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Where have all the blockchain startups gone?

Building a startup is hard. Building a blockchain startup is harder. More than 10 current and former financial blockchain builders and users detail their experiences of trying to cut their teeth on a once-darling tech, and the lessons they're still learning from it.

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The necessity of change

Hello, friend—it's been a while.

Let me explain. *WatersTechnology* (formerly *Waters*) started in 1984 as a newsletter. The publication has experienced a lot: Black Monday; the birth of the World Wide Web and the subsequent dot-com bubble burst; the horrific events of 9/11; the 2008 financial crisis; the drastic decline of print advertising; and now a global pandemic entering its third year.

So while it hasn't always been an easy road, I'm proud to say that we're still here creating journalism that—we hope—you find interesting, insightful and valuable. When a media outlet makes a major change, people tend to assume that something has gone wrong and cost-cutting measures have been put in place. So some of you might have been alarmed when you didn't receive a copy of *WatersTechnology* at the beginning of January … or February, or March. Rest assured we're healthy financially and subscriptions are up year on year.

What's changed is that we're moving to a quarterly print schedule, publishing issues in March, June, September and December, for the foreseeable future. There are a number of reasons for the change—ranging from how subscribers prefer to read our content, to environmental sustainability—but the most important is our new focus on quality over quantity.

If you are a regular reader of our articles on our website or app (and I hope you are, because some of our stories are online-only), you might have noticed that we publish fewer posts today than we did in, say, 2017. I have given reporters on *WatersTechnology* a strict mandate to only write exclusive stories that you can't find anywhere else. You pay a premium for a subscription and in return we aim to produce content you can only get from us.

Quality, exclusive journalism takes longer to produce than, say, press-released news stories. Take, for example, this issue's cover story on blockchain challenges, which took 2.5 months to write and edit, but which we think is more useful and insightful than the same old blockchain drivel that still permeates the hype cycle. This is to say that because of the work involved in producing just one of these kinds of stories, there are simply fewer to choose from each month—the magazine had been getting thinner as a result. So the new print edition will be a curated collection of our very best content from that quarter.

Finally, I love print journalism … *love* it! I still subscribe to about a dozen print publications. The fact is, though, that the vast majority—over 95%—of our readers prefer to read our content online. It doesn't make sense from a reader-preference or sustainability perspective—of which we are vary aware, and we cover environmental topics like ESG—to keep printing 12 times a year.

So here we are. If you're upset by this decision—I was the leading voice pushing for it—then let's talk: anthony.malakian@infopro-digital.com or +1 646 490 3973. wt

Anthony Malakian
Editor-in-Chief

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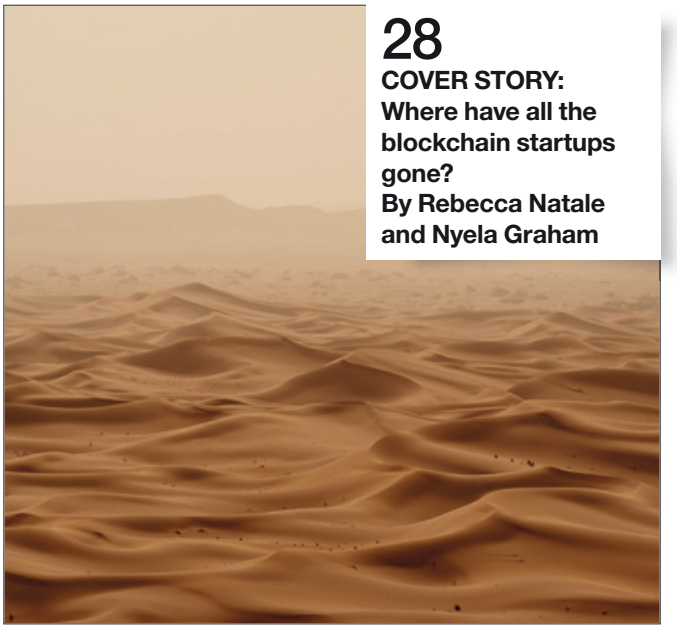

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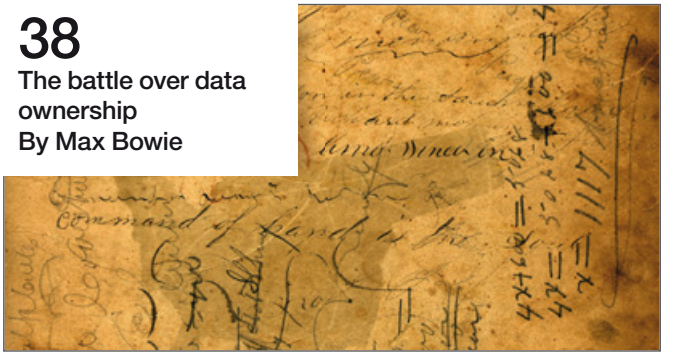

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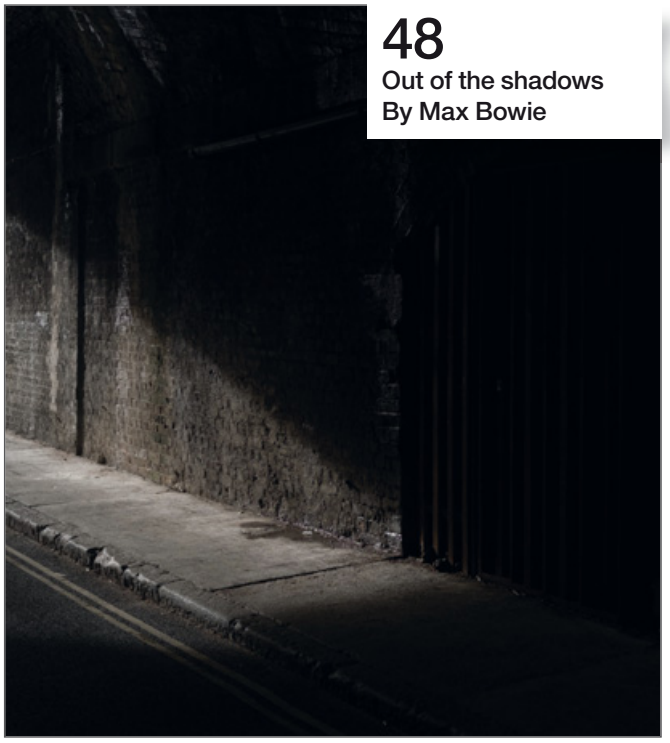

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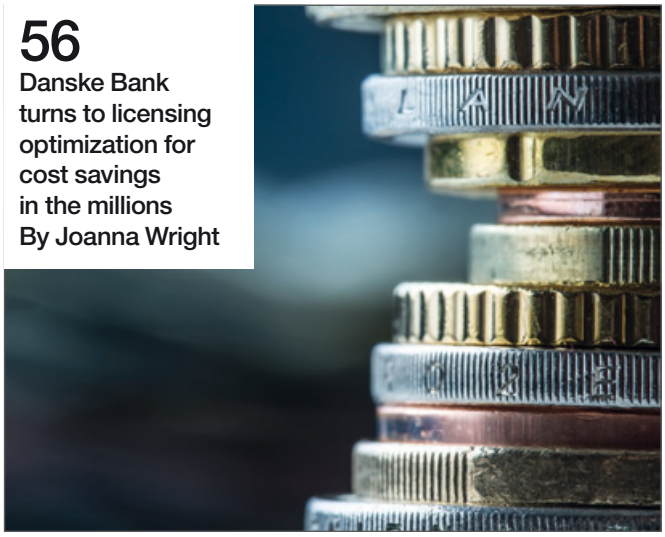

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Buy side seeks more transparency into ESG index providers' ratings

While there is no consensus on whether ESG ratings providers should be regulated, asset managers largely agree that more transparency into their vendors' methodologies is needed. By Josephine Gallagher

Which is more important: ending dependency on fossil fuels or preventing energy poverty? There is no right answer to this question; the ways we think about social issues or saving the planet are inherently personal. It's this idiosyncrasy that makes evaluating data for ESG investing a complex beast for asset managers—how do you estimate what's good for the world and what's good for an investor's balance sheet? And how do you know you can trust the data you're using, and avoid greenwashing, which involves misrepresenting a company's environmental impact?

Asset managers buy ESG ratings from providers. These vendors use proprietary methodologies to measure the ESG scores of individual corporates, applying different weights to the environmental, social and governance factors. Because this type of analysis requires so much qualitative decision-making, investment firms want more transparency into how these vendors are sourcing their data and boiling that down to single ESG scores.

"Hundreds of billions of dollars are being allocated explicitly to these types of metrics, and it's quite shocking to see how little these data providers give you in terms of transparency," says George Mussalli, chief investment officer and head of equity investments research at PanAgora Asset Management.

Global industry bodies and regulators are starting to pay attention to the risks associated with this dependence on ESG rating firms. Standards-setter the International Organization of Securities Commissions (Iosco) published a report on ESG ratings and data products in November 2021 that expressed concerns about the potential risks of depending on the subjective views of a small pool of vendors.

As part of the European Commission's Sustainable Finance Strategy, the lawmaker also pledged to improve the reliability, comparability, and transparency of ESG ratings. The European Securities and Markets Authority recently launched a call for information on the size and influence of different ESG rating providers.

Lifting the hood

Rating agencies aggregate data from disparate sources, mainly corporate disclosures of various kinds, and condense that information into a single subjective score.

Asset managers want to better understand the process by which these firms come up with that score to avoid risks like greenwashing. They want to know how that data is sourced, which sources are used and why; how they compare with other data points; which peer groups are used to contextualize the data; and how the data is benchmarked.

Nikita Singhal, co-head of sustainable investment and ESG at Lazard Asset Management, says portfolio managers also need to know where the underlying data gaps in the ESG score exist. One of the biggest problems with ESG investing is the lack of data consistency and standards associated with company disclosures.

To make up for these gaps, rating agencies impute what the answer is, basing their estimates on factors such as a company's peer group or region. For instance, if there is no record of Company A's carbon emissions, the rating agency might impute that data from Company B, a firm based in the same sector and of similar size. Singhal says ratings agencies and data vendors should be more transparent about where those imputations are made.

"That is where the errors or the discrepancies are created because the imputation of data can be based on certain assumptions that you're making and if you're carrying different assumptions you're going to end up with very different results," Singhal says.

Singhal says buy-side firms want to be able to drill down into the data to better understand the accurate level of data coverage. For instance, a ratings agency's ESG dashboard might show that it has 97% coverage of a specific metric, whereas in reality, 50% of that 97% is imputed data.

A spokesperson for Morningstar-owned ESG ratings firm Sustainalytics says clients have access to the company's methodology and can speak to their client advisors. They say Sustainalytics

analysts follow "a structured analytical framework and explicit guidance on how they should evaluate companies."

"Our goal is to create consistency so that any two analysts looking at the same situation should arrive at a matching outcome," the spokesperson adds.

A spokesperson for research and analytics provider MSCI says the company regularly reviews its ratings methodology and models to incorporate new information, industry regulation, and technical enhancements.

"We adopt a formal, in-depth quality review process in our analysis, including automated and threshold-based quality checks of data," the MSCI spokesperson says.

Sphere of influence

Asset managers say that at the heart of the transparency issue lies the fact that the ESG ratings space is effectively dominated by two players: MSCI and Sustainalytics. On a smaller scale, other providers like Bloomberg, ISS ESG and S&P-owned RobecoSAM are also vying for market share.

"It's still pretty much an oligopoly in this space," says Lazard's Singhal.

The problem for asset managers like Singhal, she says, is that the ratings from MSCI and Sustainalytics have poor levels of correlations, as their methodologies and qualitative analysis vary greatly. She says their correlation ranges from 0.3 to 0.5. Contrast that to ratings of creditworthiness, where the two main players, Moody's and S&P, agree at a range of 0.7 to 0.9.

This is important because investment firms are trying to find reliable and trustworthy signals to inform their ESG decision-making, but this can be perplexing when the two main ESG rating agencies have vastly different views on a company's ESG output. This is why users want to know how these providers measure ESG and why they differ so much.

Consolidation in the ESG vendor market is not a new phenomenon. Over the last two years, there has been a flurry of merger and acquisition activity among major data vendors looking carve out a piece of the lucrative pie, which will only cement the dominance of incumbents, making it more difficult for new vendors to break into the industry, says Brunno Maradei, global head of responsible investment at Aegon Asset Management.

George Mussalli
PanAgora Asset Management

"The barriers to entry are very high. You have to build a massive database [of company coverage] just to have an introductory meeting with an asset manager. Even if you just cover one indicator, you've got to cover 50,000 companies on that one indicator," Maradei says.

Sebastian Lancetti, head of portfolio strategy at PanAgora, says the rating industry would benefit from a more diverse group of vendors with different perspectives and methodologies to ultimately garner better ESG signals. He says that while rating agencies might not always agree in their final scores, and concedes that having to subscribe to multiple vendors creates additional work for the asset manager, a diversity of views helps generate alpha in the long run. In other words, the more data vendors to choose from, the higher chance of correlations in the data.

"We need to have a plurality of views going forward. And we don't want to end up in a situation where ESG is defined by one or two major vendors, and everybody's pushed toward that," Lancetti says.

To regulate or not to regulate?

The consensus among the four asset managers interviewed for this article is that rating firms should provide more clarity on their methodologies. But the jury is out on whether regulating these firms is the answer to these data problems. Those in favor of regulation say the agencies should be subject to rules and oversight because of the influence they have over the market.

Others are less convinced that regulating these firms would work in practice. As each rating agency follows its own methodologies, it is less clear how regulators could regulate them.

"It's difficult for a regulator to say a rating is correct or incorrect. Maybe they could regulate the process of coming up with the rating, but that itself is challenging," says Eric Nietsch, head of ESG Asia at Manulife Investment. "In credit ratings, they require certain processes to be followed and decisions are made by committees rather than just individual rating analysts."

Another lightweight approach could involve regulators auditing or validating the experts tasked with analyzing the ESG data and making qualitative judgments. Maradei says regulators could enforce a governance framework where rating agencies must ensure that the analysts or vendors making the assessments have the right qualifications.

On the extreme end of the spectrum, regulating ratings agencies could introduce a whole host of problems. Over-standardization could discourage other data vendors from entering the market, or risk oversimplifying how ESG is defined.

"We are also wary of too much standardization, if done the wrong way by the regulators, where we would end up with one way of looking at ESG," Lancetti says.

For now, at least, many asset managers believe regulation is best placed to rectify underlying data problems. This includes implementing universal taxonomies for E, S, and G—such as the EU's Taxonomy for environmentally sustainable activities—and developing international frameworks for disclosing ESG company information. Global organizations currently working on disclosure standards include the Global Reporting Initiative, the Sustainability Accounting Standards Board, and the newly formed International Sustainability Standards Board.

"Even more urgent than regulating data providers, we need more clarity from the standard setters and accounting bodies," Singhal says. wt

AWS Data Exchange gains ground with addition of FactSet content

Leveraging AWS's presence on Wall Street, Data Exchange has the potential to shake up traditional financial data delivery and contracts, if it can add relevant content and overcome challenges like real-time streaming and connectivity in the cloud. By Rebecca Natale and Max Bowie

At Amazon Web Services' re:Invent conference in Las Vegas in November, the cloud giant unleashed a flurry of news, including the announcement that Nasdaq will move its matching engine to the cloud service beginning next year, and Goldman Sachs launched the Financial Cloud for Data, a suite of cloud-based data and analytics solutions that leverage AWS. But a third announcement flew largely under the radar: The AWS Data Exchange (ADX), unveiled two years ago, recruited its first major financial data provider—FactSet—to the platform.

Sources say the move could signal the beginning of an industry shift away from traditional data pipelines, databases, and technical costs and maintenance issues that come with bandwidth, security, and scalability, and toward a data-sharing model with potential to shake up the current commercial pricing models for data across financial services.

"In the olden days, people used to ship data around to wherever an infrastructure happened to be," says Jonathan Reeve, head of content and technology solutions at FactSet. "Increasingly, especially with [AWS's cloud data warehouse] Amazon Redshift, you no longer have to move data around the planet to serve an application."

ADX acts as a central hub for users—comprising data analysts, portfolio managers, data scientists, quants, and developers across a range of industries—to access third-party data in an up-to-date cloud environment. Some 266 data vendors contribute to the

service, which caters to other industries including healthcare, automotive, geospatial, consumer, and media and entertainment.

FactSet has deployed 30 proprietary datasets to ADX through Amazon Redshift. FactSet's datasets make up the bulk of the 54 datasets available for consumption through Redshift on ADX, compared to 3,752 available through Amazon S3 (AWS's static object storage service), and 42 that are available through an API.

In an on-premises setup, moving data from one datacenter to another incurs telecoms charges for the cost of transportation, and a second database at the other end comes with storage costs. Reeve says using Redshift eliminates the costs on both fronts.

Suvrat Bansal, founder of start-up data discovery platform Stellar Data Labs and former chief data officer at UBS Asset Management, says some vendors and end-users still feel that the only way to unite data is to physically bring it together, but the growing patchwork of data vendors, sources, and users makes that belief more of a fantasy than a conviction.

"[The AWS–FactSet pairing] is the 10-year promise. This is only going to grow. Vendors all need to expose their data through some kind of sharing environment, and eventually feeds will go away because they're so expensive to build, so this will also encourage vendors to publish more data," Bansal says.

"It reduces your costs and potential failure points; it reduces pipelines, because you can treat these FactSet datasets as if they're sitting in your own Redshift database; and it opens the door for more data to be used like that. Once firms are familiar with accessing fundamentals in that way, it becomes easier for smaller vendors to make their data available."

Dream a little stream

John Kain, head of business development for banking and capital markets at AWS, is one of those responsible for Amazon's growing influence on Wall Street. He has deep knowledge of the industry's workings and market infrastructure, having joined AWS five years ago from JP Morgan, where he was responsible for the investment bank's market surveillance platforms in fixed income, foreign exchange, and derivatives trading. Prior to that, he spent time at Nasdaq, where he ran a service providing sponsored access solutions in the form of low-latency connectivity, pre-trade risk checks, post-trade portfolio risk, and reporting to investment banks so they could sponsor hedge funds into the market.

Kain knows the important role that real-time—or streaming—data plays at institutions, both because of its necessity for trading and the ire it draws from those who must pay for it. ADX hasn't yet announced the additions of any real-time data providers to the service, and FactSet's available datasets on the service are a mix of fundamental and reference data that are updated as covered companies report new metrics. But Kain says ADX plans for such vendors to join the hub in the future.

One source expressed concern that AWS messaging, which uses the HTTPS and TCP/IP protocols, wouldn't be ideal for streaming or for Fix connectivity, which uses multiple TCP/IP sessions. But Kain says Fix is less relevant to streaming market data than it is to other functions such as order entry and reporting.

"Bloomberg, Refinitiv, Nasdaq, and Cboe all have their own unique ways of sending data to their customers, and we work with all of them," Kain says. "And we do have a few customers, but I'm not sure anyone's public, using Fix connectivity from their AWS environment to exchanges in order to trade."

Old friends with new doors

ADX is not the first service of its kind.

FactSet, actually, already has its own similar offering, Open:FactSet Marketplace, a hub for FactSet and datasets from 130 partners that can be consumed via API, datafeed, or a partner's proprietary solution. Reeve acknowledges a small degree of overlap between Open:FactSet and ADX, but says both services, to FactSet, are centered on making its data "hyper-available" to customers. Curated third-party data on Open:FactSet is tightly integrated with FactSet's own, with the vendor providing linkages and mapping capabilities, and the whole offering is focused on financial markets participants. ADX, on the other hand, offers FactSet exposure to other industries, which aids the company in its efforts to grow its corporates clientele in a newer part of its Research and Advisory business.

Suvrat Bansal
Stellar Data Labs

There's also S&P Global Marketplace, another datahub launched by S&P Global Market Intelligence last year. Most datasets available through Marketplace are proprietary to Market Intelligence and other S&P Global affiliates, including Platts, IHS Markit, and Cusip, though it includes some third-party content, as well.

Also participating in the datahub craze is the recently IPOed data warehouse Snowflake and its Snowflake Data Marketplace, of which FactSet is also a contributing partner with its fundamentals data. Snowflake is a competitor of the likes of Amazon Redshift and Google BigQuery.

In an interview last year with *WatersTechnology*, FactSet CTO Gene Fernandez said FactSet had initially decided to partner with Snowflake over other data warehouses because it took the onus off users, and because Redshift worked very well with AWS, but wasn't suitable for users of proprietary or private clouds. However, in the past year and a half since the announcement, more institutions and many of FactSet's clients have gravitated toward the major cloud providers, including AWS. A spokesperson for FactSet says the company maintains itself as cloud-agnostic, and Redshift provides an efficient way to meet clients using Amazon technology where they are, while Snowflake continues to be unique as another agnostic provider and partner.

> "[The AWS–FactSet pairing] is the 10-year promise. This is only going to grow." **Suvrat Bansal, Stellar Data Labs**

A CTO for an asset manager with more than $5 billion under management says this development with AWS "could open doors for us to imagine how we might interact with our FactSet data in new ways," adding that he would need to understand the development better to flesh out more thoughts on the deal's potential.

'It will never substitute'

A senior commercial executive at a market data vendor says they use AWS extensively for what they do and is in active talks with AWS about Data Exchange.

"It will never substitute existing direct channels for data, but it's an interesting additional channel to market—it depends on the community they can build, and what clients it would allow you to reach who you can't reach directly," the executive says.

Extended reach is an attractive factor for FactSet, just as it's likely that several of the non-financial participating vendors will hope to become sources of alpha-yielding alternative data for deep-pocketed banks and buy-side firms that sign up for the service.

But Barry Star, CEO of Wall Street Horizon, a specialized data vendor in corporate events, says he doesn't see a strategic advantage to ADX other than infrastructure savings, and as a result, the deal may appeal to a limited audience.

"Hedge funds make a living by beating everyone else, and they beat everyone by having better data. And to manage that, they need better data systems. So why would they use the same platform as everyone else? The big firms all spend money to build proprietary systems," Star says.

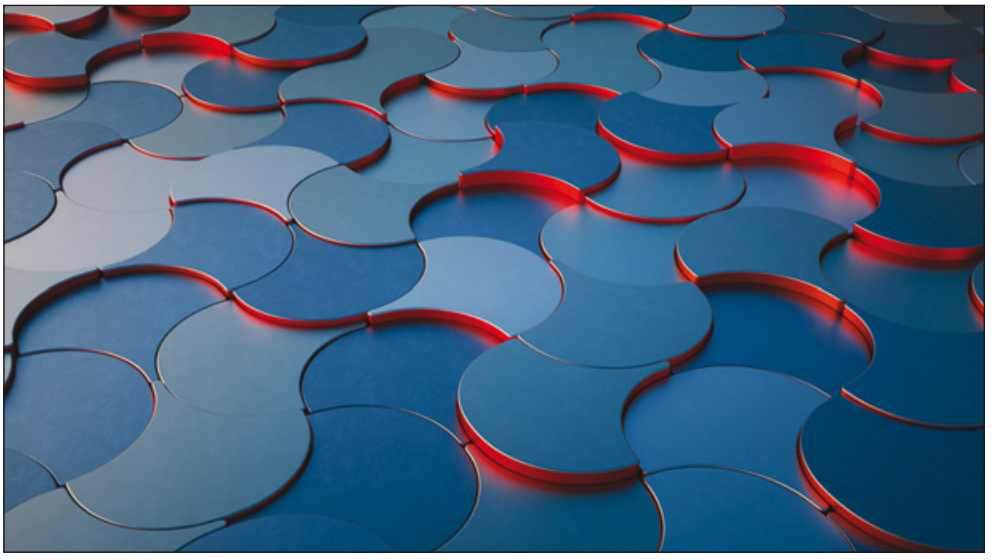
However, he says the broader buy side uses Bloomberg so extensively that it's clear that segment of the industry isn't concerned about everyone using the same system. "A buy-side researcher has very different needs from hedge fund guys. When you have 325,000 users of Bloomberg, everyone is using the same system because they know their strategic edge is not the data, but their analysts," Star says. wt

Melding tech is key to getting full value from vendor M&A

Recent tech and data M&A deals aren't just about acquiring clients or 'bolt-on' solutions, but will yield longer-term gains through granular integration of the vendors' product lines and technologies.
By Max Bowie

Mid-market data vendors are using recent acquisitions to achieve greater scale and gain a technical edge, combining newly purchased assets to create high-performance data capture and distribution infrastructures and more rounded offerings with broader coverage.

When hardware ticker plant vendor Exegy acquired datafeed and feed handler provider Vela last May, the deal immediately brought Exegy an "outstanding" bench of existing business in the form of Vela clients, some of which had originally been customers of Vela predecessor SR Labs and acquisitions such as Wombat (from Nyse Technologies), Object Trading, and OptionsCity.



However, it also gave Exegy the chance to create a reengineered consolidated datafeed distribution system, by combining its hardware appliances with Vela's datafeed infrastructure, rolling out the boxes to provide high-performance data capture at the points of presence (PoPs) that serve Vela's feeds. The vendor mapped out its vision of this "unified platform" within the first two months following the acquisition and completed the technical integration by the end of last year.

Over Q1 of this year, Exegy has rolled out its appliances at PoPs in New York, Chicago, London and Hong Kong. In Q2, the vendor plans to deliver consolidated feeds via that unified platform with the combination of feed handlers developed by both vendors—for a total coverage of more than 300 data sources, while the vendor continues to build out coverage of emerging markets—and during Q2 and Q3 will upgrade appliances and software at existing client sites.

"For our consolidated feed consumers who subscribe to Vela's SuperFeed product, they will just need to change a logical network connection. They'll see better performance, lower latency, and more consistent latency, as well as better reliability and uptime, because this will leverage the automatic failover we've designed into the system so all sites will run hot/hot," says Exegy CTO David Taylor.

The benefit to clients (and also to Exegy itself) is that the vendor can focus all its efforts on supporting a single platform, rather than having to spread its investment across two or three different code bases, Taylor says.

Also this year, the vendor will combine its hardware appliances with order gateways from SR Labs, Object Trading, and OptionsCity to form a unified execution platform. This provides the potential for Exegy to feed low-latency data from SuperFeed into its Signum predictive analytics, which can in turn generate signals-based orders and send them to market via its order gateways, where the Vela acquisition—once fully integrated and upgraded—can provide the missing pieces in a data-through-execution information and order flow.

For Options, which acquired data platform and content provider Activ Financial last October, the deal yielded immediate benefits, plus the promise of more tech wins further down the line. Options CEO Danny Moore says that following the acquisition, Activ closed a deal with an unnamed top-five global asset manager to provide a market data platform running in Amazon Web Services' cloud.

"The big opportunity for us is on the commercialization side. Activ had a lot of good assets. Now we need to put more sales and marketing functions around those," Moore says. "At Options, we've always been very strong on sales management and prospect management, and we're always very aggressive around the end of financial quarters. Even in the Wombat days, we tried to run the business like a public company in the hope that one day we would be."

At the time of the acquisition, Options said it would use Activ's data platform to build an app store of content and analytics. Since then, Moore says the vendor's technology and development teams have been working on new developments, and is ahead of where he originally expected. For example, Options is performing a gap analysis of the vendors' combined feed handler coverage of global markets, and will proactively build out coverage where gaps exist. Another example is building out support for Microsoft's Azure cloud to complement Activ's existing support for Amazon's and Google's cloud platforms.

In addition, to give its sales and marketing organization more ammunition with which to go to market, Moore says Options will focus more of its development resources on not just building services but "productizing" them for a broad audience. "That's the difference between getting a product beyond those first few clients and up to 100 clients," he says.

