Floating in the Capital Markets Cloud: Moving Beyond Data Storage

Prepared for:
TABLE OF CONTENTS

EXECUTIVE SUMMARY .............................................................................................................. 4
INTRODUCTION ............................................................................................................................. 5
METHODOLOGY ............................................................................................................................ 5
MARKET OVERVIEW .................................................................................................................... 9
CLOUD SERVICE MODELS AND USE CASES ........................................................................ 13
  CLOUD SERVICE MODELS ........................................................................................................ 13
  CLOUD DEPLOYMENT MODELS ............................................................................................... 13
BENEFITS OF CLOUD SERVICES ............................................................................................ 18
CHALLENGES AND OPPORTUNITIES ...................................................................................... 19
  CHALLENGES ......................................................................................................................... 19
  OPPORTUNITIES ..................................................................................................................... 21
DATA MANAGEMENT IN THE CLOUD ....................................................................................... 24
THE QUESTION OF MULTITENANCY ...................................................................................... 26
DATA MANAGER PERSPECTIVES ............................................................................................ 28
  PUSHING BACK ON DATA VENDORS .................................................................................... 28
  THE IMPORTANCE OF AN SLA ............................................................................................... 29
  KEY ELEMENTS OF DATA MANAGEMENT IN THE CLOUD .................................................. 29
TIPPING POINTS FOR INVESTMENT ....................................................................................... 33
CONCLUSION ............................................................................................................................... 34
ABOUT XENOMORPH .................................................................................................................. 35
  CONTACT ................................................................................................................................ 35
ABOUT MICROSOFT ................................................................................................................... 36
  CONTACT ................................................................................................................................ 36
ABOUT AITE GROUP .................................................................................................................... 37
  CONTACT ................................................................................................................................ 37

LIST OF FIGURES

FIGURE 1: TYPE OF PARTICIPATING FIRMS ............................................................................ 6
FIGURE 2: ROLE OF RESPONDENTS ....................................................................................... 6
FIGURE 3: ACTIVE REGIONS FOR RESPONDING FIRMS ....................................................... 7
FIGURE 4: ASSET CLASSES SUPPORTED BY RESPONDING FIRMS ..................................... 7
FIGURE 5: KEY DRIVERS FOR STRATEGIC IT INVESTMENT ............................................... 8
FIGURE 6: MAJOR EQUITY INDICES PERFORMANCE .............................................................. 9
FIGURE 7: EMPLOYMENT TRENDS ON WALL STREET ......................................................... 10
FIGURE 8: SAMPLE IT SPENDING REALITY ............................................................................ 11
FIGURE 9: PROJECTED IT SPENDING ..................................................................................... 11
FIGURE 10: SOLUTION DELIVERY VS. COMPLEXITY .......................................................... 15
FIGURE 11: ADOPTION OF CLOUD INITIATIVES .................................................................. 16
LIST OF TABLES

TABLE A: SAMPLE REQUIREMENTS OF CLOUD SLA DETAILS ............................................................... 29
EXECUTIVE SUMMARY

*Floating in the Capital Markets Cloud: Moving Beyond Data Storage*, commissioned by Xenomorph and Microsoft and produced by Aite Group, identifies challenges and opportunities in burgeoning industry cloud initiatives and analyzes potential benefits of moving to the cloud environment for the capital markets community.

Key takeaways from the study include the following:

- Regulatory compliance, cost control, and client management are the top three drivers for strategic IT investment for the survey respondents.

- Delivering cost savings, achieving scalability, and efficiently conducting high-performance computing are a few of the important drivers of cloud adoption in capital markets.

- Concerns still exist around security, but over the next 24 months, those firms without any clear strategy around cloud technology are expected to become part of the cloud adoption curve.

- Data management and storage has been the most common use case behind the current wave of cloud adoption, but market participants are looking to leverage cloud-based services for risk management and trade analytics.

- Data as a Service (DaaS) is the growing concept that data is provided on-demand to the end user and the service provider is responsible for all data cleansing and management functions.
INTRODUCTION

Adoption of cloud computing is no longer a theoretical discussion among practitioners of capital markets IT. Despite lingering concerns over the security and reliability of the general marketplace, cloud initiatives within the context of capital markets have been gradually picking up momentum over the last 18 months. In fact, one can also argue that for most market participants with limited IT budgets and internal capabilities, adopting cloud-based services can in fact significantly improve their security and reliability.

The main drivers for cloud adoption have been the continuing need to innovate and maintain overall competitive readiness in the age of regulatory pressures, stagnant IT spending, diminishing human resources, and unpredictable levels of profitability for financial institutions.

While it is true that certain firms are still hesitant to leverage the cloud for mission-critical operations and applications they deem competitive differentiators, firms have opened up to the great possibility of utilizing the cloud to maintain commoditized operations in a cost-effective and timely manner. Firms have also turned to the cloud for many data-intensive functions, including enterprise risk calculations, quantitative research, strategy development and testing, and more.

This study identifies challenges and opportunities in burgeoning cloud initiatives and analyzes the potential benefits of moving to the cloud environment for the capital markets community.

METHODOLOGY

This study is based on Aite Group telephone interviews with leading market participants representing the sell-side, the buy-side, exchanges, and vendors that have committed to leveraging cloud computing. During the months of March and April 2014, Aite Group interviewed market participants to capture their views on cloud technology, specifically around the data management market.

