# *Less is more:* Leaner, integrated IT platforms for the new capital markets arena

*How can sell-side financial institutions transition toward simpler, more integrated IT platforms?*



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# The heart of the matter

*Most sell-side financial institutions have sacrificed a coherent IT architecture in favor of speed to market. However, can a firm justify a growing web of applications, tangled in expensive interfaces, now that it's easier to untangle the mess? In this report, we identify leading application features that can help firms shift to simpler, more integrated IT platforms. We analyze these features across critical functional areas and show how IT executives can make the business case for change.*

Sell-side financial institutions generally have costly, expansive IT platforms. Many of these platforms—some going on decades old—are duplicative, monolithic, and were originally designed to serve specific needs.[1] Financial markets have changed dramatically since these platforms were put in place. For example, capital markets firms now find themselves in an environment in which the demand for expensive, complex products has declined. At the same time, regulatory burdens have intensified and brought demands for improved reporting and increased transparency. The bottom line: capital markets firms face a more challenging cost-to-income environment. In our view, a do-nothing approach is no longer viable.

In our experience, firms generally know that this is a problem, but they have been reluctant to act. After all, the concept of application rationalization (the technology equivalent of the adage "less is more") has been around since the mid-1990s. It's based on the idea that firms are best served when they manage their inventory of applications as a portfolio, with a minimum set of applications to produce the maximum benefit.

So why the inaction? Over the years, firms deployed purpose-specific applications to serve individual trading verticals. These applications represented a significant investment in proprietary technology, having grown organically over the years. In some cases, the technology is still highly profitable. The end result is that the status quo often remains attractive because the alternatives usually involve deep re-engineering and massive rip-and-replacement.

[1] A monolithic system is one where all the functionality has been developed under a single, tightly coupled code base. Due to a high degree of interdependencies, making a change to one piece has cascading side effects across the system.

*Adapting to new technologies ranks among the top three challenges organizations will face through 2020.*[2]

But that may be shortsighted. In our May 2014 FS Viewpoint, "The future ain't what it used to be: Why tier one investment banks need fundamental operating model changes," we discuss operating model changes that financial institutions can use to reduce long-term operating costs, support business model adjustments, and improve new product rollouts.[3] In this paper, we focus on the IT architecture simplification that we believe should accompany these changes.

In our view, recent developments enable an easier transition toward simpler, more integrated platforms. Emerging open standards—urged, for example, by the Banking Industry Architecture Network (BIAN), the not-for-profit association seeking to establish and promote a common architectural framework—are delivering options aimed at improving system interoperability. Simultaneously, component-based architecture is enabling firms to reuse proprietary solutions and tailor specific modules as needed to meet exact business requirements.[4]

We recommend that firms consider emerging industry open IT standards and new "componentized" solutions. If CIOs/CTOs can present a compelling business case for this type of change, the result could be far simpler IT platforms that connect firms from both front to back and across trading verticals. In this report, we identify features across seven functional areas that can help firms shift toward simpler, more integrated IT platforms.

[2] PwC, "Capital Markets 2020: Will it change for good?" April 2015. www.pwc.com/banking

[3] PwC, "The future ain't what it used to be: Why tier one investment banks need fundamental operating model changes," May 2014. www.pwc.com/fsi

[4] A component-based architecture delivers functionality using a series of modules that perform a specific set of tasks. The design is inherently loosely coupled, such that modules can be developed, tested, and deployed independently.

# An in-depth discussion

*More than three-quarters of PwC's surveyed executives indicate they will need an efficiency ratio of 50% or less to remain competitive for the longer term.*[5]

## Driving the need for simpler, more integrated technology platforms

Capital markets companies are under pressure to deliver products and services with a faster time to market. They also face mandates to accommodate new or changing regulations. To succeed in this new environment, companies need flexible, modular IT platforms. The factors driving these changes include the following:

### Rising cost-to-income pressure

Among the factors driving up cost-to-income ratios are caution and scrutiny around potential revenue drivers, as well as the continued pressures of regulatory and operational expense. But profitable growth requires firms to rapidly develop new products, enter new markets, and create new distribution channels without the hurdles of their traditional duplicative, monolithic platforms.

### The increasing need to provide multi-asset risk exposure

*79% of responding banking and capital markets (BCM) CEOs in PwC's Annual Global CEO Survey in 2015 worry about cybersecurity.*[6]

Firms have traditionally taken a segmented approach to risk management (for example, within a trading vertical or asset class). After 2008, the broad-based push into highly tailored deal structures and more complex asset classes means clients and regulators are demanding greater transparency into risk and its relationship with performance. Firms are now required to understand the cumulative impact of risks across asset classes.

### The changing front-to-back nature of compliance

Compliance is a resource-intensive function that continues to grow in scope and complexity. The increasing sophistication of reporting requirements (for SOX, MiFiD, Basel, Dodd-Frank, EMIR, Volcker, etc.) means data must be disseminated in ways that traditional systems were never designed to support.

### Mounting cybersecurity threats

Security incidents, cost of intrusions, and regulatory requirements continue to intensify. Yet, sell-side firms often experience competing demands, with cumbersome network security on the one hand and responding quickly to market events on the other. The problem: there are security and performance challenges inherent in a high-speed transactional environment that includes a web of interconnecting applications. Network perimeters and endpoints become susceptible to internal and external threats. A growing systems landscape typically leads to decentralized management of user access to critical applications, proprietary data, and sensitive infrastructure. Decentralization also leads to security controls being applied unevenly across the IT architecture, leaving firms vulnerable to attack.

[5] PwC, "Capital Markets 2020: Will it change for good?" April 2015.
[6] PwC, "18th Annual Global CEO Survey: Key findings in the banking and capital markets industry," January 2015.

