CONSENSYS

An Executive's Guide to the Future of Asset Management

PART 2 - THE DIGITAL ASSET MANAGER

CONTENTS

The largest global asset managers are recommending allocations of the top tokens in their portfolios and the largest retail brokerages are coming online very soon with crypto-asset offerings. This shows token asset management is relevant now”

Joseph Lubin
Founder and CEO, ConsenSys

Executive Summary

This paper is the second of a series on the future of the asset management industry and the key role we see blockchain playing in its evolution. Our first paper, 'An Executive's Guide to the Future of Asset Management - Part 1 - Transforming Asset Servicing', focused on the engine room of the European funds industry, the little-praised but crucial back and middle office functions which make up the asset servicing sector. The paper provided a taster of the role which blockchain is currently playing and will play in the asset servicing industry by showcasing use cases across all of the key areas of (i) the Custodian Bank, (ii) the Fund Administrator and (iii) the Transfer Agent and Reporting, while also briefly covering the impact on the asset manager.

We now switch our focus to the role that blockchain will play for the asset manager, which impacts a range of front and middle office activities.

This paper provides an overview of:

1. Opportunities for the evolving role of the asset manager
2. Challenges for the asset management industry
3. Trends developing in the asset management industry

The paper then examines a variety of areas within the asset management function which shows the transformative effect blockchain can have, and is having, on the industry:

1. Portfolio management is changing with new processes for issuing and trading securities such as equity and debt securities
2. Immediate and more streamlined issuance and management of fund shares
3. Disintermediation of multiple parties through the development of direct asset manager to investor platforms
4. T+0 settlement becoming a reality

Real life examples of early innovators in these areas are highlighted throughout the paper in order to demonstrate that the era of 'hype' is rapidly coming to an end, as we see blockchain being utilized by some of the largest global asset managers today.

Opportunities and Challenges in the Asset Management Industry

The asset management industry has been under the spotlight for quite some time now. Investors have become frustrated by high management fees and subpar returns from big-name asset managers[1]. A number of processes are highly manual, and therefore prone to errors, and are accessed offline which results in cumbersome and unnecessary delays for the end user[2].

The asset management industry has reached a juncture where such frustrations, coupled with the emergence of technologies such as blockchain, have brought many disruptive solutions to the surface, which have in turn brought new investors and added liquidity into the market.

If you already know what blockchain is, or have read the *'What is Blockchain'* section in paper one, feel free to jump straight to the *'Trends in the Asset Management industry'* section.

1 Suzy Waite, Annie Massa and Christopher Cannon, Asset Managers With $74 Trillion on Brink of Historic Shakeout, Bloomberg, 2019, https://www.bloomberg.com/graphics/2019-asset-management-in-decline/

2 CrowdfundUPteam, How Blockchain is transforming traditional Asset Management, Medium, 2018, https://medium.com/crowdfundup/how-blockchain-is-transforming-traditional-asset-management-370363e38779

What is Blockchain?

Blockchain is a distinct type of Distributed Ledger Technology (DLT). DLTs involve ledgers, or databases, where the input and maintenance of data on the ledger are controlled on a peer-to-peer (P2P) basis. This P2P nature means that there is no central trusted party or intermediary required to control the ledger, and so they can be said to be decentralized. Blockchain is a decentralized ledger, which simply means that a ledger is spread across the network among all parties in the network, and each party holds a copy of the complete ledger. The Blockchain DLT technology takes its name from the way in which the ledger is structured, where inputs onto the ledger are grouped into blocks of transactions, which are then validated and transmitted to the network.

HOW DOES IT WORK?

The two most important concepts which were combined to create the blockchain technology were asymmetrical cryptography and distributed IT architecture. Asymmetrical cryptography is a system of public and private keys which allows users to confidently exchange encrypted information with unknown third parties. A public key is a string of numbers and letters which can be made available to everyone [think of your email address], while the private key remains secret, and is used to access any data which is sent to your public key [think of your password used to login and access your emails].

A distributed IT system is a series of independent computers, known as nodes, which can communicate with each other over a network with no central node, much like the Internet. As all the nodes are connected to each other on a P2P basis, when one goes down it does not bring the entire network down with it, also known as automated redundancy.

Blockchains use these two concepts to allow users to store and send information in a decentralized manner, while the users of the network maintain it with the help of consensus algorithms which certify and confirm the transactions into 'blocks'. Users who complete this certification are known as miners, and a range of consensus algorithms are used depending on the blockchain, the most prevalent of which are proof-of-work and proof-of-stake. Once the miners have validated blocks through these mechanisms, it is added to the chain and shared with the network. Each block contains a hash of the previous block, which means that if any data in the block was altered in any way, the hash of the block would also change, and so the link to the chain would be broken. This means that once a block has been added to the blockchain, it is prohibitively difficult for it to be changed, making blockchains effectively immutable and tamper proof.

BEYOND TRANSFER OF CURRENCY AND THE BIRTH OF ETHEREUM

The original Bitcoin blockchain was created specifically for the transfer of bitcoin, or digital currency, between peers. However, it could not be programmed to transfer anything beyond this. In 2015, Vitalik Buterin launched Ethereum, which was the world's first fully programmable blockchain. Ethereum crucially supports the creation of smart contracts. These are contracts between two or more parties which are digitally programmed and automatically execute clauses of the contract on the completion of certain events. The events which cause the automatic execution can be external to the blockchain, and the data concerning it is fed into the blockchain by a trusted third party known as an oracle. Think for example of sensors on a property which can detect flooding, data from which could be fed into a smart contract through an oracle, leading to an automatic execution of flood insurance claims. These oracles are often linked to Internet of Things (IoT) connected devices, which allows for the automation of the collection of data into the blockchain and gives the confidence that there is accuracy in the data which the contract is being executed against.

PUBLIC AND PRIVATE BLOCKCHAINS

The original Bitcoin blockchain, as well as Ethereum's Mainnet, are both examples of what are known as public blockchains. This means that anybody in the world with access to the Internet and appropriate hardware can access the shared ledger, store a copy of it on their machine, and begin to modify it through using their computing power to validate transactions. While public blockchains are extremely powerful in ensuring the true distribution of the network and transparency, they are not always suitable for enterprises which may want to control the access and permissions of users on their chain. This is where private or consortium blockchains are useful, and many of the enterprise blockchain applications currently in production in the Financial Services industry are hosted on a private or consortium chain.

ENTERPRISE PRIVATE BLOCKCHAINS

A private blockchain is one where a central authority controls the right to access or post transactions to the ledger, which are verified through a proof-of-authority consensus mechanism. These chains can be incorporated into enterprises alongside

PROOF OF WORK

Proof of Work (PoW) is an algorithm which uses mining to solve computationally intensive puzzles to validate transactions and create new blocks.

PROOF OF STAKE

Proof of Stake (PoS) algorithm uses a pseudo-random election process to select a node to be the validator of the next block.

PROOF OF AUTHORITY

Proof of Authority (PoA) is a reputation-based consensus algorithm which leverages the value of identities, meaning that block validators are not staking coins to be the validator but their own reputation.

their existing systems and provide an encrypted audit trail of transactions between members of the enterprise or group of enterprises. The primary enterprise blockchains are outlined below:

Hyperledger Besu

Hyperledger Besu is an open source enterprise blockchain client built in Java, created by the PegaSys team within ConsenSys. Hyperledger Besu is mainnet-compatible, and includes features like consensus algorithms that are applicable to enterprise use. Hyperledger Besu provides the following benefits for enterprise clients:

- Built from the ground up with enterprise-friendly licensing
- Vendor supported by PegaSys engineers
- Secure and dependable permissioning and privacy features
- Stable consensus that enables fast, reliable transactions

PegaSys Plus

PegaSys Plus is a commercially licensed Ethereum platform. It offers all of the same functionality as Hyperledger Besu with additional features designed to accelerate production of enterprise blockchain solutions such as:

