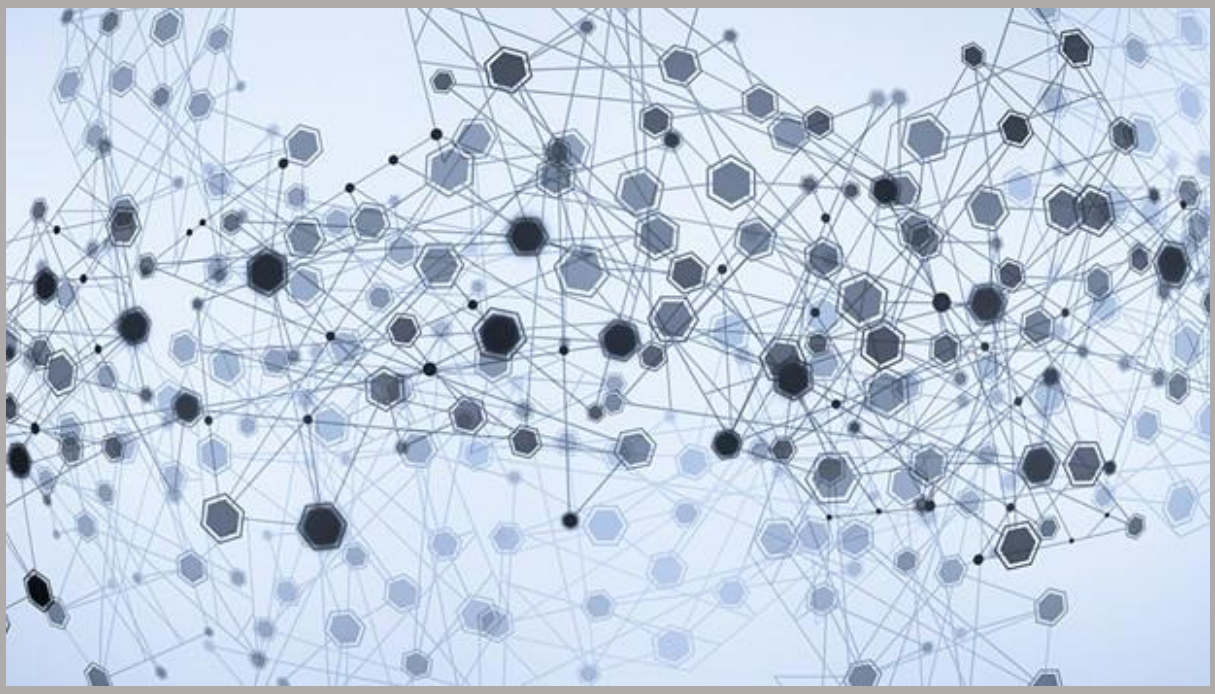

# Distributed Ledger Technology –

# An Emerging Consensus on the Buy-Side

A Research-Based Report for Asset Managers, Service Providers and Vendors

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# About the authors

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He also worked at BlackRock Solutions for 4 years and a variety of FinTech firms focusing on portfolio management, trading, compliance and analytics.

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# Foreword

The Investment Association is the trade body that represents UK investment managers, with over 300 members collectively managing over £6.9 trillion on behalf of clients in the UK and around the world. We specifically promote UK investment management, which is the second largest investment industry in the world.

We shape the investment landscape to ensure that our members are able to deliver the best outcomes for their clients. This includes spearheading initiatives, particularly promoting industry collaboration, to ensure best practice in our industry. We are working hard to help Investment Managers to take advantage of emerging technologies, such as Distributed Ledger Technologies and Blockchain.

This report is an important statement on an important topic. It collates a wide variety of views and experiences of DLT and Blockchain from across the industry and helps to craft a business-driven framework on the application of the technology to the ultimate benefit of end consumers.

We are pleased to support the authors of this report in promoting potentially transformative innovation for UK Investment Managers. We look to the evolution of this (among other emerging technologies) to help the UK industry to remain at the forefront of the global market.

**Chris Cummings, CEO, Investment Association**

The Alternative Investment Management Association (AIMA) is the global representative of the alternative investment industry, with more than 1,900 corporate members in over 60 countries. AIMA's fund manager members collectively manage more than $2 trillion in assets.

We are pleased to support this report, and are strongly aligned with its aims of establishing a Buy-Side consensus, and of catalysing innovation across the industry. Our AIMA members are, by definition, keen to foster the better understanding and potential use of alternative assets (such as cryptocurrencies); they are also likely to include early adopters of potentially transformational technologies like DLT and Blockchain. We are delighted to reinforce these collaborative initiatives across the AIMA community.

**Jack Inglis, CEO, AIMA**

# Contents

# Contributors to the Report

### Authors / Editors

The authors of the report are Dr Ian Hunt and Chris Mills. Both are independent industry consultants, well-known on the Buy-Side, and strongly involved in Distributed Ledger Technology. This report is based on the responses to an original research programme, carried out earlier in 2017. The authors have acted primarily as editors and summarisers of the responses received from the research participants, and have sought to represent those responses fairly. However, where there are errors, omissions or misrepresentations, these are the sole responsibility of the authors.

### Reviewers

Two pre-publication drafts of the report were reviewed by panels comprising a subset of the participants in the research. Wherever possible, their review points and corrections have been incorporated into the published paper. The reviewers were:

#### Asset Managers

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- Chris Bedo, Head of Business Analysis at Royal London Asset Management
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## Other Contributors

In addition to the reviewers named above, a further broad set of participants contributed to the original research programme earlier in 2017. Like the reviewers, these participants were drawn from Asset Managers, Service Providers, Buy-Side Platform Vendors, Consultants and FinTechs / DL Platform Developers. Among the Asset Managers, we deliberately sought contributions from those who are less active in DLT, alongside those taking a more active stance.

## Basis for Contribution

Contributions to the research and reviews of the report were made under 'Chatham House Rules', so the contributors have not been identified as the source of any particular statement, opinion or quote. Where companies are named, it is because they have made verifiable statements in the public domain, separately from the research underlying this report.

There is no implication that the views expressed in the report constitute the official stance of any participating business. DLT is relatively new, and many firms have not yet developed a corporate policy on its deployment. The responses from contributors, and the positions taken by the reviewers, should therefore be interpreted as personal views from well-qualified individuals within the participant businesses, rather than as authorised corporate positions.

## Sponsors

The work on this report was sponsored by M&G Investments, Insight Investment and Linedata.



# Executive Summary

Asset Management is growing and is expected to continue to grow strongly: experts predict a sustained cumulative growth in assets exceeding 6% annually, resulting in a global Assets Under Management of over $110trn by 2020, and $145trn by 2025[1]. While it is sustained, the pattern of growth is not even, and the asset mix is changing. Passive investment, driven by ETFs, will gain market share to 25%; Active investment will decline and the Alternatives, which include Real Estate, Private Equity/Debt and Hedge Funds, will likely double by 2025 to over 15% of the total AUM.

Asset Management clients are becoming increasingly demanding, diverse and knowledgeable - irrespective of their retail, institutional or wholesale beginnings. Their expectations of investment outcomes are sharpening, their tolerance of poor customer service is disappearing, and their delivery mechanisms are now expected to include modern digital media.

Simultaneously with growth and more sophisticated client demands, there is strongly increasing cost pressure on the industry, and this too is expected be sustained. Pension saving has become compulsory in the UK for all employees. In other jurisdictions where saving has become mandatory, an insistence on transparent fees has followed swiftly; the industry has experienced strong downward fee pressure as a result. The FCA is following suit, and has formed the Institutional Disclosure Working Group to support consistent and standardised disclosure of costs and charges for UK Managers. The FCA has also recently crystallised its interrogation of the industry's competitive landscape: it concluded that the industry needed to demonstrate clearer value for money, and that parts of the industry need to improve competitive tension. The agenda is obvious.

The combination of strong growth, sharper client expectations and heavy cost pressure provides an enormous opportunity, and an environment for change, for the investment market place. There is now a growing demand for stronger technology which can reduce costs by a factor, while improving the quality of the investment product. A range of new technologies is emerging to meet this challenge. These application technologies include Robotics / Machine-Learning, Big Data Analytics and Distributed Ledger Technology (DLT). The deployment of these application technologies has been strongly facilitated by technical advances, including the development of high performance parallel processing, high bandwidth communications and the open-ended storage offered by the Cloud.

If the investment industry is to transform itself, and deliver better quality product at a lower cost, then it needs to embrace and exploit these developments. The number of approaches and technologies which can enable a step change in cost and quality is limited: Asset Managers cannot afford to ignore those that do offer real potential. In this report, we focus on Distributed Ledger Technology and Blockchain, which together have high potential to enable transformational change.

While the report focuses on DLT, most engaged parties expect that the highest commercial gains for the Buy-Side will come through the deployment of a combination of new technologies. However energetically they are pursued, this will take time, and predictions of widespread, overnight

[1] Asset Management 2020: Taking Stock – Barry Benjamin et al PWC June 2017

adoption will almost certainly be wrong. Regulatory friction, among other factors, will be challenging.

The industry is faced with a blast of new, innovative technology at the same time as it is under heavy pressure from mandatory regulatory change. Regulators are focusing on the Asset Management industry as a priority, and the regulatory obligations of the sector continue to rise. The specific implications of Brexit require a concrete response and, inter alia, the imminent demands of PSD2 (Jan 2018), MiFID 2 (Jan 2018), GDPR (May 2018), and SMCR (mid-2018), are very significant indeed. However, senior Buy-Side management cannot and should not use the weight of regulation as an excuse not to innovate: it has to find a way to embrace innovation, while securely delivering to the regulatory agenda.

From the deployment of DLT, the Buy-Side identifies strong cost savings, opportunities for revenue enhancement, and risk reductions. The cost savings generally result from shortening of the investment value-chain, with fewer intermediaries leading to lower costs. The elimination of parallel data maintenance through Distributed Ledgers will in turn eliminate reconciliations. Revenue enhancement opportunities include the exploitation of new market segments and geographies, new products which exploit the peer-to-peer nature of Distributed Ledgers, and crypto-funds as a new asset class. Risk reductions spring from the elimination of exposure to disintermediated central entities, the inherent security offered by the immutability of Blockchain data, and the resistance to hacking which is inherent in Distributed Ledgers.

The contributors to the report put forward a range of DLT use-cases which would be of high and specific benefit to the Buy-Side. Among these, the most regularly cited were:

- Rationalised asset registers to eliminate parallel position stores and reduce reconciliations
- A distributed entity data service, with embedded and shared KYC and AML checks
- Automation of the management of complex asset life-cycles through ‘smart contracts’
- Direct reporting access to ledger data for Regulators and Clients
- Acceleration of the post-trade process, to exploit real dematerialisation
- Delivery of near-instantaneous settlement for funding transactions
- Automated, peer-to-peer collateral management
- Peer-to-peer distribution, linking fund manufacturers directly to their end clients

To yield the benefits of these (and other) initiatives with high value to the Buy-Side, Asset Managers have a choice of possible approaches to delivery. The most obvious approaches are:

1. Active: taking control of developments, specifically shaping them to target and maximise Buy-Side benefit;
2. Delegated: working with existing partners to share the benefit of their (Sell-Side) exploitation of the technology; or
3. Passive: spectating until a third party delivers something of interest, and then seeking to procure the resulting platform.

The Buy-Side has traditionally avoided investment in new technology, and has depended on the Sell-Side (Investment Banks, Custodians and their Service Providers) to invest on its behalf; it has then

adopted technology as a follower rather than a leader. So the Delegated and Passive approaches would reflect the Buy-Side's dominant behaviours.

However, the context for DLT is different in a number of respects from previous cycles of innovation, and there are three very good reasons why the Buy-Side should not depend wholly on its partners on the Sell-Side to 'do' Distributed Ledger Technology for them:

1. Buy-Side revenues are going up, and are already a multiple of Sell-Side Revenues. Sell Side revenues are going down, and are expected to continue to do so. To take a dependency on the Sell-Side for investment now is to fish in a shrinking pool of investible cash, which the Sell-Side increasingly needs to address its own cost and regulatory issues;
2. It is in the Buy-Side's interest that the investment value-chain should be as short as possible, with the fewest practical intermediary entities. It is in the Sell-Side's interest to preserve their place in the value-chain and defend their revenues. To take a dependency on the Sell-Side for DLT investment is to rely on a potentially conflicted partner.
3. The DLT use-cases that the Sell-Side is pursuing are different from the use-cases that have high value to the Buy-Side. For example, the Sell-Side is investing in high volume cross-border payments and trade finance; the Buy-Side wants DLT to provide distributed asset registers, entity data services and peer-to-peer distribution. To depend on the Sell-Side here is to hand control to a sector with little overlap or commonality of focus.

While these are very good reasons why the Buy-Side should not wholly depend on the Sell-Side for DLT delivery, it is clear that Service Providers particularly will deliver a material fragment of the available benefits, because the Asset Management business is heavily outsourced. We will also need the active cooperation of other partners and market players if we are to maximise and accelerate benefit delivery. These include Regulators, Vendors and Standards Bodies. It is easy to blame these parties for slowing the delivery of DLT, and for Asset Managers to justify inaction on that basis. In this report we have tried to turn this round, and provide an agenda of what we need from each of these parties to expedite the delivery of Buy-Side DLT benefits.

In addition to reaching a clear agenda of priorities and preferred approaches to DLT development, the Buy-Side needs a coherent voice on the topic. Currently, there are many forums, blogs and working groups, but none speaks with authority on behalf of the Buy-Side, and none is empowered to engage with Governments, Regulators and Standards Bodies on behalf of the industry. We need to create that coherent voice.

This report sets out to deliver on some key objectives:

- To capture the optimism of Distributed Ledger Technology and Blockchain. There is much smoke in the market, and this is an opportunity to focus on the fire;
- To collate the most likely future benefits of the technology, not only for the Buy-Side itself but also to the ultimate benefit of the market and for the end-consumers of investment product;
- To identify the most effective contribution which could be made to the acceleration of DLT benefits by the Buy-Side's partners; and

- To suggest, support and promote a consensus on Buy-Side objectives and priorities for DLT, which will enable all Buy-Side participants to collaborate most effectively.

The report is a comprehensive and consultative exploration of ideas and initiatives: as an amalgamation of input from the market's best thinkers, it shamelessly capitalises on the intellectual contributions of others. Contributions have come from Asset Managers, Vendors, FinTechs, Service Providers and Consultants. The report is a consensus document rather than an opinion paper: the views of the contributors have been reflected throughout and summarised faithfully.

We are at the end of the beginning with Buy-Side DLT, and there are already significant and exciting initiatives underway. As one catalyst of future activity across the whole Buy-Side, we look forward to the market accelerating well beyond education and proof-of-concept, and into live delivery and execution of DLT initiatives. We would be delighted for our analysis to be augmented and corrected, and to include new innovations and directions in a future revision of the report.

We are dealing with an emerging, and rapidly developing technology, and the views of the market are moving quickly alongside the technological developments. Consequently, we fully expect that the emerging consensus, which this report documents, will evolve rapidly. Following publication of this report, we intend to foster a series of events to debate and improve the consensus.

We hope you enjoy the report, and find its content helpful in framing your approach to investment in DLT. We very much look forward to your feedback and participation in future collaborative initiatives for DLT on the Buy-Side.

**Dr Ian Hunt, Chris Mills**

22nd January 2018

# Introduction

## Motivation

Distributed Ledger Technology (DLT) is one of the most prominent of current digital technology initiatives. Together with Blockchain, which provides a near-immutable data structure and a core set of algorithms in many applications of DLT, it stands alongside big data and AI / machine-learning as a major focus of innovation. Proofs of concept are widespread, multiple application platforms are under development, and in Bitcoin it has a high-profile established use-case. This paper sets out an emerging consensus on the application of DLT to the Buy-Side, and what Asset Managers need from their partners and Regulators to facilitate, accelerate and maximise the delivery of benefit.

As an industry, the Buy-Side is under increasing pressure to reduce the cost of investment, to demonstrate better value for money and to improve transparency. In the context of savings shortfalls and pension deficits, this pressure may in future translate into regulation or legislation on fees. As a response, and to protect the profitability of Asset Management as a business, we need to develop and deliver approaches which can radically reduce the investment cost base, while increasing the quality of investment products: Distributed Ledger Technology has the potential to be prominent among those approaches.

The emergence of DLT (among other new technologies) has had a stimulating effect on the thought-processes that define change, and the industry as a whole has come to accept disruption as a potential good. DLT in particular has prompted us to think radical thoughts about the entities that we actually need in financial transactions, how trust should be established, how transactions should be represented, and how data should be secured. Whether or not DLT is the answer in all cases, the fact that we are asking these questions can drive change forward.

While the technology is disruptive, the potential benefit for Asset Managers from DLT / Blockchain is significant and may be transformative: one estimate for the cost saving for 'Blockchain-enabled' order routing just for Luxembourg-domiciled funds is in the region of €1bn.[2] However the Buy-Side has been much slower to invest in DLT than the Sell-Side, and there is a very uneven level of participation[3]. The big players, like BlackRock, Vanguard and Fidelity, have their own digital research teams and emerging technology centres. These firms have allocated high quality resources to the construction of proofs of concept, and have worked alongside the Sell-Side in public DLT initiatives, developments and consortia. Many other Asset Managers are less well advanced.

DLT on the Buy-Side is still seen as discretionary R&D, rather than as part of the standard business change process. As such, it competes for a discretionary budget that is constrained by the weight of mandatory, regulatory change, and well as with other R&D initiatives. Competing R&D projects include digital developments that have immediate appeal because they are focused on client acquisition, servicing, and retention. To date that competition has not favoured DLT. A recent survey from Multifonds confirms this, and shows that big data analytics, AI and Robo-advice are currently higher up Asset Managers' agenda than DLT.[4] Multifonds explains that this is "probably

[2] Blockchain: A Game-Changer for Asset Managers? – Crystal Kim, Barron's Magazine 5th July 2017
[3] See the Greenwich Associates survey referenced below
[4] A Turning Point for the Global Asset Management Industry - The Multifonds Every Fund Survey 2017

down to the fact these new technologies are relatively easier to implement than the more revolutionary DLT concepts".