*63% of BCM CEOs state that cloud computing is strategically important as a category of digital technology.*[7]

### *The growing adoption of cloud technology*

Financial institutions have increasingly adopted cloud technology, which forces simpler application architectures because it decouples applications from the underlying infrastructure. Beyond consolidation, the key benefits of cloud include standardized application and development environments that result in better controlled and more efficient application lifecycles. At the same time, however, cloud technology raises many security and privacy questions.

### *Increased pressure to enhance the user experience through digital*

End customers are pushing sell-side firms to continually improve web portals to provide them with a better user experience. This is being accomplished through streamlined information delivery, greater personalization, real-time customer service, and multichannel support (particularly mobile). Increasing customer demand requires agile applications.

## *What we have observed*

A variety of factors have led to what we refer to as "IT incoherence"—a patchwork of bolt-on applications that have evolved haphazardly over time. This situation is the result of non-standard business processes, application acquisition driven only by tactical considerations, decentralized IT selection, trader preferences, and incomplete post-merger integrations, among other things. Worse, the lack of flexible, agile systems is largely perceived to be solely an IT problem.

Some firms have responded by initiating tactical projects to consolidate platforms in key problem areas. These disjointed, IT-driven efforts attempt to quickly consolidate applications onto fewer, but larger IT platforms. This approach often adds further complexity to already outdated architectures, and it rarely delivers on the promise of agility. In fact, the predicted cost savings become more difficult to realize as retiring legacy applications altogether may take years to realize benefits. Hidden data and infrastructure linkages may not be understood until advanced stages of the project.

Industry leaders are contributing to open IT standards. Some are also considering emerging component-based software. Yet, even market leaders often lack the breadth of perspective to leverage these trends, simplify application architectures, and increase front-to-back integration.

[7] PwC, "18th Annual Global CEO Survey: Key findings in the banking and capital markets industry," January 2015. Note: Includes respondents who stated "somewhat" or "very important."

## Our point of view

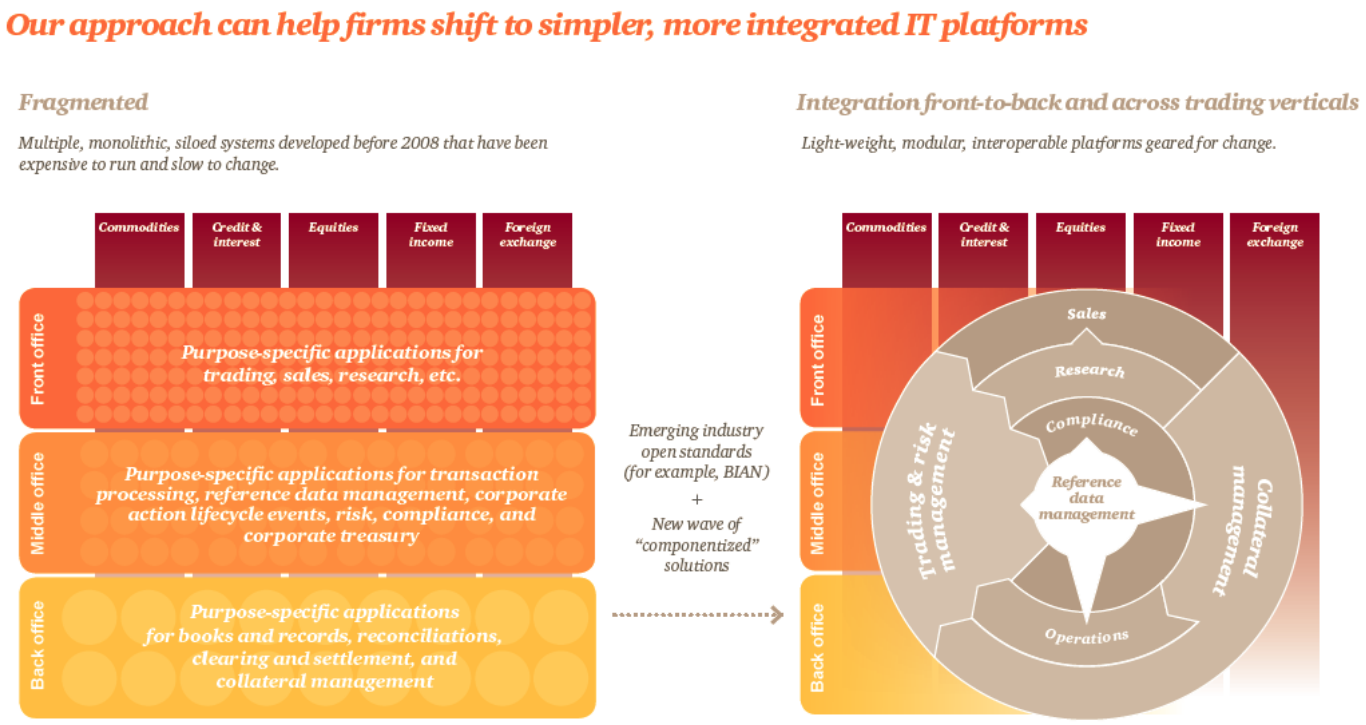
In our view, firms should comprehensively assess their IT architectures rather than undertake a tactical approach to platform consolidation. We encourage firms to embrace emerging industry open standards and component-based solutions. As shown in Figure 1, this will help capital markets firms transition from today's multiple, monolithic, siloed systems to a simpler architecture that enables better integration, both from front to back and across trading verticals.

We believe the following seven functional areas provide the greatest opportunities for firms to benefit from the implementation of simpler, more integrated applications. We will explore each one in greater depth below, along with a means of addressing various challenges inherent to each.

### Trading and risk management

Firms should move toward trading order and execution management systems (OEMS) that include high performance master shell layers. This master shell layer can load asset-specific widgets in real time as required, regardless of asset type. Firms can gain economies of scale on cross-asset trading by integrating OEMS to reduce functional redundancies. Firms can also gain efficiencies by consolidating disparate graphical user interfaces (GUIs), such as those used for profit-and-loss and risk analyses. By improving integration of these GUIs with OEMS, firms can improve real-time monitoring of positions and exposures.

