



Data management trends in capital markets: turning tides

KPMG International

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Table of contents

Executive summary	01
Introduction	02
Methodology	02
Data takes center stage	03
Challenges and opportunities	05
A changing role	07
The role of big data and the cloud	08
KPMG point of view	11
Industry pain points	11
Data solutions	11
Case study: Data governance at State Street	12
Case study: A new CDO for National Australia Bank	14
About Aite Group	16
Contact	16
About KPMG	17
Contact	17
List of figures	
Figure 1: A selection of regulatory and market infrastructure changes	03
Figure 2: The scale of the data problem in capital markets?	04
Figure 3: Data management technology environments	05
Figure 4: Most commonly cited data management pain points	06
Figure 5: Data management roles and responsibilities	07
Figure 6: Level of big data adoption	08
Figure 7: Level of cloud adoption	09
Figure 8: Cloud benefits for data managers	10

Executive summary

Data Management Trends in Capital Markets: Turning Tides, authored by KPMG member firms and Aite Group, examines the capital markets' changing attitudes toward data management as a function and the adoption of new technologies and models around cloud and big data.

Key takeaways from the study include the following:

- Data managers active within the capital markets community are faced with the prospect of coping with a rising tide of data that is flowing from post-2008 regulatory and client transparency requirements.
- The capital markets are faced with a hectic regulatory outlook over the next three years and many of these regulations have direct implications for the way data is stored, managed, and communicated.
- Regulators are keen to see an audit trail for data underlying many financial institutions' operational decisions such as risk analytics or regulatory reporting, which means that data must be tagged with metadata to prove lineage and provenance of individual items.
- Many firms are actively evaluating their internal data management strategies and there is a relatively high degree of awareness in the market about shortcomings and pain points in this area.
- Rather than residing purely under the auspices of IT, data management now has more of a business focus and a wider range of stakeholders within a capital markets firm that have input into the function overall.
- A handful of top-tier banks and hedge funds have been the frontrunners in implementing big data strategies and technologies. These strategies are being applied to a whole range of functions, everything from front-office trading to back-office reference data management.
- There are benefits of using cloud technology to host a data integration layer in order to access and normalize data from multiple sources and put in place a means of controlling enterprise-wide data consumption.



Introduction

Data managers active within the capital markets community are faced with the prospect of coping with a rising tide of data that is flowing from post-2008 regulatory and client transparency requirements. Given that there is little appetite within most firms to throw more bodies at processes for data cleanup, the active management of key data sets has become a focus for many capital markets firms. Getting data correct at source is vital and this is reliant on establishing a governance and stewardship structure. Effective data aggregation, on the other hand, requires a consistent manner of storing and managing data over time, which has been very difficult for some organizations to manage across business lines.

This white paper identifies challenges and opportunities faced by the data management function within capital markets firms against the background of regulatory and market structure change. It includes the potential benefits of moving to a cloud-based

environment and of adopting a big-data-strategy.

Methodology

This study is based on the views of KPMG member firm partners and Aite Group, as well as interviews with KPMG member firm clients. It also includes data from two Aite Group studies conducted in 2014 one on cloud technology and another on big data trends. A total of 21 firms participated in the cloud technology interviews, with a significant majority (85 percent) of respondents coming from the broker-dealer community and the rest hailing from the exchange and asset management communities. The big data online survey involved the participation of 22 firms, representing an even split between buy-side and sell-side participants. Given the size and structure of the research sample, the data provide a directional indication of conditions in the market.

Data takes center stage

The post-crisis era of increased transparency has resulted in many firms stepping in to assess the quality and the management of the core reference data sets on which they are basing their trading, risk management, and operational decisions. Reporting requirements to regulators and clients have also escalated in this environment which, in turn, has increased firms' internal data aggregation, storage, and management requirements. This has given rise to the establishment of more data governance programs within firms across the industry and the creation of c-level executive positions dedicated to championing data management and data governance at the enterprise level. Whether they are called chief data officers or any other variant, these individuals face a tough task ahead – how do you effectively manage data across operational and geographic silos and introduce a culture of

