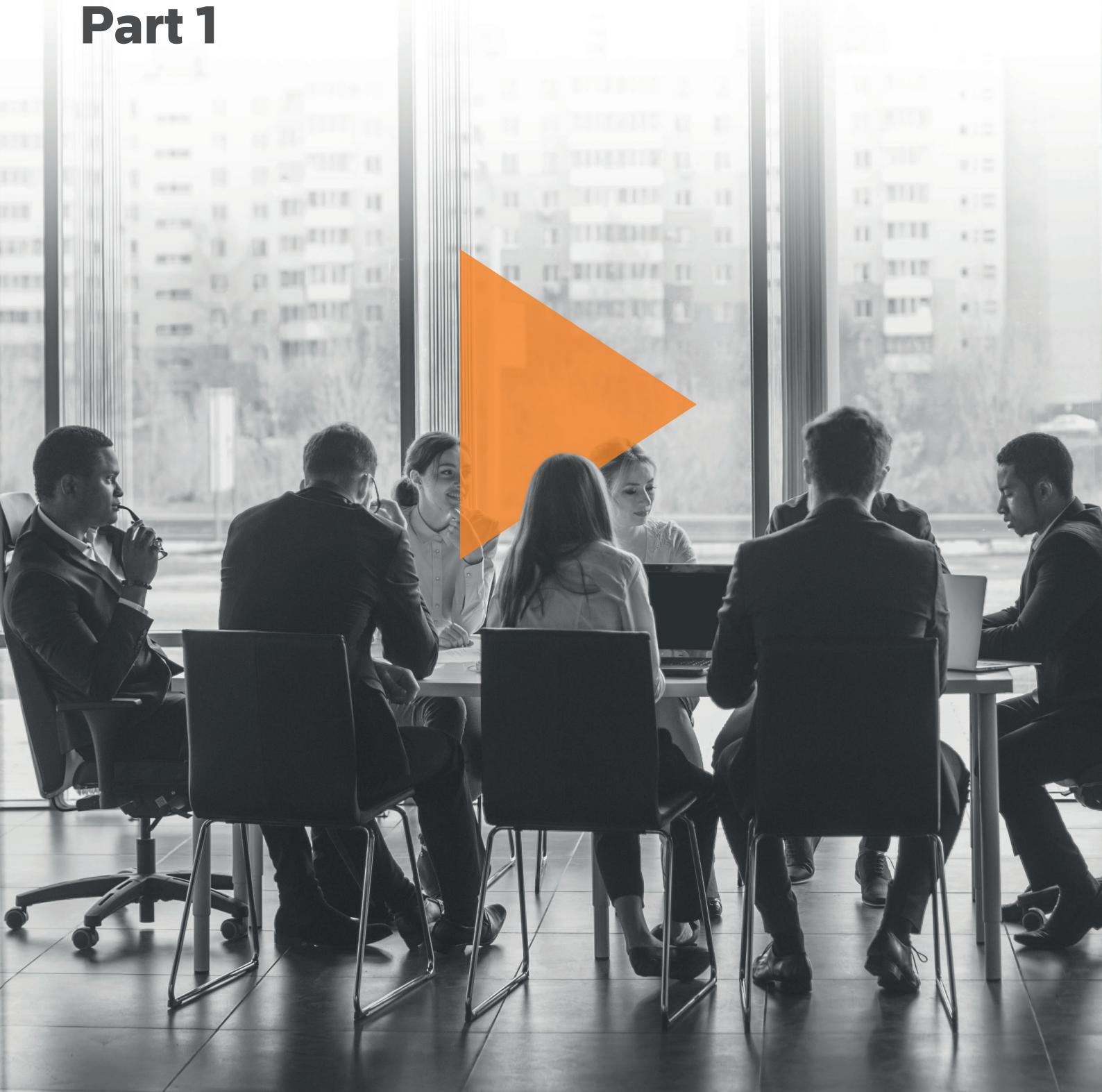


Public cloud survey report

Part 1



Executive Summary

Thomson Reuters has conducted a survey of 250 senior stakeholders within the financial services industry including CTOs, CIOs and CDOs responsible for shifting their company's assets to the public cloud.

