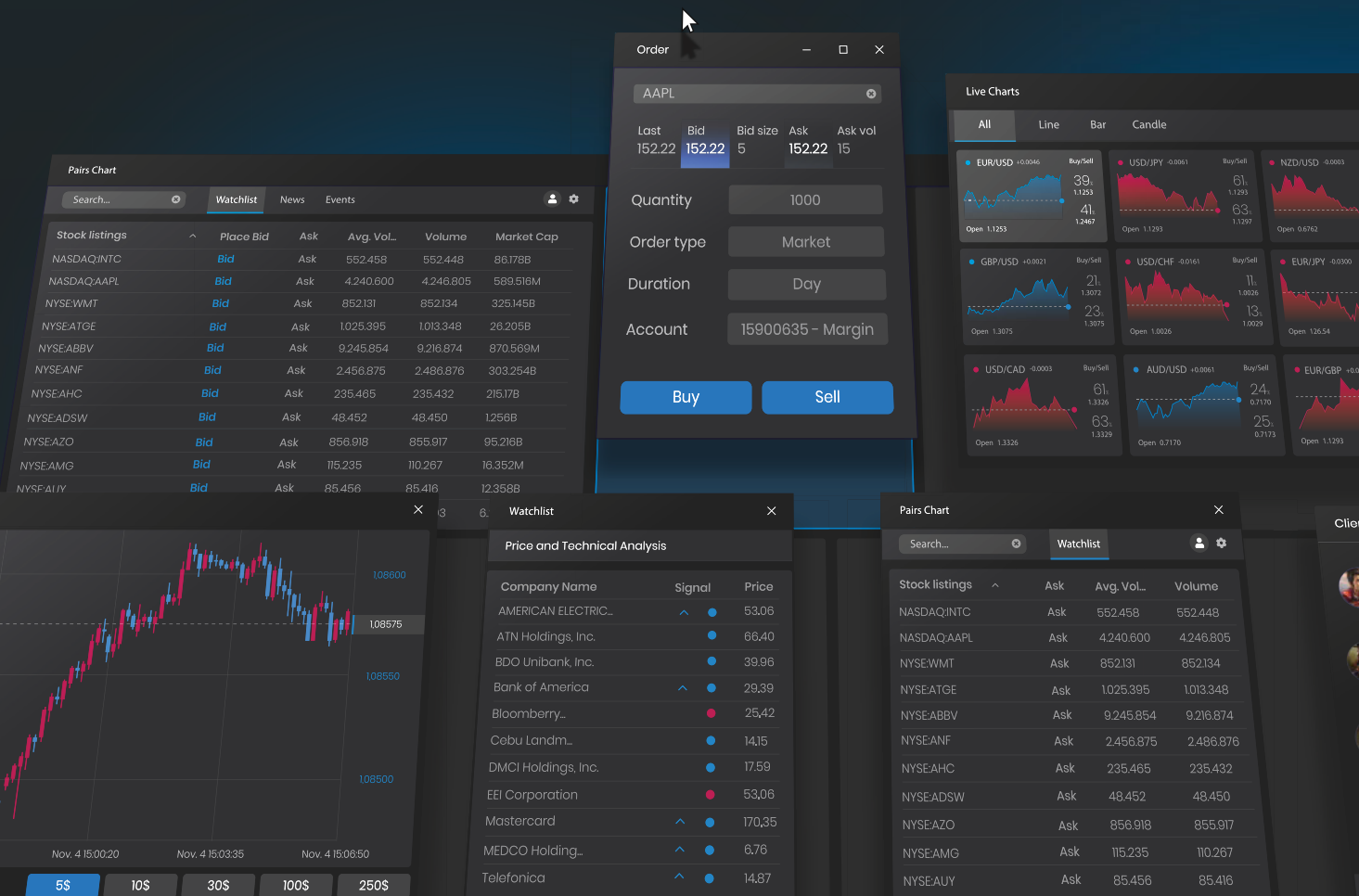




MODERNIZING LEGACY SYSTEMS

Why loving legacy apps is key to capital markets' digital transformation



Executive Summary

Financial institutions are committed to becoming data-driven enterprises through digital transformation, but they have a serious issue with so-called legacy technology. Starting over is not an option as efforts to do so quickly get mired among competing expectations. Similarly looking at digital transformation as a project to complete is a mistake, instead it is a process, and a never-ending one at that. This whitepaper presents research and analysis on how the most successful firms in capital markets are modernizing – and loving – their legacy systems as part of a continuous digital transformation culture.

