

Why the C-Suite Needs to Care About Data: A Capital Markets Buy-Side Impact Assessment Survey

April 2020

Prepared for:



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EXECUTIVE SUMMARY

Why the C-Suite Needs to Care About Data: A Capital Markets Buy-Side Impact Assessment Survey, commissioned by InterSystems and produced by Aite Group, highlights the impact of poor data support on business processes, including financial, regulatory, and risk management. This white paper is based on conversations with executives with knowledge of their firm's data architecture and data management strategy at 19 global capital markets firms. It examines why firms need to invest in data architecture to improve their competitive and operational capabilities in the era of digital transformation. Key takeaways from the study include:

- Three of the top four data architecture challenges are around integrating, cleansing, normalizing, and transforming data for use by the business. These challenges will only increase as the volume and number of data sources needed increase.
- Many buy-side respondents currently have a problem with operational and technology data silos, but many have plans to tackle silos via technology investments and strategic governance programs. A major challenge for these firms is getting clean data to specific business units from portfolio management to client reporting teams.
- For the buy-side, areas such as trading have put significant demands on data teams and technology, with the growing focus on best execution requirements and accurate regulatory reporting. Nevertheless, for these firms, portfolio management is as it should be, the function that has placed the most pressure on internal data architecture. No matter how well supporting business units perform, delivering on investment returns and attracting assets remain the overarching goals that define success for these firms.
- An effective data management team is focused on demonstrating the “value” in data and emerging business cases—the priority is gaining business buy-in and support across the enterprise for improvement of data architecture and data delivery.
- The majority of buy-side respondents view improved reliability as the most important goal and benefit of data architecture investment. Confidence in data quality and stability of internal data architectures to meet ongoing business demands is vital for firms.
- Half of asset manager respondents are focused on developing an internal API strategy to better connect siloed data sets that often live in best-of-breed applications. The goal of APIs is mainly to support straight-through processing efforts.
- Aite Group estimates that the majority of Tier-1 sell-side and buy-side firms have less than 10% of their total technology stack hosted in a public cloud environment. Multiple asset management firms are considering migrating key applications from on-premises installations to cloud hosted. However, many still have reservations largely due to security and lack internal expertise to provide oversight over cloud outsourcing.
- A sizable portion of buy-side respondents are either actively considering machine learning's (ML) application to deliver insights for the investment process or are already piloting in this area. However, many other institutions have not yet considered how ML can support their businesses.

INTRODUCTION

The capital markets community is under intense client, regulatory, and business pressure to transform the way both buy-side and sell-side firms operate. The regulatory agenda that stemmed from the global financial crisis has fundamentally altered functions such as risk management and compliance, burying many operations teams under a heavy burden of data and processing requirements. At the same time, revenue has declined, and margins have thinned, meaning firms must deal with these requirements with fewer staff resources. They must also develop new services and new insights into opportunities in the markets and with existing and prospective clients.

This white paper highlights the essential role that effective and efficient data management and data support play within buy-side firms. It provides C-suite executives with insights into the business impacts of poor data support and the competitive and operational edge that can be gleaned through investment in data management technology.

METHODOLOGY

This white paper is based on conversations with executives with knowledge of their firm's data architecture and data management strategy at 19 global capital markets firms. It also includes proprietary Aite Group data gathered during research across the capital markets community during 2019 and 2020.

WHY CARE ABOUT DATA ARCHITECTURE?

Capital markets firms face competitive and market pressures to cope with a rising tide of data and an increasing analytic workload across key functions such as trading, risk management, and compliance. Both structured and unstructured data sets are increasing in complexity and variety, and Aite Group expects spending on alternative data sets to continue to grow at approximately a 20% compound annual growth rate, exceeding US\$901 million by 2021. Timeliness of process and scalability are even considerations for middle- and back-office processes due to the continuous global regulatory focus on transparency and systemic risk reduction.

Greater demands for performance, efficiency, and cost savings have also put pressure on all firms to do more with fewer staff resources, and many regulations are also compelling firms to retain and be able to access and interrogate data for longer periods of time. The EU's Markets in Financial Instruments Directive (MiFID) II and General Data Protection Regulation (GDPR) are recent examples of regulations that have spurred data management investment at buy-side institutions. Being able to aggregate data and report on demand is more important than ever before to both regulators and clients.

The rising pressure to store a high volume of data over time also creates a real C-suite executive desire to reduce total cost of ownership (TCO) for storing decades' worth of information. For example, the Global Investment Performance Standards 2020 recommends asset management firms present 10 years of fund performance data in their presentation materials.¹ At the same time, these architectures must scale to meet the analytics requirements inherent in retaining competitive edge in the front office, be that trading, portfolio construction and management, or risk management. The need for a competitive edge is heightened by the severe market downturn and volatility in the first half of 2020.

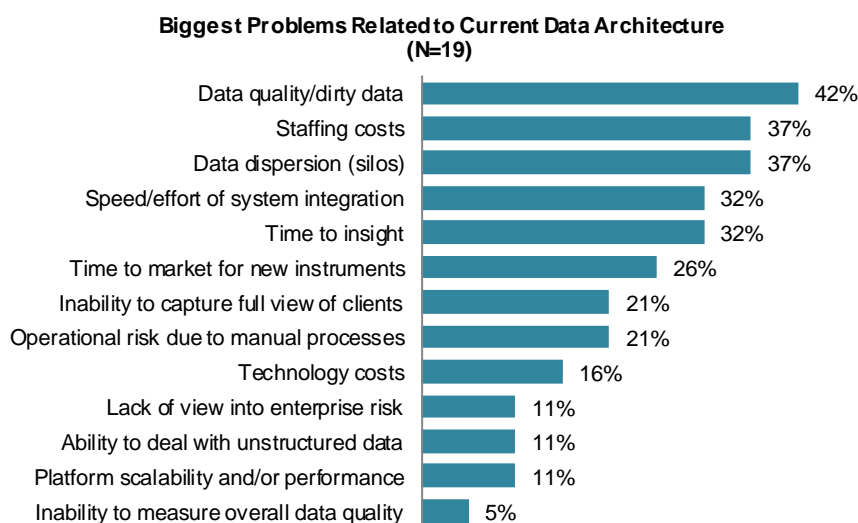
Investment data, which is the lifeblood of buy-side firms, must be suitable for the business' various functional requirements and easily aggregated and manipulated for internal and external usage. Data silos are a common problem across the asset management industry. Some firms have tackled or begun to tackle silos in the world of reference data, but most struggle with the more operationally focused data sets across their businesses. Positions and transactions, performance and analytics, risk, compliance, and other important data sets that are required to support a buy-side firm's crucial business functions all fall under the remit of investment data, and the management structure for this data varies hugely among firms.