A total of 21 firms participated in the survey, with a significant majority of respondents coming from the broker-dealer community (Figure 1). Over 70% of respondents come from the IT side, and data management executives represent 24% of the responses (Figure 2). Given the size and structure of the research sample, the data provide a directional indication of conditions in the market.
**Figure 1: Type of Participating Firms**

Breakdown of Respondents  
(N=21)

- Broker-dealer/investment bank: 85%
- Asset manager: 10%
- Exchange/ATS: 5%

**Source:** Aite Group survey of 21 capital markets participants, March and April 2014

**Figure 2: Role of Respondents**

Departments Represented by Respondents  
(N=21)

- IT: 71%
- Data management: 24%
- Risk/compliance: 5%

**Source:** Aite Group survey of 21 capital markets participants, March and April 2014

Most of the respondents’ firms were active participants across the three major financial regions. They also had a strong presence in emerging markets, signifying the global nature of their businesses. The Asia-Pacific region stands out as the most well-represented region, due to the fact that five of the responding firms only have a presence in the Asia-Pacific region (Figure 3).
Responding firms are very active in most major asset classes, including over-the-counter derivatives. A number of firms only focused on support for domestic equities, leading to a slightly lower percentage of responses for handling international equities (Figure 4).

Respondents identified three key drivers for strategic IT investments: regulatory compliance, cost control, and client support (Figure 5). Through the various discussions, it was fairly clear that...
respondents were still very much under cost pressures from the top, while at the same time attempting to manage the ongoing burden of meeting regulatory compliance requirements and ensuring high levels of client support.

**Figure 5: Key Drivers for Strategic IT Investment**

![Graph showing primary strategic technology investment drivers for business in 2014](image)

- **Regulatory compliance**: 81%
- **Cost control**: 71%
- **Client support**: 62%
- **Internal efficiency improvement**: 52%
- **Geographic expansion support**: 29%

*Source: Aite Group survey of 21 capital markets participants, March and April 2014*
MARKET OVERVIEW

Before diving into an analysis of the overall adoption of cloud services in capital markets, this section provides a few of the key market trends driving the adoption of cloud services in capital markets, especially in the area of data management. Relevant market trends include the following:

- **Stagnant global market growth**: After a dramatic decline in performance in 2008, major equity market indices have bounced back but have remained fairly stagnant until the end of 2013 (Figure 6).

**Figure 6: Major Equity Indices Performance**

![Equity Market Performance Comparison, 2005 to 2013](image)

*Source: MSCI, S&P*

- **Increasing regulatory pressures and obligations overall**: From Dodd-Frank and Basel III to the European Market Infrastructure Regulation (EMIR) and the second Markets in Financial Instruments Directive (MiFID II/MiFIR), just to start, the industry has no shortage of new regulations that must be finalized and eventually implemented. While these regulations are trying to target many areas, for the most part these regulations are collectively focused on creating more transparency and accountability within the various listed and OTC markets, forcing market participants to better manage their risk and provide more information back to their clients. Consequently, market participants are facing renewed focus on data management and analytics as well as tighter control over regulatory compliance.

- **Shrinking human resources in capital markets**: Wall Street has experienced numerous rounds of layoffs since 2008, and downsizing has continued even in recent months (Figure 7). Most firms have been operating with bare bones teams while
trying to leverage technology to make up for loss of manpower. This trend is reflected across the pond, with European markets facing similar levels of downsizing.

**Figure 7: Employment Trends on Wall Street**

![Employment Trends on Wall Street](image)

*New York State Employment Statistics, 2003 to 2013 (In thousands of employees)*

- **Focus on cost control and downward pressure on IT spending**: Since 2008, capital markets have been playing IT-spending catchup in the marketplace, remaining fairly stagnant in terms of overall spending and focusing on short-term maintenance needs over innovation. Even among top financial institutions, overall IT spending behavior has been a mixed bag (Figure 8). In 2014, more firms are expected to choose to support technologies that can help growth over the long term (Figure 9).
Figure 8: Sample IT Spending Reality

Difference from Average Level of IT Spending as a % of Revenue

- Nomura: 3.7%
- Barclays: 3.6%
- Citigroup: 3.4%
- Deutsche Bank: 3.2%
- SunTrust Bank Inc.: 3.1%
- Credit Suisse: 3.1%
- State Street: 3.0%
- Bank of America: 1.9%
- Mitsubishi UFJ Financial Group: 0.6%
- Wells Fargo: 0.6%
- JP Morgan: 0.8%
- PNC Financial Services Group Inc.: 0.8%
- BNP Paribas: 1.0%
- American Express Co.: 1.2%
- Capital One Financial Corp.: -2.0%
- BNY Mellon: -2.7%
- TD Bank: -3.0%
- BB&T Corp.: -3.1%
- HSBC: -3.7%
- Royal Bank of Scotland Group: -5.4%

Source: Financial institutions

Figure 9: Projected IT Spending

Projected Global IT Spending in the Securities & Investments Industry, 2007 to e2014 (In US$ billions)

- 2007: $38.1
- 2008: $41.8
- 2009: $39.3
- 2010: $41.6
- 2011: $41.9
- 2012: $42.3
- 2013: $42.7
- e2014: $43.5

Source: Aite Group

- A move to be more proactive in vendor relationships and retire legacy systems:
  Many firms are keen to consolidate vendor relationships (on the data vendor side and the solution vendor side), remove duplicative processes, and migrate away from (and retire) legacy systems as part of an overall industry focus on improving operational efficiency.
• **A renewed focus on improving data management and data quality overall:** Regulatory, client, and internal drivers have forced most financial institutions to re-evaluate the core reference data sets on which they are basing their trading, risk management, and operational decisions. The establishment of C-level executive positions dedicated to championing data management—a chief data officer or something similar—is proof of this enhanced focus. An enterprise view of data via a virtualization layer is often an integral part of the data management agenda.