Studies of Blockchain adoption within Financial Services make it clear that the trend of participation in the technology has been leadership by Financial Market Infrastructure providers, followed by the Sell-Side, who are in turn followed at a distance by the Buy-Side. This is despite the potential for the technology to support service models that are attractive to a more tech-savvy generation of consumers, who want more control over their investments, delivered via their favoured media.

A recent survey of 400 market participants by Greenwich Associates sets this out very clearly.[5] Summarising its findings into a measure of involvement in Blockchain initiatives, the average engagement across the sample measured 63%. At the high end, Market Infrastructure providers came in at 75% engagement (only the dedicated DLT FinTechs were higher), while Asset Managers are at the bottom, measuring half the average at 32% engagement.

Although this presents a picture of lagging adoption, recent evidence shows that the Buy-Side is waking up to both the opportunities and the threats of the technology. Examples (among many) include:

- Schroders announcement that they have joined the Hyperledger Project;
- Northern Trust's implementation of a blockchain platform for Private Equity fund administration in partnership with Unigestion and IBM;
- BlackRock's announcement of their intention to Blockchain-enable Provider Aladdin, a private platform / dashboard to streamline transactions with BlackRock's Custodians;
- The launch of a Blockchain-based solution for syndicated loan servicing by Synaps (a joint venture of Ipreo and Symbiont), with involvement from Asset Managers including Eaton Vance and Alliance Bernstein;
- Calastone's launch of Blockchain-based distributed market infrastructure;
- FNZ 's development of FNZChain as a private blockchain for Asset Management registers ;
- SETL's launch of Iznes, in collaboration with various asset managers, as a Pan-European Distribution and Transfer Agent Platform for fund subscriptions, distributions and settlements;
- The announcement from Natixis in July 2017 that they had successfully sold funds directly to clients through FundsDLT, a fund distribution platform developed by a partnership of the Luxembourg Stock Exchange / Fundsquare, InTech and KPMG;
- The news that SEB are working with NASDAQ on the development of a trading platform for Swedish mutual funds; and
- The rise of crypto fund launches in 2017, representing the fastest growth of any hedge fund sector in the industry's history. [6]

These initiatives are encouraging, but an uncomfortable fact remains: Sell-Side businesses, unless they directly own an Asset Manager, have little incentive to pursue use-cases that target benefits for the Buy-Side and Buy-Side clients: their interests lie more in ensuring that they protect their place as

[5] Addressing the Latest Trends in DL Technologies – Richard Johnson, Greenwich Associates 1st June 2017
[6] Bitcoin Rise Ignites Crypto-Fund Explosion – Hedge Fund Alert 15th November 2017

part of the future value-chain, in the face of threats of disintermediation and decentralisation. Behind this, they are focused on resolving their own cost and regulatory issues, not on what is optimal for the Buy-Side firms and Asset Owners.

Just for the global and sub-custody businesses, it is expected that the impact of DLT will be seriously threatening to net revenues: there is a credible estimate in a recent paper from Aon McLagan of the overall impact at a negative $8.4bn annually, with a revenue loss of $16.7bn only partly offset by a reduction in expenses of $8.3bn.[7] The paper concludes that: "This represents a significant call to action, as blockchain threatens the entire business model of the custody industry today. The findings present custodians with a stark choice. If they embrace blockchain technology but fail to use it to generate new revenue streams, their continued existence is at risk". It is obvious where the interests of Custodians lie and why they are engaged.

Sell-Side dominance in DLT is borne out by the focus of investment and participation in the main consortia, like R3, and DL platform and application developers, like Digital Asset. If Buy-Side management decides to delegate (or just leave it) to the Sell-Side to define and develop DLT infrastructure for them, then they should be aware that they are delegating to parties with potentially divergent interests.

Buy-Side management also needs to be keenly aware of the economic trends for the two sides of the market: Buy-Side revenues are already a multiple of Sell-Side revenues, are growing strongly, and are expected to continue to do so. Sell-Side revenues are falling, and are expected to continue to do so.[8] A decision to depend on the Sell-Side to invest in DLT for the Buy-Side is a decision to draw on a shrinking pool of investible cash, from a business segment that transparently needs to focus its investment on the protection of its own future.

The threat to the Buy-Side, unless the pattern of non-participation changes, is clear: if there is no Buy-Side influence, then the Market Infrastructure Providers, Sell-Side players and Service Providers will dominate the agenda, shape and take ownership of the technology to suit their own interests and focus on the use-cases which are of most relevance to them. Ultimately, the Buy-Side will be presented with a fait accompli and a fee schedule, on terms dictated to them to them by the Sell-Side. There will be little choice but to fall in line, and the opportunity will have been missed to shape the technology for maximum benefit to Managers, and to their clients, the Asset Owners.

The Bank of England has recognised this threat in a recent working paper "…if a DL (or other) technological solution for settlement ultimately succeeds in replacing existing settlement methods, it is likely to be characterised by network externalities and decreasing average costs. This suggests that the industry may well retain its high degree of concentration. It is possible and likely that a small number of Central Securities Depositories (CSDs) will be replaced by a small number of DL network

[7] Securities Services on Blockchain - A Value Analysis for Custodian Banks – Aon McLagan October 2017
[8] https://www.bcgperspectives.com/content/articles/financial-institutions-technology-digital-value-migration-global-capital-markets-2016/

providers and as a result future settlement services may be associated with some form of monopoly pricing".[9]

Some Managers too recognise that there are serious risks in leaving the technology to the Sell-Side: one major player asserted that "we do not believe that either banks or <DLT> consortia are acting motivated by altruism. To us this implies the Buy-Side should establish a body representing our interests in the coming engagement process".

It is clear from our research that overall the Buy-Side needs and wants to engage, to have a strong voice, and to communicate a clear direction to its Regulators, Partners and Counterparties. As it is unlikely that Buy-Side investment in the technology will match the Sell-Side in the short or medium term, influence will need to come from concerted action and a well-articulated position, rather than from the weight of money. Participants in the research reinforced this message, and added some urgency, one saying that: "the next 5 years is precisely when the foundations will be set for who the winners and the losers in the industry will be, making it a dangerous time to act passively."

This is transparently the right time to define and document an emerging consensus on Distributed Ledger Technology within the Buy-Side community.

## Method and Structure

This paper is based on research carried out in the first half of 2017. 50-60 firms involved in the Buy-Side have contributed to the work; they are drawn roughly evenly from the following:

- Asset Managers;
- Service Providers to Asset Managers;
- Established Buy-Side Platform Vendors; and
- Emerging FinTech / Consulting companies actively developing in the DLT space.

The paper is in two distinct parts. The first part describes the emerging consensus among Buy-Side players on the benefits that Distributed Ledger Technology (DLT) is expected to bring to Asset Managers, to Asset Owners and to their clients. It includes a statement of the contribution that the Buy-Side expects from its Regulators, Vendors, Service Providers and Standards Bodies to enable and to expedite the delivery of those benefits. The second section summarises the research behind the emergent consensus, where players from around the Buy-Side contributed their views, described their current activities and disclosed their expectations of the technology.

To ensure that the paper encompasses the views of a range of parties relevant to the Buy-Side, an early draft of the paper was distributed to the panel of sponsors and initial editors, who responded with amendments and review points. These were all incorporated into a second draft of the paper, which was then distributed to the original participants in the research programme. Further amendments were made as a result of comments from this wider group. While there is no claim

[9] Staff Working Paper No. 670 – 'The Economics of Distributed Ledger Technology for Securities Settlement'. Evangelos Benos, Rodney Garratt and Pedro Gurrola-Perez August 2017

that the paper fully reflects the official positions of all participants, every effort has been made to ensure that the views of the individual contributors have been faithfully represented.

The objectives of the research programme, and of the current paper are:

- To help the Buy-Side to articulate its objectives in Distributed Ledger Technology and to gain influence over the direction of development;
- To deliver a body of material from across the industry that will enable Buy-Side executives to become well-informed about DLT and Blockchain, and make better informed investment decisions as a result;
- To recognise the major potential benefits of DLT for the Buy-Side, including the sources of cost savings and new sources of revenue;
- To identify the most relevant Blockchain / DLT use-cases for the Buy-Side to focus on;
- To articulate what the Asset Managers and Asset Owners need from their Regulators, Vendors, Service Providers and Standards Bodies to expedite delivery of DLT benefits; and
- To project the likely timescales over which the Buy-Side can expect to see material impact.

# Part 1

# Emerging Buy-Side Consensus on Distributed Ledgers

## Expected Benefits of DLT for the Buy-Side

The Buy-Side, while it has not yet been as active as the Sell-Side, the Payment Banks and the Custodians in DLT initiatives, does clearly recognise and value the potential benefits of DLT. As well as facilitating the transformation of Buy-Side architectures, and promoting real dematerialisation, Distributed Ledger Technology offers Asset Managers the prospect of a range of cost savings, revenue enhancements and risk reductions.

### Sources of Potential Benefit

From the responses to the research, it appears that the balance of interest from the Buy-Side is strongly towards the first of category of benefits: 80-90% of Buy-Side engagement in DLT is driven by the prospect of cost-savings, and 10-20% by the prospect of revenue enhancement and risk reduction.

The cost savings generally result from streamlined and accelerated processes, from the elimination of unnecessary intermediation, and from the radical reduction of parallel data maintenance. The rationalisation of data stores, in addition to allowing the retirement of existing platforms, will naturally eliminate many reconciliations, removing their associated costs.

The revenue enhancements are generally secondary effects of acceleration and cost savings; good examples are:

- The opportunity to sell into new market segments as a result of lower costs;
- The opening of new geographical markets as a result of secure identities;
- The widening of investment opportunities through new options for asset-funding;
- The emergence of crypto-funds as a new and thriving asset class;
- The opportunity for new investment products and new revenue sources created by direct connection to end investors, bypassing the wholesale market and distribution platforms; and
- The optimisation of yield-enhancement and liquidity management facilitated by shortened settlement cycles.

The investment risk reductions are mostly the result of shortened settlement cycles and reduced exposure through the elimination of intermediaries. Operational risk reductions accrue from the data security offered by immutability, from the improved recoverability and resistance to hacking which are inherent in Distributed Ledgers, and from the better alignment of investment data between the Manager, Administrator, Custodian and Asset Owner.

In the context of downward pressure on fees and costs, the Buy-Side both wants and needs to yield the benefit of the cost reductions that DLT could facilitate. DLT is widely seen by Asset Managers as one of very few toolsets with the potential for radical reengineering of the Buy-Side cost-base, and its benefits are relevant to Managers across the ranges of scale and asset type.

Responses from a broad set of participants support this view: one Manager gauged the transformative impact of DLT as “8 out of 10”, while another forecast that “there will be benefit,

somewhere between local isolated benefits and transformation". A fixed income Manager foresaw that: "In the long run Blockchain / DLT has the potential to be as disruptive to double-entry book-keeping, as email was to posted mail". The caveat is the extent to which we are prepared to make fundamental process change, and to eliminate established methods and intermediations.

DLT and Blockchain are tools for the establishment and maintenance of trust between the participants in transactions. As such, they compete with more conventional trust mechanisms, based around a central intermediating entity or registry, like a Bank, a Custodian, an industry-wide Vendor platform or a Matching Utility. Distributed Ledgers are different because they establish trust on a peer-to-peer basis, which is more democratic, and could be cheaper and more versatile. The downside is disruption and risk: the technology for trusted central entities is mature and readily implementable, while DL technology is only just maturing.

There is no claim that DLT is always necessary, or is always the best technology, to deliver solutions requiring trust. Peer-to-peer trust, however, allows us to construct new and attractive business models, like non-intermediated transactions, direct-to-client fund distribution, collaborative data maintenance and crowd validation. Market data services could be paid for increasingly by contributions of data rather than by financial funding. Research, currently bought by Managers from vendors and brokers, could be shared on a distributed ledger, with secure lineage and ownership, and become a source of revenue for Managers, rather than purely a cost. It is clear that there are attractive Buy-Side benefits from the delivery of services based on distributed trust models.

The current multiplicity of asset registers across Asset Managers, Registrars, Custodians, Depositaries and Administrators could benefit from substantial rationalisation if position data were delivered in a distributed fashion, based on a shared transaction ledger. One Manager typified this view: "from an IT/architecture perspective, the largest obvious benefit <of DLT…> would be around a reduction in number of asset registers. Multiple custodians, a separate shadow accounting record (feeding core services) and multiple Investment Records could all benefit from being rationalised, with transactions being posted from the appropriate source to one ledger".

The plethora of reconciliations which the Buy-Side deploy to control data quality could be radically reduced as a result of shared access to common asset registers, and the cost of reconciliation is high. For one Manager, "a saving in reconciliation time would be significant". For another, reconciling fund IBOR positions is "the major operational overhead" in the business, followed closely by cash reconciliations. Alongside the beneficial reduction of reconciliations, Managers see further plus-points for common asset registers. For example, one Manager asserted that "the ability to publish <position> data that is known to be correct (at that point in time) out to consuming platforms in a timely fashion would be beneficial for other reasons, such as reducing reporting lag time".

The near-immutability of Blockchain data, together with computation engines running on the Blockchain, opens the potential for the secure automation of paper-based Buy-Side processes. Among these, there is particular interest in the deployment of smart contracts to support the automation of manually-intensive processing of complex assets. The acceleration and cost reduction that could result from automation could bring wider asset classes within the reach of low-cost investment vehicles. In this respect, there are strong benefits envisaged for the processing of OTC derivatives, real estate and complex loans, and the manufacturing of investment products based on

these. Approved and trusted smart contracts could be made accessible from secure repositories, so that they could be efficiently reused, with users fully confident of their trusted state.

There are other activities around client management that could benefit materially from Distributed Ledger technology. Client on-boarding is notoriously manually-intensive (both for Managers and for Transfer Agents), as are the initial creation of portfolios and position loads or transitions. The maintenance of client data, compliance rules and objectives is onerous, and KYC and anti-money laundering (AML) checks are repetitive and hungry consumers of resources. The Buy-Side is alert to the potential for improvement, and there are multiple proofs of concept and prototype DLT initiatives in this space as a result, alongside developments in Robotic Process Automation (RPA).

Other potential benefits of shared ledgers, recognised widely by Asset Managers, include improved reporting transparency for Regulators and clients, improvements in liquidity, the freeing up of capital and the optimisation of collateral management. There are opportunities for new business models, through the tokenisation of assets, the decentralisation of trading models and the replacement of funds with more efficient retail structures. The distribution activity could also see beneficial change, with direct peer-to-peer and customer-to-manufacturer connectivity.

In addition to the improvements which DLT offers to the investment business itself, there are potential new servicing models through the tokenisation of services sold over Distributed Ledgers. Innovative third party service and infrastructure providers are aiming to offer cloud space, transaction processing capacity, messaging capacity and reporting capacity, all tokenised over a Distributed Ledger. Currently, Managers are generally locked-in to contractual outsourced services, which may lack the flexibility to address specialist or more complex transactions. Tokenisation would enable the delivery of outsourced services on-demand for sporadic investment opportunities, for example, like ICOs.

Industry authorities share the view that significant benefits are available from the deployment of Distributed Ledgers. The European Securities and Markets Authority (ESMA) believes that DLT could bring a number of possible benefits to the securities markets.[10] The benefit headings which they highlight are:

- "Enhanced data management capabilities;
- More efficient post-trade processes;
- Enhanced reporting and oversight;
- Greater resilience and availability;
- Reduced counterparty risk and enhanced collateral management; <and>
- Reduced costs."

## Support for Architectural Change

The technical infrastructure for many Asset Managers is still based on outdated mainframe technology, running aging 'best-of-breed' applications in proprietary data centres. This creates a high cost of change, and is expensive to operate, maintain and develop. Managers want robust,

[10] The Distributed Ledger Technology Applied to Securities Markets – ESMA 7th February 2017

resilient technical architecture that is easy to grow, shrink and change. Inter alia, this means buying services and exploiting the Cloud.

At a high level, there is an increasingly strong consensus among Managers on the target state for Buy-Side application architecture too. Managers want to outsource commodity functions (including through on-demand services) where no real value can be added individually. Where real value can be added, the Buy-Side wants choice and specialisation, but without the heavyweight applications, complex integration, replicated data maintenance and constant reconciliations demanded by the best-of-breed approach.

Best-of-breed has been the dominant Buy-Side architecture for the last 20 years, but there is now the prospect of real and constructive change. The Asset Management business is positioning for a move towards a service-based approach, within which market data, reference data, entity data, transaction data and position data will be maintained and delivered by central services. Applications will consume, rather than maintain that data, and will cease to be islands of self-contained data: they will be leaner and fitter as a result. Consequently, the need for reconciliation can decline, and the complexity of integration can reduce.

The architectural objective is becoming clear, but it is not at all clear yet how we get there: establishing the critical mass required for genuine wide-scale services and utilities has always been challenging. Some see a migration from monolithic applications into micro-services through the breakdown of the monoliths[11]. Others assert that there is a chicken-and-egg situation: do we start by building services when there are no applications capable of consuming their output? Or do we start by building thin applications that assume access to external data, when there are no data services architected to deliver that data?

Distributed Ledger Technology is seen by Asset Managers as potentially very beneficial in this context, not because it is the only solution / technology in the space, but because it can facilitate and accelerate the establishment of the key services, and help us to navigate our way towards service-based architectures.

Data services may start as local builds, and operate internally within individual Asset Managers. Over time, though, we can expect to see the exploitation of secure distribution capability in DLT to move services beyond the boundary of the Manager, and into the wider community. The result will be industry-wide data services, with contributions from multiple participants as a key feature.

## Real Dematerialisation and Near-Real Time Settlement

The securities industry has had dematerialisation (and immobilisation) of stock for a long time, but our process of trade settlement still operates in a way which assumes an event of settlement, as if physical stock is going to move against physical payment. When we record a transaction, we record our view of what is going to happen in that settlement event, and our counterparty does the same. We then compare those records and confirm the trade data, usually through an industry utility. Banks and Custodians intermediate, and receive instructions to 'move' the cash and stock. The

[11] See Monolith First – Martin Fowler 3rd June 2015

settlement event itself, when it eventually happens, is just a pair of record entries in the form of book-entry transfers, because the stock is dematerialised and the cash is similarly non-physical.

