

Unlocking Economic Advantage with Blockchain

A guide for asset managers

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Executive summary

There is a growing realization that distributed ledger technology – popularly known as blockchain – will bring a radical shift in the way we think about financial assets and the way the financial industry will operate in the future. The blockchain journey is likely to be long and the outcome is uncertain, but a consensus is forming that it is the real deal. Disregarding it is a risk.

In this joint report, we argue that asset managers need to get off the sidelines and take the initiative to understand and embrace blockchain. The report is designed to serve as a guide to how the technology may evolve, the impact it may have on asset managers and the action they can take. Like any guide, it is not comprehensive – blockchain is a complex technical topic and the many initiatives it has spawned are too wide-ranging to be encompassed in any single document. Rather, we have imagined ourselves in the driver's seat of an asset manager organization and have raised the questions that the industry needs to address. For each member of the senior management team, we lay out a set of five key actions as they begin the journey.

This report contains four sections:

1. Blockchain is the real deal

- Blockchain-related interest and investment have reached critical mass, and the technology has shown itself to be capable of driving major change.
- By enforcing convergence on common data standards and eliminating the need for a central authority to hold a “golden record,” we can reduce reconciliation and facilitate seamless transfer of digital assets.
- Rather than presenting a “Blockchain 101,” we instead make the impacts of a transition to blockchain infrastructure approachable and tangible, clearing up common myths and demonstrating how this technology has the potential to reshape financial markets and ultimately the client experience.

2. The opportunity for asset managers

- Blockchain can help asset managers tackle many of the challenges they face today: managing data; providing solutions, not just products; and providing continuing service value to clients in a changing competitive landscape.
- Asset managers can achieve material cost benefits across front-, middle- and back-office activities through a reduction in data manipulation, the decommissioning of legacy infrastructure and lower frictional costs of investment.
- Revenue opportunities will grow out of the improved data sources, greater liquidity and lower frictional costs fostered by blockchain. Asset managers will be able to serve clients in new ways, for example, with real-time reporting or alternate trading strategies.
- Ultimately, end investors may be the greatest beneficiaries, as asset managers and other providers compete by offering improved propositions and passing on savings.

3. Time to get off the sidelines

- Many asset managers have taken a wait-and-see approach, under the assumption that any eventual cost savings or opportunities will flow downstream. We believe this is a mistake.
- Early engagement is essential for asset managers to drive prioritization of the right issues and use cases; competitive advantage can be gained from working with the right partners early on to develop real world solutions.
- Partners and regulators require the input of asset managers to ensure suitable governance and data management standards, as well as help in navigating design implications.

4. The CxO playbook

- Blockchain is quickly becoming a C-suite issue for asset managers, and the CEO, CTO and COO all have roles to play.
- The CEO needs to outline the vision for how the organization engages with and adopts blockchain.
- The CTO needs to lead understanding and development of blockchain capabilities as part of the broader FinTech agenda.
- The COO needs to understand blockchain applications and how to extract their benefits, while ensuring blockchain makes up part of a coherent target operating model.
- For each, we lay out a series of actions to help them achieve these goals.

1. Blockchain is the real deal

The credibility of blockchain

The concept of distributed ledger technology – or blockchain as it is commonly called – has taken the financial services sector by storm, with venture capital and investment pouring into technology startups. Debate over blockchain's promise, as well as its limitations, is ongoing. For every believer who says blockchain is the most revolutionary technology platform to emerge since the internet, there are skeptics who claim it is merely the latest tulip mania.

Nonetheless, a broad consensus is emerging that it represents a real innovation over many of the systems and processes used in financial services and banking today.

Our view of the credibility of blockchain technology is informed by candid discussions with clients, banks, exchanges, central securities depositories and existing market service providers. There has been an influx of attention and initiatives from market participants, including startups and newly formed industry consortia focused on driving technical standards and fostering collaboration.

While in the United States, the Depository Trust & Clearing Corp. is fielding proposals for a complete replacement of its credit default swap (CDS) settlement and reporting infrastructure, the Australian Stock Exchange is attempting to address changing regulatory requirements with a blockchain-based pilot. Regulators such as the Bank of England and European Securities and Markets Authority (ESMA) have published thoughtful commentary on the feasibility of digital cash and distributed ledger technology. Collectively, the tone of conversations has shifted from “Is this worth exploring?” to “How do we best engage?”

Financial commitments to blockchain are also growing. Investments in blockchain startups to date have reached \$300 million, a figure that is growing swiftly. Investments totaled \$125 million in 2015, and this has already been surpassed in the first half of this year.¹ Although predominantly venture capital-backed, a handful of companies have attracted significant bank investment. Furthermore, we see growing internal spending by banks, which we estimate totaled \$80 million in 2015.²

Demystifying blockchain

While the notion of blockchain may seem novel, the underlying technology is not new. It is the combination of proven, existing technologies: peer-to-peer networking, asymmetric cryptography and cryptographic hashing (see: In plain English). Bitcoin was the innovation that combined these technologies, offering the ability to transfer value, while preventing double-spend in a trustless, pseudonymous, publicly accessible system.