**Figure 1: Evolution toward simpler, more integrated platforms.**



### *Operations*

Firms will be able to consolidate operations into a single global back office with consistent data. Implementing multi-asset clearing, real-time gross settlement, and netting to support a standard factory model by region should be achievable. Operations may now be able to consider machine learning, any-to-any reconciliation engines to reduce manual break investigation, and exceptions handling.

### *Sales*

Firms should build customizable sales GUIs and leverage synergies with risk GUIs. Firms should also consider linking trading turret phones with email, chat, and CRM to get a 360-degree view of client communications. Integration across lines of business on client-facing portals should also be possible, with an emphasis on enhancing the user experience and the application of predictive analytics for proactive sales and marketing.

### *Research*

Firms will be able to adopt simpler cloud-based solutions. This will enable them to derive economies of scale, sharing computing and data resources across trading verticals and geographies.

### *Compliance*

Firms will be able to centralize pre-trade compliance limits and integrate with asset-specific trading plugins for consistency. They will also be able to leverage exploratory analysis of data lakes, containing diverse structured and unstructured data sets, to help reduce the likelihood of compliance violations.

### *Reference data management*

Data acquisition, validation, maintenance, and distribution processes can be consolidated through a centralized reference data repository, shared data model, and common distribution framework/standards. This can improve enterprise-wide data quality and consistency.

### *Collateral management*

By committing to emerging industry open solutions, companies will be able to implement front-to-back integration with pricing, trading/risk, treasury, and clearing/settlement systems. This will help improve global cross-asset margining.

## *Benefits*

In this paper, we identify leading application features that can help firms shift to simpler, more integrated IT platforms. The key benefits of our approach include:

- Improved cost-to-income ratio through simplification/integration programs. We see these improvements coming in the areas of end-user efficiencies, application development and support, data center savings, and other efficiencies.
- Reduced risk through lower IT complexity and simplified maintenance, with fewer incidents and internal reconciliation breaks.
- Improved flexibility and future scalability to plug-and-play solutions from existing in-house systems, vendor offerings, and/or industry utilities.
- Improved agility to easily respond to frequent changes in strategy, markets, products, distribution channels, and regulations.

## Our approach

### Step 1: Prioritize functional areas

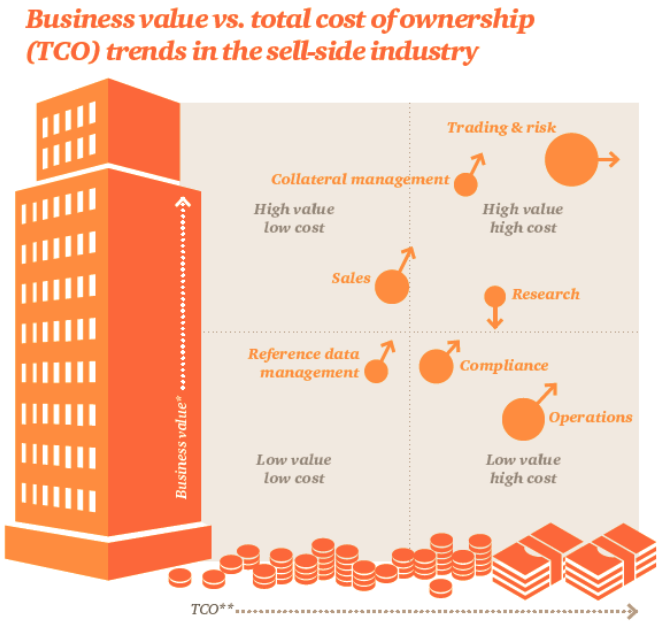
In setting priorities, the main challenge is to evaluate the business value of existing architecture while considering that wholesale rip-and-replacement of serviceable systems may actually destroy their accumulated value. Figure 2 illustrates our approach for prioritizing among the seven key functional areas.

We recommend that IT executives take several considerations into account when deciding which functional areas to include as part of technology transformations. First, transformations should lower the total cost of ownership, enhance operational capacity, and improve productivity. Second, transformations should simplify interfaces, reduce maintenance overheads, and improve data accuracy. Lastly, transformations should produce a tangible increase in revenue. Examples of revenue opportunities include faster development of new products and markets, as well as cross selling to customers as a result of more integrated, transparent customer information.

### Step 2: Determine how far to go with platform simplification/integration

The firm's roadmap should not simply aim to reduce the number of applications. Instead, we recommend a holistic evaluation of the enterprise architecture, from business processes and information to applications and infrastructure (as shown in Figure 3). This will also help identify the optimal number of data stores, warehouses, and interfaces, among other architecture matters.