Figure 1 shows the problems related to a lack of investment in data architecture cited by respondents, with three of the top four challenges centered around integrating, cleansing, normalizing, and transforming data (respondents were allowed to select multiple answers). These issues will be further amplified by the growing volume and number of data sources used by buy-side firms to support the investment process.

1. "Global Investment Performance Standards (GIPS) For Firms 2020", CFA Institute, accessed March 12, 2020, <https://www.cfainstitute.org/-/media/documents/code/gips/2020-gips-standards-firms.ashx>.

These results show that buy-side respondents are especially challenged by siloed architecture and its resulting impact on data quality and system integration. Data quality measurement can also reflect the firm's overall operational maturity. For example, many buy-side firms assess their individual data sets in a static manner on the basis of cleanliness and data quality rather than on the data's downstream usage and appropriateness. The introduction of a data governance program that doesn't have the necessary feedback loop from the business is doomed to fail, as data is only as good as its fitness for purpose by the various lines of business and functions across a firm.

Figure 1: Challenges Caused by Lack of Investment in Data Architecture



Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

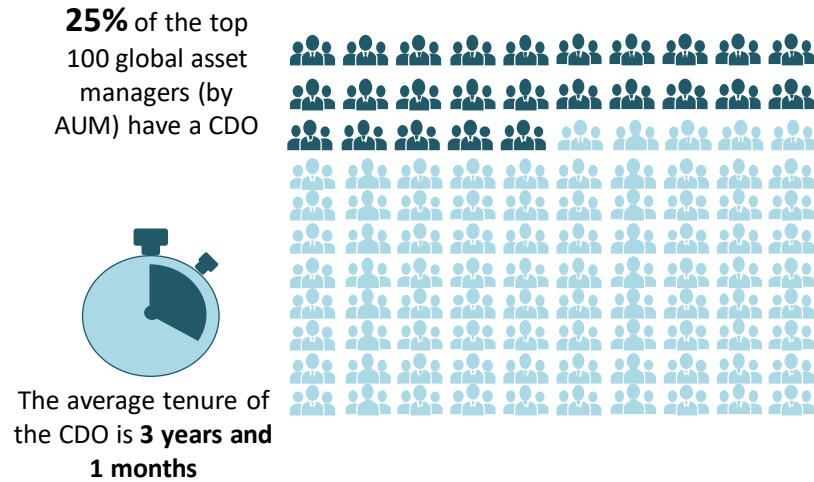
Moreover, manual processes have a limited shelf life, financial technology innovation strategists propound ad nauseam, but they must recognize that any progress in this direction is predicated on data and process standardization. And this standardization must happen within an industry that traditionally thrives on complexity and customization. Bad data is bad news for an industry seeking to introduce digital labor and ML technologies in the near future.

THE BUY-SIDE AGENDA

Asset managers and pension funds are often concerned about the accuracy of front-office decision-making and about the data quality underlying client communications in an era of increased transparency requirements. Though they face many of the same challenges as their sell-side counterparts, fewer asset managers have appointed chief data officers (CDOs) to head up their data strategy (Figure 2). Only a quarter of global asset managers have a CDO in place, but the average tenure of these individuals is slightly longer than for sell-side firms, at three years and one month. This is reflective of the lower level of maturity of the data management function and lower percentage of data governance programs in place at asset managers

compared to banks, but potentially the more realistic approach to data transformation that these firms are taking.

Figure 2: The Presence of CDOs at Global Asset Managers



Source: Aite Group

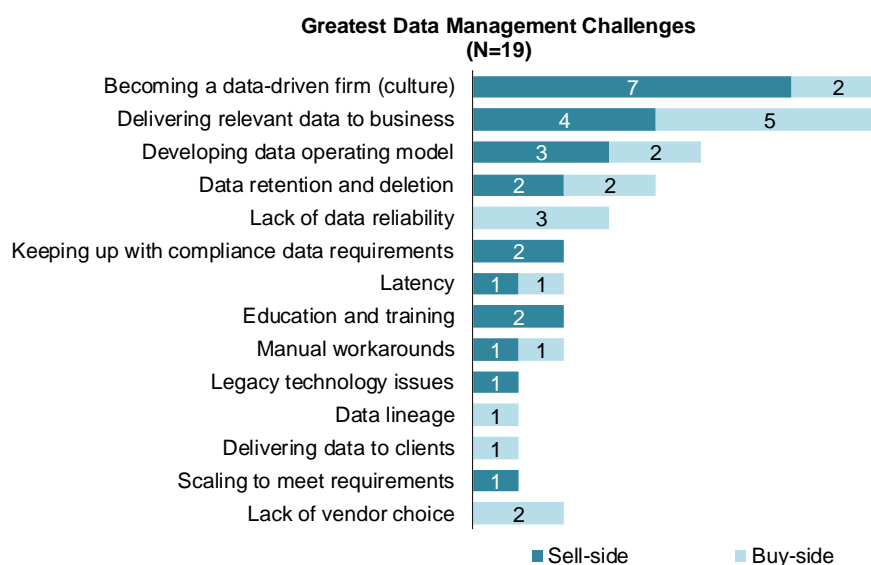
CDOs are tasked with establishing and communicating data governance and data strategy, but the overall success of their efforts is predicated on the cooperation of other functions and lines of business. The development of digital strategies has been slower to impact the asset management community versus their wealth management peers, which means the presence and remit of a CDO within an asset manager may not correlate with a transformation agenda. This can mean that technology investment is harder to glean within these firms with a view to improving overall data architecture.