In contrast to Bitcoin, blockchain applications in wholesale banking and capital markets are seeking to keep the decentralized nature of the network and immutability of the underlying ledger, while reinstating accountability and governance models that allow legal recourse and support existing regulatory frameworks. We see the most promise for distributed ledgers existing within a permissioned environment of known participants who can transact privately among one another, while selectively granting visibility of their own data to regulators and third parties, such as analytics providers.

In plain English

Peer-to-peer network

A group of computers that can communicate among themselves without relying on a single central authority or having a single point of failure

Asymmetric cryptography

A way to send a message encrypted for specific recipients such that anyone can verify the sender's authenticity but only intended recipients can read the message contents

Cryptographic hashing

A way to generate a small, unique “fingerprint” for any data allowing quick comparison of large data sets and a secure way to verify data has not been altered

In the current period of experimentation, blockchain means different things to different people. For the purposes of this report, we take a pragmatic approach and define blockchain by its fundamental impacts: creation of secured, shared data with common standards; reduced need for reconciliation; and seamless transfer of digital assets. By focusing our definition in this way, we look to drive emphasis on the near- and medium-term practical applications currently being explored, rather than the less easily digestible, more distant scenario of a fully decentralized financial system that this technology may or may not eventually enable.

¹ Source: Coindesk, Oliver Wyman and J.P. Morgan analysis

² Source: Oliver Wyman and J.P. Morgan proprietary data and analysis

Exhibit 1

What is blockchain?

Core distributed ledger functionality

**Consistent, immutable recording of data**

- Consensus is an ongoing process where ledgers are updated to hold the same data in the same order
- Historical data cannot be easily or secretly changed by any single actor, making it practically immutable

**Distribution across a network**

- Databases (ledgers) are replicated across network participants
- Validation of data is performed via a pre-defined algorithm rather than a central authority

**Richer data sources**

- Comprehensive and transparent audit trail
- Near real-time access to accurate data across multiple parties

**Frictionless asset transfer**

- Ability to record transfer of digital assets without central authority
- Efficient transaction processing with settlement flexibility

Complementary innovations

**Encryption & signature validation**

- Data “fingerprints” generated through one-way encryption makes checking data integrity fast
- In permissioned ledgers, identity and permissions are continually validated with each transaction

**Smart contracts**

- Allow business logic and workflows to be built into a distributed ledger
- Capable of updating the ledger (e.g., making payments) based on pre-defined conditions

**Malleable and robust data environment**

- Enhanced ability to manipulate, analyze and report data
- No single point of failure

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The potential impact of blockchain

Some analysts believe the impact of blockchain will be limited to the back office and other behind-the-scenes processes. And early efficiency benefits do accrue most obviously to the middle- and back-office through data standardization, reduced trade breakage and simplified infrastructure. However, when real world assets – represented digitally through tokens or smart contracts – are able to settle between owners at the speed of execution if desired, an innovation tipping point will occur. Settlement flexibility will enable new pricing models and service offerings.

Beyond better data management, the ability to verify assets held on-ledger as truly unique is an innovation not offered by traditional databases. For example, escrow of these digital assets could reduce risk in collateral management; real-time calculation of underlying asset risk could enable more accurate pricing of asset-backed securities. Centralized solutions have sought to solve these same problems in the past, but decentralized trust may be the elusive key for market adoption.

Our view is that blockchain’s impact may eventually reshape market structure, product capabilities and the client experience, ultimately having a lasting influence on the global economic system.

The challenge: Building an enterprise-ready blockchain

While early pilots are already appearing, many challenges remain before distributed ledger technology can be deemed enterprise- and production-ready. Security, privacy and scalability remain among the top technical concerns that must be addressed, while legal and regulatory feasibility are also substantial hurdles to adoption.

Blockchain technology, in all its forms, continues to evolve rapidly. Issues that seemed intractable a year ago, such as single digit, transaction-per-second throughput, now feel like natural growing pains that will soon be resolved. Industry convergence on a desire for permissioned, rather than public, ledgers has opened the door for new, faster consensus algorithms, and hundreds or even thousands of transactions-per-second are on the horizon.

Nonetheless, other challenges, like balancing privacy, security and regulatory transparency, remain. While many privacy solutions have been put forth, no clear winning approach has yet emerged. And as the recent exploitation of smart contract experiments in the public sphere have demonstrated, there is a pressing need to develop robust security audit techniques and developer best practices for blockchain systems on par with any other enterprise system, before going to market.