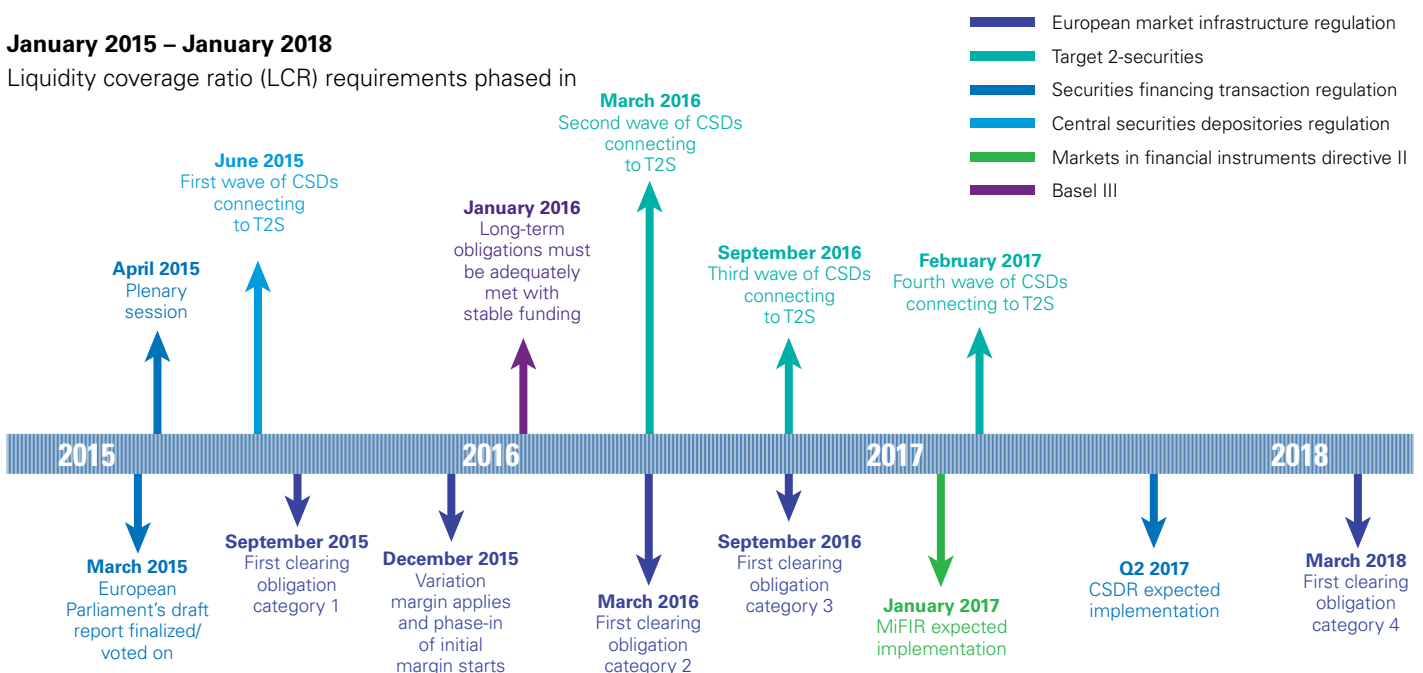
data responsibility within the business, while meeting ongoing tactical and strategic targets and cost-saving goals?

The capital markets are faced with a hectic regulatory outlook over the next three years and many of these regulations have direct implications for the way data is stored, managed, and communicated (Figure 1). The Markets in Financial Instruments Regulation (MiFIR), due to be implemented in January 2017 in Europe, for example, extends the number of fields for transaction reports to 81, up from 24 under its predecessor, increases the scope of reporting from equities to nearly all other instruments, and sets minimum data storage requirements for this information of five years. Global over-the-counter (OTC) derivatives regulations have also introduced new reporting requirements and related market infrastructures in the form of trade repositories.

Figure 1: A selection of regulatory and market infrastructure changes

January 2015 – January 2018

Liquidity coverage ratio (LCR) requirements phased in



Source: Aite Group, Securities and Exchange Commission

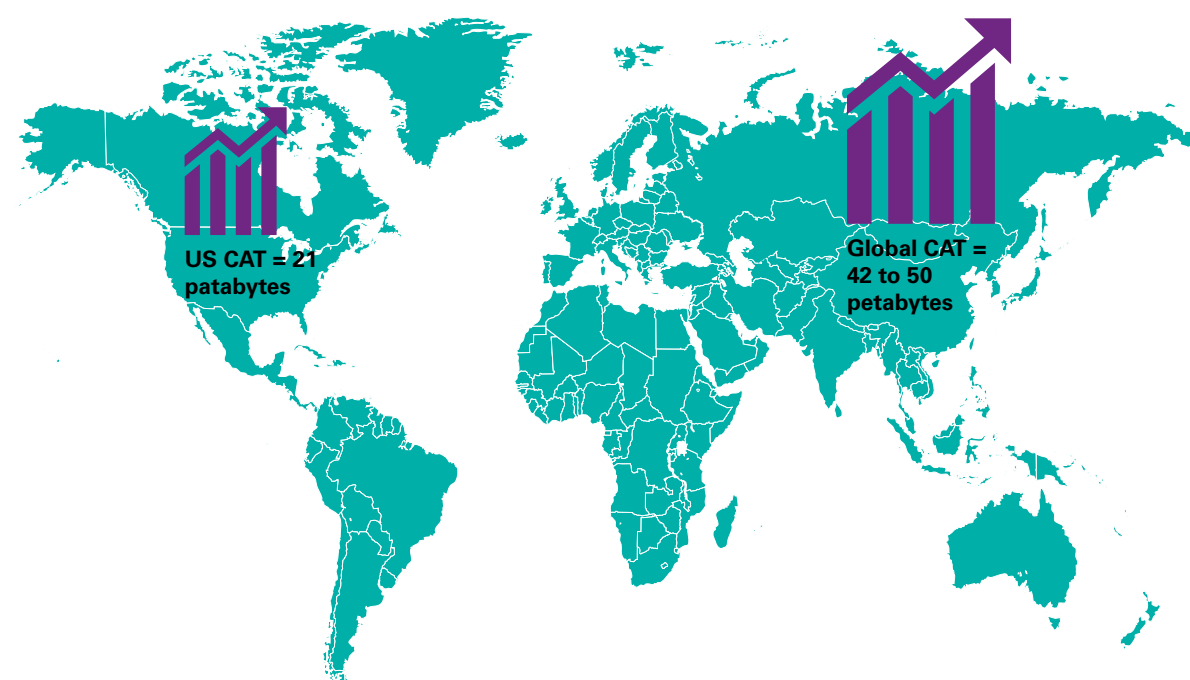
Not only do these regulations increase the volume of reported data, they also directly scrutinize the quality of the data and require firms to adopt new standards and classifications, and provide a data audit trail. To this end, the Basel Committee on Banking Supervision (BCBS) 239 compels banks to adopt new data management principles focused on supporting risk management reporting and governance. Tier-1 banks must adopt the data aggregation principles by January 2016, which will necessarily involve a focus on improving data ownership by the business and the introduction of consistent data quality frameworks across geographies and the enterprise.