• **Continued need for innovation and growth:** After five years of maintenance and stagnant IT spending, firms are finally realizing that investments must be made in innovation and revenue growth to capture the next generation of market opportunities. An increasing number of firms are focused on data-centric initiatives, looking to discover unique data-driven initiatives that can help them find alpha.

• **Growing acceptance of outsourcing:** Hampered by lack of IT and human resources but pressured by regulatory necessity and competitive forces, an increasing number of firms have embraced outsourcing as a viable option to keep up with a changing market environment while seeking new revenue-generating opportunities. A growing number of deals around investment-management operations, trading infrastructure, reference data management, and post-trade reconciliations have cemented the importance of outsourcing in today’s market environment.

• **Increase in data volume as a result of increased electronic flow and regulatory requirements:** As adoption of electronic trading has spread across different regions and asset classes, diversity of data sources and sheer volume of data have increased substantially over the last decade. In addition to traditional market data, growing interest around non-traditional, non-structured data has also added more complexity in terms of firms’ ability to deal with data. On top of all these challenges, regulatory compliance requirements around data integrity, storage, and accessibility have added more pressure on market participants to develop a viable long-term data management strategy to meet both competitive and regulatory needs.
CLOUD SERVICE MODELS AND USE CASES

While there is still some debate around its terminology and categorization, cloud computing—a model for provisioning and consuming IT capabilities on a need-only basis that allows computing resources from a massive pool of hardware and networking infrastructure to be managed independently—is quickly becoming a viable option for the banking industry. The processing capability is available on a pay-by-use basis as an infrastructure and platform as well as through services such as applications.

CLOUD SERVICE MODELS

Five primary business or commercial service models currently exist:

- **Infrastructure as a Service (IaaS):** Rather than purchasing servers, software, data center space, or network equipment, this model allows businesses to buy those resources as a fully outsourced service. This is computing infrastructure on demand—it can be scaled up or down, and customers only pay for what they consume.

- **Platform as a Service (PaaS):** The cloud service provider offers a complete platform for application, interface, and database development as well as storage and testing. In this case, the management of the infrastructure is automated and effectively hidden from the user. This environment often allows businesses to streamline the development, maintenance, and support of customized applications, thereby lowering IT costs.

- **Data as a Service (DaaS):** This is based on the concept that data is provided on demand to the end user, and the service provider is responsible for all data cleansing and management functions. The provider’s data portal is generally low-footprint in terms of technology—often a Web-based front end—and the service’s pricing is often based on data volume or data type.

- **Analytics as a Service (AaaS):** Closely tied to the concept of DaaS and viewed as an integral part of big data, this model enables businesses to engage in compute-intensive chores to analyze massive amounts of data, while spinning up or down depending on their workload through a cost-effective pay-per-use approach.

- **Software as a Service (SaaS):** The cloud service provider houses the business software and related data, and users access the software and data via their Web browser over the Internet. These solutions are typically priced on a per-user license.

CLOUD DEPLOYMENT MODELS

One of the biggest challenges for organizations wanting to move to cloud-based solutions is determining the appropriate type of deployment. The type of delivery will heavily depend on the level of complexity of the solution (Figure 10). In addition, most organizations, especially in
financial services, will not move their entire operations away from an on-premises deployment, especially when they have legacy solutions, complex integrations, or regulatory constraints. Therefore, they may select multiple cloud deployment models, depending on their needs and applications. The following cloud deployment models are available:

- **Public cloud:** The service is made available over the Internet to the general public or a large industry group and is owned by a cloud service provider.

- **Private cloud:** The service is provided by a single institution, and access is restricted to that institution. It is often used as a way of centralizing IT resources within an institution. An alternative but linked approach is to create a virtual private cloud, where the cloud access remains private for a single institution, but the provision of the service is managed by a third party.

- **Community cloud:** The service is provided and controlled by a collection of institutions or a third party engaged by them all, and access is restricted to these institutions. It is typically shared by several organizations with shared concerns and managed by the organization or a service provider.

- **Hybrid cloud:** The service is made up of a series of different interoperable clouds linked together. Different types of clouds may be joined together under this arrangement (e.g., private cloud and community cloud).

- **Syndicated cloud:** This service is offered by an institution or company that commercially rents out excess capacity in its own private cloud to third parties.
Perhaps reflecting the urgency of appropriately balancing these key requirements, more than half of the responding firms have undertaken cloud-based initiatives (Figure 11).
Commitment to leveraging cloud technology for those firms currently engaged in cloud-based services appears pretty firm, with an overwhelming 82% of the respondents expected to increase their IT spending on the cloud over the next 24 months (Figure 12). The prospect for cloud adoption is also quite bright when analyzing those responding firms that currently lack a cloud initiative; combined, 80% of those firms without a cloud initiative today expect to have something in place over the next 24 months (Figure 13).

**Figure 11: Adoption of Cloud Initiatives**

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

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>52%</td>
<td>48%</td>
</tr>
</tbody>
</table>

Source: Aite Group survey of 21 capital markets participants, March and April 2014

**Figure 12: Expected Investment in the Cloud**

Expected IT Spending on Cloud-Based Initiatives Over the Next 24 Months (n=11)

<table>
<thead>
<tr>
<th>Increase</th>
<th>Stay the same</th>
</tr>
</thead>
<tbody>
<tr>
<td>82%</td>
<td>18%</td>
</tr>
</tbody>
</table>

Source: Aite Group survey of 21 capital markets participants, March and April 2014

© 2014 Xenomorph. All rights reserved. Reproduction of this white paper by any means is strictly prohibited.
Figure 13: Likelihood of Cloud Initiatives

Q. Chances that your firm will leverage cloud services over the next 24 months? (n=10)

- No chance: 20%
- Somewhat likely: 40%
- Likely: 30%
- Highly likely: 10%

Source: Aite Group survey of 21 capital markets participants, March and April 2014

Of the firms currently leveraging cloud technology, there is a fairly even breakdown across public deployments, private deployments, and a combination of both (Figure 14).