**Figure 2: Prioritizing functional areas for action.**



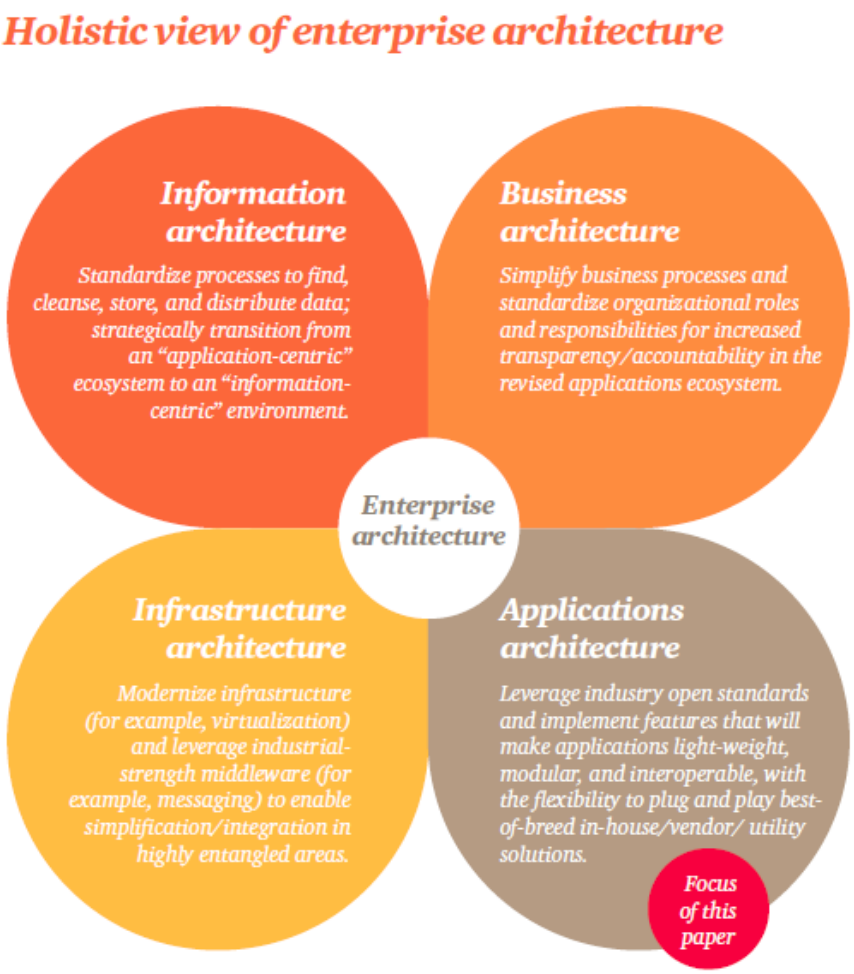

Source: PwC analysis based on multiple projects, client discussions, and a review of industry publications and analyst reports.

**Legend**

Size of circle = average number of business applications supporting functional area
Arrow = direction that functional area is trending toward due to business and technology challenges

* Business value – combined potential for higher revenue and lower risk from applications
** TCO – combined "burden" to build/license, maintain, and operate applications

**Figure 3: Determining the degree of simplification/integration requires a holistic view of the enterprise architecture. In this paper, we focus on applications architecture.**




### *Step 3: Develop a clear business case*

In all cases, it's crucial for firms to articulate a tangible business case that demonstrates how improvements pay for themselves. PwC estimates that holistic simplification and integration programs can improve a firm's cost-to-income ratio by an average of 30% over a three- to five-year period (as shown in Figure 4). We see these improvements coming in the areas of end-user efficiencies, application development and support, data center savings, and other efficiencies.

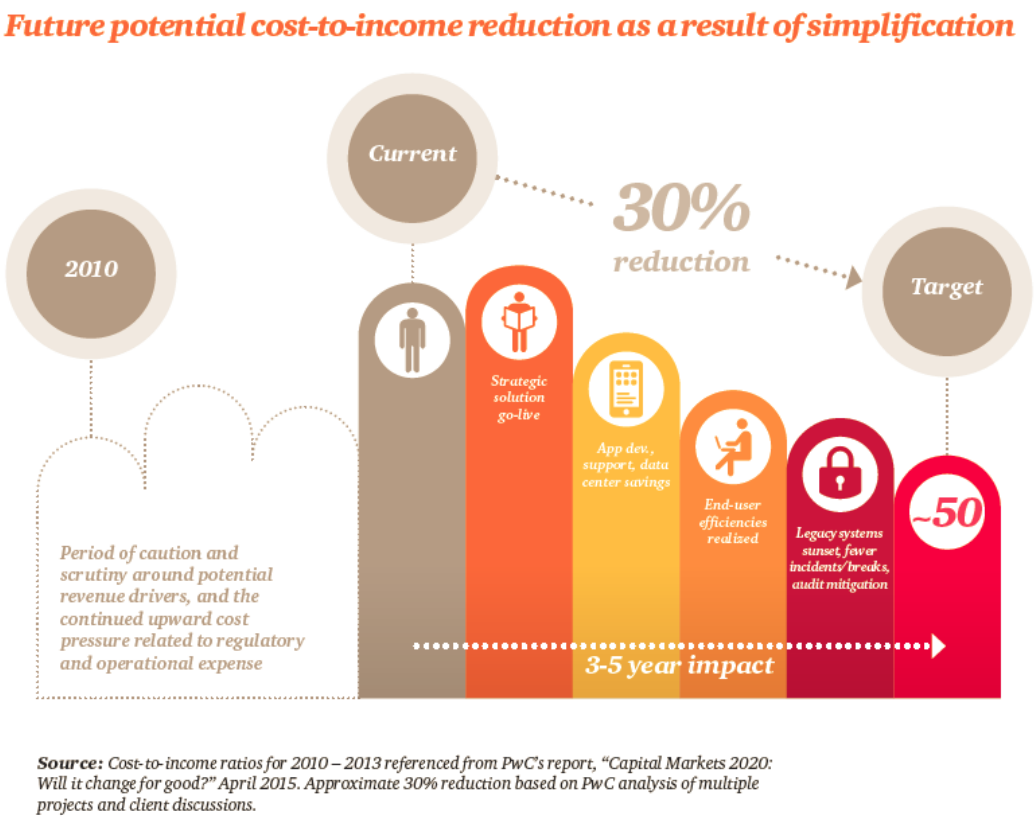
- *End-user efficiencies:* Estimated 10% to 14% improvement due to lower costs and incremental revenue opportunities:*
  - Decreased operational costs in trading and risk and operations from higher adoption of straight-through processing, standardized business processes, and simplified organization structures.
  - Fewer regulatory fines resulting from proactive compliance measures.

* Source: PwC analysis based on multiple projects and client discussions.

