive and damaging by rendering some business models irrelevant—a difficult challenge.

This forward-looking paper is the beginning of a broader conversation CPA Canada is initiating on the potential impact of disruptive technologies on the accounting profession. Although blockchain technology is still at an early stage of development and none of the speculative scenarios described in this paper is guaranteed to occur, we invite CPAs to consider what a

blockchain-enabled future might look like. The changes, opportunities and challenges identified in this paper are intended to stimulate questions and discussion about the impact of new technologies such as blockchain.

CPA Canada would like to acknowledge and thank the author Alan Wunsche, MBA, CPA, CA.

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# Executive Summary

Trust is at the heart of commerce. An innovative technology called “blockchain” delivers the potential for a powerful new form of transactional trust and is seen by some as possibly the most important technology-driven innovation since the introduction of the Internet.

Blockchain, the technology underpinning the digital currency Bitcoin, is fundamentally a digital ledger of transactions with unique characteristics designed to create records that are secure, reliable, transparent, and accessible. Blockchain-related activities could impact many facets of information management from the way transactions are processed and recorded to the way they are reported and verified.

Blockchain technology enables the transfer of various classes of assets without the need for third-party intermediaries. Capital markets and the broader financial services industry will therefore be a natural point of implementation. However, blockchain’s implications are far reaching and extend well beyond the financial services sector. Because blockchain can also offer enhanced transparency and accessibility of records, it could have potentially transformative effects on record-keeping, reporting and assurance practices.

Examples that demonstrate the impact of blockchain technology today include:

- The U.S. Securities and Exchange Commission (SEC) has approved a share offering on the blockchain.
- More than 50 of the world’s largest banks have joined a consortium to design and build blockchain solutions.
- Nasdaq has unveiled Linq, a platform that enables private companies to trade their shares using blockchain technology.
- To date, investment estimated at over US\$1 billion has been made in blockchain-related companies.

As with any new technology, blockchain technology is accompanied by risks and challenges. The extent of blockchain’s impact on capital markets and reporting will depend on its widespread acceptance and adoption. To the extent blockchain technology becomes pervasive, all relevant market participants, including governments, regulators, law enforcement agencies,

financial institutions, businesses, CPAs, lawyers, technology experts and others, will need to be involved. Society will require new rules, controls, best-practice models and skills to facilitate a smooth transition to a blockchain-enabled future.

This paper is intended to raise awareness of blockchain technology, provide examples of current blockchain initiatives, and consider how capital markets and reporting might evolve as blockchain technology is further developed and implemented.

Although it is not possible to demonstrate all the areas blockchain could impact, we encourage CPAs to consider blockchain's potential and how it could be used to their advantage in their respective field or business as well as to assess and proactively manage downside risks. CPAs may be wise to ready themselves for potentially significant changes.

# Blockchain As a Potentially Transformative Technology

## Transformative Technologies

New technologies can transform not only the way business is conducted but also the shape of entire societies. Just as the steam engine of the eighteenth century transformed agricultural economies into industrial economies, the Internet ushered in an era of data digitization that transformed global communications and moved our society into the information age.

There are numerous other recent examples of the revolutionary impact of technology: the PC disrupted mainframes, cellular phones disrupted fixed-line telephony, and open-source software distribution is currently disrupting licensed packaged software. The Internet has relentlessly digitized and replaced paper-based processes, transformed global communications and given our society an information economy. By using digital platforms, companies such as Apple and Spotify have transformed the music industry through downloadable music and streamed music services.

## Evolution of Data Platforms

The Internet revolution ushered in the so-called “Web 2.0” companies, which are highly valued for their data, analytics and scalable application platforms. For instance, the world’s largest taxi company (Uber) has no taxis but owns instead a global software platform that connects passengers to drivers and disrupts the taxi industry. The largest provider of accommodations (AirBnB) owns no hotel rooms but has a platform that connects renters to owners with rooms to rent and disrupts the hotel industry. Social media companies generate no new content of their own but house massive databases of user activity of enormous value to marketers. The world’s largest movie house (Netflix) owns no cinemas.



Nevertheless, despite its enormous successes, the Web 2.0 transition did not introduce a technology that could displace the traditional transaction-processing mechanisms at the core of capital markets and reporting. Information is still stored centrally on servers that can become points of failure and targets for hackers. Organizations continue to set up their own enterprise information management systems and use proprietary financial accounting software.

Blockchain technological innovation could upend current information systems. Blockchain could impact many facets of information management from the way transactions are processed and recorded to the way they are reported and verified. Imagine a not-too-distant future in which an information record-keeping system is shared in real time by a consortium of organizations. This system could eliminate duplicated information, processes and reconciliations. It could also usher in a new era of financial information systems.

The World Economic Forum's Global Agenda Council on the Future of Software and Society identified the blockchain as one of six software and services megatrends shaping society.

## Blockchain Innovation

Blockchain, often referred to as “distributed ledger technology”, is seen by some as possibly the most important innovation in information technology since the introduction of the Internet.