Brennan Carley

Global head of enterprise at Thomson Reuters



Within a highly conservative sector that previously regarded the public cloud with caution, if not suspicion, the survey surfaced an overwhelming desire to access the benefits that are transforming other industries.

The arguments for public cloud adoption found favour among CIO respondents and more aggressive boards, although market data managers appeared to be more restrained in their enthusiasm. Public cloud benefits are multifaceted and while cost reduction topped the wish lists of respondents, improved agility, security and scalability were among the capabilities coveted by the financial services sector.

Some of the headline findings are set out overleaf and covered in more detail in the following chapters of this report, which investigates adoption rates, business imperatives, operating strategies and obstacles and challenges to cloud migration.

Public cloud offerings have reached a level of maturity that satisfy the concerns of a highly regulated industry and the survey indicates a tipping point has been

reached in terms of acceptance in the financial service industry. But the route to destination cloud is not obvious and players are forging a path depending on their business goals legacy constraints. With no off-the-peg roadmap to cloud, the survey revealed a fragmented picture of cloud implementation, with 43% engaged in a 'lift and shift' exercise, while a 62% majority have re-engineered processes to be fully cloud native.

These disjointed journeys may reflect the fact that back and middle office functions were early financial services arrivals in the public cloud, and cost reductions were achievable with a straightforward 'lift and shift' approach. But the next phase of applying big data and artificial intelligence to real time market data is fuelled by bolder ambitions and needs an integrated and deeper approach: the 61% of respondents committed to cloud economics, suggests that a new phase is well underway.

The impetus for this next phase is coming, not from inherently conservative market data managers, but next-generation data scientists and experimenters, and it does not appear to

be a centralised effort: fewer than half of European companies (40%) operate a clearly defined cloud strategy and fewer still have the equivalent of a Cloud Tsar. Conversely, European financial firms (83%) had the highest number of cross functional cloud teams, an intrinsic element of successful cloud economics.

An overriding reason for the current surge to public cloud revealed by the survey however, is simply that reasons not to migrate have decreased. Security is no longer perceived as a barrier to public cloud, but rather as a business driver. Likewise, companies are not looking to the public cloud as a way of simplifying environment and taking cost out, but as a means to deploy latest AI technologies: it's hard if not impossible to deploy these kind of advanced capabilities in on-premise data centres.

The intelligence, technology and human expertise
you need to find trusted answers.



The increasing role of public cloud

Chapter 1





In 2018 the use of public cloud is growing fast in the financial services industry

“Most financial services firms we’re talking to intend to move to public cloud, a major shift from a year or two ago. There’s an important industry pivot taking place in the thinking and timing”

Brennan Carley, Thomson Reuters

A study by Thomson Reuters reveals the financial services industry has reached a major inflection point in its adoption of public cloud, a disruptive technology the sector has so far treated with cautious optimism. Over half of the financial services firms surveyed are exploring public cloud with proof-of-concept processes or are engaged in active rollout; one in four will use public cloud for the majority of its market data needs within the next year.

Benefits of public cloud begin to outweigh security concerns

Figures for IT budget committed to public cloud, uncovered by the Thomson Reuters research, further reflect a new confidence and optimism. Investment in public cloud is set to increase, with financial firms reporting that investment will grow to 47 percent of IT budget in 2019, up from 30 percent in 2017. The IDC Worldwide IT Spending Guide confirms that nearly \$26 billion will be spent on public cloud in 2018 by financial institutions in Western Europe.

The data depict a turning point for the finance industry, whose prioritization of stability and security of service has so far muted its appetite for public cloud. Adoption by financial firms has been stymied by concerns around security,

compliance, vendor lock-in, and fear of losing intellectual property, not to mention retaining control of critical core banking systems.