  - Incremental revenue from enhanced cross selling and proactive marketing, global cross-asset collateral management, as well as increased trading and risk agility toward new products, markets, and distribution channels.
- *Application development and support:* Estimated 6% to 10% cost savings primarily from a more modular trading and risk tool set. In addition, fewer personnel will be needed to support certain applications (such as legacy clearing and settlement).*
- *Data center:* Estimated 4% to 8% cost savings from a smaller infrastructure footprint driven by adopting cloud-based solutions for resource-intensive data and computing research and risk functions.*
- *Incidents and breaks:* Estimated 2% to 4% cost avoidance due to a smaller number of systems, fewer internal reconciliation breaks, and reduced downtime from outages on legacy systems (the result of code and infrastructure modernization).*
- *Audit mitigation:* Up to 2% cost avoidance on recurring programs to remediate IT audit findings on multiple non-standard tools.*

* Source: PwC analysis based on multiple projects and client discussions.

**Figure 4: On average, firms can improve their cost-to-income ratio by 30% over a 3- to 5-year period.**

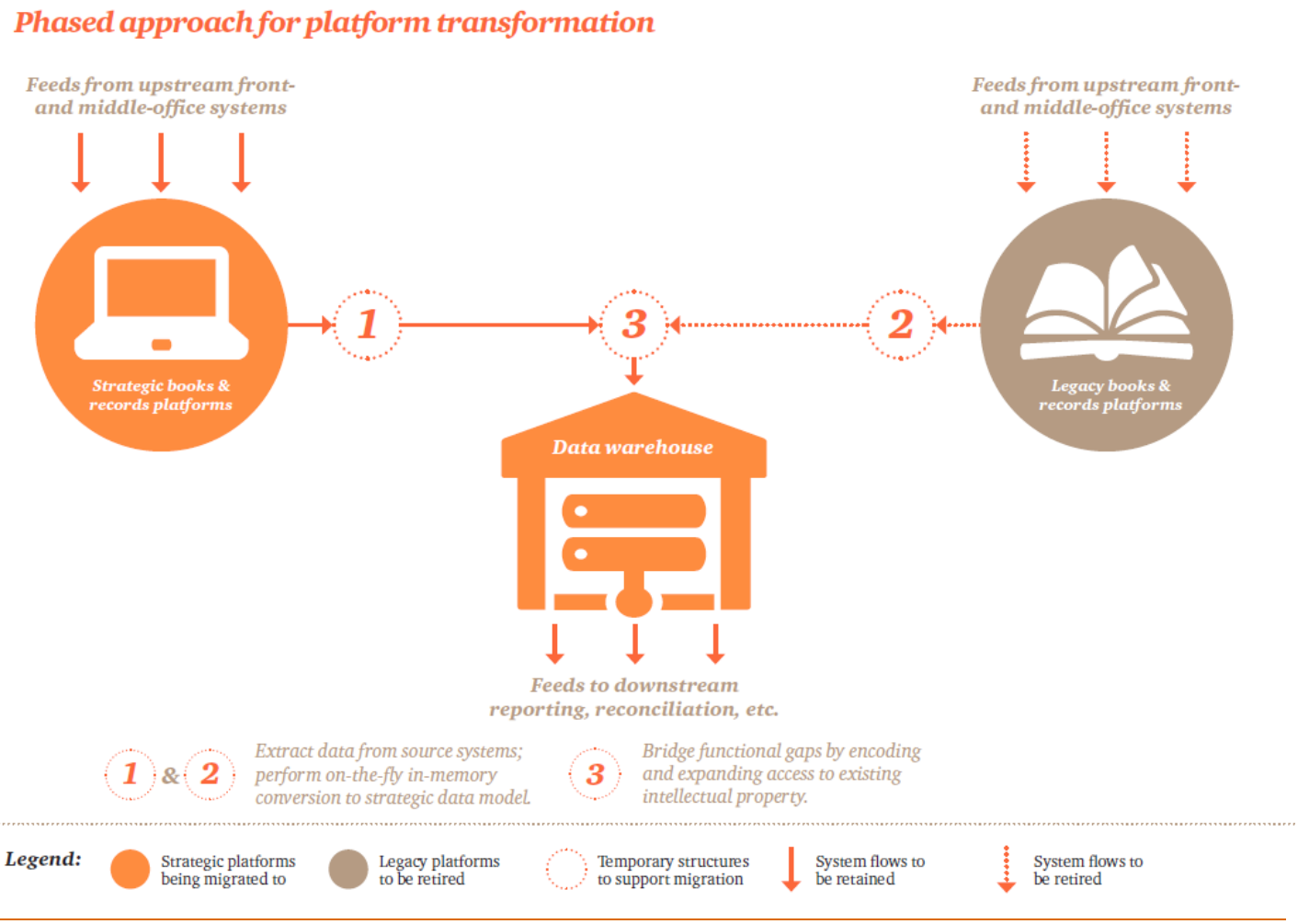



***Source:*** *Cost-to-income ratios for 2010 – 2013 referenced from PwC's report, "Capital Markets 2020: Will it change for good?" April 2015. Approximate 30% reduction based on PwC analysis of multiple projects and client discussions.*

### *Step 4: Anticipate potential roadblocks*

Common roadblocks during this transformation include the difficulties of converting data and remediating functional gaps. An effective way to tackle these issues is to leverage innovative solutions that can serve as temporary structures during the transition (as shown in Figure 5). Those structures bring speed and safety to the program and enable a phased approach (for example, gradually migrating accounts). The phases can reduce business disruptions as the firm temporarily continues to operate with two environments.

**Figure 5: A phased approach can help avoid potential roadblocks.**



### *Step 5: Develop the target-state blueprint and program roadmap*

After the seven functional areas have been prioritized, firms should define an agile target-state blueprint. We believe industry open standards should play a vital role here. With a constantly shifting business landscape and onslaught of disruptive technologies, it is unlikely that target-state architecture maps drawn up today will remain optimal several years from now. Having an open architecture will enable firms to react to market changes quicker and have the flexibility to adopt emerging leading practices.