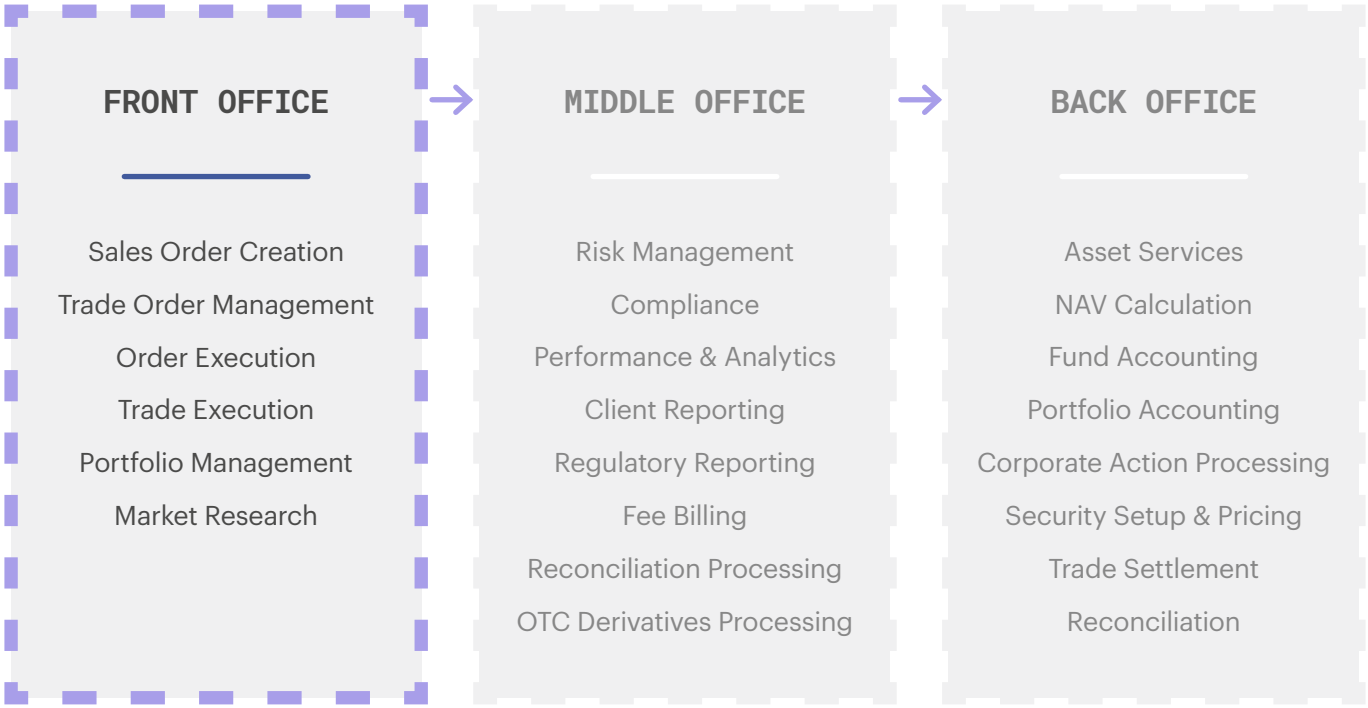
- Increased security of data when it is at rest and most vulnerable
- Advanced monitoring for consistent uptime

Quorum

JP Morgan, along with the Enterprise Ethereum Alliance and ConsenSys, created an enterprise-focused Ethereum version called Quorum, which tries to improve blockchain technology with its own solution. The objective behind this is to provide a permissioned implementation of Ethereum which supports transactions and contract privacy. Here is how Quorum is different from the Ethereum blockchain:

- Network and peer permissions management
- Enhanced transaction and contract privacy
- Voting-based consensus mechanisms

Trends in the Asset Management Industry



ACTIVE V PASSIVE

As mentioned in part one, the market has seen a shift from active to passive investing, leaving asset managers with the challenge of rethinking how they build their portfolios. In August 2019, the investment industry reached one of its biggest milestones in modern history, as assets in U.S. index-based equity mutual funds and ETFs topped those in active stock funds for the first time[3].

It was said in a report by the Boston Consulting Group that the asset management industry had to adjust to a more challenging environment in 2018 as assets under management and net inflows fell by 4% in comparison to the 12% increase seen in 2017[4]. Along with this, new net flows were 0.9% of total assets managed which significantly falls below the record 3.1% seen in 2017 and under the historical average of about 1.5%. It is such figures which could lead analysts and market watchers to believe that there is poor public sentiment towards the markets.

3 Bloomberg News, End of era: Passive equity funds surpass active in epic shift, Bloomberg, 2019, https://www.bloomberg.com/professional/blog/end-era-passive-equity-funds-surpass-active-epic-shift/79

4 Joe Carrubba et al, How Asset Managers Can Win in a Winner-Takes-All World, Boston Consulting Group, 2019, https://www.bcg.com/publications/2019/asset-managers-winner-takes-all.aspx

SHIFT IN REGULATORY LANDSCAPE

The regulatory landscape is continuing to become more welcoming towards the blockchain ecosystem. In September 2015, we saw the Commodity Futures Trading Commission (CFTC) in the United States officially classify Bitcoin as a commodity[5]. As of October 2019, another positive announcement occurred, this time for the Ethereum ecosystem. CFTC Chairman Heath Tarbert said Ether, the world's second-largest cryptocurrency by market capitalization, is a commodity and thus falls under the jurisdiction of the CFTC[6]. Such a decision has meant that there is finally a decision clearing up the regulatory uncertainty which has hindered the Ether derivatives market. This is great news for both investors and trading platforms, and it is expected to accelerate the registration procedures for exchanges, brokers, clearing houses, trading advisors, and other regulated parties.

Tarbert stated that, on the back of the announcement, the CFTC may allow Ether futures to be traded on the U.S. markets, and believes the world will see Ethereum futures contracts in 2020[7]. Later in the same week, the derivatives regulator announced that LabCFTC would become its own independent office within the CFTC, while continuing its mission of acting as the agency's research wing into new financial technology, including blockchain and cryptocurrency tools[8].

The combination of improved regulatory involvement and the shift from active to passive investing is creating never-before-seen pressures on asset managers. Boston Consulting Group commented that "the above trends have pushed the $74 trillion industry to look at what they are offering to their investors" and the attitude is that "only the strongest will survive"[9].

We have focused on how particular governments are taking different approaches to regulating digital assets further on in this paper.

5 Andrew Hecht, What is Bitcoin? Basic Fact You Should Know, The balance, 2019, https://www.thebalance.com/is-bitcoin-a-commodity-4126544

6 William Foxley, CFTC Chairman Confirms Ether Cryptocurrency Is a Commodity, Coindesk, 2019, https://www.coindesk.com/cftc-chairman-confirms-ether-cryptocurrency-is-a-commodity

7 Nikhilesh De, CFTC Chair Says Ether Futures 'Likely' in 2020, Coindesk, 2019, https://www.coindesk.com/cftc-chair-says-well-likely-see-ether-futures-in-6-months, Accessed 07 October 2019

8 Nikhilesh De, CFTC Makes Its Fintech, Blockchain Research Lab a Full-Fledged Office, Coindesk, 2019, https://www.coindesk.com/cftc-makes-its-fintech-blockchain-research-lab-a-full-fledged-office

9 Tyler Durden, Active Asset Managers Are Facing A $74 Trillion Problem, ZeroHedge, 2019, https://www.zerohedge.com/news/2019-08-08/active-asset-managers-are-facing-74-trillion-problem

Investing in Digital Assets

ASSET ISSUANCE AND MANAGEMENT

In part one, we defined tokenization as the process through which digital assets or 'tokens' are created on the blockchain as a digital representation of a unit of value. This unit of value can be assigned to anything deemed valuable by society, be it digital assets or digital representations of real-world assets. The rise in the volume of investable assets is set to increase from around $64 trillion today to $102 trillion by 2020[10].

We briefly touched on the endless possibilities tokenization could have in the financial world across various asset classes - physical assets, real estate, creative productions (luxury cars, works of art, music, etc), service leases and timeshares, securities, and a whole lot more. However, it is important to understand how digital assets have evolved, from the first ICO to regulated STOs.

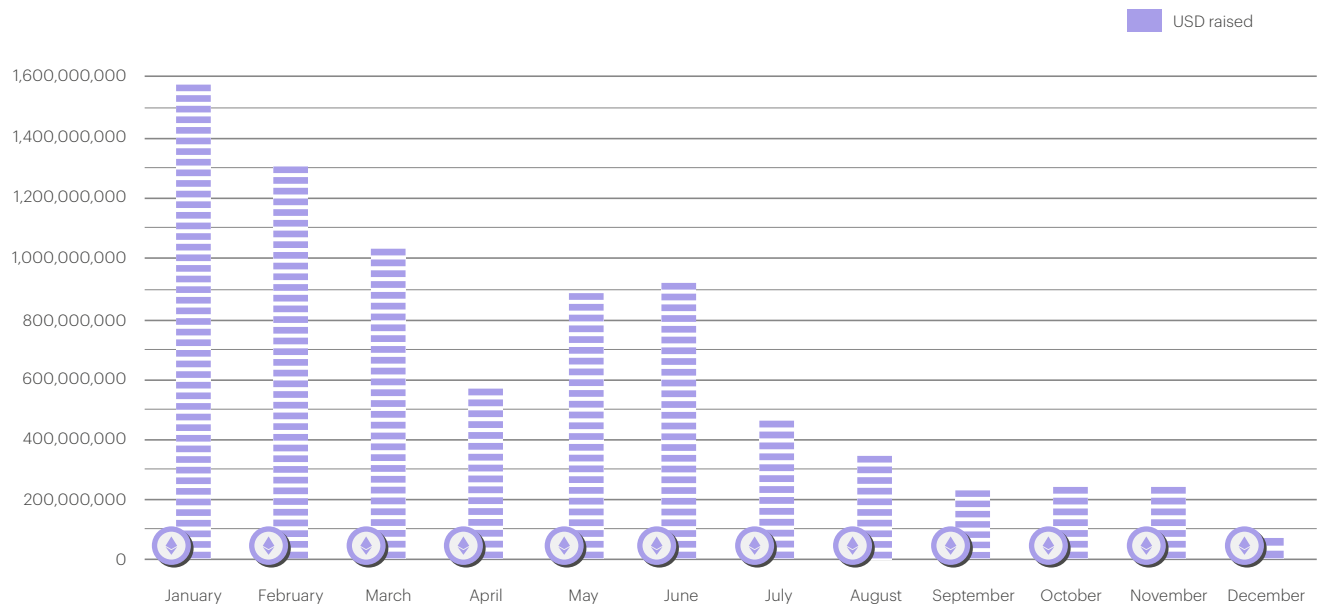
From ICOs to STOs

Blockchain technology gave rise to a new form of raising capital, known as Initial Coin Offerings (ICOs)[11]. It is similar to an Initial Public Offering (IPO) in which investors purchase shares of a company. However, these ICO token sales