Distributed ledgers, and the immutable blockchain-held data that they contain, offer us the opportunity to go much further. They allow us to share a single record of the transaction, and to make that transaction record the same as the transaction itself: once we have recorded it, the trade has happened on a peer-to-peer basis, on the ledger. Settlement happens as the recording of the immutable transfer of assets and cash.

So DLT can be seen as facilitating the ultimate achievement of dematerialisation. When the ledger entry is the asset (just as the ledger entry in Bitcoin is the value), then the record of the transaction becomes the transaction itself. The movements of asset and value are reflected in the relevant ledger entry, and accepted by the parties because the Blockchain delivers robust proof of ownership. The parties can trust each other's claim of ownership and can depend on delivery; this removes the need for trusted central entities to effect delivery against payment. The roles of Payment Banks, Custodians and Depositories will need to be redefined as a result (as will the fund and accounting regulations which currently encapsulate these roles).

Asset Managers see significant benefits from this change. Trading operations can be accelerated and simplified, because we can eliminate (rather than streamline) the activities of post-trade processing. Costs can be reduced by the disintermediation of confirmation and clearing services, and by the reduction of manual work in the trade process. Counterparty risk can be reduced, and our exposure to central utilities eliminated. As a further benefit, the immediacy of settlement improves the precision of cash and liquidity management.

No one expects this transition to be easy, and the timescale for change could be extensive: the creation of an ecosystem broad enough in participation to deliver the achievable benefits is self-evidently a challenging target. Some significant obstacles remain to be overcome to reach the target, including the questions of validation i.e. how the parties to a transaction agree on a single cash / stock entry in the ledger, and settlement finality i.e. how disputes are treated from a regulatory and legal point of view.

There is also an unfulfilled need for central bank money to be issued on a Blockchain to facilitate the cash leg of the transaction, or for the acceptance of settlement in cryptocurrency. Some early progress has been made here by t0 in their issuance of a tradeable security through a Distributed Ledger[12], and Clearmatics in their development of the Utility Settlement Coin[13].

The issuance of fiat currency on Blockchain is a possibility, but is by no means assured. Positive signs include the deeper involvement of the Central Banks in DLT: the Bank of England has joined Hyperledger, while Deutsche Bundesbank and Deutsche Borse have built a Hyperledger-based prototype which includes settlement payments. The ECB and Bank of Japan have actively investigated Blockchain-based settlement payments and concluded that they have promise. Less positive signs include ECB and BoJ's own conclusion that DLT currently lacks maturity, the Bank of

[12] https://globenewswire.com/news-release/2016/12/22/901152/0/en/t0-platform-successfully-employed-in-the-world-s-first-public-issuance-of-a-blockchain-equity.html
[13] https://www.clearmatics.com/utility-settlement-coin-pioneering-form-digital-cash/

Canada's flagship Jasper project taking a stance against issuance, and failure of the Bank of England's Real-Time Gross Settlement programme to consider DLT.

This is not an all-or-nothing objective: an interim state is possible, and we could build incrementally to full dematerialisation. While issues of on-ledger fiat currency and cryptocurrency settlements are resolved, we could make practical progress along the lines of the developing FX model, and use same-day netting to achieve near-real time, as opposed to instantaneous settlement. This could operate either through a prefunded account or a margin agreement, with end-of-day settlement to flatten the accounts. This would still offer some benefits of compressed settlement cycles, reduced risk, reduced workload and reductions in the need for working capital and collateral.

Despite the obstacles, the direction of travel and the opportunity are clear. Managers wish to see the required changes in market structure happen, which will enable real dematerialisation, and to deliver these benefits for their clients.

## Permissioning, Privacy and Trust

It is the common view of both the Regulators and of the Buy-Side participants that permissioned private Blockchains are the most likely way for DLT to be adopted in the financial markets. Private Blockchains lead directly to a requirement for robust inter-operability between ledgers. An Asset Manager was concerned that "the issue of privacy is not solved, and models of permissioning and inter-operability need to be developed which will give the Buy-Side the appropriate level of confidentiality". A Vendor asked, in the same context: "How would the concerns of releasing potentially confidential data onto a public (or semi-public) Blockchain be addressed?". As a result of these widespread views, the consensus Buy-Side use-cases largely assume permissioned ledgers.

Private Blockchains present challenges both to disintermediation and to immutability: they require a trust mechanism, which is often implemented in the form of trusted or privileged nodes. The operators of these will need to be compensated or incentivised in some way (just as miners in Bitcoin are currently compensated in coin), so there is a risk that these parties just become a new set of intermediaries. Proof of work creates immutability, and the DL platforms and private blockchains proposed generally avoid proof of work schemes, among other reasons because they are so heavy computationally. So again, with permissioned ledgers and private Blockchains, we may have to rely on the role of an operator.

Addressing the issue of ledger permissioning and inter-operability has been a major focus of attention for the developers of mainstream DL platforms and applications, like R3, Enterprise Ethereum Alliance, Digital Asset and SETL, alongside some smaller players. R3 believe that their Corda platform can achieve segregated access, and the Ethereum production version is seeking to do something similar. Digital Asset already have separate layers in their platform which creates views of sections of the overall ledger, while maintaining the fundamental integrity of transactions, such that an asset cannot be paid away twice. SETL has a technology that allows its participants to maintain privacy and confidentiality, in a regulatorily compliant context, without losing the benefit of a ledger which is distributed across the nodes. Other developers are sharply focused on the same issues.

## Approaches to the Delivery of Buy-Side Benefits

Asset Managers have a range of strategies available to them to deliver the benefits of Distributed Ledger Technology. The most obvious are:

1. To take an active stance, shaping and driving developments which offer high benefits to the Buy-Side, and facilitating collaboration where this is required to maximise that benefit;
2. To encourage and support existing Service Providers and Vendors in their exploitation of the technology, to improve their own services and products, and so to reduce costs, enhance capabilities and improve service levels for the Manager;
3. To spectate until a partner, third party or consortium delivers something of interest and benefit, and then to try to climb aboard.

Approach (1) will consume skilled resource and incur the risks of failed development or ineffective collaboration. It does, however, offer the prospect of delivering Buy-Side specific benefits that would be unlikely to be pursued by service partners, and that could lead to transformational change and competitive / first-mover advantage. It therefore has the highest potential pay-off.

While there is increasing recognition that very significant potential benefits exist, there is some impatience with the lack of hard numbers to back this up, and Managers have struggled to construct a solid business case for an active approach to DLT delivery. One representative Manager complained that they were "unclear of implementation cost versus run rate benefits". A Service Provider backed this up: "The time to realise benefits <and> the uncertainty of the business case is a primary disabling factor". Better quantification of cost and benefit would clearly encourage more Managers to invest in an active approach.

Approach (2) could result in some material benefit without the very substantial commitment of skilled resource required by approach (1): Service Providers and Vendors could be encouraged to deliver benefit through existing governance channels, and limited skilled resource would be consumed through extended oversight and service management.

One London-based Asset Manager described their current expectation that "our Service Providers (be it for instance investment platforms or Custodians) would be looking at ways to capitalise on DLT, although we would of course need to consider the impacts to our internal processes." Two other larger Managers with extensively outsourced operations had the same expectation, but had gone further and instructed their global securities services providers to leverage Blockchain / DL technologies to their advantage. They were sufficiently confident in the outcome to have made no immediate plans to make their own material investments in the technology.

This willingness to allow partners to drive development (and the trust that they would deliver benefits) has its risks, and the first Manager acknowledged that approach (2) does "of course…leave us open to the 'fait accompli' situation". Approach (2) is also not supportive to structural change: its focus is on improvement within existing service models and relationships, not the transformation and disruption of those models. As such it is unlikely to deliver anything like the full potential value of DLT.

Approach (3) demands little resource, beyond intelligent monitoring of the developments in the DL market, and is attractive for its low cost and impact. However, this degree of passivity means that

there is no active pursuit of outcomes from a technology that is increasingly recognised as offering potentially transformational benefit. For senior management and shareholders, this may not be an acceptable stance. The lack of influence and involvement in the direction of development also makes this the most likely approach to result in an unattractive 'take-it-or-leave-it' outcome.

A multi-asset Manager, who has taken a passive position so far, reflected that the topic of DLT was "overall interesting…but <reading this research material has> probably reinforced our view of 'wait and see'. We are not sure that DLT is a potential solution to a priority problem we're currently wrestling with". In other words, they favour approach (3). It is clear that many Managers struggle with the prioritisation of DLT, when they are faced with pressing short term business demands and looming regulatory deadlines.

The same Manager reflected that they did not seek active or early involvement in the development of market infrastructure: "As a manager who outsources, this is generally where we are…We let the products develop and emerge, then use our procurement process to pick those who offer the most benefit. We tend not to engage in incubation / early stage design". This approach has worked for the Buy-Side where market infrastructure development has been to mutual benefit, and is a familiar stance. However, other participants see that there is a significant difference with DLT, where major benefits could be delivered from the elimination of processes and services: there is a therefore a potential for misalignment of interest between the Buy-Side and its traditional partners.

The approaches above are not exhaustive or mutually exclusive: the most involved and committed players may do both (1) and (2), while the less active could be typically somewhere between (2) and (3). Indeed, the outsourced Manager quoted above did acknowledge that their position would not be wholly passive, and that "in reality we'd go a stage further and nudge the incumbent to tell us what their plans are".

It is plain that Asset Managers need to take informed decisions on their approach to delivery of DL Technology, based on a clear understanding of the opportunity presented by the technology, of their own capability and resourcing, and of the delivery capability of their partners and Service Providers.

## Favoured DLT Use-Cases for Asset Managers

As a part of the analysis carried out for this report, Asset Managers and other Buy-Side participants were canvassed for their favoured Distributed Ledger use-cases: these are the potential developments in the DL technology with the best capability to deliver the benefits outlined above, and which are therefore of most direct benefit to the Asset Management and Asset Owner community. There is an emerging Buy-Side consensus on these use-cases, which reflects an increasingly strong ambition to yield the available benefits of DL technology.

The use-cases which offer benefit to the Buy-Side are often different from those with attractions for the Sell-Side. Payment Banks, for example, tend to focus on the potential of DLT to accelerate the settlement of high volume and cross-border payments and FX. These are useful and sensible initiatives, but of limited direct interest to Asset Managers. There is considerable Sell-Side interest in Blockchain applications in Trade Finance too, which again is relevant but of limited appeal on the Buy-Side.

In the developed markets, a distinguishing factor in the establishment of successful DLT initiatives has been the existence of a dominant Market Infrastructure Provider (like the ASX in Australia) which can mandate change. However, the focus of DLT initiatives is by no means confined to developed markets: emerging markets are seen as attractive contexts for DLT development in the shorter term. The absence of complex regulation, the relatively simpler market structures and the smaller number of entities are all positive factors in the business case for change. Some participants went as far as to see emerging markets as the obvious starting point for Buy-Side DLT initiatives. Generally the most accessible use-cases combine high value (to maximise the business case) with lower volumes, limited complexity and a small number of participants.

A subset of the relevant Buy-Side use-cases depend on 'network-effect', and would need to be delivered in the context of cross-industry cooperation; they are therefore logistically demanding. In each case, a collaborative structure would need to be established, and appropriate incentives provided for the developer of the application. Incentivisation is an issue, as in a network DL, there is no central controlling entity which will receive revenue benefit from its operation.

Other use-cases would not require wide-scale cooperation, and Asset Managers could make progress independently, or with a single cooperative Counterparty, Client or Regulator. Collaboration would be limited or not required. Deployment of Ledger and Blockchain technology internally within an Asset Manager can offer real benefits (albeit generally less than those achievable from an industry-wide service), as well as making early progress easier to achieve, so the incentive for development would be transparent to the Manager. For certain applications, there is a half-way house: Managers could develop ledger platforms internally or in small-scale collaboration, and then deploy DLT to distribute the ledgers across counterparties, clients, Regulators and Service Providers.

The most prominent initiatives, with the potential for progression by individual Managers or small participations, are set out below. Their sequence is a reflection of the frequency with which they are cited by the respondents to the research:

1. Asset Register / IBOR, to deliver a position data service based on a single ledger of transactions. This could eliminate the maintenance of multiple internal books of record,

reduce the need for internal reconciliations and provide better flexibility in the position records provided to users and applications.

2. Secure Identity, to deliver a distributed entity data service, with embedded and shared KYC and AML checks. This could facilitate disclosure, eliminate parallel maintenance of client / entity data, reduce inefficiencies in client on-boarding, support compliance with GDPR and reduce costs.
3. Smart Contracts, to deliver practical automation to the processing of more complex asset classes. This could streamline the agreement and life-cycle management of OTC contracts, make complex loans and real estate accessible to conventional investment vehicles, standardise the application of compliance rules, and reduce costs[14].
4. Direct Reporting Access, to deliver a 'self-service' report data extract capability for Regulators and clients, based on a permissioned ledger. This could improve transparency, reduce the time and effort spent in report production and reporting data management, and reduce costs.
5. Repo / Securities Financing, to deliver near-instantaneous settlement for funding transactions. This could extend the scope of netting, make bilateral repo available as a source of liquidity to the Buy-Side, and reduce the cost of funding.
6. Collateral Management, to automate the computation, agreement and movement of collateral on a day-to-day basis. This doesn't require a cash payment on the other side of the ledger entry, which greatly simplifies the process, and makes this a practical early initiative.

While these use-cases do not require wide-scale industry cooperation, the position data and entity data services could be broadened into industry-wide services, following implementation locally within individual Managers. Data standards are emerging for position and entity data, and as that standardisation matures, so the delivery of wider services will become more practical.

For any use-case which requires wide-scale collaboration, and a shared solution, there will be possible requirements for regulatory and legal change, along with questions over the potential liabilities which may arise from data loss or corruption. These issues will make early progress harder to achieve, but the benefits of going beyond the boundaries of the single business are very substantial. Many Buy-Side participants recognise that the ultimate benefit of DL Technology will be achieved only when we move to wide-scale applications across multiple businesses. Among those most favoured are:

7. An industry-wide, distributed Entity Data Service, to support passporting of identity checks and approval status. Highly performant digital identity verification is the keystone in the creation of a trusted environment for transactions, and clearly essential where those transactions are both peer-to-peer and instantly settled. Regulators can be expected to insist on the existence of this service as a pre-requisite to approval for widespread peer-to-peer trading and settlement on ledger.
8. An industry-wide, distributed Asset Register / Position Data Service; this would enable us to rationalise the current proliferation of asset registers, deliver higher quality position data,

[14] While this use case is targeted to support the more efficient processing of more complex assets, it will be important to start simple, and graduate to the complex – hence repo, simpler loans, money market instruments and mortgages may be addressed ahead of OTCs etc.

reduce external reconciliations, and reduce costs. The position data management functions of Custodians, Accountants, Depositories and Transfer Agents would evanesce accordingly.

9. Real Dematerialisation, to accelerate the processing and settlement of transactions, eliminate low-value tasks in post-trade processing, reduce counterparty risk and exposure to central utilities, improve cash and liquidity management and reduce costs.
10. Peer-to-Peer Distribution, to link Asset Managers and fund manufacturers directly to their end clients, and to eliminate the currently high cost of retail platforms and Distributors. Criteria would have to be maintained (probably as part of the entity data service), to ensure that client / product suitability was preserved in a peer-to-peer context.

In addition to the use-cases listed above, about which there is a degree of consensus among the Buy-Side contributors[15], there are other use-cases proposed by smaller numbers of Asset Managers; some of these are of specific interest to those Managers, while others are more generally accessible, but of lower expected benefit. Examples include:

- Transfer Agency; this is a business well-suited to the rationalised ownership registers which DLT can facilitate, but relatively limited in financial benefit because of the already low cost of TA as a proportion of the cost of investment (outside the KYC and AML processes addressed above). There is, however, a benefit in making ownership records immutable, particularly in jurisdictions where corruption is prevalent.
- Proxy voting services; this uses a Distributed Ledger to communicate with registered Asset Owners, and smart contracts to capture and process the votes. This could operate on a peer-to-peer basis, or as a Custodian-led service which should result in an improved service at lower cost to the Asset Manager / Asset Owner.
- Class actions; in a similar form to proxy voting, the record of a class action could be published, and participants could attach themselves as class members, through a shared ledger.
- Smart contract-based margin payments in digital coin for CFDs and Exchange-Traded Derivatives; this is a subset of the application of smart contracts to complex asset processing, and may be a useful starting point due to relatively low volumes and (currently) thin regulation. The current clearing process and T+1 reconciliation is inefficient and outdated. A DLT-based solution could speed up clearing and guarantee agreed positions on trade date, thereby reducing execution and clearing risk.
- Asset ownership and provenance tracking; this is a use-case of potentially high benefit to Managers with Insurance businesses, and to those managing exotic assets, but of more limited interest to Managers of conventional securities.
- Open inventory; the Manager could give permissioned access to segments of their inventory, to enable offers to buy or borrow stock. Lending could move from a Custodian-led activity to an Asset Manager process.
- Immutable storage; Blockchains can be used to store a secure and accurate history of key investment documentation, and make access available in a permissioned form. Examples include: Investment Management Agreements, key investor information documents, Legal Entity Identifiers and records, client reports, and records of client positions and transactions.

[15] For example, in Q1 2017, KPMG published a Buy-Side paper 'Getting Practical', which highlighted 3 of the listed use-cases: Distribution, Post-Trade (middle office / clearing) and Asset Registry (for DLT enablement).

## What the Buy-Side Needs its Partners to Do

Asset Managers cannot deliver the potential benefits of Distributed Ledgers to themselves and to their clients in isolation. There is a strong Buy-Side Vendor community, and a set of outsource Service Providers on whom Asset Managers depend to varying extents for technology and operational efficiency. Benefits will often be delivered through their platforms. The Regulators have a responsibility to facilitate and encourage beneficial change, and a there is a need for Standards Bodies to broaden their scope to standardise new interactions within a DLT framework.