Figure 14: Adoption of Cloud by Type

Types of Cloud Services In Use (n=11)

- Public cloud: 37%
- Private cloud: 27%
- Combination of both: 36%

Source: Aite Group survey of 21 capital markets participants, March and April 2014
BENEFITS OF CLOUD SERVICES

Cloud-based environments can benefit financial institutions in mature markets by allowing them to distinguish themselves from their competitors, either by significantly decreasing their overall operational costs or allowing them to enter new markets at a lower cost and mitigate their risk and exposure. Cloud computing can also help break down legacy information silos and increase agility and customer responsiveness.

Firms located in emerging markets can use cloud services as the core foundation for their overall IT strategy, leveraging the latest cutting-edge technology to develop new applications or products and services, thereby bypassing altogether the legacy-centric IT infrastructure handicapping those firms in mature markets. These firms can quickly scale their operations to meet growing user demand or rapidly abandon unprofitable opportunities and move on to other areas of market interest.

For both, cloud-based services offer the following tangible benefits:

- **Reducing total cost of ownership (TCO):** Achieved by optimally used hardware and software licenses, reduced deployment resources, and shared hosting and maintenance costs

- **Moving from capex to opex:** Eliminates large upfront payments and shifts to a flexible pay-as-you-go term or subscription model

- **Faster time to market:** Accelerates time to market for new products and services and new regions for geographic expansion

- **System scalability:** Additional demand without incremental investment; infrastructure is scalable for peak demand loads

- **High availability:** Mission-critical for customer-facing channels; makes 100% real-time availability a reality

- **Disaster-recovery and test environments:** Ensures no data loss and requires no manual intervention upon failure—a quantum leap for all data centers

Survey respondents viewed reducing total cost of ownership and the ability to scale as two very important benefits associated with leveraging cloud technology. Disaster-recovery capabilities also ranked high, especially for those respondents from small to midsize firms (Figure 15).
CHALLENGES AND OPPORTUNITIES

Despite the obvious benefits that cloud-based services can provide, many challenges still impede increased wider adoption of cloud computing in capital markets. At the same time, as the overall concept of a cloud-based environment has become more accepted within the industry, an increasing number of practical opportunities have emerged over the last couple of years.

CHALLENGES

Most challenges associated with cloud services are related to concerns with outsourcing in general and specifically around the perceived loss of competitive differentiator. Major barriers to adoption include the following:

- **Concerns over security**: Issues around security have been the biggest industry perceptions to overcome, especially in the context of a public cloud. What is typically overlooked when assessing this perceived security weakness is that in most cases, the level of security offered by a public cloud offering will more than likely be much higher than the quality of security currently applied to on-site infrastructures being managed by financial institutions, especially within Tier-2 and Tier-3 firms. Add in a cost-effective disaster-recovery capacity that can be embedded, and opting for a cloud-based infrastructure can actually lead to enhanced security coverage for most firms.

- **Reliability and availability**: Firms migrating directly managed specific infrastructure to a cloud-based environment will naturally still have questions about the potential reliability and availability of services and products when managed by a third party.

---

Figure 15: Assessing the Benefits of Cloud Initiatives

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Not Important</th>
<th>Important</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving from capex to opex</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>High availability</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Faster time to market</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Disaster-recovery and test</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>System scalability</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Reducing TCO</td>
<td>3</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Source: Aite Group survey of 21 capital markets participants, March and April 2014
outside of their firewalls. Questions around the validity of service-level agreements (SLAs) can also play an important role here.

- **Questions about performance**: There are always lingering doubts about whether the performance of given tasks, especially customizing to improve overall performance, can be better in a cloud environment compared to what can be done in house.

- **Lack of control**: Perhaps the root of all concerns related to cloud, loss of control over management of infrastructure, applications, and services can be a huge barrier to adoption.

- **Expense**: The establishment of a private cloud can be an expensive and labor-intensive process during which a firm relies on cloud engineering experts; this also introduces key-person risk.

- **Migration**: The process of migrating from a legacy platform to a cloud-based platform requires a certain amount of process re-engineering; this is especially tricky when dealing with core financial systems.

For those respondents without an existing cloud strategy, the majority indicated concerns over security as the biggest obstacle to their firms adopting cloud technology. Lack of control was also a popular choice, especially for larger firms that view certain data sets and services as providing them with competitive edge (Figure 16).

**Figure 16: Assessing the Challenges to Cloud Adoption**

<table>
<thead>
<tr>
<th>Concerns About Cloud Initiatives (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerns over security</td>
</tr>
<tr>
<td>Lack of control</td>
</tr>
<tr>
<td>Performance issues</td>
</tr>
<tr>
<td>Reliability and availability</td>
</tr>
<tr>
<td>Regulatory restrictions on data storage</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

*Source: Aite Group survey of 21 capital markets participants, March and April 2014*
OPPORTUNITIES

Opportunities for leveraging cloud-based initiatives exist across all different sizes and types within capital markets, including the sell-side, buy-side, and exchanges. Smaller firms will have a more centralized approach, with decisions coming directly out at the CIO level and at times involving the CFO as well as the CEO. On the other hand, most large Tier-1 sell-side and buy-side firms will have a more decentralized approach to cloud technology, with decisions being made at a specific business unit’s CTO level with tacit support from the firm-wide CIO. Success of particular cloud initiatives within a larger firm can be the stimulus needed for additional projects and can increase the potential for a more centralized, enterprise-wide initiative, especially in major areas such as risk management.