However, the benefits of agility, elasticity, time to market and on-demand provisioning afforded by the hosting of data, systems and applications in a public cloud are convincing institutions that the time is right. According to Brennan Carley, global head of enterprise at Thomson Reuters, “Directionally, most financial services firms we’re talking to intend to move to public cloud, a major shift from a year or two ago. There’s an important industry pivot taking place in the thinking and timing.”

The banks have always been significant investors in technology, with the result that they are heavily invested in complex and expensive systems to manage the data they need to operate. Unpicking these systems while ensuring overall reliability and performance is not easy. Add to that the stringent regulatory burdens faced by financial firms, and it becomes clear why it is only now that the industry is making the shift to cloud.

High-profile players lead the way

The timing of the move is down to a confluence of motivators and enablers, says Carley, including high-profile success stories that have legitimized public cloud for banks, asset managers, and other financial firms. The declaration by JP Morgan last year that it would move wholesale banking applications that manage trading transactions to the cloud was one such seismic shift. "Get a bank of that stature shifting, and it makes it easier for everyone else to do the same, as cloud advocates can point to successful changes made by peers," says Carley.

Another incentive for institutions to take the plunge is the rapidly maturing public cloud offering, which places firms more squarely in their comfort zone. Growth for Microsoft, Amazon, and Google has accompanied provisioning for businesses that are highly regulated. "A couple of years ago providers didn't have the geographic coverage to meet requirements for data residency for data to be stored in country or in-region," notes Carley.