Promisingly, regulators and legal experts are now getting involved in earnest, publishing papers and issuing calls for comment. While most have yet to formally opine on topics like legal enforceability and digital property rights, industry consortia are providing a space to discuss topics collectively.

There is clearly much work still to be done to bridge the gap between proof-of-concept and real-world production systems, but we are confident that the convergence of technologists, business stakeholders and governing bodies can drive these issues to resolution. Perhaps the most difficult challenge will be maintaining motivation and industry focus on bringing solutions to market as fast as the technology evolves.

Blockchain myths debunked

Myth: In permissioned networks, participants must trust each other.

Fact: In a permissioned ledger system, participants are onboarded by a trusted governing body and may be known to each other, but using a strong consensus mechanism (not just signed message validation) is still best practice to ensure data integrity, immutability and robust network health.

Myth: Blockchains are secure because they use complex cryptography.

Fact: The cryptographic hashing algorithms used to “fingerprint” transactions and achieve consensus are well known industry standards, applied in new and creative ways.

Myth: Smart contracts run autonomously and force instantaneous settlement.

Fact: Smart contracts are application code stored on a blockchain, and execute business logic as defined by their programmers, such as requiring a human to approve a payment or referring to predefined settlement instructions.

Myth: The node (computer) that creates the next block gets to pick what gets added to the chain, and can ignore or veto trades it doesn’t “like.”

Fact: Nodes only validate technical integrity of transactions; no node can singlehandedly suppress them. In some implementations, transaction details may not be visible to all nodes.

2. The opportunity for asset managers

Asset managers face challenges and pressures on their traditional business model, and growth in revenues and assets under management (AUM) has slowed considerably. Regulatory burdens and concerns over access to liquidity are rising. To meet the new challenges and improve earnings and AUM, asset managers are focusing on a range of levers:

- Upgrading their operating model and improving data management.
- Looking to provide solutions, rather than products, to clients.
- Providing continuing service value to clients in a rapidly changing competitive landscape.

Blockchain technology has the potential to support asset managers on each of these fronts. FinTech vendors and market infrastructure providers will offer new blockchain solutions to these challenges. In time, asset managers will also develop their own blockchain applications.

We see four successive waves of deployment for blockchain technology. Initially, we expect the first two waves to be focused on sharing and using data, before expanding to critical infrastructure once confidence in distributed ledger technology grows. The final wave, in which a truly decentralized financial ecosystem arises, is perhaps the most ambitious and the most uncertain (See Exhibit 2).

Exhibit 2

Four waves of anticipated blockchain deployments		
Wave	Advancements	Examples in development
1 Information sharing 2016-19	<ul style="list-style-type: none"> • Blockchain used to share and communicate data • Used internally and between trusted external organizations • Distributed ledger solutions tested in parallel with current workflows as proof of concept • Augmentation of existing processes 	<ul style="list-style-type: none"> • CDS trade processing • Payment messaging
2 Data solutions 2017-25	<ul style="list-style-type: none"> • Blockchain enables an environment to store and manipulate data • Incorporation of distributed ledger technology as part of existing solutions, supporting new efficiencies in operations and workflows • Initial pilots may run in parallel with existing processes, until user confidence is high enough to begin migrating volumes • Users are faced with a choice of infrastructures developed by providers 	<ul style="list-style-type: none"> • Transaction management • Regulatory reporting
3 Critical infrastructure 2020-30	<ul style="list-style-type: none"> • Blockchain adopted by market participants as main infrastructure for critical functions • Centralized authority still required for administrative functions (e.g., granting access rights, setting industry standards) • Replacement of existing asset, transaction and payments infrastructure • Participants forced to adopt and integrate new blockchain-based infrastructure 	<ul style="list-style-type: none"> • Custody and settlement • Private markets
4 Fully decentralized Uncertain	<ul style="list-style-type: none"> • Blockchain replaces centrally controlled infrastructure with fully decentralized solutions • Direct engagement in digital asset transactions for organizations and individuals • Legal and regulatory frameworks support asset ownership and transfers via distributed ledgers • Disintermediation of legacy infrastructure owners 	<ul style="list-style-type: none"> • Open, P2P blockchain-powered economy • Digitally issued fiat currency

Wave 1 (2016-19)

In this first wave, simple applications focused on more robust and consistent data sharing are emerging. Uses will focus on three areas: sharing data between consenting parties, thus allowing the parties to reach a common data set and reduce the need for duplicative data collection; sharing instructions and messages between parties by posting them to a distributed ledger, thereby reducing the chances for tampering with the data; and making documentation processing more efficient.

For example, in secondary loan markets, burdensome processes for transmitting and validating documentation can be improved by augmenting existing infrastructure and processes with blockchain-based data flows. Distributed ledger solutions can reduce frictional costs, and these markets may become more attractive to access for a wider range of asset managers.