This section sets out the main planks of support which Asset Managers need from their various partners to accelerate and maximise the delivery of benefit.

### Support from Regulators

While there are some areas where DLT can be deployed to deliver benefits within existing regulations, it is clear that proactive and constructive support from its Regulators, in reshaping regulation where necessary, will facilitate and accelerate the Buy-Side's deployment of Distributed Ledger Technology.

New business models and new investment products will inevitably require changes to current regulatory frameworks. If the Regulators do not take a positive stance, then this will at best delay, and at worst prevent the delivery of a substantial slice of the potential Buy-Side benefits of DLT. If the Regulators clearly identify the potential benefits of the technology, and create a favourable regulatory environment, then this will drive commitment and investment from the Buy-Side, and accelerate the delivery of benefit.

The disruption caused by the new technology is likely to impact regulation, alongside other activities and Buy-Side business processes, and Regulators will experience their own transformation. It is not just the rules that will change: the ways in which regulators monitor behaviour and access reporting data will change, along with the mechanisms of enforcement. One Manager sees that "real-time surveillance and interpretation of data will be key themes and could foreseeably change how policy is implemented".

Managers emphasise the need for a cooperative approach with the Regulators. One said that the "Regulators need to gain comfort with technology, understand the implications for marketplaces in financial services and approve, or legislate, key infrastructure. Furthermore, they will need to decide on the degree of oversight and transparency they require from DLT-based transactions…<Overall> we emphasise the need for a constructive engagement with the Regulator".

There are well-publicised instances of Governments and Regulators trying to wrest control away from DLT / Blockchain innovators and establish a regulatory framework. High profile examples are China's ban on ICOs and the SEC's inclusion of DAO tokens as securities under the Securities Exchange Act. However, there is no sense on the Buy-Side that the Regulators are negative about, or do not want to engage with the technology.

One representative Manager asserted a belief that "the Regulators in the UK are generally supportive to Blockchain development…". A recent consultation paper from the FCA[16] bears this out, and suggests an openness to understand and embrace the technology. "We are committed to fostering innovation that advances our objectives…Distributed Ledger Technology (DLT) is an example of rapidly developing technology which offers exciting potential to support the needs of consumers and the market…We are particularly interested to explore where the balance of risk and opportunities may lie in relation to DLT". Respondents to the FCA consultation were positive too, and expressed "particular support for the FCA maintaining a 'technology-neutral' approach to regulation and welcomed the FCA's open and proactive approach to new technology".

Elsewhere there are encouraging instances of positive support from Regulators for DLT based-initiatives. For example, Northern Trust's Private Equity initiative was actively supported by the Guernsey Financial Services Commission. The design aimed to deliver compliance with current, local regulations, and to allow regulatory access when required. The Guernsey FSC was keen to accelerate the delivery of the benefits of trust and transparency that DLT could clearly enable. The GFSC stated that "Northern Trust has engaged with us as Regulators from the start and we are pleased with the level of openness and interaction. This is another example of the Commission's approach to innovation in the Bailiwick's financial services industry".[17]

There are promising signs in Europe too. ESMA, in their paper of February 2017, are equally positive, and assert that they "want to understand both the benefits and the risks that DLT may introduce to securities markets, and how it maps to existing EU regulation. In turn, our aim is to assess whether there is a need for regulatory action to facilitate the emergence of the benefits or to mitigate risks that may arise."

The French Regulator AMF has launched a new initiative focused on initial coin offerings, as it looks to formalise a regulatory framework for the blockchain use case. The Luxembourgian Regulators have taken positive stances on DLT too, particularly for distribution. It is clear that, across regulators and jurisdictions, there is a willingness to enable and accelerate the delivery of benefit from DLT through targeted revision of regulation.

While recognising that there are positive attitudes to DLT among the Regulators, Asset Managers also recognise the scale of the task ahead in reshaping regulation to facilitate delivery of DLT. The direction of current regulation mandates the existence and roles of the current intermediaries in the investment process, like Trustees, Depositaries and Custodians. Because there are new concepts and constructs introduced by DLT, there are inevitable gaps in current regulation, and rules need to catch up with the emerging technology and the new business processes that it facilitates.

Managers do recognise that Regulators face a serious challenge, and they are rightly concerned over the effect of regulatory change on the timescale for deployment, as well as concerned that current regulation will simply prevent the achievable benefits from being yielded in the shorter term. An alternative view is that the market will force the pace, in an Uber-like fashion, and that Regulators will be on the back foot, working hard to keep up.

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[16] Discussion Paper on Distributed Ledger Technology – FCA April 2017

[17] Emma Bailey, Director of the Investment Supervision and Policy Division of the Guernsey Financial Services Commission.

Examples of concern at the impact of regulation come from across the Buy-Side market participants: “Regulators are only just engaging…”; “The need for enabling regulation is a critical delaying factor”; “Disabling / delaying factors will include regulatory compliance and oversight”. One participant was very explicit, saying that: “Our central expectation is that though the technical development of DLT solutions may make market-ready solutions available within the next few years, wide-spread adoption will be determined by the speed of regulators providing the necessary framework”.

Some Buy-Side players have revised their expectations on the timing of change (and therefore the timing of benefit) after considering the weight of regulatory and legislative change that is required to enable DLT to fulfil its potential. One top UK Asset Manager had “expected the full impact of Distributed Ledger Technology to be felt in 5-10 years. However, we are now revising our view on the basis of the likely timescale for regulatory change”. This is despite a belief on the Manager’s part that the Regulators’ approach is supportive. A Service Provider echoed this view: “Earlier, we did think 5 years <for significant change to take place>, but we have now seen the real impact of the drag of regulation. A routine update to the ISO 9001 standard took 4 years, so the weight of change required for Blockchain can be expected to take a considerable time.”

One Manager went as far as to question the industry’s ability to cooperate unless Regulators played a proactive role. They were: “unsure of the cooperative value-add unless Regulators mandate that certain actions in a security’s lifecycle must be performed by unrelated legal entities. Otherwise competition and disintermediation / amalgamation look more likely than cooperation.”

It is widely understood on the Buy-Side that DL technology, and Blockchain in particular, have much to offer to Regulators, in particular in delivering increased transparency and an enhanced capability for oversight. Many respondents observed that ‘self-service’ access to a permissioned ledger would benefit the Regulators; a major Manager saw “real benefits, including improved transparency for Regulators”; another Manager said that “Permissioned access to Blockchain transaction data for Regulators would allow them to be proactive in investigation and reporting”. A third respondent reported that “<We> believe that regulators should welcome the Blockchain approach because it will give them access to clean data on market activity (inter alia), without any dependence on managers and brokers to construct reports. It should therefore be both faster and less prone to manipulation”.

Beyond reporting, the Buy-Side sees other benefits of DLT for Regulators. One Manager pointed out that the technology “can have material influence on KYC, AML and terrorist financing, which would suggest DLT has potential to gain regulatory support”. Another observed that DLT use-cases in best execution should be attractive from a regulatory standpoint.

Asset Managers want their Regulators absolutely to embrace the technology, and to work out the consequences of the Distributed Ledger and Blockchain models for established and future regulation and legislation. This goes beyond the reported feedback to the FCA consultation paper[18], which was not Buy-Side specific. That feedback suggested that “current FCA rules are flexible enough to accommodate the use of DLT by regulated firms and no changes to specific rules were proposed”.

[18] Feedback Statement on Distributed Ledger Technology, FCA 15th December 2017

However, our Buy-Side respondents widely expressed the need for proactive support and clarification from our Regulators, including:

- Facilitating off-market liquidity discovery and peer-to-peer trading;
- Clarifying the status, legality and enforceability of smart contracts;
- Working with vendors to specify the form of a repository of trusted, versioned smart contracts;
- Defining settlement finality in the context of real dematerialisation, including the acceptable form of resolution mechanisms for smart contract and settlement disputes;
- Legitimising self-service reporting for trade, compliance and regulatory reporting;
- Removing mandated clearing where settlement is on-ledger;
- Clarifying the status of cryptocurrency as the cash side of on-ledger settlement;
- Facilitating the issuance of Central Bank / fiat currency on Blockchain;
- Defining the criteria for participation in a ledger (like a common asset register) which constitutes a public record;
- Eliminating / refining the defined roles of Custodian, Trustee and Depository where shared asset registers displace / impact them;
- Legitimising the sharing of data across borders via Distributed Ledgers; and
- Clarifying how requirements (of GDPR, for example) for the deletion of personal data should be interpreted in a Blockchain context where history is (or should be) immutable.

There is a symbiotic relationship between regulatory progress and Buy-Side investment: as these points are successfully addressed, the Buy-Side will find it more and more straightforward to justify investment in Distributed Ledgers, as the benefits that they project will be less and less constrained by the effect of regulations drawn up in a different context and for a different era.

No one, including the Regulators themselves, wants regulatory inertia to become the main disabling force on the roll-out of DLT, preventing the industry and its clients from benefiting from the potential of the technology. At a time when Regulators are demanding that the investment industry should provide materially better value to its clients, it is in the clear interest of all parties to ensure that the regulatory environment is conducive to the delivery of that value, and supportive to the new business models which can help to deliver it.

## Support from Service Providers

The Buy-Side has embraced outsourcing to a far greater extent than the Sell-Side, and this has led to a large number of close, dependent relationships between Asset Managers and their Service Providers. It is inevitable that Managers will have a dependency on their Service Providers to deliver a material fraction of the benefits available from DLT.

Asset Managers do recognise that there are benefits from Distributed Ledger Technology which are specific to the Service Providers themselves, and that there are also use-cases which offer distinct benefits to Payment Banks, Custodians, Administrators, Transfer Agents, Accountants, Registrars etc. These may not be use-cases that are directly beneficial to the Buy-Side. Managers expect that their Service Providers will run their own DLT strategies, and will naturally pursue developments that have the most benefit to their own businesses. Where this is the case, then Managers will be supportive,

so long as the business benefits to the Service Provider result in improved capabilities, enhanced service levels and / or cost reductions to the Manager.

There is a concern among Managers that Service Providers may be reluctant to promote or adopt Distributed Ledger Technology, as it could lead to a convergence of operating models, and thus to the further commoditisation of pricing. However, it is a straightforward consequence of outsourcing that many of the benefits of DL technology to the Buy-Side will be delivered through Service Providers, rather than through direct development by Asset Managers. As a result, it is manifest that the Service Providers have a wider responsibility, beyond the pursuit of their own internal initiatives, and must support use-cases which directly benefit their Buy-Side clients.

So, for example, the achievement of real dematerialisation and asset register rationalisation requires strong cooperation from Depositories, Banks and Custodians. Similarly, for exploitation of Blockchain internally to Transfer Agencies, the TA will deliver the benefit. There is a clear need to ensure that the benefit of DLT is passed on appropriately from the Service Provider, and that the interests of the Asset Manager (and of the ultimate clients), are fully accommodated in the shaping of the enabling developments.

There are a number of examples already in, or close to production where Service Providers have delivered projects with real Buy-Side benefit. These include the Northern Trust implementation for Private Equity fund administration, based on Hyperledger Fabric, and delivered in cooperation with IBM.[19] HSBC is also believed to be close to launching a Blockchain-based proxy voting platform, shortly to go live in APAC.

The Buy-Side wants its Service Provider partners to articulate a clear policy on DLT, and to commit to support initiatives that deliver strong benefits to their Asset Manager clients. Such a policy would provide clear answers to the following questions:

- What will they contribute directly to support the delivery of Buy-Side use-cases, even where their own direct commercial interest is limited?
- What resources and facilities will they make available for collaborative projects with Buy-Side clients?
- What changes do they envisage in their service models, to take account of changing priorities and service demands as DLT progresses?
- What new services and capabilities do they envision, to exploit and maximise the benefit of DL technology for their clients?
- What cost savings will they pass on to their clients from their own DLT initiatives?
- What service level improvements will they deliver to clients, arising from their own DLT initiatives?
- What industry and regulatory initiatives do they intend to participate in and at what level?

As disintermediation drives a proportion of the significant benefits of DLT for Asset Managers, it is inevitable that Service Providers will be concerned over the impact of DLT on their future business models and revenue flows. The Buy-Side wants to see its Service Providers and other partners and Counterparties working constructively and cooperatively to deliver a more efficient value-chain for

[19] See https://www.northerntrust.com/about-us/news/press-release?c=70b5ba1adc9928f9977162844c34f57a

the industry, rather than to protect the status quo and to defend their current functions and revenue streams.

Where Service Providers are supporting functions at risk from disintermediation or decentralisation, then they should expect to have to change their business models over time, as implementation of DLT spreads. Good examples include services around reconciliation, trade matching, and the maintenance of parallel asset registers, which should decline in significance as these functions are made increasingly irrelevant.

The Buy-Side expects that there will be widespread benefit from more efficient transaction and data management which DLT can facilitate, and that this will increase the potential scale of the market for all participants. The Buy-Side wants this market expansion and needs the dramatic reductions in cost which DLT can facilitate. If Service Providers take a defensive position, then they will increase, not decrease the risk of their own marginalisation, and they will open the door to more innovative entrants

## Support from Platform Vendors

There has been little activity in DL technology to date that has been motivated or driven by the Buy-Side's established platform Vendors. A few Buy-Side Vendors have appointed a manager to lead their thinking in the area, and there are isolated instances of Vendor-led developments (like Multifonds' initiative in Distribution), but many are spectating at best. Little or no intellectual direction has been added to the DLT opportunity by the Buy-Side's current Vendors, despite the potential for early-mover advantage.

From the perspective of their Asset Manager clients, the established Buy-Side Vendors need to determine their approaches to five fundamental questions:

1. What (if any) new products are they going to deliver that specifically exploit DL technology, facilitate new business models and facilitate transformative change for the Buy-Side?
2. How (if at all) are they going to modify the workflows of their existing products to deal with the reengineered client processes and disintermediation of established entities that are facilitated by DLT?
3. How (if at all) are they going to exploit the potential of DL technology to the architectural benefit of their existing products?
4. How (if at all) are they going to reengineer their management of data to inter-operate with DL platforms and consume data from DL-based services, rather than accessing their own self-contained (best-of-breed) data stores?
5. How (if at all) are they going to change their commercial models to take account of the radically-changing priorities and values of the functions that their platforms support?

Asset Managers expect their Vendors to articulate product strategies which answer these questions. Currently, few Vendors are doing so in any focused way, and most are essentially sitting on their hands. A major Service Provider highlighted the central need for involvement and investment from the key Buy-Side Vendors, but regretted that they "had not seen much push from their side to date". One of those Vendors typified this view, confirming their conviction that "initiatives should be client-

driven, not Vendor-driven, so we are awaiting client partnerships". In other words, they (like most others) are waiting for clients to tell them what to do, and to pay them for doing it.

There is a classic stand-off here, which needs to be broken on both sides. Buy-Side clients would be more inclined to sponsor change with their established Vendor partners if the Vendors were:

- Contributing proactively to the development of DL technology;
- Adding design, insight and intellectual property to the evolution of the industry; and
- Articulating clear product strategies.

On their side, the Vendors point to a lack of clear guidance on DLT from their Asset Manager clients, and the resultant difficulty in framing a business case for development. However, the rationale for inaction, that direction and priorities are not clear, is wearing thin, and will become thinner over time: the emerging Buy-Side consensus documented in this paper is becoming strong enough to support the definition of credible Vendor product strategies for DLT.

Some Managers are positive about interaction with Vendors, see the need to break the stand-off, and understand that Vendors need clear business direction. One said: "Asset Managers should be far more involved in the design and specification of solutions, <but it's also essential that> Vendors commit to DLT. To wait for the Vendors is dangerous as Vendors will often deliver a robust, technical solution but not one that has total merit in the commercial world of the Asset Manager".

While the stand-off persists, and in the absence of self-motivated initiative from their existing Vendors, Asset Managers are looking increasingly to FinTechs to support their exploration of DLT and Blockchain, among other digital directions. FinTechs have had, and continue to have a material impact on other areas of Financial Services, including lending, capital-raising, insurance and pensions[20]. Asset Managers seeking transformational change may also be tempted to turn to new entrants of a different kind, and pursue partnerships with large-scale innovators like Google, Apple, Facebook or Amazon.

There is a clear threat to the dominance of the established Buy-Side platform Vendors: if they fail to treat DLT as an opportunity, then the evolution of the technology could make them increasingly redundant. Established Buy-Side Vendor products could become seen as the new legacy technologies, and as prime targets for retirement in a business increasingly moving to a service architecture.

## Support from Standards Bodies

Distributed Ledger Technology is a relatively new space in which formal industry standards have yet to emerge. There are multiple developing approaches with their own adherents, but no defined and documented standards with any realistic level of common acceptance. The absence of standards hinders inter-operability between DL networks, and makes the task of vendors more difficult in preparing their platform to interact with DLs.

[20] Disaggregating FinTechs - Brighter Shades of Disruption – Deloitte Centre for Financial Services 2016

ESMA recognises that the key challenges of DL deployment include interoperability and the use of common standards: "If DLT deployment is gradual while several DLT networks co-exist, DLT-based systems will need to be able to interoperate with each other and with legacy systems. This will require harmonised technology standards and possibly the use of a universal standard for reference data…Efforts to establish technology standards are underway with some market initiatives but it remains to be seen whether they will be successful…"

Buy-Side players also recognise the lack of mature standards, and the detrimental impact that this has on inter-operability and the roll-out of the technology. Multiple respondents highlighted this, including one Asset Manager, who observed that "disabling / delaying factors will include…<the lack of> Vendors' inter-operable blockchains". A FinTech participant asserted that "the primary disabling factors <include a> lack of established standards for Distributed Ledgers, and interoperability between Distributed Ledgers". All categories of respondents essentially shared this view, and a Service Provider echoed that: "key disablers will include…the ability to deliver inter-operability across the necessarily diverse Blockchains".

In the absence of mature standards to facilitate top-down design, approaches to inter-operability are unsurprisingly fragmented. Some players are trying to set de facto standards by launching platforms for inter-operation, while others (like SETL), believe that the emergence of private chains will create the requirement for communication, and that this will be satisfied as a natural bottom-up process.

