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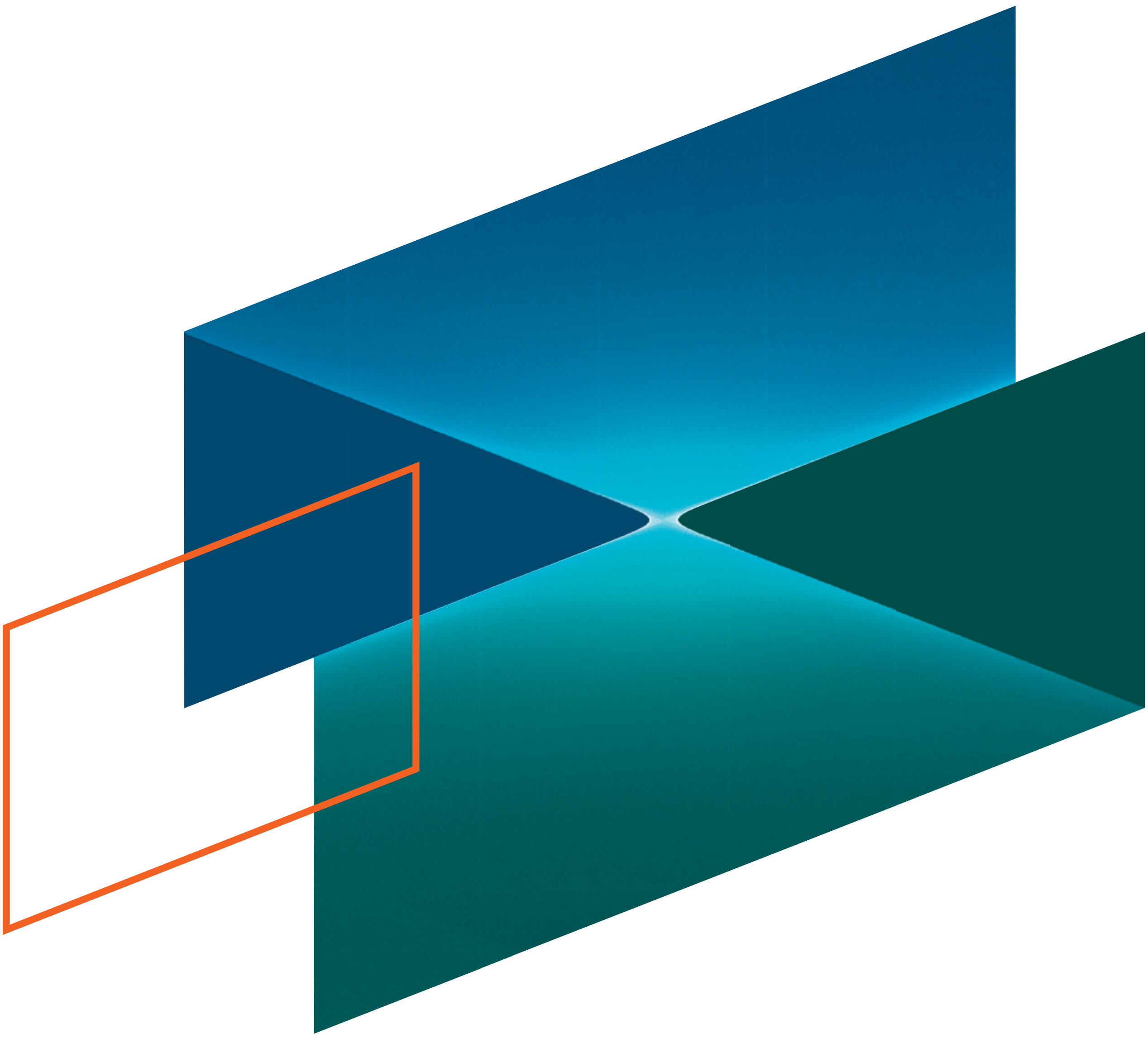
The *Evolution* of Public Asset Owners

New imperatives for a changing world



Introduction

Public asset owners, including sovereign wealth funds, public pension funds and central banks, collectively hold over US$40 trillion in investable assets.[1] Their scale gives them the power to move and shape markets locally, regionally and globally. But today, the public asset owner landscape is in a state of flux.

The structural evolution of capital markets is compelling public asset owners to reassess their roles, objectives, investment strategies and operating models. While recent geopolitical and macroeconomic turbulence has accelerated this evolution, it is likely to continue over the medium to long term. As this report shows, the ways in which public asset owners adapt will ultimately influence the broader investment ecosystem, with leaders in the sector setting the tone for financial services and, at times, society.

As a central orchestrator of the financial ecosystem, BNY Mellon works closely with public asset owners and the many institutions on which they rely. This privileged position gives us a unique opportunity to develop and share a comprehensive picture of public asset owners' evolving ambitions, challenges and paths forward.

To paint this picture, we interviewed more than 90 senior leaders from almost 50 institutions globally (excluding the United States), representing nearly US$9 trillion in assets. In addition, we collaborated with the Official Monetary and Financial Institutions Forum (OMFIF), a leading think tank among public investors, to survey public asset owners on their operating models.

Our objective is to help public asset owners adapt to increasing demands and expectations, share best practices and learn from others' experiences, and ultimately accelerate their ambitions and impact. This research provides a foundation for delivering on that promise. Moreover, it represents a critical element of our obligation to help individuals and institutions succeed across the financial world.

Executive Summary

Senior leaders at public asset owners face a once-in-a-generation moment. Old assumptions that helped guide their strategies have started to lose relevance. Technology and innovation have created new demands while allowing public asset owners to reimagine what is possible. In addition, stakeholders and beneficiaries of public institutions have new expectations, such as sustainability and transparency. These high pressures for change will draw a clear line between the present and the future. Public institutions must and will radically transform.

Yet these changes also represent an opportunity. Public institutions that succeed in breaking out of old patterns will play a new role in financial ecosystems and amplify the impact they can have on society more broadly. To understand this transformation, we undertook a comprehensive effort to speak to multiple senior leaders across public institutions and conducted a survey to gather broad quantitative data.

The insights from these efforts are presented here for discussion to help public asset owners navigate complexity and shape their future decision-making. Our findings provide a roadmap for evolving ambitions, shifting investment mandates and transforming operating models – with data and technology at the core.

Public asset owners seek more boldness and creativity in searching for yield.

- **Almost all are actively exploring new asset classes, products and investment strategies.** Central banks are extending into equities, while public pension funds increase allocations to alternatives and sovereign wealth funds test digital assets and take more active roles in shaping market structure.
- **Securities lending is on the rise, and one-third of those surveyed will initiate or expand programs over the next five years.** New tools and market models help them alleviate concerns, supported by shifting regulatory winds and more flexible systems.
- **Nearly 70% have taken on sustainability-themed or impact investing.** While adoption and approaches vary widely, most are embracing an environmental, social and governance (ESG) obligation. However, the availability of reliable, transparent and comparable ESG data remains a challenge.

Public asset owners are willing to reexamine and redefine every element of their operations.

- **Only 6% of survey respondents are satisfied with their operating model.** As public asset owners look to optimize yield, they face complex choices between operating model simplicity versus purposeful customization.
- **A solid majority (63%) have begun operational transformations.** To meet changing public demands, investment mandates and portfolio models, public asset owners are adapting or overhauling their operating models that enable the front, middle and back office.
- **Over two-thirds (68%) will change the balance between internal and external portfolio management over the next five years.** Approaches vary meaningfully, with no single answer as to the right mix of internal versus external portfolio management. Typically, institutions externalize to gain experience while they internalize to reduce costs or build permanent, local capabilities.

Digitization lies at the root of innovation and change.

- **60% view data integration and end-to-end visibility as top priorities.** Public institutions have begun to account for the importance of data, seeing the ability to seamlessly digest, analyze and apply data insights across the front, middle and back office as a source of alpha.
- **Senior leaders consistently highlighted five common data challenges:**
  1. Clarifying purpose
  2. Addressing fragmentation
  3. Accounting for diverse data types
  4. Standardizing reference data
  5. Fostering a data culture
- **Technology discussions center on the promise of cloud computing and the challenges of cybersecurity.** While political sensitivities and security concerns led some to use only local servers, new national solutions and the promise of future scalability are prompting a shift to the cloud.

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Public Asset Owners Are Standing at a Crossroads

Profound societal, economic and technological changes have upended many of the norms and expectations that had held sway since the financial crisis of 2008-2009. Our interviews with over 90 senior leaders from nearly 50 public asset owners globally revealed six megatrends that acutely influence their priorities, investment strategies, operations and future.

90
senior leaders interviewed

50
public asset owners participated

6
megatrends revealed

Shifting Up for Yield

A decade of historic lows has pushed public asset owners to embrace diversification and look beyond traditional portfolios focused on sovereign fixed-income holdings. Conservative central banks have explored corporate bonds and equities. Public pension funds have made significant moves into alternatives. The most sophisticated investors (typically sovereign wealth funds) have widened their multi-asset strategies to include new types of alternatives, including hard assets and market infrastructure. Finally, the need to generate returns has prompted many public asset owners to reconsider securities lending.

ESG: Imperative, but Ambiguous

Most public asset owners interviewed now consider ESG factors in their investment strategy, manager selection or exclusion lists. Some even play an activist ESG role. The practicalities of incorporating ESG into investments and operations are now the key challenge. Many public asset owners are exploring how best to balance ESG objectives, investment performance and the need to substantiate their ESG advances, while issues surrounding ESG data along with a lack of consensus on evaluation and analytical methodologies hinder ESG progress.

A Growing Focus on Transparency

Leaders we interviewed say that stakeholder expectations have raised the pressure to be transparent. As a result, many believe they need to be able to provide the public and media with near-instant insights into strategy and investments. Transparency must also be provided in new ways. For instance, leading public pension funds use innovative technology to build simulation exercises, interactive apps and comprehensive lifestyle overviews that enable members and beneficiaries to engage directly with their investments.