10 PWC, Asset Management 2020: A Brave New World, 2019, https://www.pwc.com/gx/en/industries/financial-services/asset-management/publications/asset-management-2020-a-brave-new-world.html

11 David Hao, The Rise of ICOs: A Comprehensive Primer of Initial Coin Offerings, Medium, 2018, https://medium.com/the-ledger-group/the-rise-of-icos-a-comprehensive-primer-of-initial-coin-offerings-96050529257

INITIAL COIN OFFERING - MONEY RAISED IN 2018



Source: https://www.icodata.io/stats/2018

typically represent access to the services a startup is building rather than a share in the company[12]. The total amount raised by ICOs in 2018 was almost $11.4 billion, against little more than $10 billion during 2017[13].

Fraud and Unregulated

In the first week of January 2019, only $6 million was collectively raised[14] with investor's concerns over the amount of ICOs found to be susceptible to fraudulent activity. A study by Satis Group LLC found that 81% of ICOs analyzed had been found to be scams. Further to this, 6% had actually failed, 5% had gone dark and only 8% went to trade on an exchange[15]. ICOs were largely unregulated and it is this unregulated nature which led to the demise of the era of the unregulated Initial Coin Offerings.

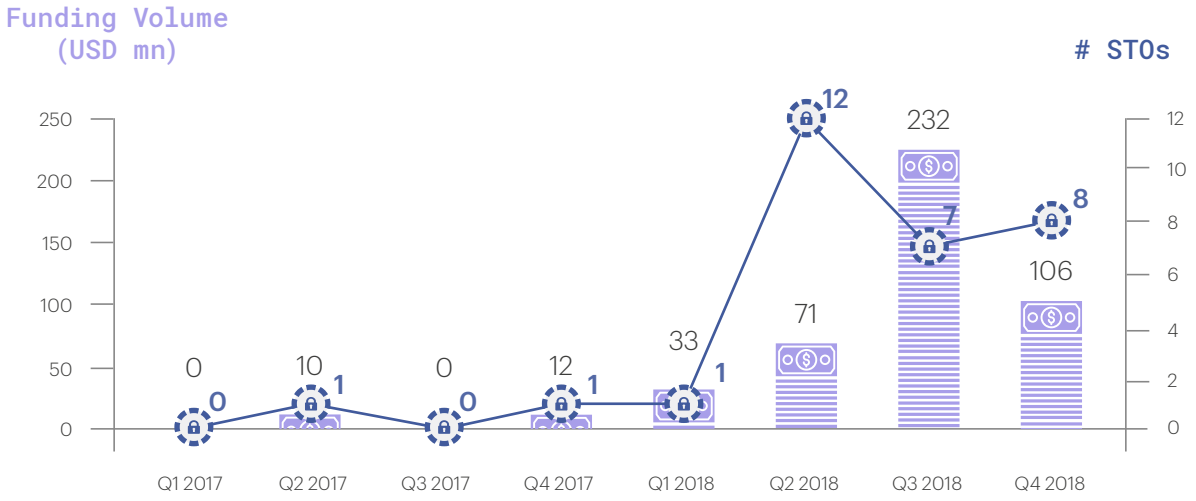
12 Jonathon Keane, People were raising millions without even a product: Inside the world of startup ICOs, Fora, 2018, https://fora.ie/ireland-initial-coin-offerings-4233336-Sep2018/

13 Daniele Pozzi, ICO Market 2018 v 2017: Trends, Capitalization, Localization, Industries, Success Rate, Cointelegraph, 2019, https://cointelegraph.com/news/ico-market-2018-vs-2017-trends-capitalization-localization-industries-success-ratem

14 Samuel Haig, ICOs Produce Slow Start to 2019, Bitcoin.com, 2019, https://news.bitcoin.com/icos-slow-start-2019/

15 Edward Kelso, New Study: 80% of ICOs are Scams, Only 8% Reach an Exchange, Bitcoin.com, 2018, https://news.bitcoin.com/80-of-icos-are-scams-only-8-reach-an-exchange

SECURITY TOKEN OFFERING - MONEY RAISED IN 2018



Source: https://cryptovalley.swiss/wp-content/uploads/ch-20190308-strategyand-ico-sto-report-q1-2019.pdf

Security Token Offerings (STO)

The eventual decline of ICOs gave rise to the new and improved Security Token Offering (STO). As mentioned in part one, an STO is a process whereby security tokens are created representing a tradable asset. Security tokens can represent shares in companies, precious goods like metals or fine art, shares in a fund or even the ownership of real estate.

Backed by assets, STOs are a way of fundraising which offer a part of a company's business to investors, in return for a short-term cash injection that can help them to realize their latest goals and plans. Investors can also be entitled to profits, dividends and interest rates. STOs are always backed by some form of a tangible asset, which helps to prevent investors from falling prey to fraudulent business practices[16]. STOs provide investors peace of mind that they are classified as a security.

The overall process of tokenization opens up over $256 trillion worth of real-world assets that have yet to be tokenized[17]. Access to such previously untokenized assets reaps benefits for a range of parties.

16 Yuval Halevi, ICO vs STO: All You Need to Know About the New Fundraising Method in the Crypto World, Hackernoon, 2019, https://hackernoon.com/ico-vs-sto-all-you-need-to-know-about-the-new-fundraising-method-in-the-crypto-world-54a1a43a08d6

17 Kristin Housner, We Need to Expand Access to $256 Trillion in Real-World Assets, Futurism, 2018, https://futurism.com/need-expand-access-256-trillion-real-world-assets

ISSUANCE AND TRADING SECURITIES

Securities can be broadly categorized into two distinct types, equity and debt. An equity security represents an ownership interest held by shareholders in an entity in the form of shares of capital stock. While debt securities include government and corporate bonds.

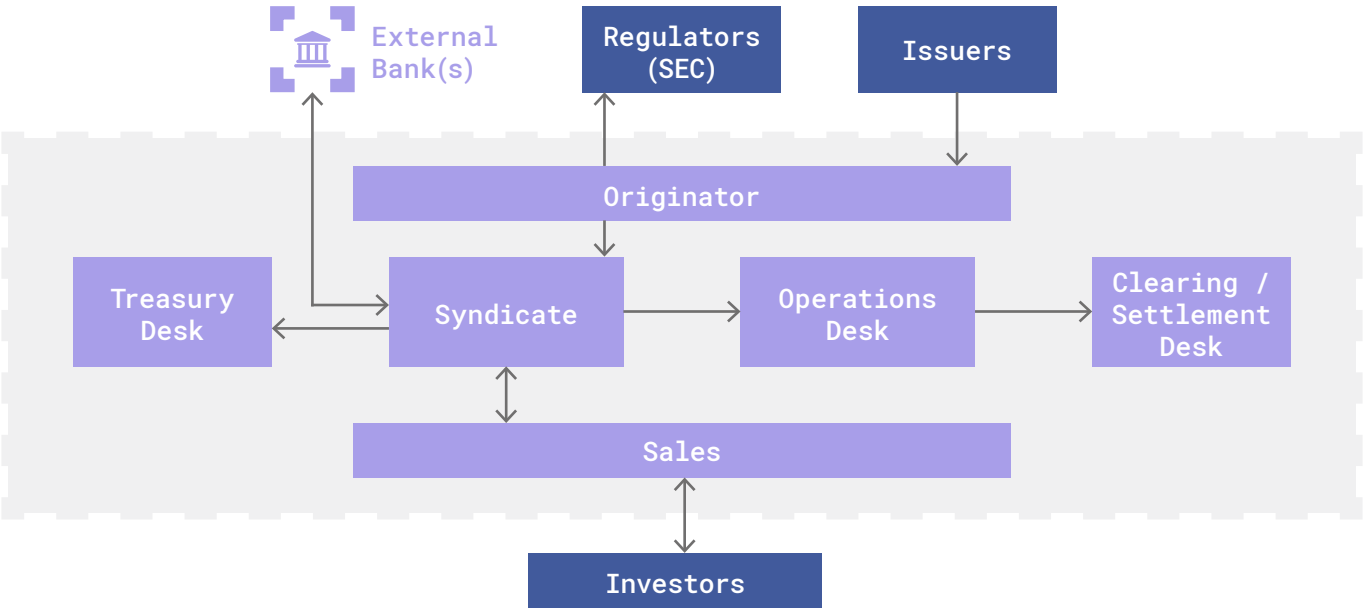
The issuance and trading of securities is a government-regulated process. In the U.S. the Securities and Exchange Commission (SEC) is responsible for overseeing the capital markets industry using a traditional accounting-book entry system.