Regulators are keen to see an audit trail for data underlying many financial institutions' operational decisions such as risk analytics or regulatory reporting, which means that data must be tagged with metadata to prove lineage and provenance of individual items. Some firms are working on centralization programs in order to store and scrutinize this data in a comprehensive manner as well as to bring down data costs in the long term. Given

that many incoming regulations require the storage of this data for a minimum period of five years, the scale of the data problem is becoming much greater than before.

A useful industry-wide proxy to use for scale is the US equity and options markets' consolidated audit trail (CAT) initiative and the projected data capacity requirements of the new system after a five-year implementation period. The CAT proposal estimates that five years' worth of US equity and options quote, order, and execution data will total around 21 petabytes of data, which is equivalent to the amount of data Google was processing per day in 2008. If the US market represents around half of the global equities and options market, then a global CAT could potentially require anywhere between 42 and 50 petabytes of data in the same time period (Figure 2). While this is a significant or potentially "big" data challenge in terms of volume, it must be noted that this is structured data that is provided by market infrastructures and vendors; hence complexity and variety of data is less of a problem than for unstructured data formats.

Figure 2: The scale of the data problem in capital markets



Source: Aite Group, Securities and Exchange Commission

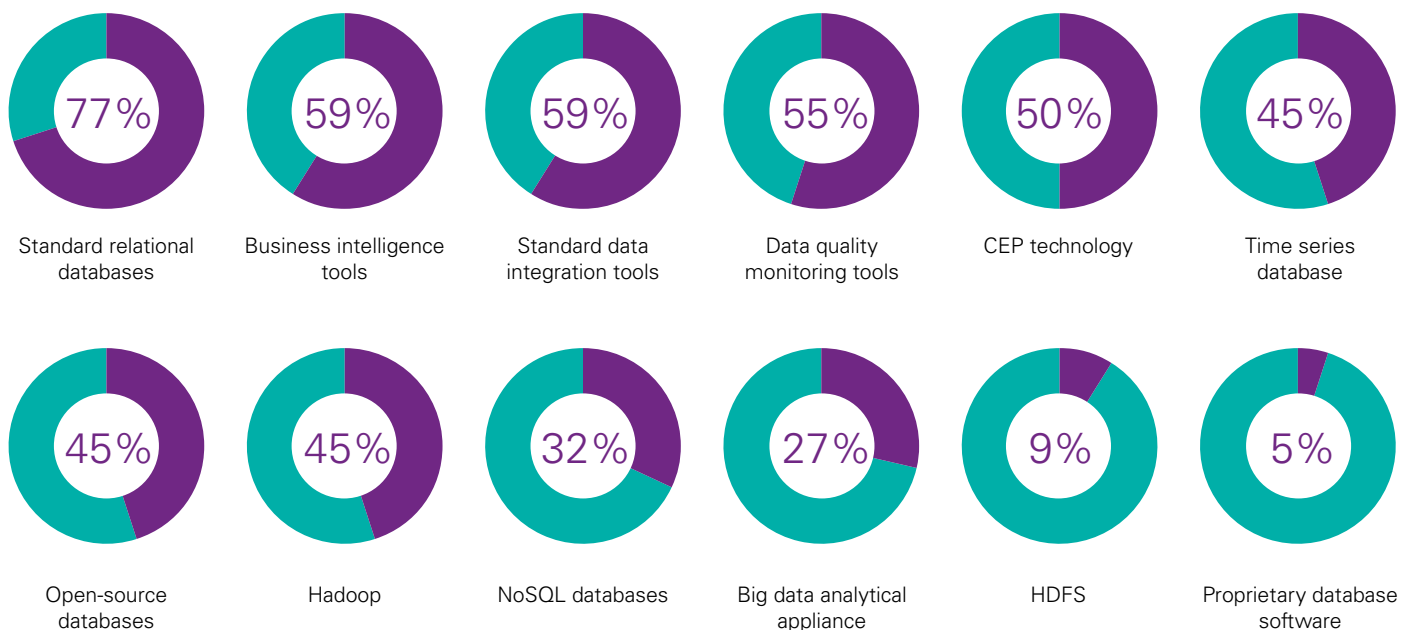
Challenges and opportunities

The technology environments that data management teams are currently dealing with are dominated by standard relational databases, though there is a fairly high level of data-related tooling, including those focused on integration, business intelligence, and data quality (Figure 3). Some respondents are using big data technologies, with 45 percent using Hadoop, 32 percent using NoSQL, and 27 percent using other big data analytical tools and complex event processing (CEP) technology.

Historically, in-house teams have built data management technology because of a desire to craft a platform

that meets the bespoke needs of the business, or so the theory goes. The reality of such projects is that they are often subject to scope creep and delays due to reliance on internal IT staff members who must split their time over multiple projects. A common complaint by business heads is that the support of new asset classes takes too long because the data management team must understand and model the required data components and the IT department has to build the required functionality. Firms that have a rigid, canonical data model underlying their internal data architecture must gather end-user requirements into a definition document on which the new asset class schema design must be based.