Buying power

That element of fully capitalizing on an acquisition may take longer. Indeed, these integrations are not always quick wins: Australian market data and trading workstation provider Iress acquired French low-latency data and connectivity provider QuantHouse in 2019, and has spent the past 18 months integrating the vendors' technology to gain commercial advantages and better serve clients. It now has "a solid roadmap of tasks for the next 34 months," says Arthur Tricoire, general manager, commercial for Iress' recently formed API Data and Trading Solutions business line.

David Taylor
Exegy

For Iress, the acquisition gave the vendor a proprietary market data collection infrastructure, whereas it had previously relied on data sourced from other third-party distributors to serve its 9,000 clients and 500,000 end users worldwide.

"The big driver behind the acquisition, besides revenue growth, was sourcing and market data distribution of exchange price feeds," and being able to leverage a proprietary data collection mechanism to power additional solutions with greater control over the cost and reliability of data, Tricoire says. "So, the first thing was enhancing the client experience and ensuring the quality of data that our brand is attached to—so making sure that we are in control of the data we're providing."

> "For our consolidated feed consumers who subscribe to Vela's SuperFeed product, they will just need to change a logical network connection. They'll see better performance, lower latency, and more consistent latency, as well as better reliability and uptime."
> **David Taylor, Exegy**

This is an important factor when managing around 200 client connections across a global network, he adds. "By managing that directly, you know you're in control, and you can manage the quality. If you're outsourcing that, then you're relying on other vendors," he says.

This especially becomes an issue—as the vendor discovered during the integration process—when dealing with the data administration aspects of bringing additional products to clients who themselves provide services to their client bases. While the vendor can now simply provide new services via APIs as needed by clients, it would previously have needed to obtain licenses from the original data source to provide other services, such as broader distribution.

"Because you are managing the collection and distribution, you can bring data into third-party platforms. But if you are getting data from third-party vendors, you are limited in what you can do with that data downstream, and what clients can do with it," Tricoire says. "By controlling the overall data, there is no cannibalization issue for a third party that is not willing to allow distribution. Clients can provide data to their customers, and/or Iress can serve these clients' customers—the client is free to decide how much they want to be involved in that distribution."

Integrating QuantHouse allowed Iress to identify "immediate synergies that could be addressed by in-sourcing their data collection," Tricoire says. Within the first 12 months following the acquisition, the vendor began migrating groups of markets from indirect to direct sourcing. The vendor has also combined the Iress and QuantHouse engineering teams under Tricoire, and his next priority is creating a unified back-end platform that Iress can leverage across different products and businesses.

"In terms of really unifying the back-end platform, it's probably a 24-month journey ahead," he says. "The analysis work is well underway, and we're defining the roadmaps."

The next step, Tricoire says, is making clients aware of what the vendor can now offer. "As a result of those migrations, it positions Iress with a comprehensive feed and data platform for streaming data solutions and historical tick solutions, provided on-site, or in the cloud," he says. "Our next priority is to make existing clients aware that we have new products available, and that Iress can now be a one-stop shop." wt

Memx data fees tackle professional vs. non-professional audit risk

The exchange delivers on its promise to reduce the cost of exchange data, but subscribers still face an administrative cost burden associated with the lower user fees. By Max Bowie

The Members Exchange (Memx) finally announced in February that it will begin charging fees for its market data in April this year. The low monthly per-user fees (along with higher, enterprise-wide fees) live up to the exchange's promise to deliver lower fees for data than the rest of the industry, but also serve a serious purpose in reducing the compliance burden faced by firms designating whether end users should be classed as professionals or non-professionals.

Memx will charge $0.01 per user, per month for professional users and non-professional users alike to subscribe to top of book or last sale data, and is part of the exchange's aim to reduce firms' overall data costs. In this case, the fees are not only low, but also help lower administration costs, officials say.

Although an added benefit of charging the same fee for professional and non-professional users is that there is no incentive for firms to try to save money by intentionally misclassifying professional users as non-professionals, a Memx spokesperson says this was not a consideration in setting the fees. "We did this to reduce complexity and risk exposure. We don't believe firms intentionally misclassify users," the spokesperson says.

However, the issue of correctly classifying professional and non-professional usage is rife with complexity and risk, with significant grey areas existing around what constitutes non-professional usage. On the other hand, determining whether an individual should be classified as a professional or non-professional user is easier said than done. Not only do definitions vary by exchange, they can also be counterintuitive.

Memx will charge $0.01 per user per month

For example, someone placing a retail-sized trade using their personal Robinhood account from home outside of work hours might intuitively appear to be a non-professional user. However, they might still be considered a professional user if they hold certain qualifications, or happen to work at a financial firm—even in a non-trading role—and would be subject to the same per-user fees as professional traders.

For Memx, its definition of a non-professional data user is more than 170 words long. In contrast, its description of a professional data user is barely one line: "Any data user other than a non-professional data user."

Therefore, the definition of "professional" is dependent on the definition of "non-professional," and how an individual is designated on one venue may differ on others. Thus, even though Memx's fees may reduce the cost exposure for firms, even a slight variance in definition from other exchanges contributes to a higher overall administration cost burden.

Indeed, one market data expert says firms will still face these costs associated with reporting and complying with data licenses and usage terms, though the low fees should encourage usage.

"The real pain for end-user firms is often the reporting—the need for entitlement controls, the understanding of where the data is going and being used, non-display matters, and the disparate definitions from exchange to exchange," the expert says, adding that the cost of performing these tasks remains the same regardless of the fee being charged. "What the lower fees means is that if there are compliance issues, the fine—back fees, penalties, interest—will potentially be minimized."

Of course, the $0.01 per-user fees aren't the extent of Memx's data fees. Indeed, the exchange has published a matrix of fees that it plans to charge for different services. These range from $500 per month for internal use of its last sale data to $10,000 per month each for unlimited distribution of top-of-book and last sale prices to professional and non-professional users.

In a communication sent to members, the exchange states that its monthly fees for market depth data are 25% lower than comparable exchanges, and its fees for those using data in non-display trading systems or internal matching systems are at least 20% lower than comparable exchanges.

The spokesperson cites two examples of how the fees would add up in real-world use cases. In the case of a retail broker subscribing to top-of-book and last-sale data, the broker would pay a monthly external distributor fee of $2,000 for each dataset, plus $0.01 per user (whether professional or non-professional). In the event that the firm is serving data to more than 1 million users, "the enterprise fee would kick in and they would pay no more than $10,000 per month in user fees," the spokesperson says. In the case of a proprietary-only trading firm subscribing to market depth data, the firm would pay an internal distributor fee of $1,500 per month and a non-display fee of $4,000 per month to use the data in a trading platform, the spokesperson adds. wt

Cost, security concerns dampen banks' appetite for multi-cloud infrastructures

Firms making progress on cloud adoption are finding that multi-cloud strategies for individual businesses can duplicate costs and inadvertently downgrade a firm's resiliency. By Josephine Gallagher

A multi-cloud architecture hosting critical applications should, in theory, be the gold standard for a resilient and cost-effective technology stack in financial services. But in practice, the reality looks very different, banks say.

Several years into their cloud journeys, some firms have realized that using multiple cloud service providers (CSPs) for each critical function can cancel out the benefits of moving to the cloud. One senior executive at a large global investment bank says that using multiple CSPs for the same use case would introduce unnecessary inefficiencies and double—or even triple—the cost of the outsourced services.

"We have chosen not to use Google Cloud, Amazon Web Services [AWS], and Microsoft Azure for similar uses cases. We haven't gone down that route because it presents challenges and inefficiencies, and honestly and it's not worth the price you pay in those inefficiencies for the theoretical benefit you get in terms of workload mobility," the executive says.

One of the recommendations from EU regulators on outsourcing critical functions to the cloud is to develop exit strategies where a bank could transfer their data to an alternative cloud service provider or an on-premise system in the event of an outage.

In practice, porting data between two or more CSPs is a painful and complex exercise. A second senior executive at another global investment bank says that different cloud providers have different technical provisions and different ways of formatting their data, making it a nightmare to move the data from one CSP to another.

Porting data between two or more CSPs is painful and complex

"Regulators ask, 'If AWS goes down, can you move your data to Azure?'. The answer is 'No, not easily, because the infrastructure setup between Azure and AWS is different'. It typically takes a long lead time to put your data in AWS and go live; you can't just snap your fingers and make it happen in Azure," the second senior executive says.

Complexity equals vulnerability

James Fox, director of technology consulting for enterprise cloud services at Protiviti in London, says that at the beginning of their cloud journeys, many banks are "tripped up" by opting to use two or more cloud providers per application, but it quickly becomes clear that they would have to "rein that back" to avoid overcomplicating their technical footprint.

He says banks must now explain to regulators that opting for a multi-cloud approach, for individual business units, can inadvertently make their IT stacks less resilient.

"Because of those complexities and those issues, rather unintuitively, it makes you less resilient, because you can't do two [cloud integrations] as well as one," Fox adds

Using more than one cloud provider per business unit, such as the front or middle office, could also mean some banks end up sacrificing parts of their security. Matt Barrett, co-founder and CEO of London-based trading systems developer Adaptive Financial Consulting, says banks are now discovering that they must make compromises to meet a minimum level of security that works across each of the CSPs they use.

This is made even more complex when considering the size and scale of a heavily regulated global entity.

In September 2021, the European Securities and Markets Authority (Esma) published its Report on Trends, Risks, and Vulnerabilities in which the European regulator discusses the benefits of having a secondary cloud provider or backup system to prevent service disruption in the event of a failure.

An Esma spokesperson tells *WatersTechnology* that the article on Cloud Outsourcing and Financial Stability Risks within the Trends, Risks, and Vulnerabilities report was conducted in order to conceptualize the risks of cloud outsourcing, but that it also recognizes that "the migration strategy of the multi-cloud backup is treated in an idealized way."

The regulator acknowledges that challenges involving data portability could deter banks from using different CSPs, but says interoperability could play a role in resolving this issue in the future.

The Esma spokesperson adds that the regulator's guidance is not prescriptive on the type of cloud strategy that financial firms should adopt.

"The aim [of the article] is to inform future risk assessments and policy considerations from a broad financial stability perspective, rather than to be prescriptive on what solutions are optimal, which will depend on the details of any given real-world situation," the spokesperson adds. "We explicitly recognize in the article that we are modeling risks only and that the costs of risk mitigation also need to be considered." wt

NEWSDESK

WatersTechnology's roundup of headlines that hit the wire this quarter from around the industry

MSCI launches new ISaaS apps

The apps are built on Microsoft Azure

MSCI has announced the launch of Developer Community and Data Explorer, two new Investment Solutions-as-a-Service (ISaaS) applications that respectively enable the discovery, use, and integration of MSCI's APIs and MSCI's content.

Following MSCI's introduction of ISaaS in collaboration with Microsoft, the launches of Developer Community and Data Explorer reflect greater investor demand for technologies that scale big data, feature advanced analytics, and facilitate customized experiences for clients to accelerate their own innovation efforts. Built on Microsoft Azure, MSCI the applications intend to deliver and distribute MSCI content, insights, and data at scale by leveraging key capabilities such as data integration, enterprise data warehousing, and big data analytics from Azure services such as Azure Synapse.

In response to demand for greater data transparency and a seamless user experience, Data Explorer strives to enable quant analysts, investment managers and chief data officers to discover, understand, and access thousands of data points across hundreds of MSCI datasets that cover indices, ESG and climate, analytics, and real estate in a quick and efficient manner.

Finos grows in 2021, adds new board members

BMO has recently joined Finos

Finos (Fintech Open Source Foundation), a financial sector project of the Linux Foundation, has announced its 2021 annual results. Led by the more than 1,200 contributors working on Finos projects and a 34% increase in new corporate members. Finos present their largest yearly growth on record. In total, Finos now has 53 members leveraging its open-source collaboration forum, including the most recent additions of Bank of Montreal (BMO), Fannie Mae and NatWest Markets in addition to 16 more fintech and financial services organizations this past year.

Finos also added five new board members in 2021, which reflects an exceptional concentration of talent and intellectual capital atop the foundation. Goldman Sachs chief architect for technology John Madsen chairs the board and Kim Prado, CIO for US capital markets at BMO, is the co-chair.

DTCC launches Treasury Kinetics Service

Repos are critical in US finance

The Depository Trust & Clearing Corporation (DTCC) has announced the launch of DTCC Treasury Kinetics, a new service that aims to provide access to critical US treasury transaction data, increasing transparency into the repurchase agreement (repo) market.

Leveraging data from the Government Securities Division of DTCC's subsidiary, Fixed Income Clearing Corporation, this new service strives to provide a daily summary of aggregated and anonymized trade activity including number of trades, volumes, dollar amounts and rates for delivery versus payment repo.

The repo market plays an important role in the US financial ecosystem, acting as a source of liquidity and short-term funding. As the repo market continues to evolve and expand, increased volatility in this sector has underscored the need for market participants to have access to data that enables them to better understand valuation, rates, and liquidity. Treasury Kinetics hopes to provide historical data dating back to 2011, allowing users to back-test current repo data against historical events.

HSBC, Bloomberg partner for post-trade workflow

HSBC and Bloomberg are collaborating on a post-trade workflow through product and data integrations, which intend to deliver a more streamlined front-to-back user experience for mutual clients. This integration brings together Bloomberg AIM, an investment and order management system, with HSBC's middle-office technology to help support efficient real-time trade management processes, including matching and settlement. The offering is now live and available to Bloomberg clients who outsource their middle-office operations to HSBC.These capabilities are the first of a series of ongoing integrations between Bloomberg Buy-Side Solutions and HSBC.

Refinitiv, Microsoft collab launches AI assistant

Refinitiv is launching Refinitiv AI Alerts, a market data-powered intelligent assistant in Microsoft Teams. Refinitiv AI Alerts aims to provide market insights in collaboration with ModuleQ. User-specific content suggestions and alerts driven by ModuleQ's algorithms and Refinitiv Intelligent Tagging are linked to Refinitiv Eikon and Workspace for more analysis. The alert system learns the individual user's priorities from their Microsoft 365 interactions, and recommends content based on upcoming meetings and frequent email conversations.

Dash launches Dash OMS

Ion Trading's Dash Financial Technologies has launched Dash OMS, which aims to augment its routing, analytics, connectivity, and post-trade products to give clients a new tool for options trading workflows. Features include access to all Dash routing and algorithmic execution tools, support for all US listed-option products, integration with Dash's BrokerPoint network, and access to post-trade tools.

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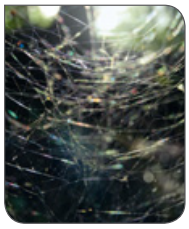

"The internet is upside down in terms of it being a risk mess. It went from being a distributed thing to a cloud-based thing that, when Amazon's down, we're all screwed."
Brad Levy, Symphony

» see page 44 for full feature...

"Clients don't want three products for three geographies. Just because you have Tora and Redi, that doesn't mean that [LSEG's] clients can magically trade globally."
Former Refinitiv executive

» see page 24 for full feature...

"The ability to make change and address costs requires choice. Vendor lock-in eliminates that ability. Without choices, firms have no option but to pay higher prices. And with industry consolidation, I don't see that changing."
Terry Roche, Pegasus Enterprise Solutions

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"As an industry, we've done quite a good job of tackling things like reference data or market data in the more standardized areas, but I'd say most firms don't have a great handle on their investment data. That's a much wider bucket. That can be datasets coming from your custodian and other service providers." Virginie O'Shea, Firebrand Research

» see page 20 for full feature...

"We have heard some concerns expressed by buy-side firms about how their data is used by brokers, but it's not widespread. The main concern we've seen is that anonymized data is not as anonymous as you may think—that is, that with certain assumptions, you can determine who is behind a trade and guess their strategies, then use that to game them."
Derek Lacarrubba, Schulte Roth & Zabel

» see page 38 for full feature...

"I'm not rooting for a doomsday scenario for any of the cloud providers, but as a thought leader, we are challenging ourselves to better position ourselves so if that time comes, we should be able to take our workload and switch it to another. In order to do that, a lot of planning is required. Just having a Kubernetes orchestration layer across private–public cloud is a starting point, but you have to go all the way up to the design of the application to make sure that it is designed, architected, and tested properly to support that type of movement." Jikin Shah, RBC

» see page 52 for full feature...

"In Itam, you need the technical specialists and the specialists in licensing. People can be skilled up to a degree, but it's very difficult to train someone fresh. In software licensing it takes a long time and a lot of experience—these are key personnel with very specific skillsets. Those are not cheap, and I had to go outside of the normal countries to find them." Rachel Ryan, Danske Bank

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Slow burn to a big bang

For decades, market data platforms have been critical components of financial firms' trading infrastructures. But with changing user needs and emerging technologies gaining ground, will the platforms of the past be replaced by upstart challengers—or can they evolve into something new? By Max Bowie

Market data feeds are often referred to as firehoses, spewing out torrents of data. But while data enriches financial firms' trading operations in the same way water brings life to the earth, it's not a river; it doesn't flow naturally from source to soil, but is rather a complex, manufactured irrigation system that must be carefully managed to ensure it reaches the places where it's needed. To do that, firms employ market data platforms to make sure the right data reaches the right consumers and applications.

First, a history lesson. For many years, Refinitiv (and before it, Thomson Reuters, and Reuters) has enjoyed the dominant—even monopolistic—position in this market, with (chronologically) its Triarch platform; the Tib platform sold under an arrangement with Tibco; then RMDS (the Reuters Market Data System), which combined features of both; then Trep (the Thomson Reuters Enterprise Platform), which under new ownership of the London Stock Exchange Group (LSEG), has been rebadged RTDS (Real-Time Distribution System).

Over the years, rival platforms either fell by the wayside, or were acquired by others—often by Reuters itself. One that gained some significant traction in the mid-2000s was Wombat Financial Software, a startup that foresaw the industry's obsession with low latency and built a streamlined data platform and feed handler solution that suited high-performance trading desks, which frequently deployed Wombat while the rest of their business used RMDS.

Wombat was acquired by the ill-fated NYSE Technologies, and some of the assets were eventually bought by SR Labs (and which was later rebranded as Vela), a similar startup that also acquired other fintech companies before ultimately selling to hardware ticker plant vendor Exegy earlier this year. The deal creates some tech synergies and potentially helps grow the footprint of each party's existing business, but also sets the stage for potential further acquisitions (or even, itself, being acquired) to create a broader, full-service fintech solutions provider.

But the Exegy–Vela deal, along with other M&A activity and new developments from other vendors, also comes at a time when Refinitiv has been going through some major changes that could allow other providers to gain a foothold. In just the past few years, the vendor has been hived off from Thomson Reuters—its news organization retained by its Canadian former owner—it was then sold to private equity firm Blackstone Group, which flipped it to London Stock Exchange Group. While LSEG figured out how to absorb the company, clients griped about service and uncertainty over the future of the platform. To its credit, Refinitiv responded by unveiling plans to make RTDS available in the cloud, and by hosting regular client briefings with its executives and developers, but also warned clients that they needed to update software versions quickly to remove older versions whose code referenced its former owner, Thomson Reuters.

All this gave some clients pause for thought, and even momentary uncertainty creates a gap for others trying to muscle in on Refinitiv's space. For example, Pegasus Enterprise Solutions—a tech startup founded by two former Reuters

execs and one of their market data clients—this year released its MarketsIO Platform, which CEO Terry Roche says is "the first platform with the capabilities to replace a platform with the capabilities of Trep."

Refinitiv was unable to make a spokesperson available in time to participate in this article.

Roche says MarketsIO will help firms eliminate vendor lock-in to proprietary technologies and content, making it easier for firms to integrate best-of-breed third-party content and tools, increasing competition and reducing costs.

"The ability to make change and address costs requires choice. Vendor lock-in eliminates that ability. Without choices, firms have no option but to pay higher prices. And with industry consolidation, I don't see that changing," Roche says. "We're building an open-technology feature to enable the capital markets to operate as a modern industry, to exchange standards, to recover and monetize their IP, and transform the fabric of data that's been unchanged for 30 years."

One key to Pegasus' proposition is that it's not a data company, and so has no interest in building a platform that advantages proprietary datasets. Its aim is purely to provide a suite of tools—from its MarketsIO EventStream platform to APIs, an Excel add-in, a data viewer for operations staff, Control Center entitlements service, and other components, all of which require one-tenth of the code footprint of traditional platforms, and which Roche says should deliver savings of at least 50%. These tools aim to deliver the mechanisms and controls by which a client firm can use anyone's data how and where they want to.

"Our mission is to empower those who create and consume data, to unlock them, and to provide a competitive environment for market data that provides choice and lower cost," Roche says. "The first step to cutting platform costs, we suggest, is to obtain platform independence from the technology you rely on. And the way to do that is to have a high-performance API suite to connect to your other systems using standard interfaces. That makes development teams more efficient, so that when they make changes, those take place in a more efficient way."

Build bridges, not barriers

Rob Wallos, chief innovation officer at West Highland Support Services, who served as global technology director at Thomson Reuters between 2010 and 2015, thinks the API model has the potential to serve as the foundation of next-generation data platforms, augmented with services that add value.

"The ability to make change and address costs requires choice. Vendor lock-in eliminates that ability. Without choices, firms have no option but to pay higher prices. And with industry consolidation, I don't see that changing." Terry Roche, Pegasus Enterprise Solutions

"I feel like Rest APIs are probably sufficient for most applications, outside of low-latency ones. So, I would identify those and marry them to an API provider where I could change things easily. I would do that first, and that would take a lot of applications off the table. Then I'd move on to the next demographic, such as front-office users who need tools, analytics, and rich data—areas where providers like Refinitiv shine—and to take advantage of the interplay between the data," Wallos says.

Making developers more efficient empowers them to make changes—potentially to replace large parts of firms' existing infrastructures, or to create structurally independent "bridges" between existing infrastructure and different data sources and applications, without being locked into a specific vendor's content or to one central component that can't be replaced.

One data and technology vendor that has touted the idea of bridges to future-proof firms' infrastructures is Activ Financial, which was this year acquired by IT infrastructure provider Options Technology. Danny Moore, CEO of Options—who, in his prior role as COO of Wombat, competed directly against Activ—notes the investment that Activ made over the years in things like identifier mapping, data transformation, and data conflation, and other "boring" but necessary functions to create a "very complete" platform that will combine co-located data capture at exchanges with its platform running in multiple cloud environments.

That in itself, with Activ's enterprise platform and broad data coverage, provides the basis to displace elements of existing platforms. But where Moore sees even greater potential, much like Pegasus, is in becoming an independent enabler for content providers.

"We have global distribution, distributed data capture, and standardized formats … and what we want to do is create something like an app store that enables exchanges and other data providers to get their high-quality data to market," he says. "Then it becomes easier to have conversations with data providers about what they want to create and how they want to commercialize it—we become that enablement layer."

Show me the money

The prevailing theme driving firms to consider new platforms is cost and the potential for new technology to reduce costs.

"Back in the early 2000s, when Reuters was facing competition from startups like Wombat, HyperFeed, Infodyne, and Activ Financial, the main issue wasn't cost—it was data quality and speed," Wallos says. "Now, I think interest in other platforms is a question of cost. Companies feel the price points they're paying for feeds versus what they're getting … and some feel they can do better with a smaller provider," such as one with a lightweight platform that runs in the cloud and serves a smaller, more focused set of use cases.

While the most latency-sensitive trading firms may decide it's worth the expense of building their own solutions or buying ultra-high performance solutions from niche providers, most firms consider market data platforms a necessary expense rather than a strategic investment that contributes directly to business or revenue growth. And for that majority of firms, switching platforms—while a potentially expensive and

complex challenge—has the potential to yield significant cost savings, especially if there are viable alternative platforms available to keep prices competitive.

Like Pegasus, Options and others, this is one of the drivers that New York-based data and technology vendor MayStreet is hoping to capitalize on. MayStreet has traditionally built components such as its Bellport feed handlers to support high-performance data needs, but now sees much greater potential from offering these collectively as a platform—an integrated suite of components, comprising its feed handlers, its Data Lake, and Analytics Workbench.

"Financial firms spend hundreds of billions of dollars per year globally on capital markets IT—$33 billion on data alone, and 10 times that on making that data usable," says MayStreet CEO Patrick Flannery. "I think there's a much bigger business to be built here, given that the financial services industry is very competitive and there is not a lot of advantage to be gained from building this in-house."

Significant parts of that spend could be replaced with combinations of components that create an on-demand data infrastructure, Flannery says, adding that relevant use cases range from trading groups to risk, compliance, and trade desk support departments.

"Too often, a firm might be paying a lot of money for different solutions in the front office and middle office, such as a low-latency solution in the front office, and other systems for risk, reconciliation, and so on," he says, adding that using the same underlying building block-style components could potentially deliver "significant" cost-of-ownership improvements. "We did a crude comparison of our Data Lake against [collecting data via] co-location. A tier-one bank might pay $15 million per year for a data lake. Now, it depends how many venues that bank connects to—many need far fewer than 300 venues—but we can deliver that for one-fifth of the cost."

And it's not just smaller, agile tech startups driving change: Some of those venues themselves also believe there's an opportunity for them to play a role beyond just provision of exchange content. This is the case with the LSEG's acquisition of Refinitiv, and now Nasdaq is also eying this space, with its new cloud-based Nasdaq Data Fabric offering, which it says can outsource large parts of a firm's data infrastructure.

"There are all these technical challenges that we've become used to. But technology has improved a lot, and cloud is making more things possible," says Bill Dague, head of alternative data at Nasdaq. "With Data Fabric and Data Link, we think that for the content we have, there's a better way to distribute it, and for the content that clients have, there's a better way to distribute that, too."

Not just a platform for distributing data from Nasdaq's exchanges, Data Fabric is a companion to its Data Link offering of third-party data, based on its acquisition of alternative data marketplace Quandl in 2019. But beyond that, it also allows clients to use it as the delivery mechanism for any other third-party vendor data they consume. Instead of maintaining direct links to multiple vendors, firms access Data Fabric via existing connections to Nasdaq, while Nasdaq obtains the data from vendors via its own existing connections, eliminating one side of the cost triangle—as well as for distributing and managing internal data, a feature that is currently in testing.

Nasdaq looks at Data Fabric as an additional channel for data sources to reach potential clients, rather than

something designed to replace vendors themselves—though it's clearly designed to replace aspects of data infrastructure currently controlled by other vendors. In short, Data Fabric potentially becomes the conduit for all a firm's data from a multitude of sources, via dedicated and isolated, secure channels.

"For example, if someone subscribes to Bloomberg Fundamentals, we go and pick it up. If a second client needs that, we go and get it again—we're not trying to collect it once and federate it … and we don't want to become a redistributor," Dague says. "We think of our platform more like a Snowflake, Databricks, or even some of Amazon Web Services—as an extension of the client's infrastructure."

In addition, firms can use Data Fabric for compliance and governance tasks, such as to centrally track and manage purchases and usage, entitlements, and reporting. That alone would make this a compelling proposition, but Nasdaq's existing presence and scale as a market and infrastructure operator may make it an easier sale to potential users thinking twice about big migration projects.

"People know that we understand markets, we understand data, and we understand how to run mission-critical systems," Dague says.

It's not all about the Benjamins

But cost isn't the only driver of change: Nasdaq argues that Data Fabric addresses a combination of cost and complexities, as well as the need to spin up access to data just as rapidly as firms can spin up cloud resources, so as to be able to quickly take advantage of new trading opportunities. "Every day that a firm doesn't have access to a dataset is a day it's not in the market, and not making money," Dague says.

But another reason that data platforms need to change—beyond keeping up with the advances of new technologies—is the need to keep up with the advancing needs of a changing user base.

Hence, what's more important than being able to displace the data platforms available today is what a platform's technology roadmap looks like over the next decade, says James Bomer, COO of the Activ business at Options Technology. "Going forward, we can expect to see more diverse applications requiring more diverse sets of data," he says.