Challenges with the Issuance process

There are a number of challenges associated with the current issuance process of securities. There are multiple versions of the truth which exist in the network due to each participant having to maintain their own version of record while continuously reconciling the information. These participants have been working with outdated systems of paper ownership, which they eventually dematerialized, that is not only slow but can be inaccurate and prone to deception.

Clearing and settlement cycles can take up to 3 business days from the transaction date to the settling of the trade due to the involvement of multiple intermediaries working on separate systems, which makes it nearly impossible to maintain 24 hours, 7 days a week availability of services.

CURRENT SECURITIES ISSUANCE PROCESS



Source: https://cryptovalley.swiss/wp-content/uploads/ch-20190308-strategyand-ico-sto-report-q1-2019.pdf

Equity and Debt

Blockchain has already begun to affect the bond market by eliminating all of the associated formalities as private companies along with official institutions are now able to issue bonds in the form of token securities.

On the debt side, Banco Santander announced in early September that it had issued the first end-to-end blockchain bond worth $20 million using the public Ethereum blockchain. The bank issued the bond directly onto the public mainnet and the bond will also continue to exist only on the blockchain[18]. Société Générale and the World Bank also completed similar issuances in 2018 and 2019. HSBC has announced that they plan to launch a blockchain based custody platform in May which will give investor real-time access to securities bought on private markets. This is a major step in the right direction to an increase in speed to market for issuers and investors.

On the equity side, Aboveboard, are one of the companies that have put pressure on traditional asset managers by streamlining the way companies can issue securities. Aboveboard, a Delaware corporation, became the first company to issue corporate stock on the blockchain[19]. They "minted" all of their issued shares to a company wallet, and then distributed stock to the Ethereum wallets of employees. The stock is represented as ERC-20 tokens and the shareholders are tracked using their own Aboveboard's registry software. Their registry software tracks security token holders on the Ethereum blockchain and provides the management of shareholder rights, governance and trading rules.

The vision of Aboveboard allowed investors from many different countries purchase stock after qualifying to be on a local blockchain "whitelist". This has made a hassle-free global distribution possible. Furthermore, approved investors could immediately trade particular securities on exchanges for private and public tokenized securities, this has the potential to significantly increase the liquidity of these assets[20].

MINTING

Minting is defined as the computer process of validating information, creating a new block and recording that information into the blockchain.

ERC-20 TOKENS

Tokens can be bought, sold, or traded. The most significant tokens are called ERC-20, which has emerged as the technical standard used for all smart contracts on the Ethereum blockchain for token implementation.

ERC-1400 TOKENS

ERC-1400 is a standard for security tokens. It shares many of the characteristics of ERC-20 tokens. Many believe this standard has the potential to create the boom in security tokens just like the ERC-20 standard did for Utility Tokens.

18 Santander, Santander launches the first end-to-end blockchain bond, 2019, Press Release, https://www.santander.com/csgs/Satellite/CFWCSancomQP01/en_GB/Corporate/Press-room/2019/09/12/Santander-launches-the-first-end-to-end-blockchain-bond.html

19 Henry Finn, The trend of issuing corporate stock on the Blockchain has already started, Hackernoon, 2018, https://hackernoon.com/the-trend-of-issuing-corporate-stock-on-the-blockchain-has-already-started-a615056b1d2b

20 Tech Bullion, The First Company to issue Stock on the Blockchain, Press Release Tech Bullion, 2018, https://techbullion.com/the-first-company-to-issue-stock-on-the-blockchain/

SETTLEMENT

By limiting the need for intermediaries such as transfer and paying agents, central counterparty clearing house (CCP) and central securities depositories (CSD) - blockchain enables near-real-time settlement, making T+0 a reality. Blockchain technology can serve as a decentralized "ledger" of transactions. Rather than using SWIFT to reconcile each financial institution's ledger, a blockchain could keep track of all transactions publicly and transparently.

CLS announced in late 2018 that they were launching their blockchain foreign exchange netting solution CLSNet with Morgan Stanley and Goldman Sachs as initial clients, along with 6 other clients who committed to the service, including Bank of China[21]. Its existing CLS system, which acted as an existing FX netting and settlement system, processed $5 trillion in foreign exchange payments daily but only dealt with 18 major currencies. The new blockchain powered system deals with 120+ currencies, giving increased importance to emerging markets and an open platform for hedge funds, brokers and corporations.

The Australian Securities Exchange (ASX) announced in late August 2019 the signing of a three-party memorandum of understanding (MOU) with Digital Asset and VMware to work together on distributed ledger technology (DLT) initiatives. Their initial focus is to replace their cash equity clearing and settlement system CHESS, but the partnership will strengthen its ability to support the financial services industry, using the infrastructure to create new services and innovations beyond clearing and settlement[22].

Atomic Delivery versus Payment (DvP)

Further, blockchain technology can facilitate "atomic" Delivery versus Payment (DvP), or transactions which settle when a payment is made. This stands in contrast to current systems, which settle aggregated transactions in omnibus accounts making it hard to have transparency on which transaction has been paid[23].

Technologies like blockchain are helping turn clearing services into a source of competitive advantage by helping to reduce systemic risk. Accenture has recently estimated that the global financial industry could save up to $10 billion by using blockchain to store and process clearing and settlement[24].

21 Nicky Morris, Morgan Stanley, Goldman go live on CLS / IBM FX blockchain, Ledger Insights, 2018, https://www.ledgerinsights.com/morgan-stanley-goldman-cls-blockchain-fx-clsnet/

22 Maria Nikolova, ASX, Digital Asset and VMware collaborate on DLT, Finance Feeds, 2019, https://financefeeds.com/asx-digital-asset-vmware-collaborate-dlt/

23 CBInsights, How Blockchain Could Disrupt Banking, CBInsights Report, 2018, https://www.cbinsights.com/research/blockchain-disrupting-banking/

24 Marie Gonzalez, Settlements & Clearing — a $10B per Year Opportunity, Medium, 2019, https://medium.com/gochain/settlements-clearing-a-10b-per-year-opportunity-97c27ef9d9b8

WHAT ARE THE BENEFITS?

1. **Improved liquidity** through automation resulting in the reduction in cost and thus lowering entry barriers for a market base of people who could not previously access the markets due to such cost barriers
2. Investors can purchase tokens that represent **small percentages of the underlying security**
3. Increased inclusivity and tokenization of highly divisible assets allows investors the opportunity to easily **trade on secondary markets** without the administrative burdens of traditional private securities[25]
4. **Utilizing self-executing smart contracts** on the blockchain to create transaction records that are incorruptible and significantly reduce the administrative burden involved in the deal execution of buying and selling stocks[26]. The UK Jurisdiction Taskforce of the Lawtech Delivery Panel have recognized crypto assets as tradable property and smart contracts as enforceable agreements under English Law providing investors with increased confidence of their rights[27].
5. **Immediate post-trade processing** resulting in the immediate change of records of ownership and arrangement for the transfer of securities and cash[28]

DrumG

ConsenSys invested in Bermuda-based DrumG Technologies in 2018 due to the significant role they are playing in driving towards the generation of true business value via the deployment of enterprise blockchain networks.

"The Finsbury Network represents a classic example of how we can collapse the complexity of post-trade communication for asset managers and asset servicers while, crucially, maintaining the bilateral privacy that is a predicate for a functioning industry. The result of solving this collective action problem is a meaningful increase in operational and capital efficiency for all market participants. And that's just the beginning..."