It is also quite common to see different cloud initiatives being applied depending on particular regions. For example, in risk-averse Asian markets, our survey results indicate that cloud initiatives revolved around internal communication and productivity-related tools and applications. In the North American and European markets, data management seems to be a given area of opportunity for most cloud-based initiatives, while at the same time the interest is moving up the trade life cycle all the way to the front office.

Market participants are essentially looking to keep up with the various IT and regulatory changes driving capital markets, while at the same time trying to establish a firm foundation for future growth. As such, migrating applications or services over to the cloud must have specific metrics that can illustrate overall improvement in business processes. These metrics could be in the form of cost reduction, enhanced productivity, increased client numbers, or assets under management (AUM), and more. High-level opportunities within capital markets currently exist in the following areas:

- Data management
- Regulatory compliance
- Trading infrastructure
- Risk management
- Trade analytics
- Quantitative research
- Strategy development and testing

Perhaps not surprisingly, a significant percentage of responding firms are currently focused on cloud-based data management projects. Many responding firms based in the Asia-Pacific region focused more on non-essential functional areas for their cloud initiatives, including email, human resources, legal, and more (Figure 17).

Survey respondents mentioned cloud bursting as one area of growing interest, especially around activities that typically take a lot of computing power and scalability to generate timely and accurate results, such as strategy back-testing, risk analysis, and trade analytics. As a result, firms are trying to take advantage of cloud technology’s inherent strengths of lower cost and scalability to push those activities that require high-performance computing onto the cloud.
Floating in the Capital Markets Cloud: Moving Beyond Data Storage

Figure 17: Areas of Focus for Current Cloud Initiatives

<table>
<thead>
<tr>
<th>Areas of Focus for Cloud Initiatives (n=11)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference or market data management</td>
<td>64%</td>
</tr>
<tr>
<td>Positional or transactional data storage</td>
<td>36%</td>
</tr>
<tr>
<td>Other*</td>
<td>36%</td>
</tr>
<tr>
<td>Strategy development and testing</td>
<td>27%</td>
</tr>
<tr>
<td>Trading infrastructure</td>
<td>27%</td>
</tr>
<tr>
<td>Trade analytics</td>
<td>18%</td>
</tr>
<tr>
<td>Risk management</td>
<td>18%</td>
</tr>
<tr>
<td>Regulatory compliance</td>
<td>18%</td>
</tr>
<tr>
<td>Quantitative research</td>
<td>9%</td>
</tr>
</tbody>
</table>

*Other includes email, call center, HR, legal, technical projects, etc.

Source: Aite Group survey of 21 capital markets participants, March and April 2014

For potential future projects, data management once again topped the list, with a strong push toward trade analytics as the second most popular area of potential cloud technology projects (Figure 18). As mentioned earlier, the increasing interest in cloud-based trade analytics is very much tied to the needs of both sell-side and buy-side firms to figure out a cost-effective way to engage in compute-intensive tasks.

Figure 18: Future Focus Areas for Cloud Initiatives

<table>
<thead>
<tr>
<th>Future Focus Areas for Cloud Initiatives (N=21)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference or market data management</td>
<td>43%</td>
</tr>
<tr>
<td>Trade analytics</td>
<td>29%</td>
</tr>
<tr>
<td>Positional or transactional data storage</td>
<td>24%</td>
</tr>
<tr>
<td>Quantitative research</td>
<td>19%</td>
</tr>
<tr>
<td>Other</td>
<td>19%</td>
</tr>
<tr>
<td>Risk management</td>
<td>19%</td>
</tr>
<tr>
<td>Regulatory compliance</td>
<td>14%</td>
</tr>
<tr>
<td>Strategy development and testing</td>
<td>14%</td>
</tr>
<tr>
<td>Trading infrastructure</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: Aite Group survey of 21 capital markets participants, March and April 2014
After initial hesitancy, overall adoption of cloud initiatives is gaining momentum in the marketplace, driven by the need to control costs as well as the search for renewed growth. By the end of 2013, estimated IT spending in capital markets for cloud-related initiatives reached over US$2 billion and is expected to hit more than US$3 billion by 2017 (Figure 19).

**Figure 19: Projected IT Spending in Capital Markets Cloud Initiatives**

![Projected IT Spending on Capital Markets Cloud Services, 2011 to e2017](In US$ billions)

<table>
<thead>
<tr>
<th>Year</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>e2014</th>
<th>e2015</th>
<th>e2016</th>
<th>e2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$3</td>
<td>$3</td>
<td>$3</td>
<td>$3</td>
</tr>
</tbody>
</table>

*Source: Aite Group*
DATA MANAGEMENT IN THE CLOUD

The practice of data management in a capital markets context is focused on supporting various sets of data that allow a firm to identify, describe, classify, verify, and link items such as instruments, legal entities, and corporate actions, as well as support and identify the processes related to the trading of those instruments with counterparties and for clients. Essentially, data management supports all the business functions carried out by firms active in the capital markets arena, from trading to clearing and settlement. The task is typically challenging because the data is often distributed across multiple sources within a financial institution (internal systems, data warehouses, and external feeds) and stored in inconsistent formats from an enterprise point of view; data aggregation is therefore a far from simple task.

Historically, data management technology has been built by in-house teams 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. This process can take anywhere between one day and several weeks, depending on the complexity of the asset class in question and the availability of internal resources to perform the required tasks.

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. Time to market for new instruments can therefore be slow due to a lack of internal system support. This delay to market and the lack of viable internal systems to handle this process can often tempt individuals to rely on the dreaded desktop spreadsheet approach to data management as a short-term solution, which makes peer review and testing difficult and significantly increases risk and inefficiency. As a data management head at a European fund administrator explains, the data management team needs to know the whole business process in order for the onboarding of the new instrument type to be effective.