Accelerating Change and Mounting Threats

Public asset owners believe that new technologies – including digital ledger technology, artificial intelligence and the cloud – have the potential to streamline the investment process and enhance operational alpha. Many have already experimented with such solutions, accelerating efforts due to COVID-19. However, most institutions have yet to take full advantage of new technologies, mainly because of the complexity of integrating with their existing operations. And with technological advancement come new threats: Cybersecurity is a top concern for many public asset owners. Strikingly, all of the public asset owners we spoke with felt they could be better prepared for cyberattacks.

Addressing the Data Challenge

Most public asset owners describe data as a vital source of value, with better data management as a crucial means to drive improvements at all points of the value chain, from transparency and reporting to portfolio management and investments to operations. Despite this, they wrestle with data integration and analytics, and many leaders feel overwhelmed by data-centric initiatives. Executives and managers highlight internal organizational barriers to improvement, a lack of suitable providers and practitioners, and a mismatch between their data-management ambitions and the underlying operating model.

New Skills and Scarce Talent

Historically, public asset owners have struggled to recruit and retain top talent, given that few institutions can compete with private-sector compensation. Now, these challenges are compounded. COVID-19 disrupted the labor market, and Millennial and Generation Z workers have unique expectations of employers. Moreover, the range of skills required by public asset owners has expanded. They now need ESG experts, data-savvy middle-office professionals and managers adept at building relationships with partner institutions. These skillsets are in demand in many industries, forcing public asset owners to compete for talent with other financial institutions, as well as technology and consumer enterprises.

Pockets of Innovation Appear Across All Segments

Policy objectives fundamentally shape public asset owners' investment strategies. Still, market forces have catalyzed a redefinition of those policy objectives and a reexamination of the means for achieving them. At the same time, inflation and rising interest rates have called into question the "lower for longer" paradigm that defined the years after the financial crisis of 2008-2009. Meanwhile, public asset owners are on the path toward greater diversification, securities lending and an increasing role for ESG. These factors play out differently for central banks, public pension funds and sovereign wealth funds.

Central Banks

Returns – described as a "dirty word" by one interviewee – are usually a secondary priority for central banks. Their core mission remains capital preservation and managing monetary policy, foreign exchange rates and debt. Therefore, safety and liquidity are primary concerns. However, an acutely low-yield environment makes it challenging for central banks to preserve capital and maintain reserves.

Although central bank reserve portfolios are still primarily comprised of high-grade sovereign bonds issued in reserve currencies, as well as gold and cash deposits, many central bank interviewees say they face significant challenges sustaining their assets through traditional fixed-income portfolios. As a result, some central banks admit they have "taken a hit" to their reserves.

New Assets and Geographies

Diversification strategies look to a variety of asset classes that still put safety first. Some central banks have recently increased allocations to developed market sovereigns and agencies, and many have bought corporate bonds. Mortgage-backed securities and emerging market debt also offer opportunities. Outside fixed income, many central banks are either already investing in equities or exploring the asset class. The most advanced central banks in this space have active equities desks or employ external managers, while others tentatively consider equities via ETFs.

There is strong interest in geographic diversification as well, with increasing allocations to APAC and, most specifically, to China and the renminbi (CNY) despite a shifting geopolitical environment. In some geographies, there is an additional strategic rationale for increasing CNY exposure. However, not all central banks want to take direct exposure to CNY: One executive at a central bank noted that it is more comfortable with indirect exposure via Bank of International Settlement (BIS) funds.

Interview Perspectives

"We're too small to take on the whole universe of equities and invest directly, so when we start doing equities, it'll be through an index fund."
Central Bank

"We have long-term bilateral loans from China, so it makes sense to have some exposure."
Central Bank

Organizing for Diversification

Central bank interviewees described four strategies for tackling the challenges associated with diversification:

- **Building asset class knowledge:** Central banks typically gain comfort with an asset class by initially relying on external managers. Small central banks with limited resources also look to external providers such as the World Bank for guidance, if not management.
- **Tackling governance and administration:** External managers can provide some short-term relief from the administrative burden associated with diversification by helping with reporting and advising on setup. Value-added services offered by external managers, such as market insights and reporting, were the second-most-cited reason for employing external managers. In the long term, however, central banks must internally address the operational implications of diversification.
- **Managing risk:** Central bank boards' primary concern is the increased reputational and policy risk associated with new asset classes. A "tranche" approach allows central banks to organize assets into different pools that distribute risk. The first tranche is usually associated with liquidity and daily operational requirements, while the second tranche focuses on returns and capturing investment trends. A third tranche has a higher risk budget and is managed on a risk-return basis, allowing for small investments in new asset classes. "Our third tranche has a longer-term perspective," said an official at a central bank. "It's where we involve external management and focus on more complicated assets such as emerging market bonds or MBS."
- **Adjusting portfolio approaches:** The most advanced central bank investors embrace multi-asset mandates within the second or third tranches, combining different asset classes and adopting a more dynamic approach to risk management. However, they typically have not expanded to a total portfolio approach. "If you think in tranches, you wind up with different time horizons and objectives for various pools of money that aren't optimized in terms of overall asset allocation… We take a weighted average approach instead," said one central bank official.

Are SWFs the End Game for Central Banks?

If a dedicated tranche managed on a risk-return basis sounds like a precursor to a returns-focused sovereign wealth fund, that is because it often is. A sovereign wealth fund (SWF) can be the eventual and even inevitable evolution of this part of central bank portfolios. Of the 17 central banks we interviewed, six discussed the possibility of setting up a SWF.

Technological shifts are set to play a role in the emergence of new SWFs. *The Economist* predicts that "electrostates" – nations rich in increasingly sought after "green metals" – will emerge. It expects new SWFs may be established to protect and grow the resulting wealth.

Source: "The transition to clean energy will mint new commodity superpowers," The Economist, March 26, 2022 https://www.economist.com/finance-and-economics/2022/03/26/the-transition-to-clean-energy-will-mint-new-commodity-superpowers

Public Pension Funds

The prolonged low-yield environment has hit public pension funds hard. They have traditionally used a combination of member contributions and investment income from predictable fixed-income securities to pay pensions to their members. Recent trends, however, see public pension funds coming under pressure to diversify and extract the highest possible returns from equity positions and less liquid investments.

However, public pension funds must balance this shift with the need for sufficient cash flows to pay liabilities. Returns cannot compromise the ability to pay pensions when required. This requirement leads most public pension funds to deploy a strategic asset allocation (SAA) investment model. They base pools of funds on fixed allocations to specific asset classes over the medium term, even if a different allocation might mean greater returns. Pension risk transfer is another innovation in which a fund largely transfers its liabilities to others, such as selling them to insurance companies. The growth of pension risk transfer may be a structural shift or a temporary adaptation to the gains made by public pension funds in 2021.

Alternatives and Equities

Alternatives are an increasingly significant destination for public pension assets. For example, following recent changes in regulation, one public pension fund plans to grow investment in alternatives to 40% of its portfolio. An interviewee at another public pension fund that had reached a 5% alternatives allocation now targets 16%, while still another said it plans a new 6% allocation to alternatives. These allocations reflect growing assets under management and reallocation of investments across asset classes. For example, one public pension fund is reallocating from equities to alternatives (partly to de-risk its portfolio following successful equity strategies).

Given their national and public character, a small number of public pension funds interviewed also said that they face pressure from stakeholders to invest in local real estate, corporate debt or domestic companies. However, these funds face challenges given the size of their assets relative to the overall market. For example, one public pension fund said it wants to grow its real estate portfolio from 7.5% to 10%, but the availability of local opportunities often constrains such efforts.

Interview Perspectives

"There are limited quality assets for us to invest in... It's why more alternatives mean more global exposure."
Public Pension Fund

"Investments represent a huge share of local listings already —there isn't much further we can go. A global portfolio allows us to diversify, but there's opposition within the country."
Public Pension Fund

"Trustees want us to do something on social housing, but the investable options are limited, and we don't have the resources or expertise to evaluate local projects for direct investment. Also, if a fund invests in one region of the country over another, it could give rise to questions of fairness."
Public Pension Fund

"Over time, we might increase alternatives given their low volatility and link to inflation, but I suspect we'll push equities up first."
Public Pension Fund

Sourcing New Opportunities

Given the size of their assets yet less extensive in-house expertise, public pension funds must be creative when sourcing new opportunities – particularly in alternatives and private investments. One preferred tactic is co-investment, in which public pension funds combine forces with other investors and leverage their partners' ability to identify targets and perform due diligence. For example, an interviewee at a mid-sized public pension fund said it was adopting a multi-pronged approach to diversify its alternatives exposure, including "customized portfolio solutions with bigger houses, co-investments, getting access to pre-IPOs and trying to find specific niches and pockets to capture opportunistic alpha."

Sovereign Wealth Funds

Sovereign wealth funds (SWFs) have traditionally pursued returns as their primary objective, often with a goal of beating inflation by a specific measure. They have typically operated with a long-term investment horizon, a greater risk appetite than other public asset owners and expansive investment guidelines to achieve these goals. Such factors have enabled SWFs to invest in a wide range of asset classes and strategies.

Private and Public Markets

In private markets, the key yield-related challenge for SWFs is access to attractive investments given increasing competition and skyrocketing valuations. In public markets, their steepest challenge is investing in equities at scale, given their potential to move the market, the availability of shares and the visibility of any significant investment to the wider market. Some of the largest SWFs have begun embracing complex investment practices from the private sector.

Interview Perspectives

"The way you invest US$100 million into the equities markets won't work when you're trying to make a US$10 billion investment."
Sovereign Wealth Fund

"[We are] building our quantitative trading team, employing synthetics, long-short activity, doing quarterly rebalances and increasing the sophistication of our derivatives use."
Sovereign Wealth Fund

The Total Portfolio Approach

Unlike their other public asset owner counterparts, many SWFs look to a total portfolio approach focused on a core portfolio with a secondary alpha-driven portfolio for outsized returns. The core portfolio functions as the mainstay public markets portfolio, while the alpha portfolio, which competes for capital with the core, is often biased toward private markets and credit strategies.