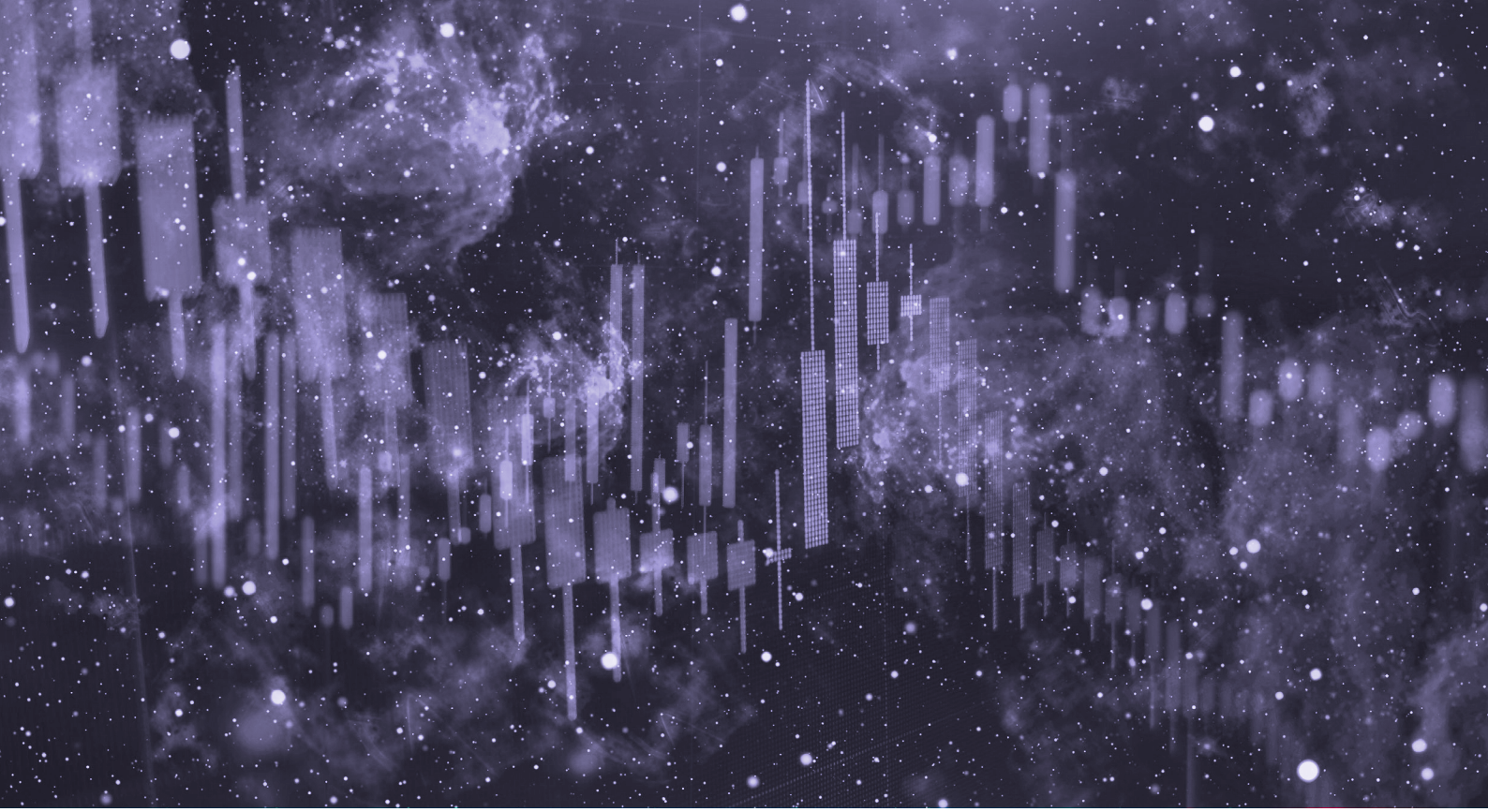
Tim Grant, Founder and CEO
DrumG Technologies

25 Julianne Sloane, Security tokens: Enabling trading on secondary markets, Medium, 2018, https://medium.com/@juliannesloane/security-tokens-enabling-trading-on-secondary-markets-4b5d6da5fa8f

26 Blockheads, 5 Ways Blockchain Will Disrupt Finance, Hackernoon, 2018, https://hackernoon.com/5-ways-blockchain-will-disrupt-finance-c71a9c23058e

27 Finextra, UK charges ahead with legal certainty for smart contracts and cryptoassets, 2019, https://www.finextra.com/newsarticle/34790/uk-charges-ahead-with-legal-certainty-for-smart-contracts-and-cryptoassets

28 European Central Bank, The potential impact of DLTs on securities post-trading harmonisation and on the wider EU financial market integration, 2017, https://www.ecb.europa.eu/paym/intro/governance/shared/pdf/201709_dlt_impact_on_harmonisation_and_integration.pdf



6. Markets stay open trading **24 hours a day, 7 days a week**[29] as currently stock exchanges are closed more hours a week than open

7. Entrance of competing platforms increasing the **accessibility for companies to issue STOs**. Companies such as Polymath and ConsenSys' Codefi are making it easier to create, issue, and manage digital securities using a blockchain based system[30]

8. **Reduction in costs, administration procedures** and **additional certainty and trust** into financial transactions

9. **Reduction in compliance costs** by embedding permissions and restrictions on the token level removing the fear of violating securities law[31]

10. **Asset interoperability**, which means digital assets are portable between different platforms and exchanges which are sharing the same technology layer, something that was not achievable previously, with each technology company traditionally having their own closed system[32].

29 Ash Bennington, Crypto Assets Trade 24/7 – And That Changes More Than Uptime, Coindesk, 2017, https://www.coindesk.com/crypto-assets-trade-247-changes-uptime

30 Polymath, 2019, https://polymath.network

31 Jon Wood, Polymath —Purchasing and trading securities on the blockchain, Medium, 2018, https://medium.com/trivial-co/polymath-purchasing-and-trading-securities-on-the-blockchain-62e551ea8610

32 Remi Gai, Investing in the Security Token Ecosystem, Hackernoon, 2019, https://medium.com/hackernoon/investing-in-the-security-token-ecosystem-6a75e750beef

Issuance, Distribution and Management of Fund Shares

The funds sector relies heavily on financial services intermediaries such as transfer agents, fund registries, distributors and fund administrators. Fund subscriptions and redemptions are complex processes involving a handful of intermediaries such as distributors and transfer agents. New business models are emerging which enable individuals to invest directly into a fund through a blockchain powered platform without the need for such intermediaries.

TAKING MORE CONTROL

The industry has seen a shift towards asset managers interacting directly with investors, leading to the disintermediation of distributors. 2017 saw the creation of two European platforms aimed at providing asset management companies a way of having transparency over their shareholders, and better management of the distribution and of the fund's liabilities.

FundsDLT and IZNES

FundsDLT, a blockchain powered platform, was founded by Fundsquare and quickly backed by Ostrum Asset Management to smooth the data flows between actors (asset managers, transfer agents, custodians, etc.). IZNES was another company founded by 6 asset management companies and a technology provider to facilitate the record keeping of European shares of funds.

FNZ

In August 2019, FNZ launched the world's first production blockchain platform which enables asset managers to connect directly with their retail investors[34]. FNZ partnered with a consortium of global fund managers, including Aberdeen Standard, Equity Trustees Fund Services, Kames Capital, Legg Mason and Merian Global Investors to create FNZ ChainLink. FNZ ChainLink replaces the thousands of copies of transactions and holdings that have hindered the funds industry with a single, secure, verifiable source of truth. As a result, this vastly reduces the associated costs, complexity and risk in such operations, which ultimately affects the bottom line for retail investors.

Calastone

Other players in the market, such as Calastone, who process over £170 billion of investment value each month, launched their Distributed Market Infrastructure (DMI) platform which digitized the trading, settlement and distribution of funds with intentions of reducing costs and providing greater speed, transparency and return on capital[35]. The overall global cost of fund distribution could be reduced by as much as £3.4 billion, achieved through the technological mutualization of the trading and settlement processes.

34 FNZ, Sectors, 2019, https://www.fnz.com/services-for

35 Jonathan Watkins, Calastone successfully shifts funds network to DLT platform, Global Custodian, 2019, https://www.globalcustodian.com/calastone-successfully-shifts-funds-network-dlt-platform

WHAT ARE THE BIG GUNS DOING

All of the top asset management companies have either invested heavily in developing their own blockchain platforms or are researching the topic of blockchain and its potential impact on their business.

BlackRock

BlackRock, who are the world's largest asset manager with assets worth over $6 trillion, announced in mid 2018 that they are exploring the cryptocurrency market. They have set up a working group to find ways to incorporate virtual currency into the mainstream business model. However, no further announcements have been made in this space as of yet[36].

Vanguard

Mutual fund giant Vanguard partnered with Symbiont, a Nasdaq Ventures backed startup, to develop a trading platform that boosts peer-to-peer trading for investors by connecting them directly via blockchain technology[37]. Such a move is an indicator that the fund managers are committed to lowering the cost of investing for all of their investors.

TP ICAP

TP ICAP, the world's premier interdealer broker, has launched a Bitcoin Futures trading service that matches buyers and sellers of Bitcoin derivatives. The service will cater to the increasing institutional interest in Bitcoin as an asset class. TP ICAP is also exploring other digital assets, including tokenized securities, which could be added to the company's product suite in the future. While the brokerage will focus on regulated, exchange-traded Bitcoin Futures, the London-based company may act as an intermediary for crypto assets in the future[38].

Duncan Trenholme, TP ICAPs co-head of digital asset markets, speaking with Bloomberg commented "Every institution is on an educational journey. Many are exploring how tokens can legitimately be traded or stored and I'd expect more products to hit the market over the next year or two"[39].

According to TP ICAP's Simon Forster, TP ICAP's other co-head of digital asset markets, "We want to be close to what's happening within this nascent asset class because we believe it's important to invest in the early stages of a growing market. TP ICAP also understands that this technology could disrupt or impact other asset classes where we currently operate, so we feel it's important to be informed".