The World Economic Forum (WEF)'s Global Agenda Council on the Future of Software and Society identified the blockchain as one of six software and services megatrends shaping society.<sup>1</sup> In what is being called “Web 3.0”, blockchain applications have the potential to challenge global payment infrastructures by enabling the transfer of assets such as digital currency and securities without the need for trusted third-party intermediaries. This could be particularly disruptive to capital markets and the financial services industry.

A majority of respondents to a survey undertaken by the WEF expect that 10% of global GDP could be stored on blockchain technology by 2025.<sup>2</sup> According to the WEF report: “The blockchain, an emerging technology, replaces the need for third-party institutions to provide trust for financial, contract and voting activities.”

A recent report by Banco Santander's innovation arm, Santander InnoVentures, Oliver Wyman and Anthemis Group would seem to support this: “In contrast to today's transaction networks, distributed ledgers eliminate the need for central authorities to certify ownership and clear transactions.”<sup>3</sup>

1 World Economic Forum, *Deep Shift – Technology Tipping Points and Societal Impacts*. Survey Report, September 2015. [www3.weforum.org/docs/WEF\\_GAC15\\_Technological\\_Tipping\\_Points\\_report\\_2015.pdf](http://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf)

2 Ibid.

3 Santander Innoventures, Oliver Wyman and Anthemis Group, *The Fintech 2.0 Paper: rebooting financial services*, Santander Innoventures, 2015. <http://santanderinnoventures.com/fintech2>

After the first private securities offering on the blockchain-enabled platform Nasdaq Linq, Bob Greifeld, CEO of Nasdaq, Inc. stated: “Through this initial application of blockchain technology, we begin a process that could revolutionize the core of capital markets infrastructure systems. The implications for settlement and outdated administrative functions are profound.”<sup>4</sup>

The Bank of Canada is also experimenting with blockchain technology. Carolyn Wilkins, Senior Deputy Governor of the Bank of Canada, recently acknowledged blockchain’s potential benefits for consumers and business users but cautioned that “several important issues with distributed ledger technology must be resolved before its benefits can be realized.”<sup>5</sup> In an effort to better understand the risks and opportunities associated with blockchain technology, she commented “The Bank of Canada is also partnering with Payments Canada, Canadian banks and R3—which leads a consortium of financial institutions—to test drive distributed ledgers. Our only goal at this stage is to understand the mechanics, limits and possibilities of this technology.”

Governments are exploring the opportunities for blockchain technology in the delivery of services such as the disbursement of government aid and benefits. For example, a report from the U.K. Government Office for Science sets out how blockchain technology could transform the delivery of public services and boost productivity.<sup>6</sup> The Government Chief Scientist, Sir Mark Walport, stated that blockchain technology has “the potential to redefine the relationship between government and the citizen in terms of data sharing, transparency and trust and make a leading contribution to the government’s digital transformation plan.”<sup>7</sup>

Professional service firms Ernst & Young, KPMG, PricewaterhouseCoopers (PwC) and Deloitte are also pursuing blockchain initiatives. For example, PwC has recruited 15 technology specialists to exploit and commercialize blockchain technology.<sup>8</sup> Deloitte has entered the blockchain arena with their Rubix initiative.<sup>9</sup>

4 Nasdaq, “Nasdaq Linq Enables First-Ever Private Securities Issuance Documented With Blockchain Technology,” press release, December 30, 2015. <http://ir.nasdaq.com/releasedetail.cfm?ReleaseID=948326>

5 Carolyn Wilkins, “Fintech and the Financial Ecosystem: Evolution or Revolution?” (speech to Payments Canada, Calgary AB, June 17, 2016). [www.bankofcanada.ca/2016/06/fintech-financial-ecosystem-evolution-revolution](http://www.bankofcanada.ca/2016/06/fintech-financial-ecosystem-evolution-revolution)

6 Government Office for Science, “Distributed ledger technology: beyond block chain,” press release, January 19, 2016. [www.gov.uk/government/publications/distributed-ledger-technology-blackett-review](http://www.gov.uk/government/publications/distributed-ledger-technology-blackett-review)

7 Matt Hancock and Ed Vaizey, Government Office for Science, press release, January 19, 2016. [www.gov.uk/government/news/distributed-ledger-technology-beyond-block-chain](http://www.gov.uk/government/news/distributed-ledger-technology-beyond-block-chain)

8 PriceWaterhouseCoopers, “PwC launches new global technology team to harness Bitcoin technology,” press release, January 21, 2016. [http://pwc.blogs.com/press\\_room/2016/01/pwc-launches-new-global-technology-team-to-harness-bitcoin-technology.html](http://pwc.blogs.com/press_room/2016/01/pwc-launches-new-global-technology-team-to-harness-bitcoin-technology.html)

9 <http://rubixbydeloitte.com>

# What Is Blockchain Technology?

Blockchain began as the underlying technology for the digital currency Bitcoin.<sup>10</sup> While Bitcoin still operates on the original Bitcoin blockchain, there are now next-generation versions of blockchain technology that have much wider applicability beyond digital currency. Various types of assets and information can be digitally represented and exchanged via the blockchain.