THE HURDLES TO OVERCOME

The number one priority of data teams at most asset management firms is on delivering relevant information to the business as and when it is requested. This tends to mean that firms have been relatively reactive rather than proactive in addressing data architecture problems—focusing on day-to-day priorities rather than crafting an overall strategy that is forward-looking. The fact that becoming a data-driven firm isn't the top concern of asset managers (Figure 3), though it is for sell-side firms, reflects this lack of operational planning. Instead, many buy-side institutions tend to be one step behind—still focused on how best to service various business functions, especially trading, performance, risk, and client reporting.

One asset manager respondent made it clear that for the firm, multiple sources of truth or golden copies exist for portfolio data, dependent on the end user, highlighting some of the complexities for buy-side firms. Each business division has its own datamart that is fed by a centralized data warehouse. A common example of this setup is for client reporting and ensuring data is client ready, which means it can contrast to an in-house view. This can complicate client communications if the portfolio manager views its portfolio from a different perspective when compared to how data is presented to a client.

Figure 3: Greatest Hurdles to Overcome to Address Data Architecture Problems



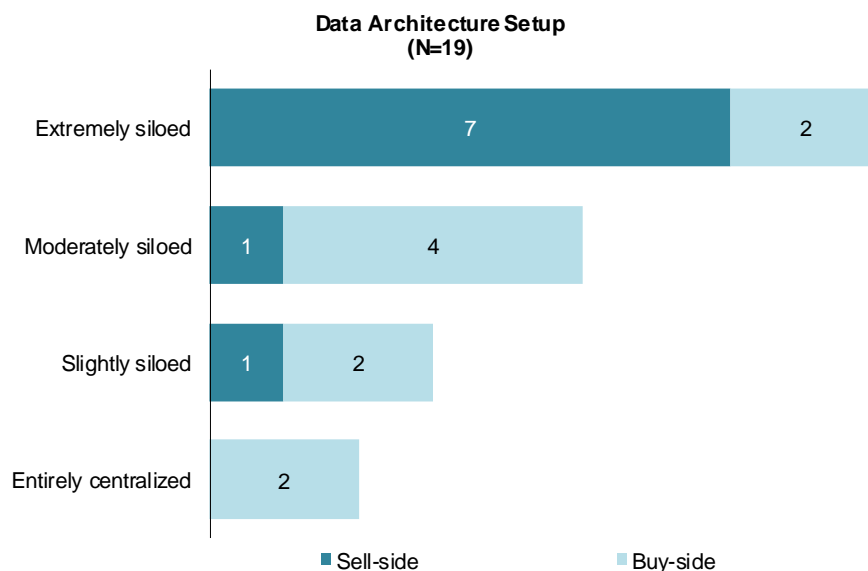
Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

PHYSICAL AND CULTURAL SILOS

Although a few asset managers have centralized their data operations, the majority are still faced with technology and operational silos (Figure 4). Due to the disparate nature of most firms' system architecture, the data management team must manually extract much of the data required for internal and external reporting purposes from end-user systems and then cleanse, aggregate and harmonize it. This is a manually intensive, slow process that is not aided by

inconsistencies between systems and end-user functional requirements—they lack a common integration layer or shared data taxonomy across functions.

Figure 4: The Silo Problem Within Top-Tier Firms



Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

Sometimes these silos are practical in nature, however. Where firms have established regional rather than global hubs, it has often been with a view to support different data requirements from each region and establish follow-the-sun support for institutional clients active across markets. Those that have adopted this model intend to pass the investment book of record between the hubs in order to cope with global data flows. This is a practicality that may be hard to overcome from a time zone perspective; hence, global centralization of teams or technologies is unlikely.

Asset managers active in multiple regions must therefore cope with operational latency issues caused by time zone differences and country-level regulations that restrict how data can be stored outside domestic borders. Global firms are forced to look at how well they support cross-border investment while simultaneously meeting local regulatory requirements—a feat that requires a delicate balancing act. The business priorities that data architecture teams must take into account on an ongoing basis include the following:

- Supporting the addition of new asset classes and new processes related to those asset classes (central clearing for derivatives, for example)
- Supporting expansion overseas to other markets and regions and scaling the operations to cope with a higher volume of data and complexity
- Using a data warehouse or data hub to act as an insulation layer between asset managers and their third-party outsource providers to enable links with multiple outsourced providers

- Meeting data aggregation requirements for client reporting and for internal business users focused on improving analytics and risk management
- Lowering operational risk across the business overall
- Keeping the total cost of ownership down

When it comes to cultural hurdles, respondents indicate that inorganic growth strategies and the rampant merger and acquisition activities within the asset management industry over recent years have exacerbated the problems. Each newly acquired business tends to have its own operational structure and technology preferences that must be assessed and then integrated. The more acquisitive the firm, the more systems and data architectures accumulate. A Tier-1 global asset manager respondent indicates that the firm doesn't have a collaborative data culture and it also lacks alignment of goals across the various investment teams, which makes operational alignment very difficult.