36 Daniel Palmer, Report: World's Biggest Asset Manager BlackRock Exploring Bitcoin, Coindesk, 2018, https://www.coindesk.com/report-worlds-biggest-asset-manager-blackrock-exploring-bitcoin

37 David Pan, Vanguard Developing Blockchain Platform for $6 Trillion Forex Market, Coindesk, 2019, https://www.coindesk.com/vanguard-developing-blockchain-platform-for-6-trillion-forex-market

38 Alex Lielacher, World's largest broker TP ICAP launches Bitcoin futures trading, Brave New Coin, 2019, https://bravenewcoin.com/insights/world's-largest-broker-tp-icap-launches-bitcoin-futures-trading

39 Alastair Marsh, TP ICAP Enters the Crypto Business to Trade Bitcoin Derivatives, Bloomberg, 2019, https://www.bloomberg.com/news/articles/2019-06-17/tp-icap-enters-the-crypto-business-to-trade-bitcoin-derivatives

Codefi

We are seeing an increase in demand from our Financial Services clients for Decentralized Finance (DeFi) products. As a result, ConsenSys launched Codefi blockchain operating system which powers commerce and finance, built to optimize business processes and digitize financial instruments.

Jeremy Millar, Enterprise Ethereum Alliance founding board member, who is also Chief of Staff at ConsenSys, remarked that "there are a series of smart contracts and workflows and capabilities that everyone needs. It doesn't make sense for every organization or team working in DeFi or institutional assets to rewrite the same code. It makes much more sense for a large, well-resourced, software organization to write a set of modules that will work together"[33].

> *"It doesn't make sense for every organization or team working in DeFi or institutional assets to rewrite the same code. It makes much more sense for a large, well-resourced, software organization to write a set of modules that will work together"*
>
> **Jeremy Millar**
> Enterprise Ethereum Alliance founding board member, Chief of Staff at ConsenSys

33 Leigh Cuen, ConsenSys Announces Codefi Project to Boost DeFi Adoption, Coindesk, 2019, https://www.coindesk.com/consensys-announces-codefi-project-to-boost-defi-adoption

CONSENSYS Codefi

The blockchain operating system for global Commerce and Finance

Commerce and Finance are evolving as the infrastructure, manufacturing, and distribution value chains move to blockchain networks and digital assets. We built ConsenSys Codefi to help clients benefit from this profound transformation across trade finance, banking, investing, and real estate. Our platform comprises an "operating system" with modular capability to digitize financial instruments and catalyze new markets.

Optimize business processes

Incorporate blockchain-native authenticity, scarcity, and programmability into work-flows, enabling governance, compliance, and system incentives through secure APIs and scalable, customizable software

Activate digital financial instruments

Create and grow markets with potential for greater liquidity, reduced costs of capital, access to a broader investor and capital base, and improved incentive alignment between stakeholders

Deploy production-ready blockchain solutions

Leverage the pioneering innovation of the Ethereum ecosystem to create compliant, production-ready blockchain solutions for use-cases across the financial sectors

Why ConsenSys Codefi?

ConsenSys is one of the world's largest blockchain companies, building the tools, infrastructure, and applications that power the Ethereum network. Since 2014, we have tokenized billions of dollars in digital assets, including a wide range of consumer products, stablecoins, real estate, and financial instruments, powering tens of billions of dollars in blockchain-based transactions. Through our applications, we have served hundreds of thousands of users, ranging from central banks and major financial institutions to developers and retail users of the Ethereum mainnet.

Our solutions not only navigate but also help shape regulation and public policy. As the official blockchain partner of the EU Blockchain Observatory and Forum, and as a founding member of Global Digital Finance and The Brooklyn Project, we are equipped to navigate and deploy blockchain-based software in the most complex of regulatory environments. Across our strategic engagements, we have optimized assets and business processes within large multinational corporations in traditional and emerging financial markets and commercial networks, to realize cost savings of 20 to 80%.

TRUSTED BY WORLD GOVERNMENTS, CENTRAL BANKS, AND MAJOR FINANCIAL INSTITUTIONS

ENTERPRISE ETHEREUM ALLIANCE · European Commission · GLOBAL DIGITAL FINANCE · South African Reserve Bank · WFE WORLD FEDERATION OF EXCHANGES

Key Considerations

While new innovative clusters in recent decades have tended to concentrate in places like Silicon Valley, Europe has established an early lead over the U.S. in the field of blockchain digital securities, according to a report titled "The Global Digital Securities Ecosystem 2019"[40]. In the case of the security token ecosystem, the study found that new blockchain services are being driven by both startups and institutional players, with the latter's involvement adding some reassurance about the stability of such systems[41].

Traditional asset managers are being overlooked as trusted entities to help issue securities such as stocks. The study identified 88 companies in the security token ecosystem based in Europe, compared to 83 in the U.S. On an individual country basis, Germany hosted 20 of the companies, followed by 15 for Switzerland and 12 in the U.K.

To keep this momentum going, the study also found that the ecosystem is still lacking critical building blocks, including secondary exchanges that would facilitate greater trading. Dirk Manelski, Chief Technology Officer at Pimco, said they are looking closely at blockchain as there are many areas where it could cut spending and inefficiency. However, he explained that "the ecosystem of the buy-side, sell-side and market infrastructures need to come together so there is real value added to the community"[42].

IMPORTANCE OF SECURITY

As smart contracts and decentralized applications become more ubiquitous and more complex within the asset management industry, the need for powerful and accessible security tools is greater than ever before.

MythX

MythX, which has been developed by ConsenSys Diligence, is a new web3 SaaS solution that addresses this growing problem by bringing advanced security analysis directly into smart contract development environments and build pipelines in an accessible API. MythX also bundles multiple bleeding-edge tools and techniques into an extensible platform and Software Development Kit (SDK), which allows developers to create purpose-built Ethereum security tools that are powered by MythX[43].

40 BlockState, The Global Digital Securities Ecosystem, BlockState Report, 2019, https://blockstate.com/digital-securities-study-en/

41 Chris O'Brien, Europe has slight lead over U.S. in emerging blockchain digital securities market, Venture Beat, 2019, https://venturebeat.com/2019/10/30/europe-slight-lead-u-s-emerging-blockchain-digital-securities-market/

42 Shanny Basar, Pimco Looks To Data Advantage, Markets Media, 2018, https://www.marketsmedia.com/pimco-looks-to-data-advantage/

43 Tom Lindeman, Powered by MythX, Medium, 2018, https://media.consensys.net/powered-by-mythril-introducing-the-mythril-partner-program-8acbca470503

REGULATORY CONSTRAINTS

Once a new nascent technology enters a regulated territory, it challenges existing frameworks and practices. As incumbents are assessing how blockchain is impacting their current role, regulators must assess whether there is a need for amendments to be made to their laws, to allow for a new ecosystem to develop.

Cryptocurrency funds as an example, challenge European Commission investment fund regulation due to the uncertainties of the specific risks attached to the new crypto assets and distributed ledger technology projects[44].

Beyond cryptocurrency, digital assets and security tokens, as regulated instruments, are challenging the current organization of financial markets. New services are being developed, for example: cross-border payments, post-trade settlement, fund distribution, collateral management, custody services, which invite incumbents to rethink their role in the current ecosystem.

In the context of digital assets, private keys are essential in order to move an asset from one investor to the other. As such, depending on the type of securities, the entity managing the private keys may need to have similar agreements as custodian banks. Likewise, it is not trivial whether a blockchain can be used as an official register for regulated assets. Some countries, like France or Luxembourg have anticipated these changes and provided the missing piece to the law to allow for certain assets to be registered and transferred using a blockchain. The French government published a DLT Order which states that the use of distributed ledger is allowed for representation, transmission and pledge of unlisted securities; and a decision of the issuer is required to register securities on a distributed ledger[45].

ANTI-MONEY LAUNDERING

The European Union will make its 5th EU Anti-Money Laundering Directive (AMLD5) effective on the 1st January 2020 and bring into the scope cryptocurrency exchanges and custodians operating in Europe. Their aim is to improve the detection of suspicious cryptocurrency transactions[46]. The 5th AML Directive will effectively bring the EU in line with cryptocurrency measures introduced in the United States in 2013[47].

While there have been efforts at a European and United States level to regulate digital assets and cryptocurrencies, we have also seen a multitude of efforts made in other regions. Hong Kong's Securities and Futures

44 Jones Day, Setting Up Crypto Funds in the European Union, 2019, https://www.jonesday.com/-/media/files/publications/2019/07/setting-up-crypto-funds/setting_up_crypto_funds_in_the_eu.pdf?la=en&hash=E31A7AE8FB7CEAD57DA8FE40EDA549AF

45 John Le Guen and Franck Guiader, France renders applicable the use of blockchain for certain financial securities and confirms its worldwide pioneering legal framework, 2019, https://www.gide.com/en/news/france-renders-applicable-the-use-of-blockchain-for-certain-financial-securities-and-confirms

46 Dechert, AMLD5 in Germany: Implementation provides far-reaching licensing requirements for crypto-asset service providers, Lexology, 2019, https://www.lexology.com/library/detail.aspx?g=8ac13a85-a5b9-4a9d-ac0e-be851766bfa1

47 Financial Crimes Enforcement Network, Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies, 2013, https://www.fincen.gov/resources/statutes-regulations/guidance/application-fincens-regulations-persons-administering

Commission (SFC) has issued a new regulatory framework for granting licenses to virtual asset trading platforms, with a strong emphasis on protection for investors and their virtual assets[48]. This is a favorable move that will encourage investors to invest in such assets as it will allow "investors to choose to participate only in those platforms or exchanges that agree to be regulated and supervised" states Ashley Alder, the SFC's Chief Executive.