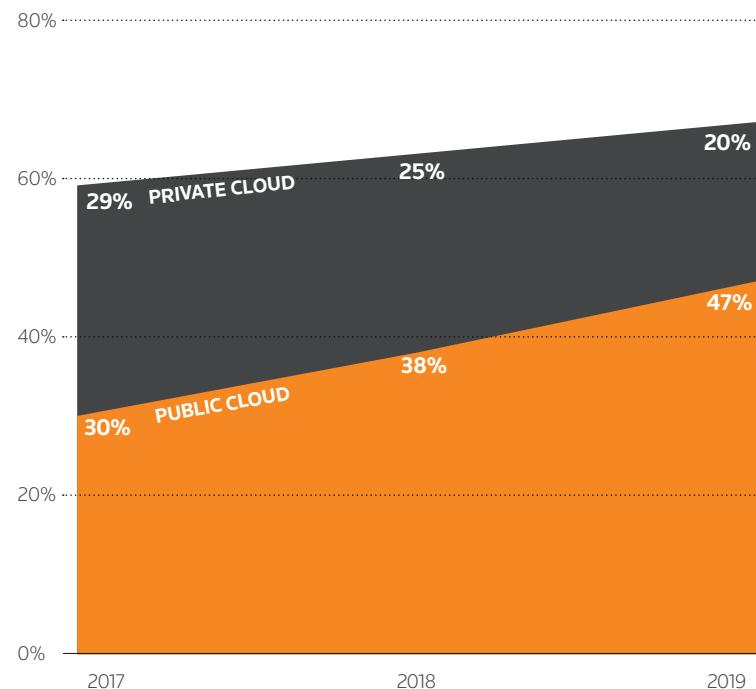
25%

will use public cloud for the majority of market data needs within one year

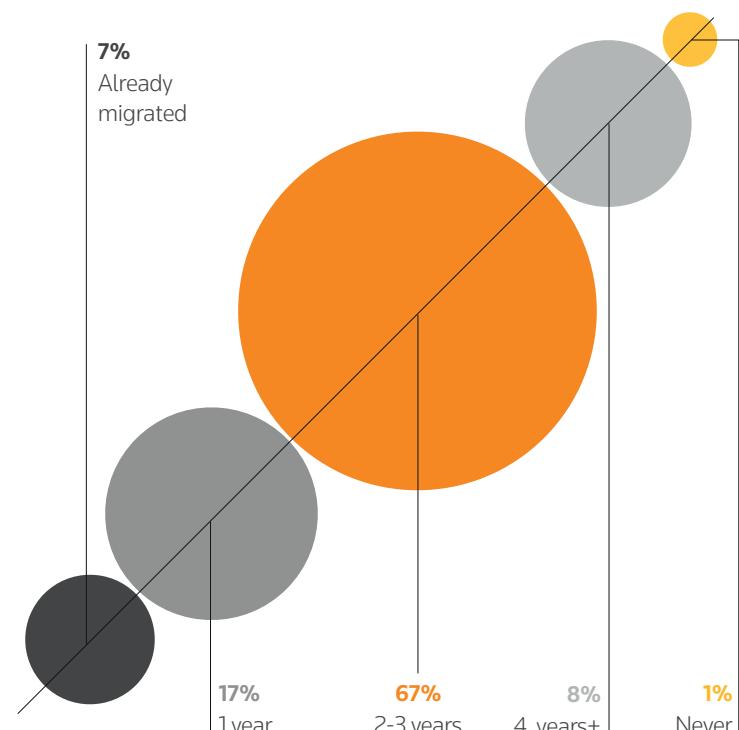
52%

are already either exploring using public cloud with proof of concepts or rolling out implementation

Percentage of IT budget committed to the cloud



Financial firms planning to use the public cloud for the majority of their market data needs



Cloud providers now have a more pervasive physical presence around the world, and their provisioning to meet regulatory requirements has evolved. Operational robustness and integrity of performance have also matured, while security has advanced. Most cloud providers are proactive about obtaining certifications and independent audits that keep the regulators happy, and indicate that public cloud is fit for the rigorous demands of financial firms.

Given the incentive of stellar case studies, such as that of Capital One, and the maturing of a still youthful technology, the common conclusion is that there are fewer excuses not to move. Capital One lists the ability to provision infrastructure on the fly, the elasticity in handling purchasing demands at peak times, high availability, and pace of innovation as advantages of public cloud. As Carley, puts it, "Many of the reasons for financial firms not to move to public cloud have fallen away."

The new role of AI

Institutions are looking to the cloud to enable technologies such as AI, and not simply seeking ways of simplifying the environment and reducing cost, says Carley. "Combining clean financial data

with the cloud means firms can exploit advanced machine-learning capabilities that are arriving on the market, giving themselves an innovation edge."

Developments such as AI advances indicate that public cloud will be transformative for market data—the price- and trade-related data for financial instruments reported by trading venues. Once market data is in the cloud and accessible for experimentation, innovation is inevitable; the 67 percent of institutions surveyed intending to put market data in the cloud is indicative of a new adventurous era for banks and financial players.

A typical enterprise use case for market data is in the quantitative and systematic hedge funds space, which analyses trading signals from data to prompt buy and sell decisions.

Algorithms analyze increasing volumes of data in increasingly novel ways to better identify alpha-generating signals or manage trading risk, explains Carley: "Apply big-data and machine-learning techniques to market data and you can find and exploit more tradable signals."