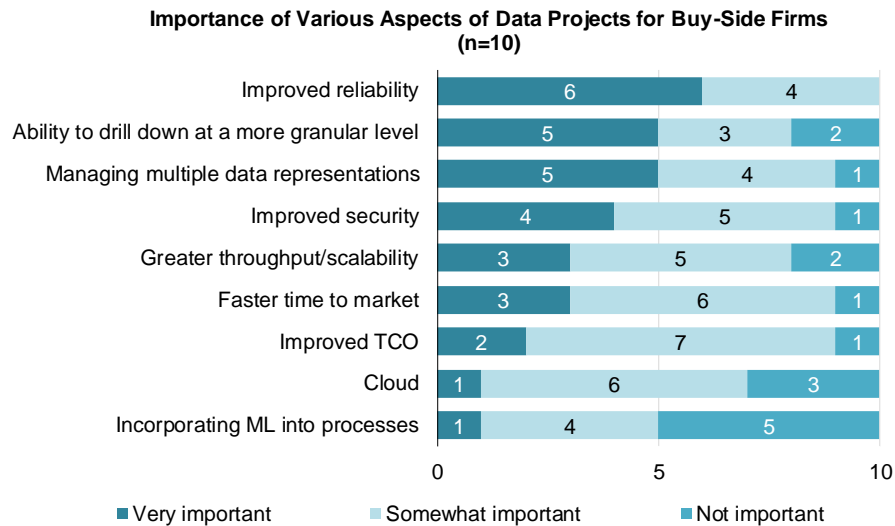
HOLDING SERVICE PROVIDERS ACCOUNTABLE

One of the key challenges for asset managers that have outsourced their middle or back offices is the behind-the-scenes replication work that allows buy-side firms to monitor whether these outsourcers are meeting their internal data requirements. Many firms feel tightly bound to their outsourcers because of the need to develop bespoke connections to these third-party outsourcers and normalize and standardize the data they receive from them; hence, an insulation layer between outsourcer and buy-side firm is desirable.

IMPROVING CONFIDENCE IN DATA

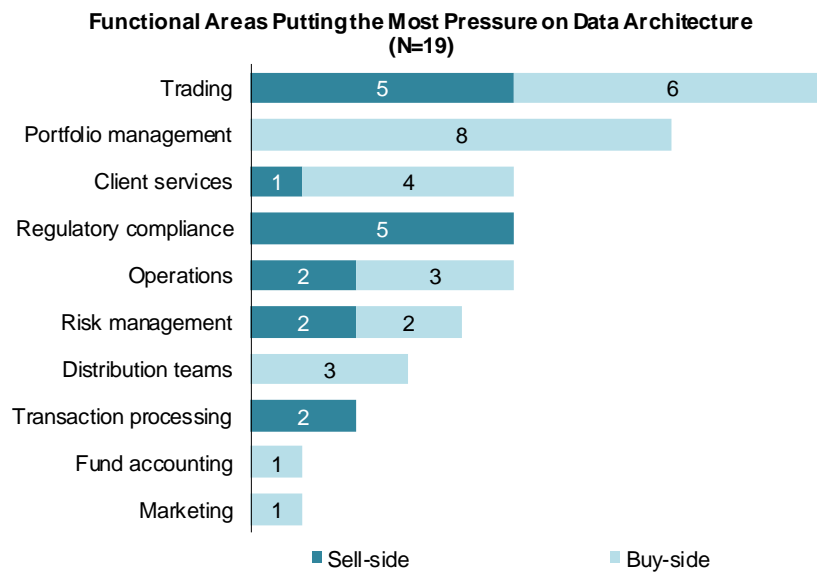
Reliability of data is the highest cited benefit of data architecture improvements for buy-side respondents (Figure 5). Without reliable data, these firms are unable to accurately calculate risk, make investment decisions, report information to their clients or regulators, and conduct business as usual. As noted by one respondent, the goal of a data strategy is to deliver data that is ready to use when needed, which requires the data to be accurate, timely, and standardized, as well as provided on a self-service basis. The ability to drill down into data to view opportunities and insights that competitors may miss is also essential to half of buy-side respondents, which reflects the pressure these firms are coming under to deliver active management performance.

Figure 5: Buy-Side Respondents’ Views on Benefits of Data Architecture Improvements



Source: Aite Group’s interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

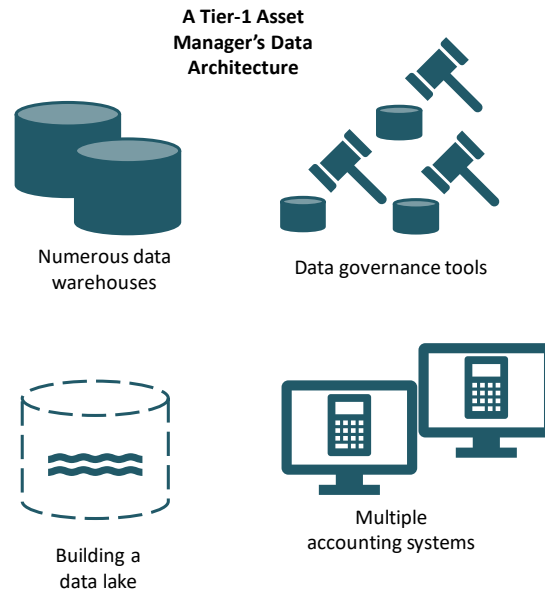
Much like their sell-side counterparts, the data management teams within buy-side firms tend to receive the most demand for data support from their front-office teams in trading and portfolio management functions (Figure 6). As noted by a respondent from a large global asset manager, the firm’s investment teams and client servicing teams are currently most demanding, but the data team expects more demand from compliance and regulatory teams in future. There is also some demand within the front office for more real-time or intraday data support, but these firms face less pressure on this front than their sell-side counterparts. A respondent notes that there is demand within the firm for analytics on positions intraday outside of the portfolio management system.

Figure 6: The Business Areas Most Impacted by Data Architecture

Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

REDUCING COST AND COMPLEXITY

A Tier-1 asset manager respondent notes that there is pressure to improve data architecture coming from the firm's investments and distribution arms. These teams have been vocal about the firm's data platform shortcomings, indicating that they are too complex and the reliability of data is low. The firm is investing in its architecture to address these issues and to grow its capacity to further expand globally. Figure 7 shows the current data architecture setup within the asset management firm, where data is stored in numerous warehouses and end systems, such as its multiple accounting platforms. The firm is building a data lake and has rolled out several data governance tools to build out a global data validation process. The data team is trying to understand the different data-related processes across the firm to ensure consistency and to be able to gather metrics and arm data stewards with these metrics.