Once the target-state has been defined, firms will need to develop a program roadmap. This roadmap should identify which applications will be simplified, what the integration points will be, the timing of the changes, and how those changes should be executed. While firms typically like to focus on quick wins in the early stages, we believe firms are better served by prioritizing the largest applications first. Although these larger applications are more complex, if firms can successfully simplify them up front, it will instill confidence in the program and demonstrate that rationalization projects can be self-funding.

Another decision firms need to evaluate is how they will replace the applications: should they build the application in-house, buy from a vendor, or use an industry utility? We recommend that firms consider the business' needs, as well as market trends, when making this decision. Business functions that create competitive differentiation may be best served by fast-moving in-house applications. Functions with regulatory mandates may need more flexible options, such as the ability to engage an industry utility. More stable areas may prefer industrialized vendor tools that have a strong record of efficiency and reliability.

Finally, we recognize that some applications may be so entrenched in the firm's architecture that it is not immediately feasible to simplify them. In these situations, we suggest that firms consider other options presented in Figure 3 to help pave the way for simplification in the future. For example, firms might start with modernizing the infrastructure through virtualization.

### *Step 6: Develop a shared vision*

Application rationalization should be seen as a catalyst to standardize and simplify processes. The challenge is to enable stakeholders to engage more, in an effort to align IT and business transformations. In our view, it is necessary to foster a sense of shared ownership and accountability. We also recommend that firms implement a robust governance structure, with leadership providing tone from the top and making a commitment to change course when business priorities evolve.

## *A deeper look at features*

To mitigate the challenges discussed previously, we recommend that firms implement features that result in light-weight, modular platforms. In this section, we discuss in greater detail each of the seven key functional areas we think will benefit the most from a comprehensive assessment of the IT architecture. We describe the specific feature that we recommend firms adopt, provide a brief description of the feature, and present our reasoning as to why this feature should be included.

## *Trading and risk management*

There are high costs to maintaining multiple order and execution management systems (OEMS) across geographies, asset sub-types (especially commodities, credit, and interest rate derivatives), and trading venues (including exchange traded and over the counter (OTC) cleared/bilateral). Also, because trading and risk systems are not integrated, traders must manually sign-off on valuations and volatility estimations from risk departments.

Moreover, there is a proliferation of duplicative risk and P&L views performing slightly different work. Firms have multiple licenses for market data and market depth, with numerous entry and storage points.

In our perspective, here are the key features of a leaner, more modular platform that addresses trading and risk management:

| Features | Elements | Rationale |
|---|---|---|
| Asset-agnostic master shell layer | Multithreaded and resource efficient, with the ability to load plugins in real time based on the asset class that needs to be traded. | Avoids functional redundancies between OEMS. Gains economies of scale on cross-asset trading commonalities. |
| | Subscribes to market data on demand. | Manages market data costs. |
| | Centralized connectivity for smart order routing and messaging based on ultra-low latency standards (such as Financial Information eXchange (FIX) protocol and XML-based formats). | Reduces errors in trade booking due to duplication of entries. Eliminates transfer protocol errors. |
| Asset-specific trading plugins | Plugin provides a tailored view of the assets and market depth for the desired asset class. | Retention and enhancement of asset-specific differentiators is pivotal to the client value proposition. |
| | Ability to leverage agile methodologies to adapt to changing needs. | Plugins keep pace with changing regulatory and compliance landscape. |
| | Plugin connects to market participants as needed to source only what is required. | Lowers costs through subscription-based on-demand requests for marketing information. |
| Cross-asset customizable GUIs (risk view) | Advanced slice-and-dice capabilities for a rich market risk view that can be leveraged for multiple business units (especially sales and trading). | Cost savings from maintaining fewer (or even one) highly customizable risk GUIs, instead of separate apps/GUIs performing similar functions. |
| | Library of statistical and analytical models, with cloud-based what-if scenario simulation engine and embedded workflow manager for escalation procedures. | Sends large calculation bursts to a cloud of processors to reduce infrastructure costs and provide better management through pay-per-use. |
| | Direct connection to OEMS. | Full integration for real-time decision-making to reduce losses. |

## *Operations*

The challenges here are many. Legacy systems often feature multiple books and records, with a stream of batch jobs replicating data between disparate systems. This can create a large volume of daily operational data breaks. In addition, there may be a high fixed cost to maintaining multiple legacy systems (particularly multiple clearing and settlement systems per asset class and region). We have seen firms adopt makeshift tools in treasury, accounting, and reconciliation, with no single "source of truth."

None of this is optimal; operations can benefit from a leaner, more modular system in the following ways:

| Features | Elements | Rationale |
|---|---|---|
| Unified back-office data repository and reporting | Single back-office "golden source" with a centralized source for pricing, corporate actions, market and lifecycle events, accounts structure, trades, cash movements, intraday position, etc. | Decreased operational risk from data errors or inaccurate reporting. Decreased security vulnerabilities through centralized management of user access/entitlements. |
| | Open database that uses industry standard event-driven, message-based communication protocols. | Avoids point-to-point integration with consuming applications in front- or middle-office. |
| | Library of common reporting templates and data translations. | Data transformation and normalization rules managed centrally and reused universally. |
| Standard securities clearing and settlement "factory" per region/sovereign | Single solution for exchange-traded and OTC products (centrally cleared and bilateral) per region/sovereign. | Centralized, rules-based management of clearing/settlement per local regulations. |
| | Multi-protocol adapters (such as FIX, Society for the Worldwide Interbank Financial Telecommunication (SWIFT), and FTP) for multi-counterparty clearing. | Interfaces with increasingly diverse counterparties, such as execution brokers and clearing members, central counterparties (CCPs), swap execution facilities, and multilateral trading facilities. |
| | Real-time gross settlement and multiple netting models. | Mitigation of regulatory risk in countries that require settlement within a stipulated time frame (for example, same-day settlement). |
| | Plug-in approach for new instruments or trading venues, and scale-out architecture to add processing capacity/servers. | Incremental growth, so different solutions can be deployed at different points in time to satisfy evolving needs. |
| Machine learning, any-to-any reconciliation | Machine learning to detect patterns in historical exceptions and identify manual corrective actions that were applied. Intelligence to auto-suggest corrective actions for new breaks. | Reduces lead time for resolution, and improves operational efficiency. |
| | Business rules engine for any-to-any, position-level, or transaction-level matching. | Allows for transaction matching rule sets to be leveraged across different types of reconciliations (such as custody & accounting). |
| | Workflow manager for break investigation procedures. | Near-real-time transparency into status and aging of breaks. |