Figure 3: Data management technology environments



Source: Aite Group's survey of 22 capital markets firms, 2014

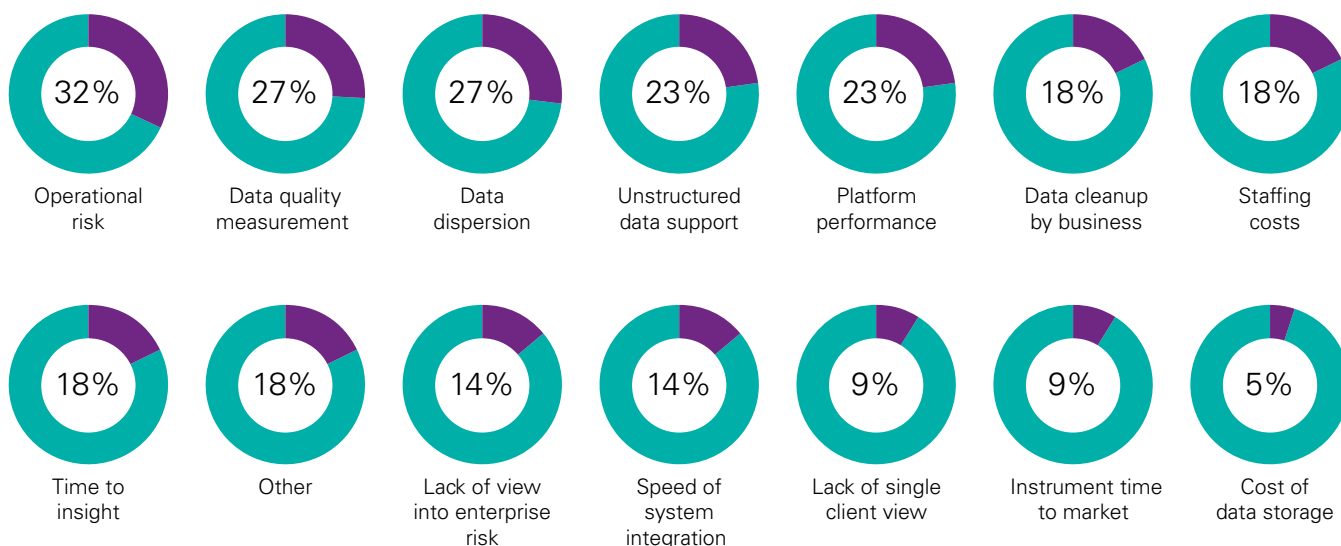
Though the primary focus of the data management function is on dealing with structured data residing in relational databases or warehouses, there has been an uptick in requirements to managed unstructured data items such as source documentation stored in PDF formats, especially in the realm of legal entity data and know your client (KYC) contexts. The adoption of electronic trading has spread across different regions and asset classes, which has meant the diversity of data sources and sheer volume of data have also increased substantially over the last decade.

Given that many firms are actively evaluating their internal data management strategies, there is a relatively high degree of awareness

in the market about shortcomings and pain points in this area. Figure 4 shows the top three pain points cited by respondents, indicating that operational risk is the biggest concern for just under a third of firms due to the high level of manual effort and the resulting lack of reliability of data. This is compounded by the second and third pain points, an inability to properly measure the quality of data assets and the dispersed nature of the storage of these assets across the business. Without a consolidated view and an understanding of the data's shortcomings, data managers are hampered in their ability to support the business.

Figure 4: Most commonly cited data management pain points

Respondents' top three data management pain points (N=22)



Source: Aite Group's survey of 22 capital markets firms, 2014

A changing role

Rather than residing purely under the auspices of IT, data management now has more of a business focus and a wider range of stakeholders within a capital markets firm that have input into the function overall. Communication skills and the ability to coordinate multiple teams is therefore a much more important skill set for those engaged in data management, regardless of whether it is related to big data or small data. To this end, the chief data officer role is currently in a state of early evolution, and the intent is for these individuals to focus on developing firms' overall data strategies rather than purely focusing on technical challenges. This necessarily involves looking at data from a business value perspective rather than purely as a control function.

Most firms are dealing with a fragmented technology environment, and this means that data management teams face a significant challenge to aggregate internal data and respond to internal business, client, and regulatory demands. As part of an industry-wide push to reduce operational risk, these firms are also attempting to improve the manner in which they measure the maturity of their key internal data sets. These assessments include a focus on areas including the following:

- data-quality metrics such as accuracy, completeness, timeliness, integrity, consistency, and appropriateness of individual data items
- how satisfied the business end users and clients are with regard to data transparency and availability overall
- the amount of manual reconciliation or data cleansing that must be done to get data into the right state for consumption, including the cost and number of employees dedicated to these tasks
- the ability of the business to respond to data requirements (internal and external) in a timely manner and not be hampered by scalability issues
- the elimination of legacy applications and systems via the consolidation of data environments.