The competition for capital ensures a disciplined and rigorous approach to capital allocation and makes the process more dynamic than the more rigid SAA approach. It also has governance implications. With a total portfolio approach, the investment team under the direction of the CIO makes decisions more dynamically, without directly engaging the board. The team bases decisions on risk factors rather than benchmark weights, bringing together disparate investment professionals into one team, as risk rather than asset class is the primary consideration.

How SWFs Approach New Opportunities

Making new connections
- Collaborating along the investment lifecycle; pushing for issuances where they see opportunity, acting as a quasi-investment bank
- Leveraging government-to-government connections to spur co-investments or exerting influence over their own governments
- Creating large-scale collaborations with other asset owners to help shape markets

Finding new ideas
- Taking thematic approaches and creating dedicated cross-asset class teams to ensure a multi-asset class approach to select topics
- Looking holistically at infrastructure, such as a fund investing in power grids to capture the growth of infrastructure that supported an emerging tech sector

Investing in new ways
- Seeking access to pre-IPO opportunities, SPACs and customized portfolio solutions
- Direct access to investments with general partners, in addition to traditional fund allocation as a limited partner

In addition, SWFs employing a total portfolio approach require a dynamic monitoring process to ensure that investment strategies and dynamic rebalancing are consistent with an SWF's investment policy statement. Their middle- and back-office data capabilities must be robust enough to support this oversight.

New Assets and Investment Strategies Set the Tone

The rapidly evolving environment for public asset owners is driving significant change in their investment strategies, including exploration of new asset classes, a revival of securities lending, greater emphasis on ESG and shifts in the balance of internal and external portfolio management.

New Frontiers With Emerging Assets

In the search for yield, public asset owners are exploring a number of new asset classes. Their approach ranges along a continuum of bold to conservative, with SWFs expressing the greatest interest in entering new sectors, asset classes and markets early.

Interview Perspectives

"We're a public institution, handling public money; crypto is not yet at the stage where we can invest and feel it won't potentially cause a scandal."
Sovereign Wealth Fund

"There is a lot of interest in the underlying technology and the infrastructure surrounding cryptocurrencies."
Public Pension Fund

"Our economy is so focused on agriculture, it's right to be looking at carbon as an asset class."
Public Institution

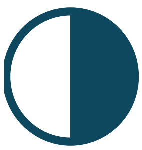
Digital assets are one area of interest, but none of the interviewees are yet seeking to invest in cryptocurrencies directly, given the lack of regulatory certainty and investment security. Instead, public asset owners look to indirect investments in the digital currency space. According to the public asset owners interviewed, digital assets and tokenization attract more interest. Many see tokenized assets as a powerful way to increase market liquidity, especially in alternative asset classes such as real estate. In particular, SWFs foresee an opportunity to shape the market. One fund official said: "We want to be leaders in this space – market makers who play a role in creating liquidity."

Among emerging sectors, the space economy is also generating excitement. Institutions with equity investments are familiar with companies such as SpaceX and their ecosystems. In the Middle East, in particular, public asset owners are interested in the broader sector, such as satellite telecommunications, where the prospect of returns is distant. One public institution, for example, has a joint venture with a satellite company and plans to invest significantly in building capacity for its country and region.

Several institutions in APAC also recognize carbon as an emerging asset class, with one suggesting it could become a core part of its portfolio. Carbon allowances or credits are a small and volatile market, currently worth around US$100 billion with an estimated US$250 billion in annual turnover [2] and growing 20% annually as emissions trading systems and regulatory regimes mature.[3] Moreover, investors look to carbon and its derivatives (futures and options) as a tool to hedge the climate risk in their portfolios.

Reviving Securities Lending

Securities lending has regained a degree of momentum as a part of front-office investment activity, with the most sophisticated investors making it a core component of the total portfolio approach.



Half of public asset owners indicated they plan to increase their use of internal yield-enhancing activities.

One-third plan to expand their securities lending programs in the next five years to generate incremental revenue.

Source: BNY Mellon/OMFIF operating model survey

Among institutions already engaged in securities lending, some plan to liberalize lending guidelines and review existing lending agreements. These shifts counter the retreat from securities lending programs following the 2008 financial crisis, when a lack of transparency, concerns about short selling and perceived links to market volatility steered many public asset owners away.

Interview Perspectives

"Our securities lending program has been doing well in the past few years - we lend 50% of a specific portfolio, and we're looking to make that 70%."
Central Bank

"I've had a lot of discussions about securities lending in recent years, but many people can't shake their negative impression of it. A lot of education is required."
Sovereign Wealth Fund

"When we started our agency securities lending program, it was a passive, back-office activity. But over time, we saw the need for better connectivity between our managers and our agent lenders, and greater agency over activities like corporate actions."
Public Pension Fund

"Securities lending sits within portfolio management, alongside fixed income and equities, where it's operated as an investment activity. The goal is to see all these activities together, so we don't miss any opportunity to increase yield."
Sovereign Wealth Fund

"If you're serious about ESG, you're likely an active owner and exercise your voting rights in service of your ESG objectives. How can you square that with a lending policy that's about maximizing income?"
Public Pension Fund

Securities lending is moving beyond these concerns. Growing regulatory support, front-office control and governance, flexible platforms and technology, and alignment to broader principles and mandates may create a supportive backdrop and foster a more positive attitude.

- **Growing Regulatory Support**
  Recent initiatives focusing on transparency and reporting have reinforced institutional confidence. For example, the European Union's Securities Financing Transactions Regulation (SFTR) introduced granular transparency for securities lending transactions.[4] In November 2021, the U.S. Securities and Exchange Commission (SEC) proposed similar reporting rules for securities lending participants.[5] Regulators are also considering mandatory clearing to strengthen securities lending.[6] Central clearing would increase utilization and revenue for public asset owners while reducing risk.
- **Front-Office Control and Governance**
  Institutions increasingly see securities lending as part of front-office investment activity rather than merely an offset for administration and custody costs. One official who relies heavily on external managers explained, "The most sophisticated investors see securities lending as a component of a total portfolio approach alongside their investments."
- **Flexible Platforms and Technology**
  Public asset owners have more flexibility in securities lending than previously. For example, they can tailor lending for a given spread or focus only on a limited set of high-value securities. The industry is also increasing its flexibility by extending the range of acceptable collateral: The overall features of a collateral set, such as concentration limits, minimum capital requirements and minimum share price levels, are recognized as more important than the inclusion or exclusion of a specific security. Additionally, fintechs are also offering so-called "fully paid" securities lending, allowing intermediary banks or brokers to act as a counterparty for higher value/spread trades. Finally, securities-lending platforms can increasingly integrate with institutions' operations for better visibility alongside other portfolio data, using APIs, for instance.
- **Alignment to Broader Principles and Mandates**
  Sustainability considerations can raise concerns about conflicts with an institution's mandate and objectives. Further, public asset owners in the Middle East and parts of Asia want to ensure that securities-lending counterparties are Shariah-compliant. Malaysia became the first market to adopt a Shariah-compliant securities-lending framework in 2017.[7] Still others struggle with the ethical implications of perceived downward pressures on markets. As a result, securities-lending platforms are evolving to accommodate a broader set of principles, affording public asset owners better tools to understand the implications of their securities-lending programs. Emerging solutions are also allowing clients to see the ESG implications of their collateral and to control prohibited short-selling.

Meeting the ESG Imperative Holistically

Given the mandates of public asset owners, ESG is a consideration for the majority of institutions, although implementation of ESG considerations varies. ESG leaders incorporate ESG along their whole value chain, including securities lending. They are also more inclined to make significant investments such as ESG-focused infrastructure projects, engage in ESG activism with portfolio companies and expand their approach to ESG (e.g., by bundling carbon assets and agricultural investments). These market leaders provide an example to other public institutions in shaping international ESG frameworks more broadly.

Other institutions show a more tentative or preliminary approach to ESG. Common tactics include applying exclusion lists, investing in specific green instruments and strategies (e.g., green bonds) or starting to incorporate ESG principles into selected areas of investment, such as energy efficiency requirements for real estate.

Interview Perspectives

"ESG is analyzed on a portfolio-wide basis. We factor it into every asset class. For example, we had to think hard about the implications of America's exit from the Paris Accords on our fixed-income portfolio."
Public Institution

"We're just beginning to develop our ESG strategy. But it's going to be on a global scale, not only in relation to reserves but every component of the institution."
Central Bank

"My ideal would be to have a single dashboard with performance, ESG and other metrics all side by side, looking across all asset classes. We want to be able to run what-if scenarios as an integral part of our decision-making."
Public Pension Fund

However, across the board, the most significant ESG challenge for public asset owners is the availability of reliable, transparent and comparable data and metrics to measure performance. ESG data lacks standardization, even in asset classes where data is relatively advanced, such as equities. We heard consistently that public asset owners find it challenging to measure ESG performance in each function and are actively looking for providers to help them understand and improve their ESG frameworks and decision-making.

Various supranational and regulatory bodies are making progress in overcoming data challenges, however. For example, the EU taxonomy for sustainable activities offers standardized data structures. Notably, interviewees outside the EU said they are adopting the EU taxonomy, often alongside existing approaches to ESG data. Other popular sources include MSCI and the UN PRI. Some banks also offer applications that enable public asset owners to manage, monitor and analyze ESG factors across portfolios, scoring them against customizable ESG and sustainability metrics based on multiple vendor outputs and even crowdsourced data.

Over time, greater regulatory harmonization, taxonomies and technology should address the challenge of standardization. However, public asset owners ultimately need robust data-management systems and processes that deliver a total portfolio view to apply an ESG framework fully. Such a dashboard requires an operating model with data at its core and the requisite skill set for using it effectively.