Wave 2 (2017-25)

In this wave, distributed ledger technology and smart contracts will likely be used in combination to store and share core transaction data. Distributed ledgers can enable a data environment in which asset managers track their investments, develop products and provide client services. Given the real-time nature of data transmitted via blockchain, up-to-the-minute risk and performance analytics can be made available to clients. Investors will be able to access their own transactional data through direct ledger connectivity or via vendor-provided interfaces in real-time, providing a new means of self-service reporting.

We expect these Wave 2 applications to be developed in stages and to begin to be adopted in the next two to five years. Initial pilots may run in parallel with existing processes to minimize any unwanted effects on clients. As the overall ecosystem and end users build up their confidence in the distributed ledger solution, we will see volumes begin to migrate. Over time, redundant back- and middle-office data infrastructure can be retired, cutting costs.

Wave 3 (2020-30)

The third wave involves the adoption of blockchain technology in major pieces of capital markets infrastructure. Once assets are held as tokens on the blockchain, the clearing and settlement of trades across multiple asset classes can move to distributed ledger-based infrastructure, as opposed to the hybrid or dual systems that we project through the first two waves. This will drastically cut processing cycles and unlock liquidity.

Other developments may impact asset managers even more fundamentally. Blockchain-based infrastructure could enable new investment products and platforms, such as new product wrappers that allow investment in shares of ETF-like baskets of underlying assets and deploy smart contracts to reduce administrative and trading-related overhead.

Wave 4 (Uncertain)

It remains to be seen if the financial system will ever be based on a truly decentralized infrastructure of the sort envisaged by some pioneers. We believe initial waves of deployment will be implemented and administrated by regulated infrastructure providers. However, there remains the potential for a disruptive adoption path, with issuers and end investors interacting directly on open source platforms.

Some of our initial thinking on promising applications of distributed ledger technology for asset managers follows (See Exhibits 3 and 4).

Exhibit 3

Examples of potential asset management use cases - vendor driven			
Use Case	Description	Target Benefits	Anticipated Timeline
Accelerated document processing for origination and trading settlement	Blockchain used for sharing and validating loans, IPO documentation among a trusted network	Incentivizes standardization of contractual terms Accelerates processing cycle Aids liquidity	Wave 1 (2016-19)
Shared reference data sources (e.g., KYC, trade repositories)	Common reference data for market participants held and updated on a blockchain as a central utility	Avoids duplication of work across participants Reduces anti-money laundering (AML) risks, potential for fines	Wave 1 (2016-19)
Data environment to support workflow and analytics	Transaction-level data stored in cryptographically secured smart contracts, which users enrich and use through their workflow; data accessed via nodes	Can become a golden source for multiple sets of reference data Removes need for reconciliation Enables more powerful analysis	Wave 2 (2017-25)
Tracking collateral assets across sources and uses	Status and location of pledged assets tracked via blockchain, used to flag eligibility, rehypothecation rights and excess collateral	Bridges multiple margin accounts Real-time status With smart contracts, can support optimization logic	Wave 2 (2017-25)
Seamless transfer agency	Fund unit transfers and ownership tracking carried out on a distributed ledger between funds and investors	Automation of subscription and redemption processes Enhanced investment cycles	Wave 2 (2017-25)
Near-T+0 settlement of trades	Faster clearing and settlement systems via asset and cash ledgers, with both sides of the transaction executed simultaneously	Significant reduction in settlement liquidity risk More efficient deployment of capital	Wave 3 (2020-30)
Corporate actions processing	Streamlined process for managing corporate action events (e.g., proxy voting, income distributions) across issuers and investors via distributed ledger	Reduces administrative costs and manual processing required	Wave 3 (2020-30)
Automatic execution of margin calls at central counterparties (CCPs)	Clearing member and CCP collateral assets held on blockchain; smart contracts calculate margin requirements and automatically update pledge status of assets within member margin accounts	Near elimination of intraday liquidity risk at CCP and subsequent reduction in overall requirements Reduced operational burden for members	Wave 3 (2020-30)