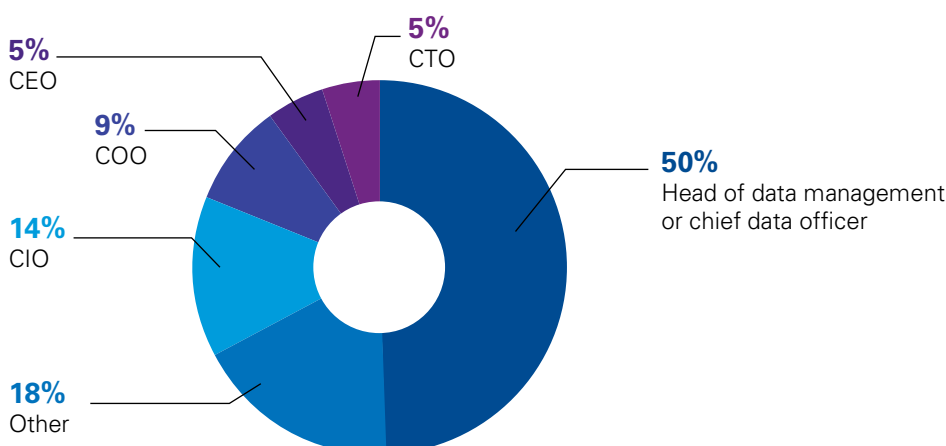
Figure 5 shows that there is no one way to structure data management because of the range of individuals under which the function sits in respondent firms. Half of respondents have a senior level individual (C-level at some firms) that is in charge of data management, highlighting the independence and importance of the function overall.

“ It’s not about having the technology; it’s about how to use that technology and data for business purposes. Technology alone can’t solve problems. There is often too much data which is why you need to derive meaning and insights from the data. ”

— **Mike Conover**
Partner
KPMG in the US

Figure 5: Data management roles and responsibilities

Responsibility for data management function (N=22)



Source: Aite Group's survey of 22 capital markets firms, 2014

The role of big data and the cloud

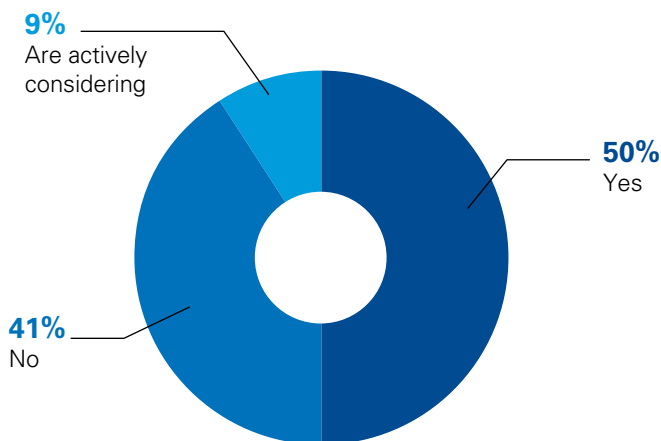
Big data has no doubt made the biggest visible impact in the business-to-consumer retail space, where Internet giants such as Amazon and eBay have used these strategies and technologies to profile consumer behavior and better target end-consumers. Within the capital markets sector however, it is relatively early days for the adoption of big data strategies, which is reflected by the fact that only half of respondent firms from last year's Aite Group survey had such a strategy in place and the overall respondent group was a particularly educated subset of the capital

markets community with regard to big data (Figure 6).

A handful of top-tier banks and hedge funds have been the frontrunners in implementing big data strategies and technologies. These strategies are being applied to a whole range of functions, everything from front-office trading to back-office reference data management. The most popular use cases for big data within respondent firms are analytics for trading and quantitative research, both of which sit together in the front office and are tied to revenue-generating opportunities.

Figure 6: Level of big data adoption

Does your organization currently have big data initiative or strategy in place? (N=22)



Source: Aite Group's survey of 22 capital markets firms, 2014

In contexts outside of the capital markets industry, big data technology is often closely interlinked with cloud technology. For example, Cloudera was founded in October 2008 to deliver the first enterprise-class implementation of Apache Hadoop. An obvious benefit of using cloud computing as a solution to support a big data strategy is its cost effectiveness. Clouds essentially eliminate the upfront cost of IT investment and the ongoing maintenance costs of on-premise hardware and software, a key dynamic when you consider the resource-intensive nature of most big data implementations. By using cloud, businesses are able to scale up or down on a “pay as you go” basis, rather than relying on internal IT resources.

The vast majority of the capital markets is, however, rather cautious about the use of public cloud technology in commercially sensitive areas. Security remains a concern for most firms, and as big data is used to deliver insights for revenue-generating functions, senior management may decide against handing over sensitive information

to cloud providers. Private clouds tend to be the norm for top-tier sell-side firms, but these involve higher costs than public cloud deployments and therefore may not bring down the costs of big data support in any significant manner. Much like the rest of the market, the most frequently cited concerns about the cloud within the data management community are around data security and performance reliability. Firms remain nervous about putting client and customer data outside their perceived control, and a number of firms have concerns about regulatory restrictions on data storage.

There are benefits of using cloud technology to host a data integration layer in order to access and normalize data from multiple sources and put in place a means of controlling enterprise-wide data consumption. A data virtualization layer in the cloud could therefore potentially federate different data sources and provide different ways to access the single virtual data source, whether that is reference, transactional, or operational data.