A New Mix of Internal and External Portfolio Management

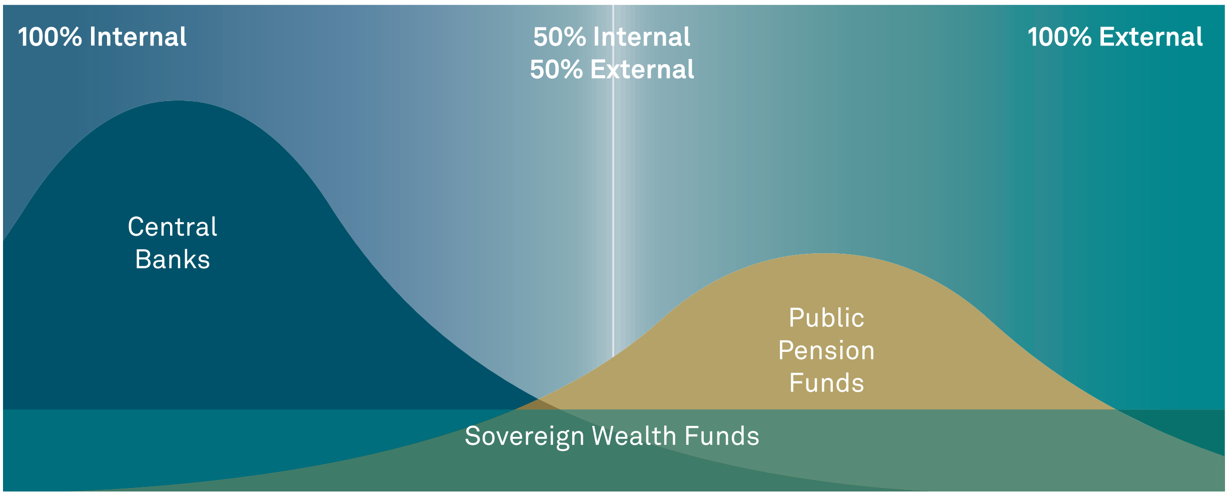
Diversification of investment strategies has a notable impact on whether to conduct portfolio management internally or externally. Central banks show a clear preference for internal management, with most wanting 80%-100% of assets managed in-house. Meanwhile, public pension funds slightly favor externalization, with 40% of assets managed internally and 60% allocated to third-party managers (see Figure 1, "Public Asset Owners Vary in Their Preferences for Internal/External Ratios").

Approaches vary depending on the asset class and instrument, with some institutions internalizing some asset classes while concurrently externalizing others. For example, one central bank will increase in-house fixed-income management but externalize the management of corporate bonds specifically. Likewise, a public pension fund will further in-house alternative investments and specific equities while externalizing others.

Cost and the ability to build up national capabilities rank as the top rationales for internalizing portfolio management. Improved performance and better control and oversight are a close second. Examples include several institutions currently establishing internal trading teams and a pooled pension fund, which in the past had moved asset management toward external managers, rebuilding its internal desk.

Figure 1: Public asset owners vary in their preferences for internal/external ratios

What ideal ratio of internal to external management are public asset owners targeting in the next 5 years? (Select one)



Source: BNY Mellon/OMFIF operating model survey

Public asset owners typically externalize strategically for specific geographies or asset classes where they can learn from external managers' expertise. Some more sophisticated institutions go as far as running a concurrent external and internal strategy to explore new asset classes. One sovereign wealth fund professional said that it employs both internal and external desks and "plays them off each other."

In alternatives, public asset owners' first forays are often through direct investments and acquisitions of real estate. As they gain sophistication and confidence, many co-invest with external third-party institutions, while others add private equity, hedge funds and hedge funds of funds to their portfolios. At their most sophisticated, public asset owners can act as quasi-private equity shops themselves, leading sourcing, due diligence and strategic investments.

Interview Perspectives

"We are the single most important asset manager in the country. The more we internalize, the more we can help the local financial sector as a hub for activity and a destination for talent."
Sovereign Wealth Fund

"If our investments are with an external manager, usually in another country, we don't have proximity and visibility over what's going on, no matter how many reports or data we get. But it's our duty to oversee investment closely."
Central Bank

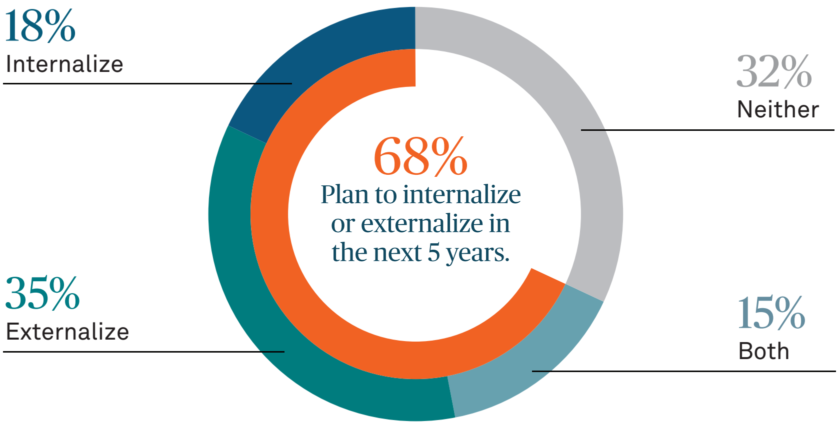
"We have a general push to internalize, but when it comes to exotic stuff, we go external."
Sovereign Wealth Fund

Public asset owners also seek out external managers to achieve improved performance and benefit from additional services, such as market insights or reporting. Only a small minority say cost benefits are a primary driver when hiring external managers.

Not only are there a variety of approaches taken to internalization and externalization, but the balance between the two approaches changes over time. Unlike operating models, which are much more static, the ratio of internal and external management is highly dynamic, with two-thirds of institutions planning to change their strategy over the next five years. (see Figure 2, "The Majority of Public Asset Owners Will Change Their Mix of Internal and External Portfolio Management").

Figure 2: The majority of public asset owners will change their mix of internal and external portfolio management

Do public asset owners plan to move part of their portfolio management to external managers in the next 5 years? (Select all that apply)



Source: BNY Mellon/OMFIF operating model survey

Internalizing Trading: Lessons from Central Banks

Several central bank officials said their institutions have sought to develop internal expertise and bring portfolio management in-house. Their experiences offer helpful insights and learnings for other public asset owners.

Working with external managers is key to a successful transition:

- Be open with managers about the desire to internalize
- Select external managers based on their willingness to facilitate knowledge transfer

The decision to internalize can be made for different reasons:

- Immediately, for strategic reasons (e.g., driven by a national policy or mandate)
- Once internal capabilities are developed (a typical timeline is five years)
- Based on equivalent or superior performance at an acceptable cost, after running external and internal managers in parallel

Operating Models Are Ripe for Transformation

Only 6% of survey respondents are satisfied with their operating model.

Diversification, the growth of securities lending, the integration of ESG factors and shifts to internal or external portfolio management have downstream implications for public asset owners' operating models. Strategy changes in these areas require corresponding adjustments to operating models, processes, providers and technology – with a foundation of data that enables future scale and flexibility. Public asset owners concur that current operating models are not adequately meeting their evolving needs.

Interview Perspectives

"We simply cannot continue with our existing operating model as we grow. We'll have issues across the board—not just in the front office, but the middle and back office too."
Public Pension Fund

"The more we internalize and diversify, the more complex our operational needs become."
Sovereign Wealth Fund

Illustrative Operating Model Challenges

Institutions face operational challenges that result in significant end-to-end inefficiencies and friction. Interviewees cited numerous situations.

- Performing reconciliation only once per month because the process is understaffed and overwhelmingly manual
- Responding to cybersecurity issues by turning off internet connections during a crisis
- Keeping records on paper in offsite storage facilities they rarely access
- Coping with siloed systems, unresponsive vendors and expensive legacy technology that is impossible to upgrade

One crucial investment-management decision – which assets to manage in-house and which to manage externally – has outsized implications for operating model design. The promise of new technologies, the value of better data management and the need for resiliency and cybersecurity also give institutions further reasons to reimagine how their front, middle and back offices operate.

Choosing an Effective Transformation Approach

Surveyed public asset owners' top concerns are streamlining processes and improving efficiency across the board. But addressing these challenges requires them to undertake operating model transformation.

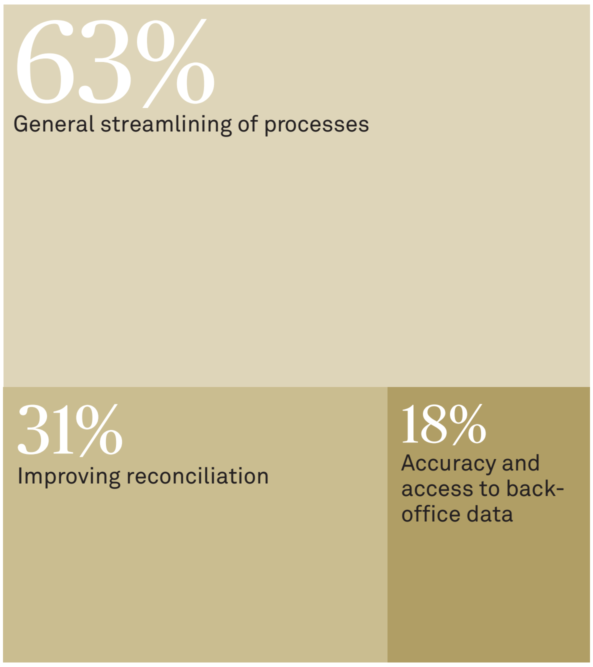
Figure 3: The Majority of Public Institutions Are Changing Their Operating Models as They Address Top Challenges in the Front and Middle Offices

63% of survey respondents are undergoing an operating model transformation

Top Challenges in the Front office

Note: Other challenges included access to the right market data, manager selection process and timeline, and performance attribution, while 2% indicated no challenges.

Top Challenges in the Middle office



Note: Other challenges included engagement among middle-office employees, managing book of records, information flow, implementation of new investment types, access to aggregate data, and resourcing, while 2% indicated no challenges.