Success requires finding ways to continually leverage the valuable business knowledge and insight contained in legacy technology while laying the foundations for agility and flexibility going forward. This paper discusses how progressive firms are approaching desktop modernization to deliver a hybrid environment in support of a data-driven enterprise, where legacy applications co-exist with modern ones in a fully integrated way.

The story of capital markets' challenges is well understood – a unique combination of heavy regulation, a diverse and sophisticated product set, and rapidly changing market structure are resulting in reduced margins and significant cost pressures for capital markets players. Technology's advance is both friend and foe, offering an opportunity for positive change but lowering barriers to entry for competition. Paraphrasing Darwin, it is not the fittest that survive, but those most adaptable to change.



Introduction



There is a balance to be struck between supporting the business now and enabling it to move forward. You don't want to box in the business with technology."

—Head of Trading Technology, Global Investment Manager

While much of the capital markets industry is struggling with digital transformation initiatives some institutions are succeeding by embracing, not fighting, legacy applications. Often legacy applications contain a highly valuable but undocumented feature – a deep understanding of the firm's uniquely

complex workflows and highly regulated environment. Despite often being difficult to integrate, these applications can be critical to the business. In these cases a “rip and replace” approach will likely mire efforts to modernize user workspaces as expensive and time consuming discovery sessions are required to understand all the undocumented nuances and workarounds built in over the years.

There are few opportunities for greenfield development within capital markets, so, as the saying goes, ‘if you can’t beat them, join them.’ New technologies and approaches supporting desktop modernization allow financial institutions to continue to extract value from current applications, while also delivering gains in employee productivity and supporting data-driven enterprises. There is also a recognition that ‘digital transformation’ is not a one-off project but a continuous journey. This means today’s applications are tomorrow’s legacy. Digital transformation should be seen as a continuous process with the aim of creating an agile and flexible technology base which supports the business as it changes and grows.



This paper presents current thought leadership from leading capital markets participants from across the buy-side and sell-side who are finding that the solution to the ‘legacy problem’ centres on working with, rather than against, legacy. That starts with a 360-degree definition of legacy, incorporating the perspectives of all stakeholders whether technology or user-side. Incorporating all stakeholders shows that there are many ‘flavours’ of legacy, for example, stacks that perform well but are difficult to expand, technology that hinders hiring/retaining the right talent, or applications that have been highly customized but poorly documented.