“ When we look at data, and we look at how financial institutions store data - legal entity identifiers, client onboarding - these are all issues that are very heavily data intensive and involve legacy systems. We will see a big change when it comes to the type of people that institutions are hiring to really take it to the next level to managing their data. ”

— **Mike Conover**
Partner
KPMG in the US

Figure 7: Level of cloud adoption

Does your firm currently have cloud initiatives in place? (N=21)



Source: Aite Group's survey of 21 capital markets firms, 2014

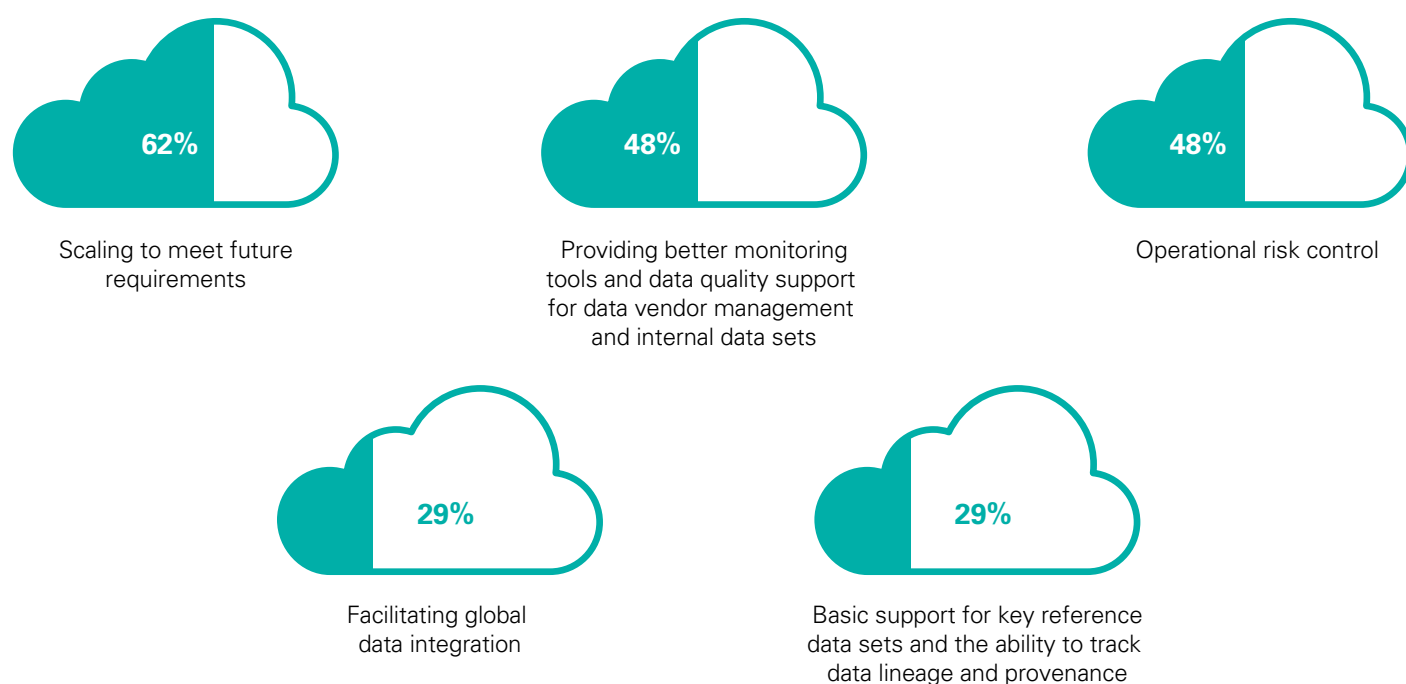
The appeal of cloud technology in a data management context is therefore:

- a rapid way to reduce costs via the removal of duplicative processes at an enterprise level and the elimination of the requirement to support internally deployed software and hardware
- predictability in ongoing costs
- scalability in dealing with a higher volume of data in a timely fashion without requiring internal investment
- ability to have a centralized point for the metering and permissioning of data vendor feeds across an enterprise – a way to rationalize data feeds and improve vendor management via increased transparency of consumption at an enterprise level.

Focusing on the potential role of cloud technology in data management, 62 percent of the respondents cite scalability to future proof requirements as one the most important for their firms. The growth in data volume as a result of increased electronic flows (resulting from global market structure changes) and the regulatory push for more frequent and granular reporting is no doubt the underlying cause of this trend. Operational risk management and enhanced monitoring tools and data quality support round out the top three areas of importance for respondents (Figure 8), also reflecting the external and internal push for increased transparency and a data audit trail.

Figure 8: Cloud benefits for data managers

Which aspects of data management in the cloud offering are the most important for your firm? (N=21)



Source: Aite Group's survey of 21 capital markets firms, 2014

KPMG point of view

Reflective of the client universe in capital markets, KPMG has invested in its data and analytics (D&A) capabilities and expertise over the last few years in order to focus on delivering insights into the range of data sets managed and maintained by financial institutions. Though big data has been a popular topic among capital markets firms, many are not fully benefiting from the actionable insights that this approach can deliver; hence this is a focus area for KPMG in areas such as risk and trade analytics, and client data and onboarding.

Industry pain points

A key area of operational inefficiency within capital markets is the client onboarding process, including meeting know your client (KYC) requirements, and it has long been criticized for its manual and labor-intensive nature, which often results in data discrepancies, delays, and, accordingly, higher operational costs. If the data inputted at the point of entry of a client or fund is not standardized, then reconciliation is required further downstream, thus incurring further inefficiency and costs for other parts of the organization. Traditionally, client onboarding teams have been tasked with balancing speed of onboarding with the rigor applied to KYC checks – making sure that the potentially riskier clients are assessed adequately but also onboarded in a timely manner.