Blockchain began as a digital ledger to record transactions (i.e., a database) with unique characteristics designed to create records that would be secure, reliable, transparent, and accessible. Alternative versions of blockchain are emerging that are more than just databases; they now include the ability to encode and execute any business logic within the blockchain.

The following is a high-level overview of the key characteristics of blockchain technology.

## Distributed Consensus

Blockchain is a shared or “distributed” digital ledger of transactions over a network of participating computers. Since blockchain technology embeds peer-to-peer communications among the participating computers, the need for management of the network by a central third party is eliminated.

Computers participating in a blockchain use an automated process to validate the format of the transaction record to be included in the next “block”. Once this “consensus” is reached, the information is recorded in a block.

“Blockchain is a vast, global distributed ledger or database running on millions of devices and open to anyone, where not just information but anything of value—money, but also titles, deeds, identities, even votes—can be moved, stored and managed securely and privately. Trust is established through mass collaboration and clever code rather than by powerful intermediaries like governments and banks.”

—Don Tapscott & Alex Tapscott

[www.marketwatch.com/story/4-blockchain-companies-that-could-change-everything-from-accounting-to-money-transfers-2016-05-11](http://www.marketwatch.com/story/4-blockchain-companies-that-could-change-everything-from-accounting-to-money-transfers-2016-05-11)

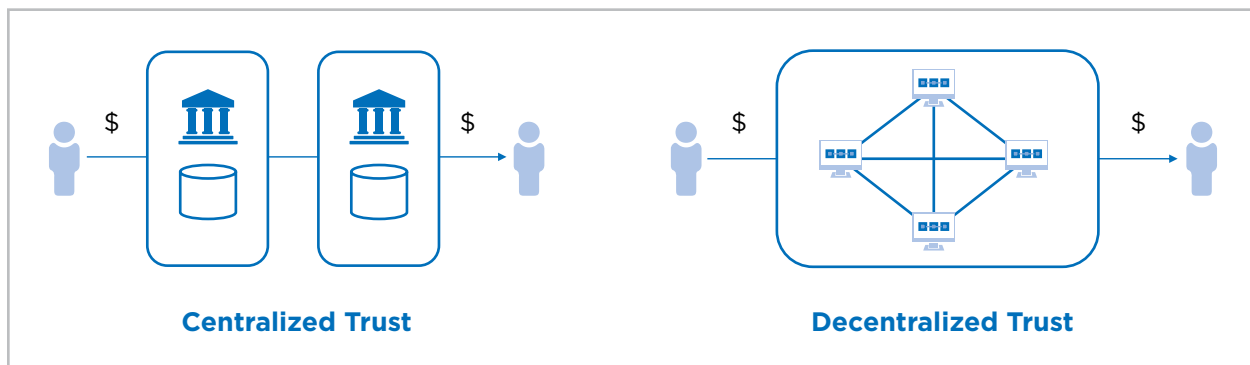
<sup>10</sup> Satoshi Nakamoto, “Bitcoin: A Peer-to-Peer Electronic Cash System,” October 31, 2008. This is the original whitepaper that introduced the blockchain concept. It is available at <http://nakamotoinstitute.org/bitcoin>

The full set of chained blocks forms a “ledger” referred to as the blockchain. Each computer participating in the blockchain network maintains a copy of the complete ledger, which is updated in real time as new blocks are created and validated.

As participants reach a consensus on the transaction, there is no need for facilitation by a trusted third-party intermediary. The blockchain-based “distributed trust” model stands in contrast to the centralized trust models used today to transact. For example, upon agreement, one participant could transfer digital currency (e.g., Bitcoin) to another participant across the blockchain network without the involvement of a bank.

Figure 1 graphically illustrates how a transaction on the blockchain differs from conventional transactions mediated by financial institutions.

**FIGURE 1: TRANSACTIONS WITH AND WITHOUT AN INTERMEDIARY**



## No Single Point of Failure

The peer-to-peer shared nature of the blockchain ledger allows participants to leave and rejoin the network at will (i.e., if one computer drops out of the network through choice or failure, the rest of the network continues to operate). A transaction system is thus created that does not have any single point of failure.

## Built-In Security

### Encryption

Blockchain technology uses public- and private-key cryptography to sign transactions digitally.<sup>11</sup>

### Timestamping and Irrevocability of Transactions

All blocks are timestamped and the chain is sequenced chronologically. Timestamped data storage in the blockchain can therefore be used to prove the existence of records at a point in time.

Once included in blocks, transactions are permanent records. New blocks carry the cryptographic signature of previous blocks and copies are kept by all participating systems (decentralized vs. centralized). As a result, it is very difficult to alter earlier transactions in the blockchain. The blockchain is therefore regarded as being more secure than traditional centralized databases.