Primary current strategies include:

- Vertical approaches, where the business application is integrated into a proprietary DL fabric, e.g. Digital Asset, SETL, Paxos;
- Horizontal fabrics, where the dominant candidates are open source, e.g. Hyperledger Fabric, R3's Corda and the Enterprise Ethereum Alliance (EEA)[21]; and
- Application providers who offer multiple fabric options (e.g. Otonomos).

To make the matter more complex, some primary vertical developers (including Digital Asset), recognise that inter-operability is key, and are also developing approaches to inter-operation and open-sourcing alongside their proprietary fabrics. The complexity of inter-operation increases project costs and damages the business case for proposed initiatives. The diversity of approaches makes it more difficult for Buy-Sides to adopt DLT, as project sponsors need to make decisions between competing technologies, often without feeling confident that they know enough to commit, and worrying that they are making an unsupported bet. In those circumstances it is an easy choice to delay participation.

It is transparent that, as adoption becomes more widespread (and indeed to facilitate adoption becoming more widespread), DL Technology needs a standardised approach which will:

- Reduce fragmentation of approaches;
- Facilitate interoperability;

[21] Participation in the three largest open source communities averaged roughly 100 participants at the end of 2016: Hyperledger Fabric had around 140, EAA 80 and R3 70. The next level down was a significant drop.

- Provide a realistic target for platform vendors;
- Reduce project risk; and
- Reduce the costs of development, support and operations.

To achieve this we are dependent on an appropriate and effective initiative being put in place, either by the existing standards bodies (ISO, the Fix Trading Community, SWIFT, ISITC, ISDA…), or by a new body specific to Distributed Ledger Technology. The Buy-Side will be supportive to any such initiative, provided that it is credible, attracts cross-industry support and engages the existing dominant providers of open DL fabrics.

## The Way Forward

As set out above, the choice of approaches open to Asset Managers to the delivery of benefit from Distributed Ledger Technology is broad. It ranges:

1. From the active - shaping and driving developments to get the benefits that the Manager wants, and facilitating collaboration where necessary;
2. Through delegation - encouraging and supporting existing partners to exploit the technology in their businesses, with the Manager sharing the benefit;
3. To the passive - spectating until someone else comes up with something interesting, with the Manager then trying to climb on board for the available benefits.

Asset Managers need to assess their appetites, resources and expectations of benefit from DLT, and make informed decisions on their approach to delivery. It is important for the maximisation of Buy-Side benefit than a substantial fraction of Asset Managers choose to be in the first camp, or at least to fall between the first two camps. If the Buy-Side opts to sit between the second and third camps, then its future participation will be defined by other parties: it will get what it is given.

Those other parties are precisely the Market Infrastructure providers, Sell-Side businesses and Service Providers whose business models could be changed, shrunk or disintermediated by new business models enabled by DLT: there is therefore clearly a potential divergence of interest. The revenues from which the Sell-Side can carve out investment are shrinking, so over time it will become even more likely that the Sell-Side will focus investment on its own priorities, rather than those of the Buy-Side.

The technology has moved too far, and its potential benefits are too widely appreciated for senior Buy-Side management credibly to plead ignorance or a lack of interest, and to end up doing nothing by default. In order to be able to make such informed decisions, Buy-Side executives need to understand the context. This paper has set out to inform the Buy-Side on DL technology, its risks and potential benefits; however, the responsibility for learning and engagement is with the Buy-Side management teams themselves.

Our partners in the Regulators, Service Providers, Vendors and Standards Bodies are keen to support the development of technology and business models which will benefit them, and which will benefit investors and Asset Owners. To date, the Buy-Side has not engaged in a coherent dialogue, and has not made clear to these partners what it needs and expects from them, in order to facilitate and accelerate the delivery of benefit. This paper has set out an initial agenda for each, and proposed them as a position based on consensus; the Buy-Side more widely needs to determine if that agenda is correct, and change it if it is not. Once the agenda is clear, then active engagement can follow.

Support from our partners is a necessary, but not sufficient condition for maximising Buy-Side benefit-delivery. The Buy-Side needs to put its own house in order too, including:

- Ensuring that executives are sufficiently well-informed on DLT enable them to make efficient decisions on investment;
- Allocating and protecting investment to enable promising initiatives to proceed;
- Recruiting and developing competent resources to enable projects to be productive; and

- Encouraging cross-industry collaboration, where this is necessary for the delivery of benefit.

As well as making coherent demands of its partners, the Buy-Side needs to help them to contribute most effectively. In doing so, it needs to be clear about its own objectives, which would mean providing clarity over:

1. The high priority business problems it would like to solve, that can be addressed by DLT;
2. The new opportunities and business models it would like to pursue, that are facilitated by DLT; and
3. The models of ledger / Blockchain delivery that it is comfortable with.

This paper has identified a set of use-cases under (1) and (2) above, and again proposed them as a consensus position. The Buy-Side more widely needs to confirm its view, and to communicate it clearly. This will help Vendors and Service Providers to tune their product plans, Regulators to prioritise their reviews, and Standards Bodies to expand their scope in the right direction.

To articulate its position on DLT with clarity and conviction, a coherent Buy-Side voice is needed; no such voice currently exists, and engagement is patchy and of variable quality. There is a prima facie need for collaboration through to a single industry grouping, which can curate the Buy-Side's interest in Distributed Ledger Technology, and which is empowered to represent the Buy-Side in its engagement with partners at an industry level.

# Part 2

# Summary of Responses from Research Participants

## Methodology / Questions

Contributors to the research behind this paper were all asked a set of nine questions; their responses were in written form, but they also participated in calls and meetings to discuss and clarify the questions and responses. The questions were:

1. How significant do you believe that, ultimately, Blockchain / Distributed Ledger Technology will be for the Buy-Side, from irrelevant at one end, through materially significant, to transformative at the other end?

2. If you do think that there is significant or transformative benefit for the Buy-Side, how actively involved do you intend to become in DLT / Blockchain, from spectating at one end, through passive participation and active sponsorship, to thought-leading at the other end?

3. If you do think that there is significant or transformative benefit for the Buy-Side, what do you think are the salient attributes of Distributed Ledger Technology that will drive that transformational change?

4. If you do think that there is significant or transformative benefit from DLT / Blockchain, what areas of established Buy-Side process and technology do you think will be impacted and require material overhaul in order to yield those benefits?

5. If you do think that there is a financial benefit for the Buy-Side, what do you expect the main drivers of revenue enhancement / cost saving will be?

6. If you believe that DLT / Blockchain will deliver real disintermediation, which central entities do you believe will actually be disintermediated to the benefit of the Buy-Side?

7. If you do think that there will be a material impact from DLT / Blockchain, do you expect that impact to manifest itself over 0-5 / 5-10 / 10-15 / over 15 year timeframe?

8. If you are already, or intend to be involved in DLT / Blockchain developments, what will be the focus of those developments, what is your development approach (in-house, product, consortium etc.), and in what timescales do you expect to deliver anything concrete?

9. What do you think will be the major obstructions to the widespread acceptance of Distributed Ledger Technology?

The responses to these questions, either from written responses or as noted in meetings, are summarised in the sections that follow. The responses were contributed under 'Chatham House Rules', so the contributors have not been identified and their specific contributions are not attributed. For the purpose of this review, the participants are only identified by the categories of their businesses.

## The Expected Level of Impact on the Buy-Side from DLT / Blockchain

Participants were asked how significant they believed that, ultimately, Blockchain / Distributed Ledger Technology would be for the Buy-Side, from irrelevant at one end, through materially significant, to transformative at the other end.

There are divisions among and within Asset Managers on the level of potential benefit of Distributed Ledger Technology: some parties are more bullish than others. Two managers reported that they had both DLT enthusiasts and DLT doubters in the businesses. On balance, however, there is an expectation that the impact could and should be significant, but that it will be a relatively long time before the full potential benefits are yielded.

One manager thought that, "on a scale of 1 to 10, 10 being transformative…the impact will be 8", while another that "there will be benefit, somewhere between local isolated benefits and transformation". A fixed income Manager foresaw that: "In the long run Blockchain / DLT has the potential to be as disruptive to double-entry book-keeping, as email was to posted mail."

Notwithstanding any differences of expectation about the scale and timing of benefit, there is widespread agreement among managers that the emergence of the technology has prompted a useful and deep critique of existing processes and architecture. It is "good that Blockchain has prompted people to contemplate and talk about fundamental process improvements."

The industry is challenged by the need for dramatic improvement in value for money and pressure for an equally dramatic reduction in cost. DLT has the potential to contribute to both, so long as we are prepared to contemplate fundamental process change, and to eliminate established methods and intermediation. One asset manager summed it up that "the impact of Blockchain / Distributed Ledger Technology will be significant if it happens in a reasonably complete form".

Most conventional Buy-Side platform Vendors are less bullish about the potential of DLT for Asset Managers than the Managers themselves. There are notable exceptions, who are actively investigating the technology and facilitating client participation, but the majority are waiting for their clients to direct them, rather than taking the initiative themselves.

One mainstream Vendor considered that the thought process is as or more significant than the technology, which may be overtaken in time. "The emergence of the technology has prompted <us> to think about things (including the entities that we need, how trust is established, and how immutability is implemented) in a new way. This may lead to systemic changes over time, but delivery could be in a future generation technology, rather than in Distributed Ledgers as we now see them."

Predictably, the emerging FinTech Vendors are more bullish than both the conventional Vendors and the Asset Managers themselves: there will be "major new business models and new product opportunities". They forecast major transformation and expect a high degree of disruption.

However, because they see the new technology as being pervasive over time, they do not expect the transformation to be perceived as revolutionary: it "will be materially significant to Buy-Side, Sell-Side, wholesale, retail and more, until it is so embedded in the way that information is managed and

value transferred that we no longer recognise Blockchain or DLT, just that 'this is how things are done'".

While recognising their value as innovators and change-agents, Managers are generally sceptical about the practicality of the smaller FinTechs creating revolutionary change in isolation, or fundamentally reengineering established process. Real evidence of capability and delivered benefits will be required before Managers become less sceptical, commit to change, and invest in FinTechs as a sector. However, there are precedents in other contexts of FinTechs taking market share quickly and changing the landscape. One cited the experience of the defined benefit pensions market, where the de facto standard for scheme risk analysis has been created by a FinTech start-up.

The Service Providers (i.e. Transfer Agents, Custodians and Administrators) generally expect that the Buy-Side will see some significant change from DL technology: they recognise that there is potential for Asset Managers to benefit from the increased automation, cost / risk-reductions, product innovations and data alignment improvements that are facilitated by DLT: "There are multiple opportunities for Asset Managers to save money. Transfer Agency could be done by Asset Managers, without intermediation. Asset Managers could readily attract new clients if dramatic cost reductions were achieved."

However, they expect that the scale of change experienced by Managers will be less than for the Sell-Side, the banks and the Custodians. Some are even sceptical that the Buy-Side has understood and embraced the opportunity: "the Asset Managers are not interested: they are looking at big data and distribution platforms rather than Blockchain".

The Service Providers are concerned that, without external support, Managers may not be nimble enough (and not have the right technology in place) to interact with the new ledgers and join the new ecosystems: "There has been little or no re-writing of <Buy-Side> legacy systems over the past few years in terms of registers and platforms…Barriers to entry will remain high unless Asset Managers help propel this industry forward through investment in these <FinTech> companies".

Service Providers do not expect change to be driven by the Asset Managers on their own account, and see that their partners have a major role to play. It could require a combination of counterparties, banks and Service Providers to deliver adequate platforms, and facilitate real change on behalf of the Buy-Side. One Service Provider is "not sure that the Buy-Side will need to do much as the Sell-Side and the infrastructure players will spend all the money and do the majority of the work".

A major Buy-Side Vendor saw the current landscape as immature and fragmented, but forecast that there would be consolidation among DLT players: "DLT, crypto currencies and indeed the wider FinTech market is very likely to go through what we saw in the late 1990s with e-Commerce, and the early 2000s with dot com: a gold rush followed by a bursting bubble. After the downslide, a few players like the GAFA (Google, Amazon, Facebook and Apple) of FinTech will likely emerge as the true winners, based on a virtuous cycle of re-investment in a small number of players".

Usually, the use-cases that are focused on by the Service Providers are aimed at efficiencies and cost reductions in their own operations, and at the protection of their revenue flows. They are not targeted directly at the delivery of benefit to their Asset Management clients, and the Asset

Managers are aware of this. If this pattern is allowed to develop, then there is a risk that the Buy-Side will never yield the full potential benefits of the technology, and the shape of their participation will be dictated by the Service Providers. Asset Managers need to turn this relationship around, take the initiative independently where they can, and otherwise make coherent demands of their counterparties and Service Providers to deliver achievable Buy-Side benefits.

## The Level of Buy-Side Involvement in DLT / Blockchain Development

Participants were asked how actively involved they intended to become in DLT / Blockchain, from spectating at one end, through passive participation and active sponsorship, to thought-leading at the other end.

It is obvious that the Buy-Side is well behind the Sell-Side in investment in, investigation of and deployment of DL technology: objective measurement is difficult, but from sampling and informal observation it appears that 90-95% of investment in DLT and Blockchain flows from the Sell-Side, and just 5-10% from the Buy-Side.

Within the Buy-Side itself, there are also very different levels of participation. The Asset Managers who have digital innovation teams and laboratories are very likely to have a material DLT activity underway. This may take the form of Proofs of Concept, pilot developments or involvement in consortium initiatives. Such players are normally at the very large end of the scale of Asset Managers, and / or are part of a larger banking or insurance group where senior management includes a digital innovation responsibility. Among these, there are instances of Managers with between 3 and 10 resources working in the field as dedicated DLT experts. Examples include BlackRock, Vanguard and Fidelity.

At the other end of the spectrum, many managers (even relatively large ones) do not have any material activity on DLT. Some are spectating, and waiting to see what happens before declaring a position. Some are taking an active interest, but without any involvement in developments. Some are snowed under with other initiatives, and particularly with Mifid II and other regulatory imperatives. A handful have made an active decision not to become involved at this stage.

Even the most advanced of Buy-Side participants do not position themselves as thought-leaders or drivers of industry change. They describe themselves more as “proactive but cautious” and as “fast followers”. One goes as far as to describe itself as an “actively engaged sponsor”.

While there is disparity in the current level of participation, there is more agreement that, over time, participation will become essential: “…there is a current phase of ‘disillusion’, following early enthusiasm, <but> this is temporary. It is anticipated that downward pressure on costs for end-investors will force action: Blockchain is a strong potential facilitator of cost reduction, and this will be an irresistible attraction”.

Most Managers anticipate that we are entering a period of strong downward pressure on fees and costs, and there is a common expectation that this will lead to a rise in interest in DLT around the Buy-Side. While there is no absolute consensus on its potential benefits, Distributed Ledger Technology is seen widely as one of few tools that could facilitate an order of magnitude change in the cost of investment.

There is a level of interest in participation through investment in relevant FinTechs, and this may provide an appropriate channel for Asset Managers both to engage in the technology and to exploit their investment analysis skills.

Some of the larger conventional Buy-Side Vendors and data providers have investigated the potential of DLT / Blockchain for Asset Management, but have not yet identified any compelling

areas for investment that are Buy-Side specific. They and other Vendors are "waiting to be guided by their clients", which, in reality, means that they are waiting for client funding before committing any resource to Buy-Side Distributed Ledger developments.

Some Vendors (like Linedata) are taking a more proactive view, and are actively encouraging clients to participate in developments and prototypes, but generally there is a level of dependence on partners (like SWIFT and DTCC), who are very active in the space, to keep the Vendors up to date with developments in the technology.

Despite this current lack of Buy-Side focused action among the conventional Vendors, many declare themselves to be willing to participate in future initiatives, should compelling candidate projects emerge which they feel would benefit their products and clients. Typically, one said that they: "would be happy to collaborate with customers and infrastructure providers to ensure their products remain relevant and create the most value possible for their customers. In situations where we (or one or more clients) could galvanise the market to move to a new standard, we would be very interested in supporting (or leading) that initiative".

The real activity among conventional Vendors is concentrated in those with large scale and Sell-Side client bases, like Finastra and Temenos. There are large-scale collaborative developments between the big technology firms (like Microsoft and IBM) and the specialised banking system Vendors. There are also Vendor-led initiatives in trade finance, syndicated loan settlements and securitised bank debt settlements, for example, but these are targeted at trading, payments and settlements in applications that are relevant, but not specific to the Buy-Side.

The FinTechs involved in DLT are split between those whose raison d'etre is Blockchain (like Ripple and SETL) and those (like Aprexo and Finbourne) who are deploying DL technology to the benefit of their products, but in contexts where other more conventional technologies could also support a solution.

The FinTechs necessarily see themselves as thought-leading, as do the consultancies who are active in the space. A number of the larger, established consultancies (including KPMG and Deloitte) have identified DLT as focal, and have established their own development teams. They are strongly promoting the transformative potential of the technology: some major industry forums are led by the consultants, and there is a flow of white papers, alongside a plethora of blogs and threads contributed by developers in the space. Some have described it as "a process of reinvention", which includes reinvention of their own businesses.

The Service Providers to the Buy-Side are often parts of larger banking businesses, and involved in DLT through their parent's digital innovation programme; in any case, the Service Providers are all involved in some DLT / Blockchain trial initiatives of some form. A number are on the cusp, proceeding from prototype to real development, while others are still focused on proofs of concept, and establishing a business case for more committed projects. In a small number of cases (like HSBC's proxy voting prototype), the proof of concept has become reality, and a version has moved into limited production.

All the Service Providers wish to be influential in the development of the technology, to be seen as thought-leaders, and to shape developments. As a result, they are active in working with the

primary consortia and industry initiatives. SGSS, for example, participated in the first round of the Luxembourgian FundChain initiative, and is also exploring similar use cases in the French market.

The Service Providers recognise that their business models and revenue flows could be challenged by Distributed Ledgers, so they are naturally interested parties. One went as far as to acknowledge that "Securities Services businesses are at risk from Blockchain, so they are naturally interested. We will be very involved, and <see ourselves> defining Blockchain applications: we will be an actor in the change".