## *Sales*

Sales often misses opportunities to cross sell due to the lack of an integrated view of customers' businesses. And there often are challenges in integrating customer data from CRM systems with the many other customer communication tools being used.

Meanwhile, sales teams continue to rely on the static pitch-book approach to sales that is based on rudimentary and manually intensive customer analytics.

Features of a leaner, more modular platform for sales include the following:

| Features | Elements | Rationale |
|---|---|---|
| Cross-asset customizable GUIs (sales view) | Advanced slice-and-dice capabilities provide a rich sales view that can also be leveraged by other business units. | Leverages synergies with cross-asset customizable GUIs to save development and maintenance efforts. |
| | Shows sales what they require, such as client profitability, client spending across asset classes, client toxicity, and credit value adjustment (CVA) allocation by sales staff versus clients. | Greater customer-centricity, with a focus on understanding "what has happened thus far." |
| Integrated customer data and communication | Trading turret phones linked to email, chat, CRM, trade blotters, risk, and P&L systems. | 360-degree customer view, linking client communications to trading history to exposure. |
| | Integrated video conferencing. | Improves client relationships because face time is easier to establish. |
| | Cross-line of business integration on client-facing portals, including consistent branding, well-defined data dictionaries, dashboards with live data and drill-down features, persona-based customizable plugins, user-centric navigation, workflow-based service management with self-help options, call back feature with live chat, social plugins, and mobile device support. | Digital interactions drive customer value. |
| Analytics engine for proactive pitching | Recommendation engine for proactive sales and marketing of products/services based on client's portal usage, persona, favorites, patterns in transactions, etc. | Decision science provides insight into why things happened and what is likely to happen next. Enables quantitative and qualitative metrics around client revenue and profitability. |

## *Research*

The buy-side continues to intensify pressure on sell-side firms to unbundle research from trading. As such, the research function faces multiple challenges with the traditional siloed systems approach. These include duplicative research infrastructure across geographies. Also, there are high fixed costs due to expensive, quantitative analytics engines that rely on large-scale historical data.

Features of a leaner, more modular platform for research include the following:

| Features | Elements | Rationale |
|---|---|---|
| Cloud data storage | Very large-scale data storage—ability to handle 10 to 20 years' worth of historical data and end-of-day market data. | Provides research on historical data to test profitability of new recommendations and ideas. |
| | Reference data adapter to consume authoritative source. | Data consistency across all business lines and regions. |
| | Global data repository in a high-availability environment. | One cloud for all data, reducing the number of environments enterprise-wide. |
| Cloud computing; integration with risk libraries | Integration with a centralized risk library of statistical and analytical models. | Centralized management of models, reducing inconsistencies between risk and research teams. |
| | Shared global pool of cloud computing processors for resource-intensive what-if scenario simulations. | Shared computing resources help meet demand of different lines of business at different points in the day. Leverage unused computing in other regions to reduce idling costs. |
| Integration with sales, trading, reporting | Integration with reporting engines to reuse templates for client-ready presentations. | Less need for a middleman between research and trading. |
| | Integration with sales and trading plugins to provide investment insights by asset class. | Assistance for sales teams and traders in suggesting investment ideas to customers. |

## *Compliance*

Compliance challenges generally encountered with legacy systems include decentralized pre-trade risk controls and inconsistent system safeguards, which increase the dangers of severe market disruptions (such as the Flash Crash of 2010). Other challenges include the need for increasingly sophisticated reporting across front-, middle-, and back-office functions. Meanwhile, compliance is often challenged to make connections—that is, "look for clues"—in disparate sets of structured and unstructured data. They are also at risk of missing important information.

Features of a leaner, more modular platform for compliance include the following:

| Features | Elements | Rationale |
|---|---|---|
| Centralizing front-office pre-trade compliance | Common rules-based engine defines pre-trade controls and limits for each product, sector, and trader. | Controls and limits are applied evenly across the organization. |
| | Integration with asset-specific trading plugins for consistent trading restrictions and limits per asset class. | Efficient reporting of threshold breaches and near-limit alerts, due to one layer of management across all lines of business. |
| | Workflow manager for centralized handling of threshold breaches, near-limit alerts, and auditable actions. | Reduced lead time for management override/approvals or compliance action. |
| Analytics engine for exploring context-specific data relationships | Engine capable of correlating structured data (such as trades and watch-lists), unstructured data (such as emails, chat, and phone records), and external data (such as news articles) to detect suspicious activity, such as insider trading. | Analytics can proactively compare unstructured traffic with external market news for possible compliance violations. |
| | Natural language processing (NLP) for pattern recognition and clustering algorithms. | Leverage semantics-based analytics to determine context and find hidden relationships between disparate data sets. |
| Data lake that is massively scalable, low cost, and in any format | Massively scalable storage to respond to regulatory demands with greater insight (such as storing market depth to prove "best execution," a request to determine best price for a trade in the shortest timeframe). | Easily scalable to large structured and unstructured data sets at significantly lower costs than traditional data warehouses. |
| | Flexible schema for emerging data formats (structured and unstructured data sets). | Adaptability to changing compliance landscape is greatly increased. |
| | Integration with sales systems to provide auditable communication logs on receiving client orders, as well as on negotiating, agreeing, and arranging transactions. | Streamlined data integration is needed to satisfy compliance requirements. |

*Reference data management*

The reference data management function faces challenges with fragmented environments, multiple systems, and an inflexible batch-oriented architecture that creates inefficient workflows. Maintenance costs may also increase due to several competing data structures and repositories, as well as inconsistent data hierarchies and classification schemes. In addition, intensive manual data-cleanup processes are costly, which makes scalability difficult and increases operational risk.