The desire to keep technology and resources in house is, however, gradually declining due to cost pressures on the back office in light of the tougher economic climate and the imperative to focus on core business functions (revenue-generating ones) rather than on sustaining cost centers. Cost per trade, taking into account the whole trade life cycle, is much more visible to financial institutions' senior management teams, and this means that firms are far more aware of "keeping the lights on" costs in the middle and back office. Scrutiny of data acquisition costs and data vendor rationalization efforts have also been a feature within these efforts.

The buy-side has been the front-runner in moving to adopt off-the-shelf vendor solutions or managed services approaches to data management, but the sell-side's appetite to at least explore options other than in-house development is gradually catching up. Hedge funds and asset managers have been particularly active in their assessment of cloud technology in this context, with hedge funds taking the lead in implementing public cloud-based solutions. The investment bank and custodian community, on the other hand, has gravitated toward assessment (and, in some cases, deployment) of private cloud-based solutions.
Figure 20 highlights the areas cited by respondents as causing the most pain with regard to the data management function in the current market. The top pain point for just over half of respondents is the latency in the time to market for new instruments, followed by operational risk, the cost of reference data storage, and the speed of system integration (when new systems are added downstream).

**Figure 20: Data Management Pain Points**

Q. Which of these factors is causing the most pain to your firm at the moment?
(N=21)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to market for new instruments</td>
<td>52%</td>
</tr>
<tr>
<td>Operational risk due to manual processes</td>
<td>48%</td>
</tr>
<tr>
<td>Cost of storage of reference data over time</td>
<td>43%</td>
</tr>
<tr>
<td>Speed of system integration</td>
<td>43%</td>
</tr>
<tr>
<td>Data cleanup by business</td>
<td>24%</td>
</tr>
<tr>
<td>Platform performance (coping with data volume or complexity)</td>
<td>24%</td>
</tr>
<tr>
<td>Staffing costs</td>
<td>14%</td>
</tr>
<tr>
<td>Other</td>
<td>14%</td>
</tr>
<tr>
<td>Inability to measure overall data quality and provenance</td>
<td>10%</td>
</tr>
</tbody>
</table>

Source: Aite Group survey of 21 capital markets participants, March and April 2014

In concert with a re-evaluation of technology and external data costs, data management teams have come under increased pressure to improve data quality and data aggregation processes in order to meet regulatory and client requirements related to transparency. Firms are also being forced to cope with more heterogeneity in their end-user application portfolios, with business process outsourcing and application outsourcing on the rise on the buy-side in particular. These dynamics lend themselves to a business case for 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.

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.

All of these factors are confirmed by respondents who are looking to leverage cloud technology to effectively control their data management initiatives (Figure 21).

**Figure 21: Key Drivers for Cloud Adoption in Data Management**

<table>
<thead>
<tr>
<th>Q. Which factors have or are likely to influence your use of cloud technology for data? (N=21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost reduction</td>
</tr>
<tr>
<td>Desire to rationalize data feeds/vendor management</td>
</tr>
<tr>
<td>Strategic data quality related programs</td>
</tr>
<tr>
<td>Client data-focused initiatives</td>
</tr>
<tr>
<td>Migration from legacy systems</td>
</tr>
<tr>
<td>Regulatory initiatives</td>
</tr>
<tr>
<td>Risk management function support</td>
</tr>
<tr>
<td>Coping with a greater variety of complex products</td>
</tr>
<tr>
<td>Strategic consolidation post-merger</td>
</tr>
<tr>
<td>Need for a more structured approach to pricing function</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

Source: Aite Group survey of 21 capital markets participants, March and April 2014

**THE QUESTION OF MULTITENANCY**

One of the biggest hurdles to acceptance of cloud infrastructure in a data management context is the understanding and acceptance of the concept of multitenancy. For a start, not all cloud-based solutions are multitenant; some are merely single-tenant arrangements. These arrangements can be of various shapes and sizes, and Figure 22 highlights three different models—a single-tenant arrangement with separate databases and separate schemas, a shared database with separate schemas, and a shared database approach with a shared schema. Cost can be an influencing factor in the extent to which a firm is comfortable with any of these models, as the more that is shared between tenants, the cheaper the arrangement—maintenance and development costs are lower if software and hardware are shared.
The term "data utility" has increasingly become a part of the data management lexicon over the last few years. It is fundamentally based on the concept of a multitenant environment where data is collected from multiple financial institutions, aggregated, cleansed, and validated, and a golden copy record of that data is stored centrally for use by all participants. This is very much a collaborative golden-copy creation process—data is compared between financial institutions before validation occurs.

Though this utility concept has been much discussed and has even been moderately successful in certain areas—such as in the legal entity data and Know Your Customer (KYC) universe, with the approach of the Depository Trust and Clearing Corporation’s subsidiary Avox (a collaborative effort focused on the collection of company data)—it has not yet made a significant dent in the reference and market data universe. Many firms remain wary of ceding commercial edge, even in the relatively innocuous area of reference data, and of sharing private client data on a common industry platform that is perceived to be less secure than on-premises data storage. Despite the slow start, an increase in the number of so-called utility services on the market highlights the economic benefits of sharing data and scrubbing tasks across firms.

Some of the utility offerings are not what they first appear however, and are in fact managed services that offer either separate databases with separate schemas or a shared database with separate schemas. Instead of creating a single golden copy to be shared across firms, these services tailor their data provision to an individual firm's requirements.