Data giant Bloomberg experienced this while developing its BQuant platform for creating and publishing research, which was originally designed to meet specific needs of researchers and analysts. Bloomberg had already built desktop and Microsoft .Net tools for building apps for clients, but these were aimed at developers and were "clunky" for analysts to use. Instead, the team wanted to be able to publish directly from Python notebooks.

> "Financial firms spend hundreds of billions of dollars per year globally on capital markets IT—$33 billion on data alone, and 10 times that on making that data usable. I think there's a much bigger business to be built here, given that the financial services industry is very competitive and there is not a lot of advantage to be gained from building this in-house."
> **Patrick Flannery, MayStreet CEO**

"In the beginning, it was a desktop product—a terminal for quants. But we quickly realized this was something that could be used across an enterprise," says Tony McManus, global head of Bloomberg's Enterprise Data division, and himself a former director at Wombat and managing director at NYSE Technologies.

"We envisaged this as being primarily for quants to do research," echoes Bloomberg CTO Shawn Edwards. "But the biggest adoption was among firms using it for internal publication of research to their own workflows. It showed that quants needed a way to communicate with other users within their firms."

And by the time the vendor released BQuant Enterprise earlier this year, which allowed users to share the output of BQuant across their firm, it was clear that BQuant's potential had evolved far beyond its initial use cases.

"Originally, we weren't really targeting quantitative programmers. But our user base was changing. … So, early on we recognized that this was something that could be truly transformational," Edwards says.

At one level, BQuant Enterprise provides greater compute power than the desktop BQuant could provide alone, allowing users to run automated machine-learning computations on vast quantities of internal and third-party data. It's cloud-native, and uses Kubernetes containers to virtualize Jupyter, Apache Spark for big data processing, NumPy for mathematical functions, and other data analysis tools and open-source libraries.

"It takes you from ideation through testing and to production, so you have the complete workflow," Edwards says.

But on another level, it goes beyond a quant-focused platform to provide broader capabilities for sharing data across an organization.

"We see BQuant as not only a solution for building factor scoring and pre-trade portfolio construction and analysis, but as a long-term platform for many solutions. We'll get to other areas like post-trade analysis, transaction cost analysis, and analyzing trading algorithms—we don't ring-fence or limit how or where clients can use it," Edwards says. In fact, the platform will play a strategic role in Bloomberg's efforts to integrate alternative datasets from its recent acquisition of Second Measure and to build out a more powerful set of alternative data-focused tools for quants and analysts—all linked to other data within Bloomberg—that can be used to enrich users' existing workflows.

A paradigm shift

Like BQuant, Ingenii—a startup formed by former executives of managed data services platform Hentsu, which was acquired by buy-side technology firm Portfolio BI in February—is focusing on research with the initial launch of its own cloud-based distribution platform, but sees the potential for it to become an enterprise platform, serving different tiers of users throughout an organization, from traders to senior management.

Among its target base of hedge fund clients, firms are approaching research differently from the past, trying out new

datasets to see if they work—and if they fail, to fail fast. That requires significant data engineering resources for a firm to do in-house.

"What we're finding is that most of the time, even if they have data engineers in-house, they don't want them doing that full-time," says Ingenii CEO Christine Johnson. The vendor's proposition is to give away its platform and charge maintenance fees for updates and additional features. Johnson says Ingenii's API connectors can already handle 90% of data that firms might need out of the box, and that the vendor can add other sources and visualization tools as required by clients.

However, looking ahead, Johnson sees Ingenii as moving beyond an infrastructure play toward a different level of data management, research and analysis. "There's a massive technological convergence coming in the next three to five years between quantum computing and artificial intelligence that will allow you to compute things simultaneously on a single machine with more power than we can comprehend," she says. "So, if you're a hedge fund manager and want to research multiple datasets that in the past would take weeks to run, that's huge. That, and the ability to consume massive amounts of data in parallel, will also contribute to the evolution of AI. You can't do that on clunky old architectures—you have to be in the cloud, and using quantum."

Like Johnson and so many others, Bill Bierds, president and chief business development officer of BCC Group is also bullish about the cloud as the new domain of market data platforms. And that's hardly surprising: First, BCCG operates a cloud-based data platform. And second, the evidence is growing that the cloud can provide a home for real-time (if not yet ultra-low latency) market data beyond massive storage and compute resources.

In recent months, Nasdaq's launch of Data Link and Data Fabric—as well as its recent announcement of plans to run its matching engine in Amazon Web Services' cloud—have demonstrated this, as has Google's alliance with CME Group to make more data available via Google's cloud, and FactSet making some 30 datasets available via AWS' Data Exchange cloud data marketplace.

"Market data is going to the cloud. It's going to happen over the next three to five years, and we want people to be more aware and better prepared," Bierds says. "There still seems to be an incorrect perception that cloud is not reliable or ready—but it is. I think people who are talking about problems with data in the cloud are thinking about ultra-low latency or co-located data. But we're delivering double-digit millisecond speeds for clients."

> "Market data is going to the cloud. It's going to happen over the next three to five years, and we want people to be more aware and better prepared. There still seems to be an incorrect perception that cloud is not reliable or ready—but it is."
> **Bill Bierds, BCC Group**

To reach the "right" people talking about cloud strategically within firms, BCCG has partnered with IBM and KPMG to bring its data-specific expertise to the advisory firms' consulting efforts. "For example, IBM is already talking to most business areas within these firms, so we can leverage the relationships they have … to get to the right executives who have cloud on their minds," Bierds says. "We're talking to market data managers, and we need to reach a different audience."

'Banks don't like to rip things out'

Even when development is driven by evolving end-user needs, new technologies and capabilities often contribute to both driving those changing user demands, and also to being able to turn concept into reality.

"The emergence of really rich open-source software, such as Python and Jupyter notebooks—especially for quants and other research communities—is an important contributing factor," says Bloomberg's Edwards. "We are prominent contributors to and consumers of open-source software—we have funded JupyterLab, we've had people on Project Jupyter's steering council … and we've even open-sourced some things," such as BQPlot, the vendor's interactive charting and plotting tool for Jupyter.

But whatever the driver, it's one thing for a vendor to build a new solution; it's another thing entirely to persuade user firms that they need to fix something that ostensibly ain't broke.

"I think existing platforms like RTDS will probably be around for another decade because they serve a purpose that I don't see changing—collecting and aggregating data—and data rates will only continue to increase." says Brennan Carley, who recently retired from Refinitiv after a decade at the vendor in various senior roles, including running its Enterprise Data Solutions business, which includes responsibility for RTDS. "The main users of these platforms have a huge amount of cost sunk into them—not just software licenses, but everything that's built around them. And banks don't like to rip out things that they've sunk lots of money into."

Indeed, MayStreet's Flannery says one of the practical issues that the vendor has to deal with is whether the market is ready to handle a big change. "Right now, if we said 'it's all or nothing,' firms would choose nothing. So, we need to have piecemeal ways to support customers. We think that approach allows us to engage with customers," he says.

Thus, Flannery prefers the softly-softly approach rather than suggesting a "big bang" cutover, saying that its platform is "not necessarily about replacing existing solutions; it's more about new use cases, such as tick collection and storage. Having said that … we see lots of opportunities where firms could remove use cases where they use more cumbersome and costly solutions."

One of the reasons why solutions such as those offered by Pegasus, Activ and others to abstract critical layers of infrastructure offer such encouragement to firms is because they can feel trapped by their technology choices.

"When I was at Citi, I thought I got good value from my Trep license," says West Highland's Wallos, who before joining Thomson Reuters in 2010 spent four years as global head of market data architecture at Citi, and the seven years

prior to that at Bear Stearns running the firm's RMDS and Wombat architectures. "But had I wanted to move everybody at Citi off Trep, it would have taken years and $25 million in development costs. We had something like 400 suppliers connected to Trep. And every time you want to change the data structure or change an API, the development team has to manage that. Every little change that's not planned can be a major issue."

That's why there is understandable trepidation on the part of financial firms, adds BCCG's Bierds. "People are very nervous about moving away from Refinitiv and Trep/RTDS because they've spent 30 years building everything around those platforms. So now, if we go into a Trep customer, we are very prescriptive, and we explain that you have to write applications differently so that they aren't locked in to one vendor's data. Technology shouldn't be the reason you're stuck with a provider."

When firms are more open to big changes, it's often because they have already undergone some level of major structural change. One senior market data technology executive at a European bank says there were three catalysts for the firm becoming more open to new solutions. One was a scaling-back of some business lines, drastically reducing the scale of its market data consumption. The second was the adoption of a cloud-first strategy to align with exchanges and brokers making data available via the cloud, to save money without adding complexity. The third is that whereas the bank has traditionally been conservative about adopting new and cutting-edge technologies, nearly two years under Covid-19 pandemic restrictions has made it more open to trying new things. "Now, they're more willing to say, 'Have a go,' than before," the executive says.

But that approach can be rare. John Greenan, CEO of technology advisory firm Alignment Systems, says that with the trend toward cost-cutting and outsourcing among larger investment firms over the past decade, innovation isn't being driven by the big banks with large data budgets, but rather by institutions willing to challenge established practices and to try new things, such as blockchain and peer-to-peer networks.

For example, Greenan highlights the Pyth Network, a peer-to-peer network where vendors and liquidity providers contribute their market data and gain access to that of their peers. Though currently heavily weighted toward crypto content, the network counts several major firms among its members, including the Chicago Trading Company, Flow Traders, Jane Street, Jump Trading, and Susquehanna, as well as startup exchange Memx, IEX Cloud, and the Bermuda Stock Exchange.

"Right now, the primary use cases are around crypto trading," says a Pyth official, where traders need market data on traditional asset classes to provide a benchmark for valuing crypto assets. Pyth currently only carries limited data on the equities and foreign exchange markets, but the official says he can imagine both expanding the symbols provided in each asset class, as well as potentially expanding to cover other asset classes, based on demand from participant firms.

Thus, Pyth's main play may be in displacing content sources. The official says the network also has the potential to provide a market data infrastructure, but warns that the Solana blockchain platform on which Pyth runs, while fast enough for many data needs, may be too slow to supplant existing data platforms entirely.

"Solana updates every 400 milliseconds or so, which is fast for a blockchain, but slow for equities markets, for example. So I don't think it will ever completely replace the types of platforms that our participant firms currently use," the Pyth official says.

Nevertheless, firms could use the data from Pyth to power non-latency sensitive applications, or to potentially build a "serverless market data terminal … without needing any of the back-end data engineering or architecture." Though these datasets don't contain instrument-level reference data and standard identifiers, he says that initiatives to issue securities and publish data via distributed ledgers could solve that challenge.

And though adoption remains uneven, making firms unlikely to re-point existing systems to this new paradigm immediately, he says the gradual migration of these data types on-chain will start to make it a more compelling proposition for firms as existing systems reach the end of their life, or contract term, and firms need to look for replacements.

"This is the moment where the market data industry gets with the program, or goes the way of Blockbuster, film cameras, and black-and-white TVs," he says.

Sowing the seeds of change

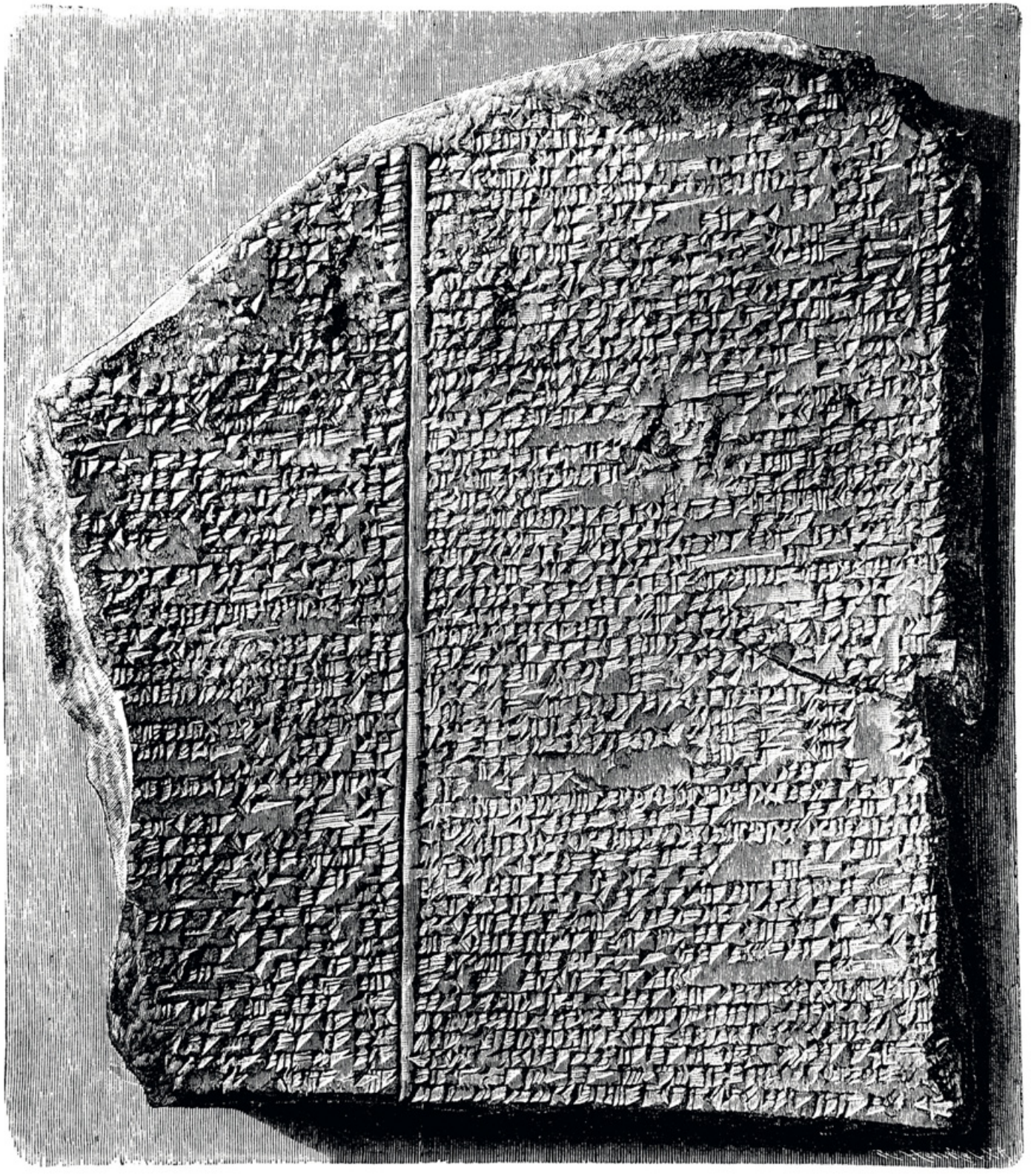
But while all providers are making advances toward new ways of delivering data, Bloomberg's McManus warns that change won't happen overnight. "It's not like one day you have a datacenter and the next day you have a cloud. There will be years of operating in a hybrid model," he says, adding that the richer the ecosystem of content, tools, and services that a vendor provides, the more complex that process becomes. "The question for me is how you help customers navigate that complexity."

And there are efforts underway, leveraging technology advances, that are designed to cut out that complexity altogether. Perhaps the real question is whether the industry will support or stifle them.

In the past, data delivery required a large technology footprint because that's what was necessary to support distribution of real-time data. Terminals ran on proprietary desktops, but with the evolution of the internet, many forms of data displays and services were able to migrate to being web-based.

Now, tools exist to move even more of that data distribution process online, reducing the need for costly infrastructure in-house or even dedicated platforms in the cloud. At the very least, the data platforms of tomorrow have the potential to look very different from those of the past two decades—and most likely will involve combinations of all those mentioned above, and more, rather than being the domain of a single platform or provider.

Data is the water that nourishes the soil from which trade ideas grow. But to yield change, the industry must nurture and cultivate a fertile ecosystem. With cost pressures rising and so many choices now viable options, perhaps financial firms are ready to get their hands dirty. wt



Speaking a common language

Asset management firms still struggle to consolidate their data so that it speaks the same language across different business lines. Some new SaaS-based investment management vendors are aiming to solve this.
By Nyela Graham and Wei-Shen Wong

Financial institutions are seeking new ways to monetize their data and improve existing processes. Technological advancements such as machine learning and cloud technologies have helped them along that path, but these technologies don't mean much if firms don't first get their data right.

"As an industry, we've done quite a good job of tackling things like reference data or market data in the more standardized areas, but I'd say most firms don't have a great handle on their investment data," says Virginie O'Shea, CEO and founder of consultancy Firebrand Research. "That's a much wider bucket. That can be datasets coming from your custodian and other service providers."

Achieving a consolidated view of their data can be arduous for asset managers due to siloed business lines and duplications in data across those entities. Throw in experimenting with and using alternative data or ESG data to find alpha, and it can become more complicated.

Some data management software and services vendors are offering platforms that incorporate a unified data layer that gives asset managers a consolidated view of their data across different business silos. There could still be some pushback from end-users in switching over to such platforms due to difficulties in untangling existing systems, but it is getting easier with the shift to the cloud and to as-a-service models.

A unified data layer brings varying data sources together to offer a single view of an enterprise's data at its most basic level. Using software-as-a-service (SaaS)-based applications and platforms could give investment managers up-to-date views of their portfolio positions while decreasing operational risk around installing and hosting hardware and performing upgrades on a less frequent basis.

For investment manager Fidelity International, reaching for that unified data layer means ensuring its data strategy is fit to handle any future changes. Yugo Ashida, head of investment solutions and services enterprise architecture at the London-based investment firm, tells *WatersTechnology* that Fidelity believes improving its data infrastructure will allow it to grow different areas of its business, such as its private asset business, as well as allow it to get new products to market faster.

"We're essentially trying to make sure the data platforms we have are fit for the future and strategically placed," Ashida says.

Helping Fidelity International get its data strategy "fit for future" is five-year-old investment management technology vendor Finbourne Technology. Fidelity International's venture capital arm, Fidelity International Strategic Ventures, took a minority stake in Finbourne, participating alongside undisclosed investors in the latest series-A funding round completed in 2021 that raised £15 million ($20.3 million), although executives decline to quantify the value of the stake in Finbourne.

Finbourne has two platforms: Lusid and Luminesce. Lusid, through open APIs, takes in data across operational stacks and provides real-time positions, while Luminesce is a data virtualization platform providing a data fabric for analytics and insights.

Fidelity International's Ashida says that in the traditional approach to application architecture, data is ingested into the application database where business logic sits on top to provide views into the application. With the unified data layer, that business logic is now pushed into the data layer. This means there is data consistency across applications that provide different functional capabilities specific to performance attribution, risk, or portfolio construction.

"We can have a more componentized approach to building an application—different technology teams don't need to think about some of those functions, because they're already there in the services layer," he says.

This approach also helps resolve the issue where people see "different versions of the truth." While Ashida notes that not everyone needs to see exactly the same data, the way the logic is built in allows the firm to talk the same language across the different capabilities.

Finbourne was founded on the premise of building technology that mirrors the efficiency of products from Big Tech companies like Amazon and Google. Co-founder and CEO Tom McHugh says Finbourne's founders started with the idea of building software the way asset managers would use it. "The existing systems [in investment management] are traditional, very file-based, and batch job-based," he says.

McHugh started his career at Morgan Stanley in 2000, where he did network engineering before turning to the buy side, working in asset management on portfolio optimization and rebalancing. After a stint at the Royal Bank of Scotland in derivatives trading technology, and front-office risk and quant development, McHugh went to UBS where he met the people who later helped him found Finbourne.

"We looked around and found that there is actually a huge amount of

efficiency to be brought to asset management," McHugh says. "We looked at the fact that they sit with a lot of legal responsibilities to run their trading operations themselves, they have the fund administrators set the books and records, and they have the custody bank take safekeeping of [records] at the transfer agency."

He says this complicated landscape with its legal obligations means asset managers face a heavy technical burden simply to operate.

Adding to these obligations is the fact that participants use different identifiers and operate in different geographies. Between identifiers—such as Sedol, Cusip, Isin, Figi, and Reuters Instrument Code—accountants, custody banks, and other participants can be looking at different data.

Alcova Asset Management is another firm using Finbourne's Lusid platform. As a systematic asset manager, Alcova adjusts its portfolios' long- and short-term positions on a security according to price trends.

"Our firm is very data-driven. It is therefore imperative to be able to access large amounts of data in a consistent format for us to analyze," says Russell Hart, COO for Alcova. "After previously relying on vendors for part of the solution, and a mix of in-house systems for those requirements vendors couldn't meet, Lusid allows us to have a central repository that is cloud based and scalable, delivering a single source of data. For meeting internal, investor and regulatory requests, this single source is imperative to have."

Other vendors are also aiming to solve this issue for asset managers. Dan Groman, CTO for SaaS-based order execution management platform provider Enfusion, says different roles along the value chain—portfolio managers, traders, accountants, and risk analysts—aren't always looking at the same data.

Like Finbourne's McHugh, Groman says managers are used to systems that are more batch-based. "As orders get executed, if they have a real-time market data feed, they actually have a better insight into how their intraday performance is going than they've ever had in the past," Groman says.

Batch-based data processing, while efficient for sifting through large amounts of data, doesn't feed immediate results and doesn't allow for real-time insights. A manager looking for immediate insight into their positions won't have that information immediately and may need to wait until the next business day.

Enfusion's platform was initially tailored to hedge funds, but the company has since broadened its focus to the wider investment management industry. The platform offers trading, real-time portfolio monitoring, accounting, and data warehousing and analytics.

"Often, [a manager] might have a passive investment strategy where maybe they're following a benchmark or an index," Groman says. "But multi-asset strategies are becoming more and more common, especially in some of the bigger players, where it really functions more like a hedge fund strategy."

A multi-asset strategy encompasses a variety of assets like stocks, bonds, real estate and others to create a more diversified portfolio. Multi-strategy hedge funds operate similarly to use different investment strategies that can be uncorrelated but deliver returns to investors like long/short equity. Each strategy can be facilitated by a different portfolio manager.

Groman says this is where Enfusion comes in, as with the right click of a mouse, users can "unwind all of their positions," and get a real-time view of capital and where they'll need to make adjustments. He contrasts that to other systems where managers may have to ask themselves if their data is synchronized or if everyone is looking at the same thing.

Legacy vs. SaaS

Fidelity International Strategic Ventures' investment in Finbourne has a specific dual purpose: strategic impact to Fidelity International and financial returns from its portfolio. The venture capital arm had spent time looking at the front-to-back investment and asset management tech stack before deciding to invest in Finbourne.

Alokik Advani, managing partner at Fidelity International Strategic Ventures, says most investment managers' systems are built on archaic, legacy infrastructure. "A lot of that is based on third-party providers coupled with internal builds that have happened over time, that are built on old-school tech," he says. "The organizations are running with a lot of technical debt, and have been using a bunch of plaster, sticky tape and Band-Aids to solve some of that to get ready for the next generation."

A benefit of SaaS applications is that they can be constantly updated as they are deployed to users.

"There's a question I always ask people who use Microsoft Office 365: How often does Microsoft release it? In once-a-year, twice-a-year release cycles? But it's every day, probably," says Finbourne's McHugh. "It just works. That's the kind of change we want to make: We deploy our kit to production customers 5, 10, 15,

sometimes 20 times a day. But we write the infrastructure so that they won't have any downtime. That's our obligation."

McHugh says when a developer makes a code change, it results in a higher cadence of release with much lower risks in each chunk because that developer knows the software is being deployed to the client in 45 minutes. He says firms have an advantage from using a system that allows for real-time data as opposed to legacy technology that sends out an end-of-day report.

This doesn't mean incumbent players in this space are sitting still. In December 2021, SS&C Eze, whose Eze Eclipse platform is an all-in-one cloud native front-to-back investment management platform, launched Eze Marketplace, a cloud-based marketplace that provides access to investment management apps and other solutions.

Mike Hutner, general manager for SS&C Eze, says the new marketplace is aimed at saving asset managers time and money. "It gives you more secure, real-time capabilities, it eliminates the need for custom coding, time-consuming integration work, as well as data normalization that a lot of people have to spend a lot of time, hours, effort and money on," he says.

Hutner says asset managers can end up using disparate systems and other non-linked tools and then must go to multiple data sources to determine how to act on an investment idea, model or review current positions.

Other incumbent vendors like SimCorp and BlackRock Aladdin also offer cloud solutions to the buy side. SimCorp rolled out a SaaS-based version of its flagship Dimension investment management platform in August 2020. SimCorp Dimension as a Service on Microsoft Azure was released as the vendor said "heightened global market conditions, increased competition and regulation" were placing higher demands on buy-side operations. SimCorp launched its multi-asset, end-to-end DataCare platform for the buy side in April 2020 for market and reference data management.

Last February, BlackRock announced a strategic partnership with Snowflake that included the rollout of the Aladdin Data Cloud, a managed data-as-a-service solution. The solution would allow clients to access a centrally managed data store pre-loaded with Aladdin datasets that can be supplemented with proprietary third-party data sources.

Chris Farrell, COO for Finbourne, says defining the company in a sea of competitors can be difficult. "We sometimes struggle with articulating our offering because we are an API-led open investment management platform," he says. "The question we get quite a bit is, 'What are you most like?' We are actually different from all the offerings out there, because [firms] that buy Snowflake buy us, [firms] that buy BlackRock Aladdin buy us." Farrell says it's up to the client to decide whether they want to decommission other systems and use them natively or continue to use Finbourne as the bridge between all their different systems' states.

In line with the theme of interoperability, Finbourne has integrations with the likes of Refinitiv, Bloomberg, Six Financial, Salesforce and others.

"We don't believe in this 'winner takes all' or that you can have a single system view of the world. That's actually the wrong outcome. You can't be best at everything," McHugh says.

A challenge remains

While there's an appeal in having a more consolidated data view and less monolithic hardware, the switchover is easier said than done.

A chief investment officer at a large European asset manager says that the ability of a firm to make a change from legacy/incumbent technology to SaaS isn't a guarantee. "Typically for legacy reasons or for historical reasons, firms tend to continue using what they have. So any change—even changing the custodian—is a pain. So if today I said to an asset manager, 'Let's move from Bloomberg to BlackRock,' it won't happen. There has to be a compelling reason," the chief investment officer says.

That compelling reason could be better access to data and the ability to connect to tools and platforms that can help distill data to contextualize and find correlations among vast amounts of information.

A December 2021 survey from Nasdaq outlined quantitative, fundamental, and quantamental portfolio managers' top data infrastructure concerns. Sixty percent of fundamental managers cited an inability to quickly onboard or deploy new data, 53% cited a difficulty finding or accessing data within their organization, 47% cited compliance, and 40% cited outdated technology as a concern.

For example, a fund may be split to be managed by two managers with different specialties. Because they are operating in the same fund, whatever actions one manager takes in terms of generating an order and or what they're modeling, the other manager may want to see.

The capabilities and the different styles, from an application point of view or technical capability perspective, might mean each manager wants a different application. Traditionally, keeping one fund manager's views, models, or actions, on their fund, and having that appear near real time on the other portfolio manager's desktop would be tricky, because two different applications have two different databases.

Fidelity International's Ashida says this issue is resolved with Finbourne's Lusid. "If you start using a single data platform, essentially, you move the application databases of those two applications into Lusid. Then you don't really have to keep things in line because any kind of order being generated is being stored back into Lusid, and Lusid knows about it, and can be updated on the view of the other fund manager in near real time," Ashida says.

Fidelity's Advani adds that the buy side wants more flexibility so that they can better map and manage their tech roadmap to solve legacy issues.

"I think this marketplace, and this industry is littered with single-vendor dependency," he says. "That creates difficulty, extreme cost, and timescales that are just inhumane, when you're trying to create changes or improvements."