Exhibit 4

Examples of potential asset management use cases – asset manager driven			
Use Case	Description	Target Benefits	Anticipated Timeline
Distribution of “golden source” data across disparate internal systems	Blockchain used to converge upon single version of data across multiple internal sources (e.g., different books of record)	Removes need for internal reconciliation Provides a more accurate and holistic view within complex managers’ organizations	Wave 1 (2016-19)
Peer networks for sourcing and placing illiquid instruments	Buyers and sellers of illiquid, OTC instruments find counterparties on a distributed ledger of “adverts”	Standardized, shared view of relevant instruments Reduced brokerage costs Access to larger asset pool Permissions limit access and prevent leakage of market-sensitive information	Wave 1 (2016-19)
Self-service reporting for regulators	Regulators access permissioned and partitioned blockchain to self-serve for reporting	Reduced risk of regulatory reporting failure	Wave 2 (2017-25)
Analytical portals for clients	Client access to real-time transactional data through direct or portal-based channels, with supporting tools and interface to carry out portfolio and performance analysis	Real-time tools for clients with richer information Different partitions (available data) for different users based on identity and analytical need	Wave 2 (2017-25)
New product wrappers	Investors own shares of a digitized fund recorded on a blockchain, akin to an ETF structure, enabling them to be traded; smart contract-powered execution would ensure that underlying assets reflect the defined basket or allocation	Potential to drive market share Reduces operational overhead related to trading and administration Avoids need to provide daily liquidity (compared to current UCITS/40 Act funds) and hence impact of draft SEC regulations on liquidity	Wave 3 (2020-30)
Peer-to-peer custody and settlement networks	Builds on peer OTC trading networks referenced above, but digitizes assets such that ownership can be transferred and recorded via the ledger	Eliminates need for agents and intermediaries Significantly speeds up settlement processes	Wave 3 (2020-30)

Wide scope for cost efficiencies

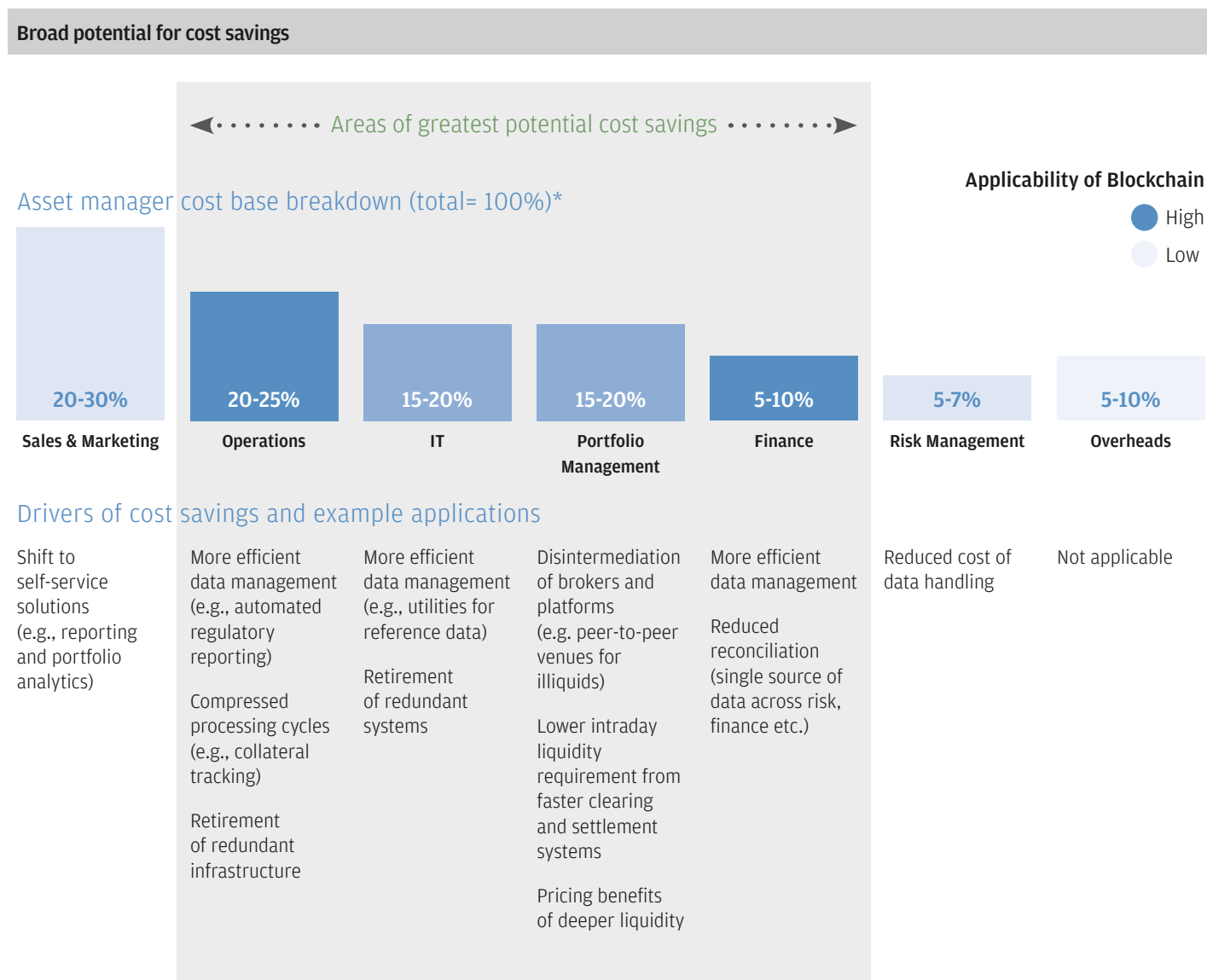
We believe that the cost savings to the asset management industry will be material. By our estimate, more than half of a typical asset manager’s cost base could be impacted, to varying degrees, through the use of blockchain (See Exhibit 5).