The concept of a data utility can also potentially be viewed within the context of a crowdsourcing environment that is hosted in the cloud (likely a public cloud). Under this scenario, clients can opt to contribute their data to a shared environment in which the community of users can change and correct that data in a similar manner to the addition of content to online encyclopedia Wikipedia. Reference or market data could be treated in such a manner in order to significantly bring down the cost of scrubbing and cleansing this data in house.
DATA MANAGER PERSPECTIVES

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. A mid-tier European asset manager interview respondent notes that the market retains a degree of fear about security, even though cloud technology in the context of reference or market data is "useful in principle."

Cloud technology is also often perceived by data management people to be a cost-driven initiative; hence, one of the top-tier asset management interview respondents indicates that the respondent’s company is not currently pursuing a cloud approach because the company’s focus is not on cost saving in reference data. The firm has concerns that such an approach may impact customer service and would not therefore deploy a cloud technology unless it was assured of substantial savings that it could then reinvest in customer service initiatives.

A mid-tier asset servicing interview respondent supports this notion and is considering cloud technology in the future because of the prohibitive cost of data storage over time; the firm is keen to future-proof itself against significant increases in data volume resulting from regulatory compliance requirements. The firm is not actively evaluating the market, however, because of concerns about the reliability of such solutions. It is most concerned with accessibility and connectivity via a Web-based interface that it feels could be negatively impacted by external factors. It is therefore adopting a conservative wait-and-see approach to the technology—holding back until first movers have proven the capabilities of the technology in the realm of data management.

PUSHING BACK ON DATA VENDORS

One area of increased interest in the application of cloud technology from the point of view of the data management community is in supporting the more active management of market and reference data vendor feeds. There is a desire within the community to rationalize the usage of these feeds across their enterprises and strip out any unnecessary costs, for example where data is being provided to teams and functions that do not require it. Given that a few large players dominate the market, there is also some degree of interest in seeking cheaper alternatives that have lower annual licensing charges and in bringing greater competition into the space overall.

Accordingly, cloud technology can be used to aggregate data from a range of vendors and data providers and to take away the requirement for firms to maintain multiple vendor interfaces, though the direct relationship with the vendor remains with the firm. The technology can also provide an integration and comparison framework for the management of vendor data quality, enabling firms to push back on vendors if they feel certain items are incorrect or in need of improvement. On the data vendor side, this approach also grants niche providers focused on supporting specific asset classes the opportunity to offer their services to the wider market.

The adoption of cloud technology is predicated on firms moving their operating cost model from a shared-cost to a unit-cost model in order to allocate costs back to business units based upon...
usage. This sits well alongside the notion of metering market data vendor feeds and adopting a similar mechanism for data usage across business units.

THE IMPORTANCE OF AN SLA

Given the concerns voiced by data managers about cloud technology, there is a desire for a strong SLA to be established in order to ensure that providers of these solutions are held to account. An asset servicing respondent noted that in order for the firm to sign off on such a solution the firm would demand a punitive SLA that guaranteed security and 99.9% accessibility. A top-tier investment bank that is currently evaluating cloud technology for potential future deployment noted that the vendor SLA it is seeking should guarantee full control, privacy, data alignment, and cost reduction. Table A presents other sample requirements often cited by market participants who Aite Group interviewed for this study.

Table A: Sample Requirements of Cloud SLA Details

<table>
<thead>
<tr>
<th>Sample requirements</th>
<th>Performance guarantees</th>
<th>Scalability</th>
<th>Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guaranteed minimum latency around response time</td>
<td>Data retention/backup guarantees</td>
<td>Uptime/availability guarantees</td>
<td>Technical support requirements</td>
</tr>
<tr>
<td>Monitoring access</td>
<td>Data location</td>
<td>Sharing of potential liabilities</td>
<td>Regulatory compliance</td>
</tr>
</tbody>
</table>

Source: Aite Group survey of 21 capital markets participants, March and April 2014

KEY ELEMENTS OF DATA MANAGEMENT IN THE CLOUD

Focusing on the potential role of cloud technology in data management, 62% of the respondents cited 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 23), also reflecting the external and internal push for increased transparency and a data audit trail.
In terms of specific data sets perceived as ideal for cloud initiatives, respondents select market data, instrument data, and corporate actions as the top three choices (Figure 24). Market data is at the top of the list because of its perceived neutrality in terms of confidentiality and privacy issues—it is externally provided by third parties and common across participants, so is ripe to be stored in the cloud. On the other hand, many respondents indicate that there is a certain level of security sensitivity associated with transactional and performance data due to their typically confidential nature, often related to clients. The storage of these data types is therefore deemed to be less suitable for the cloud environment (in the short term at least) because of the desire to keep them on premises.
Closely associated with cloud technology, an overwhelming number of respondents declare business intelligence tools as "important," though 65% of the respondents point out that they would not be a deciding factor in cloud adoption (Figure 25). Data managers often independently assess business intelligence tools (separate from cloud projects) as part of a data quality or operational risk improvement program.

Figure 24: Data Best Suited for the Cloud

Q. Which data sets are best suited for a cloud environment? (N=21)

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market data</td>
<td>52%</td>
</tr>
<tr>
<td>Instrument data</td>
<td>43%</td>
</tr>
<tr>
<td>Corporate actions data</td>
<td>33%</td>
</tr>
<tr>
<td>Regulatory compliance data</td>
<td>29%</td>
</tr>
<tr>
<td>Risk data</td>
<td>24%</td>
</tr>
<tr>
<td>Positional or transactional data</td>
<td>24%</td>
</tr>
<tr>
<td>Legal entity data</td>
<td>24%</td>
</tr>
<tr>
<td>Performance data</td>
<td>19%</td>
</tr>
</tbody>
</table>

Source: Aite Group survey of 21 capital markets participants, March and April 2014

Figure 25: Importance of Business Intelligence Tools

Q. How important are business intelligence tools? (N=21)

- Very important: 25%
- Important but not deciding factor: 65%
- Not important: 10%

Source: Aite Group survey of 21 capital markets participants, March and April 2014
Regarding another capability typically associated with cloud technology, the respondents’ views on mobile consumption of data yield surprising results, with 40% of the respondents considering it a "very important" part of the overall cloud experience. Those that deem it "not important" (35%) largely hail from the data manager community and do not currently focus on this aspect of data consumption for internal or external users.