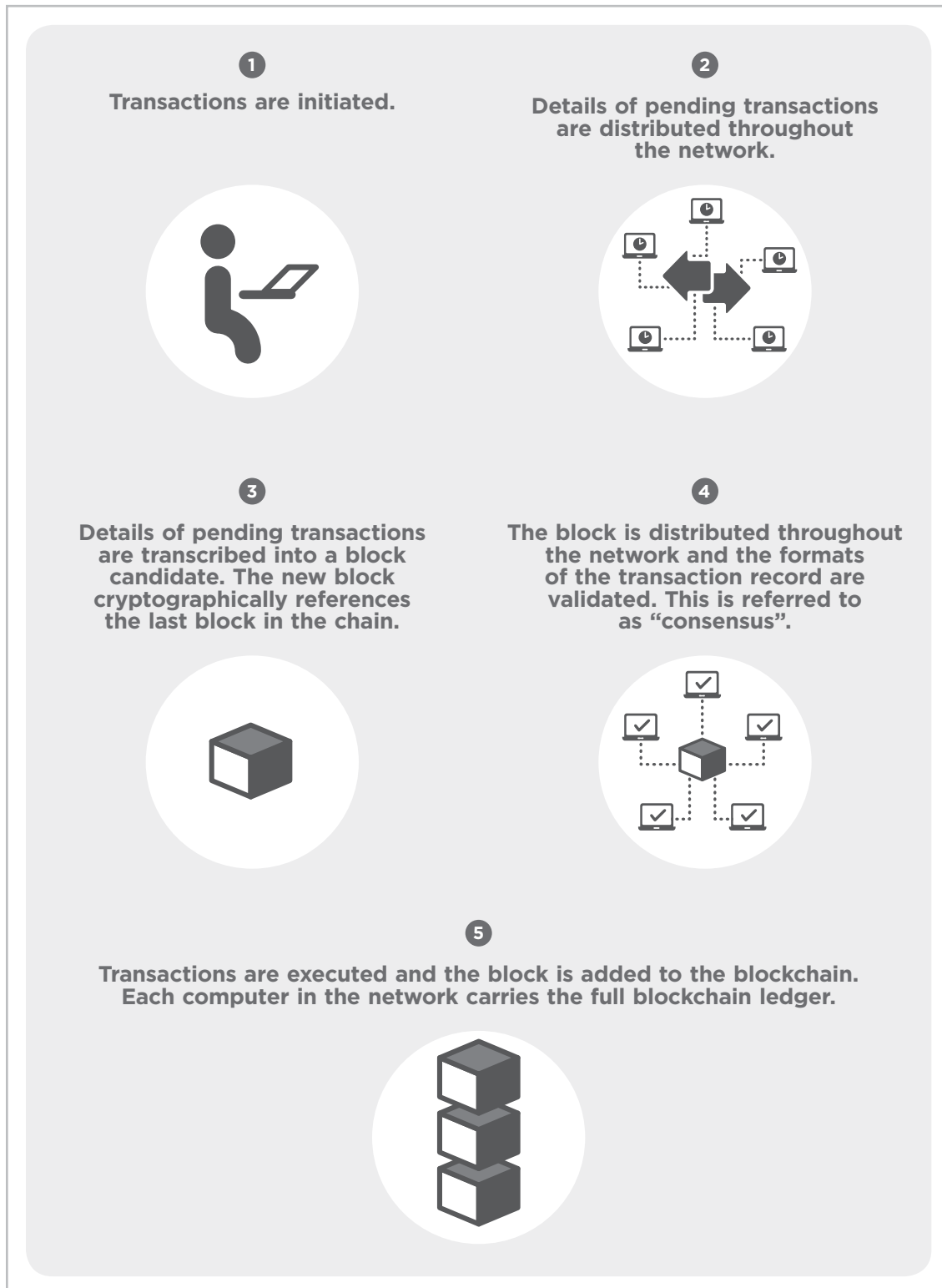
### Real-Time Transparency and Auditability

Because transactions within the blockchain can be traced to the authorized originator, an audit trail is automatically created. Since transactions are permanent, auditors, regulators, and others could gain unprecedented insight into the state of accounts, which includes not only the most recent transaction but also a complete record of all transactions.

Figure 2 illustrates how transactional data enters and moves through the blockchain process.

<sup>11</sup> Cryptography is a mathematical method of securely storing and transmitting encrypted information so that it can be read only by the use of an access key.

**FIGURE 2: TRANSACTION PROCESSING IN THE BLOCKCHAIN**



## Blockchain Programmability—Smart Contracts

An important component of blockchain technology is its ability to support and execute “smart contracts.” A smart contract is software code representing business logic. For example, smart contracts could represent the terms and conditions of legal contracts. Smart contracts are embedded and self-executed by the blockchain technology.

Importantly, while the concept began with a legal perspective, smart contracts are expanding to encompass more general business logic beyond legal contracts. Blockchain researchers envision encoding virtually any business logic into the blockchain’s smart contracts. Ethereum is an important example of this next-generation blockchain platform.<sup>12</sup>

Ethereum’s blockchain can execute these enhanced smart contracts. Smart-contract programs can be designed to communicate with other smart contracts and send data among themselves. For example, software developers could build programs in Ethereum to manage manufacturing workflows or automate the distribution of funds based on the terms of any contracts or processes.