Figure 7: A Tier-1 Asset Manager's Data Architecture Setup

Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

Many data executives have a vision of the target operating model in which data is truly an asset to the organization, but the steps required to get there may not be clear. It is almost like being able to view the final move in chess to checkmate the king but being unable to visualize all of the pieces that need to move before that can happen. The key to developing this model is engaging the business and focusing on goals such as the following:

- Better aggregating data for regulatory, business, and client reporting purposes
- Trying to reduce latency in the provision of data to downstream systems and users
- Keeping costs down at a time when the business is in cost-rationalization mode
- Extracting and harmonizing data from end-user environments and systems
- Being able to prioritize the long list of end-user requirements that the data management team faces

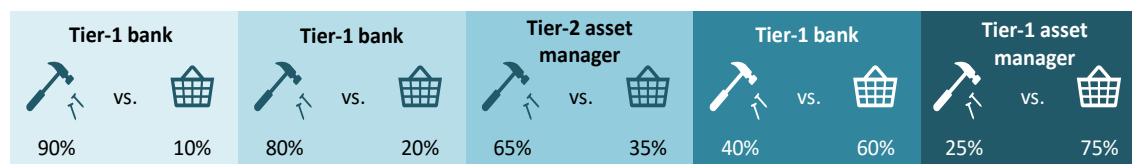
ARMING YOUR FIRM FOR THE FUTURE

Of course, existing competitive dynamics are only one aspect that C-suite executives must bear in mind when assessing data architecture. They must also take into consideration future client and market requirements, as well as enabling their firms to cope with the rapid evolution of technology.

BUILD VERSUS BUY

Figure 8 shows the range of approaches to build versus buy that different types of firms have adopted. Buy-side firms have long relied on vendor solutions in nondifferentiating areas and core infrastructure areas, such as portfolio accounting or reconciliation, and will tend only to build in areas the C-suite feels will add a competitive edge to the business. The custom work for many asset managers tends to be to support integration efforts and middleware, or part of the vital processes of portfolio construction. Some asset managers are more prone to building solutions, such as the asset manager having 65% of its stack custom built because the lack of viable off-the-shelf solutions on the market to meet its bespoke requirements in certain areas of the business.

Figure 8: The Range of Approaches to Build Versus Buy



Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

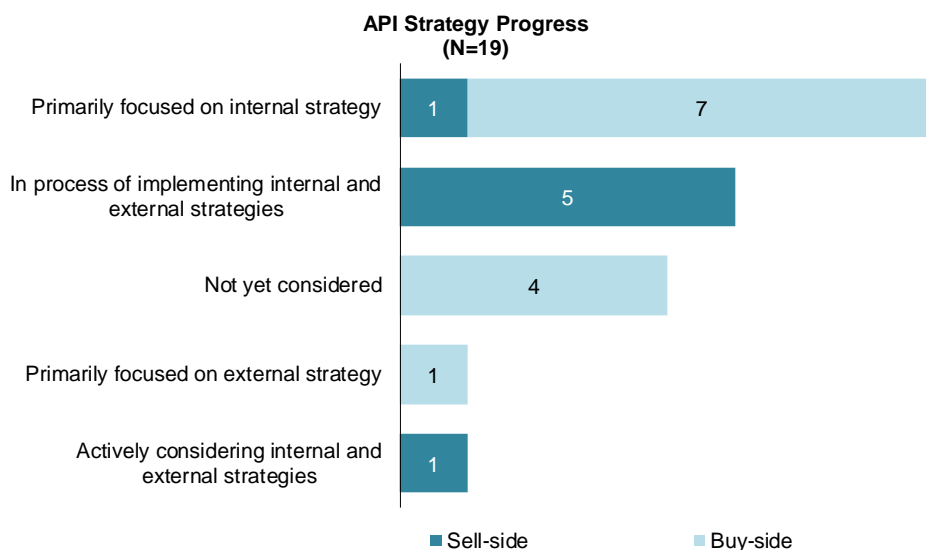
API STRATEGIES

APIs have been around for decades, but until recently, the concept of an API strategy or the API economy (to take it a step further) wasn't in the industry lexicon. As a potential spillover from what's happening with open banking within the realm of retail and commercial banking, APIs have suddenly become front and center for those operating in the capital markets. APIs essentially allow clients or internal teams to connect one application to another or allow a client or applications to access services or requested data sets. They come in a variety of flavors, but the industry is focused on open APIs—also known as public APIs—because they allow access to the public and select external parties, along with web services APIs such as representational state transfer (REST) APIs. Usage of APIs can be restricted by user keys, and they can also be throttled as desired by supplying firms.

Figure 9 shows that over half of asset manager respondents are focusing on developing an internal API strategy to better connect siloed data sets. A bank-owned asset manager respondent explains that the firm consumes and develops APIs internally as well as for some integration with some partners. The firm would like to use more APIs with external parties, but

the respondent feels that it is the vendors that are the laggards. A large global asset manager respondent indicates that the firm is quickly coming up the curve on API strategies, and it has made some investment in APIs to simplify its internal environment.