Features of a leaner, more modular platform for reference data management include the following:

| Features | Elements | Rationale |
|---|---|---|
| Centralized master data repository | Authoritative, global reference data repository with configurable data validation rules for use by all business units and regions. | Consistent legal entity hierarchies, standing settlement instructions, client onboarding, Know Your Customer (KYC) rules, tax reporting, asset handling, and compliance requirements for Dodd-Frank, European Market Infrastructure Regulation (EMIR), and other regulations. |
| | Business-rules engines for strict checks on market activities (such as corporate actions and dividend payouts) to avoid confusion around cash flows and new asset creation. | Error avoidance and improved preparedness on days when market activities occur (such as IPOs and corporate actions) enable smoother trading and order execution. |
| Common distribution framework | Abstract distribution layer provides a common mechanism through which consumer applications are able to access reference data, regardless of the underlying data type and source location. | User access to reference data is managed through a central interface that also shields users from changes to the structure of the source data. |
| Standardized reference data model | Organization-wide conceptual data model incorporates all reference data types. This provides the flexibility to represent data relationships and hierarchies across the diverse needs of downstream applications while adhering to data standards. | All lines of business source the same data instead of having to deal with multiple data transformations across repositories. |
| | Naming conventions and standards across the repositories drive data quality and integrity. | Data standards are defined and applied to master repositories during acquisition or maintenance to avoid data quality issues downstream, such as duplicate records and missing or inconsistent attributes. |

## *Collateral management*

Collateral management faces challenges related to regulatory mandates that drive the convergence of legal, credit, risk, and liquidity functions. All of these push collateral management to be more aligned with front-office and treasury tasks, rather than being a purely back-office concern. Meanwhile, volume pressures rise due to an increase in margin call traffic.

There is increasingly complex netting across entities, assets, and agreement types, leading to labor-intensive reconciliations.

Features of a leaner, more modular platform for collateral management including the following:

| Feature | Elements | Rationale |
|---|---|---|
| Centralized collateral inventory and optimization | Consolidated collateral inventory for all margining, funding, liquidity, and yield enhancement activities helps enable an enterprise-wide view of collateral across various pools and asset classes. | Improved ability to realize cross-asset margining, preserve margin limits, meet margin calls, and post eligible collateral. |
| | Algorithms not only identify collateral that is the “cheapest to deliver” but also improve the firm’s overall credit risk exposure. | Greater availability of high-quality liquid assets, which will help improve short-term capital ratios and liquidity. |
| Integration with front-office trading and risk | Alignment of collateral management systems with front-office trading and credit risk management. | Greater opportunities to do more transactions in the markets, with less capital and less time required for credit review and settlement. |
| | Specialized views for concentration limits. | Control of certain issuers, product categories, or ratings of the issuance/issuer by category of collateral. |
| | Fully automated predictive modeling for next-day calls, with a single margin calculated across all CCPs. | Improve ability to anticipate collateral needs and optimize available inventory. |
| Integration with back-office operations | Collateral management systems are aligned with operations machine learning and any-to-any reconciliation engines. | More efficient matching of collateral cash and securities movements, and of positions with custodians and counterparties. |
| | Workflow manager for break investigations procedures and dispute management. | More efficient dispute management. |
| | Settlement netting across products (such as CCPs and bilateral), legal entities, client funds, and regions. | Reduced volume of settlement instructions with counterparties. |

# *What this means for your business*

In our view, capital markets firms have reached a tipping point when it comes to IT investments. Can a firm justify a continually growing web of applications, tangled in expensive interfaces, when it's now easier than ever to untangle this web? We don't think so. If CIOs/CTOs can present a compelling business case for change—and we believe this report offers that business case—the result could be far simpler IT platforms that connect well, both front to back and across trading verticals.

Here are some final guidelines to consider:

- **Analyze leading application architecture features.** Technology-enabled transformations require a combined focus on reducing risk, complexity, and cost while increasing flexibility and future scalability. Institutions should focus on leading application architecture features across trading and risk management, operations, sales, research, compliance, reference data management, and collateral management to increase the effectiveness of multiyear, multidisciplinary transformation programs.
- **Prioritize functional areas for action**. Firms should focus not only on cost savings but also on evaluating business value versus the total cost of application ownership across different functional areas.
- **Simplify, but also balance priorities.** The transformation should not be driven by the single goal of reducing the number of applications; instead, it should balance competing priorities, such as local line-of-business autonomy and firm-wide standardization. Firms should thoroughly evaluate key tenets of enterprise architecture, including business process, information, applications, and infrastructure.
- **Partner with the business.** IT executives who want to steer multidisciplinary transformation programs need to form strong partnerships with the business and have a deep knowledge of its functions. Innovative solutions can now increase the speed and safety of data conversion, as well as remediate functional gaps between new and old systems. Executives will need practical project and program management skills to balance competing demands for resources, manage interdependencies, and mitigate risks.
- **Think strategically**. Executives will need to assess organizational risk and readiness, create project branding, engage stakeholders, and enable workforce training and feedback. Navigating this transformation will require a pragmatic but strategic approach to ensure continued support and funding for the long-haul journey to the new operating model.

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"Less is more: Leaner, integrated IT platforms for the new capital markets arena," PwC, May 2015, www.pwc.com/fsi



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