Source: BNY Mellon/OMFIF operating model survey

While each transformation, like each institution, is unique, we can group institutions into two broad buckets:

1. Foundation transformers
implement or overhaul a single system organization-wide

2. Component integrators
tackle critical front-, middle- and back-office components before integrating

Foundation Transformers

Interview Perspectives

"The key word is 'integrated.' We want a system where trade flows to compliance to ensure activities fit our guidelines, and if it's authorized, the trade automatically feeds into the back office, who release the necessary instructions. There's much less manual intervention."
Central Bank

"To accommodate more complex products, we needed a system that could integrate front-, middle- and back-office activities end to end."
Central Bank

"We've taken the first step in implementing something that will stand the test of time - it's more than we need right now, given how little we do in-house, but it will evolve into something that's used by portfolio analysts, middle-office investment operations and can even touch our custodians."
Public Pension Fund

Foundation transformers focus on a single central system, such as Aladdin®, SimCorp, Alto (Amundi Leading Technologies & Operations) or others, as the backbone of their operating model. In many cases, they already use these systems in a more limited capacity, for instance, as an order management system (OMS) or accounting system. They work with their provider to stretch or upgrade these systems to encompass end-to-end operations as much as possible.

These large-scale systems can enable middle-office teams to receive inputs directly from a front-office OMS and perform activities such as trade confirmation or corporate action processing. Back-office teams can likewise perform accounting activities such as portfolio valuation on a book of record that more easily reconciles with front-office positions. These large platforms can also facilitate diversification and growth. Each new instrument or asset class adds complexity, but leading foundational systems typically accommodate most asset classes that public asset owners seek to add.

Ultimately, these systems can enable an efficiently integrated accounting book of record (ABOR) and an advanced investment book of record (IBOR) supporting in-house trading. Together, an ABOR/IBOR can bring together investment data from across the organization, enabling management, risk and compliance on a real or near real-time basis and, ideally, acting as a single source of truth across the organization. Many vendors are currently developing solutions based on this approach.

However, implementing foundational systems is a significant and often expensive undertaking, typically only available to the largest public asset owners. Interviewees from several medium-sized and small institutions expressed this sentiment. In addition, some public asset owners, most often central banks, hesitate to adopt high-profile brand name providers.

Component Integrators

Interview Perspectives

"We don't go for the best of breed, but we integrate as much as possible."
Central Bank

"We don't have the luxury to choose the best systems out there, but we need something that is integrated and gives us a strong accounting backbone."
Public Pension Fund

Component integrators consider all of their priorities and choose to address specific pain points in the front, middle and/or back office, and then weave those solutions into their broader operating model. While every institution has its own unique challenges, there are a number of common themes.

The **front office** needs to operate efficiently and effectively, with a fundamental focus on investment performance. The key improvements depend on whether the public asset owner relies on external or internal managers or a combination.

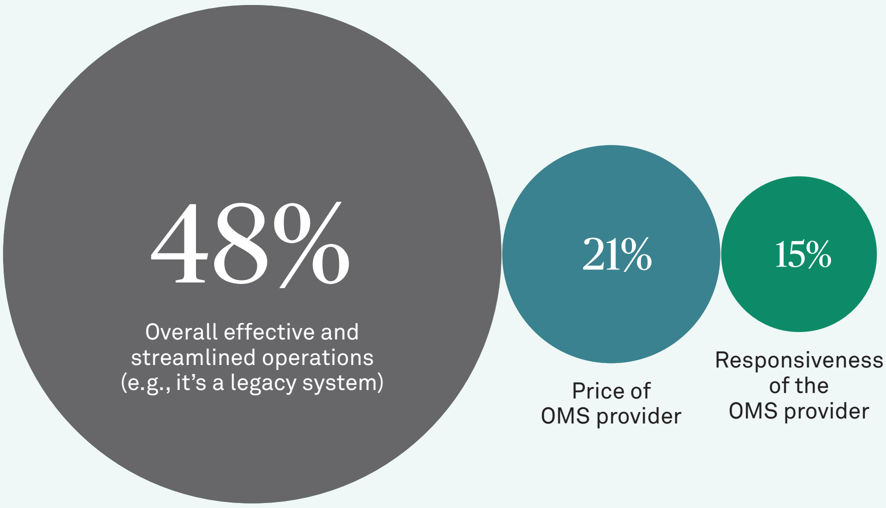
Conducting portfolio management in-house raises the stakes for attracting, retaining and upskilling talent with the access and skills to use more effective analytical tools. Many are looking for savvier ways to calculate risk; others want the ability to run complex what/if scenarios and improve stress testing. However, such analytics are only valuable if the underlying data is accurate and timely. Robust data management is therefore critical.

Keeping but Improving the OMS

One striking survey finding is that 90% of respondents that perform some management in-house are happy with their OMS provider and have no plans to replace, consolidate or add to their OMS. That said, many owners want their OMS to perform better and at a lower cost.

Figure 4: Public Institutions' OMS Challenges

What are the main challenges with public asset owners' order management system? (Select all that apply)



Note: Other challenges included connectivity to back office, accounting or settlement system, and connectivity to liquidity pools, while 12% indicated no OMS challenges.
Source: BNY Mellon/OMFIF operating model survey

Interview Perspectives

"We have a small part of our portfolio where returns are not strictly a priority, and the team can play around—the idea is to keep their brains working and give them a chance to innovate."
Central Bank

"In the past few years, we've observed that the incoming workforce has a strong programming skillset. To keep them engaged, we encourage them to use the tools they like, such as Python or Tableau. As long as it is within a governance framework so that analyses and models can be checked or replicated, this can work well."
Sovereign Wealth Fund

"We can use AI for reporting and manager searches and automate how we send out RFPs. If we have the right platform, we would be able to operate effectively with a small team."
Public Pension Fund

"We use one main manager, and their level of service has deteriorated as they've grown. But we stick with them because of their low pricing."
Public Institution

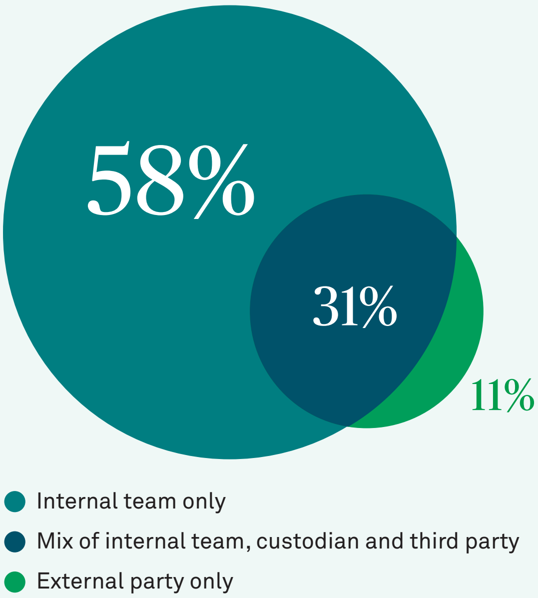
By contrast, when externalizing portfolio management, the key to operational improvement is empowering the front office to get more from relationships with external managers, from improving manager selection to data exchange. Many public asset owners are exploring or implementing AI to improve manager selection. Yet, gaining access to data and reports from external managers, especially for smaller public asset owners, makes it challenging to achieve a clear overview of their entire portfolio. Fintechs may have a role to play in bridging this reporting gap.

Manager Oversight

Oversight of external managers varies by asset owner type, size, the complexity of portfolios and desired objectives.

Figure 5: Most Institutions Rely on Internal Oversight of External Managers

How do public asset owners oversee the performance and compliance of external managers?



Source: BNY Mellon/OMFIF operating model survey

For the **middle office**, the most common approach to streamlining and improving efficiency is to deploy technologies such as robotics or AI for targeted pain points such as reconciliation. Several mid-sized institutions interviewed use robotics solutions. However, automation is not necessarily a panacea. Entering new markets or asset classes and continued industry evolution are already stretching the ability of many institutions to address their middle-office challenges through automation.

Interview Perspectives

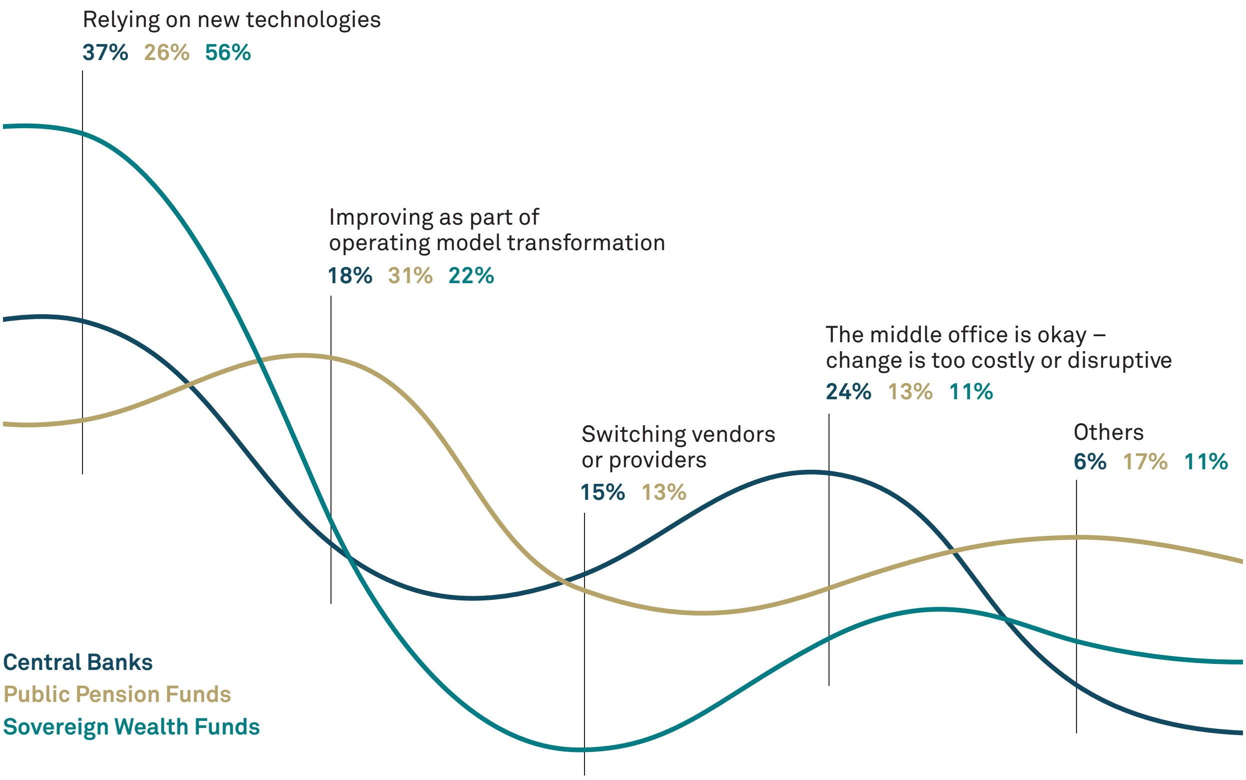
"We were initially impressed to see institutions implementing robotics, but we've realized it's just a very advanced Band-Aid. It won't give you what you're really after, which is transparency across the entire system." Public Pension Fund