Legacy Technology Challenges in Capital Markets



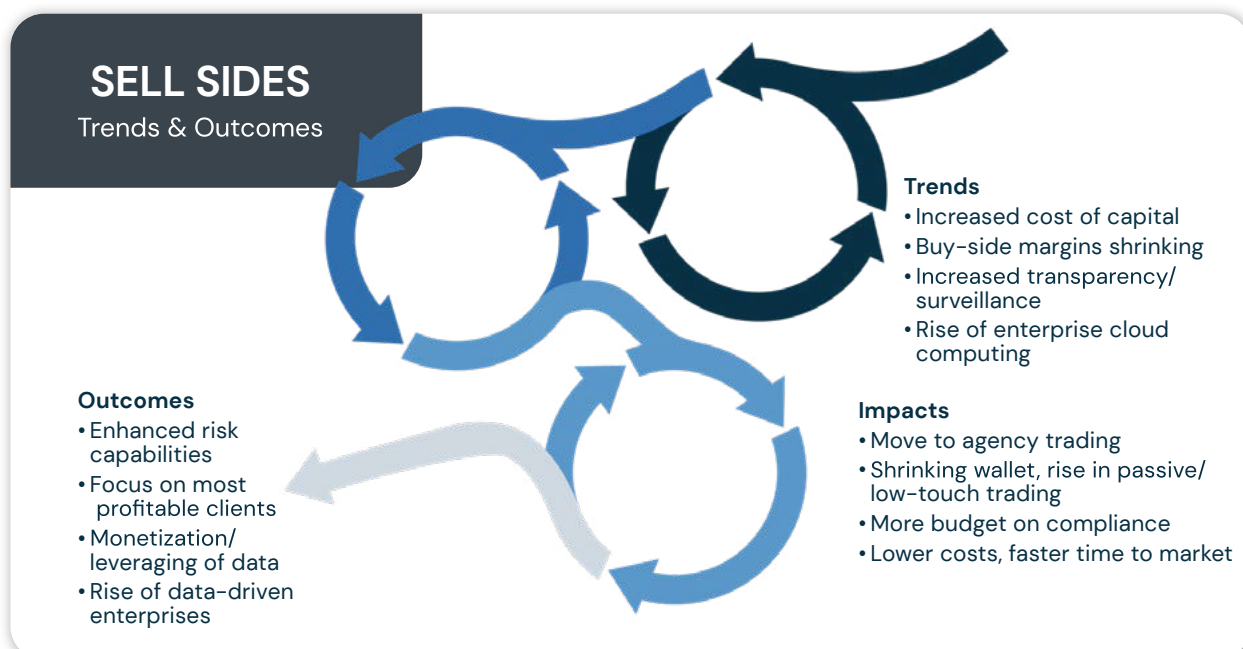
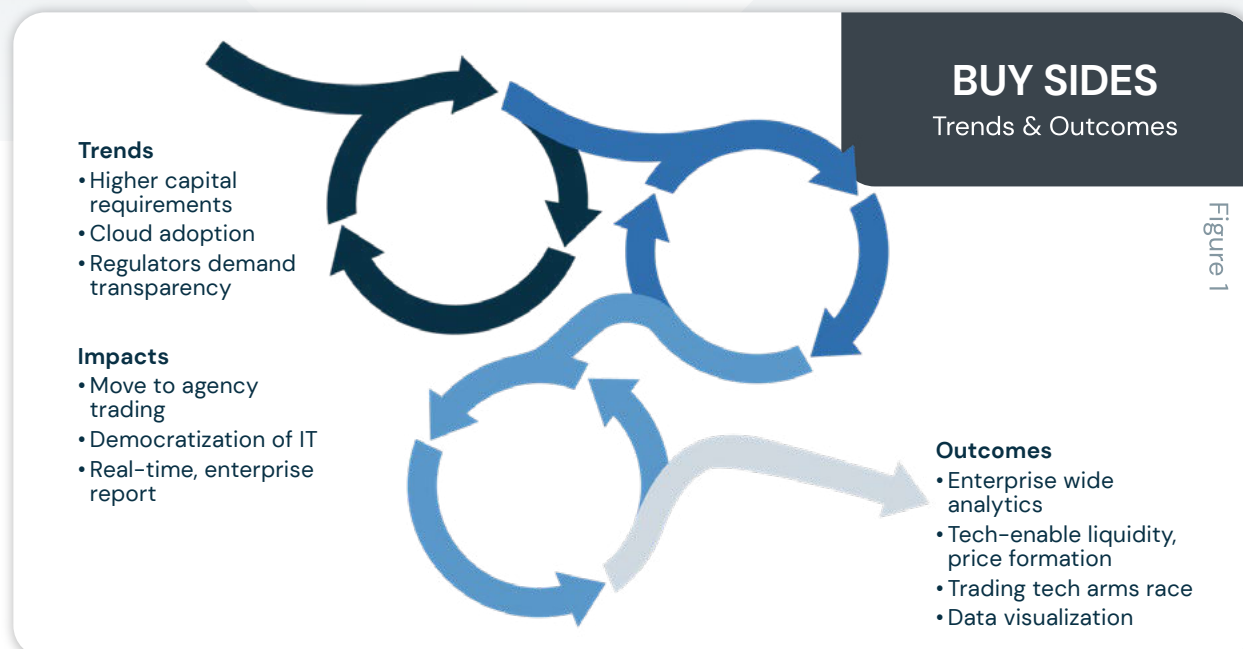
Today’s tech refresh cannot default to rebuilding from the ground up.”