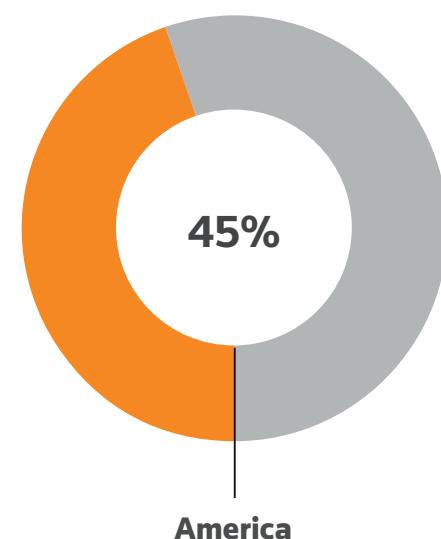
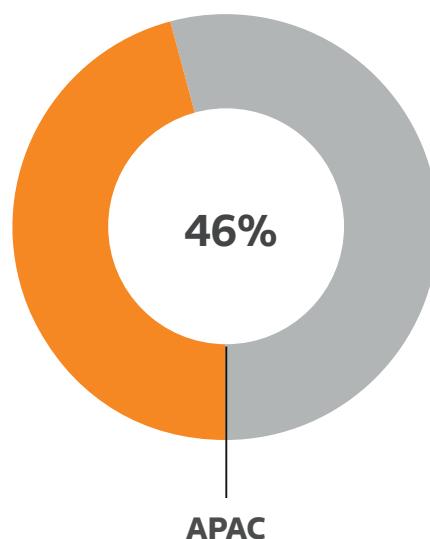
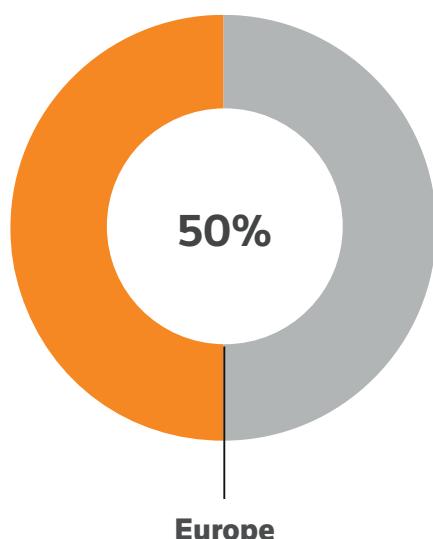
Some personnel within financial firms are more evangelical about public cloud

than others. For example, CIOs forecast 54 percent of IT budget would be dedicated to public cloud in 2019, representing a 10 percent increase over 2018, and over 10 percent more than market data managers.

Public cloud has arrived in the financial industry, and Carley compares its revolutionary power to the arrival of the Internet in the late 1990s. "People said it then was a newer, better, cheaper, faster form of communication. But Jeff Bezos looked at it and saw in five to ten years' time tens of millions of people would be connected to the internet and would want to buy stuff. Public cloud is not just a technology evolution but a market transformation. That transformation is now shifting to the financial markets, and just as consumers moved to the internet, data hungry applications are beginning to move to public cloud."

Percentage of IT budget spent on public cloud in 2019

● 2019



Public cloud gains ground across applications

Chapter 2



Use of public cloud is extending well beyond non-customer facing functions.

"Technology used in the trading space will move to the cloud at different speeds; applications that are not latency sensitive, such as end-of-day reporting, are easier to move to public cloud"

Marion Leslie, Managing Director, Enterprise at Thomson Reuters

It's an exciting time to be in financial services with adrenalin levels stimulated by a migration to the public cloud that is ushering in a new era of innovation. While levels of cloud adoption are not uniform, Thomson Reuters' survey data charts a common journey that begins in data science and innovation use cases, moves to the back office, continues to middle office and compliance, and culminates in front office pre-trade and trade.

Public cloud serves an increasingly wide range of functions

A large percentage (61 percent) of back-office infrastructure, including treasury, HR, accounting and other non-customer-facing functions have already been migrated, giving banks vital experience and a confidence boost in public cloud. Risk-management activities in the middle office (47 percent) and compliance (42 percent) follow close behind. Trade (33 percent) and pre-trade (32 percent) notched up nearly a third each for respondents currently using public cloud.

As the research shows, compliance systems are a good fit and an early

arrival in the public cloud: regular reports can be processed cheaply, and private cloud is an unnecessary premium. "Compliance needs to be done accurately and within deadline – there's no other option," says Marion Leslie, Managing Director, Enterprise at Thomson Reuters.

Equally, the much heavier migration in back office and lower rates in pre-trade and trade "should be expected," adds Leslie. She says issues associated with performance are not yet fully solved: "Technology used in the trading space will move to the cloud at different speeds; applications that are not latency sensitive, such as end-of-day reporting, are easier to move to public cloud."