"We implemented robotics and bots in our operations a few years ago, but that's now 'old hat.' Today, we're addressing these problems through our major transformation." Sovereign Wealth Fund

As a result, institutions consider outsourcing activities to those specialists that can bring scale, efficiency and continuous investments in innovation. Some public asset owners increasingly rely on external providers to manage the bulk of their middle-office activities, while others are interested in investigating outsourcing as an option. Where institutions seek to outsource their middle-office activities, custodians are preferred since many have evolved middle-office platforms from back-office services. In addition, custodians are often seen as trusted providers able to protect privacy due to their existing back-office roles.

Figure 6: Public Asset Owners' Plans for Addressing Middle-Office Challenges

How do public asset owners plan on addressing their middle-office challenges? (Select all that apply)

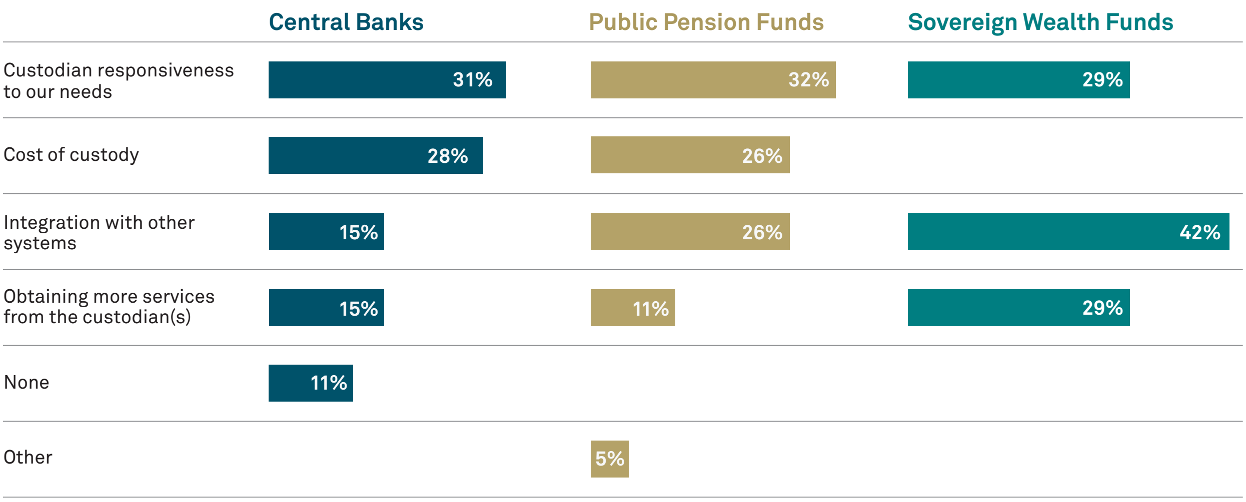


Note: Other plans on addressing middle office challenges included building an investment book of record and outsourcing middle office.
Source: BNY Mellon/OMFIF operating model survey

Public asset owners typically delegate their **back office** to custodians, with central banks, public pension funds and sovereign wealth funds uniformly highlighting custodian responsiveness as their greatest challenge. Still, most institutions appear wedded to their existing arrangements, with just 14% of survey respondents planning a change in the next three years.

Figure 7: Key Areas for Custodians to Improve

What are the key areas that public asset owners would like their custodian to improve? (Select all that apply)



Note: "Other" responses included quality of service as an area to improve.
Source: BNY Mellon/OMFIF operating model survey

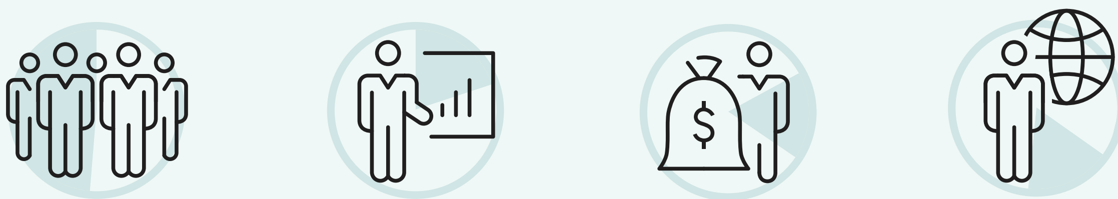
As custodians expand their offerings to address middle- and front-office needs further, they must build cooperative, strategic relationships with clients and other providers. Some public asset owners favor a single custodian model, which results in simpler vendor management and easier integration. Those that use a multi-custodian model can benefit from different providers specializing in geography, asset class, external managers or a combination of these factors. Competition across custodians can also enable public asset owners to extract more value from these relationships, but that comes with greater complexity in managing multiple providers and integrating across custodial boundaries.

Integration: Coordinated Leadership Is Key

Public asset owners need to integrate the front, middle and back office to achieve desired efficiencies and streamlining.

Figure 8: Most Public Asset Owners Lack a Single Point of Accountability for Integration

Who has responsibility over the operating model? (Select one)



49%
No single point person

19%
Other
(CEO, CFO, Line of Business Manager, External)

17%
Chief Investment Officer

15%
Chief Operating Officer

Source: BNY Mellon/OMFIF operating model survey

While institutions may have project managers and leadership to manage their transformations, surveyed public asset owners frequently have no single individual responsible for the success of the end-to-end operating model on a full-time basis.

Data Must Move to the Core

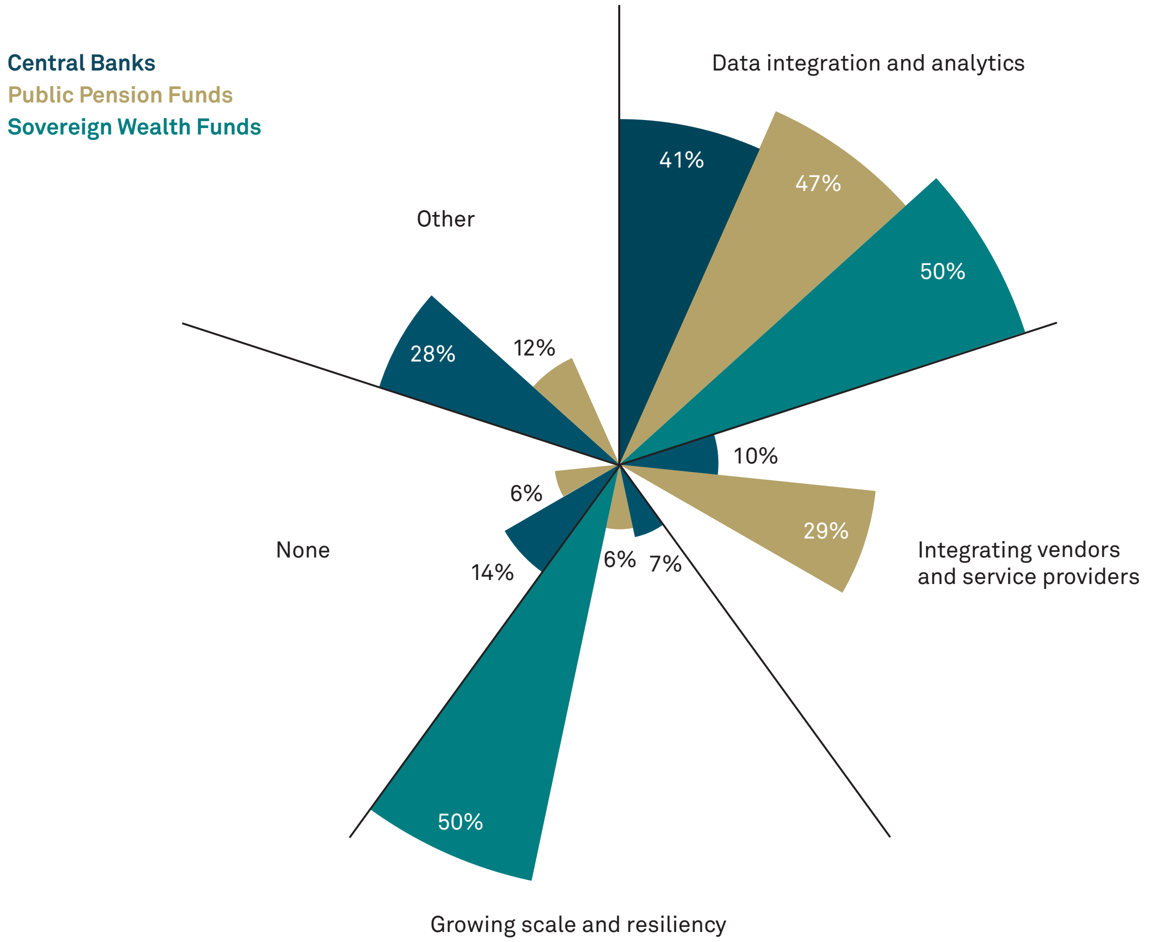
As public asset owners manage the shift in their investment strategies and the transformation of their operating models, data is the foundation of their future. There are a number of challenges to overcome and best practices to consider as institutions seek to build a data-centric organization.