The greatest savings will likely come from the reduced need for manual intervention in aggregating, amending and sharing data. Regulatory reporting could become easier and require less manual processing. These drivers are particularly

applicable to operations and finance, which together make up 25% to 35% of a typical asset managers’ cost base (See Exhibit 5).

As a result, employees will become more productive, and firms will find it possible to decommission systems and infrastructure. This addresses another large portion of costs in IT. There will also likely be additional savings as the risk of data mismanagement, and the need for resolution or remediation, declines.

Exhibit 5



*Note: individual differences exist driven by size, business scope, region, diversification etc.

Source: Oliver Wyman proprietary data and analysis

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The cost of investing is also expected to be reduced. Shifting to peer-to-peer venues can reduce brokerage costs. Accelerating settlement and clearing for standardized instruments will lower post-trade costs, while streamlining transaction processes for more complex instruments should make such trades more economic.

We also expect liquidity to increase as a result. New venues will bring groups of buyers and sellers together; lower trading costs are expected to increase activity; faster settlement can unlock intraday liquidity and greater transparency will likely encourage market participation.

Revenue growth in play

While the obvious business case will be around cost reduction, the deployment of blockchain can also lead to revenue opportunities. First, improved data sources can enhance value-added client services such as analytics and real-time reporting. Second, trading strategies can benefit from access to new liquidity or by lowering the risk profile of complex products, such as syndicated loans. Third, blockchain can enable new product structures or vehicles, such as tradable, digitized fund units.

On the investment side, active managers will have more to gain than passive managers. For example, loan-based strategies may become more economic.

Nonetheless, the majority of revenue benefits are on a slower track due to the greater complexity of deployments and higher contingency on wide adoption.

Varied benefits between individual firms

The more complex an institution's current data environment, the greater the benefits from blockchain can be. Multi-entity, multi-jurisdictional asset managers with complex client networks will be the greatest beneficiaries of deployment. But their implementation challenge is likely to be more complex, too.

The degree to which asset managers outsource middle- and back-office processes will also affect how savings are realized. Managers with mostly in-house operations, the majority today, will have more control but also more to do. Those asset managers who have outsourced their back-office operations will need to renegotiate with suppliers instead.

Asset managers with established teams exploring transformational themes, including blockchain, will be better equipped to engage and adopt new solutions. In this way they can gain advantages, and others are likely to be forced to respond to remain competitive.

Many benefits will accrue to the whole industry, but an individual firm's setup and implementation approach can also drive incremental advantages.

The chief beneficiaries: end investors

Asset managers can realize benefits as they boost efficiencies in-house and as providers use blockchain to cut costs and improve services. These savings, in turn, may be passed along to end investors who will benefit from lower fees over time.

To a degree, asset managers will compete with one another in passing on more savings to clients. However, they will discover that distributed ledger technology can also be turned to a competitive advantage by enabling new and improved client services with the potential to increase asset stickiness. Consequently, asset managers will also compete by differentiating their proposition to client.

Ultimately, end investors can be the beneficiaries of both better pricing and improved propositions.

Exhibit 6

Accrual of blockchain benefits						
	Benefits to asset managers		Benefits to end investors		Estimated timing	
Impact of blockchain	Cost reduction	Revenue growth	Cost (expense) reduction	Investment returns	Initial impact	Full benefit
Improved data management/transparency					2017	2023
Retirement of redundant infrastructure					2022	2030
New and improved client services					2020	2025
Improved liquidity					2019	2030
Reduction in frictional trading costs					2019	2030
New product structures					2022	2030

Major benefits					Limited benefits
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3. Time to get off the sidelines

Historically, most players in the asset management industry have taken a passive approach to technology-driven changes in market structure. This has led to some asset managers having to make up ground in recent areas of technological progress, such as data analytics and robotics/machine-learning.

Unfortunately, we see a similar trend developing in blockchain. Based on conversations with a multitude of asset managers of varying setups, the majority of firms have yet to engage directly with blockchain. However, they have been nearly unanimous in their eagerness to learn more about blockchain and engage with the technology.

We see three areas in which asset managers should look to get involved:

1. Providing input to developers and regulators on major implementation choices.
2. Directing external efforts toward use cases of benefit to asset managers.
3. Identifying early deployments that are capable of creating competitive advantages.