Take as a hypothetical example a simple apartment rental agreement between two parties. A smart contract could be programmed and deployed to a blockchain to accept a digital currency payment (e.g., Bitcoin) from the renter (in a way similar to a series of post-dated cheques) and automatically distribute pre-determined portions of the payment to the owner over time. The digital currency transfer would happen within the blockchain without requiring a trusted third party such as a bank to process the payments.<sup>13</sup>

## Public/Private Implementation Models

A blockchain can be implemented in three ways: public, private, and consortium. For example, the Bitcoin blockchain is a public blockchain; participants have full visibility of transactions through user interfaces.<sup>14</sup> Private blockchain implementations can restrict access to the ledger to a single organization. Consortium blockchain implementations can include the membership of an entire industry. For example, several global banks have joined a consortium of financial institutions to investigate blockchain technology.<sup>15</sup>

“This technology has the potential to replace entire transaction systems, including core payment systems, and offer new products, such as smart contracts. Smart contracts are agreements written in computer code that do not need human intervention to be executed.”

—Carolyn Wilkins, Senior Deputy Governor, Bank of Canada

Speech to Payments Canada, Calgary, AB, June 17, 2016

<sup>12</sup> [www.ethereum.org](http://www.ethereum.org)

<sup>13</sup> There are real-life examples of the use of applications with Ethereum currently—e.g., Slock.it, <https://slock.it>

<sup>14</sup> The Bitcoin blockchain is available for exploring in real time at <https://blockchain.info>

<sup>15</sup> Trixe Smith, “R3 completes trials of five cloud-based emerging blockchain technologies with 40 bank consortium members,” press release, March 3, 2016. <http://r3cev.com/press/2016/3/3/r3-completes-trial-of-five-cloud-based-emerging-blockchain-technologies-with-40-bank-consortium-members>

# Blockchain Initiatives in Capital Markets

Although blockchain technology is still early in its lifecycle, blockchain applications have the potential to transform today's capital markets and impact the roles of numerous intermediaries and regulators.<sup>16</sup> In November 2015, SEC commissioner Kara M. Stein commented on the blockchain's potential: "... one can imagine a world in which securities lending, repo and margin financing are all traceable through blockchain's transparent and open approach to tracking transactions.... However, creative uses of blockchain are still in their infancy, and a lot of questions will need to be answered, including on issues related to cybersecurity."<sup>17</sup>

Here are a few signs that blockchain technology is entering capital markets:

- In December 2015, the SEC approved Overstock.com's plan to issue shares using blockchain technology. In March 2016, Overstock.com announced it plans to complete a blockchain public offering.<sup>18</sup> In June 2015, Overstock.com issued blockchain corporate bonds in a private offering.<sup>19</sup> Overstock.com unveiled a new blockchain securities trading platform (tØ) at Nasdaq and intends to license it as an enterprise trading platform.<sup>20</sup>

16 Oliver Wyman and Euroclear, *Blockchain in Capital Markets. The Prize and the Journey*, February 2016. [www.euroclear.com/dam/Brochures/BlockchainInCapitalMarkets-ThePrizeAndTheJourney.pdf](http://www.euroclear.com/dam/Brochures/BlockchainInCapitalMarkets-ThePrizeAndTheJourney.pdf) This report describes how blockchain could be applied to capital markets and impact the role of various participants.

17 Kara M. Stein, "Surfing the Wave: Technology, Innovation, and Competition" (speech, Harvard Law School's Fidelity Guest Lecture Series, November 9, 2015). [www.sec.gov/news/speech/stein-2015-remarks-harvard-law-school.html](http://www.sec.gov/news/speech/stein-2015-remarks-harvard-law-school.html)

18 Overstock.com Investor, "Overstock.com Announces Historic Blockchain Public Offering," press release, March 16, 2016. <http://investors.overstock.com/phoenix.zhtml?c=131091&p=irol-newsArticle&ID=2148979>

19 Pete Rizzo, "Overstock Sells \$5 Million Cryptobond to New York Trading Firm," *CoinDesk*, July 31, 2015. [www.coindesk.com/overstock-sells-5-million-cryptobond-to-new-york-trading-firm](http://www.coindesk.com/overstock-sells-5-million-cryptobond-to-new-york-trading-firm)

20 Pete Rizzo, "Overstock Unveils Blockchain Trading Platform at Nasdaq Event," *CoinDesk*, August 5, 2015. [www.coindesk.com/overstock-unveils-blockchain-trading-platform-to](http://www.coindesk.com/overstock-unveils-blockchain-trading-platform-to)