**Figure 26: Importance of Mobile Consumption of Data**

Q. How important is support for mobile consumption of data?  
(N=21)

- Very important: 40%  
- Important but not deciding factor: 25%  
- Not important: 35%

*Source: Aite Group survey of 21 capital markets participants, March and April 2014*
TIPPING POINTS FOR INVESTMENT

There are numerous internal and external drivers for investment in cloud technology, ranging from shrinking staff numbers to increased regulatory reporting, but tipping points in the realm of data management seem to be largely related to ensuring the future scalability of the function in the face of widespread cost-cutting measures. The post-crisis market structure and regulatory changes that are in the process of being implemented across the globe have pushed data managers to re-evaluate their current technology environments and manual processes. Cloud technology—whether private or public—could enable these firms to support and manage higher volumes of data without requiring significant ongoing internal investment.

- Unsurprisingly, **TCO** will be one of the most convincing proof points for any cloud technology assessment—proving the potential for and then realizing significant ongoing savings will ensure budget signoff from the C-level initially and year over year.

- The **ability to scale data management tasks** during periods of regulatory or market pressure, such as before a reporting deadline, will be key to firms’ ongoing commitment to cloud technology.

- The **increasing burden of regulatory reporting** in North America, Europe, and the Asia-Pacific region could be a tipping point for investment by top-tier investment banks, custodians, and asset servicers that are currently considering cloud technology in a more conceptual (rather than actively practical) sense.

- Because SLAs will need to include guaranteed levels of security and availability, the **assessment of failover arrangements and business continuity support** will be an essential part of any evaluation process. Punitive measures against service providers that grant firms some recourse if things go awry may be required as part of these SLAs in order for firms to feel more in control of the arrangements.

- The **sales cycle for cloud adoption in the realm of data management** will not be quick, especially for first movers from the sell-side community—the move is as much a cultural change as it is a technological one.

- Data management is a relatively conservative function; hence, **many will wait for first movers to either sink or swim** before they venture to implement cloud technology themselves. This could include another part of the same firm implementing cloud technology in order to support a function such as research and development or systems testing.

- Many of the same success factors against which on-premises deployments are judged will apply to data management deployment in the cloud—removal of risks related to manual processes, reduced time to support new asset classes, and improvement in data quality, etc.—but there is likely to be more emphasis within cloud evaluations around **technology support and investment**. These deployments will need to be proven cheaper than on-premises options.
CONCLUSION

Market participants are gradually leaving their initial concerns about cloud technology behind as they look to leverage the various cost-saving benefits of cloud-based services and also actively seek out market innovation and competitive edge. Key takeaways from this study include the following:

- Regulatory compliance, cost control, and client management are top three drivers for strategic IT investment for the survey respondents.

- Delivering cost savings, achieving scalability, and efficiently conducting high-performance computing are a few of the important drivers of cloud adoption in capital markets.

- Concerns still exist around security, but over the next 24 months, those without any clear strategy around cloud technology are expected to become part of the cloud adoption curve (even if this only involves a more active evaluation of the offerings on the market).

- Data management and storage has been the most common use case behind the current wave of cloud adoption, but market participants are also looking to leverage cloud-based services for risk management and trade analytics.

- DaaS is a growing concept in which data is provided on demand to the end user and the service provider is responsible for all data cleansing and management functions.

- First movers will pave the way for the more conservative players in the market with regard to the application of cloud technology in a data management context.
ABOUT XENOMORPH

Xenomorph is the leading provider of analytics and data management solutions to the financial markets. Risk, trading, quant research, and IT staff use Xenomorph’s analytics and data management solutions at investment banks, hedge funds, and asset management institutions across the world’s main financial centres.

CONTACT

For more information on Xenomorph, please contact:

Sales
London: +44. (0)20.7614.8600
New York: +1.212.401.7894
Singapore: +65.6408.0547
info@xenomorph.com

For all press inquiries, please contact:

Cognito
+1.646.395.6300
xenomorph@cognitomedia.com
ABOUT MICROSOFT

A changing industry landscape is unlocking new opportunities, and financial institutions are looking beyond the near-term to drive profitability and growth through sustainable innovation. Game-changing technologies are enabling this wave of innovation to meet new customer expectations, improve transparency, and stay competitive against non-traditional industry entrants. Microsoft is uniquely positioned to provide financial institutions with solutions to attract and retain customers, drive customer insight, manage enterprise risk, and support mission-critical operations. Through a combination of Microsoft and partner solutions, financial institutions can turn data into insight, transform ideas into action, and turn change into opportunity.

CONTACT

For more information on Microsoft, please contact your local sales office:

www.microsoft.com/worldwide

For all press inquiries, please contact:

Waggener Edstrom Worldwide
+503.443.7070
rrt@waggeneredstrom.com
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.

CONTACT

For more information on research and consulting services, please contact:

Aite Group Sales
+1.617.338.6050
sales@aitegroup.com

For all press and conference inquiries, please contact:

Aite Group PR
+44.(0)207.092.8137
pr@aitegroup.com

For all other inquiries, please contact:

info@aitegroup.com