As more vendors look to the cloud and SaaS-based services to provide a consolidated, unified view of data, the work doesn't stop there. Perhaps the next roadblock for the legacy incumbent players lies in providing interoperability and seamless access to their clients' third-party providers. wt

LSEG–Tora: A tale of crypto, Asia expansion and (more) integration burdens

When LSEG acquired Refinitiv, it added Eikon, FXall, and AlphaDesk to its portfolio of execution platforms. In February, the exchange also bought Tora, which has a stronghold in Asia, as well as a presence in crypto. While sources say there are clearly synergies, the key piece of the deal will come down to integration and interoperability.

By Anthony Malakian, Josephine Gallagher and Wei-Shen Wong

In the world of financial technology, size matters. Proof of that can be seen in the order and execution management system space, where the likes of SS&C Technologies, Ion Group, Broadridge and even State Street have been growing rapidly through acquisition. One of the more unique entrants into this M&A blitz, though, has been London Stock Exchange Group (LSEG).

In February, LSEG announced, subject to regulatory approvals, that it was acquiring buy-side OEMS and portfolio management system technology provider Tora for $325 million—a "hefty" price tag for a vendor that is mainly focused on Asia, some sources say. The appeal for the exchange operator is clear, though: LSEG doesn't currently have an OEMS with a strong presence in the growth market of Asia. Tora also helps LSEG expand its fixed income, foreign exchange (FX), derivatives, and, perhaps most importantly, its cryptocurrencies coverage, since the exchange doesn't currently have any products that enable for the execution of digital assets.

As the exchange digests this new acquisition, sources say the greatest concern for users will likely be around tech integration and support. In the summer of 2019, LSEG announced it would acquire Refinitiv in a deal valued at an eye-watering $27 billion. At the time of the announcement, *WatersTechnology* wrote an article titled "LSEG's proposed Refinitiv deal: It's about more than just market data." And the deal was certainly about much more than market data. Yes, Refinitiv was the second-largest market data provider (and a powerhouse in the alternative data and reference spaces), but its portfolio also included a raft of execution tools, such as the Eikon trading terminal, the Redi EMS, the FXall trading platform, and the buy-side OMS AlphaDesk. (*See* "Growth through acquisition" *box below*.)

> "Clients don't want three products for three geographies. Just because you have Tora and Redi, that doesn't mean that your clients can magically trade globally."
> Former Refinitiv executive

Soon after the Refinitiv deal closed at the start of 2021, LSEG announced that the integration of the tech and data giant would take longer than originally expected. Now, the exchange operator is adding further complexity to the integration project by adding yet another trading platform.

"Geographical expansion makes sense, but how do you offer a product? Clients don't want three products for three geographies. Just because you have Tora and Redi, that doesn't mean that your clients can magically trade globally," says a former Refinitiv senior executive.

Tied to that integration challenge is the issue of support. Last year, Eikon suffered three major outages, as well as a series of smaller disruptions, which the exchange said were "unacceptable."

"You can't have that with a trading product," the former executive says. "So one of the biggest concerns should be support. If you put all the support and technology functions in the centralized departmental corporate structure, a product can wither away—a trading product needs real-time support."

The source says that at the time of their departure a few years ago, FXall was a standalone product, and Eikon and Redi were still working toward full integration. (The AlphaDesk deal closed in June 2019 and is still being integrated.)

A former LSEG executive who was still at the exchange when the Refinitiv deal closed says there were indeed internal conversations over the cost of the Refinitiv integration.

"As powerful as Refinitiv and the platform is, it still needs to be modernized, and I think that's part of what they're dealing with—a tech stack that's not completely modernized yet, but onto which they are trying to integrate more acquisitions," they say.

Modern family

So, Tora becomes an additional integration burden for LSEG at a time when the exchange already has a spate of projects underway to slot the massive Refinitiv piece of the puzzle into place.

Growth through acquisition

Acquisitions involving Thomson Reuters/Refinitiv that are pertinent to the Tora acquisition:

July 2012: Thomson Reuters bought FXall (then FX Alliance) for $625 million. The deal closed in August 2012.

September 2016: Thomson Reuters acquired Redi Global Technologies for an undisclosed amount. The deal closed in January 2017.

January 2018: Thomson Reuters agreed to sell its Financial & Risk unit to a new company minority-owned by the vendor and majority owned by a consortium led by Blackstone Group. The $20 billion deal closed in October 2018 and the new company was named Refinitiv.

May 2019: Refinitiv acquired AlphaDesk for an undisclosed amount. The deal closed in June 2019.

July 2019: London Stock Exchange Group bought Refinitiv for $27 billion. The deal closed in January 2021.

For example, even before the LSEG deal closed, Refinitiv decided to subsume Eikon (and its Thomson One workstation) into a new data and collaboration platform called Workspace.

> "One of the reasons they moved onto Workspace is they needed to be a lot more open; they needed to be on a lighter, more modern technology. So they're doing all the right things, but it's still happening and in the works, so that definitely makes the Tora integration a little more challenging."
> Former LSEG executive

Workspace is built using the Electron open-source software framework (not to be confused with Refinitiv's own Elektron low-latency infrastructure), which makes it easier to build JavaScript and HTML applications, make changes, speed up production cycles, and respond to client requests, without the "inherent rigidity" of older technologies.

Workspace also contains a cloud-based, integrated Python scripting environment, dubbed CodeBook, which enables users to build Jupyter notebooks using Refinitiv data. Separately, an integration with Microsoft Office allows clients to incorporate data via the vendor's API into models built in Microsoft Excel, and other Microsoft Office applications. And key to the platform, Workspace has an API-driven back end that enables clients to make use of its data in other applications, depending on a firm's needs.

On top of this Workspace project, the exchange also made the decision to re-platform FXall to the LSEG Millennium tech stack. The company said at the time that the migration would boost order processing and quoting speeds and enable the support of a broader range of order types.

"Refinitiv's always had a pretty old tech stack," says the former LSEG executive. "One of the reasons they moved onto Workspace is they needed to be a lot more open; they needed to be on a lighter, more modern technology, and so they're doing all the right things, but it's still happening and in the works, so that definitely makes the Tora integration a little more challenging."

The crypto connection

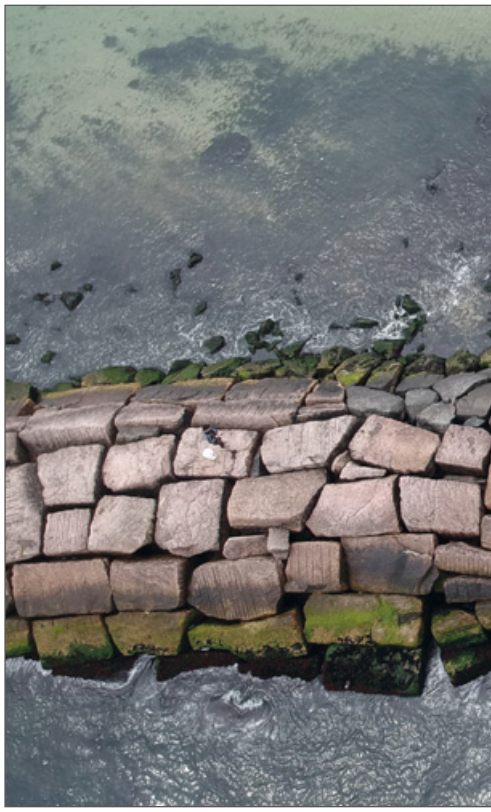
As noted previously, the price tag for Tora surprised some observers. The former LSEG executive believes Tora's crypto capabilities played a big part in the $325 million valuation. "The multiple that the deal commanded is just crazy. To pay $325 million on that—I think the crypto side definitely commanded a premium, and I think that's one of the reasons they were interested," the executive says.

The former Refinitiv executive concurs, saying they believe this deal was about "buying revenue, and they're not buying it cheap—they're buying at nearly a 10x revenue multiple."

And a senior executive at a competing OMS provider says that even though a lot of time and money has been put into getting these systems to work together, even prior to the LSEG deal, in the end, they expect the exchange to consolidate the AlphaDesk, Redi and Tora pieces, where Workspace will eventually become the focal point from which users access global, cross-asset trading.

"They spent a lot of money buying these products, and then they actually have to make money from it afterwards. Unless this is, I suggest, a way to entrench their position to be able to sell more data and other bits and bobs. Then they'll have to maintain all three products—AlphaDesk, Redi and Tora—and that comes with a cost. So if we look at something like this, we will look to consolidate because it's really difficult to afford having multiple products that basically do the same thing. You can, of course, say that maybe the Asian market is different, and so on, but for this piece, I would argue that the market is largely global," the rival OMS executive says.

However, integration challenges are not unique to LSEG. There's tremendous pressure for firms to scale up through acquisition, otherwise they risk getting squeezed in the middle, fighting over bread crumbs. At the same time, buy-side firms are having to expand into new asset classes and geographies to generate alpha, as passive investing and tech innovation create unique challenges.



"The natural guess is that desktop terminals are going to be less important. Yet, if you look at it, what we're seeing is different forms of distribution," says Brad Bailey, head of market intelligence at broker-dealer Clear Street.

"There are still people that need desktops, but I think the overall business as you think about the future of where we're going—and this is fixed income, equities, crypto ... whatever the trading product or data—the more you have unique distribution channels, whether it's to a desktop or an API, it doesn't matter as much as having the breadth of data," Bailey says.

Tora, which was founded in 2004, has made its mark in Asia, an area where the various other LSEG products are lacking. Conversely, Redi has far greater penetration in the US and European markets, where Tora has limited relationships. So from a geographic perspective, pairing Tora and Redi makes sense, Dean Berry, group head of trading and banking solutions at LSEG, tells *Waters Technology*.

Tora will also allow LSEG to expand its multi-asset class coverage, specifically in fixed income, FX, and derivatives, and, as noted previously, cryptocurrencies. Tora

has a digital asset trading platform called Caspian, a sibling company that connects to over 30 different crypto exchanges and aims to provide institutional-grade tools for trading in the nascent—but rapidly growing—asset class.

While Berry says the crypto piece wasn't the main driver of the acquisition, he notes that a "big" asset manager asked during a recent request-for-proposal (RFP) process, "What can you do in the crypto EMS space?" Other buy-side firms, though not directly involved in an RFP, have also asked LSEG about its crypto capabilities, he says.

"A key theme we are seeing from customers is the demand for multi-asset coverage. When we talk about multi-asset, that 'multi' piece is getting a bit wider—it's not just your classic asset classes," Berry says.

Furthermore, Berry hopes that Tora's crypto capabilities will help it to expand its offering at tier-1 banks in the US.

"Global banks have been very vocal about providing digital asset trading to their clients," he says. "As such, they will need a trusted partner to be able to execute on crypto, and we want to be that trusted partner. To be clear, we are acting as the infrastructure to facilitate the trading, akin to a motorway network. These banks could go directly to the crypto exchanges and build connectivity directly, but that can be timely, expensive, and difficult to maintain—so many are choosing to connect via an infrastructure provider."

'Unknown unknowns'

Berry's career spans three decades. He joined Refinitiv from BGC Partners in November 2020. He says when he arrived, he began thinking about acquiring Tora. While he declines to give an exact timeframe of when official discussions began with Tora, he says they ramped up about six months ago.

Berry acknowledges that trading platform integrations are challenging, but says that when it comes to LSEG's integration of Refinitiv, the process has been underway for more than a year, and the thinking around that integration had been ongoing for a while before that, as it took some time for the deal to clear regulatory hurdles.

Berry anticipates the Tora integration going smoothly because it is built on a more modern architecture—though, Tora was not born on, say, the cloud, and is undergoing a major tech modernization process.

"They've embarked on their journey to the cloud," Berry says. "So some of their stack is already in the cloud, as is ours, so that is really important for us to be able to work with."

He also notes that Tora has embarked on an HTML5 overhaul, "moving away from legacy Java-type applications," which is important from a compatibility perspective because the new Workspace platform is built on HTML5. This will also be important if, as expected, hybrid in-office, work-from-home work structures become the norm in a post-pandemic world.

"You feel more confident when you're working with a more modern tech stack," Berry says. "If you're working with a newer company, the technology tends to be much more agile."

The long, slow road

Refinitiv's predecessor, Reuters, started developing electronic trading platforms in the 1970s, and Tora itself is nearly two decades old. But it must be reiterated that in today's consolidating market, firms need to scale up and diversify asset and geographical coverage.

If LSEG is successful at stitching these pieces together, the exchange operator will become a powerful force in the world of market data and trading technology. If it's disjointed and not connected—not interoperable—client frustration will lead to the exchange learning new lessons when it comes to trading-platform user feedback.

Given Tora's price tag, if the former prediction comes to pass, then it will have been an expensive but necessary move. If it's the latter, those lessons could prove very costly indeed. wt

> "A key theme we are seeing from customers is the demand for multi-asset coverage. When we talk about multi-asset, that 'multi' piece is getting a bit wider—it's not just your classic asset classes." Dean Berry, LSEG

Where have all the blockchain startups gone?

Building a startup is hard. Building a blockchain startup is harder. More than 10 current and former financial blockchain builders and users detail their experiences of trying to cut their teeth on a once-darling tech, and the lessons they're still learning from it. By Rebecca Natale and Nyela Graham

Some roads are paved with good intentions but end at underwhelming destinations. Blockchain, as a tool for capital markets, but also as a grand promise—of less dependency on intermediaries, increased reliability of information, and faster settlement; the list goes on—has traversed road that's led it, in some cases, to a version of technology purgatory.

Neither useless nor as revolutionary as some initially thought, the once uber-hyped tech has been relegated to niche corners of the market such as smart contracts, digital assets, trade finance, and back-office recordkeeping, and even then, its implementations are mostly experimental or internal, rather than focused on industry-wide solutions. Believers maintain that its time just hasn't come yet; skeptics think it's had more than enough time since its 2008 inception alongside bitcoin.

It is impossible to get a full number of the blockchain startups that have attempted to get in on the action—and the funding—in the last decade, and especially of those that were geared toward wholesale capital markets, as opposed to retail banking or other industries. But with blockchain funding more broadly having reached an all-time high last year—$7 billion in the first half of 2021—it's safe to say the number is large.

"Blockchain" first entered this publication's lexicon in 2015. We subsequently reported on several new companies, and those stories have become increasingly interspersed with coverage on institutions' pursuits of the technology. Over the last two months, we have been investigating to determine what has become of those startups and projects.

We found that some were successful—though hardly revolutionary—and many were not. Some were acquired by larger companies, and then up-to-date information about them became scarce. Others pivoted to new business lines such as crypto services, computing, or more traditional trading solutions. Others seem to have disappeared entirely.

> "When I started building KYChain, I totally believed in the world narrative and the people saying it would work, but as I built it, I realized it doesn't work. … It's almost like tomorrow the North Korean dictator says, 'We are going to be democratic tomorrow; I'm going to be the only one voting.' How democratic is that?"
> **Kunal Nandwani, UTrade**

Such is the nature of startups. Regardless of industry, most of them fail, with the storied Silicon Valley motto and directive being "fail fast." But sources spoken to for this story describe a more arduous process than they would have liked.

In April 2019, Elliot Grossman left his family's firm, Dinosaur Financial Group—a broker-dealer, investment banking advisory, and wealth management services provider—for TZero, a blockchain-based security token exchange founded by online retailer Overstock.com, to become the CEO of its upcoming retail brokerage affiliate, TZero Markets. Additionally, TZero sports an alternative trading system (ATS) run by SpeedRoute, an institutional-grade provider of liquidity services and order routing for US equities that TZero bought in 2015.

Grossman's appointment followed a February 2019 announcement that Dinosaur and TZero had partnered on digital securities trading, and Dinosaur would be the firm to provide brokerage accounts for investors seeking to trade TZero's digital security tokens.

Almost two years later, in March 2021, Grossman left TZero and returned to Dinosaur, where he is once again a managing director. A bold, black box on the homepage of Dinosaur's website now reads: "DFG is no longer affiliated with TZero."

Grossman says he made the switch back in part because he was more comfortable being a trader and managing a P&L, not building a fintech from the ground up during a pandemic. During his tenure, the brokerage did go live, and some retail investors traded their tokens on the platform. At the same time, TZero embarked on a journey to usher in a more institutional crowd, but felt "paralysis" when such partners and users didn't materialize.

"We couldn't convince the capital markets industry to start adopting this technology. … Even though I think they saw the benefit, they thought, 'This is great; we'd like to be the second, but not the first.' It was a lot of frustration because we all felt like we had this really exciting and interesting product, but then we ran into miles and miles of red tape, and we ran into an industry that is built on legacy technology, that doesn't really have much ability to unfurl into adaptive technology," he says. "So much is still being caught up to the 20th century, let alone the 21st century."

If the startups that swim are the ones that can grow their user base—and fast—then Grossman felt TZero Markets needed a different leader.

A timeline of early blockchain hype

December 2015: Nasdaq completes private securities transaction
On December 31, 2015, Nasdaq successfully documented a private securities transaction on its distributed ledger-based platform, Linq. Chain.com, a privately owned blockchain development company, issued shares to a private investor using Nasdaq's Linq system.

January 2016: DTCC publishes white paper asking for industry-wide blockchain collaboration
The Depository Trust and Clearing Corp. (DTCC) released a white paper asking for industry-wide collaboration around blockchain technology. The paper, *Embracing Disruption: Tapping the Potential of Distributed Ledgers to Improve the Post-Trade Landscape*, discussed the pros and cons of distributed ledger technology, and also urged the industry to come together to find the proper ways to implement the new technology.

March 2016: R3 test drives five blockchain technologies with over 40 banks
Blockchain consortium R3 CEV, now just R3, tested five blockchain technologies by trading fixed-income assets between 40 banks over blockchains via cloud technology. The 40 banks included Bank of America, Barclays, BMO, BNP Paribas, Goldman Sachs, JP Morgan, Royal Bank of Canada, Royal Bank of Scotland, Societe Generale, and UBS. Private distributed ledger technologies built by Chain, Eris Industries, Ethereum, IBM, and Intel were all tested within R3's global collaborative lab.

September 2016: Accenture files editable blockchain patent
Consulting firm Accenture filed a patent for a prototype it created, along with Giuseppe Ateniese, a cryptographer and professor of computer science at Stevens Institute of Technology, allowing permissioned blockchains to be edited. The internet did not receive the news well.

September 2016: Credit Suisse and partners prepare proof-of-concept for syndicated loans blockchain system
A proof-of-concept for a more efficient syndicated loans systems was launched by Credit Suisse, Ipreo and blockchain firms Symbiont and R3 with plans to run through 2016. Member banks in the R3 consortium like BBVA, Danske Bank, Royal Bank of Scotland, Scotiabank, Societe Generale, State Street, US Bank, and Wells Fargo were participating. Buy-side firms AllianceBernstein, Eaton Vance Management, KKR, and Oak Hill Advisors were also involved.

September 2016: ASX completes prototype for Chess replacement
The Australian Securities Exchange (ASX) completed its distributed-ledger-based prototype for a new equities clearing and settlement platform, but announced it would make its final decision whether or not to replace its existing Clearing House Electronic Subregister System (Chess) platform at the end of 2017. The project has since experienced several delays along the way and is now slated to go live in April 2023.

November 2016–May 2017: Four banks depart R3 consortium before $107 million funding round
In November 2016, Morgan Stanley, Goldman Sachs, and Santander left the R3 blockchain consortium. Goldman Sachs was one of nine financial firms that founded R3 in September 2015. In April 2017, JP Morgan became the fourth bank to leave. Asked about the departure, a managing director at R3 said the bank was pursuing a "very distinct technology path, which is at odds with the one chosen by the global financial services industry, represented by our 80-plus members." In May 2017, R3 secured $107 million in funding to accelerate development of its Corda blockchain.

January 2018: Societe Generale tests a full trade cycle on blockchain
Societe Generale Securities Services was able to buy, sell, and settle shares of funds of the French asset manager OFI by plugging in a blockchain platform to its legacy system. The initiative was launched in 2017, when the two firms collaborated with the blockchain firm Setl in an effort to see whether the use of distributed-ledger technology could fully function on top of the bank's legacy IT and whether transactions could be completed without interruption.

"It was a very mutual decision where I said, 'Look you guys, we all need to grow, but I'm not going to take you to the promised land.' That being said, I still think the technology and the company have a lot of potential, but it's still very much ahead of its time," he says.

Perhaps he's right about potential. On February 2, the Intercontinental Exchange (Ice), the parent of the New York Stock Exchange, announced it would take an ownership stake in TZero. David Goone, a long-time member of Ice's management team and currently Ice's chief strategy officer, will join TZero as its next CEO and will serve on TZero's board of directors.

Now with Ice's backing, TZero's narrative stands to be totally reset, Grossman says.

Speaking to *Waters Technology* after the Ice announcement, TZero's executive vice president and chief legal and corporate affairs officer, Alan Konevsky, says that driving institutional interest in the technology (blockchain), the asset class (crypto), and forthcoming products and services that the company is actively developing, remain key priorities going forward.

Konevsky rejects the characterization of blockchain—or any technology for that matter—as being "ahead of its time" by referencing an old Steve Jobs-ism: "You can't just ask customers what they want and then try to give that to them. By the time you get it built, they'll want something new."

"There's no such thing as being with your time, particularly when you're trying to innovate," Konevsky says. "Innovation is a time-travel exercise. Sometimes you get it right, sometimes you misjudge. But it's not because the fundamental premise is wrong; it's because time and variables that come

with it—known, unknown, and unknowable—are difficult."

Roads to nowhere

In trying to trace the whereabouts of other startups *Waters Technology* had previously covered, some roads led to nowhere. In November 2016, London-based technology vendor Nimbrix launched a blockchain consortium aimed at increasing buy-side participation in the development of distributed-ledger technologies (DLTs). Participants in the consortium included KPMG, Microsoft, Thomson Reuters, and industry veterans from institutions such as BlackRock, UBS and BGI. The group had plans to launch a platform leveraging cloud, open-API, software-as-a-service, and blockchain technologies running on Microsoft Azure.

Only one month later, the official Nimbrix Twitter account made its last post—a retweet of an image of Gary Vaynerchuk, an entrepreneur who is prominent in crypto circles, superimposed with a quote attributed to him: "There's not a single winner on Earth that took it easy." The company has no website, but does still have an Instagram account with no posts.

> "Banking and securities are all heavily dependent on trust, but not blind trust. Trust based on established, credible entities. Fundamentally, the banking industry likes intermediaries."
> **Brennan Carley, Proton Advisors**

It's unclear what happened to Nimbrix, and apparently so soon after its big-name announcement. Former Nimbrix CEO Simon Bullers declined to comment on the matter, citing "post-sale" non-disclosure agreements; however, there is no publicly available information on an acquisition or buyout involving Nimbrix.

"I am not sure the world still understands the power of chains and cryptlets and closed blockchains. It's with regret that I can't talk," he said in a message.

Other vendors, which were not blockchain-native but attempted to get in on the hype when it was at its highest, seemed to become quickly disillusioned.

Trading and risk solutions provider Calypso Technology, now known as Adenza following its merger last year with AxiomSL, seemed to go all in on blockchain beginning in 2016. It first joined the Wall Street Blockchain Alliance, a non-profit trade association focused on promoting comprehensive adoption of distributed ledger technology in financial services.

The blockchain movement continues

While this article looks at the efforts around utilizing blockchain in capital markets from 2015 to 2018, there are still firms looking to replace legacy systems with DLT-based technologies or roll out new platforms aimed at efficiency and quick fixes. Here's a look at some recent blockchain moves:

ASX looks to replace Chess with blockchain systems
At the end of 2017, the Australian Securities Exchange (ASX) announced that it would replace Chess—its Clearing House Electronic Subregister System, that serves as its equity clearing and settlement platform—with a blockchain platform developed by Digital Asset. The platform is slated to go live in April 2023. In January 2021, ASX launched its customer Daml Sandbox, which sits within its distributed ledger technology solutions unit. The Sandbox allows individuals and firms to familiarize themselves with the Daml smart contracting language, the language on which the ASX's Chess replacement project is based. Sandbox participants can also start coding and developing applications.

Broadridge: a blockchain believer
Broadridge's new DLT-based repo platform was launched in June, adding to the company's existing DLT projects in the private equity and proxy voting spaces. The platform utilizes Daml smart contracts through Digital Asset to simplify the complex multi-party workflows in the repo market. It also uses the VMware Enterprise blockchain platform to provide the underlying cryptographically secure distributed ledger network. In 2019, Northern Trust transferred its private equity blockchain to Broadridge for further development, which went live as Private Market Hub in 2020.

DTCC expected to go live with TIW DLT replacement at the end of 2022
At the beginning of 2017, the DTCC announced it would replace its Trade Information Warehouse (TIW) with a new system using distributed-ledger technology The original go-live date for the platform was for the end of Q1 2018 and is now aimed to launch in late 2022. TIW automates recordkeeping, lifecycle events, and payment management for more than $11 trillion of cleared and bilateral credit derivatives, according to the DTCC, and provides lifecycle event processing services for about 98% of all credit derivative transactions across the globe.

Vanguard looks to DLT for FX forwards
Asset manager Vanguard is planning to roll out distributed ledger technology across its range of funds that utilize foreign-exchange forwards throughout 2022, following a successful pilot using smart contracts to margin a live trade at the end of last year. The firm's fintech unit partnered with custody bank State Street and DLT provider Symbiont to test the margin calculation for a live 30-day euro/US dollar FX forward trade on a platform called Assembly in December 2021, with the aim being to use smart contracts to automate and increase the frequency of valuation events of over-the-counter derivatives.

LEI Foundation pilots blockchain-based credentials solution
The Global Legal Entity Identifier Foundation (Gleif) and Evernym, a portable credential technology firm, announced in 2020 that they would partner to pilot a blockchain-based solution that allows companies to create and maintain digital wallets. These wallets would store credentials that confirm the identity of a company and its employees and could be used by financial firms to validate digital business transactions and perform activities like client onboarding and submitting regulatory filings. Gleif is the global body that oversees the issuance of the LEI, an alphanumeric code that is used within financial services to represent legal entities.

The next year, it partnered with Synechron, a technology consulting company that remains an advocate of blockchain, among other emerging technologies. Also in 2017, Calypso CTO Tej Sidhu said the company was planning "aggressive investments in cloud microservices and blockchain solutions to streamline the IT operations." This was also around the time it partnered with R3—then a blockchain consortium but today an enterprise technology company—for FX trade matching.

In 2018, Mayank Shah, Calypso's managing director of strategy, transformation and alliances, sat down for an interview with *Bobsguide*, in which he made clear the company's stance on blockchain: "Calypso has embarked on a journey to become a leading blockchain technology provider for capital markets, working closely together with the leading blockchain platforms such as R3 and CLS/Hyperledger. We believe that blockchain will transform the way capital markets operate and we are an active participant in this transformation."

In the time since then, Calypso appears to have mostly stopped talking about blockchain altogether. Now in its new form, Adenza makes no mention of blockchain in the list of services it offers, which include cloud, customer delivery, and education solutions. A spokesperson for Adenza did not return requests for comment.

Meanwhile, data and workflow tools provider Ipreo looked to blockchain in 2016, partnering with Symbiont, a blockchain startup that has recently inked deals with big names such as Vanguard and State Street. Ipreo and Symbiont embarked on a venture to create a new company that would disrupt the syndicated loans market. They named it Synaps.

By the end of the year, the two had launched a proof-of-concept, meant to shorten syndicated loan settlement times, with partners R3 and Credit Suisse. In 2017, the foursome deemed the endeavor a success. Synaps had combined the Symbiont smart contract technology with Ipreo's business process platform to speed up loan settlement times. Participants in the proof-of-concept included Barclays, Royal Bank of Scotland, Scotiabank, Societe Generale, State Street, Wells Fargo, AllianceBernstein, and 12 others.