Figure 9: Progress Toward Implementing an API Strategy



Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

THE MOVE TO CLOUD

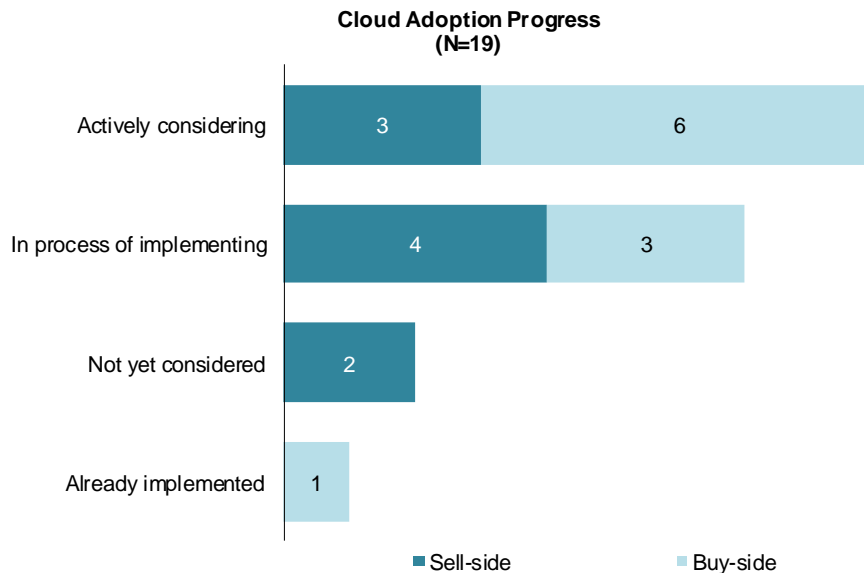
Aite Group estimates that the majority of Tier-1 sell-side and global buy-side firms have less than 10% of their total technology stack hosted in a public cloud environment. The financial services industry as a whole has been slower than many other industries to adopt cloud technology, and large capital markets firms lag behind those from other sectors. Cybersecurity and data security risk have been on the radar of all market participants over recent years due to high-profile data breaches and denial of service attacks, which has made some C-suites wary of moving mission-critical systems to a public cloud environment. There are also a host of cultural and operational hurdles to overcome before a firm can adopt a cloud-first approach to technology.

Enterprise-level innovation within capital markets firms is always much slower than functional-specific innovation within revenue-generating areas, such as the front office. Given that moving to the cloud has often been viewed by financial institutions as a strategic enterprise decision, it is unsurprising that the size or existing technology footprint of the firm has a significant impact on how quickly the firm pulls the trigger on the rollout of a cloud strategy across its divisions. To this end, asset managers tend to be a little further ahead in terms of cloud implementation than their bank counterparts.

Figure 10 indicates that the majority of asset managers are either considering a move to public cloud or are in the process of implementing the move, with one having already implemented cloud for its mission-critical functions. A bank-owned asset manager respondent notes that the firm has had a cloud-first approach for the last few years. The firm has actively been

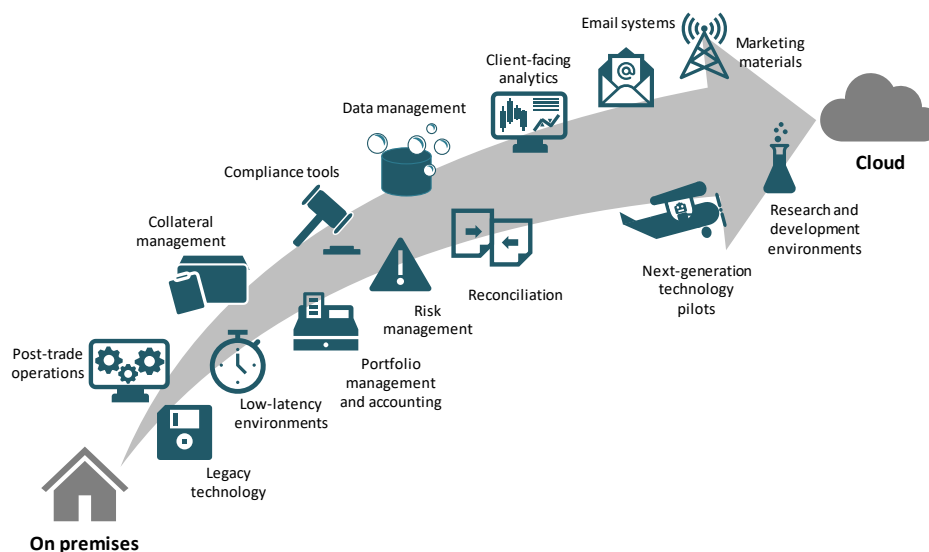
implementing Software-as-a-Service (SaaS), but its systems of record databases remain on premises or in private cloud environments. Another large asset manager has less than 50% of its technology stack in the cloud at the moment, but the firm wants it to have 90% in the next two years.

Figure 10: Adoption of Public Cloud by Respondent Firms



Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

Figure 11 shows a high-level snapshot of where the industry is in terms of moving on-premises functions to a public or private cloud environment. Legacy technology and nonclient-facing post-trade operational functions still tend to be hosted on premises, because they are perceived as being harder to move to a cloud environment and because C-suites view them as cost centers and lower-priority functions. At the opposite end of the spectrum are research and development environments and marketing and email systems, which are more client facing and less sensitive in terms of data privacy in the case of marketing information. The more industrialized and standardized processes, such as reconciliation, are also perceived as easier to move to a cloud-hosted environment because of the IT team's greater understanding of data flows and processes.

Figure 11: The Functional View of Cloud Adoption

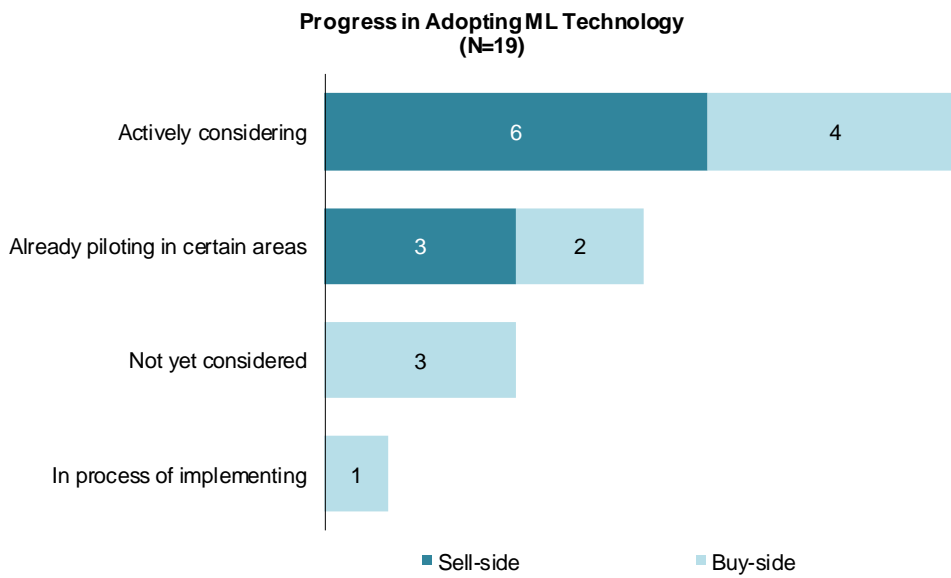
Source: Aite Group

As with any enterprisewide technology choice, the strategic decision to move into a cloud environment involves a lot of functional players from across the firm. Many firms still rely on IT to pull the trigger on investment in a cloud, but as the volume of data balloons, determining long-term hardware requirements without creating redundancy issues is a tough challenge to face. Mid- and low-tier firms may also be driven to adopt cloud technology, because they do not have the security specialists on staff to meet increasing cybersecurity requirements.