To date, Asset Management clients have not normally provided coherent direction on DL technology to their Service Providers, or identified the primary use-cases for their attention. The Service Providers have defined their own initiatives, and there is an obvious tension as a result: should DLT be deployed to protect the business models and revenue flows of the Service Providers, or to optimise the benefits deliverable for the Service Provider's Asset Manager clients?

## Transformative Attributes of DLT / Blockchain

Participants were asked what they thought were the salient attributes of Distributed Ledger Technology that will drive transformational change on the Buy-Side. Their most popular responses were:

- Shared access to an identical and secure Distributed Ledger;
- Confidence in the immutability of data history;
- The establishment of peer-to-peer trust;
- Encoding of complex terms and life-cycle events through smart contracts;
- The creation of secure identity records; and
- Permissioned access within private ledgers.

Among Asset Managers, there is strong consensus that shared access to an identical and secure Distributed Ledger is the key driver of DLT's transformative potential. Having total confidence that all parties to a transaction or participants in a function are looking at the same data allows us to eliminate reconciliations and replicated data maintenance. Asset Managers see this as a rich potential source of process acceleration, cost reduction and risk mitigation: one Manager identified that "reconciling fund IBOR positions is the major operational overhead <for the business>". The Service Providers, Vendors and FinTechs broadly agree, but there are some who highlight that DLT is not the only technology through which shared access can be provided to common data.

One large Vendor pointed out that: "immutability is not tied to Blockchain, and there are ways to guarantee integrity through a public oracle service from a trusted third party. The trusted third party has the advantage that there is a well-identified point of reference in case of failure". Another significant Vendor, however, sees the immutability of Blockchain data as key: "Blockchain gives participants the confidence that their counterparties own what they say they own, and therefore when they transact, the right parties own what they have bought".

Behind shared access and immutability, Asset Managers and FinTechs expect most benefit to flow from the resulting establishment of peer-to-peer trust, and the opportunity for disintermediation of central entities. One large Manager asserted that: "there are too many places where asset registers are maintained, too many entities maintaining them, and too many peripheral processes driven by this, for example reconciliations. Generally, we should target a reduction of disparate systems and entities, and the elimination of redundant processes across entities".

Unsurprisingly, the Managers' enthusiasm for this is not shared by the Service Providers; one responded: "Total disintermediation of all existing parties will not take place in secure markets due to the involvement of regulators, investor protection, CSDs etc.". There are sceptics among the conventional Vendors too, who see that existing central entities may persist, but in a changed form: "as incumbents work to avoid being disintermediated, the new technology may reduce transaction costs".

The Custodians and Service Providers are particularly focused on the potential of smart contracts. One asserts that: "the proper use of smart contracts can create increased automation through the establishment and execution of business logic throughout many existing processes". Smart contracts are recognised by many parties as a key tool for the automation of complex asset and event

processing (in particular for OTCs and complex loan settlements), and it is expected that the deployment of complex assets in portfolio construction will grow as a result.

Even sceptical Vendors are convinced by the application to complex assets: a major global Vendor believes that "there is a lot of hype and noise around Blockchain, but that there are real applications where the technology will improve existing processes… <we> will pursue specific use-cases and proofs of concept where <we see> value. At present, the focus is loan settlement…".

Secure identity records delivered across a distributed ledger could drive significant benefit in the automation / passporting of Anti-Money Laundering and Know-Your-Client checks, as well as eliminating low value work in data management.

It is widely recognised that entity data management suffers from heavily replicated data maintenance, and a high incidence of poor data quality. However, DL technology is not the only technical approach which can be taken to entity maintenance, and contributors acknowledge that there are central utilities already delivering services here based on relational technology, including initiatives from SWIFT and Thomson Reuters.

Permissioning the access to a central ledger cuts across the ideological principle of 'open Blockchain', but does deliver a capability to open up the ledger to individual clients and regulators, for 'self-service' reporting. Cryptographic security and the immutability of the Blockchain data are seen as important and useful attributes of the technology, but more as necessary enablers than as drivers of measurable benefit for Asset Managers. Some Vendors point out that they already deliver immutability for transaction records through conventional technology.

## Targets for Transformation Among Buy-Side Processes

Participants were asked what established Buy-Side processes and systems they thought would be most impacted by DL technology, and would require material overhaul in order to yield available benefits. Across the contributors, almost all areas of the investment process are seen as being impacted in one way or another, and sooner or later, by DLT. However, the heaviest impacts are expected in:

- Post-trade processing;
- Client on-boarding;
- Asset ownership registers and position management;
- Reconciliations;
- Entity / identity management;
- Corporate actions; and
- Life-cycle event processing for complex assets.

Lower impacts are forecast for:

- Portfolio management;
- Trading;
- Risk / performance;
- Proxy voting;
- Distribution; and
- Fund accounting.

There is strong consensus here: the various groups of participants are generally well-aligned on the areas of impact and their relative weightings.

Asset Managers see the need for DLT-inspired change in trading and in the post-trade process, but at this stage this is not a 'soup to nuts' approach: the current focus is on poorly automated segments of the business, where the 80/20 rule applies, like the processing of loans, OTCs and ETFs, rather than in mainstream equities, where the process is already highly automated. This is the equivalent of the Sell-Side focus on complex cross-border payments, rather than highly automated, high volume and efficient domestic payments.

Ultimately, however, wholesale change is foreseen: "Whole areas of the middle and back office systems, people and processes associated with reconciling, matching and validating data should be retired…" according to one Manager. Asset Managers expect that transformation of the mainstream trade process will follow from the full implementation of dematerialisation, and the immediate settlements that will result. This will change (and improve) the current processes of cash, liquidity and capital management.

The middle office is seen as a prime target for transformation. A fixed income-focused Manager forecast that: "a team of developers managing the API <to a set of data services> is the new Middle Office department." Another fixed-income Manager observed that this applies more widely: "this <replacement of conventional teams with service APIs> could be easily extended to some parts of the investment process itself". The same Manager pointed out that the new crypto-fund asset class

is not a simple addition to the pool of available assets, but is "so innovative and different from existing asset classes that it requires new set of skills and tools at all the different steps of an investment process: from pre-trade analysis, to execution, and post trade"[22].

A prominent Wealth Manager observed that: "where cash becomes an asset, then the multitude of players and services impacted is enormous…there needs to be a great deal more work done in this area." The Wealth Manager asks us to focus on cash transaction as an example: "there are multiple banks, clearing agencies, payment facilitators, etc. involved which adds cost and complexity to just the simple movement of cash. PSD2 and open banking don't directly solve this issue. To accommodate all these players into a DLT solution, even as micro services, is a complex and time consuming task".

For those Managers with an outsourced post-trade process, the change will depend on, and be delivered by the Service Provider. One outsourced Manager observed: "The post-trade process is most likely to be a target for change driven by DLT: it is a relatively easy target. However, from our perspective, this would be pure cost-saving delivered by <our Service Providers> rather than something driven internally".

Managers believe that, over time, the multiple processes which maintain position and ownership data will be rationalised. This is expected to change the roles and relationships of Custodians, Registrars and Depositaries, as well as impacting the Asset Manager's own position-keeping. The delivery of position data is expected to move from existing applications onto a wide-scale service based on a complete transaction ledger: "Fund unit registers and fund registers will probably eventually move onto a Blockchain of some kind, impacting participating organisations, messaging layers and potentially marketing and sales".

Reconciliation processes are expected to decline in number as a direct effect of the rationalisation of asset registers, and should improve in efficiency as the data they draw on is increasingly standardised. A key Vendor expects that "the major impacts to be acceleration in the post-trade process and a reduction in reconciliations".

The management of client / entity / identity data is seen by Asset Managers as a likely target for early change. This is driven by the manually-intensive nature of current processes (obvious examples are client on-boarding, KYC and AML) and by forthcoming regulation: GDPR will bring a sharper focus on identity data management. A cautionary note was added by a Consultancy involved in KYC / AML, who identified "a lack of enthusiasm from the buy-side to place their KYC data with the utilities <i.e. the existing central services run by, inter alia, IHS Markit and Thomson Reuters>." However, they did believe that it was achievable to deliver a DL-based KYC data "to provide better and more consistent data than at present, but with the expectation that each firm will still complete its own KYC checks using that data".

Client reporting, and the extensive data management processes which support it, could be the target for change if we can make a success of permissioned Blockchains, and if it proves culturally acceptable for clients and regulators to access their data on a 'self-service' basis.

[22] See blog at https://medium.com/@etiennebr/so-you-want-to-start-or-invest-in-a-blockchain-crypto-fund-part-i-ii-745eccad3999

Managers, Service Providers and Consultants who are focused on retail management see potential changes in Distribution, and there are multiple proofs of concept active in this space. The focus on Distribution, rather than Transfer Agency, is driven by the relatively high cost impact of Distribution. One Vendor said that "it is hard to ignore the 20-30 bps cost of Distribution (when TA, for example, costs approximately 1 bp)".

As a side-effect of Sell-Side DLT use-cases, some Managers expect to see improvements in the payments infrastructure, and in the execution of foreign exchange transactions.

## Main Drivers of Cost Saving / Revenue Enhancement

Participants were asked where they expected that DLT would be a major source of cost saving and / or revenue enhancement. Their main responses were:

- Disintermediation of central entities, including asset registries;
- Reduced costs of servicing the post-trade process;
- More efficient data management and data sourcing;
- The elimination of parallel data maintenance, including entity and position data;
- Reduced spend on reconciliations;
- Improved liquidity and a reduction in the need for cash reserves;
- Lower costs in client on-boarding, KYC and AML;
- Improvements in collateral management, asset utilisation and yield enhancement;
- A reduced cost of servicing complex assets; and
- Opportunities for new markets and products.

In addition to these major sources of financial benefit, smaller numbers of respondents also identified other headings for cost saving, and revenue enhancement, including:

- The general re-engineering of processes and reinvention of business models;
- Further potential for outsourcing;
- The reduced cost of Client / Exchange / Regulator / Audit reporting;
- The opportunity for new services around digital safekeeping;
- The launch of cryptocurrency funds; and
- Linkage with other new technology, including big data analytics and AI / robo-advisors.

The majority of Asset Managers see cost reductions in the transaction process as a promising source of savings; they expect this to arise from peer-to-peer transaction and the disintermediation of central entities. One manager observed that: “There will be no need to pay intermediaries when you don’t need them”. However, they recognise that this is no cross-asset, cross-market panacea, and that “depending on the asset class and trade, there will still be intermediaries using Blockchain systems, so the commercial relationship remains but on different terms”. Another Manager saw the benefits, but was cautious: “<digitising and trading assets on a peer-to-peer basis> is positive, but we need to be realistic – these are early days for Buy-Side institutions”.

The conviction that there can be significant transaction cost reductions from peer-to-peer transaction and disintermediation is largely shared by the Buy-Side Vendors and FinTechs. One FinTech put a different spin on this, with the emphasis on Service Providers to reduce costs: “<there will be> reduced fees in the transaction process, not through disintermediation, <but rather> through a change in business model for the central entities. Lower costs for them will be passed on to the Buy-Side”. The Service Providers, with an isolated exception, generally do not see this in the same way at all. A representative view from a Custodian / Administrator was that: “the benefits offered <from DLT / Blockchain> will be safety, transparency, security links and not big cost reductions”.

Cost reductions in data management (along with data quality improvements) are seen by most participants across all groups of respondents as both significant and achievable. This benefit results from of a reduction in parallel data maintenance. The target for each Manager is a single set of services in market data, reference data, entity data, transaction data and position data, ideally shared across Distributed Ledgers with external parties. The potential is well-recognised for collaborative market data and entity data services, where members contribute data to the benefit of all consumers. However, this is seen as hard to achieve, as one Manager pointed out, because of "the continuing need for multiple sources of external data, and the lack of incentive for data Vendors to collaborate".

The opportunity to reduce reconciliations is seen by all parties as a welcome source of cost saving and a reduction in operational complexity. Like the reduction in data management costs, this results from of a reduction in parallel data maintenance, and particularly parallel maintenance of asset positions. Having a single set of services in market data, reference data, entity data, transaction data and position data would eliminate most internal reconciliations. If key services are shared with external parties, then external reconciliations would be reduced also. While there is universal recognition that this is a worthwhile aim, its full achievement is seen as unlikely. One Asset Manager observed "we will still need to reach across multiple platforms, so inter-operability, aggregation and reconciliation will remain as requirements".

As a part of the digitisation of transactions and the achievement of near real-time settlement, some respondents expect cost savings and operational risk reduction from the elimination of clearing. This is a contentious point as other respondents are worried about the loss of netting windows. One Manager thought that: "Real-time, T0 settlement would be technically possible, but not always desirable as it reduces or eliminates netting in intraday, end of day trading, etc.". Another thought that T0 settlement would become a reality "in unregulated / emerging markets only".

The Service Providers among the respondents are more confident in DLT's potential to facilitate cost savings from improvements in liquidity, and from a reduction in the need for cash reserves. For two Service Providers, these are the major sources of benefit. Asset Managers are more circumspect, while recognising the potential upside; one asserts that: "The reduced need for cash reserves <from T0> is a plus…<and> would be technically possible.", but the "potential liquidity improvement needs to be proven in practice". One larger FinTech warns that: "The technology can improve liquidity… but can also make it worse if used incorrectly, for example with a blanket move to T0".

Position management is a persistent issue to Managers, Service Providers and Vendors alike, and the potential for DL technology to enable improvements is well-recognised across the parties. An Asset Manager confirmed that "we see benefit from improved forecasting and as-of reconstruction through the IBOR use-case". The potential to construct a position management service that could cross organisations is seen as key. The same Manager reports that: "our Service Provider has an ambition to deliver services much further upstream in the investment process, and that this would be facilitated by a Blockchain-based IBOR". Service Providers are similarly enthusiastic about the potential for an IBOR service, delivered by them, and consumed by their clients.

Cautionary notes are sounded by all parties, as this Blockchain-based IBOR technology does not yet exist, and development may be challenging. Another Manager cautioned that "<Blockchain-based IBOR> needs to be proved in practice", and one of the FinTechs pointed out: "the <DL> technology

does not do this, it enables it. On the back of Blockchain, new services will be offered by current intermediaries or new third parties…". Clearly the construction of a live IBOR service, and its sharing across a Distributed Ledger, is a serious design challenge, even with strong enabling technology.

Lower costs of client on-boarding, KYC checks and anti-money laundering are seen as achievable through the exploitation of digital identity. This depends, according to one FinTech on "industry standard KYC processes / tools / utilities <being> in place". Another respondent explains that "the subscriber could have a smart identity, and be on-boarded once by a specialist KYC firm. Some regulators are thinking of creating a special regulated status for KYC firms in order to facilitate this". By contrast, a Consultancy questioned whether the Regulators are really comfortable with central KYC data, as it could "systemise bad data and flawed processes and distribute them". They continue, suggesting that "the benefit to the Regulators of each firm doing its own KYC is that at least that way some of them might be getting it right!".

It is clear that the current primary focus of DLT benefit from Managers is on cost saving, with revenue enhancement in second place. The potential of Distributed Ledgers to facilitate increases in revenue is well-recognised by some parties (particularly the Service Providers), while Asset Managers themselves acknowledge its existence but are less confident in the achievement of meaningful growth.

Within this pattern, there is recognition among Managers that yield enhancement strategies, collateral management and other asset utilisation challenges could benefit from more certainty over cash and more immediate settlement of assets. At some Managers they see "a reduced need for cash to be held as collateral", but this becomes more vague for OTC contracts with long life-cycles. Generally there is a willingness to see that a yield enhancement benefit may accrue, but a scepticism over the scale and timing of that benefit: "Optimised yield enhancement?...possibly. This needs to be proved in practice".

DL technology, and specifically the deployment of smart contracts, offers the ability to automate more of the processing of complex assets, and thus reduce the cost of their servicing. The prize is also revenue generation, through the ability to launch products which are currently impractical, and / or to include complex assets in mainstream investment products within acceptable boundaries of cost and operational complexity. Managers generally recognise this potential, and certainly believe that smart contracts have a role to play in the administration of complex assets: "smart contracts can help in the optimisation of operational asset servicing, for example in the automation of margin payments and income payments". However, another Manager (who does acknowledge the potential benefit) warns that: "<wrapping of complex assets> is very hard to achieve safely".

Potential new products are recognised by the Service Providers too. One observes that: "there is the opportunity for innovation with new products and services – e.g. cryptocurrency funds, with subscriptions in bitcoin etc.". However, the same firm believes that "the inclusion of complex investment products will have a complexity limit". A cash management-focused Asset Manager was particularly positive on crypto-funds, and saw "…the emergence of a new and completely different asset class. While the asset management industry might be lagging or behind the curve on the technology investment, it has definitely embraced this new asset class with enthusiasm. Crypto fund launches this year represent the fastest growth of any hedge fund sector in the industry's history".

There is scepticism from Managers on new revenue generation from access to new markets and market segments. This is alleged to accrue from access to geographic and economic market segments that were previously inaccessible for mainstream investment products because of high cost or insecure markets. A number of Managers do not expect any benefit here, while those who do expect benefit see it as a long way off. A significant FinTech believed that new markets would have a "Low-medium impact, on a case by case client basis, depending on their current product / solution / distribution network".

## Targets for Disintermediation

Participants were asked which central entities they believed would actually be disintermediated if the full potential of Distributed Ledger Technology were to be realised. The parties generally identified by the respondents as the primary targets for radical change and / or disintermediation were:

- Confirmation / matching services;
- Settlement utilities;
- Payment Banks;
- Custodians / Trustees;
- Depositories;
- Registrars / Transfer Agents; and
- Clearing Houses / Central Counterparties.

Other participants, more sparsely, saw as likely candidates for disintermediation:

- Corporate Treasuries; and
- Loan Agents.

The Service Providers, as potential targets for disintermediation themselves, were surprisingly candid about the future for intermediaries. One observed that: "All of the…intermediating entities have the chance of being disintermediated in some way and it is possible that some will be totally removed". They go on to acknowledge that ownership of the technology may be key to survival "…however, it will very much depend on who builds the ledgers. Who builds the ecosystems and changes the business model and so survives in a new form will be key. In essence all of the functions are likely still necessary and…how the technology evolves will <determine> who is left at the table in 5/10/15 years' time".