The next year, IHS Markit made the surprising announcement that it would acquire Ipreo for $1.86 billion, while simultaneously letting go of its MarkitServ derivatives business. Today, a page on IHS Markit's website about Ipreo provides little information on what became of Ipreo and its technology post-acquisition, simply reading: "Following the acquisition in August 2018, IHS Markit has integrated Ipreo's services and solutions to provide greater value to our customers." A rep for IHS Markit declined to comment, adding that the company would not be issuing any updates regarding strategic initiatives during the ongoing merger between itself and S&P Global.

Synaps, for its part, was ultimately dissolved after Symbiont sued IHS Markit and Ipreo for breach of contract following the acquisition. The lawsuit was settled in January of this year, with IHS Markit paying out $53 million in damages to Symbiont.

Oil and water

UTrade Solutions, a trading technology provider based in India, was launched about 10 years ago. The company primarily sells its services and solutions—which include sell-side order management, buy-side execution management, risk management, direct market access, and market data distribution—inside India, though it has some foreign presence as well.

In 2016, it, too, sought to capitalize on blockchain's promises of immutable recordkeeping and enhanced security by launching UClear, a real-time clearing and settlement solution, and KYChain, a know-your-customer platform, both based on distributed-ledger technology.

The solutions were on the market for less than a year, says Kunal Nandwani, CEO and co-founder of UTrade, who admits he was somewhat misled by early blockchain zeal.

"When I started building KYChain, I totally believed in the world narrative and the people saying it would work, but as I built it, I realized it doesn't work," Nandwani says. He digs his heels in

further. "You can't have scale, speed and efficiency—you can have one of the three but not all three. With blockchain, by definition, decentralization brings slowness. Scale is not easy, and because of the speed and scale problems, blockchain will actually not solve any problem anywhere."

After working with blockchain and observing other companies that have worked with blockchain—then dropped it—he believes that the decentralized tech is simply diametrically opposed to a centralized society, one in which most people, and especially intermediaries like banks and governments, don't feel the need to fix something that isn't broken. And he adds that any institutions that claim to be exploring real implementations of blockchain—open-source public, able to be viewed and validated by anyone—are merely paying lip service.

"It's almost like tomorrow the North Korean dictator says, 'We are going to be democratic tomorrow; I'm going to be the only one voting.' How democratic is that?" Nandwani says.

The most successful blockchain projects, at least in finance, are the ones that have established intermediaries—with good reason, says Brennan Carley, managing principal at Proton Advisors.

"Banking and securities are all heavily dependent on trust, but not blind trust—trust based on established, credible entities," Carley says. "Fundamentally, the banking industry likes intermediaries. It likes the DTCC, and Swift, and so forth because there's somebody standing in the middle of a transaction, between me and somebody who might have conflicting interests."

Carley's sentiment is a familiar refrain shared by several others in this story, but it comes with a catch: Blockchains with intermediaries are *something*, but they're fundamentally not blockchains.

Accenture, for one, learned that lesson early.

In 2016, the consulting firm filed a patent for a prototype it created, along with Giuseppe Ateniese, a cryptographer and professor of computer science at Stevens Institute of Technology, allowing permissioned blockchains to be edited. A permissioned blockchain differs from a true one; it cannot be accessed by anyone, but only by pre-approved nodes, usually internal to a single organization or group of organizations.

Almost immediately, it caught hundreds of tweets' worth of flack. Detractors argued creating a workaround to edit the blockchain would essentially destroy one of its main differentiating factors.

Looking back, David Treat, senior managing director at Accenture, calls the patent "very misunderstood," but maintains that its principles stood the test of time, saying that in a highly regulated, systemically important environment such as capital markets, one must have the ability to fix something that goes wrong.

> "I've always looked at it and thought I don't know that it is a technology that we need to use for most of the things it has been trialed for. I understand its use in areas where we don't currently have technology that works. But I don't really get the point of introducing it to areas where we've already got technology that works."
> Virginie O'Shea, Firebrand Research

Neither he nor his detractors were technically wrong. Accenture *did* negate a central tenet of blockchain's philosophy, but it also allowed compliance with regulations such as the EU's General Data Protection Regulation (then called the Right to Be Forgotten rule), and offer the chance to remedy other data privacy or data segregation mistakes.

He echoes TZero's Grossman: "It was very much ahead of its time."

In the end, the consulting firm did not use the patent, instead relying on other enterprise permissioned, private blockchains like R3's Corda platform, IBM's Hyperledger Fabric, and more recently, Besu, an Ethereum-based DLT software product of the Hyperledger Foundation, which includes members such as the DTCC, JPMorgan, IBM, and more than 200 others across financial services, healthcare, telecoms, logistics, and more.

"[Our patent] was a really important lesson around key management, sharding and governance, and operating and recourse models for blockchain. But no, we knew that it wouldn't be relevant, or potentially never be relevant, until you got to the point of using an on-chain data structure," Treat says, referring to an idea in which data markers, rather than actual data, would be stored on a blockchain, and create linkages to actual data or business logic that's processed off-chain—essentially a balancing act between confidentiality and tamper-proofing.

Proton's Carley believes that it's not that blockchain doesn't work, it's just that it's not usually necessary. But with that said, there have been positive byproducts as a result of blockchain development, such as the creation of the Daml programming language by Digital Asset, which isn't dependent on blockchain. More importantly, though, is that while blockchain might not have been necessary to solve a particular business problem, the hype around blockchain helped to free up financing that otherwise would likely not have been available.

An underfunded group in a bank, he says, "could have gone to the CTO or CFO and said they needed funding to automate a particular workflow and they're going to use SQL Server or Oracle or whatever, and it probably wouldn't have gotten funded. But, because the bank has an innovation budget, and it's cool, and somebody wants to check the box that they're doing something with blockchain, they'll go ahead and they'll implement it. In the end that's probably not a bad thing, because you've got some inefficient workflow that's now been automated with decent technology," Carley says.

"Did it need to use blockchain to get there? No, it could've been done in another way. But in a way, blockchain provided the marketing hype that allowed it to get funded," Carley says.

Trust, but verify

Trust is a big, and nuanced, element of blockchain. On one hand, it's meant to foster (or force) trust. Due to its distributed nature, transaction records are stored in several places at once. It guarantees accuracy and reliability, and

any updates added to the chain are checked and validated by the rest of the computers that participate in a network. But while these networks are difficult to hack, they're not impossible—so long as the code underlying isn't perfect.

A 2018 report by a joint research team in the UK and Singapore found that more than 34,000 Ethereum smart contracts containing $4.4 million in Ethereum may be vulnerable to exploitation due to poor coding and bugs.

Similarly, the new, explosive world of non-fungible tokens—digital assets that represent real-world objects like art, music, and videos—is part of the blockchain movement, but is easily manipulated through screenshotting or copying the same images that someone else "owns" on the blockchain. Recently, an NFT collector had $2.2 million worth of images stolen from him by hackers, who used a phishing link to get access to the items.

To be clear, in both instances, the blockchain itself is not what is hacked, but the applications and products built around it, NFTs and smart contracts, which don't automatically inherit its security; it has to be subsequently built in.

Virginie O'Shea, founder of Firebrand Research, says blockchain logically lends itself to areas where trust, anonymity, and reputation are recurring issues—for example, NFTs, crypto, or emerging, underserved markets like Nigeria—but doesn't make much sense in industries that are typically reliable, regulated, and well-served by more established technologies.

"I've always looked at it and thought I don't know that it is a technology that we need to use for most of the things it has been trialed for. I understand its use in areas where we don't currently have technology that works," she says. "But I don't really get the point of introducing it to areas where we've already got technology that works."

Of course, the definition of a technology that "works" is somewhat open to interpretation.

One startup that has arguably made enterprise blockchain palatable—even embraceable—for capital markets firms is R3. Founded in 2014 as a consortium backed by major investment banks, its first product line was Corda, a private, permissioned blockchain designed for the needs of regulated enterprises.

Last year, it diversified by launching Conclave, a confidential computing service, which leverages a physical piece of hardware, known as an enclave or trusted execution environment, that isolates sensitive data within a CPU and protects it while it's in use (as opposed to data's two other states, "in rest" and "in motion"). At the time of Conclave's launch, Richard Brown, R3's CTO, said the consortium had created a confidential computing product accidentally, while working on improvements to Corda.

Today, it counts the likes of Nasdaq, Amazon Web Services, DTCC, Deutsche Börse, and IBM as partners, and its technology underpins systems at the likes of Bank of New York Mellon, Six Digital Exchange, and several digital currency initiatives at central banks. In 2019, a joint distributed ledger technology venture between R3, Barclays and Royal Bank of Scotland—both investors in the firm—was said to reduce the property transaction times to fewer than three weeks.

But to find as much as success as it has, R3 has weathered at least a few bad days.

In late 2016, a handful of R3's major backers pulled out of the consortium, including Goldman Sachs, Santander, and Morgan Stanley. In 2017, JPMorgan followed suit. Reuters reported that the departures stemmed from disagreements over funding. A few months prior to JPMorgan's exit, R3 drew ire from the crypto community after an internal PowerPoint slide on "pertinent" Corda features surfaced online, which read in part: "No block chain [sic] because we don't need one."

Todd McDonald, co-founder and chief product officer at R3, calls the ordeal a "crazy kerfuffle," and says he was shocked by the amount of attention it garnered. As it often does, the story began with a party, specifically a developer-relations event held at the office with pizza and beer. A friend of McDonald's, a crypto enthusiast, took a picture of the slide deck—merely one snippet of a vast number of slide decks created by any business—and posted it on Twitter. The rest is literally history.

McDonald doesn't go as far as to call the slide deck a joke, but says it was certainly never intended to be seen as a product marketing or strategy document.

The fact of the matter, McDonald says, is that R3 is a company that aims to "provide the ability for multiple, mildly distrusting parties to get together on a network and have some level of coordination, share information, and create, trade, and manage digital assets." It's blockchain, but it's not the same kind of blockchain that crypto die-hards are using.

"Going back to the hype cycle, initially people were looking to use the technology vs. potentially starting with the problem itself," he says. "We shifted quite a bit to: what is the problem? What is the solution? And how can we apply technology to it?"

Plan B

If all else fails, pivot.

Like R3, a startup called Secretarium is a supplier of confidential computing technology. Founded by two former SocGen technologists and grown in SocGen's incubator, the vendor is supplying the technology for a new consortium, called Danie, a loose association of nine banks including SocGen, that seeks to enable financial firms to compare notes on encrypted data, and perform computations and reconciliations without breaching client confidentiality or allowing their peers to peek into their secrets.

While not a blockchain company today, Secretarium planted its roots in blockchain in 2013, beginning as SocGen's blockchain lab. In 2016—at the peak of blockchain-mania—founder Bertrand Foing was already second-guessing the tech's usefulness in the context of banking. Having built several prototypes, each one had hit a wall when the bank wanted to go live with it due to privacy issues. He subsequently left SocGen and founded Secretarium to experiment with secure-enclave DLTs.

"It's absolutely true—working as a blockchain company in the financial services sector is complicated. There is a lot of red tape," Foing says. "The innovation departments at banks are always very excited about blockchain projects, but these are not the right people. They're not the right people

you want to talk to because they've got a limited budget, and they don't have decision-making powers."

That isn't blockchain's biggest problem, though. According to Foing, its biggest problem was referenced by TZero's Grossman and repeated by what R3's McDonald called "the cold start" problem: Convincing just one bank of its merit is essentially the same as convincing none. Because blockchain functions as a network, one needs a network of support from a group of organizations—in this case, organizations that don't typically relish the thought of giving up their intellectual property for free.

Tech stalwart IBM was also once big on blockchain. While its own private blockchain, Hyperledger Fabric, is a trusted and popular choice among businesses in and outside of financial services, the company itself has decidedly tamped down its enthusiasm for it.

Anthony Lipp, IBM's global head of strategy for banking and financial markets, says he's never personally been much a fan of the tech, and that its concept—how multiple parties can work together best—has been around for decades. However, he believes that a *blockchain-enabled* world will soon be a given; it just won't be *blockchain-reliant*.

"As we build out all these platform business models, they are all going to have blockchain embedded as part of that. But the thing is, you don't start off by saying, 'Hey, blockchain is going to do all of this.' It's not. Blockchain is just one of the many enablers used to build out those platform business models, so I'd say we aren't going to hype it as much as we have in the past, blockchain itself," Lipp says.

Something will stick

There are plenty of examples of defeats and pivots, lessons learned and oversights. However, it would be remiss to imply that blockchain shows no promise in financial technology.

On December 30, 2021, Nasdaq, the second largest exchange in the US—which makes it the second largest exchange in the world—published a blog post titled "How Blockchain Will Become a Driving Force on Wall Street." Though CEO Adena Friedman stated in 2020 that she viewed blockchain's potential to disrupt as "a bit of an overstatement," it's clear the exchange hasn't dismissed it completely.

Johan Toll, vice president head of digital assets at Nasdaq, says the exchange first ventured to use blockchain in 2013, after finding it to be incredibly interesting in the way it powered bitcoin. Two years later, Nasdaq issued the first share of its kind on Nasdaq Linq, a blockchain-powered trading platform for private securities. In 2016, it collaborated with Citi on an integrated payments solution to understand how to move cash over a distributed ledger.

"How can we build up new types of ecosystems in the digital asset world? That's what it's all about," Toll says. "How can we launch existing assets into a smart contract-based infrastructure? How can we settle them in a good way? Can we move potentially from T+2, T+3 into immediate settlement?"

Nasdaq is not limiting its use of blockchain to securities and transactions, either. As part of a recent ESG bid, the exchange made an investment in Puro.earth, a marketplace that offers industrial carbon removal instruments that are verifiable and tradable through an open, online platform. It counts names like Microsoft and Swedish financial group SEB as clients.

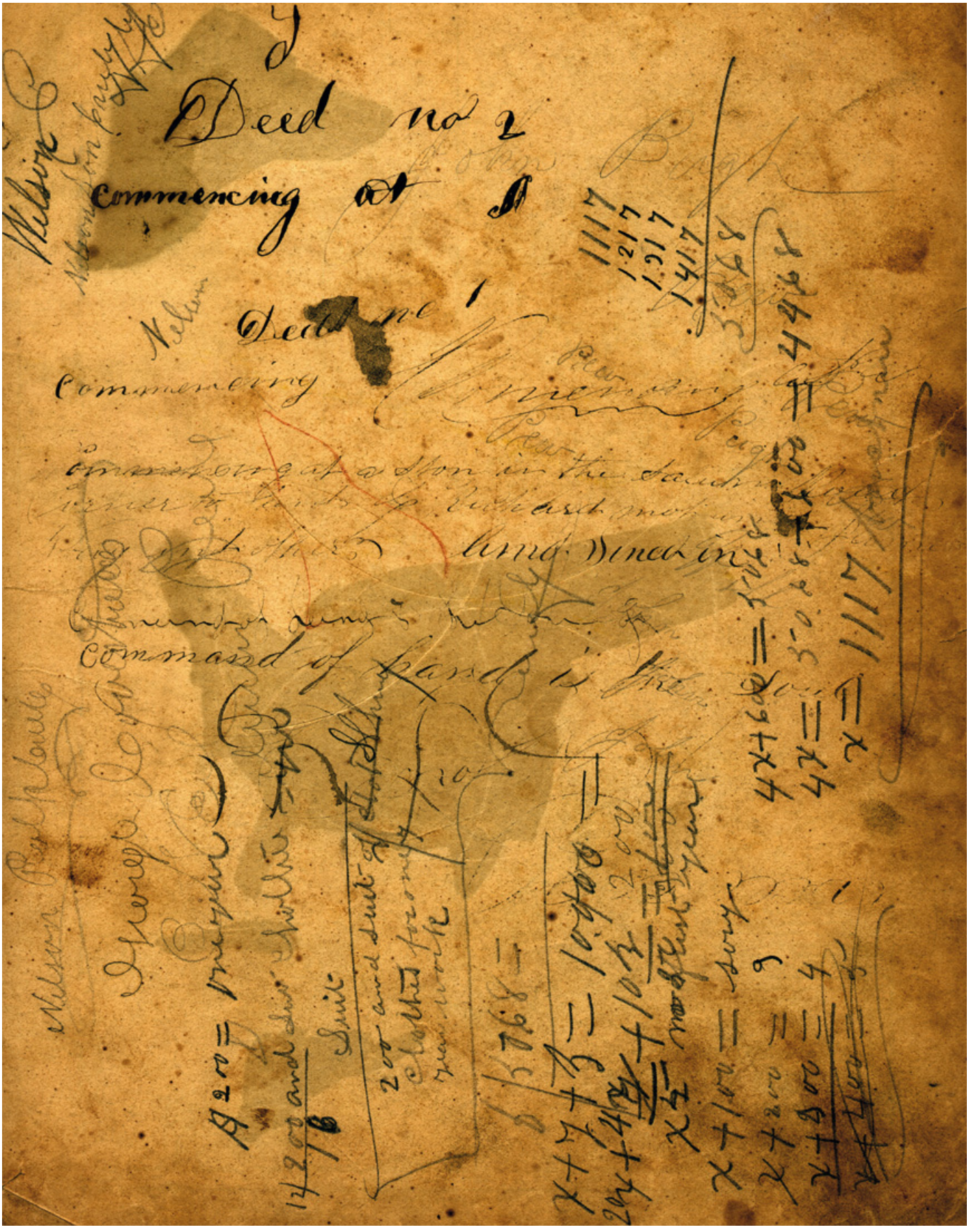
If blockchain does not easily lend itself to bank collaboration, then perhaps it does for ESG.

"The carbon industry is now super interesting for these types of networks because that's where you have multiple different stakeholders participating in a shared network," Toll says. The investment is meant to ensure Nasdaq will be able to serve incoming investors looking to offset their carbon footprints.

The real goal, Toll says, is much bigger and—somewhat paradoxically—much simpler, than blockchain and all its nuances. Nasdaq wants to be able to serve anyone who wants to trade any type of asset at any time.

Of course, that isn't a bet on blockchain *per se*. Sometimes, the game is won by throwing everything at the wall and seeing what sticks. wt

With additional reporting by Anthony Malakian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The battle over data ownership

The issue of data ownership may be obscure, but has important consequences for firms considering alternative data models, or firms looking to commercialize their in-house pricing or other resources. So ask yourself some serious questions: Who owns 'your' data? And why does it matter? By Max Bowie

It sounds obvious, but do you know whether you own your data? When your firm sends a quote or an order to a broker or exchange, whose property is that quote or order, and what rights does it give them? What can they legally do with it (or not) and charge for it? Do you know? Are you 100% sure? And even if you know whether you own it or not, actually owning it isn't a given.

Confused? You're not alone. It's an area that has in the past been rife with uncertainty and assumptions, but one where the ramifications have not been costly or disruptive enough to warrant spending the time or money required to establish watertight controls. However, as financial firms seek to monetize more of their internal data to buy-side clients, and establish less costly alternatives to exchange data feeds, uncertainty around data ownership could lead to more serious disputes.

"It depends very much on the legal controls you put around the data. Firms may grant access to their data, or they may have to hand it over as a condition of participating on an exchange. But simply because you can access the data doesn't mean you can collect it, market it, and sell it with impunity. You have to work backwards to determine who has rights to every piece of quote and order data," says Frank Desmond, managing director at data advisory firm FXD Data, and the former head of TP Icap Information, the broker's data arm.

But even then, Desmond says, confusion frequently remains around ownership, which breeds conflict between participants. "Organizations can be very defensive about this because no one has 100% certainty about some of these issues," he says.

While much of the ownership issue is driven by commercial factors—indeed, in many cases, practitioners find it hard to address the ownership and cost issues separately—there are other drivers. These include data privacy and firms' attempts to ensure that competitors cannot reverse engineer the identity of the firm behind specific quotes and trades, which could allow those rivals to trade against them.

"Everyone is always trying to reverse engineer other peoples' algorithms to get ahead of them," so firms are increasingly placing greater value on protecting their data and their rights, says Kelvin To, founder and president of big data advisory firm Data Boiler Technologies.

> "Firms may grant access to their data, or they may have to hand it over as a condition of participating on an exchange. But simply because you can access the data doesn't mean you can collect it, market it, and sell it with impunity. You have to work backwards to determine who has rights to every piece of quote and order data."
> **Frank Desmond, FXD Data**

Derek Lacarrubba, special counsel at law firm Schulte Roth & Zabel, who advises broker-dealers and hedge funds on regulatory issues, says this is common practice. "Funds already use multiple executing brokers to camouflage their activity. It's standard practice to not give a single entity access to your whole order history. But you need a lot of scale to do that, so the opportunity to have multi-prime relationships is limited for smaller funds," he says.

"We have heard some concerns expressed by buy-side firms about how their data is used by brokers, but it's not widespread. The main concern we've seen is that anonymized data is not as anonymous as you may think—that is, that with certain assumptions, you can determine who is behind a trade and guess their strategies, then use that to game them," Lacarrubba says.

'Proof' of ownership

It's this concern—rather than being motivated to establish ownership of data for cost or revenue reasons—that motivated startup agency broker-dealer Proof Trading to address the data ownership issue recently, explicitly stating that clients own their data in the broker's contracts.

"One of our pilot clients asked us what would happen if Proof ever got acquired by one of the large trading firms like Virtu, and that firm would then all own the trading data of our client," says Daniel Aisen, CEO of Proof. "They were worried that if someone can understand your positions and when you put on and take off a position, then they can detect the patterns in your trading. And once they see that pattern starting, they can pre-position themselves ahead of that to take advantage of it."

Nervous traders might be equally concerned that one of Proof's management could "go rogue" and abscond with data, then start a hedge fund to trade against its clients. Aisen stresses that Proof has no plans to sell or start a hedge fund. Nevertheless, it responded to the concerns by creating a policy that requires clients to explicitly opt in to any usage or analysis performed by Proof, allows them to delete their data—aside from records that Proof is required to keep in "cold storage" for regulatory compliance purposes—and promises that the broker won't use their data to create commercial data products.

Proof analyzes trading activity and creates execution reports for clients. Under

the new policy, clients need to opt in to continue receiving those reports, or can opt out if they don't want their data used in reports.

"If clients opt out, we won't be able to generate reports for them. We do think that we add a lot of value, and our hope is that most people will want us to analyze their data," says Proof president Allison Bishop. "If everyone opted out, we would lose that ability. But we don't think that's very likely. We're self-imposing a burden that will be a trade-off. But we think it's a better position. It puts clients in a position to drive the value we can provide for them. It lets them choose."

> "We think this is an important issue. It's not a hot topic yet, but we think it should be, and we want to be out in front of that. And we think regulators and others should be looking more closely at it."
> **Daniel Aisen, Proof Trading**

Aisen says the response has been "pretty modest," as data ownership is seen as a "nice-to-have" compared to other priorities, but that he expects enthusiasm to grow as the issue gains recognition.

"We think this is an important issue. It's not a hot topic yet, but we think it should be, and we want to be out in front of that. And we think regulators and others should be looking more closely at it," he says.

While Proof's initiative may not make a huge impact immediately because of the broker's early-stage status, it may spark a greater appreciation of the issue overall, which is not widely well understood.

Don't assume the 'obvious'

In fact, there were significant differences in opinion among several data experts interviewed for this article. Some assumed ownership, others assumed others owned it, while still others asserted ownership claims but were unable to point to exactly where that ownership is set out in black and white.

Perhaps one reason for the confusion is that data ownership is often buried in the contracts signed by trading firms that allow them to participate on exchanges, but which may not involve data professionals who are well-versed in data governance issues in the process.

Suzanne Lock is CEO of UK-based consultancy EOSE, which helps data sources commercialize their data, and helps potential consumers and distributors identify suitable datasets for their needs. She has seen contractual issues firsthand from both sides of the fence, having spent 13 years at inter-dealer broker Tradition. Part of the issue is that no one "owns"—that is, actively takes responsibility for—the data that they own, so others reap the benefits unchecked.

"Heads of desk who sign trading agreements may not know about ownership or commercial issues—and probably aren't in a position to assert something—while market data teams are overwhelmed with dealing with inbound data and can't think strategically about creating a profit center," she says.

Mauro Viskovic, a partner and corporate and securities lawyer at law firm Weiss Zarett Brofman Sonneklar & Levy, reports similar concerns. "On the trader side, I think they don't know about this," he says. "They assume 'the obvious' but the contract may say otherwise or may even say nothing. A lot of firms may not even have these contracts reviewed by attorneys."

Those data executives who are aware of the ownership question may view it as a cost issue, rather than—or perhaps ignoring—the governance concerns. For example, trading firms have long complained that their quotes and orders create the liquidity that make exchanges successful, but that the exchanges then charge them to receive the data they created. Exchanges counter that they aren't charging firms for their own data, but rather are charging for the service they provide of consolidating market-wide data.

That argument goes on. But for firms seeking to lower the growing burden of exchange data fees by leveraging peer-to-peer networks—where market participants make datasets available for free or at a nominal cost—the issue of whether they own the data they want to contribute, and what they can do with it, becomes a major issue and potential barrier.

One such P2P network is Pyth Network, which is building a decentralized, on-chain system of data from exchanges and trading firms. But an early challenge for Pyth was where its data would come from.

"If you need financial market data on-chain, where does all that come from? Because off-chain market data comes from a relatively small number of sources. And our view was that it's going to be a stretch to see exchanges like CME making all their data available on-chain. So we scratched our heads and said, 'Where's that data going to come from?'" says Michael Cahill, a director at the Pyth Data Association arm of Pyth Network. Cahill is part of the Special Projects team at Jump Crypto, the

cryptocurrency arm of Jump Trading, a contributing member of Pyth.

For Pyth, that data comes from a coalition of firms that make up the bulk of liquidity in the US markets, including Jump, the Chicago Trading Company, Flow Traders, Jane Street, Susquehanna International Group, Two Sigma Securities, and Virtu Financial, among others, as well as exchanges IEX, Memx, and the Miax-owned Bermuda Stock Exchange. Between them, these firms' trading provides an accurate representation of market activity, while the exchanges provide "a pretty representative" best bid and offer price, Cahill says.

But these firms can't just contribute any old data—literally, they may legally not be allowed to contribute data that they already send to other parties. An executive at one contributing Pyth member who requested anonymity described the challenge of identifying what they could and couldn't submit. "We went through our contracts, and it became clear that we would be in violation of our agreements with exchanges if we shared the bids and offers that we submit to exchanges because they have exclusive rights to that data," the executive says.

Though it seems counterintuitive that exchanges would claim ownership of data that exists before it's even submitted to them—not to mention, contrary to what exchanges say about the topic—the executive is emphatic that's what firms sign up to. "I assure you, we don't own it," he says.

And, according to this executive, the loophole that enables Pyth to exist is equally counterintuitive: "There's one piece of data they don't own—and that's why Pyth exists: When a trading participant executes a trade, they can make that data available to anyone, and the exchange can also make it available. So, firms that trade thousands of times per second can create a very accurate approximation of US market data based on their trades," he says.

Pyth hasn't received any push-back from exchanges because, although it creates "a new competitive landscape" for basic market data, it doesn't compete directly with exchanges' main revenue-generating data products. "This is a new distribution channel, and one that is entirely different from traditional channels—it's on-chain with smart contracts. And it's published at 400-millisecond updates, which might as well be two weeks in co-location timeframes. We're not competing with that space … so we're not yet an existential threat to the exchanges' current off-chain businesses," he says, adding that other exchanges have expressed interest in participating in Pyth.

The exchanges' definition

One possible reason for the lack of any push-back so far is that the exchanges disagree about ownership—though in a way that actually benefits the user firms.

"I don't think we would challenge the statement that Pyth [and its members] own their trade data," says a senior official at one US-based exchange, who calls it "an interesting real-life experiment to see if market data consumers will find value from it," adding that he expects initiatives like Pyth to "complement the high transparency of exchange market data."

However, while not contradicting the Pyth member's statement, the senior exchange official's description of ownership is in contrast with the trading firm's assertion that exchanges own its quote and order data.