MACHINE LEARNING AND AI

ML and AI technologies are not yet as widely adopted on the buy-side as the sell-side, but the majority of respondents are either considering their application or piloting the technology in certain areas (Figure 12). A bank-owned asset manager respondent indicates the firm is looking at its application in the client data space and in quantitative data support, but the work has been limited thus far. A large global asset manager respondent expects that use of AI will replace some of the firm's higher-end functions because of the technology's ability to take business logic and rules and create them programmatically and apply them to data sets on the investment side.

Figure 12: Progress Toward Adopting ML Technology



Source: Aite Group’s interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

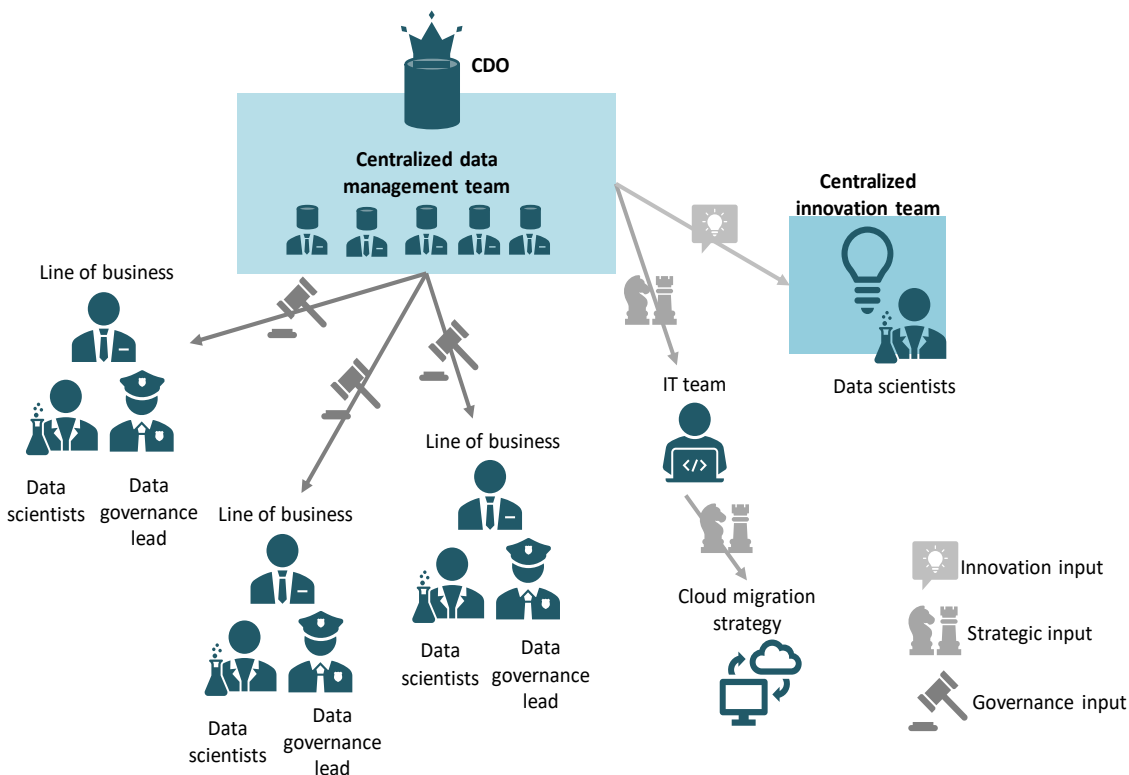
The true value of AI or ML technology for the investment team or in generating client insights can only be realized if the underlying data that is fed into these systems is of sufficient quality and consistency. Data architecture and support are therefore crucial to the successful adoption of these technologies.

FOLLOW THE LEADER

No one firm has addressed all its data architecture challenges—even the most sophisticated banks and brokers have some way to go before they have solved the majority of their issues. It can be helpful for firms, however, to examine how a market leader in data transformation has gone about tackling these challenges. Figure 13 shows how one such firm has tackled establishing a data governance framework and connected its line of business leaders with the CDO and data management team. The CDO’s office sits at the top of the structure with a centralized data management team across all lines of business that coordinates IT strategy, including cloud migration, with the CTO’s team.

The CDO’s most immediate focus after appointment was developing a model for cataloging and managing data for each division, so that each data set could be held to a baseline standard per function. The CDO’s team set up a stewardship program within each line of business and appointed individuals to enforce data governance and feedback into the centralized team. The data scientists within each line of business are also connected into the centralized function and provide a feedback loop in terms of data architecture challenges and requirements related to engineering and quantitative analysis functions. The team also works with a centralized innovation unit on projects related to business goals of creating differentiated insights for clients and lines of business.