- The Australian Securities Exchange (ASX) has invested in Digital Asset Holdings, a developer of blockchain technology, to develop a new system using blockchain technology for clearing and settling trades in the Australian equity market.<sup>21</sup>
- As an emerging global digital currency with a market capitalization of over US\$10 billion as of July 2016, Bitcoin is the largest successful digital currency of the approximately 700 known digital currencies traded in hundreds of digital markets outside the traditional currency markets.<sup>22</sup>
- Goldman Sachs has applied for a patent for “Cryptographic Currency for Securities Settlement” that includes “methods for settling securities in financial markets that employ distributed, peer-to-peer, and cryptographic techniques” using a digital medium of exchange named SETLcoin.<sup>23</sup>
- In December 2015, Nasdaq unveiled its latest blockchain initiative Linq, a platform that enables private companies to trade their shares using blockchain technology.<sup>24</sup>
- Barclays is testing derivative trading using blockchain technology.<sup>25</sup>
- Numerous blockchain start-ups are pursuing innovations such as blockchain crowdfunding (e.g., WeiFund).<sup>26</sup>
- Digital Asset Holdings provided the technology to allow private company Pivit to issue digital securities on the blockchain.<sup>27</sup>
- The International Organization of Securities Commissions (IOSCO) is looking at the challenges and opportunities associated with blockchain technology and has agreed on “further research on financial technology subsectors with particular relevance for securities regulators, including blockchain.”<sup>28</sup>

21 Australian Securities Exchange, “ASX Selects Digital Asset to Develop Distributed Ledger Technology for the Australian Equity Market,” media release, January 22, 2016. [www.asx.com.au/documents/about/ASX-Selects-Digital-Asset-to-Develop-Distributed-Ledger-Technology-Solutions.pdf](http://www.asx.com.au/documents/about/ASX-Selects-Digital-Asset-to-Develop-Distributed-Ledger-Technology-Solutions.pdf)

22 Crypto-Currency Market Capitalizations. <http://coinmarketcap.com>

23 Brian Cohen, “Goldman Sachs Files Patent Application For Securities Settlement Using Cryptocurrencies,” *Bitcoin Magazine*, December 1, 2015, <https://bitcoinmagazine.com/articles/goldman-sachs-files-patent-application-for-securities-settlement-using-cryptocurrencies-1449000967>

24 Nasdaq, “Nasdaq Linq Enables First-Ever Private Securities Issuance Documented With Blockchain Technology,” press release, December 30, 2015. <http://ir.nasdaq.com/releasedetail.cfm?ReleaseID=948326>

25 Arjun Karpal, “Barclays used blockchain tech to trade derivatives,” CNBC, April 19, 2016, [www.cnbc.com/2016/04/19/barclays-used-blockchain-tech-to-trade-derivatives.html](http://www.cnbc.com/2016/04/19/barclays-used-blockchain-tech-to-trade-derivatives.html)

26 WeiFund, “Let’s Decentralize Crowdfunding”, <http://weifund.io>

27 Joseph Young, “Blythe Masters’ Digital Asset Holdings Issues Crypto-Security for Betting Platform Pivit,” *The CoinTelegraph*, November 9, 2015. <http://cointelegraph.com/news/115260/blythe-masters-digital-asset-holdings-issues-crypto-security-for-betting-platform-pivit>

28 “IOSCO plays a key role in responding to global securities markets’ challenges,” media release, Madrid, February 22, 2016. [www.iosco.org/news/pdf/IOSCONEWS419.pdf](http://www.iosco.org/news/pdf/IOSCONEWS419.pdf)

- To date, investment estimated at over US\$1billion has been made in blockchain-related companies.<sup>29</sup>
- A blockchain-enabled decentralized crowd-funding and governance mechanism referred to as a “decentralized autonomous organization” or “DAO” was launched in April 2016.<sup>30</sup> The DAO has no traditional corporate ownership; rather, it exists as a smart contract on the blockchain. The DAO accepts and converts digital currency into a token-based holding for its contributing members. The DAO is self-governing and DAO members have the right to vote on project proposals submitted to the DAO. DAO members also vote on how profits of funded projects are distributed. The DAO attracted investment estimated at over US\$100 million.<sup>31</sup> On June 17, 2016, the DAO was hacked and currency with an estimated value of \$50M at the time was stolen thus exposing vulnerabilities within the blockchain.<sup>32</sup>

Blockchain’s influence has already begun in the financial sector. For example,

- As of July 2016, over 50 global banks have joined a consortium to explore blockchain solutions facilitated by technology start-up R3CEV.<sup>33</sup>
- The Institute of International Finance (IIF) stated in a 2015 report: “Blockchain technology, once viewed as a profound threat to financial intermediaries, is now being embraced by traditional financial services firms as a way to reengineer financial industry infrastructure to their advantage.” The IIF further commented that “improving the efficiency of cross border payments and the currency exchange market are some of the most obvious applications of the technology.”<sup>34</sup>
- A 2015 report by Banco Santander, Oliver Wyman and Anthemis Group estimates shared-ledger technology could reduce the banking industry’s infrastructure costs attributable to cross-border payments, securities trading and regulatory compliance by between US\$15-\$20 billion per annum by 2022.<sup>35</sup>

A 2015 report by Banco Santander, Oliver Wyman and Anthemis Group estimates shared-ledger technology could reduce the banking industry’s infrastructure costs attributable to cross-border payments, securities trading and regulatory compliance by between US \$15-\$20 billion per annum by 2022.