Value-add is also seen by the Service Providers as central to the survival of existing intermediaries: "If central entities truly only pass data from point a to point b, they are likely to be disintermediated. However, if they add value by netting, underwriting / guaranteeing, intelligence gathering / reporting, etc., they may find a niche (albeit with a changed cost structure)". Timescale is also a significant parameter and real disintermediation, while inevitable, is seen as a long way off: "We view the extent to which Blockchain might cause disintermediation of existing actors to be dependent on timeframe under consideration…With a long enough time horizon we do see potentially much larger and meaningful disintermediation as certain activities and actors become less relevant".

The Regulators too recognise the potential for disintermediation. ESMA, for example, confirmed in a recent paper on DLT[23] that it "realises that DLT may render some processes redundant or change the role of certain intermediaries through time."

Unsurprisingly, most of the FinTechs believe that they can catalyse real change and displace current central actors. One emerging player warns the incumbents that: "vendors for Buy-Side firms should take lessons from Retail Banking and ensure they're part of the continued unbundling that DLT will likely accelerate, as a fragmented market with many participants is exactly where the technical properties of DLT shine."

Another FinTech, however, takes a less optimistic position about their own significance and influence, and admits that: "Financial institutions…play vital roles within financial markets and are trusted to perform certain functions. They will not be disintermediated by Blockchain start-ups seeking to take on such roles. This technology will allow them to do what they do today, but at a lower cost, with less risk and more efficiently." A major Service Provider disagrees, and sees real risk from new players: "These entities <i.e. existing intermediaries> are all trying to be involved in this technology but the risk is that new entrants completely break their model". A further threat is seen by a leading DLT think-tank: "Is GAFAA, not FinTech, the bigger threat: Google, Apple, Facebook, Amazon, Alibaba?".

Across all the groups of contributors, there is consensus that Confirmation Services are caught in the cross-hairs. This results from the eventual implementation of real de-materialisation, and the sharing of ledger entries: when there are no longer two records to compare, then matching will be irrelevant. One Manager predicted: "Ultimately confirmation…utilities (like Omgeo / Alert) will become redundant, but it may take 5-10 years for this consequence to be worked through". A Service Provider was more blunt: "Confirmation services? Gone!".

A multi-product Vendor raised the question of transaction validation in the capture of the relevant ledger entries. "If a single entity submits each trade record to the ledger <how can you> ensure 'trust' here, as only one of the counterparties to the trade submits the transaction, and does so through their own software, which potentially is at risk of being manipulated". There is a possibility of using smart contracts in the validation process, or using a trusted third party of a different form: "there is probably a 'middle-stage'…, which is where a third entity does become (or continues to be) the 'trusted' partner to trading counterparties and takes on the role of submitting agreed transactions for stock and cash to the ledgers". A case of re-intermediation, possibly.

Settlement Utilities, similarly to Confirmation Services, diminish in value as immediate settlement happens through real de-materialisation, and a single central record of the trade delivers an immutable record of ownership of both cash and asset. A prominent FinTech suggested that Settlement Utilities would be ultimately disintermediated, but "only when assets and cash become digitised, and thus settle on-ledger". Service Providers generally do not disagree, but foresee extended timescales for transformational change.

The role and form of Payment Banks is expected to change: clearly if the ledger entry is the payment then there is no need for a separate payment action. According to all groups of contributors,

[23] The Distributed Ledger Technology Applied to Securities Markets – ESMA 7th February 2017

however, this will be a process over the longer term. A major Asset Manager saw that Payment Banks would be "potential losers if / when international payment networks become integrated". One of the FinTechs similarly saw the prospect of change, but not until the longer term: "Disintermediation of Payment Banks? Not until digitised fiat currencies are a reality, in >7 years". Another Manager thought that Payment Banks would "move onto a different type of market infrastructure, but we don't see them disappearing as institutions. To put it simply, something still needs to throw its weight behind a ledger".

Custodians are seen by many Managers as targets for disintermediation. This is for two reasons: the first is the potential for common asset registers based on a transaction ledger to provide a master source of positions across Managers, Custodians and others; the second is the potential for immediate on-ledger settlement removing the need for stock delivery. One Manager typified this view, saying: "Custodians … are at a high risk of early rationalisation and potential disintermediation".

Others see that Custodians may lose their master record-keeping role, but acknowledge that they provide a range of other services that could persist. A Consultancy predicted "a reduction of the Custodian role" rather than disintermediation, "from rationalisation of asset registers and streamlining of settlement". Custodians themselves are predictably less convinced, and see any fundamental change as being a long way off. One commented that: "there may be compression of global and sub-custody but Custodians will remain". Clearly the Custodian (and Trustee) roles are defined and mandated in some very significant regulations, including UCITS; regulatory change would be required before their role could change radically in these contexts.

Depositories, like Custodians, would see their role change or under threat, if common asset registers became established. A Manager predicted that Depositories would be "losers, if they lose their record-keeping monopoly." Another saw the "disruption of Depositories <as> likely. New business models will probably emerge". Again the Service Providers see this change being more distant, and one caveated that, as with the Custodian role, Depositaries were in some cases mandated by law. Legal changes would be required, and disintermediation of Depositories would take place "not until the repeal of legislation". In its recent DLT paper, ESMA's position on this is consistent: it "sees it as unlikely for DLT to eliminate the need for financial market infrastructures, such as Central Counterparties ('CCPs') and Central Securities Depositories ('CSDs')".

Service Providers do, however, see Registrars and Transfer Agents as vulnerable. One made it clear that they saw "the primary targets as the Transfer Agent and the Registrar", while another suggested that "the reduction of asset ownership entities would be a very positive step", but obviously not for the Transfer Agent or the Registrar in their existing form. A plus for Transfer Agents is that their core function does not add a large cost to the overall charges to fund holders: Distribution is seen as a much more expensive activity. Nonetheless, Asset Managers see the potential for change and disintermediation. One Manager described Transfer Agents and Registrars as "losers in a digital environment where reconciliation is distributed and instant", while another thought they too would be losers "if they lose their record-keeping monopoly".

Clearing Houses and Central Counterparties are classic trusted central entities. The model for CCPs and Clearers has only just become pervasive for OTC derivatives, and for some participants it is too soon to consign them to history. One large Asset Manager "has mixed views on CCPs and Clearing

Houses, and we expect any role changes or disintermediations to be further out". However, it is clear that a trusted and secure peer-to-peer transaction model devalues the rationale for CCPs, and that immediate on-ledger settlement similarly devalues the clearing function. By eliminating these actors, the exposure of the market to central players is eliminated, and margining dies out, so there are both financial and risk benefits. Another Manager thinks that these entities will be "losers if Smart Contracts make clearing obsolete". The Service Providers don't disagree, but as usual see change as a long-term possibility, rather than an immediate prospect.

The most unlikely central entities to be disintermediated, according to most respondents, are Broker / Dealers. Trading on a peer-to-peer basis is seen as likely and desirable, but the discovery and provision of liquidity is seen as a service which the market needs in advance of the trade itself. It is not clear to the respondents either how that would happen without Broker / Dealers or how Distributed Ledgers are going to help with an alternative solution.

A major Buy-Side Vendor asserted that "<Broker / dealers> provide important services such as liquidity in return for risk-adjusted return: It is hard to believe that Buy-Side to Buy-Side direct trades do not happen because we don't have Blockchain". Most Asset Managers in the sample agreed. One typically thought that "Broker / Dealers… will be reshaped, but they are unlikely to be disintermediated in the short or medium term".

## Expected Timescale for Material Impact

Participants were asked what they expected the timescale to be for transformational change as a result of DLT-enabled developments, from a short horizon of 0-5 years, through 5-10 and 10-15 years, to a long horizon of over 15 years.

Other than some optimistic forecasts from FinTechs, no respondents expect transformational change from Distributed Ledger Technology in a short timescale. Some parties who were more bullish have started to understand the weight of regulatory and legislative change that is required to enable DLT to fulfil its potential, and have revised their forecasts accordingly.

One top Asset Manager "expected the full impact of Distributed Ledger Technology to be felt in 5-10 years. However, we are now revising our view on the basis of the likely timescale for regulatory change. This is despite a belief that the Regulators in the UK are generally supportive to Blockchain development". A Service Provider echoes this view: "Earlier, we did think 5 years <for significant change to take place>, but we have now seen the real impact of the drag of regulation. A routine update to the ISO 9001 standard took 4 years, so the weight of change required for Blockchain can be expected to take a considerable time."

A Fixed Income Manager, who believes that disruption and benefit will be significant, projected that: "The revolution…will be slow to arrive. The adoption speed of DLT / Blockchain cannot be judged in isolation, it requires consideration together with a "host" or "carrier" technology. A candidate to be such a carrier technology are cloud-based micro-services."

There is some impatience with the disabling forces that push benefit out into the future, and a sense that the technology is more ready than the culture. Another Fixed Income Manager believes that "the technology could be ready (e.g. Smart Contracts) in 2-3 years, but will be delayed for years by regulatory approvals and rear-guard action fought by vested interests, until a tipping point arrives." Another sees cultural change and emergent technologies coming together to deliver change: "It could be like the New Economy of 1998/99 which only realised its promises in the 2010s when smartphones delivered mobile internet, social networks and e-commerce."

Participants highlighted the general tendency of the Buy-Side to accept and adopt new technology very slowly. One specialist Manager observed that "it took 15 years to establish Calastone, when BNP were looking for distribution" and expected that the more radical innovation offered by DLT would take a long time to be accepted by the industry.

The next 5 years are seen generally as a bedding-down period for technology and regulation, and the Asset Managers and FinTechs among the respondents are the more optimistic groups on what will be achieved over that next period. A typical contribution from an Asset Manager predicted that "elements of new market infrastructure <will be delivered> in 0-5 years. Significant transformation will follow". A prominent Service Provider was more circumspect, restricting the expected scope of change to technology: "technology developments and transformation will be done inside of 5 years".

A Buy-Side Vendor echoed the idea that the next five years will be exploratory, but thought that cultural progress would be made too: "the next 5 years will remain experimental / not mass market other than in specific niches. We will get regulatory clarity, legal precedent, and tech maturation in

that time frame. Beyond that will come more mass adoption". Another Vendor reflected the same sentiment: "Yes, there is plenty of momentum in terms of large firms researching Blockchain, but there are relatively few opportunities for a Buy-Side Asset Manager to actually use a Blockchain based technology within their business, so we have another 3-5 years of pure 'innovation'".

Most FinTechs expected change in the short / medium term, and one particularly emphasised the importance of the immediate future in shaping the direction of development: "In any world where a material amount of value is moving through DLT technology, there will be large implications for how many market participants remain and how much value each of them capture out of the end-to-end value-chain; the next two years are critical in establishing those who will win big and those who will be blindsided."

One FinTech stood out from the others, with a view that "technology will need to mature for enabling required features, such as permissioned DLT, and capacity increase before more fundamental change can happen. So it will be 5-10 years before we see transformational change".

For Asset Managers and Service Providers, 5-10 years is the favoured timeframe for material change. A prominent Manager explained: "We expect to see progress over the next 5 years, with widespread adoption in the 5-10 year timeframe". Another Manager had been reading from the same script: "We expect elements of new market infrastructure in 0-5 years. Significant transformation will follow in 5-10 years". Managers are naturally concerned how to get quality attention and consistent funding for such a long-term play; one smaller Manager observed that 5-10 years was "beyond the effective planning horizon of most small / medium sized businesses".

The Service Providers were in the same region, but somewhat less optimistic. One skewed the forecast to the end of the timeframe: "We now expect significant impact in the 5-10 year window, and more precisely 8-10 years". Another projected that it would take "5 to 10 years for the infrastructure to start to develop. A little longer for it to become the standard ecosystem."

A couple of Managers and Service Providers, most of the Vendors (but none of the FinTechs) believed that fundamental change would take 10-15 years. One of the Managers in this category added a caveat: "We now expect a timescale of 10-15 years…<but> some material impacts (like KYC) could be delivered much more quickly." A Service Provider set out a vision of fulfilment over an extended timescale: "Over the longer term (5-10-15 years), we expect to see the truly distributed model develop where multiple parties (Buy-Side, Broker, Custodian, Regulator, Clearing House, etc.) sit on a Blockchain network and facilitate the movement of a digital asset."

The Buy-Side Vendors were the least optimistic among the respondents. A representative view from a Buy-Side Vendor was "Overall, our view is that Blockchain is an evolution over the longer-term. Given the complexity of institutions, the need for critical mass participation and the current immaturity of solutions, we expect the timescale over which Blockchain will deliver significant change in developed markets to be long: maybe 10-15 years". Two other Buy-Side Vendors believed that it would take over 15 years for fundamental change to take place.

A FinTech highlighted the risk that springs from such an extended timescale, in an industry where management often focuses on shorter-term priorities: "It's clear from the research and industry communications that the Buy-Side should consider the opportunity/threat of DLT with more urgency

than they have historically done. Presumably, the estimate that this technology will take 5 to 15 years to fully show its benefits has contributed to the lack of urgency to date; however, the next 5 years is precisely when the foundations will be set for who the winners and the losers in the industry will be, making it a dangerous time to act passively."

## Focus of Current Buy-Side Projects

Participants were asked what DLT / Blockchain developments they would be focusing on in the next year, what their approach would be to these developments (in-house, product, consortium etc.), and over what timescales they expected to deliver concrete results.

Buy-Side projects range across the emergent technologies and platforms in the Distributed Ledger space. Technologies on which current and immediately planned Buy-Side projects are based include:

- Hyperledger Fabric;
- BigChainDB;
- Ethereum;
- Corda;
- SETL; and
- Ripple.

The involvement of the Buy-Side with commercial developments, consortia and industry initiatives is similarly wide-ranging, and includes:

- Digital Asset;
- Enterprise Ethereum Alliance;
- Fundchain;
- FNZChain;
- Iznes;
- Paxos;
- PTDL (the Post-Trade Distributed Ledger Group);
- R3;
- T0;
- The DTCC Advisory Board ; and
- The Linux Foundation - Hyperledger Project.

One actively-engaged Asset Manager reported that they had projects underway with “a mix of in-house and external input, with development timescales ranging from few months to 1-3 years”.

Predictably, all of the Service Providers and FinTechs had active projects underway, and plans for an increasing level of activity over the coming year. At the other end of the scale, a handful of Asset Managers and a material number of Vendors had no active Buy-Side DL projects in train. All claimed to be interested and prepared to become involved, but that interest had not yet translated into practical initiatives.

One very large Vendor reported that, while it had no Buy-Side DLT activity underway, it was on the look-out for potential development areas. It had “considered some promising directions, including the use of smart contracts in loan processing, but felt that this was adequately covered by other initiatives: there was no added value in our kicking off a parallel initiative”. Others described their position as “active spectating”, while one bluntly admitted that it had “no concrete plans”. A typical stance was articulated by one Vendor as a belief that “<DLT> initiatives should be client-driven, not Vendor-driven, so we are awaiting client partnerships”.

Most current Buy-Side initiatives are essentially prototypes, proofs of concept or small-scale pre-production developments. In a small number of cases, the developments are part of a larger consortium initiative with production ambitions. The views of the participants on consortia were mixed: some viewed the Buy-Side working groups of the primary forums as 'talking shops'. Others were concerned that the large consortia (and other client-funded developments) were Sell-Side dominated. One comment from a Vendor was: "there needs to be an independent approach, where parties that have a stake in the value-chain must work together….not like <the current main consortia> where it is driven and forced by the Banks – but more like an open source model (e.g. Apache Foundation) where an independent group create and manage a roadmap for use cases and development".

Some participants saw emerging markets as the obvious starting point for Buy-Side DLT prototypes and wider initiatives. A Wealth Manager asserted that: "an emerging market prototype (proof of concept) jointly owned by a number of industry participants is the way forward …an emerging market concept with regulatory involvement seems the logical approach. The FCA's 'sandbox' and Innovate team's involvement would surely create the desired participation and drive the best possible outcomes…the Regulator would welcome the opportunity to participate and this could potentially answer managers concerns <over regulatory friction>".

The range of application areas of current Buy-Side DLT projects is wide and well-distributed. The following gives a league table of the most popular target business applications by a simple count of active projects, and the categories of respondents who are pursuing them.

1. 15-20% are in the Position Management / Asset Register / IBOR space. There are primary participants among Asset Managers, FinTechs and Service Providers;
2. 10-15% are in Secure Identity / KYC / AML. Again there are participants among Asset Manager, FinTechs and Service Providers;
3. 10-15% are in Regulatory Reporting. There main participants are among FinTechs and Service Providers;
4. 5-10% are in Smart Contracts. The participants are predominantly Asset Managers;
5. 5-10% are in Post-Trade Automation. Again the participants are predominantly Asset Managers;
6. 5-10% are in Syndicated / Complex Loans, with participants among Asset Managers, Vendors and Service Providers;
7. Up to 5% are in Transfer Agency. The main participants are Service Providers;
8. Up to 5% are in Payments / Transfers. The participants are Asset Managers and Service Providers associated with wider banking businesses.

Other than these, there are multiple more isolated target business applications, generally (but not exclusively) being pursued by Service Providers. These include:

- Trading / Crossing;
- Crypto-Securities;
- Reconciliations;
- Fund Accounting;
- Proxy Voting;

- Distribution;
- Securities Lending;
- Collateral Management;
- Cash Management;
- Reference Data Management; and
- Loyalty Cards for Retail Clients.

## Major Obstructions to Benefit

Participants were asked what the expected would be the major obstructions to the widespread and timely acceptance of Distributed Ledger Technology.