Figure 13: A Market-Leader’s Data Governance Framework

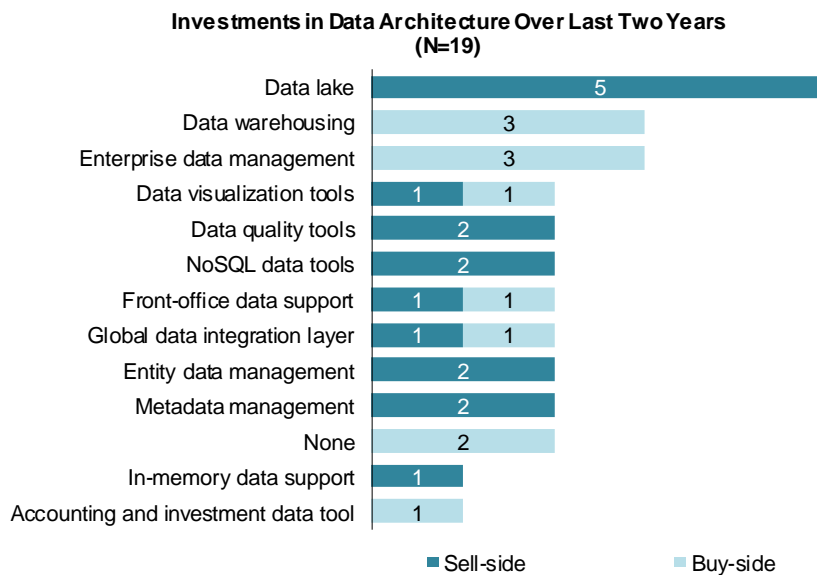


Source: Aite Group

RECENT AND FUTURE INVESTMENTS

Asset managers' recent data architecture investments tend to have been on the more industrial and operational side of the spectrum, with respondent firms investing in data warehousing and enterprise data management solutions (Figure 14). A large global asset manager respondent indicates that the focus of much of its investment has been on operational risk reduction, and the result of the investment has also been that the speed at which it can access data has improved.

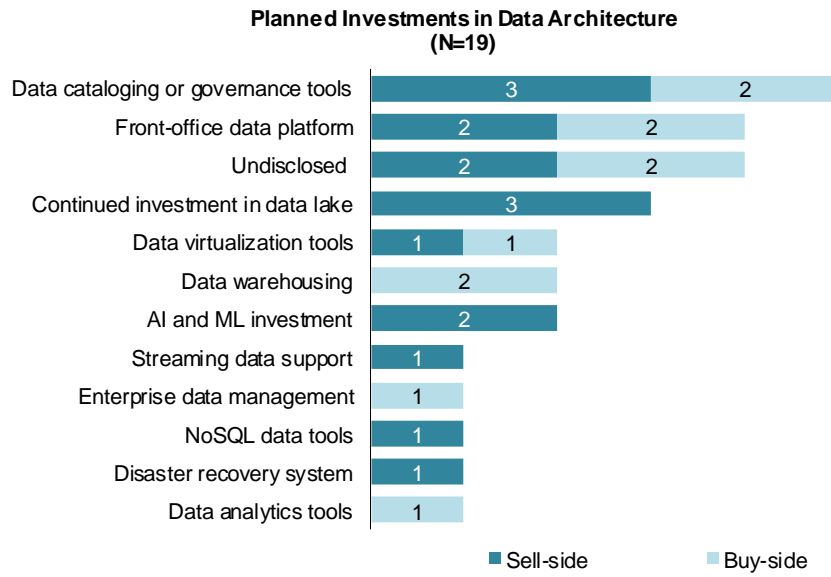
Figure 14: Recent Data Architecture Investments



Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

Future investments in data architecture by respondents (Figure 15) range from data cataloging to front-office data platforms and highlight the different priorities and approaches that buy-side firms are adopting toward data architecture improvement. Not all firms have a defined plan for investment at the moment and are instead reviewing their requirements and business plans before putting together a business case for investment in specific technology. Some firms are still relatively immature and are investing in more of the basics, while others are focusing on functional support areas.

Figure 15: Planned Investments in Data Architecture Over the Next 12 Months



Source: Aite Group's interviews with 19 data management executives at capital markets firms, between Q3 2019 and Q1 2020

CONCLUSION

A coordinated enterprise data management strategy is one which can only start from the top. C-suite executives should focus on the following major findings when considering or prioritizing data management investments, especially in the context of digital transformation:

- **Buy-side firms need to be proactive and forward-looking when developing an enterprisewide data strategy:** Instead of focusing on how to satisfy immediate specific functional needs, these institutions should focus on implementing an overall firm strategy to help deal with data silos, instead of being reactionary which will likely mean falling behind on the growing data demands placed on them.
- **Communication and consistency are the bedrocks of successful data governance strategies:** Communication of realized goals and strategic progress across the affected business units and also across the wider enterprise is important, but unless each unit is educated about the benefits at a local level, barriers and cultural resistance can increase. The introduction of governance frameworks and the appointment of data stewards are key components of these programs at the grassroots level, and a steering committee is a key component at the top level.
- **Data transformation is a marathon not a sprint:** Newer technology implementations should be deployed alongside existing architecture and done so in manageable sizes to ensure operational gains can be delivered more quickly, rather than trying to deliver change through a big-bang approach that will likely lead to delays and loss of internal project support over time.
- **Next generation technology and cloud adoption require data investment:** The true value of AI or ML technology for the front office or in generating client insights can only be realized if the underlying data that is fed into these systems is of sufficient quality and consistency. API strategies also often go hand-in-hand with cloud adoption programs and cloud to legacy interoperability is much easier to achieve with an API-first adoption approach.
- **Regulatory compliance agendas can be better supported by modern data architecture:** If the data underlying regulatory reports are not normalized and the systems from which these data sets must be pulled do not communicate in a timely manner, it can be impossible to fulfill the rule requirements. Lack of compliance, in turn, can result in financial penalties, which impact a firm's reputation and competitive edge. Firms with robust data architectures and strong governance programs therefore tend to be better able than their peers to deal with the ongoing barrage of regulatory changes.
- **Significant costs and risks can be avoided if data architecture is adequately supported:** A consistent metadata layer and data model across silos enable the integration and support of multiple data sources; hence, the lack of such a framework results in increased reconciliation and data cleansing activity. The higher the number of manual processes and bespoke technology workarounds used by a data management team, the higher the operational and key-person risk.

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