—MD, Technology, Tier 2 Bank

Capital markets business models and workflows are being challenged and adapted in response to various drivers including technology innovation, new competitive threats, increased regulation and changing client expectations. COVID-19 brought significant changes to the physical work environment. Business margins in some areas shrunk or evaporated completely. Although once known

for being at the cutting edge of technology, a focus on cutting costs and regulatory compliance post financial-markets crash has left many capital markets players with significant technology debt.

As the industry consolidated, financial institutions' technology estates became siloed along business and function. The underlying systems are often monolithic in design and customizations done over the years are poorly documented. The post-crash years meanwhile have seen huge advancements in cloud computing, mobile computing and artificial intelligence. While consumers have got used to highly interactive and personalized experiences on their own devices and during retail interactions,



many capital markets business models are constrained by the monolithic and siloed technologies underpinning their enterprises.

Both buy-side and sell-side financial institutions in the capital markets industry have prioritized savings and efficiencies in the post-financial crisis years. As one senior technology executive said, "Today's technology refresh cannot default to rebuilding from the ground up."

The nomenclature of the industry has broadened. Whereas the term buy-side bought to mind an institutional asset management industry happy to outsource technology to the 'sell side', today's buy-side includes some of the most tech-savvy players in the market. Hedge funds and passive managers often depend on technology pushed to its limits. Cloud business models have democratized access to advanced hardware and analytics.

General trends impacting the buy-side (see Figure 1). Higher capital requirements on the sell side has seen a move away from risk trading, sparking a need for tech-enabled approaches for liquidity management and price formation. Similarly the regulatory push for enhanced regulation has resulted in more enterprise data being readily available, offering tech-savvy firms the potential to extract key insights through advanced analytics and visualization. The rise in cloud computing is making much of this possible and helping to level the playing field in the trading technology arms race.

“We’re running in lean mode, but there is still room for us to succeed against better-funded competition. We don’t have to redraw everything, but whether new or old, in-house or vendor-produced, these all have to work together.”

—MD, Trading Technology, European Bank

These entities all have something in common — the need to ensure they get the best out of their technology and people through every step of its lifetime. However, a shrinking buy-side wallet only adds to the pressure on a sell-side industry which is also facing numerous challenges to its business model and profitability. From globally diversified financial services firms through to specialist/regional players, none are exempt from significant headwinds.

Capital has become more expensive, encouraging a move to agency trading; but those taking positions need a clear, complete and up-to-date picture of risk. As buy-side commissions have decreased, the sell side has been forced to better understand who its best customers are — and this requires a more joined up view across the firm. Cloud computing's promise of lower costs and improved time to market is helping the sell-side transform into truly data-driven enterprises. The ability to visualize and connect this data has exposed the limitations of the typical user desktop where largely siloed applications fight for real estate.

The Many Flavours of Legacy

“Legacy is everything you are using right now”

—CTO, capital markets fintech

So what is legacy? There was a common thread from discussions with capital markets executives from across buy and sell side, technology and business roles. As one capital markets CTO put it, “Legacy is everything you are using right now.” In other words technology is always changing, the grass is always greener.

Legacy tends to have negative connotations. These are based on an underlying assumption that yesterday’s technology is by default constraining the business from competing effectively. Over time, integration via flat files, databases, the creation of static siloed data pools and increasingly complex non-intuitive UIs, leads to security and operational risks, poor client experience and a build-up of technical debt. Legacy technology become associated with frustration (see Figure 2).

Common legacy technology frustrations:







- | | |
|--|--|
|  Hard to integrate
Monolithic systems are difficult and expensive to integrate with modern SaaS solutions |  Poor User Experience (UX)
End-users expect more |
|  Data Access Issues
Users find it difficult to access and use data directly, forcing various workarounds and manual steps |  Rigidity
Older systems can have baked-in assumptions about organization/business models which hinder exploring new ways of working |
|  No Dynamic Scaling
Systems design pre-cloud are unlikely to scale easily |  End-of-Life
Software ceases to be updated or supported, creating security and operational risks |

Figure 2

Deeper conversations with technology and business executives reveal a more finely nuanced picture. Legacy technology has no ‘sell-by date’ and can come in many flavours (see Figure 3).