29 [www.coindesk.com/bitcoin-venture-capital](http://www.coindesk.com/bitcoin-venture-capital)

30 <https://daohub.org>

31 <http://fortune.com/2016/05/15/leaderless-blockchain-vc-fund>

32 [www.wired.com/2016/06/50-million-hack-just-showed-dao-human](http://www.wired.com/2016/06/50-million-hack-just-showed-dao-human)

33 <http://r3cev.com/about>

34 Institute of International Finance, “Banking on the Blockchain – Re-engineering the Financial Architecture,” November 16, 2015. [www.iif.com/publication/special-briefing/banking-blockchain-re-engineering-financial-architecture](http://www.iif.com/publication/special-briefing/banking-blockchain-re-engineering-financial-architecture)

35 Santander Innoventures, Oliver Wyman and Anthemis Group, *The Fintech 2.0 Paper: rebooting financial services*, Santander Innoventures, 2015. <http://santanderinnoventures.com/fintech2>

# Potential Future Blockchain Applications and Implications

Blockchain offers enhanced transparency and accessibility of transaction records with potentially important effects on record-keeping, reporting and assurance practices. While users of financial information will still require accounting, reporting and assurance services, the delivery and execution of such services may change with the adoption of blockchain technology.

Setting aside existing regulatory requirements, the following section discusses some potential applications and implications of blockchain technology.

## Potential Impact on Accounting and Assurance

In a blockchain future, management could give a set of blockchain digital “keys” to external auditors that would provide unprecedented access to detailed, timestamped information about all transactions. Such access could significantly impact an auditor’s approach to an audit. Enterprises that use the blockchain could conduct continuous internal audits on their processes, supply an audit trail and provide account analysis at the push of a button.

Blockchain technology offers enhanced transparency and accessibility of financial and non-financial information which could profoundly impact current record-keeping, reporting, assurance and governance practices. Systems and processes, including controls, would take a different form but will remain important and essential.

## Potential Impact on Reporting

Companies using blockchain technology could have a powerful new set of reporting tools, complete with full transaction visibility, to manage and communicate their financial condition and performance.

**Imagining the Possibilities of Accounting Systems—Triple-Entry Accounting**

Blockchain technology could provide new ways to record and report financial information. For example:

Organizations could retain their double-entry accounting systems. In addition, parties to a transaction could record their respective entries in a shared blockchain ledger which would represent the “third entry.” In this way, participants in the transactions would confirm the integrity of the transactions in the shared ledger. This could be beneficial to assurance providers.

Early-stage organizations such as Balanc3 are building blockchain applications to deliver this type of triple-entry accounting system.<sup>36</sup>

Smart contracts could be inserted into or replace operational and/or administrative functions affecting internal and external reporting.

Performance targets and budgets could be translated into smart contracts that would track performance against actual results. New blockchain performance management tools could be linked to performance contracts, productivity reviews and performance bonuses.

Non-financial reporting such as sustainability reporting could also be facilitated. For example, stakeholders could access manufacturing supply-chain records on the blockchain and trace them from raw materials through to finished products. Emerging blockchain start-ups such as Provenance are already building supply-chain transparency solutions.<sup>37</sup>

Blockchain ledgers could rapidly aggregate and consolidate financial reports in real time thus reducing month-end reporting delays. Financial statements for executive and board reporting requiring company-wide consolidation could be largely automated on the blockchain.

Regulators could be provided blockchain access to review transactions in real time.

Companies could provide investors with access keys that would permit real-time access to financial information. This could enable easy transfer of information into analysts’ financial models and enable drilling down into the details of material transactions. An important caveat would be that rules prohibiting selective disclosures would remain intact and need to be followed. There would need to be appropriate controls and procedures around access keys to enable regulators and others to determine who had access to what information and when.

<sup>36</sup> <http://balanc3.net>

<sup>37</sup> [www.provenance.org](http://www.provenance.org)

Systems and processes, including controls, would take a different form but will remain important and essential. For example, companies would want to institute appropriate controls and procedures over the encoding of smart contracts and any changes thereto to ensure their accuracy and appropriateness. This would also be a point of interest for assurance providers.

### **Accounting for Specific Accounts**

**Cash** in the form of digital currencies could clear directly without the need for reconciliations to third-party records. In addition, the instantaneous settlement of transactions would eliminate the time currently required to clear transactions through third parties.

**Accounts receivable and accounts payable** balances could be embedded in a new form of smart contract that could be programmed to route funds automatically once certain conditions have been met (e.g., based on delivery receipts and agreed payment schedules).

**Inventories** could be updated based on “asset transfer” smart contracts that would respond to a “buy message” from the buyer’s inventory management system.

**Intangible assets** reflecting intellectual property rights could be reflected as “smart royalty contracts” which could be programmed to route funds automatically. Disagreements over property ownership could be eliminated by the timestamping feature of the blockchain.