"In general, with respect to an order instruction, that is the property of the originator. But in signing agreements, they grant a perpetual, non-exclusive license to the exchange, allowing it to perform any number of tasks. So exchanges don't own a firm's order, but they can use it to, for example, create market data that the exchange does own," the official says.

Part of that ownership is because the resulting aggregated data is not the same as the original members' data, but also because the exchange performs a variety of tasks and services that add value.

"When we receive order instructions from members, once that hits our systems, we can use that information to run the exchange and create market data," the exchange official says. "When we receive an order instruction, we process it, determine the effect on liquidity, and perhaps we even reject it—for example, if the stock is short-sale restricted. There are a bunch of things that could happen. So what comes in the front door is not what goes out to members—we're creating that."

A market data executive at another US exchange concurs: "Our underlying premise is that subscribers own their own data. They retain ownership of that and the rights associated with their data." But though that original data remains the property of the member firm, once it reaches the exchange, "We can do what we want with that data so long as we don't 'out' participants—that is, that we don't display their market participant ID (MPID) along with their quotes or trades. That aggregation process is important, because if we do something that drives trading away from the exchange, that hurts us—so we want to drive as much transparency as possible," he adds.

> "If I were representing a trading firm, I'd rather not leave it to chance, and I'd ensure that brokers are not exercising rights over order data—only execution data. But if that's not in the contract, and if I were a broker wanting to monetize that data in some way, I'd be cautious about that. I think they would need to set express conditions."
>
> **Mauro Viskovic, Weiss Zarett Brofman Sonneklar & Levy**

And while the data executive says he hasn't received any client demand to change that arrangement—though the exchange is "ready, willing, and able to engage with customers," he adds—he encourages participants to understand the implications of data ownership issues. "You see many clients trying to make money out of data, and they certainly should be getting educated about data as a business, and what they own and how they can use it," he says.

In general, exchanges—perhaps because they are more open to scrutiny about what data they own and what they can do with it—are clearer about ownership, and typically set out their terms within their services agreements that govern firms' participation on an exchange.

However, things become less clear when dealing with inter-dealer brokers, since they may strike customer-by-customer agreements, whereas an exchange would have the same agreement with all participants. "So [with IDBs] people with different opinions may both be right," the senior exchange executive says. "It's probably not that people are confused, per se, but just that diversity exists."

When it comes to brokers, Viskovic believes execution data is fair game for brokers to claim ownership, but believes that in many cases ownership remains unspecified, and advises that firms should demand that their ownership of their own quote and order data be recognized in contracts.

Data Protection

"If I were representing a trading firm, I'd rather not leave it to chance, and I'd ensure that brokers are not exercising rights over order data—only execution data. But if that's not in the contract, and if I were a broker wanting to monetize that data in some way, I'd be cautious about that. I think they would need to set express conditions," he says. "I've never had a broker object to revising their standard contract, but their standard contracts either don't address it, or—as in a couple that I've seen—might suggest ownership."

Of course, "suggest" isn't the strongest legal term to rely on in the event of a dispute. And Viskovic couldn't recall any recent lawsuits establishing or disputing data ownership. However, a precedent does exist—at least for data *after* it's been submitted to and consolidated by exchanges. The decision dates back to the US Supreme Court in 1905, when the Chicago Board of Trade sued Christie Grain and Stock Company to prevent the latter from accessing quote and trade data from its wheat, corn, and provisions trading pits. Specifically, CBot asserted ownership over the data created via floor trading in its pits, which was then distributed to authorized firms via telegraph, and which the exchange sought to prevent from being freely available to "bucket shops" without a contract in place.

However, that decision—which, while still relevant, may not be the best benchmark for a marketplace that has evolved significantly over the intervening 117

years—still does not clarify ownership of the data prior to consolidation and redistribution. That may fall to individual contracts and contract law, says Christopher Mohr, senior vice president for intellectual property and general counsel at industry body the Software and Information Industry Association (SIIA), which includes data industry association FISD.

"The raw data itself—such as the security, and the amount traded—is not protected by copyright law … so it depends on what kind of business relationship a broker or exchange can come up with to get revenues from data, and how they can enforce it," he says. "So the owner of the data may look to other ways to protect its rights, such as via terms of service agreements relating to data access, for example."

In fact, Mohr warns that over-zealous attempts to assert ownership over grey areas may only stifle innovation and lead to more disputes.

"What we are seeing now among owners of data is a realization that the data they have is quite valuable. Investment is increasing across technology and services, and the data that feeds these engines is incredibly valuable … and there will be more fights over the data that creates that value," he says.

Data Boiler's To acknowledges that copyright is not currently used to protect data rights, but says it could serve as a model for data. "Other industries around the world embrace copyright licensing systems, and I think the time is right for the financial markets to look at this," he says. "The beauty of a copyright licensing system is that it aligns rights with obligations, so if your data is used to create some kind of market manipulation, you should be held responsible for it."

Like Mohr, To also warns of consequences if the issue isn't addressed. Establishing proper ownership protections could end up growing not only the slice of the pie but the overall pie, To says. But he believes that an inability to protect and establish ownership of data in traditional markets will push traders into alternative markets, such as cryptocurrencies—another focus of Pyth Network—that potentially offer more protection for their data.

FXD Data's Desmond also notes the recent investment in new technologies, such as Pyth and blockchain, to create new markets and "rewire" existing ones. But he warns that this has thus far ignored the elephant in the room of data ownership—even though some of these technologies have unique capabilities that could be applied to the challenge.

"A lot of people are investing significant amounts of money into finding better ways to rewire the marketplace. But on IP rights, they've been very conservative so far. Typically, they're rewiring existing businesses with new technologies, but they're not really changing the fundamentals," Desmond says.

He adds, however, that he expects that to change as firms start to associate data ownership with bottom-line opportunities. "People are focusing on technology, but legal rights, controls and IP will become more relevant—especially if firms think it can add value."

Viskovic says he's already starting to see signs of change, reflecting an increased recognition of the importance of data ownership and governance. "It's an issue that I don't think is addressed seriously enough," he says. "That said, I think it's starting to be taken more seriously, driven by economic trends, especially around monetizing data. Now, people automatically think of data as an asset."

It's this approach that may ultimately prove sufficient incentive for firms to assert their rights and rewrite—or in many cases, write for the first time—contracts that govern how their data is used.

'Lock' down your rights

"I think change will come from bank initiatives to commercialize proprietary datasets," EOSE's Lock says. "Once you put a contract in front of people, they suddenly get very excited about their rights and responsibilities … even if they've been giving this away for decades with no controls in place."

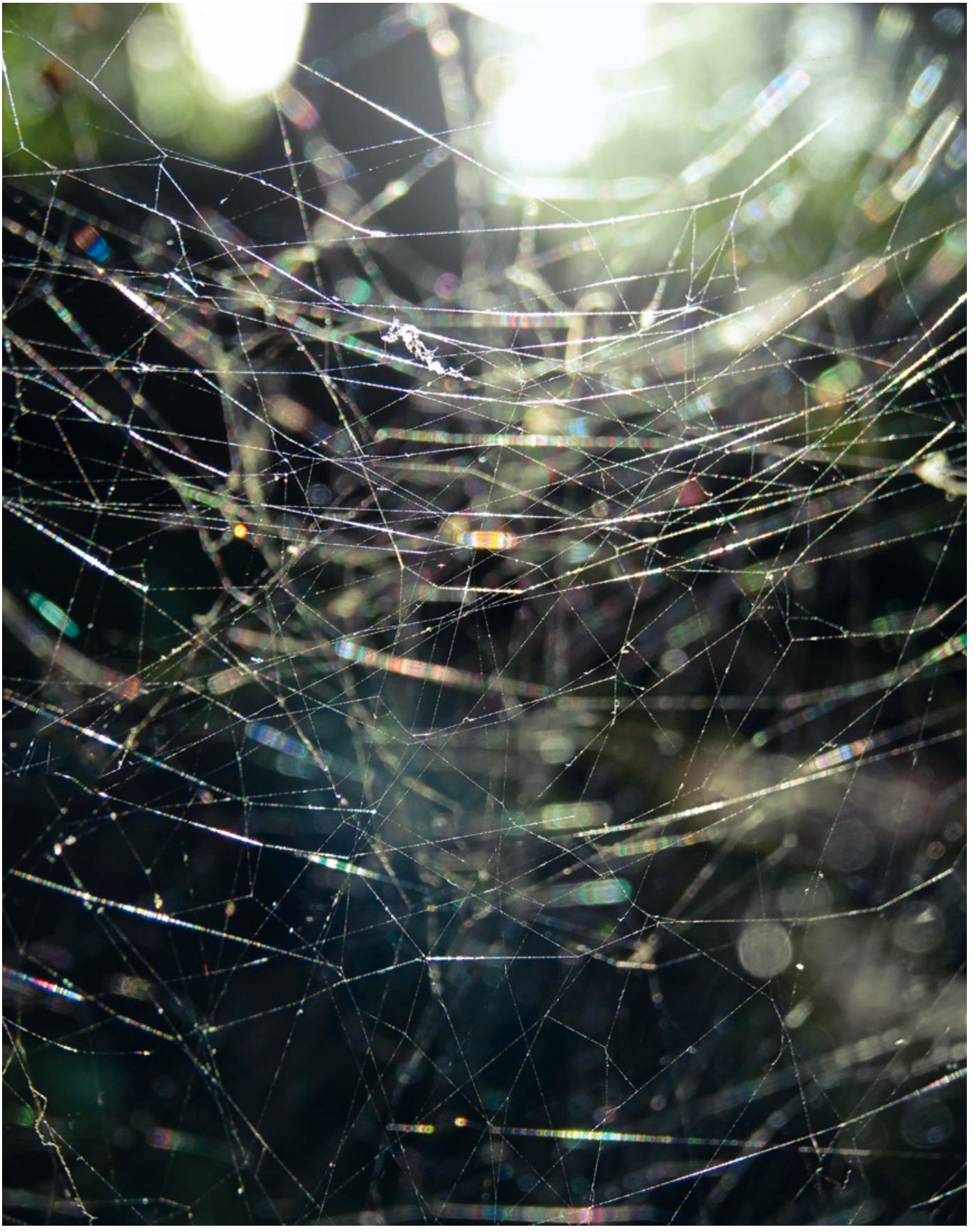
For example, in the case of regional banks that may dominate the market in specific local, and perhaps illiquid, currencies or securities, their data effectively constitutes the market in those assets. They quite literally "own" the market and its data, and hence their pricing has a high inherent value to those who make money from redistributing it.

Of course, as Lock says, it shouldn't take the promise of potential revenues to make people take data ownership seriously. It should be considered good business practice, especially for avoiding unforeseen exposures.

"Whether a piece of data is fee-liable or not, it's all about governance. As a provider of data, you *should* have governance and terms about ownership in place," Lock says. Before drawing up any commercial terms, EOSE has clients complete a detailed questionnaire, compiled from templates used by the Alternative Investment Management Association and individual banks' due diligence questionnaires. This covers everything from how a dataset is created and how its underlying data is sourced to whether the provider has compliance staff, and how it handles specific data types, such as personally identifiable data. If a company can't answer all the questions, it's not ready to provide its data, she says, regardless of whether it's free or fee-liable.

"We tell clients that they need to have governance over how their data is used, or people may use it in unintended ways, such as to create a tradable instrument, or for settlement. That creates inherent responsibilities that you didn't know you had—for example, to ensure the data is fit for purpose, such as whether it's an observed and executable price or an individual's evaluation," she says. "Yes, the user should be responsible and tell you how it's being used, but you also have some responsibility—and you don't want your data falling into the hands of your competitors."

In short, whether you make money from your data or not—or if you plan to in the future—you should protect it. If your data is used by other parties, you should protect it—and yourself—lest it be used in a way that creates liabilities for your firm. And if you use data originating somewhere else, you should check who owns it, and who's allowed to use it. Markets are changing, and as data becomes more valuable, firmly establishing who owns that data and has rights to use it and charge for it will become increasingly important. wt



What the hell is Web3, anyway?

The next iteration of the internet is upon us, with the potential to deliver radical shifts to every industry, including banking. The movement, which is currently buoyed by the prospects of blockchain and virtual reality, has implications for computing, data protection, networking, collaborating, and the very definition of a bank as a trusted intermediary and institution.

By Rebecca Natale, with additional reporting by Wei-Shen Wong

It's neither bird, nor plane, nor superhero. It's not an app or a singular new piece of technology. To define Web3.0, this year's latest buzzword notch in the Gartner hype cycle, it might be easier to say what it's not, rather than what it is.

From large US institutions—such as Goldman Sachs and Meta (formerly known as Facebook)—to the smallest start-ups, there's a general consensus that Web3.0—or Web3, the latest iteration of the internet following Web1 and Web2—is something we need to brace for. But whether it brings forth a fully digital, immersive world—daily life experienced not through rose-tinted spectacles but through virtual reality (VR) headsets—or ushers in a decentralized, privacy focused, blockchain-led utopia, or looks like something else entirely, is anyone's guess.

Analysts at Goldman Sachs say Web3 will usher in "dramatic shifts in industry structure … that could impact current investor perceptions of platform moat/strength, industry input costs, possible headwinds to monetization driven by personalization, and potential for shifting media and commerce trends." Microsoft, for one, is feeling the winds shift, having recently bought video game company Activision Blizzard for $68.7 billion in cash. And to further illustrate the flow of money into this new arena, Animoca Brands, a Hong Kong-based gaming software and venture capital company, completed a capital raise of nearly $359 million, at a pre-money valuation of $5 billion.

Those are hefty sums, being spent by large corporations, which clearly intend to become dominant digital players. But on a smaller level, a new world is already in motion.

Brion Bonkowski, founder and CEO of Tern, a start-up that specializes in white-labeling other fintech products, mainly in payments, has hired roughly half of his employees since the start of the Covid-19 pandemic. To make up for the fact that most of Tern's staff had yet to meet face-to-face, Bonkowski, like many others, began hosting company happy hours via Zoom on Friday afternoons.

> "I know people use 'Web3.0' freely, and everybody has a different interpretation and understanding. Our view is that it's supported by decentralized technology."
> **Fangfang Chen, BNY Mellon**

During one of the meetings, a few employees mentioned that they'd been using VR headsets for entertainment during the long days of quarantine. This caught the attention of Tern's chief product officer, Corey Glaze, who then bought a headset for himself and hosted a work meeting with employees that already owned one.

"He said it had fantastic dynamics—[that it was] really interesting how you actually almost feel like you're in the same room as somebody. That intrigued me," Bonkowski says. "So I bought a headset for myself, just to try it out."

After one meeting using VR, Bonkowski bought each member of the company a headset made by Meta's Oculus. On average, he says his team now spends five to 10 hours of their week in VR, hosting and attending formal and informal get-togethers. They're learning each other's voices, hand gestures, mannerisms, even the ways in which they walk across a room—all, still, without ever meeting one another in person.

Tern's staff have created a virtual office, which features the company logo on the lobby wall and rooms containing virtual computers and keyboards, which are operated by physical keyboards connected to the headsets. Represented by avatars created in each person's likeness by one of Tern's designers, employees can pop in and out of the rooms, work on a collaborative virtual whiteboard, and take their places at a panoramic conference table. They can even carry on whispered side conversations with those seated near them, undetected by colleagues.

"The utility of it is really starting to ring true. We find it to be a very efficient way to do some relatively sophisticated problem solving beyond the flat, two-dimensional Zoom calls," Bonkowski says. "And I think one of the key elements that I've found is it's really hard to take the headset off and look at your phone or look at your keyboard. You're really engaged—when you're in there, you're really *in there*."

A case, perhaps, for both increased productivity—particularly during an era of unprecedented burnout—and mild dystopia, this experiment in VR, and others like it, are part of the public's introduction to the metaverse, the forthcoming fully-digital, immersive, and interactive world upon which people like Mark Zuckerberg have bet all their chips. We can think of it as the new internet—albeit one with an even more prominent place in society than we can imagine today—whereas its sister component, Web3, will underlie and govern it.

The internet as we currently know it is based on what's called Web2, which gave rise to the interactive web. More concretely, the advent of smart mobile devices, subscription services, and social

media sites gave the world services considered nearly ubiquitous today, such as Netflix, Twitter, and Instagram. On these platforms, users can interact with the service itself and with each other, though only within the confines of the application. The foundation of Web2 was Web1, the first iteration of the internet—the world of desktops, dial-up modems, and static, read-only web pages.

Users vs. corporations

On the face of it, the vision for Web3 from a consumer perspective is that of a great equalizer. Its most ardent believers think it can be wielded to take power away from large, centralized corporations—Google, Amazon, Meta, et al.—and return it to users, who will own and maintain the next generation of internet applications (as well as their personal data) through a decentralized ecosystem built on the blockchain. It also makes application interoperability a central tenet, through which users would be able to interact with each other without an application and provider acting as an intermediary that collects and monetizes their data along the way.

> "The internet is upside down in terms of it being a risk mess. It went from being a distributed thing to a cloud-based thing that, when Amazon's down, we're all screwed." **Brad Levy, Symphony**

Naturally, the cryptocurrency community is excited. But with the aforementioned companies already leading—or even fighting back against—the new movement, it's entirely possible that such an aspiration will never materialize. Twitter's former CEO, Jack Dorsey, wrote in a tweet: "You don't own 'web3.' The VCs and their LPs do. It will never escape their incentives. It's ultimately a centralized entity with a different label."

However, fintechs and institutions are expecting the unexpected, and expecting derivatives of the unexpected. In a December equity research report by Goldman Sachs, *Framing the Future of Web 3.0: Metaverse Edition* the bank's analysts said that one of the key elements that management teams and industry experts have stressed is that the metaverse must be an interoperable experience, in which consumers can take virtual assets and experiences throughout the metaverse—a stark contrast to Web2, which has witnessed large-scaled walled platforms that require users to operate within the confines of the respective app or device.

"While these walled gardens have allowed companies to collect vast amount of data and innovate and enhance products, the experience ultimately disadvantages consumers (by confining them to only operate within the respective ecosystem) and developers (by forcing their hand to develop for multiple devices and operating systems). Looking ahead, we anticipate that many large-scaled platforms will need to disrupt their business models in order to operate within the metaverse. While we are still many years away from an interoperable world, we have started to see some progress being made on opening up walled gardens," the report reads.

Banks on board?

While Goldman's findings may offer insights into how its traders are thinking about the changing the technology sector broadly, BNY Mellon's Asia-Pacific chair and head of asset servicing and digital, Fangfang Chen, is thinking about Web3's implications for traditional banking—which, to date, has not been overly receptive to blockchain projects.

"Web3.0 is a journey. If you look at it from the financial industry we're going toward that by utilizing DLT technology, and over time you'll start to see [progress]. There are some grassroot efforts, which probably financial institutions haven't been actively participating in, but closely monitoring, which is the decentralized finance (DeFi) movement," Chen says.

It seems counterintuitive that a classic intermediary, such as a bank, would be on board with a school of thought that revolves around disintermediation and decentralization. But Chen recognizes that this is the direction in which consumers are headed, with or without the banks. The public's desire for financial democratization can be seen in the rise of the day-trading app Robinhood, and was intensely felt when last year's meme stock frenzy rattled the upper echelons of finance.

As a result, BNY Mellon's projects that fit into the frame of Web3 are for now confined to distributed-ledger technology (DLT), a permissioned version of blockchain that allows for access control, customer confidentiality, and data protection.

One such project is the bank's participation in the Marco Polo Network, a consortium leveraging DLT technology to create a more open and connected global trade finance ecosystem. BNY Mellon is also one of 15 institutional members of Fnality, which aims to

tokenize cash and use it to facilitate clearing and settlement at the wholesale level. Currently, Chen says, the initiative is looking at creating three tokenized currencies and working with central banks on approval processes. In addition to industry-level projects, Chen adds that the bank is the throes of several proofs-of-concept with clients related to asset tokenization.

"We believe Web3.0 really is a focus on trust, transparency, privacy, and user control, supported by this dispersed network and decentralized consensus, which is really blockchain technology. And that's the open distributed internet or a digital world of sorts. … I know people use 'Web3.0' freely, and everybody has a different interpretation and understanding. Our view is that it's supported by decentralized technology," she says.

While Chen and those who already work and play in digital assets are inherently more bullish on Web3's coming, there's a possibility that banks—which are already lagging behind in areas such as cloud adoption when compared to less-regulated tech sectors—may be inclined simply to do nothing, or rather, finish what they've started in other areas before future-proofing for a whole new, somewhat mystical era. But the fintechs and platforms they employ for their trading and operations services, which are nimbler and more adaptable by nature, may be well ahead of them, exposing them to Web3 and its philosophies before they even know what's hit them.

As these shifts render the world ever more digital, the CEO of Symphony Communications, Brad Levy, for one, is concerned with identity and how the internet's evolution has stolen the concept from its users.

"I don't use rewards cards. I don't like being tracked. I don't like giving up my life. The internet is upside down in terms of it being a risk mess. It went from being a distributed thing to a cloud-based thing that, when Amazon's down, we're all screwed," he says. "We've taken decentralized internet, made it without identity, and then we've put cloud on top of that, which has taken the good part of it, centralized it and made it riskier, and it's even given others power over us."

He recounts Apple's decision last year to let users decide whether the apps on their iPhones are allowed to monitor and share their activities with other entities. The move prompted a response from Facebook (prior to its rebrand), which took out full-page newspaper ads denouncing Apple's privacy feature as harmful to small businesses, *The New York Times* reported. The move also would have hurt Facebook's own business by hindering its ad-targeting algorithms. (In the story, Zuckerberg denied that his company's business would be hurt by Apple's policy.)

> "If a person is a trader for 20 years, his or her job doesn't change for 20 years. With new innovation, you have less regulation, and then you have the opportunity to make more money, and you can shape where the industry is going." Ying Cao, Work in Fintech

In Levy's ideal digital world, users could establish themselves, their likes, and their interests on a platform, and any content targeted at them would be a direct result of those user-set boundaries. Nothing more, and nothing less. That's why Symphony bought StreetLinx, a counterparty mapping platform, last year. The acquisition added more than 200 institutional counterparties to Symphony's roster of more than 1,000 service users.

"[With StreetLinx], you're going to establish your identity; you're going to create your profile; and the Street can send you research that you want. And the moment you don't want that certain ticker anymore because it's not on your list, you stop getting that research," he says. "And you are *willing* to expose that profile to Goldman Sachs, or let's say AllianceBernstein, because it will allow them to target you better with what you ultimately want. What you don't want is them watching your actions, because then they could figure out what you're maybe trading."

And if it isn't through their own volition or exposure by their fintech partners that banks encounter Web3, perhaps they'll begin losing staff—not only to the big tech firms, but also to agile technology-led start-ups that may end up as winning lottery tickets in the internet's evolution.

Ying Cao was one such loss for Barclays. After a 10-year stint at the investment bank, in July last year she ended her tenure as head of digital products, a group she had helped form and which she helmed for nearly four years, and resigned.

"After being the digital head, I realized there's so much you can do in a bank, but at a very, very slow pace compared to the modern-day of technology," Cao says.

In the next breath, she cofounded her own firm, Work in Fintech, which she started with Matthew Cheung, CEO of Ipushpull, an enterprise software-as-a-service platform provider to the capital markets. The company studies and develops projects in blockchain, non-fungible tokens, and Web3 to attract students and young professionals to work in fintech and apply such technologies to their work.

Cao, however, doesn't view the advent of Web3 as a threat to banks, but rather as a catalyst for bigger and better things.

"If you work in finance, you hate your job. And the reason you hate your job … is actually two reasons. I think number one is because there are a lot of restrictions: You are very constrained in the things you can use at work compared to your normal life. We have a smartphone, but at work you still use an old, crappy phone," she says. "Number two is that there's not a lot of innovation in the finance space. If a person is a trader for 20 years, his or her job doesn't change for 20 years. With new innovation, you have less regulation, and then you have the opportunity to make more money, and you can shape where the industry is going." wt

Out of the shadows

When it comes to private companies, data transparency still lags its public market equivalents, and a lack of data quality and availability is a barrier to increased investor participation. But an alliance between a startup and niche brokers is aiming to change that. By Max Bowie

Trading stock in privately held companies that have not yet listed on exchanges has exploded—as detailed in *Waters Technology* last year—creating a raft of new marketplaces and datasets offering trading access and insight into the value and behavior of private stocks. This movement has also prompted efforts to deliver greater transparency into these markets by regulators and new vendors alike.

Leading the charge is the US Securities and Exchange Commission (SEC), which is planning to step up its scrutiny of private markets. Last year, commissioner Allison Herren Lee gave a speech calling for greater transparency to address the "explosive growth of private markets," which for the past decade have raised more capital each year than on public exchanges.

For example, in 2019, private offerings accounted for 70% of new capital raised, while the number of so-called "unicorns"—privately held companies with a value of more than $1 billion, and in some cases, so-called "hectocorns" with valuations as high as $100 billion—rose from around 39 worldwide in 2013 to some 900 last year. With such companies staying private longer and growing more valuable before investigating an IPO, commissioner Lee warned that "we are again watching a growing portion of the US economy go dark."

By this, she meant that a large and growing part of the US economy is opaque to potential investors because privately held companies are not required to file reports or disclose financial information or audited statements in the same way as publicly traded companies, meaning there is little public information available about these potential investments. "This has consequences for investors and policymakers alike, which in turn may have consequences for the broader economy," Lee said at The SEC Speaks event last year.

Richard Smith, an author who is also the CEO and chairman of the Foundation for the Study of Cycles, tells *Waters Technology* that interest in private markets is partly being driven by activity in public markets. "Last year, two-thirds of companies that IPOed were trading at below their market value," Smith says, citing popular trading app Robinhood, which—albeit as a result of some turmoil—IPOed at $38 and peaked at $55 on August 6, before dropping to $15.52 on January 13 this year.

> "I think there is more data available than is actually being leveraged right now. But a lot of the data that is being used is poor quality. So, we need a new way of sharing data so everyone can benefit—including the sources/generators of that data." **Richard Smith, Foundation for the Study of Cycles**

And though the amount of data available is growing, Smith says the overall lack leads to questions about its quality. "I think there is more data available than is actually being leveraged right now. But a lot of the data that is being used is poor quality. So, we need a new way of sharing data so everyone can benefit—including the sources/generators of that data," he adds.