Despite these challenges, a combination of internal proof points and public-domain use cases for public cloud are whetting appetites to apply the disruptive technology to the front office. Thomson Reuters' survey reveals that the industry has already embarked on a sharp adoption trajectory: 71 percent and 73 percent of companies have either migrated or are in the process of migrating in trade and pre-trade respectively, according to Thomson Reuters, where public cloud promises to yield the highest rewards in terms of revenue generation.

A tipping point in uptake

Uptake has accelerated over the past two years, partly because this conservative sector has responded with alacrity to public declarations of allegiance to the cloud by influencers such as JP Morgan. However, this is no lemming-like rush, but a tipping point, Marion Leslie notes: "It's not a black and white issue, where people sit on the sidelines and suddenly jump in, but an incremental change in mindset and culture."

Leslie says internal influencing has shaped this migratory shift, as well as aspirational use cases in the public domain: "Look within any of the banks, and they have set up departments, filled with data scientists who are tasked with innovation, and opportunistic about exploiting new technologies. As they get results, they're demonstrating that it is viable; that kind of influencing behavior is having an effect."

"There's an accelerated growth toward public cloud adoption, and it wasn't that way a few years ago," agrees Chad Duncan, technology advisory cloud enablement lead at Accenture Financial Services. He also observes a slower adoption curve for financial services than in other sectors.

"Uptake will be driven not by market data people but by the users of the market data."

Brennan Carley, Thomson Reuters



"The main difference slowing financial services compared with other industries is legacy technology. The industry's core banking and trading platforms are relatively old, and to get over the hurdle of updating and modernizing applications is quite a feat." Data sets, too, are more complex, notes Duncan, often involving social security numbers and core bank account information, which has to be secure and protected—another reason for a slower move.

Because of the ubiquity of complex legacy systems within financial institutions, the use of micro-services to break down monolithic applications is an attractive proposition, as confirmed by its being the most frequently occurring step undertaken by respondents to maximize the benefit of public cloud. But rebuilding them on

the public cloud represents a significant task. "Most financial services firms have the majority of their data stored on legacy systems, and getting it off into cloud to enable analytics is a big step," says Marion Leslie.

Likewise, the transition from a capex to an opex budgeting model—a significant driver to the public cloud across multiple industries—presents a more convoluted transition for the industry, says Leslie. "Clients invested heavily in private cloud systems: they are asking themselves whether they need to reinvest and repeat, or go to a public version."

A range of factors is therefore at play in the timing of migration of the financial services sector as a whole to the public cloud. The conservative nature of the