**Capital assets** could be recorded on a blockchain. Ownership could be readily transferred in a manner similar to the transfer of digital currencies discussed above. Additional blockchain ledgers could be established to record repairs and maintenance. The full maintenance history of capital assets would be readily available and transferable as well. This could be referenced in insurance clauses.

**Corporate loans** could be fully digitized as “smart loan contracts” and deployed onto a blockchain. Once represented as blockchain smart contracts, these debt obligations could be readily transferrable and their history automatically tracked to maturity.

## **Potential Impact on Governance**

Organizations using blockchain could be more transparent because blockchain could enable the disclosure of a fully traceable and timestamped record of all decisions and actions by management and the board of directors. BoardRoom is an early example of a blockchain governance application being developed on the Ethereum blockchain.<sup>38</sup>

In future applications, shareholders could also digitally record their votes on the blockchain regarding shareholder proposals.

38 <http://boardroom.to>

# Challenges and Risks

As with any new technology, blockchain will have its share of risks and challenges, some examples of which are highlighted below.

- There remain risks of hacking of the blockchain and its applications, especially as the power of new computing techniques are introduced.
- While blockchain automatically validates transaction formats, it does not ensure the accuracy of the data underlying the digital record. Participants to a transaction must confirm the information posted to the blockchain. However, errors that participants may not always identify could occur in the input of the information.
- The blockchain stores data but does not store the underlying supporting documents.
- There are concerns over the privacy and accessibility of data on public blockchains.
- Blockchains are not yet as scalable as existing commercial transaction systems and there are questions regarding costs and computing power needed to maintain blockchains.
- Blockchains may not be deemed secure or transparent enough by financial regulators and governments.
- As with many advanced encrypted applications, there are concerns that blockchains could facilitate fraudulent or illegal activities due to the anonymity of blockchain participants.

**“One key regulatory issue is whether blockchain applications require registration under existing Commission regulatory regimes, such as those for transfer agents or clearing agencies. We are actively exploring these issues and their implications.”**  
—SEC Chair Mary Jo White

Keynote Address at the SEC-Rock Center on Corporate Governance Silicon Valley Initiative, March 31, 2016

[www.sec.gov/news/speech/chair-white-silicon-valley-initiative-3-31-16.html](http://www.sec.gov/news/speech/chair-white-silicon-valley-initiative-3-31-16.html)

- There could be integration issues among blockchain applications and existing systems within the same large organization.
- There could be obsolescence issues for early blockchain versions. Upgrades could be challenging.

The degree to which blockchain impacts capital markets and the corporate reporting process depends on how widely it is adopted. To the extent blockchain technology becomes established, government and regulatory bodies, financial institutions, law enforcement agencies, businesses, CPAs, lawyers, technology experts and others, will need to be involved. If the momentum of blockchain development continues at the rate indicated by the preceding discussion, new rules, controls, best-practice models and business skills will be needed to make a smooth transition to a blockchain-enabled future.

# Considerations for CPAs

Blockchain is on the horizon. Its implications are far reaching and can extend well beyond the financial services sector. If widely adopted, blockchain has the potential to be transformative and revolutionary, affecting the way business is conducted and the way information is exchanged and reported.

Although the full potential of this new technology has yet to be witnessed, business leaders, boards and oversight bodies, and business professionals should all take heed.

## Call to Action

CPAs are encouraged to:

- learn about blockchain technology
- increase their understanding of the opportunities and risks associated with blockchain technology
- actively monitor blockchain developments
- consider the potential impact of blockchain technology on their business model and environment
- take action as appropriate to exploit business opportunities and/or manage downside risks accordingly.

Reading this paper is a starting point. The investment of money and effort in any next steps should be commensurate with the significance of the potential impacts of blockchain technology.

In addition, accounting bodies should continue to monitor the impact of technological advances on the skills required for the CPA of the future and include relevant material in educational requirements and programs.



Should blockchain technology become widespread, CPAs will need to be well trained in its applications; depending on the nature of their role, some CPAs may require significant training in the underlying technology. New training may be required to understand the implications of the technology for the various roles of CPAs.

CPAs are not strangers to transformative technology. CPAs have consistently proven that they possess the necessary skills and knowledge to adapt and thrive in the face of changing technology. Capitalizing on the opportunities and managing the risks presented by new technologies will require careful planning.

In order to be proactive and initiate dialogue on the near-, medium- and long-term implications of blockchain technology, readers are invited to consider for themselves the following questions:

- Has our organization heard about blockchain technology? If not, what needs to be done to familiarize personnel with its potential implications, opportunities and risks?
- Is there a need for our organization to develop a blockchain strategy?
- Would it be appropriate to become a member of a related industry consortium, if applicable?
- Is there a business case for experimenting with blockchain technology? Have we identified possible blockchain applications for our industry and organization?
- Are we providing our employees (including our leadership) with the necessary skills and training to understand the implications of significant new technologies, such as blockchain, and will we be able to adapt as appropriate?

## About the Author

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