The many flavours of legacy technology

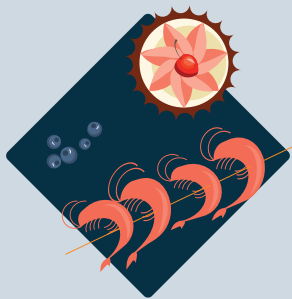
Figure 3



Performant stacks that are difficult to extend



Useful, but fail to present a cohesive user experience



Support for highly effective and complex business needs, but lacks integration capabilities



"Unfashionable" tech that causes difficulties around recruiting and retaining top talent

Often end-users are very fond of their 'legacy applications' and for good reason — their workflows, applications and even muscle-memory have been finely tuned over time. Attempts to truly modernize by rewriting the applications can be crippled by a business mandate to provide the same functionality and experience as the original application. This approach involves many man-hours (often man-years in reality) reverse engineering application functionality and behaviours and has the potential to disable more innovative functions offered up by the new underlying technology.

From a more technical perspective, legacy technology can refer to old stacks built on technology like .NET, Java, older technologies like Delphi, or modern applications that need improved levels of integration with other applications.

Let the Desktop do the Work

“Legacy apps often have a rich experience which represents a huge investment.”

—Head of Trading Technology, Global Investment Manager

Now more than ever financial institutions must empower staff and clients to collaborate in real-time on the device and location of their choosing. Modern concepts like the cloud and mobile computing are outside the reach of many legacy technologies. Older application stacks weren't designed to support flexible, loosely coupled approaches to development. As discussed earlier however, a rip and replace approach is not realistic or desirable. There is a shift away from the server side as a focus of modernization efforts. Progressive organizations are turning to desktop modernization and the re-use of applications to form the base of their digital transformation strategy.

Desktop modernization is turning to new technology approaches which allow new and legacy applications to be effectively glued together to form a cohesive user experience. This allows the latest HTML5 and JavaScript applications to communicate with legacy apps such as those using .NET, COM, Silverlight, Delphi etc. as if they were designed and built together.

“[Our desktop interop solution] gives us the opportunity to make surgical changes and lets us integrate with the investment we have today. Whether the app is Java or C#, legacy or newly created, it's all glued together. That's key, as it may take years to move off certain legacy applications.”

—Head of Trading Technology, Global Investment Management Firm

This approach supports the trend of end-users moving away from using one application or provider for everything — a so-called 'great unbundling'. However, moving to a best of breed approach means data has to be pulled or passed from one application to another, often by end-users copy-and-pasting data or a semi-automated export/import of flat files. There is often no single unified view or access across all applications.

The great unbundling has been likened to the iPhone app store, where users happily select the best applications for their needs at that moment in time. But this approach quickly falls down if individual applications cannot seamlessly share or pass on information, the user experience lacks cohesiveness or firms become locked-in to a particular vendor's license-based ecosystem. It certainly falls down in an enterprise context as while only one or two apps are likely to be used at the same time on mobile phone, a business desktop requires many more apps (and windows) to share data and remain in sync

at any one time. For example, one investment manager said that while their traders use about 20 applications, each trading app will have six or seven windows open.

These issues can be solved through the use of a number of modern technology approaches and concepts:

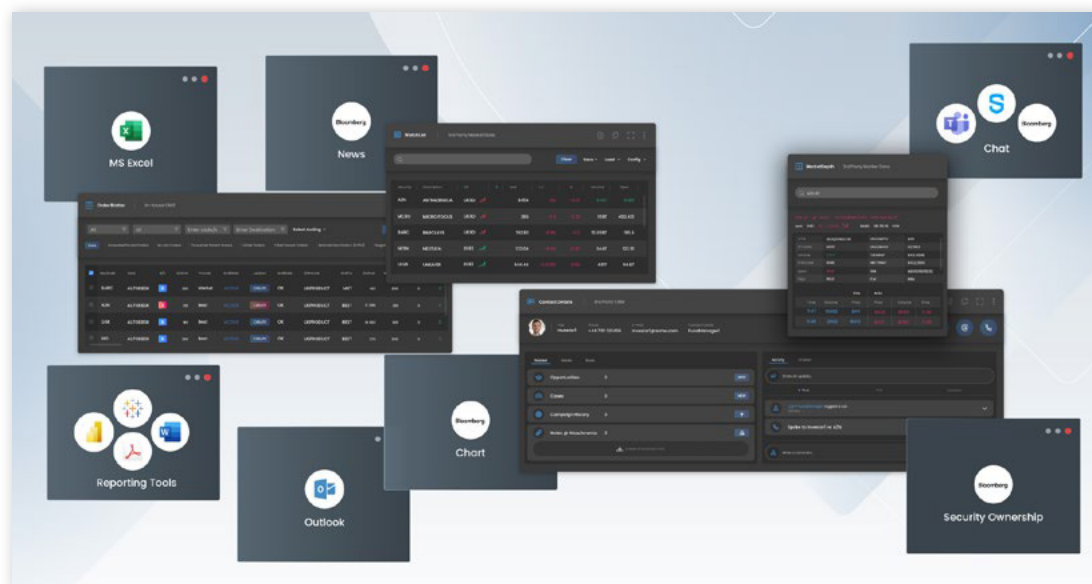
- UI integration (workspaces)
- Interoperability (data exchange and sharing)
- Micro frontends
- Deployment via the web browser (PWA)
- Standards (e.g. FDC3)

UI integration is simply when an end user carries out a single operation that involves two or more applications. A workspace approach takes this to the next level ensuring that new and old applications can be visually integrated together while minimising valuable screen real-estate.

“We can’t possibly bring in, test and integrate all [new fintech] apps into our platform, and certainly within the desired timeframe. [Interop] creates a faster time to market delivery to our users.”

—Global Head of Client Insight, Bank & Digital Channels, Tier 2 Global Investment Bank

Interop is a relatively new segment of the application integration space and its definition may vary. Some view it as an approach that allows one to break down monoliths into micro applications. This approach of building web applications on top of a microservice architecture is called micro frontend. Server-side approaches such as enterprise service bus (ESB) although relevant to integration do not integrate the user experience.



In a micro frontend architecture, an interop gateway enables micro applications to communicate with any other app on the desktop. When plugged into the interop gateway, a set of micro apps behave and appear to the end users like a single application. But each micro app is only aware and dependent on the interop gateway. There are many advantages to micro frontend approaches such as allowing multiple teams to work on a single product simultaneously, as the smaller chunks of code can be developed, tested and deployed independently. There are of course pros and cons (see Figure 4) but overall, they enable a truly plug-n-play approach allowing legacy applications on the desktop to work seamlessly with the latest applications.

Micro Front Ends Pros and Cons

Pros	Cons
Incremental upgrades	Payload size
Simple, decoupled codebases	Environmental differences
Independent deployment	Operational and Governance complexity
Autonomous teams	

Figure 4

Standards are inevitably required when striving for plug-n-play. A cross-industry initiative named FDC3 (or “The Financial Desktop Connectivity and Collaboration Consortium” to give it its full name) defines standards, financial product taxonomies, and nomenclature in order to deliver more efficient interoperability between desktop applications in financial workflows. FDC3’s members include 40+ financial firms including buy/sell side and vendors – and the organization falls under the umbrella of standards body FINOS, the fintech open-source foundation. It is doing for desktop interop what the Financial Information eXchange (FIX) protocol has done for electronic trading on the server side. While a useful starting point, FDC3 is a jumping off point for larger interop projects.

An exciting, and potentially game-changing development in the desktop modernization space is the rise of the Progressive Web App (PWA) which can be used to deliver native app experiences to web applications whereby installation is immediate and secure. Most desktop interop solutions in the market currently utilise a container-based approach for packaging and development, with the container based on open-source Electron or a proprietary fork of Electron. However one solution provider, interop.io, offers a browser-based versions of their interop platform which doesn’t require a container and also provides a set of data sharing and window management capabilities.