It is clear that there are significant disabling and delaying factors, which can push, and are pushing the Buy-Side benefits of DLT further out than we would like to see. This extensive list of issues includes:

- Regulatory friction;
- The need for updated legislation and cross-border alignment;
- Technological immaturity – current performance and scalability constraints in DLs;
- The need for an efficient trust mechanism which is not computationally heavy;
- The need for a critical mass of cooperative participants, across business types;
- The lack of rationale for an individual firm to invest in developments which are distributed;
- The maturing of a model of incentives for collaborative behaviours in a non-currency DL;
- The absence of standards and the consequent difficulty of inter-operation;
- The existence of deep vested interests with heavy investment in the status quo;
- A poor understanding of the technology among key Buy-Side executives / decision-makers;
- The limited and expensive resources available to deliver real projects and developments;
- The hump of investment required, with uncertain business cases and extended timescales;
- The questionable acceptability of crypto-currencies and on-ledger settlement;
- Continuing concerns over the security and hackability of Distributed Ledgers;
- The inappropriateness of public ledgers in the context of Buy-Side confidentiality;
- The need for clear responsibility models, so fixing of issues can be rapid and effective; and
- The need for an efficient facility for encoding of smart contracts.

This is a long list. In moving towards the adoption of DL technology, the Buy Side needs to confront these multiple factors head on. There is a high degree of consensus on the primary hurdles, from across all categories of Buy-Side respondent. We need to enlist the support of our Vendor partners, our Service Providers and our Regulators in order to find credible solutions to what are very real obstructions.

### Regulatory Friction

The need for regulatory change is top of the list of the causes of delay. For one particular Manager and a Service Provider, concerns over the weight of regulatory change required has caused a reassessment of timescales, and they have revised their expected timing of material change from DLT upwards by 5 years. A typical Manager just sees that “the need for enabling regulation is a critical delaying factor”. Managers do not see this as a short term issue: “legal and regulatory uncertainty is a key issue, especially across jurisdictions. This is likely to endure for quite some time”.

There is no general sense that the Regulators are hostile to DL technology: the problem is the weight of change required across multiple regulatory frameworks. A Vendor observes that “regulation will…have a braking effect…as there is no really good model for regulation of a totally global / cross-border technology such as Blockchain, and there are some fairly high barriers to entry”. Another

Vendor sums up the dependency of the industry on action by the Regulators: “Regulators…must facilitate and encourage deployment if DLT is to succeed”.

Managers want Regulators to expedite their involvement, and are impatient for the revision process to start in earnest. One Asset Manager thinks that “Regulators are only just engaging”, while another cites “the questionable value some recent regulations such as EMIR have delivered” and sees it as “unlikely <that we will> see Regulators acting swiftly on DLT”. A further Manager agrees with the need for a constructive engagement with the Regulator, but “I am doubtful of real material change in regulatory position in the medium term”.

It is seen as a potential anomaly that Regulators should simultaneously pressure Managers to deliver better value for money, but also constrain them, through the enforcement of out-dated regulation, from deploying the most promising cost-saving approaches. The pressure to improve value will be intensified as a result of legislation mandating pension savings: where contribution is compulsory, Government is likely to set a fee budget. [24]

### Legislative Change

Legislative changes are seen as essential to the success of DLT and also as likely to cause delay in deployment of the technology. The status and enforceability of smart contracts is a popular theme: a large US-based Manager thought that: “the major inhibitors include...smart contracts, which need to be legally enforceable”. Another theme picked up by multiple participants is the interaction of immutability and the legal requirement for record deletion. A Vendor was concerned that “it is not clear that the Regulators will accept that deletion of a key is the same as deletion of data”. Another Vendor was worried about both: “We need regulatory and legal thinking to catch up - a contractual framework which recognises immutability and legitimises smart Contracts is essential”.

Overall there is a widespread concern that existing regulation and legislation mandates a pre-Distributed Ledger model of financial markets. As part of this, it solidifies the existence and roles of parties that need to change radically in a DLT world. One Vendor sums this up as “The regulatory framework that exists today underpins the existing centralised, trusted and guarded model of securities processing. Unwinding this would take years and cross-jurisdictional cooperation – which is also not very easily achievable”. The same Vendor goes on to list some relevant regulations which would need to change, with dramatic effect : “Think about the SEC regulation that supports DTC in the US, or CSD-R in the EU which mandates T2S. Think SEPA and Target2. Think CCPs and EMIR/AIFMD/Dodd-Frank!”.

A Service Provider less dramatically sums up what the industry needs: “Legal certainty requires the creation of a harmonised set of rules setting out the rights, obligations, protections, and enforcement of laws for investors and financial intermediaries with assets on the DLT”.

### Technological Immaturity

Wherever Blockchain is discussed, the performance and capacity limitations of Bitcoin (and its hunger for processing power) are bound to be mentioned. The research participants were no

[24] Australia already mandates 9.5% superannuation from employers, and the UK is following suit with mandatory pensions. This will grow an increasingly significant pool of assets for Managers. Deloitte projects that Australia’s superannuation pool will grow to $4 trillion within 10 years, and reach $9.5 trillion by 2035.

different, and many made reference to constraints of performance, scalability and technology. A prominent Asset Manager acknowledged that "scalability is an issue: in the classic Blockchain model, every node does everything in parallel, and this makes it computationally very heavy". A Buy-Side Vendor echoed this: "we see scalability as a major issue for the processing of fundamental transactions at the point of trade; there is a 14 second latency for locking blocks in Bitcoin". Even a FinTech questioned the technology, saying that: "the technology itself is not mature - nor proven at massively high volume / throughput".

While there are legitimate concerns over the maturity of the DL technology, it is clear that recent progress has been strong, and there are expectations that this will improve equally strongly over the relatively short term. There is considerable focus from the major developers of DL platforms on resolving the issues of performance and scalability. For some, like SETL, the ability to carry high volumes of transactions is key to their proposition, and they claim to have resolved the central issues.

A Service Provider highlighted the relatively low volumes of Asset Management transactions compared to Sell-Side flows: "the level of transactions and scale required for the fund management industry is small in comparison to equities. UK wholesale messages are approximately 200,000 per day; by comparison Hyperledger Fabric can currently perform 200 transactions per second, 12,000 per minute, 120,000 per hour or 960,000 messages per 8 hour day. Obviously peak time traffic management will be important".

A Vendor was optimistic, while acknowledging current state limitations: "Technology should not be a major hurdle, although there are current challenges around performance and scalability". A Service Provider shared the sentiment: "Technology hurdles still exist, but the technology will mature as more resources and investment become committed". More directly, a FinTech / Consultancy asserted unequivocally: "we believe that the primary obstacles to roll-out of DLT will not include technology…".

### Efficient Trust Mechanism

Multiple participants pointed out that the trust mechanism deployed for Bitcoin, based on proof of work, while it may be effective in that context, is computationally wasteful: it consumes computing resource heavily, and acts to limit the capacity and performance of the DL. We need to develop mechanisms for trust that are both effective and efficient.

### Critical Mass

It is well-recognised that the achievement of wide-scale change in transaction processing and position management requires a critical mass of participants to come together, and to force a market alignment targeted on the maximum delivery of DLT benefits. A major Manager asserted that "success depends on participation – firms are not isolated, not even the largest: buy-in from multiple players is essential". Another manager emphasised the importance of "the market alignment required to maximise the effect of a shared Blockchain – i.e. new business models to benefit from T0 and no reconciliations". A DLT-focused FinTech saw "the need for a community / ecosystem to take Blockchain forward, as against isolated and protectionist individual firms".

For the KYC use-case, convergence across firms is seen as challenging. A Consultancy with strong involvement in AML questioned whether it would ever be practical to have all checks completed and passported from a DL platform, because it would "require all firms consuming the KYC to have the same AML risk appetite and the same KYC policies. That is VERY unlikely and this issue has been another hurdle the <existing> KYC Utilities have failed to overcome...players in the financial services markets differentiate themselves by different levels of risk appetite, and AML risk appetite is simply one of those differentiators".

The value proposition of wide-scale Distributed Ledgers relies on ubiquity. The value is not so much in the ability to execute individual transactions, but in the liquidity and transparency created by having all (or nearly all) participants transacting all (or nearly all) transactions on a single network or market-place. One larger Vendor observed that: "when creating a trading or settlements DL, the value only appears when you can do nearly all trades or all settlements for that particular asset class or geography …on that particular DL".

The Vendor compares this benefit of ubiquity to the benefit of having "just one LinkedIn (that benefits from having all professionals and all head-hunters on it), <or> one Google Maps (that benefits from having better traffic data)". Prior to achieving ubiquity, even if the per deal cost of the DL is lower than the alternative, that benefit could be negated by the fact of having to have two alternatives ways of achieving the same thing. The Vendor concludes: "So, 'network effect' is an important topic, and, once it becomes clear that a DL or approach is likely to achieve that, then it is likely that there will be a near monopoly for the winner, as for LinkedIn and Google".

An Asset Management participant with senior Operations experience concurred that "gaining buy-in for joint actions will not be an easy undertaking…Asset Managers are not used to collaborate (unconditionally)". The same participant foresaw that real collaboration would be catalysed by "a few COOs (rather than CTOs) who are truly minded to augment their firm's future operating model, rather than just talking about 'disruption'".

It is clear, however, that not all of the DLT use-cases require mass collaboration. A global Vendor pointed out that "outside cash markets it is possible and practical to implement local solutions, so the critical mass is not required. This would be the case for OTC derivatives". Other participants highlighted that benefits will often be achievable without a critical mass, for example deploying Blockchain internally as an enabler for regulatory compliance reporting.

### Incentives for Investment

DL platforms are distributed trust networks. When there is no single trusted entity at the centre of a trust network, then there is no individual party with a strong incentive to invest in and build the network. All participants in a DL network benefit, but the incentive to create the platform is not overwhelmingly strong for any one player. One large vendor pointed out that this "gets you to the "chicken and egg" problem – who scales the proposition?".

The same Vendor observed that "If building a DL is a public good (because everybody benefits equally), than you need a public body to administer it. It could be a regulator, it could be an industry association, a consortium, or a JV. But in all of these cases, the incentives and governance of such a body means that it is likely to be slower and more complex than 'pseudo-distributed' use cases such as those put forward by those at risk of being disintermediated". Those at risk of disintermediation

definitely do have an incentive to invest, but not necessarily to the advantage of the DL network participants: "The benefit (or threat) to individual players on the sell side (and market infrastructure providers) is far greater, hence their bigger appetite to innovate. If you can crack that conundrum, then you will shape the industry".

Incentives for Collaborative Behaviour

Outside the crypto-currency world, where cooperative behaviour from Blockchain participants is encouraged through rewards in the currency itself, so players see issues with Incentivisation. A UK-based Asset Manager asserted that "Blockchain is not simply a technology. To achieve new private or public Blockchains requires a complex arrangement of incentives".

### Standards

DL technology is relatively new, and mature standards have yet to be developed. There are general features expected of a DL platform, but no formally defined or accepted APIs, message types or semantics specific to DLT. This makes inter-operation between disparate technologies both necessary and difficult. This is widely observed among the participants, and a FinTech typically observed that "the primary disabling factors <include a> lack of established standards for Distributed Ledgers, and interoperability between Distributed Ledgers". A Service Provider said essentially the same thing: "key disablers will include…the ability to deliver interoperability across the necessarily diverse Blockchains". An Asset Manager similarly felt that "disabling / delaying factors will include…<the lack of> Vendors' inter-operable blockchains".

### Vested Interests and Investment in the Status Quo

The finance industry is seen by the Buy-Side as subject to a set of vested interests, which may deliberately slow the pace of benefit delivery. A multi-national Asset Manager regretted that "there are strong vested interests, particularly among the actors who are at threat of disintermediation: this leads to very different incentives for different players".

The weight of investment in legacy technology, which would be displaced or radically impacted by DLT, is a further drag on progress. Another Asset Manager set this position out, saying: "there are strong vested interests which have grown rich due to the technology "status quo" of the last 35-40 years. The status quo is quasi-paper-like…". This theme is common, and amplified across all categories of respondent. A Service Provider predicted that "the legacy and technology debt of incumbents will prohibit them from investing in R&D". A FinTech stated a belief that: "the primary obstacles to roll-out of DLT will <include> legacy systems and legacy budget spend".

Another leading FinTech broadened the scope of vested interests to market structure, pointing out the hidden cost of investment inherent in the relationship between Issuers and Investment Banks: "the cost of corporate debt to issuers depends on the revenues generated for the banks by issuance: both sides therefore have a vested interest in the status quo, to the cost of the investor". Even a Vendor regretted the impact of investment in existing market structures and technology: "Asset Management is full of vested interests and large amounts of capital sunk into existing infrastructure, business models and contractual arrangements, which will all serve to slow the pace of change".

### Level of Knowledge Among Buy-Side Executives

The poor understanding of new technology on the part of Buy-Side management comes under fire, generally from FinTechs and Service Providers, one of whom criticised the unpreparedness of Buy-Side management to embrace innovation: "Asset Management industry leadership is typically weak in terms of its understanding of new technologies and the opportunities / threats to them through this. There aren't many Chief Digital Officers in the industry, which is a transformative role. So this is a significant issue".

A European Vendor echoed the sentiment, but generalised it across sectors, observing that "the whole financial services industry is still at the early stage of understanding DLT, let alone applying it – when I talk at industry conferences / roadshows I usually have to ask the audience if they get DLT – typically the answer is no or not really".

Most Asset Managers are silent on the issue, but one did acknowledge that there was "a gulf between senior management and people who truly understand Blockchain. Given that the Blockchain technology came from a position of libertarian, maverick technologists, getting senior, tech-aware management to a place where they can invest significant money safely is a huge challenge."

### Availability of Competent Resources

At a lower level, the skilled resources to deliver successful DLT projects are currently seen as scarce and expensive. An Asset Manager felt constrained by the "lack of relevant skills in the market", while a Service Provider's view was that "the primary disabling factors <include> lack of expertise in developing the technology". A premier Consultancy highlighted "the efforts <required from> Buy-Side organisations in recruiting knowledgeable DLT techies and investing in this generation of staff".

### Hump of Cost and Investment

The adoption of DL Technology is seen as a slow process which will take many years to complete. Over that time, the management of transactions and generation of positions will involve a combination of conventional and DL approaches. While this duplication remains in place, then costs are likely to increase, rather than decrease. A Service Provider observed: "The time to realise benefits <and> the uncertainty of the business case is a primary disabling factor". Asset Managers want to be convinced of benefit delivery, and one insisted that "we need a practical demonstration of a compelling use-case".

The difficulty of getting over the hump of spend, and the long pay-off time, are recognised even by the Vendors as constraints on investment. One observed that "there is a reluctance to invest wholesale whilst still having to run / maintain existing infrastructure". Another offered more colour: "The market dynamics of moving from a somewhat cumbersome and inefficient (but broadly functioning) model with intermediaries (clearing houses, custodians, centralised data repositories, etc.) make a break with the past very difficult". The answer may be to start where the context is simpler: "We see markets in, for example, Australia, Estonia and Chile as better targets for early reengineering than the more complex markets and institutions in the UK, US and Europe. This is borne out by Digital Asset's heavy involvement with ASX".

### Immediate Settlement On-Ledger

The establishment of settlement in cash outside nationally-legitimised / fiat currencies is seen as an obstruction to on-ledger near-real time settlement. Resistance is expected from Governments and Central Banks both to the recognition of crypto-currencies, and to the establishment of ledger-based ownership of fiat currencies outside approved banks. A Vendor predicted that "Central Banks will want to maintain control over monetary policy, and will therefore not fully endorse a digital (crypto) currency a la Bitcoin". The image of Bitcoin is also seen as negative in some quarters, despite its spiralling value, and another Vendor expected this to cloud judgement more widely: "There is a reputational hurdle – Bitcoin has a linkage to fraud and money-laundering in some peoples' eyes".

### Security and Hackability

Much is made of the quality of cryptography and record locking associated with Blockchain, and of the inherent protection from hacking that is a feature of the multiple aligned ledgers in a DLT framework. Participants recognised that current centralised databases have significant vulnerability too, and are not a good comparator for future security.

However, there remain material concerns over DLT security, typified by one Service Provider's input: "<we need> proof of security - recent 'hacks' of various parts of the technology stack will not prove the end of the technology developments, but if more happen it will focus efforts on how to keep a global ecosystem safe and that will not be easy <or cheap>". A Vendor also thought that: "security…is still a concern", but, as with the performance and scalability issue, also believed that it "may be addressed by future technical developments (in cryptography)".

### Confidentiality and Private Ledgers

There is a shared concern that public ledgers are not a sound basis for Buy-Side developments in DLT, as Asset Managers need to safeguard the Privacy of their clients' investment data. A mature model of permissioned Blockchain is needed, but has not yet been fixed on. An Asset Manager was concerned that "the issue of privacy is not solved, and models of permissioning and inter-operability need to be developed which will give the Buy-Side the appropriate level of confidentiality". Another put it more strongly: "Data security, given client profiles, is an obsession – which means that any service / market utility that has client data outside the organisation will get push back (cultural if not logical). The cloud is tough enough!" A Vendor asked, in the same context: "How would the concerns of releasing potentially confidential data onto a public (or semi-public) Blockchain be addressed?".

More optimistic participants see that the long term future rests with public ledgers, expect that these issues will be resolved, and believe that public ledgers are part of the answer, not the problem. One of the main industry DL groups has the "increasingly positive view that everyone will eventually end up on public blockchains, or link to public blockchains, as they are more secure and robust. And solving problems (privacy, confidentiality, scaling, interoperability, etc..) - not there yet but advancing...".

### Dispute Resolution and Fault-Fixing

The lack of a central authority in a Distributed Ledger is attractive from a peer-to-peer perspective, and eliminates the power of the central function and the exposure of the market participants to it.

However, it leaves a gap in responsibility when things go wrong. In an autonomous world, it is not clear who is responsible for recovery and fault fixing. A large Asset Manager suggested that: “no one knows what the back-up plan is if Blockchain goes down.”, while a Vendor asked: “who do you call if there is a failure in a Distributed Ledger where all parties are autonomous?”. There need to be clear answers to these questions if the Buy-Side is to move to operating models based on DL Technology.

### A Language for Contracts

Smart contracts are widely seen as a useful tool in the automation of currently manual Buy-Side processes, but their definition is currently tortuous and slow, and requires highly specialised skills. A FinTech / Consultancy involved in smart contract development identified the “need for an efficient high level language for the definition of smart contracts” as a pre-requisite to their widespread exploitation.