In today's regulatory environment, there are also a plethora of new checks that need to be performed and classifications that need to be applied to legal entity data in order to ensure investor transparency, regulatory reporting, and risk management obligations are being met. The KYC process is therefore more extensive and complex than ever before, involving the assessment of many more data points and documentation

checks, including at the fund level. Moreover, financial penalties for non-compliance with anti-money laundering (AML) and KYC legislation have been gradually increasing over the last few years.

Data solutions

KPMG in the US's approach to tackling client onboarding and regulatory compliance challenges is to focus on policy automation – the task of meeting the requirements of regulations such as the Foreign Account Tax Compliance Act (FATCA), and specific national regulations focused on KYC and AML. There is no one-size-fits all approach to KYC across regulatory jurisdictions, which makes compliance challenging for firms if they are primarily reliant on manual effort and workflow tools to gather and monitor required data. KPMG's intent is to enable clients to move away from these error-prone manual processes and toward a proactive enterprise-level approach to client data management and onboarding from a compliance perspective. Rather than acting solely as a repository of client data and documentation, KPMG professionals apply big data techniques and a metadata-based rules engine in order to check the data's level of compliance with specific requirements and flag any exceptions. Users can therefore focus on tackling exceptions and oversight of higher risk clients instead of the heavy-lifting tasks of onboarding.

Another focus of the solution is to enable firms to move away from reliance on tracking paper-based documentation, which can be costly and inefficient, and toward electronic storage of client documentation. KPMG maintains an electronic record of the documents for clients, which enables them to quickly respond to both client and regulatory queries, rather than digging through mountains of hardcopies. The unstructured data

that is stored in documentation such as ISDA agreements is also unlocked via metadata tagging and electronic content enrichment processes in order to allow firms to potentially benefit from further analysis of this information in future.

The use of NoSQL database technology means that the solution avoids some of the lengthy data mapping tasks associated with a relational database and client data is onboarded more rapidly. The bitemporal storage capabilities of the MarkLogic database, on which the KPMG solution is based, also enable point in time analysis of data lineage and audit tracking.

The hybrid cloud model allows the solution to provide a hub and spoke model for firms' internal clients and to join up client data from siloed operational business units. The solution hosts firms' data through in-country private cloud arrangements that can be made for jurisdictions that do not allow data to be hosted offshore. KPMG in the US also partners with Tata Consultancy Services for the business process outsourcing aspect of the offering, which provides operational and staffing resources in numerous markets across the globe.

Common challenges faced during implementation include:

- working with the client to define data security and privacy issues that need to be accommodated
- determination by the client of how much customization of the policy engine is required
- delineating lines of demarcation between the external services team and the client's operations team – points of operational integration.



Case study: Data governance at State Street

Last year, State Street appointed its first chief data officer (CDO) as part of its multi-year program to overhaul the way it manages its internal data assets, including establishing a robust data governance framework and a new internal technology architecture. The CDO's role at the firm is to foster a data stewardship program among the business user community and create processes to support the ownership and ongoing management of the firm's data.

The firm initially launched a three-year IT and operations program that included data governance elements back in 2010, but it has since extended and enhanced the work to address the end-to-end support of data across the enterprise. A major building block of the program is a private cloud application framework that provides a unified and open architecture for data governance. Though the architecture is open, the firm has worked with KPMG in the US on its journey to help ensure

that data permissioning is rigorously applied and users are able to access only the data they are allowed to view.

Chris Perretta, Executive Vice President and Chief Information Officer (CIO) at State Street, explains that the firm continues to develop and evolve a metadata layer to track the lineage and provenance of data, which helps the data management team to ensure data quality standards are met. "The intent is to move away from a functionally-oriented approach to data into an enterprise-wide consistent approach and reduce the amount of translation required between various data sets," he explains. "By, for example, defining the lexicon of a trade, the team can control the amount of code that needs to be written and cross-referencing work that needs to be done across the enterprise."

Reference data may be a low hanging fruit for this approach but the State Street team is

“ The intent is to move away from a functionally-oriented approach to data into an enterprise-wide consistent approach. ”

— **Chris Perretta**
Executive
Vice President and
Chief Information
Officer
State Street



looking beyond this area into all of the firm's data assets in a holistic manner across the data lifecycle, including trade data. Peretta contends that in a "semantic-web world" data needs to be properly defined in order for it to be used efficiently. "Understanding metadata is a good building block for data and analytics," he says. One functional beneficiary of this common data infrastructure has been the firm's risk team, which is able to manipulate the data to suit various analytics tasks.

The consolidation of the firm's data assets has also led to huge increases in application performance and the timeliness of data delivery. Instead of focusing on maintaining a heterogeneous set of data across the firm's systems, the uniform data infrastructure means that the data management team can focus on ensuring reliability of performance and deal with any issues as they arise. The program has allowed the team to measure around two million different data attributes on a weekly basis and project development time has been reduced from months to weeks in those areas where the solution has been implemented.

As well as improving matters for internal business users, the change program is also

of benefit to State Street clients because it provides a mechanism for them to dynamically interact with their data. The team is able to support ad hoc client interaction and dynamic data refresh, so that clients can update their information and receive data back in whatever format they require.

Peretta compares State Street's approach to data management and governance to the rules for manufacturing: "The data needs to be high quality and fit for purpose, so we have one assembly line for data much like the manufacturing of cars. Though different cars are produced by one manufacturer, they are all based on common components. There is a high degree of engineering rigor applied to the data production line and we focus on end delivery rather than process customization for data." End consumers of the data such as the middle office or compliance teams may need different aspects of the same data, but there are common components throughout.