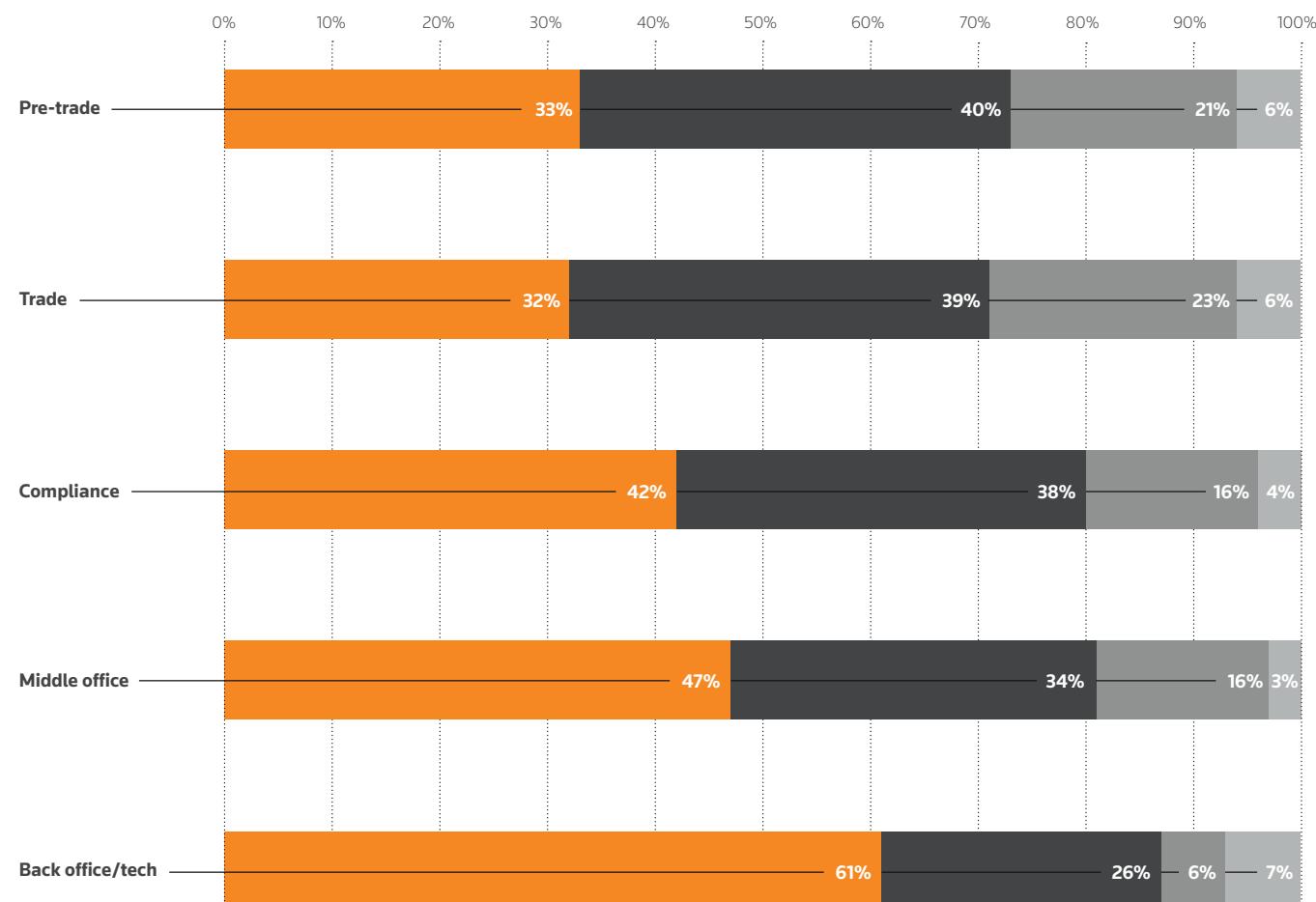
industry, old technology, and monolithic systems that need to be converted all exert a drag on adoption. More than anything, however, risk management and regulatory compliance determine the order of deployment of systems, data, and applications by department to the public cloud.

"The back office, consisting of treasury, HR, and other non-business-critical stuff is a no-brainer to move to cloud," says Dr Daniel Gozman, senior lecturer at the University of Sydney, and honorary fellow at Henley Business School. "If a cloud-hosted front office fails in trades, there is a much more serious impact than merely not being able to process account information so quickly," he points out.