Mastering Data Management

Survey respondents cited data integration and analytics as by far the greatest operating model challenge across all public asset owner types, sizes and geographies. Optimal data integration allows data to move seamlessly from the portfolio manager to the front and middle office and then to the custodian and back office, informing decision-making throughout.

Figure 9: Data Integration and Analytics Is by Far the Most Significant Operating Model Challenge

What is the main challenge in public asset owners' current operating model? (Select one)



Note: "Other" responses included cost reduction and granularity of performance attribution.
Source: BNY Mellon/OMFIF operating model survey

Interview Perspectives

"If we have better transparency in the portfolio and timely and accurate data, we can design new strategies and get better returns. But it's not just about better returns. We want efficient data management so we don't have to second guess and recalculate our accounting records. And we want non-investment data too, so we can better understand our beneficiaries."
Public Pension Fund

"Given the size of our portfolio and strategies that span asset classes, we need to look at exposures not just across geographies, capital structures and issuers, but also securities lending, so we have a true view of our risks."
Sovereign Wealth Fund

"We can figure out what the front-office return is on investing in one country over another. But I also want the fully baked cost, taking into account sub-custody fees, for example. When yields are low, knowing the true operational implications of activities can make a difference."
Public Pension Fund

Public asset owners' top data priorities are overwhelmingly:
1 improving end-to-end data integration and transparency
2 building underlying data-management systems

Obtaining better sources of data and compliance with reporting requirements were a distant third and fourth among survey respondents. The focus and source of value are now less on obtaining more data but rather on how to integrate and use that data most effectively.

Figure 10: Integration and Data Management Are Top Priorities

What are public asset owners' key data priorities for the next 1-3 years? (Select all that apply)

61% of respondents are focused on integrating data sources and increasing visibility end to end

53% of respondents are focused on building an internal data management system / data warehouse

25% of respondents are focused on obtaining new or better sources of data

24% of respondents are focused on complying with new reporting requirements

Note: The "other" response specified externalizing data quality management as a priority.
Source: BNY Mellon/OMFIF operating model survey

Tackling Five Key Data Challenges

Data management and aggregation is often an arduous manual process, with analytics still often performed on individual spreadsheets and within organizational silos. Some public asset owners have only just started to digitize their records and find the task overwhelming. Maturity ranges from the most advanced public asset owners building sophisticated analytics structures, supported by advanced data-management platforms and moving towards IBORs, to laggards or small public asset owners that cannot marshal resources to address data challenges holistically. Overall, five challenges are most common: clarifying purpose, addressing fragmentation, accounting for diverse data types, standardizing reference data and fostering a data culture.

- **Clarifying purpose:** Institutions want a comprehensive data model for their organization but frequently struggle to articulate precise objectives and a guiding framework for their efforts. Such institutions risk embarking on complex efforts to build a data warehouse or a single source of truth with ill-defined parameters.

- **Addressing fragmentation:** Public asset owners often face uncertainty about how to break down silos to bring their data together — from front-office analyses to fundamental back-office information from multiple sources.
- **Accounting for diverse data types:** Unlike basic equities market data, more qualitative information, such as ESG reports or the tone used in analyst calls, is harder to incorporate. 80% of survey respondents have some form of unstructured data (PDFs, images, video) but the majority (60%) can only "somewhat" incorporate this data into their analyses, while 20% cannot use it at all.
- **Standardizing reference data:** Differing formats for reference data, such as information that identifies securities, also pose problems. Extracting unique insights from data often requires analysis that cuts across multiple sources, and combining standard data from different providers into a single format could reduce costs without impacting data users. Although few data providers support easy interoperability, the industry is moving in this direction.
- **Fostering a data culture:** Although interviewees acknowledge the importance of data, many organizations have not adopted a data-driven mentality. An executive at a pension fund said its board perceived data as a topic that "sits with the technical people." Other interviewees described data as being seen as a niche or "ivory tower" topic.

Adopting Data Best Practices: Purpose, Process, People

A range of best practices has emerged from these discussions and our experience guiding both public and private asset owners through data-centric transformation projects. They fall under three rubrics: purpose, process and people.

To avoid "boiling the ocean," our discussions highlighted a series of questions that public asset owners can use to clarify their data needs and **purpose**.

- **What do I want my data to tell me?** Specific data needs will vary, but there are four areas most asset owners need to address: ***total portfolio exposure*** to asset classes or sectors that can inform investment strategy; ***cost per trade*** analysis to identify opportunities to reduce operational costs (e.g., for specific markets or asset classes); ***ESG impact*** and performance; and ***insights for external stakeholders*** such as pension fund beneficiaries or the broader public.
- **Which users need data, and in which format?** Data serves not only senior decision-makers and the front office but also many user groups across and outside the organization – including business unit leaders, managers leading special projects, analytical champions and the public. Understanding these needs, and the formats required, helps public asset owners focus on outcomes and guide their selection of data tools and providers.

Interview Perspectives

"We kicked off a project to create a data warehouse to bring data together across the organization. But we had to pause the project to identify the data needs of the front, middle and back office and assess how data would be used and who is the best provider to implement the effort."
Public Pension Fund

"Historically, data management and data analytics were performed in teams, with limited transparency. We need to look across all of these components, decide what to standardize and facilitate transparency but still enable each team to perform the work they did previously."
Public Pension Fund

"Financial institutions haven't really stepped up their data-management thinking or investment for years. Twitter, Facebook and Instagram are far ahead when it comes to data analytics, management and mining."
Central Bank

- **What are the non-negotiable data outputs and where should I focus after addressing them?** Prioritizing user groups and their data needs identifies the most critical outputs to address first, typically for senior decision-makers. Thinking more long-term and holistically, public asset owners should map data needs against their mandates and business strategy.
- **What visibility do I *really* need into my portfolio?** Speed can be more important than accuracy in certain circumstances. For example, many asset owners complain that data for alternatives is less up to date than for equities, but timelines may not impede a total portfolio view for real estate data. Similarly, data preferences can differ by user group: Some data consumers need raw data, others require it checked, while others need official released data.

The transformation **process** is also critical. A data transformation is a journey whose conditions and objectives often evolve. While multi-year and multi-million-dollar programs focus on the initial data problems to solve, data needs change and new challenges emerge.

- **The baseline: Understand how processes, people and data intersect from end to end**
  Public asset owners need a clear and holistic view of their processes and how multiple data user groups, inputs and outputs intersect. Creating this view helps the institution break down organizational silos.
- **The endpoint: Establish the end state and the transition state**
  A typical path to designing the end-state data model is to establish a target information model (TIM), a target architecture model (TAM) and a target operating model (TOM), along with a transition systems architecture (TSA) that bridges the gap between the baseline and the end state.
- **The mindset: Be agile and focus on outcomes**
  Successful institutions adopt an agile or outcome-focused approach to design and implementation instead of tackling the entire universe of data. They focus, for instance, on a specific security's flow throughout the organization, identify problems and solutions from this analysis and apply these lessons elsewhere as appropriate. This approach also enables adaptation as an institution's data needs evolve over time.

Finally, transformation initiatives require **people** engagement—from institutional leaders to end-users to service providers. Each of these groups plays an instrumental role.

- **Leadership provides vision**
  Interviewees at several public asset owners emphasized the critical role of leadership in driving data transformation projects. Although there is no consensus among interviewees about the value of a single institutional data czar, it is clear the C-suite must be fully onboard, if not leading data transformations.
- **Cultural change is important**
  While a central data function can serve as a helpful incubator of data initiatives, data should be integral to everyone's work. Public asset owners that have successfully transformed data use in their organizations have invariably deployed purposeful initiatives that encourage and reinforce data-driven decision-making.
- **The right providers contribute to success**
  A successful data strategy involves collaborating with the right external entities, from data providers to custodians to key technology vendors. Success often depends on selecting the providers that are willing and able to collaborate in building a data-centric future. In particular, the right custodian can play a critical role as the source of an institution's most fundamental data. Recently, custodians have enhanced their business models by integrating deeply with best-of-breed technology to deliver data integration, harmonization, aggregation and analytics.

Interview Perspectives

"It's not just about the technology and systems. We also need to transform our mindset and our teams' level of engagement when it comes to data."
Central Bank

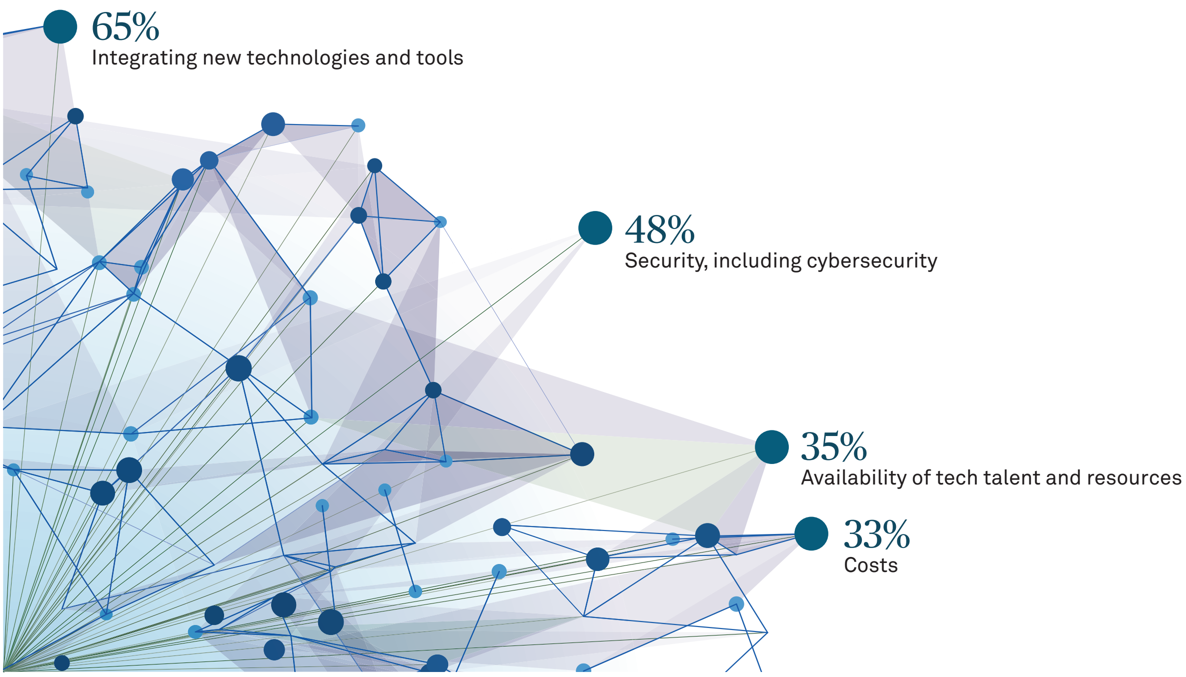
"Eventually, we won't have data scientists sitting alongside our portfolio managers: our portfolio managers will be data scientists."
Public Pension Fund

Focusing on Fundamentals: Cloud and Cybersecurity

A data-centric operating model must have an adequate technology stack at its heart. The most frequently cited technology challenge is not cost or vendors but integrating new technology and tools. While innovations such as AI and robotics have yielded benefits for the front office, they have yet to do the same in the middle office. Strikingly, a more mature technology, namely, cloud, is still capturing outsized mindshare. Cybersecurity, with the potential to scale up or down in response to the geopolitical environment, also garnered significant attention in our interviews.