While distributed ledger technology in its fully realized form could make it difficult for individual participants to gain long-term competitive advantages, we believe forward-thinking asset managers can differentiate themselves from peers by being at the vanguard of assessing and adopting new blockchain-based capabilities.

Action 1: Shape the future ecosystem

Blockchain startups, developers and regulators are now looking to the asset management industry for guidance. Developers of pilot use cases are already raising fundamental design questions, some of which have long-term commercial and technical implications. To ensure their decisions benefit end investors, while meeting governance and data management standards, blockchain providers need engagement from the buy side. As blockchain pilots proliferate, it is essential for all participants to have a voice in the design and implementation process, in order to address key issues such as:

- Defining where providers, like banks and market infrastructure firms, will deliver solutions versus where asset managers can and should lead the effort.
- Debating the system and control implications of who owns the data, who controls the infrastructure and how it is regulated.
- Identifying and solving for the operational and technological requirements of each use case, such as throughput, privacy, business logic and user-interface tools.
- Navigating the complexities of real-world deployment, especially around governance and security procedures.

Simultaneously, regulators are gathering input from market participants to guide their views on any forthcoming regulatory framework. European regulatory bodies have identified areas of concern around cybersecurity, fraud, operational risks and competitive impacts. Many of these will also be important for asset managers to consider, given their fiduciary obligations, and their perspectives should be shared with the appropriate regulatory agencies as guidance.

Action 2: Direct external efforts to highest priority use cases

Asset managers can help direct industry R&D resources toward the most critical use cases. Most of the investments by service providers and market infrastructure firms in blockchain have focused on their own internal efficiency. That is partly due to the substantial savings from those initiatives; but another driver has been the difficulty of inventing solutions in a vacuum.

Until asset managers put forward their views on how they wish to see the technology utilized, service providers may hesitate to commit investment dollars toward solving the most tenacious pain points or creating new products that grow the value proposition for asset managers and end investors.

Action 3: Identify and unlock near-term benefits

Asset managers will be faced with a bewildering array of blockchain concepts and pilots for storing, processing and deploying their data in the coming years.

As the industry progresses through the initial wave of blockchain development and adoption, asset managers need to be proactive in both their thinking and investment in the development of the technology. Asset managers of sufficient complexity will be able to achieve efficiency gains from internal applications, such as data management and distribution (See Exhibit 4). These use cases will lower costs for end investors and open up new product capabilities, such as faster reporting and enhanced data analytics. At the same time, vendors will need to be chosen based on their ability to ensure the security and portability of data and solve wider challenges. To navigate the new vendor landscape, asset managers must be prepared to act, not react.

We foresee a long transitional period, where legacy infrastructure and distributed ledger-based models coexist before full-scale implementation. However, by plugging into the ecosystem early, grappling with the challenges of integrating the technology and understanding its strengths and gaps, cutting-edge asset managers can benefit. Planning ahead will allow them to retire redundant infrastructure earlier. They can direct developers to the problems of their own organization, including pushing for bespoke solutions. And they can ensure clients see them as forward-thinking and innovative. Together, these factors can help asset managers who engage early to steal a march on competitors.

How to get involved

Some asset managers have already taken up the gauntlet. They are holding internal blockchain hackathons, building specialized technology teams and prioritizing distributed ledger R&D across their management team, from the front office to the back office.

While such an approach may not be appropriate for every asset manager, the bottom line is this: Asset managers who neglect blockchain technology may be taking a greater risk with their business models. A wait-and-see strategy is no longer tenable – preparing for the changes that distributed ledger technology will bring about will require a pragmatic, balanced approach and active early engagement across the organization.

The final part of our guide provides a set of practical, high-impact steps for each member of the asset management C-suite.

4. The CxO playbook: What do you do now?

We believe that blockchain is becoming a C-suite issue for asset managers. As a group, management teams need to understand the potential impact on the business and right-size their response. Both business and functional heads have a role to play and a list of tasks to execute over the next two years.

Chief Executive Officer

Role: The CEO needs to outline the vision for how the organization engages with and adopts blockchain. The priority placed on blockchain will depend on the size and nature of the firm, and this needs to be understood. From this basis, the CEO can mobilize the management team and make the right level of investment.

Five suggested actions:

Assess and understand the potential impact of blockchain on your organization.

- Are you personally well-educated on blockchain?
- What level of change can blockchain bring to your business and organization?
- Do you understand what can accelerate change? What are the hurdles/open questions? What is the timing?

Outline the longer term vision and the ambition for your organization.

- Where do you want to be a first mover, a fast follower or wait for industry solutions?
- What level of resourcing do you want to commit (e.g., investment budget, management bandwidth)?
- What areas of impact do you want to focus on (e.g., technology development, regulatory reporting)?
- Are there strategic partners you intend to engage (across your competitor and ecosystem community)?