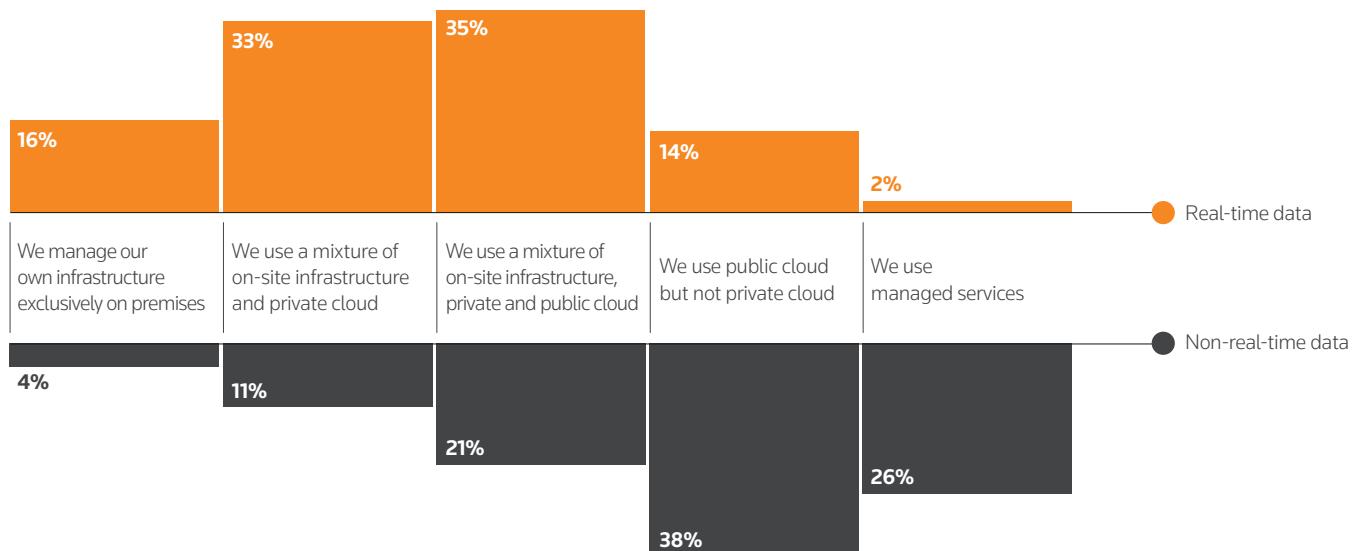
Point where majority of infrastructure will migrate to public cloud

Back office functions are leading the way in adoption but front office are already realizing the benefits

- Already moved
- Currently migrating
- Not yet migrating
- Never



Market data infrastructure management method



Confirming these adoption priorities from the heart of the team making a transition to public cloud is Dan Phelps, chief architect at foreign exchange giant, Travelex. "When I joined three years ago, back-office systems, such as HR, were moving to the public cloud, but trading systems remained on-premise." The latter have since moved, and while Travelex hasn't yet moved market data, it is part of a two-year plan, says Phelps.

"We currently have a Thomson Reuters box in our data center that provides FX rates, and we move that data within systems on premise, and then to our trading platforms in the cloud," says Phelps. He doesn't believe putting market data in the cloud is any riskier than storing other types of sensitive data. Nonetheless, Travelex's decision to stream market data in the cloud after it has shifted other applications reflects the adoption curve revealed by Thomson Reuters' research.

Ideal for non-real-time market data

The survey indicates a clear difference between the present adoption rates of

public cloud for real-time and non-real-time market data (14 and 37 percent, respectively). Thomson Reuters' Brennan Carley cites trading in FX or equities, with the need to process tens of millions of updates per second, and for latency to be no more than a few microseconds. "In that instance, there is probably no rush to move to cloud," he says.

In contrast, wealth portals present the easier use case for non-real-time market data—a "bursty," or intermittent, kind of application that would otherwise sit idle on expensive on-premise kit when not in use. "Consumers can check online what their portfolio is worth today; those things can move relatively easily and quickly to the public cloud because performance is measured in human time and not microseconds," says Carley.

Increasing the appeal of public cloud for real-time market data even more than improved processing power or latency, however, is the prospect of applying AI and machine learning. AI tools offered as a service from the cloud can identify patterns in data that

may offer trading or investment opportunities. "This uptake will be driven not by market data people but by the users of the market data," predicts Carley.

It's a proposition that is motivating the final leg of Travelex's journey to public cloud, confirms Phelps: "Locating market data in the cloud with access to associated technologies means you can stream it in real time and manage stock levels and pricing in real time. As well as more responsive decision-making, you can apply AI on the top of decision-making. It's the direction Travelex wishes to travel."

Our next installment in September discusses the benefits of the cloud and potential security concerns. If you'd like to discuss your cloud-data requirements with us in more detail, please contact us [here](#).