SWITCHING COSTS

Claims such as "blockchain can save asset managers up to $2.7 billion a year"[49] have really shone a spotlight on the potential role that blockchain can and is playing in helping asset managers gain the upper hand on their competitors while cutting costs. However, one of the biggest constraints to companies trying to upgrade their technology is the integration of blockchain with their legacy systems. Many of the failed attempts at creating blockchain platforms which were touched on earlier in this paper were a result of the unsustainable cost of running two platforms in parallel. The true value of blockchain technology requires companies to eventually turn off their legacy systems once they are confident with the security and ability of their new systems.

WHERE WE ARE TODAY

Despite the appetite for asset managers to engage with crypto assets, they must be aware that the process of buying, selling and holding digital assets today, provide no immediate operational efficiency. Based on legacy systems and evolving regulation, trading crypto assets can be complex alongside how to select the assets, how to mark them to market and how to custody them. Based on this, you must have investors who are seeking exposure to this class in search of alpha and or as a hedge.

48 Georgina Lee and Enoch Yiu, Hong Kong sets out regulatory framework for virtual asset trading platforms, emphasises investor protection, South China Morning Post, 2019, https://www.scmp.com/business/banking-finance/article/3036632/hong-kong-sets-out-regulatory-framework-virtual-asset

49 Attracta Mooney, "Blockchain 'could save asset managers $2.7bn a year'", Financial Times, 2018, https://www.ft.com/content/b6171016-171f-11e8-9e9c-25c814761640

Blockchain is powering platforms which are connecting industry leaders directly with their end users and reducing the need for intermediaries"

Lory Kehoe
Managing Director, ConsenSys

Conclusion

Quotes such as "blockchain has the potential to totally revolutionize the asset management industry" and "blockchain can save asset managers up to $2.7 billion a year" are starting to become live solutions, and moreover, tangible platforms delivering real value to the asset management industry.

Blockchain is powering platforms which are connecting industry leaders directly with their end users and reducing the need for intermediaries that were once driving up costs for the investors. Global regulators are starting to regulate digital assets and cryptocurrency exchanges to give investors more peace of mind investing through such platforms.

For the asset management sector to unlock the benefits of blockchain technology, the following points should be considered:

1. Collaboration and partnerships will be absolutely crucial
2. Asset managers will more and more be expected to quickly send and receive information in a way which is not possible through traditional means
3. Imagine new products as well as automated services when assessing the potential impact of blockchain technology
4. The full benefits of blockchain technology will appear when asset managers engage and trust partner organizations, and create an ecosystem where resources are pooled in shared ledgers
5. Asset managers need to continue to listen to the wants and needs of their investors

This paper only provides a taster of the impact blockchain is having, and will continue to have on the asset management industry. We are seeing a greater amount of untokenized assets becoming available to a broader market base of people. Issuance of such assets as securities and funds are immediately executed through the introduction of Smart Contracts. The introduction of such Smart Contracts are helping to achieve T+0 settlement through Atomic Delivery versus Payment (DvP) transactions.

Examples of blockchain platforms that are production ready and beginning to serve the asset management market are demonstrating the speed at which theory is becoming practice and the role that some of the larger asset managers and incumbents are already playing in this space.

Asset managers around the globe have much to gain by engaging with blockchain technology. To discuss how blockchain can be leveraged by your organization, reach out to ConsenSys through one of the contacts on the following page.

About the Authors

This report was produced by the ConsenSys Dublin Innovation Studio. ConsenSys is Ireland and the world's biggest dedicated blockchain company. The Dublin Innovation Studio is ConsenSys' global delivery centre, with a highly skilled team focused on excellent delivery of both product and advisory.

Lory Kehoe - Managing Director
lory.kehoe@consensys.net

Lory leads ConsenSys' Ireland hub. Prior to ConsenSys, Lory was a Partner with Deloitte, where he founded, set up and led Deloitte's Europe Middle East and Africa blockchain Lab. Lory has led blockchain corporate and governmental strategy projects, including production / live, pilot and POC projects. With the IDA in Ireland (Industrial Development Authority), Lory was the founding member of the Ireland national blockchain initiative "Blockchain Ireland'. This group includes 200 entities made up of global enterprises, universities, government entities and start-ups. Lory is a Qualified Financial Adviser, registered stockbroker and is currently (and has been for the past 13+ years) an adjunct assistant professor with the Business School in Trinity College Dublin.

Neal Costigan - Senior Consultant
neal.costigan@consensys.net

Neal joined the ConsenSys Dublin Innovation Studio team in May 2018. Within ConsenSys, Neal's primary focus is working with enterprises and consortia to assist them in identifying, designing and building products and platforms. Neal has experience as a Business Analyst on blockchain engagements ranging from Proof of Concept to large production environment. Prior to working in ConsenSys, Neal was a member of the Deloitte EMEA Blockchain Lab in Dublin focusing on growing and education the blockchain ecosystems through activities such as global roadshows events and enterprise hackathons.

Anne-Sophie Cartray - Executive Director
anne-sophie.cartray@consensys.net

Anne-Sophie Cartray is an Executive Director at ConsenSys, focusing on business development for Financial Services. Anne-Sophie started her career at Accenture in Financial Services. She then spent 14 years at Citigroup in London and New York, working in Audit and Capital Markets. She led several enterprise-wide initiatives, including the remediation of Foreign exchange consent orders, development of a new conduct and operational risks framework. She was also involved with Citi Markets' initiatives to develop new products and services leveraging blockchain technology and data analytics (AI and machine learning), and mitigate associated regulatory and operational risks. Anne-Sophie holds an MBA from Columbia University (New York).

GLOBAL CONTACTS

Australia
Claudio Lisco
claudio.lisco@consensys.net

France
David Poupardin
david.poupardin@consensys.net

Hong Kong
Charles D'Haussy
charles.dhaussy@consensys.net

United Kingdom
Emmanuel Marchal
emmanuel.marchal@consensys.net

U.S.
Phil Kelly
phil.kelly@consensys.net

Sources

1. Suzy Waite, Annie Massa and Christopher Cannon, Asset Managers With $74 Trillion on Brink of Historic Shakeout, Bloomberg, 2019, https://www.bloomberg.com/graphics/2019-asset-management-in-decline/, Accessed 07 October 2019
2. CrowdfundUPteam, How Blockchain is transforming traditional Asset Management, Medium, 2018,https://medium.com/crowdfundup/how-blockchain-is-transforming-traditional-asset-management-370363e38779, Accessed 07 October 2019
3. Bloomberg News, End of era: Passive equity funds surpass active in epic shift, Bloomberg, 2019, https://www.bloomberg.com/professional/blog/end-era-passive-equity-funds-surpass-active-epic-shift/, Accessed 07 October 2019
4. Joe Carrubba et al, How Asset Managers Can Win in a Winner-Takes-All World, Boston Consulting Group, 2019, https://www.bcg.com/publications/2019/asset-managers-winner-takes-all.aspx, Accessed 07 October 2019
5. Andrew Hecht, What is Bitcoin? Basic Fact You Should Know, The balance, 2019, https://www.thebalance.com/is-bitcoin-a-commodity-4126544, Accessed 07 October 2019
6. William Foxley, CFTC Chairman Confirms Ether Cryptocurrency Is a Commodity, Coindesk, 2019, https://www.coindesk.com/cftc-chairman-confirms-ether-cryptocurrency-is-a-commodity, Accessed 07 October 2019
7. Nikhilesh De, CFTC Chair Says Ether Futures 'Likely' in 2020, Coindesk, 2019, https://www.coindesk.com/cftc-chair-says-well-likely-see-ether-futures-in-6-months, Accessed 07 October 2019
8. Nikhilesh De, CFTC Makes Its Fintech, Blockchain Research Lab a Full-Fledged Office, Coindesk, 2019, https://www.coindesk.com/cftc-makes-its-fintech-blockchain-research-lab-a-full-fledged-office, Accessed 07 October 2019
9. Tyler Durden, Active Asset Managers Are Facing A $74 Trillion Problem, ZeroHedge, 2019, https://www.zerohedge.com/news/2019-08-08/active-asset-managers-are-facing-74-trillion-problem, Accessed 07 October 2019
10. PWC, Asset Management 2020: A Brave New World, 2019, https://www.pwc.com/gx/en/industries/financial-services/asset-management/publications/asset-management-2020-a-brave-new-world.html, Accessed 10 October 2019
11. David Hao, The Rise of ICOs: A Comprehensive Primer of Initial Coin Offerings, Medium, 2018, https://medium.com/the-ledger-group/the-rise-of-icos-a-comprehensive-primer-of-initial-coin-offerings-96050529257, Accessed 10 October 2019

12. Jonathon Keane, People were raising millions without even a product: Inside the world of startup ICOs, Fora, 2018, https://fora.ie/ireland-initial-coin-offerings-4233336-Sep2018/, Accessed 10 October 2019

13. Daniele Pozzi, ICO Market 2018 v 2017: Trends, Capitalization, Localization, Industries, Success Rate, Cointelegraph, 2019, https://cointelegraph.com/news/ico-market-2018-vs-2017-trends-capitalization-localization-industries-success-ratem, Accessed 10 October 2019