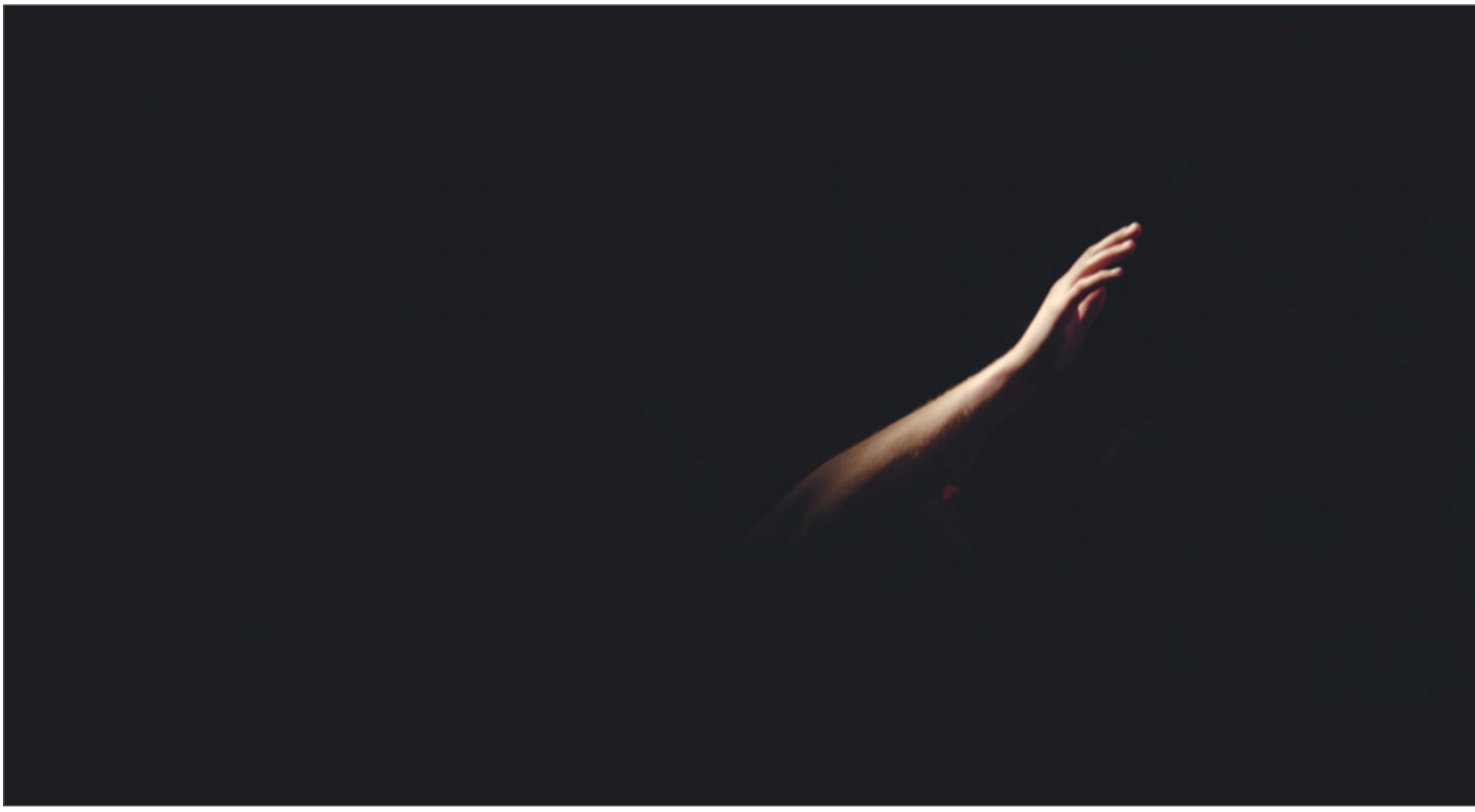
The lack of available information also creates significant challenges for brokers seeking to provide investor access to private markets, says David Hartzell, senior analyst at Santa Monica, Calif.-based Park Lane, an investment bank and capital investor.

"Accredited investors/qualified purchasers are smart, savvy, and well-read, and often require decks and data rooms to make educated decisions," he says. "Unfortunately, a lot of the most popular names … have little to no data access—aside from a possible former founder or employee willing to opine on where they think the company is headed."

He says that even when information on these types of companies can be found, the sources are fragmented, and institutional investors, high-net-worth individuals, family offices and sovereign wealth funds "often consider it a non-starter if they can't see data," which makes it difficult to effectively make markets in high-demand names.

To quantify the impact of that lack of data on trading, Alex Zykov, managing partner at New York-based investment bank and strategic advisory firm Argo Capital Partners—which participated as a special-purpose vehicle sub-advisor in private-stock technology provider Carta's $215 million series-F fundraising round—says that between one-third and half of all potential trades are not completed because of a lack of either price transparency or due diligence information.

"Unless you are dealing exclusively with hedge funds that are willing to make trades 'thematically' and hedge their bet elsewhere, investors want some level of info to wrap their head around how a given private company compares to public comps or other similar privates in terms of financial performance, growth, etc.," Zykov says. "In those instances where the seller has info (or the trade comes from/through management), even those who are transacting in the secondary market for the first time can get comfortable enough. Without that, folks feel like they are operating in the



> "One of the most important things is providing data that is more timely than three months or six months old."
> **Nicholas Fusco, ApeVue**

fog, even if they have some parameters around valuation."

In many cases where existing data providers carry data on private companies, that data includes reference and fundamental data, and even information on funding rounds, valuations, and possibly some business metrics, but not indicative price data.

"There are platforms that provide information on funding rounds, such as Forge, EquityZen, etc., but none show what's happening in between," in terms of price data that funds and asset managers can use to mark their investments over time, or the kinds of high-level financial data they desire, such as historical and/or projected revenues, profitability and cash burn, and other key performance indicators, like number of locations, units sold, customer numbers, and more, he says.

But when it comes to price data, much of that was generated in a fragmented manner by brokers based on their trading activity.

Filling the void

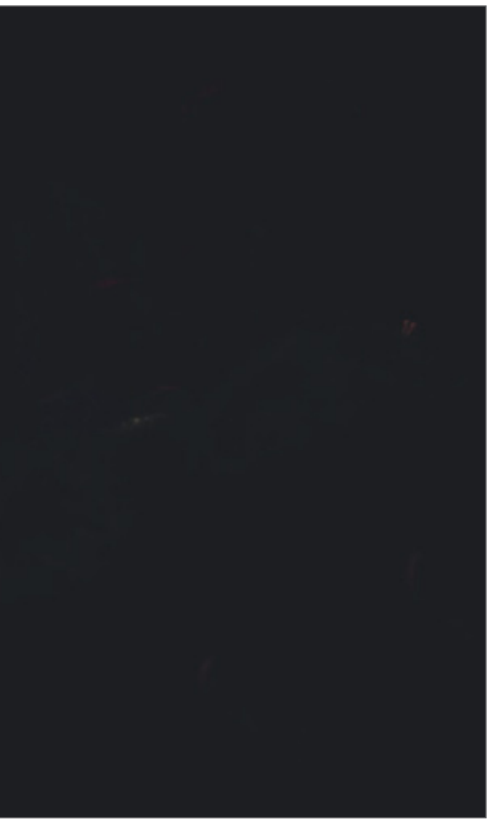
It was while helping his brother secure a job with a broker in the pre-IPO space that Nicholas Fusco realized that although the private markets were on a roll, they lacked an independent, third-party pricing source. Fusco recognized the similarities between the evolution of the private stock markets and the early days of credit default swaps, syndicated loans and collateralized loan obligations from his 13 years at Markit and IHS Markit, and saw an opportunity to fill that gap.

The result is ApeVue, a New York-based startup of which Fusco is founder and CEO. Since the vendor's inception last March, Fusco has secured agreements with four brokers to provide price data from anonymized trading activity, which the vendor then normalizes to provide aggregated prices for privately traded stocks, which clients—contributing brokers and others who can subscribe to its data—can use to perform risk management or calculate net asset values (NAVs).

The service currently provides daily prices for around 100 private companies based on a weekly batch-pricing process, and Fusco says the company aims to provide same-day pricing for most—if not all—names covered.

Contributing brokers supply bids, offers, and traded prices via a template, then ApeVue extracts the data and cleans it to remove outliers and normalize the data—a challenge in itself, since some brokers quote in stock price and others quote market value, while all use different naming conventions. Then the vendor runs the numbers through a Python script and then filters them against its own requirements around price and size to ensure it is producing quality prices based on institutional-sized trades that would be useful to asset managers.

ApeVue makes the data available to contributors and subscribers by exposing an API, or as a CSV file via email. By the end of March, the vendor plans to offer a user interface that will pro-



vide more features, such as dynamic charting and sector comparisons.

"One of the most important things is providing data that is more timely than three months or six months old," Fusco says. "We're exclusively market data-driven. We're providing what we believe is a better price for the inputs you use to price NAV or to use as a comparable. We don't use comps in our pricing—that's a fundamental differentiator between us and other pricing providers."

The data inputs by definition are different from the data produced by traditional listed markets because the way the markets operate are different, says Hartzell at Park Lane, which has been one of the early contributing brokers to ApeVue's service during its beta period.

"These trades are often complex, and it's not uncommon to put months of work into one trade. Unlike Robinhood or other digital platforms in public stock trading, this is still a complex landscape that requires a handful of skilled humans to effect the trade legally and accurately. ApeVue and a few others have made huge progress in data aggregation. The composites they've built are only going to get better and more user-friendly as they are fed more information. They've built out charts, ticker symbols, and historical data that is catnip for analysts."

Smith also believes the latest developments are a move in the right direction for private markets seeking to achieve greater transparency, but says meaningful change may still be five or so years away, and may require incentives to encourage—rather than enforce—public disclosures by non-private companies.

"Greater transparency and data collection are moves in the right direction—and I think those are inevitable. There has been a lot going on in terms of new exchanges coming online to give us access to loads of data on different assets. I believe that trend will continue and will allow for better price discovery," Smith says. "And I hope the SEC defines the rules a little better to help these new trading venues become more valuable to the public."

One such new trading venue is Securitize Markets, an ATS for trading privately held securities created last year by Securitize, whose main business thus far has been navigating private companies through the process of issuing and digitizing private stock.

"The challenge in this space that we're trying to solve for is that there's a general trust issue compared to the information available in public markets," says Securitize Markets CEO Scott Harrigan. "The regulators have come to realize that it's a $7 trillion growth market, and they are cognizant that they need to put as many rails around private securities as exist around public ones. Now, what you see is regulators requiring a greater level of public disclosure [from private issuers] to ensure investor protection and that investors are making decisions with all the available information."

Thus, he welcomes greater regulation and disclosure requirements, as well as market-led efforts such as ApeVue, saying that making more information available will only help increase investor confidence in private markets, where data thus far has been largely limited to pricing based on a company's last round of fundraising, and not interim—let alone real-time—observable data.

Another way to build out that kind of data is to create a marketplace for private securities, where dealers make markets in stocks, and investors can see a record of executable quotes and traded prices. So in late 2020, Securitize acquired Distributed Technology Markets, a registered broker-dealer and ATS, which—once Securitize built out back-end systems and a front-end user interface—became Securitize Markets.

"The distinction for us is that we have control over the supply, and the ability to create our own supply. We have a number of private issuers and funds looking to digitize their assets. And when those assets become available to trade, the natural choice will be to trade then on our ATS, because it's all part of the same ecosystem," Harrigan says, which in turn will create datasets that—while "still not at the level you'd expect from public securities"—go some way toward creating exchange-like transparency. "We're building out real-time transaction data on the platform, and at some point, we'll be able to push that out in a more useful way, which will increase investor confidence." wt

"The challenge in this space that we're trying to solve for is that there's a general trust issue compared to the information available in public markets. The regulators have come to realize that it's a $7 trillion growth market, and they are cognizant that they need to put as many rails around private securities as exist around public ones. Now, what you see is regulators requiring a greater level of public disclosure [from private issuers] to ensure investor protection and that investors are making decisions with all the available information." Scott Harrigan, Securitize Markets

Eliminating the human touch

The Canadian bank's tech infrastructure unit is using Kubernetes as it looks to become a 'truly end-to-end digital enterprise.'
By Nyela Graham

Jikin Shah is something of a human Swiss Army knife. He studied instrumentation and control engineering at Gujarat University, about an hour's flight north of Mumbai. After gaining some work experience, he moved to the US and earned a master's degree at Marist College in New York.

In 2000, he landed at MetLife and while working at the insurance giant, decided to pursue an MBA in finance. By 2008, he had earned the MBA and worked in five different roles at MetLife, ranging from building out its middleware practice to managing its three digital platforms for institutional, individual, and broker clients.

Shah decided a new challenge was in order and moved to Atlanta to work at regional bank SunTrust. He spent 11 years there in seven different roles, including head of consumer channels and head of the bank's business accelerator unit. Then he served as head of enterprise transactions operations technology. Finally, he was head of financial crime and compliance tech.

These roles gave Shah a broad mix of technological and business expertise, but his resume lacked experience in technology infrastructure at a time when financial services firms were increasingly moving to the cloud.

So in 2019 he joined the Royal Bank of Canada (RBC) as vice president of architecture, innovation and cloud, and today serves as senior vice president of technology infrastructure.

Changing forecasts

While there is a lot of talk about public cloud adoption, most big banks' critical workloads are still run on-premises.

RBC has taken a cautious approach to the public cloud. First, the bank focused on building out its private cloud capabilities before moving to a hybrid model. Shah says that some 600 applications run on this private–public hybrid model, with 80% of them using a private architecture. But, he says, that number will shift.

"In the next three to four years, we will see roughly an equal balance between on-premises and multi-cloud and maybe more at 40:60 in four or five years," he says. "Early in our strategy, we anticipated that shifting operational and security functions toward the developer community would have a learning curve that would hinder our acceleration to cloud. As such, we built an internal platform where we've automated many of these functions for our developers. It was primarily built internally with the support of external–local, as well as vendor resources to complement our internal team." The strategy, design, and engineering IP belong to RBC.

> "In the next three to four years, we will see roughly an equal balance between on-premises and multi-cloud and maybe more at 40:60 in four or five years."
> Jikin Shah, Royal Bank of Canada

RBC isn't rushing to the public cloud, however, because it has taken what Shah calls a "crawl, walk, run" approach when it comes to cloud deployment. Specific to tech infrastructure, Shah wants RBC to be software-defined—an organization where infrastructure is powered by software as much as possible—and where manual processes are nixed from the equation.

"How do you untangle that from that vision perspective, and simplify it? So running it as a business, it starts from software-defined because I want to identify every opportunity to eliminate the human touch and have that as a straight-through processing [tool], as a request, as an API, as a micro-service," he says.

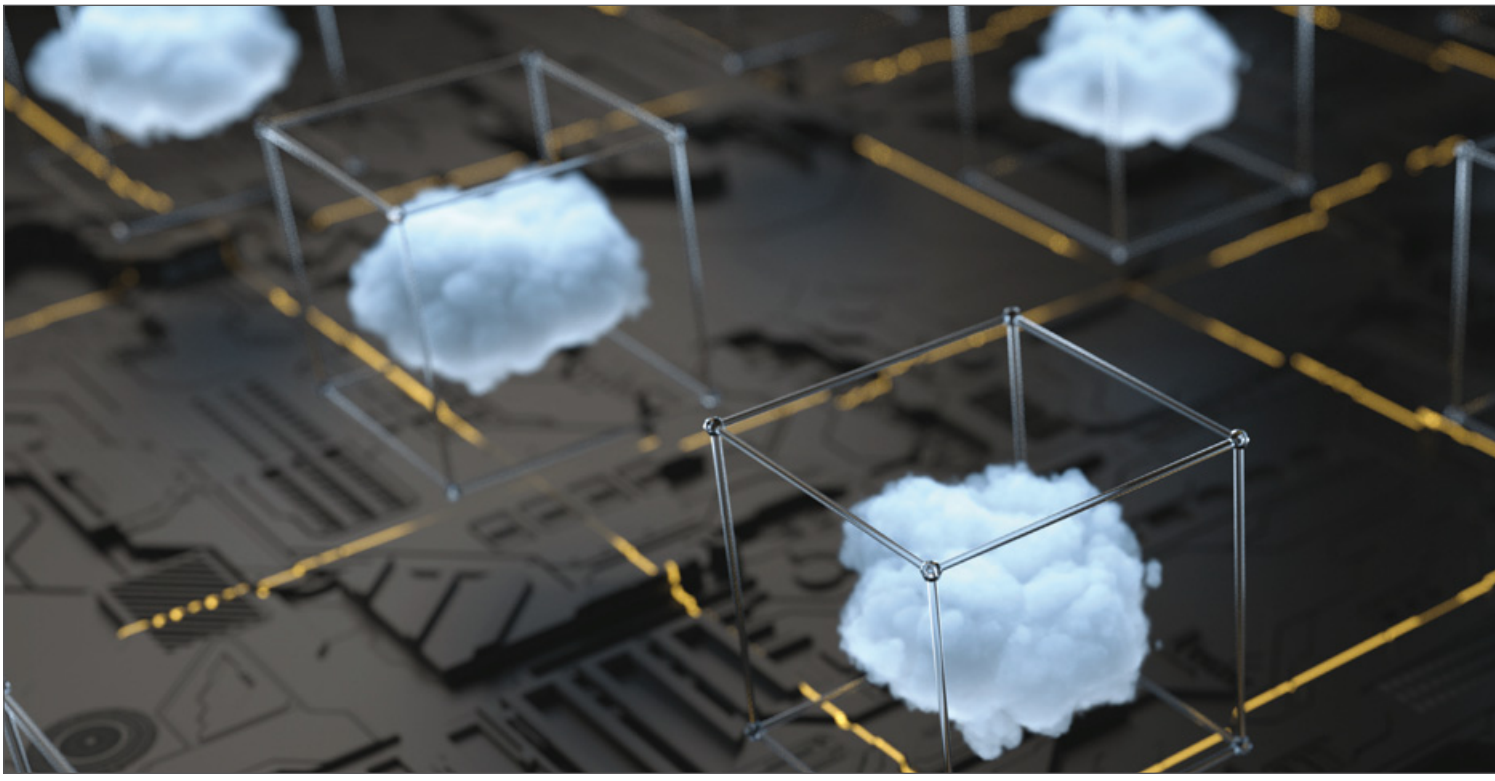
Vinod Jain, senior analyst at consultancy Aite-Novarica Group, says it's difficult to move bread-and-butter, in-house-built applications to the cloud because there tends to be a lack of documentation around how the platform was built. On the other hand, transparency is a competitive advantage for vendors vying for business.

"The homegrown application is a challenge because of lack of documentation—nobody knows exactly what's hidden underneath that," Jain says. "So it's more difficult to move or migrate the homegrown application to a cloud platform. And when we want to build the services around it, it's a bigger investment. It can be done, but it's just additional work that needs to be done."

For Shah, the next step after being software-defined is for the architecture to be automation-enabled, which entails listing all the functions in the bank that are still not automated to see where a machine could do the job better and more efficiently. The third step is for the bank to have a tech-delivery model that is AI for IT operations (AIOps)-influenced.

RBC was founded in 1864 and in the ensuing 158 years has undergone mergers and acquisitions and the installation of new third-party systems in addition to internally built tools. Large longstanding banks must manage technical debt—there's a reason why a cottage industry of Cobol developers still exists. It can be a nightmare to replace critical legacy systems, which is why they persist.

To get RBC's infrastructure development to be software-defined, automation-enabled, and AIOps-influenced, Shah's team must identify processes that have not yet been automated, and either shift them to the bank's hybrid-cloud model, or make them have



"cloud characteristics," with the end goal of "RBC growing to become a truly end-to-end digital enterprise."

Shifting winds

Over the last decade, financial services firms have become more comfortable with the security and requirements of cloud infrastructures (though less comfortable than other less-regulated industries). At the same time, they have legacy systems that are accruing technical debt and, thus, hindering investment in innovation.

In the same vein, cloud has helped facilitate the rise of software-as-a-service (SaaS) and managed services. Additionally, vast quantities of data can be stored, processed, and analyzed far more quickly and efficiently, and delivery mechanisms, such as the use of APIs, have improved. And the cherry on top has been the democratization of AI tools, specifically around machine learning and natural language processing.

Where banks tend to struggle is that middle layer between new (or evolved) technologies and legacy platforms that are upwards of 30 to 40 years old. That's what Shah and his team are currently looking to address.

"When I took this role 1.5 years ago, I truly made it the priority, where multi-cloud means everything we do in tech infrastructure needs to be cloud characteristics," he says. "So if it is a public cloud, you know that. Private cloud, you know that. But whatever is left, I am challenging my team and myself and my partners to identify opportunities to insert those automation and AIOps and drive cloud-type characteristics."

This is also where Kubernetes containers for software development come into play.

"We are Kubernetes right now in private cloud and public cloud," Shah says. "What we are seeing now as a next thing is how we can enable the business to architect an application where it is designed to run primarily on private cloud, but for a surge or spike-type scenario, it goes and bursts into public cloud. We don't have millions of dollars of investment to increase our private cloud offering just for that one single month scenario."

So, for example, in late January 2021, trading volumes by share count exceeded peaks originally set during the 2008 financial crisis. Followers of the Reddit board r/WallStreetBets were short-squeezing stocks of video game retailer GameStop and movie theater chain AMC in a move against hedge funds that had been short-selling the stock. The high trading volume triggered service disruptions across the industry.

At the time, Shah says the bank saw a 3–5x increase in trading volume as a result of the GameStop/AMC activity. RBC's private clouds are architected in a way that when they achieve about 90% capacity, they "burst" into the public cloud (the bank uses Amazon Web Services and Microsoft Azure) to handle the excess demand. Once traffic levels off, that flow is redirected back to the on-premises instances. Kubernetes serves as the layer that assists in that traffic flow.

Shah wants to make the process more robust so that it can work not just in cases of volume spikes, but also if there's an outage at AWS or Azure, or a major security concern. Seamlessly failing over from, for example, an AWS environment to an Azure environment (or Google Cloud or IBM Cloud) isn't currently possible for the most part.

"We feel that there will be a time where we will be able to move the workload from one place to another for this type of spike scenario. But also, if we

> "I'm not rooting for a doomsday scenario for any of the cloud providers, but as a thought leader, we are challenging ourselves to better position ourselves so if that time comes, we should be able to take our workload and switch it to another. In order to do that, a lot of planning is required. Just having a Kubernetes orchestration layer across private–public cloud is a starting point, but you have to go all the way up to the design of the application to make sure that it is designed, architected, and tested properly to support that type of movement." **Jikin Shah, Royal Bank of Canada**

find ourselves in a situation where there's a significant security issue with one provider, we don't want to put our entire bank into them," he says.

"I'm not rooting for a doomsday scenario for any of the cloud providers, but as a thought leader, we are challenging ourselves to better position ourselves so if that time comes, we should be able to take our workload and switch it to another," he says. "In order to do that, a lot of planning is required. Just having a Kubernetes orchestration layer across private–public cloud is a starting point, but you have to go all the way up to the design of the application to make sure that it is designed, architected, and tested properly to support that type of movement."

He adds that while Kubernetes gives users those technical standards in terms of interoperability between cloud layers, in order to get that value, it is necessary to lay the foundation around proper design, architecting, and testing.

"The fundamental thing is, how do you stop developers from using a unique feature in AWS that is not available in Azure? So you have Kubernetes; it is portable. But if you use cloud-native functionality, you can't do it," Shah says. "So when we say multi-cloud, what it means is we are trying to provide faster training wheels to our developer community to leverage Kubernetes and use cloud—private or public—but we are restricting them from a unique cloud-native functionality, unless they come and explain a genuine business case, and when they do that, we educate them around the price it comes with."

Lake effect

As the tech infrastructure unit looks to codify these practices, a key next step is that third tier of AIOps.

To look at this in motion, Shah points to an operational data lake the bank has built, which brings in data from systems, applications, and networks from around the organization. Currently, the lake employs about nine AI models that sift through that information. When a change request is submitted, the system will use AI to predict if there's a higher probability of something going wrong with that change, as well as a confidence score.

For example, an employee might submit a change request for a payment application for March 31, 2022. The person filing the request believes it to be low risk, but the AI tags it as a moderate risk, which alerts the user to go back and check to make sure the request won't cause a disruption. For future tech rollouts, AI capabilities will need to feature prominently in the decision-making process, Shah says.

"The latest [IBM] mainframe that we will roll out in the next two years or so will feature AI out of the box that helps us understand how we can optimize the Mips (million instructions per second) usage for the mainframe. It will have out-of-the-box features and functionality for us to understand what might not be operating at the optimum level," Shah says.

For Shah, it all comes down to a change in thinking about tech development, a belief that has been formed over almost three decades in a range of tech and business roles.

"What I saw typically in large organizations is, here's what I want, here's what I need, so that I can do this," he says. "I operate in the reverse. Here's what I'm going to make given what I have and showcase what good looks like, and I always see the money and resources following that." wt

Danske Bank turns to licensing optimization for cost savings in the millions

In a cloud world, IT asset management can save on operational and compliance costs and get the most out of software usage. But it's important to find the right people for the job. By Joanna Wright

If you are a technologist at Danske Bank, Rachel Ryan wants you to know that she's not the "software police."

Ryan is the first vice president and global head of IT asset management (Itam) at the Nordic bank. Itam is a methodology for keeping tabs on all the assets of an organization, including hardware and software. Itam's remit is broad: An Itam team could work closely with network security to ensure the removal of any software containing vulnerabilities; or it might be responsible for making sure that laptops are wiped of sensitive data at the end of their lives; or it could be tasked with finding loopholes in the complex licenses of large enterprise software vendors like Microsoft, Oracle, and IBM.

Itam's proponents say it can save large organizations millions, but it's still often seen by businesses as a passive function—largely about keeping the organization safe from compliance risk—rather than an active one that can optimize spending on software and cloud architecture. And it can be difficult to find license specialists with the necessary skillsets.

Getting business buy-in and finding the right people for the job were Ryan's main challenges when she joined Danske back in 2019, tasked with the newly created role of building a specialized Itam team.

"Initially, it was about establishing the department as not the software police, but as a department that can bring value to the business. And we had to demonstrate that value. So it was very much about changing the perception of our role from just compliance, to cost optimization. We were very conscious about building relationships and bringing people information so they could make business decisions on the information we are providing," Ryan says.

> "In Itam, you need the technical specialists and the specialists in licensing. People can be skilled up to a degree, but it's very difficult to train someone fresh. In software licensing it takes a long time and a lot of experience—these are key personnel with very specific skillsets. Those are not cheap, and I had to go outside of the normal countries to find them." Rachel Ryan, Danske Bank

Preston, UK-based Ryan, who speaks with the broad accent of her native Lancashire, started her career in tech sales. Before joining Danske, she was global software asset management lead at pharmaceutical giant AstraZeneca for over eight years, prior to which she spent a decade at Fujitsu in software operations and licensing roles.

Before she joined the bank, Danske's Itam team consisted of six or seven specialists who worked with external third parties to manage the bank's tech estate. External consultants told the bank it should grow its team. "They decided they needed somebody who was experienced in running large global programs, they needed some expertise in Microsoft, IBM and Oracle, and they needed to upskill everybody," Ryan says.

The "somebody" they hired was Ryan, who immediately set about growing the team's headcount. "I said I would bring in some high-level expertise, and then we would train from the top down and upskill everyone over two years," she says.

"In Itam, you need the technical specialists and the specialists in licensing. People can be skilled up to a degree, but it's very difficult to train someone fresh. In software licensing it takes a long time and a lot of experience—these are key personnel with very specific skillsets. Those are not cheap, and I had to go outside of the normal countries to find them," Ryan says.

Ryan's team now consists of 19 people spread across three countries—the UK, Lithuania, and Denmark—all of whom have been accredited as specialists in parsing the licenses of the large vendors, including Microsoft, IBM, and Oracle. After the first year, the business asked Ryan to expand to take on responsibility for hardware asset management, so she founded a dedicated team in India for that.

In building her team at Danske, Ryan looked for the depth of experience of people who have worked as specialists for years. "You'd have to be very naïve to think you could just tell someone, 'OK, go on a course on Oracle.' That's when you end up with multi-millions in non-compliance [penalties]," she says.

This is why many of her team are based in the UK, rather than the bank's headquarters in Copenhagen, or in low-cost development centers overseas. "For the IBMs and the Oracles, you've got to go for people who have worked at

large corporates. And the big corporates that are doing it well are in the UK and Europe—countries like Germany—and they're very established. To find these people, you have to look at engineering firms like Volvo, BMW, something like [shipping company] Maersk, or the big pharmas. You're looking at large corporates with like 20,000 employees—that's where you'll find the people with a lot of experience," Ryan says.

Though she declines to give an exact number, Ryan says her team has saved Danske "millions" of euros since 2019. The savings principally came from optimizing the use of software—that is, saving on new purchases and renewals, and right-sizing on license use—and heightened the profile of her team from being perceived as a back-up department to now being recognized as a key contributor to the bank's bottom line.

But it wasn't easy—it took some work to get the right people in place first.