Though the initial focus of the work is on structured data, the team plans to extend its support for unstructured data in the future. The program of work should therefore put the firm well on the road to establishing a truly digital enterprise.

// The data needs to be high quality and fit for purpose, so we have one assembly line for data much like the manufacturing of cars. **//**

— **Chris Peretta**
Executive
Vice President and
Chief Information
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State Street



Case study: A new CDO for National Australia Bank

National Australia Bank (NAB) is increasing its focus on data management and governance strategy in order to improve the quality of customer data, decision making and reporting. As part of this ongoing program of work, the bank recently appointed a chief data officer (CDO) to own the Enterprise Data Strategy.

This strategy encompasses a new governance structure, the measurement and reporting of data quality performance, education, and awareness. This should positively influence a culture of 'caring about data', leveraging data assets and value creation through analytics and alignment of information definition as well as usage and information flow across key processes. "While NAB's focus on data management is far from new, the creation of the CDO role and the introduction of a high-level support team to implement the strategy reflects the increased internal importance of the function overall" says Matthew Lawrance,

Executive General Manager, NAB Wealth Operations & Enterprise Shared Services.

Tania Foster has been appointed as CDO for her breadth of experience across the organization, including customer-facing, finance and product roles as well as her understanding of the bank's data management priorities. The high-level support team, which comprises about 17 full-time employees, provides regular reporting to internal business and risk committees. Employees throughout the business have also been tasked with acting as data stewards to promote data quality awareness and training, identify key data concerns and change initiatives that affect data and drive the use of enterprise information definitions and models.

The last 12 months have seen NAB's data management team focus on implementing a data management system and fostering a culture of data governance within the various business lines. "The transformation

“ The focus is on driving value through quality analytics, insights and intelligence. ”

— **Matthew Lawrance**
Executive General
Manager
NAB

of data assets into accessible and actionable intelligence is reliant on getting the basics right,” explains Lawrance. “This includes ensuring there is accountability at the source for data to enable the right level of analytics and insights further down the line. The focus is on driving value through quality analytics, insights and intelligence.”

Lawrance indicates that the bank is always evolving the simplification of its technology environment, data warehousing and management information as part of its data and information management agenda, which includes the adoption of cloud-based solutions and innovation. “I anticipate that cloud technology will play an increasingly important role within our organization as we continue to learn about areas of opportunity”.

While taking a long-term view, the NAB team aims to ensure ‘day-to-day’ customer and operational data is accurate at source across its various systems and engages actively with people from across the entire organization to this end. Their goal is to leverage data better for the benefit of customers while reducing operational risk through improved data accuracy and ongoing modernization of technology and data assets.

The data management team’s stakeholders have also evolved in line with the rising importance of the function. Though historically

it has been the finance, risk management and treasury functions that have engaged heavily with the importance of data management, the team now engages actively with customer-facing and marketing-focused functions across the organization.

“In the next 12 months we will be focusing on customer-facing initiatives and our growing digital agenda, explains Lawrance. “We have an increasing analytics capability that means we can leverage our valuable data asset in a way that enhances the customer experience, reduces operating costs and ensures we get it right first time.”

The metrics of success for the program include improvements in customer experience, enhanced risk management and better business outcomes. The CDO will use data quality scorecards and other maturity indicators, driven by data, to measure progress.

“Data is everyone’s business and financial services organizations run on it,” says Lawrance. “It is the blood that pumps through the veins of the organization and it will definitely become a source of competitive advantage in a strategic sense. The relevance of data management has never been clearer.”

“ If we look at the state of client data management in general, it is heavily manual and a lot of labor goes on offshore but is not truly scalable when you look at incoming regulatory requirements. Regulators have set enterprise-wide mandates to examine all communications with clients and that cannot be supported with a siloed view. ”

— **Bill Cline**
Partner
KPMG in the US

About Aite Group

Aite Group is an independent research and advisory firm focused on business, technology, and regulatory issues and their impact on the financial services industry. With expertise in banking, payments, securities & investments, and insurance, Aite Group's analysts deliver comprehensive, actionable advice to key market participants in financial services. Headquartered in Boston with a presence in Chicago, New York, San Francisco, London, and Milan, Aite Group works with its clients as a partner, advisor, and catalyst, challenging their basic assumptions and ensuring they remain at the forefront of industry trends.

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About KPMG

KPMG's Global Financial Services practice has more than 34,000 partners and professionals across a global network comprised of 155 member firms, providing Audit, Tax and Advisory services to the retail banking, corporate and investment banking, investment management and insurance sectors. Each professional brings ideas, innovation and experience from across this vast network, to help benefit financial services clients around the world. KPMG professionals serve leading financial institutions with practical advice and strategies backed by high quality implementation. Commitment to the industry, sector-specific insights and a passion for serving clients to the best of their abilities helps KPMG's Global Financial Services practice professionals stand out.

We welcome the opportunity to discuss how KPMG member firms can help you achieve your business objectives.

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Bill Michael is KPMG's EMA Head of Financial Services. And a member of the UK Executive. Bill has 20 years' experience specializing in corporate and investment banking including major transactions and advisory work around the world. He has led major regulatory and advisory projects including IFRS and USGAAP conversions, finance and risk governance reviews including target operating models and quality of MIS, SOX projects, anti-money laundering reviews, review of high level controls of major global organizations, and cross-border due diligence.

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