PWAs have been around for a few years already, gaining desktop support with Chrome 73 in 2019. They are characterized as being reliable (even in uncertain network conditions), fast and engaging. They are instantly installable (but corporate-friendly with no actual download/execution of an installer package), indexable, work offline, can send push notifications and are progressive meaning they will work for any device even with poor internet. Administrators in corporate environments can manage installed PWAs through standard group policy templates.

Desktop Modernisation Use Case — Global Investment Manager

Challenge: A global investment manager wanted better collaboration and efficiency between its PMs and traders without having to rebuild existing applications or tools, but functions across applications were not easily exposed. Desktop real estate was also a key issue with around 20 apps in use and six or more windows open per app. With no persistence of desktop layout, users had a dull, inefficient process to start every new session.

Solution: A workspace approach allows individual teams share information seamlessly, re-use functionality embedded in siloed apps and persist workspace layout. The solution successfully leverages pre-existing investment, modernizes the environment/user experience and improves productivity.

Big Wins: Traders love the cross-application functionality, for example accessing Bloomberg functions in other apps. PMs are thrilled to be able to return to their desktop layout exactly as they left it when restarting a trading session. Dev teams can develop/deploy new apps faster while ensuring they work together seamlessly.

PWAs are already in use by large enterprises e.g. Twitter, Forbes, Instagram. With Chrome and Edge browsers sharing a common core, features being designed now to bridge the native app gap will be available in both browsers simultaneously (for more information check out Project Fugu which is organized as Chromium project; contributors/organizers include Microsoft, Intel, Samsung and Google among others).

While exciting, PWAs will likely be one piece of the puzzle when solving the challenges of modern desktop design. Achieving this will require a blend of the trends discussed.

Conclusion

Like puppies, digital transformation is for life. At the start, the digital transformation process requires research, time and resources. Leading capital markets entities who are succeeding at this realise that transformation is not a project but a process, and one which has no definitive finish point. This requires new ways of working. When it comes to modernizing legacy applications, leveraging modern technology concepts, as outlined in this paper, assures users that their current state of the art desktops do not become tomorrow's legacy technology.

Capital markets entities are experiencing massive changes in market structure, regulations and client expectations. Leading financial institutions understand the need to be flexible and agile in order to

adapt, find new sources of alpha and real competitive edge. A continuous lifecycle approach to technology helps firms meet these new challenges and similarly, digital transformation should be a journey not a destination. Becoming a data driven enterprise is not a one-off project.

Under this paradigm the idea that you can remove legacy technology once and for all is unrealistic — today's systems are tomorrow's legacy after all. Instead getting the most out of your technology investments, whether new or old, while building a flexible platform for the future is paramount. It is no wonder that desktop modernization utilizing concepts including interop and micro front ends has become so popular with capital markets. This supports a 'hybrid' approach combining legacy with modern applications. It is a win-win-win as end users get the best of 'old' and 'new' apps, technologists get the integrated environment and the new stack that they need and business heads see overall productivity rise.

Technology is changing all the time. If you are not already familiar with desktop interop, then hopefully you are now motivated to start the journey. For those already on the road or comfortably ahead, it is never time to rest. While container-based web apps have proved popular in the capital markets space, they introduce some of the same distribution complexities as native-apps. Are PWAs a game changer? The question warrants further investigation. After all, to paraphrase one head of technology I spoke with, technology should free business, not box it in.

ABOUT THE AUTHOR:

Monica Summerville is a seasoned financial services industry executive and recognized thought leader (quoted by *WSJ*, *FT*, *Financial News*, *Forbes*, *CNBC*, etc, recognized in *Spears500*) with more than 20 years' experience in capital markets on both the buy and sell side as well with solution providers. With a deep understanding of market structure and emerging technology underpinned by years of delivering cutting edge technology solutions for capital markets participants, Monica has a proven track record of assisting clients in leveraging the emerging technology and industry trends driving change in business models and workflows.

Linked In: [linkedin.com/in/monicasummerville](https://www.linkedin.com/in/monicasummerville)

Twitter: [@M_Summerville](https://twitter.com/M_Summerville)



For more information around legacy apps and interop, contact us at interop.io/contact ☒