Specialist discipline

Itam as a discipline is about 15 years old, Ryan says. It emerged when the licenses of the largest enterprise software vendors started to get more and more convoluted as they sought to monetize their IP and track usage by conducting huge audits. Many large corporates have found to their dismay they have 10,000 users of a product and were only licensed for 1,000; or perhaps that a software license signed by their US headquarters didn't extend to use by teams outside the US, for example, technical teams in locations such as India.

"What happened is that suddenly, the vendors realized, 'Wow, this is a bigger money-maker than it is to actually sell software,'" Ryan says.

According to polls conducted by consultancy Gartner, the percentage of Itam professionals subject to vendor software audits rose from 30% to 62% between 2005 and 2012. A decade later, Itam software provider Flexera's *State of Itam 2022* report showed that in the past three years, 50% of Itam teams at 465 mostly large companies were audited by Microsoft. Software asset managers (SAMs) still focus most of their time on managing internal and external audits, the survey says.

Of Flexera's respondents, 24% paid more than $1 million in "true-up" costs to become compliant and penalties related to audits over the past three years, while 9% paid over $5 million.

These audits are so lucrative that users have wondered whether the large vendors are deliberately making their licenses more complicated. The large vendors, on the other hand, say they are trying to capture all the possible usage of their IP and ensure that the customer understands the costs upfront. They say they continually review and reduce the complexity of their licenses. Microsoft, for instance, streamlines license management under one single organization-wide agreement, according to its Enterprise Agreement.

Either way, an ecosystem of SAM practitioners specializing in the ins and outs of the licenses of different vendors has evolved. Most of these professionals boast years of knowledge honed from careers at resellers or the vendors themselves.

Over time, Ryan says, Itam has become as much about right-sizing and reducing costs as it was about protecting the company from audit and liability. Most large corporates are paying for software they don't even use. Any computer probably has apps that go unused but come standard as part of Microsoft Office 365. It's no different for enterprises.

"Software asset management became a methodology firstly to understand the different complex licensing rules, and then to put all the processes of governance and controls there, and then we moved into saying, 'We can save you millions on your next big agreement'," Ryan says.

Evolution to finops

Itam has become an established discipline with an ISO standard (ISO 19770) and trade associations like the Itam Forum, of which Ryan is a board member. But the skills of SAM practitioners are having to adapt as large organizations move onto the cloud.

Finops (a portmanteau of "finance" and "operations") is the next trend in Itam, says Tony Mackelworth, who is head of Microsoft advisory for software provider SoftwareOne. Mackelworth has been at the vendor, which offers Itam-focused solutions, for 9.5 years, and helps develop platforms aimed at saving customers money on their cloud architecture. Prior to this role, he worked with Microsoft and then BT in licensing and SAM roles, where, he says, he became an expert in product usage rights and standard contract rules—and, more importantly, how to apply those rules to real-world server environments.

When Mackelworth began his career, infrastructure was on-premises. Procurement took place over long lifecycles with capital expenditure sunk into datacenters over years-long horizons. "There was always the pressure to optimize costs, but it was a more static and less dynamic environment. You could apply SAM principles and capabilities to that," he says.

As the years went by, virtualization and then cloud computing emerged, and tracking licenses got tougher. Cloud offers elasticity, allowing users to scale resources up and down as they wish, but assigning licensing assets to this ever-shifting environment is a challenge.

"Today, cloud spend is an operating expense. And the purchasing power can be in the hands of individual engineers, not in procurement. They can spin up new workloads with elastic scaling of those resources. So that means you have a very dynamic, elastic environment that they have to manage on an ongoing basis. And that is a challenge for many organizations," Mackelworth says.

SAM practitioners must increasingly combine that knowledge of licensing and commercial programs with a technical understanding of cloud architecture, tracking innovations in Amazon Web Services, Microsoft Azure, and Google Cloud Platform, as well as in software-as-a-service apps in older platforms like Microsoft 365.

"Even vendors like SAP and Oracle are moving to hyperscale environments. As organizations move workloads to the cloud or refactor applications natively for the cloud, there's going to be increased demand for Itam professionals in finance," Mackelworth says.

Flexera's research shows that SAM teams are still in the early stages of understanding cloud and SaaS—with less than half saying they right-size SaaS subscriptions—but adds that most expect to increase their work in these areas, reducing their focus on datacenter and desktop software. But there are savings to be had by understanding contracts. Among Flexera's respondents, 89% of teams with mature SAM programs realized savings from reusing licenses.

In turn, the hyperscalers have introduced mechanisms that allow customers to access discounts. Many offer a model called "bring your own license," allowing customers to apply licenses they already have to a cloud platform.

Azure has Hybrid Benefit, a licensing mechanism aimed at reducing the costs of running workloads in the cloud by enabling Windows Server and SQL Server licenses, and Red Hat and Suse Linux subscriptions, on Azure. AWS similarly offers the ability to switch between its own licenses and those for Windows Server and SQL Server workloads, retaining the application, instance, and networking configuration associated with the workload.

On the other hand, vendors offer discounts to incentivize customers to license with them in volume, rather than bringing their own or buying on-demand licenses.

"Today, cloud spend is an operating expense. And the purchasing power can be in the hands of individual engineers, not in procurement. They can spin up new workloads with elastic scaling of those resources. So that means you have a very dynamic, elastic environment that they have to manage on an ongoing basis. And that is a challenge for many organizations."
Tony Mackelworth, SoftwareOne

These are all nuances SAM practitioners must be aware of, as well as "whether customers make purchases monthly or over longer terms like multiple years. Licensing has a role in all these factors that can really impact the bottom and top lines of the profit and loss balance sheet," Mackelworth says.

SoftwareOne works with customers to understand exactly what their cloud usage is, and if those functions are going to be revenue generators or cost centers, even extending accountability to individual engineers

"The role of Itam in finance is connecting the silos of IT procurement to engineers and cloud architects to understand what is going on in their environment and know how spend is allocated across the business," Mackelworth says. "It's a collaborative effort to understand what cloud spend is ... making sure that KPIs and success criteria are aligned with policy."

And it's when the Itam department can demonstrate that it can save the business money by improving this awareness and accountability of cloud costs that it will get business buy-in, he adds.

Itam as a moving target

Ryan says that now Danske's Itam team is in place and showing its worth to the business, it will focus more on finops, as well as "shadow IT"—users deploying hardware or software outside the auspices of the IT department.

Shadow IT mostly happens by accident: For example, an employee wants to try out some software, pays for it themselves, or uses their company credit card, and installs it. This usage could present a security and compliance risk, especially in an era of data protection regulation. Ryan says shadow IT has grown significantly due to the cloud, which has made it easier for users to buy and use software outside of the governance and controls of the IT department.

Like Mackelworth, she also sees Itam evolving. The thinking behind the discipline is trending toward encompassing wider and broader definitions of an IT asset—including business applications, services, and even people. As everything in an organization becomes an IT asset, mapping it all to obtain a comprehensive view of those assets and how they interrelate becomes crucial to an Itam team.

Danske has been working on mapping its business applications and services under a methodology called the Common Service Data Model (CSDM). This model is a framework for building configuration management databases—databases that organizations use to store information about their hardware and software assets. These are an important tool in Itam: Flexera's report says that 71% of respondents use a CMDB, with on-premesis virtual machines representing the most-tracked type of cloud assets in these databases.

"We at Danske Bank have been working on the CSDM, which is mapping all the business applications and services. We started that journey in 2020, and want to move further into that journey this year," Ryan says. "We will be looking at the different tooling and integrations and how we can share data to different departments. We want to give a visual to our business application owners so they can see everything, how it all fits together, so they can manage risk and costs." wt

Google's cap markets play portends a shift in trade tech philosophies

According to Google's Phil Moyer, the capital markets are shifting from a world where location determined liquidity, to one where accessibility will be the main differentiator for exchanges. Anthony Malakian explores what this could mean for trading firms going forward.

For the very first *Waters Wrap*—which was published on July 12, 2020—I wrote about how companies like HPR, Trading Technologies, and various other lowercase-t trading technology providers were undergoing ambitious projects to move their legacy platforms to the cloud. Three weeks later, I wrote about how some of the largest exchanges were partnering with the Big Tech cloud providers for increasingly more complex functions.

If I'm doing my job well, the whole point of the *Waters Wrap* column is to highlight trends earlier than other outlets and connect today's events to those in the past. Cloud adoption is hardly a new concept, but on November 4 of last year, a fundamental shift was felt in the capital markets with the announcement that Google would invest $1 billion into the CME Group as part of a 10-year partnership. It's the largest investment Google has made to date in the financial services sector. Through the deal, the CME will begin moving its technology infrastructure to Google Cloud, with the exchange's data and clearing services being the first to migrate.

At the time, I wrote this was likely the first domino to fall and that other exchanges would likely follow suit. Sure enough, at the end of November, Nasdaq announced a similar partnership with Amazon Web Services that would see the exchange migrate its North American markets to AWS in a phased approach. The future of the capital markets will reside in the cloud.

The CME and Nasdaq will not be the last to make aggressive pushes to the cloud using the tech giants. To get a better feel for how a large migration like this looks at its outset, I spoke with Phil Moyer, vice president of strategic industries for Google Cloud. We talked about a range of trends (and crazy theories I have), as well as how the CME rollout will unfold. Let's start with the latter.

Moyer says the exchange is committed to migrating its core, non-latency-oriented applications to the cloud in phase one. "This will give those applications global accessibility, as well as on-demand scale and capacity to those workloads," he says.

Phase two will aim to "accelerate innovation" at the CME. As Big Tech firms look to carve out a niche for their services, AWS has focused on using its massive user base and cheap prices to attract more users; Azure possesses the Microsoft Office suite (and those ubiquitous Excel spreadsheets) along with its Teams collaboration tool; and IBM brings its mainframe and hardware business along with its inroads into the regtech and AI spaces.

Google Cloud, on the other hand, wants to differentiate itself using AI in the front and middle offices. As a leader in the fields of natural language processing and computer vision, its facial recognition tools can pick out and identify your mom in a sea of uploaded images to Google Photos. Its machine-learning tools like BigQuery are used by quant funds of all sizes, as is the Google-developed, open-sourced Tensorflow. For a nominal fee, you can store all your documents, photos, and entertainment in its cloud.

Google is looking to sell itself on the premise that if it can do all these things for everyday people, imagine what new products and services it can create for an exchange.

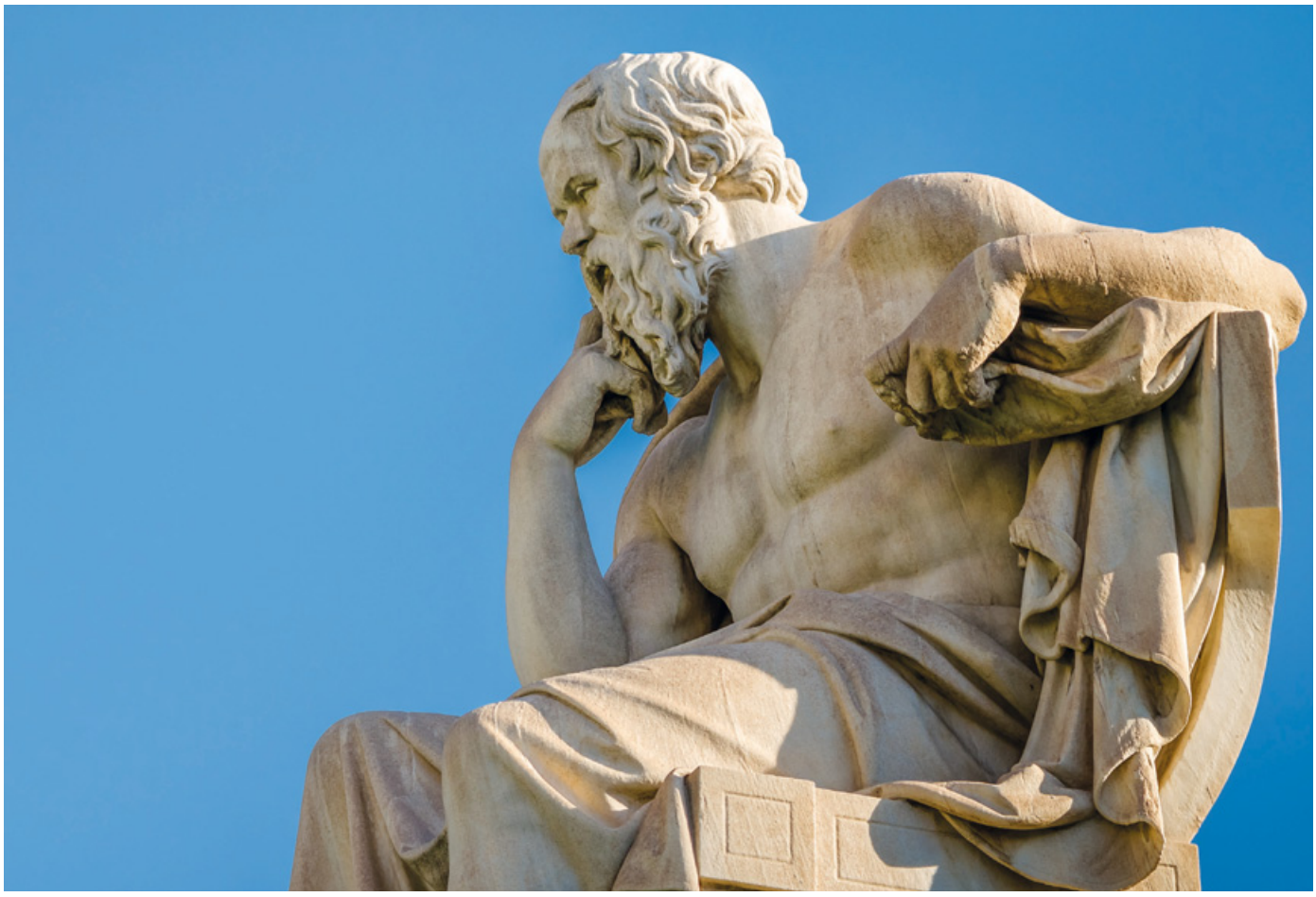
"We believe [exchanges] will have many innovative uses for Google's data analytics and machine learning including our knowledge graph, our natural-language processing capabilities, our Document AI technologies—a whole variety of technologies that they will be using in innovative ways for their markets, customers and settlement, clearing and regulatory functions," Moyer says.

The third phase is more in the realm of space exploration. What can the CME teach Google about the capital markets and how to serve them well, and vice versa?

When I started at *WatersTechnology* (then just called *Waters*) in 2009, the discussion of Big Tech centered around co-location and high-frequency trading. (The short-sighted—in my humble opinion—*Flash Boys* would be published five years later.)

Location was everything, as alpha was generated by trading faster than the other guy, so firms would spend millions of dollars to get closer to the exchange and plug in the fastest data distribution tools. For the purposes of trading, cloud was not a latency-friendly tool. What this third phase will look to address is unlocking some of the hardest financial services problems associated with low-latency workloads, Moyer says.

Listening to Moyer, it sounds like this exploratory potential is what's leading the push by financial services firms to get further inside the cloud. If you want to use alternative data, you need cloud for storage and analytics. If you want to use more sophisticated forms of AI like neural networks, cloud is going to play an important role. If exchanges want to improve on multicasting, the next frontier is the cloud. When you



have two of the largest exchanges in the world announcing that they are moving their trading infrastructures to AWS and Google, the tipping point for cloud's Wall Street takeover is already in the rearview mirror.

So it is that Moyer believes that cloud has brought along with it a paradigm shift in the capital markets.

"I think the financial industry has always had significant interconnectedness between all of its participants. But in the past, proximity and location determined liquidity. As we look forward, it's less and less about physical location, and more about the accessibility of the asset, and your ability to attract investors while meeting regulatory requirements," Moyer says. "To do this at a global scale, you need to be able to settle and clear assets 24/7, and as quickly as possible to support your customers in managing risk. I think the CME and lots of other exchanges are realizing that accessibility to the capital markets is going to determine the future of liquidity, and not necessarily proximity."

Crawl, walk, run

Those three phases mirror broader trends in the market. As much as banks and asset managers like to talk a big game when it comes to cloud adoption and migration, the financial-services sector is not as advanced as some might have you believe. To start, it's a crawl, walk, run scenario, and the crawl is moving the low-hanging—non-mission critical, latency-sensitive—workloads to the cloud.

The second phase is all about innovation and, specifically, using AI to generate alpha, improve risk systems, and more efficiently handle middle- and back-office processes. Trading firms like to make it seem like they're all Renaissance Technologies, but use glorified robotic process automation (RPA) to masquerade as AI, and are nowhere near as sophisticated with neural networks or making advancements in the field of natural language processing, where Google's Bert is exemplary.

And then there's the third phase. On Wall Street, you need to be fast. Before (and even still) that meant being first to a trade. That definition is evolving, though, as people want to be fast/first when it comes to both connecting dots and running analytics. Contextualizing data to make informed decisions is becoming the great differentiator for trading firms—cloud and AI are essential to doing that better and more efficiently.

Through this partnership, Google and the CME have a shared fate in how this all plays out over the next decade. Outages or hacks will set back not just those two companies, but the entire industry and how it incorporates the cloud tools of the future (and even quantum computing). But a success here (and at Nasdaq) will lead others to follow similar paths. wt

Human Capital

Tradeweb announces executive leadership changes

Tradeweb co-founder and CEO Lee Olesky has been elected chairman of the board and will retire as CEO on December 31, 2022. Tradeweb president William Hult will become the company's next CEO.

Martin Brand has stepped down as chairman and is leaving the board after three years in the role. Olesky will serve as both chairman and CEO of Tradeweb through 2022, after which he will continue as chairman through 2023. Director Paula Madoff has been elected lead independent director of the board.

Olesky co-founded Tradeweb 25 years ago and has been CEO since 2008. He left in 1999 to launch BrokerTec, another electronic trading platform, before returning in 2002 and becoming CEO in 2008. Prior to Tradeweb, he was COO for the fixed income Americas division at Credit Suisse First Boston.

Hult joined Tradeweb in 2000 and has been president since 2008.

New York Fed names Neal as head of the markets group

The Federal Reserve Bank of New York has named Michelle Neal as head of the markets group. In this role, she will also join the bank's executive committee. Neal was previously CEO of US operations at LedgerEdge, a distributed ledger technology-powered corporate bonds trading platform.

Michelle Neal

Sunil Cutinho

Renaud Larzilliere

Neal has held leadership roles in financial services organizations for nearly 20 years, during which time she was previously head of US fixed income, currencies and commodities at RBC Capital Markets. She was also CEO of markets at BNY Mellon.

Rimes names Larzilliere COO

Rimes Technologies has promoted Renaud Larzilliere to COO. He leads the sales engineering, implementation, client services, and enterprise project management teams, and is a member of the executive committee. Larzilliere will continue to lead the Rimes technology group as he had previously served as CTO for five years.

He previously held the positions of senior vice president and head of research and development, president of Rimes Technologies France, and managing director of Rimes Technologies France. He joined Rimes in 2009.

CME announces changes to management team structure

CME has announced that Sunil Cutinho, who previously led CME Clearing and served in a variety of technology roles since joining the company in 2002, has been appointed chief information officer.

Overseeing CME's enterprise technology, Cutinho will replace Kevin Kometer, who is retiring in the middle of the year. COO Julie Holzrichter will assume an expanded role to oversee both global operations and CME Clearing.

Suzanne Sprague has been promoted to the management team as senior managing director, global head of clearing and post-trade services, reporting to Holzrichter. Sprague has served as managing director, credit, collateral and liquidity risk and banking, at CME Clearing since 2015.

Sean Tully will continue to lead the company's interest rates business as senior managing director, global head of rates and OTC products. He will also continue to oversee CME Group's cash and OTC businesses.

Tim McCourt has been promoted to the management team as senior managing director, global head of equity and FX products. He has led CME's equity and alternative investment business since joining in 2013.

CFO John Pietrowicz has announced his plans to retire in 2023. Lynne Fitzpatrick has been promoted to the management team as deputy CFO and will succeed Pietrowicz upon his retirement.

Former CFTC chairman joins Digital Asset board of directors

Digital Asset, a software and services provider of products based on distributed ledger technology for financial institutions, has announced that J. Christopher Giancarlo, former chairman of the US Commodity Futures Trading Commission (CFTC), has joined the company's board of directors. Giancarlo will provide counsel to Digital Asset's leadership on strategic matters, namely asset tokenization, distributed ledger technology advancement, and the regulatory and monetary developments impacting this space.

Giancarlo served as the thirteenth chairman of the CFTC from 2014 to 2019 under Presidents Barack Obama and Donald Trump. As chairman of the CFTC, he also served

as a member of the US Financial Stability Oversight Committee, the president's working group on financial markets, and the executive board of the International Organization of Securities Commissions.

Giancarlo currently serves as senior counsel to the international law firm Willkie Farr & Gallagher, and is a member of several boards.

ASX CEO Dominic Stevens plans to retire

The Australian Securities Exchange managing director and chief executive officer Dominic Stevens has announced his plans to retire this year.

Stevens was in his ninth year at ASX and sixth year as CEO, having joined as an independent non-executive director in December 2013 after close to 30 years' experience in financial markets. He was appointed ASX CEO in August 2016.

He will continue to serve as CEO until a successor is appointed.

MarketAxess hires Panchal as CIO, replacing Themelis

MarketAxess, an operator of electronic trading platforms for fixed income securities and a provider of market data and post-trade services for the global fixed income markets, has announced that Nash Panchal will succeed Nick Themelis as chief information officer. MarketAxess previously announced Themelis' retirement from MarketAxess, after 16 years as the company's CIO.

Panchal joins MarketAxess after more than 20 years as a technology leader at Goldman Sachs. Themelis will remain with the company in an advisory capacity through 2022 to ensure a smooth transition.

Panchal was most recently managing director and global co-head of technology in Goldman Sachs' asset management division.

He will be based in New York and report to president and chief operating officer, Chris Concannon.

CAPCO APPOINTS SENIOR EXECUTIVES IN APAC

Edwin Hui

Capco, a global technology and management consultancy, has hired Rezwan Shafique and Edwin Hui in Hong Kong as part of its Asia-Pacific expansion.

Shafique has been named a partner and will focus on wealth management and capital markets. He has 18 years of financial services and consulting experience, including senior roles at Delta Capita, Deloitte, and Credit Suisse.

Hui has been named executive director and APAC data lead. He has more than 20 years' consulting experience. Hui's most recent role involved leading the applied intelligence practice at Accenture. He previously held senior roles at KPMG, IBM, and HSBC.

Nash Panchal

Michelle Shanley

MSCI announces flurry of senior leadership changes

MSCI has announced various senior leadership changes in its solutions and client coverage teams.

Remy Briand, MSCI's current head of ESG and climate, has been appointed chief product officer. In this newly created role, Briand will be responsible for leading and driving MSCI's integrated product suite. He will continue to report to president and chief operating officer Baer Pettit.

Briand will also become head of index. Diana Tidd, current head of index and chief responsibility officer, will become fully dedicated to the latter role. As head of index, Briand will be lead the vision and business strategy for MSCI's index product line.

Tidd was appointed as the firm's first chief responsibility officer in 2018. She will continue to guide ESG policies for the firm and focus on the comprehensive integration of ESG practices across MSCI's strategy process, governance structure, and business operations.

Eric Moen will assume the role of head of ESG and climate. Moen has been with MSCI for more than two decades, and has focused on leading the expansion of client solutions across the company's ESG business. He will oversee the day-to-day operations of the ESG and climate team and drive collaboration and innovation across MSCI's product lines.

Alvise Munari, MSCI's global head of client coverage, will become chief client officer and continue to report to COO Pettit.

Jeremy Baskin, head of Americas client coverage, will take on the new global role of head of buy-side client segments, including asset managers, asset owners, hedge funds, and wealth.

Christine Berg, head of Americas index client coverage, will assume the role of head of Americas client coverage and will oversee MSCI's sales, consulting, and client service teams in the region.

Michelle Shanley, head of strategic Americas account management, will take on the global role of head of strategic and key accounts, focusing on program expansion, C-suite engagement, and governance. wt

Max Bowie

‘Morgan Freeman’ sends a message to fintech pros

There’s evidence that deepfakes are being used to commit fraud in the financial markets. And as scam artists become more tech savvy, Max says financial firms will need to quickly employ new tools to protect their assets.

We all recognize Morgan Freeman. You name it, he’s acted it. His voice has narrated iconic movies, from *The Shawshank Redemption* to *March of the Penguins*. He can earn $10 million per movie, and up to $1 million just for a voice-over on a TV commercial. So, it was surprising to see him in a one-minute monologue video online.

Even more surprising, he began, “I am not Morgan Freeman. And what you see is not real. … What if I were to tell you that I’m not even a human being? Would you believe me?”

The video was created by Dutch filmmaker and deepfake creator Bob de Jong to challenge perceptions of reality in a digital age, where we can create “synthetic” people using AI and digital imagery. First, de Jong recorded himself speaking, then digitally grafted layers over his own face, capturing the actor’s facial features and expressions to a tee. Experts may recognize the video as a fake, but to the uninformed naked eye, it appears real.

And that’s the problem: The Internet of Things has exposed a plethora of network-connected devices as backdoors into a firm’s confidential systems and data, yet the biggest single cyber risk is human. You may not believe everything you read on Facebook, but you trust your senses.

So what if his first words had been “I am Morgan Freeman. And I’m here to promote this crypto token”? Or, what if the face had been your boss on a video call, instructing you to wire a payment for a supposed M&A deal, or to change security settings on an important piece of corporate IT?

Last year, *Risk.net* reported how in 2020 a manager at a UAE bank approved a $35 million money transfer after receiving a phone call from the bank’s CEO—at least, he recognized the voice and believed it was the CEO. In fact, a thief used voice-cloning technology to imitate the CEO and instruct the manager to transfer funds.

There are many AI programs available to fake a voice. Most require you to record your voice for hours or read specific text to generate a convincing imitation. But recordings of a company’s CEO, such as financial results or TV interviews, may be suitable inputs to clone a voice. If your voice is online, treat it with the same caution as other personal information.

This technology may not yet be sufficient to conduct a two-way conversation that would fool a would-be victim, but it can’t be far off. And cyber risk is now the top concern of financial firms, according to a 2021 DTCC survey.

But the scammers face some hurdles: for example, to ensure compliance on video calls while working from home, UK-based Citycom Solutions developed facial recognition technology that maps 78 points on a person’s face, and can confirm an individual’s identity with 99.9% accuracy, combined with voice biometrics and other factors. It can even detect a person’s blood pressure and heart rate, whether they’re lying based on iris size, and whether they’re “live” or “synthetic” based on muscle movements and “natural” reactions, says Citycom founder and CEO Mark Whiteman.

Other fraudsters believe credentials are more effective than a trusted face or voice. Security software vendor WireSecure, which validates messages using a combination of data, device authentication, and physical identity authentication, has spotted cases of “social engineering”—where, instead of a hacking or phishing scam designed to yield a single “heist,” a fraudster targets specific executives, hacks their email accounts, then patiently learns all about them and their business until an opportunity appears.

WireSecure CEO Brian Twibell cites how a venture capital firm raising money for an upcoming deal was contacted by an investor querying its wire transfer instructions. The VC hadn’t yet issued any instructions: a fraudster had infiltrated its email, learned about the deal, then inserted themself into the process at the critical point.

“They know the deal, the dates, the parties, and they can personalize communications using information gleaned from email or LinkedIn.... The fraudsters can make it very authentic and unique,” Twibell says.

Whether it’s “deepvoice,” or “synthetic humans,” or intercepting and diverting legitimate emails, fraudsters are becoming more sophisticated, while IT staff fight an uphill battle that gets steeper every day.

As IT security professionals say, “To win, we have to get it right every day, every time. For the hacker to win, they just have to get it right once.” wt

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