Determine where blockchain falls on the priority scale for your leadership team, especially vis-à-vis other innovative technologies.

- Does blockchain make the top five focus areas in the next five years? Top 10?
- If a potential Top 10 priority, who is leading blockchain thinking for your organization?
- Do you need to spend significant resources now, or can you wait a few years?

Encourage open and transformative thinking, particularly among young tech teams.

- What is the forum for blockchain to be discussed and ideas to be raised with you?
- Are you allowing creative liberty and time for senior leaders to explore the radical transformative impact of blockchain technology?
- Are you driving the right balance between thinking/learning about blockchain as well as executing on potential ideas?

Develop an external engagement approach.

- Are there select partners in your peer group that may allow you to share thinking and build use cases together?
- Which consortia partnerships may make sense for you to pursue?
- How public do you want to be on your ambition level? How important is it for you to be perceived as a front-runner among your peers?

Chief Technology Officer

Role: The CTO needs to lead understanding and development of blockchain capabilities as part of the broader FinTech agenda. This includes setting up the right teams internally and working with external parties. The CTO needs to ensure the advancement of blockchain expertise on the management team and within the organization.

Five suggested actions:

Lead internal understanding and awareness campaign around blockchain.

- Do your colleagues (e.g., COOs) understand the distributed ledger technology (DLT) and its potential applications?
- Are the right leaders following the development of the technology and protocols?

Identify the emerging experts across the organization.

- What is the forum your teams have to raise DLT-related ideas to you?
- Are technology teams encouraged to contribute actively (e.g., hackathons, desk time)?
- Are responsibilities clear across monitoring market developments, engagement, internal communication, driving use cases?
- Do you need to make investments in IT capabilities, skills or training?

Determine if/when the creation of a blockchain lab makes sense.

- Are there potential use cases that your organization wants to drive? Is a consortia model appropriate?
- Are efforts focused on identifying use cases from real pain points (and not finding a problem for blockchain to solve)?
- Do you have the right mix of technical understanding and business familiarity?

Review any long-term technology decisions that can be impacted by blockchain.

- Are you making technology decisions that can be heavily impacted by blockchain?
- What technologies could make today's decisions incorrect?
- What are the long-term implications of other disruptive technologies (e.g., machine learning, robotics, data analytics) converging with blockchain development?

Engage with external vendors, and follow technology advancements in the space.

- Who are the key vendors that you want to closely follow as this space advances?
- What industry events and conferences do you want to participate or engage in?

Chief Operating Officer

Role: The COO needs to understand blockchain applications and ensure they make up part of a coherent target operating model. The COO is responsible for extracting the benefits for the organization, as well as fitting work alongside existing transformation initiatives. The COO also needs to be the pragmatist, preventing disruption to the firm's day-to-day ability to do business.

Five suggested actions:

Bring the business process and controls view to potential blockchain applications.

- What blockchain enhancements can dramatically alter your current businesses processes?
- Which of your processes could most benefit from blockchain? What is the potential impact?
- What processes could be rewritten or made redundant due to blockchain technology?

Partner with the CTO on determining if/when a blockchain lab makes sense for your organization.

- Who is driving and leading the business case development for your organization?
- Is blockchain thinking and development led solely by the technology organization?
- Are you assessing the way competitors are approaching the technology?

Future-proof long-term operating model decisions that may be impacted by blockchain.

- Are you making operations decisions (e.g., location strategy) for the future that can be heavily impacted by blockchain?
- Could any outsourcing or vended solutions become obsolete?
- What capabilities will require investment in the long term?

Identify partners across the ecosystem that are active and engage them.

- Who are the key business partners (e.g., custodians, clearing partners, FinTech startups) that you want to work with on blockchain?
- Are any competitors experimenting with use cases? If so, how do you want to engage/respond?

Prioritize use cases to follow/monitor, and ones to lead and develop yourself.

- Are there select use cases you want to incubate and lead for your organization or business?
- Of the different industry use cases, what are the top ones that you want to monitor?
- When do you plug in to new deployments to maximize savings and other benefits?

In conclusion

The consequences of blockchain will vary for individual asset managers – your firm’s vision and approach is a unique decision. This report offers our perspectives on the potential of blockchain for asset managers and our CxO playbook as a guide to help you begin the journey. As we highlight, there are many considerations to evaluate. It is our belief that distributed ledger technology is not only credible, but creates opportunities for asset managers and has the potential to change the way they do business. Just as it was impossible to predict the impact the internet would have on financial services, it is impossible to know with certainty how markets will look or operate when distributed ledgers and cryptographically secured digital assets are the norm. However, recognizing the impact that FinTech innovation continues to have on the industry, it is pragmatic to be well-informed and organized to unlock economic advantage in an increasingly digital world.