Figure 11: Public Asset Owners' Top Technology Challenges

What are public asset owners' top technology challenges? (Select all that apply)



Note: Other challenges included little risk appetite in technology constraints, systems integration, efforts to maintain and upgrade system, and deciding what to do internally vs outsource.
Source: BNY Mellon/OMFIF operating model survey

Global and Local Cloud Architecture

Cloud was the hot topic among public asset owner interviewees. It offers significant benefits in terms of flexibility, scalability and resilience. But it is also controversial: Some institutions are worried about security and privacy. The independence of major providers (which are typically U.S. private-sector firms) raises concerns. While some public asset owners have embraced mainstream cloud solutions and providers, others retain specific data types in-country or on-premises and only store less sensitive data on the cloud. Alternatively, some institutions continue to store all data on-premises or with local cloud providers.

In turn, local cloud is gaining ground as various national governments have tightened data collection, storage and management regulations. For example, Switzerland's Federal Data Protection Act now imposes robust restrictions on storing and transferring Swiss citizens' and entities' data. And in 2018, Saudi Arabia's National Cybersecurity Authority issued requirements that Saudi financial data be stored locally. Both measures effectively limit the use of international cloud solutions.

As a result, many public asset owners said they will deploy national cloud solutions. "We haven't used cloud because of the security risks involved," said one sovereign wealth fund official. "Instead, we have data on local servers. But now that the government has built a national cloud system, we are planning to switch over since it's efficient and financially sensible and because the security risk will be borne by the government."

Addressing Cybersecurity Concerns

Closely tied to the growth in cloud storage is the urgent challenge of cybersecurity. Public ownership exposes these institutions to heightened risk of cyberattacks as part of warfare or covert destabilization strategies, in addition to asset theft, making security the second-most cited technological challenge.

The approach to tackling cyber risks varies widely, typically based on size and available resources.

- **IT-led command and control:** Large and sophisticated institutions, such as major sovereign wealth and public pension funds, may adopt complex, internally driven solutions. A small number have command centers with resources rivaling private-sector firms. They typically take a comprehensive and programmatic approach to cybersecurity, covering a full range of IT security considerations, from penetration testing to employee training.
- **Risk and compliance-led:** Some other large institutions take a less centralized approach to cybersecurity. While the IT team still plays a key role, the critical importance of cybersecurity also makes it a key responsibility within the risk and compliance functions and the business itself.
- **Third-party reliance:** The smaller the institution, the more likely it is to rely on external parties to support cybersecurity efforts. For example, local government public pension funds in the UK frequently rely on the cybersecurity efforts of their county council parent entity. Our interviews also suggest that such institutions continuously roll out tactical improvements, such as securing and limiting how they can send instructions, providing training to employees and sharing best practices with their peers.

The broader ecosystem of external actors, from custodians to consultants, must also be considered part of cybersecurity initiatives. Reassuringly, from our conversations with public asset owners, there is evidence that institutions are integrating external parties into their cybersecurity initiatives. Cybersecurity is now a critical component of vendor RFPs for responsibilities such as custody mandates or data provision.

Conclusion: Riding the Winds of Change

Public asset owners' position as stewards of public wealth and some of the most influential investors in public and private markets puts them at the confluence of structural and technological change. It is essential for these institutions to remain resilient and maintain the agility to respond to an ever-growing range of challenges, such as geopolitical crises, a shifting macroeconomic environment, intensifying social media scrutiny and cyberattacks. These institutions aspire to be the most sophisticated investors, meet their financial objectives and pursue broader and bolder ambitions in society.

- Leading central banks want to secure and grow their reserves while tracking how well they deliver on ESG objectives and retaining critical talent.
- Public pension funds must meet their liabilities while balancing exciting investment opportunities in the alternatives space. They empower their beneficiaries to understand their wealth through interactive, data-driven solutions.
- Leading sovereign wealth funds seek to compete with private sector investors in terms of sophistication and aim to shape new markets, from tokenized assets to the nascent space economy. In parallel, they are implementing new technologies such as cloud in ways that align with their national priorities, as well as developing their national and regional financial systems for the benefit of their publics.

To do so successfully, public asset owners must future-proof their operating models and put data at their core. Some institutions deploy a single system across their organization, with an aim to reduce complexity. Others implement specific improvements to the front, middle and back office and then integrate, relying on emerging custodian or fintech platforms to ensure that data flows seamlessly across their organizations.

Regardless of the approach, institutions must focus on end-to-end connectivity built on a foundation of data. Every part of the organization must share a common data core while facilitating a tailored experience for users inside and outside the institution. To achieve this vision, public asset owners need a clear purpose and framework for their efforts and an agile, results-focused approach. Organizations must also cultivate an enterprise-wide data-centric mindset. This shift requires leaders, culture carriers and providers that share the institution's vision.

The journey for transformation does not end there, however. We are at a major inflection point. Shifting public expectations, expanding investment mandates and evolving technology are enabling public asset owners to exert far greater influence and impact – and often demanding that they do so. As a result, leading public institutions will not only continue to capture, but also create, exciting new opportunities and solutions across the financial ecosystem. A passive wait-and-see approach is no longer sufficient.

In this new future, rapid change, growing complexity and demand for impact and success compels public asset owners to increasingly collaborate with world-class peers, providers and other stakeholders. It is through these collaborations that public asset owners unlock opportunities, strengthen their operating models, and deliver on their promise to the people, communities and countries that they represent and serve. BNY Mellon looks forward to continuing this collaboration as we jointly power individuals and institutions to succeed in the financial world.

Methodology

To obtain a systematic view of the public asset owner landscape and its evolution, we interviewed more than 90 senior leaders from nearly 50 public asset owners worldwide, with a combined almost US$9 trillion in assets. We spoke with institutions in Europe, Asia Pacific, the Middle East, Africa and the Americas between July and November 2021.

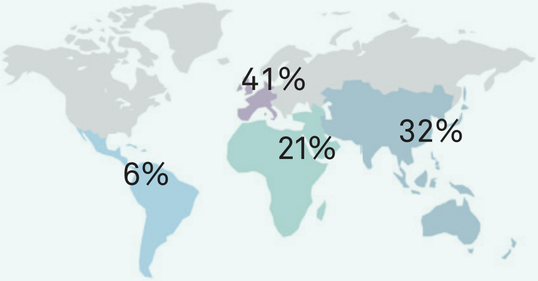
Interviewees included central banks, public pension funds, sovereign wealth funds and other public asset owner institutions (e.g., treasuries functioning as asset owners, guarantee funds), with assets under management ranging from approximately US$2 billion to several hundred billion. The institutions interviewed spanned all major geographies except the U.S., which we excluded given the distinct nature of its public asset owners.

To supplement our interviews, we collaborated with the Official Monetary and Financial Institutions Forum (OMFIF), an independent think tank for public investment, central banking and economic policy, to develop a co-branded survey focused on public asset owners' operating model priorities and challenges. OMFIF conducted the survey between October and December 2021, obtaining 52 responses from central banks, public pension funds and sovereign wealth funds in Europe, APAC, the Americas (excluding the U.S.), the Middle East and Africa. The identities of these institutions were not revealed to BNY Mellon.

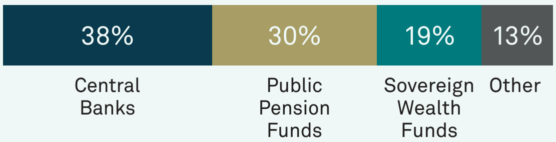
Figure 12: Methodology

BNY Mellon interviewed more than 90 senior leaders from nearly 50 institutions representing almost US$9 trillion in investible assets

Geography

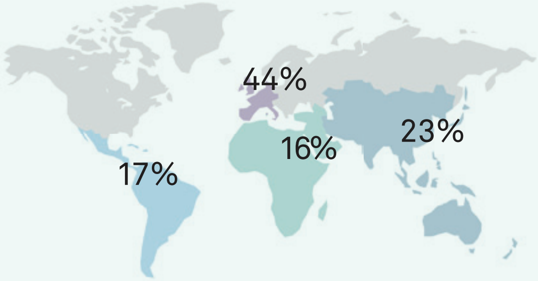


Asset Owner Type



Collaborated with OMFIF to anonymously survey public asset owners on their operating model priorities and challenges

Geography



Asset Owner Type

Note: % figures reflect share of total institutions interviewed or surveyed.

Our work was further supplemented by BNY Mellon's own internal data and research, as well as the views of our leaders, experts and finance practitioners, who benefit from BNY Mellon's unique position as a trusted provider in the industry.

We greatly thank the institutions and leaders that contributed to this work and hope our findings serve them well in preparing for the future. We also thank OMFIF for their support in conducting the operating model survey.

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