14. Samuel Haig, ICOs Produce Slow Start to 2019, Bitcoin.com, 2019, https://news.bitcoin.com/icos-slow-start-2019/, Accessed 10 October 2019

15. Edward Kelso, New Study: 80% of ICOs are Scams, Only 8% Reach an Exchange, Bitcoin.com, 2018, https://news.bitcoin.com/80-of-icos-are-scams-only-8-reach-an-exchange, Accessed 10 October 2019

16. Yuval Halevi, ICO vs STO: All You Need to Know About the New Fundraising Method in the Crypto World, Hackernoon, 2019, https://hackernoon.com/ico-vs-sto-all-you-need-to-know-about-the-new-fundraising-method-in-the-crypto-world-54a1a43a08d6, Accessed 10 October 2019

17. Kristin Housner, We Need to Expand Access to $256 Trillion in Real-World Assets, Futurism, 2018, https://futurism.com/need-expand-access-256-trillion-real-world-assets, Accessed 10 October 2019

18. Santander, Santander launches the first end-to-end blockchain bond, 2019, Press Release, https://www.santander.com/csgs/Satellite/CFWCSancomQP01/en_GB/Corporate/Press-room/2019/09/12/Santander-launches-the-first-end-to-end-blockchain-bond.html, Accessed 10 October 2019

19. Henry Finn, The trend of issuing corporate stock on the Blockchain has already started, Hackernoon, 2018, https://hackernoon.com/the-trend-of-issuing-corporate-stock-on-the-blockchain-has-already-started-a615056b1d2b, Accessed 10 October 2019

20. Tech Bullion, The First Company to issue Stock on the Blockchain, Press Release Tech Bullion, 2018, https://techbullion.com/the-first-company-to-issue-stock-on-the-blockchain/, Accessed 10 October 2019

21. Maria Nikolova, ASX, Digital Asset and VMware collaborate on DLT, Finance Feeds, 2019, https://financefeeds.com/asx-digital-asset-vmware-collaborate-dlt/, Accessed 14 October 2019

22. CBInsights, How Blockchain Could Disrupt Banking, CBInsights Report, 2018, https://www.cbinsights.com/research/blockchain-disrupting-banking/, Accessed 14 October 2019

23. Marie Gonzalez, Settlements & Clearing — a $10B per Year Opportunity, Medium, 2019, https://medium.com/gochain/settlements-clearing-a-10b-per-year-opportunity-97c27ef9d9b8, Accessed 14 October 2019

24. Julianne Sloane, Security tokens: Enabling trading on secondary markets, Medium, 2018, https://medium.com/@juliannesloane/security-tokens-enabling-trading-on-secondary-markets-4b5d6da5fa8f, Accessed 17 October 2019

25. Blockheads, 5 Ways Blockchain Will Disrupt Finance, Hackernoon, 2018, https://hackernoon.com/5-ways-blockchain-will-disrupt-finance-c71a9c23058e, Accessed 17 October 2019

26. Finextra, UK charges ahead with legal certainty for smart contracts and cryptoassets, 2019, https://www.finextra.com/newsarticle/34790/uk-charges-ahead-with-legal-certainty-for-smart-contracts-and-cryptoassets, Accessed 19 November 2019

27. European Central Bank, The potential impact of DLTs on securities post-trading harmonisation and on the wider EU financial market integration, 2017, https://www.ecb.europa.eu/paym/intro/governance/shared/pdf/201709_dlt_impact_on_harmonisation_and_integration.pdf, Accessed 17 October 2019

28. Ash Bennington, Crypto Assets Trade 24/7 – And That Changes More Than Uptime, Coindesk, 2017, https://www.coindesk.com/crypto-assets-trade-247-changes-uptime, Accessed 17 October 2019

29. Polymath, 2019, https://polymath.network/, Accessed 17 October 2019

30. Jon Wood, Polymath —Purchasing and trading securities on the blockchain, Medium, 2018, https://medium.com/trivial-co/polymath-purchasing-and-trading-securities-on-the-blockchain-62e551ea8610, Accessed 17 October 2019

31. Remi Gai, Investing in the Security Token Ecosystem, Hackernoon, 2019, https://medium.com/hackernoon/investing-in-the-security-token-ecosystem-6a75e750beef, Accessed 17 October 2019

32. Leigh Cuen, ConsenSys Announces Codefi Project to Boost DeFi Adoption, Coindesk, 2019, https://www.coindesk.com/consensys-announces-codefi-project-to-boost-defi-adoption, Accessed 17 October 2019

33. FNZ, Sectors, 2019, https://www.fnz.com/services-for, Accessed 21 October 2019

34. Jonathan Watkins, Calastone successfully shifts funds network to DLT platform, Global Custodian, 2019, https://www.globalcustodian.com/calastone-successfully-shifts-funds-network-dlt-platform/, Accessed 21 October 2019

35. David Pan, Vanguard Developing Blockchain Platform for $6 Trillion Forex Market, Coindesk, 2019, https://www.coindesk.com/vanguard-developing-blockchain-platform-for-6-trillion-forex-market, Accessed 21 October 2019

36. Daniel Palmer, Report: World's Biggest Asset Manager BlackRock Exploring Bitcoin, Coindesk, 2018, https://www.coindesk.com/report-worlds-biggest-asset-manager-blackrock-exploring-bitcoin, Accessed 21 October 2019

37. BlockState, The Global Digital Securities Ecosystem, BlockState Report, 2019, https://blockstate.com/digital-securities-study-en/, Accessed 21 October 2019

38. Chris O'Brien, Europe has slight lead over U.S. in emerging blockchain digital securities market, Venture Beat, 2019, https://venturebeat.com/2019/10/30/europe-slight-lead-u-s-emerging-blockchain-digital-securities-market/, Accessed 21 October 2019

39. Shanny Basar, Pimco Looks To Data Advantage, Markets Media, 2018, https://www.marketsmedia.com/pimco-looks-to-data-advantage/, Accessed 23 October 2019

40. Tom Lindeman, Powered by MythX, Medium, 2018, https://media.consensys.net/powered-by-mythril-introducing-the-mythril-partner-program-8acbca470503, Accessed 23 October 2019

41. Jones Day, Setting Up Crypto Funds in the European Union, 2019, https://www.jonesday.com/-/media/files/publications/2019/07/setting-up-crypto-funds/setting_up_crypto_funds_in_the_eu.pdf?la=en&hash=E31A7AE8FB7CEAD57DA8FE40EDA549AF, Accessed 25 October 2019

42. John Le Guen and Franck Guiader, France renders applicable the use of blockchain for certain financial securities and confirms its worldwide pioneering legal framework, 2019, https://www.gide.com/en/news/france-renders-applicable-the-use-of-blockchain-for-certain-financial-securities-and-confirms, Accessed 25 October 2019

43. Dechert, AMLD5 in Germany: Implementation provides far-reaching licensing requirements for crypto-asset service providers, Lexology, 2019, https://www.lexology.com/library/detail.aspx?g=8ac13a85-a5b9-4a9d-ac0e-be851766bfa1, Accessed 25 October 2019

44. Financial Crimes Enforcement Network, Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies, 2013, https://www.fincen.gov/resources/statutes-regulations/guidance/application-fincens-regulations-persons-administering, Accessed 28 October 2019

45. Georgina Lee and Enoch Yiu, Hong Kong sets out regulatory framework for virtual asset trading platforms, emphasises investor protection, South China Morning Post, 2019, https://www.scmp.com/business/banking-finance/article/3036632/hong-kong-sets-out-regulatory-framework-virtual-asset, Accessed 31 October 2019

46. Attracta Mooney, "Blockchain 'could save asset managers $2.7bn a year'", Financial Times, 2018, https://www.ft.com/content/b6171016-171f-11e8-9e9c-25c814761640, Accessed 31 August 2019

47. Finextra, UK charges ahead with legal certainty for smart contracts and cryptoassets, 2019, https://www.finextra.com/newsarticle/34790/uk-charges-ahead-with-legal-certainty-for-smart-contracts-and-cryptoassets, Accessed 19 November 2019

48. Alex Lielacher, World's largest broker TP ICAP launches Bitcoin futures trading, Brave New Coin, 2019, https://bravenewcoin.com/insights/world's-largest-broker-tp-icap-launches-bitcoin-futures-trading, Accessed 19 November 2019

49. Nicky Morris, Morgan Stanley, Goldman go live on CLS / IBM FX blockchain, Ledger Insights, 2018, https://www.ledgerinsights.com/morgan-stanley-goldman-cls-blockchain-fx-clsnet/, Accessed 19 November 2019

50. Alastair Marsh, TP ICAP Enters the Crypto Business to Trade Bitcoin Derivatives, Bloomberg, 2019, https://www.bloomberg.com/news/articles/2019-06-17/tp-icap-enters-the-crypto-business-to-trade-bitcoin-derivatives, Accessed 20 November 2019


CONSENSYS
Blockchain is powering platforms which are connecting industry leaders directly with their end users and reducing the need for intermediaries"
The Digital Asset Manager | A ConsenSys Insights Report