WHITE PAPER

The Financial Service Industry's New Competitive Platform

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Introduction

The Financial Services industry has become a much more competitive arena than it was only a decade ago. Technology has become an enabler for even the smallest of startups to directly compete with large institutions across many different product lines. The competition is real, intense, and already causing a major diversion of resources from established organizations into the startup ecosystem.

Competition is healthy and will push the entire industry forward into the next generation of financial products and solutions, ultimately benefitting customers. However, many of the largest organizations have never been challenged so directly as by the recent competitive innovation in information technology: the promise of secure, reliable, distributed, mobile financial services is being fulfilled by forward-thinking upstarts. This is a disaster in the making for FI's who have been slow to modernize their aging systems and processes.

Let's look at an example. In 2012, Michael Katchen created a spreadsheet to help his colleagues set up investment portfolios after the startup they worked for was acquired. The spreadsheet was so well-received that Michael returned from Silicon Valley to Toronto and started Wealthsimple, a robo-advisor based on his learnings from that simple spreadsheet he created to help out his friends. Three years and 75 employees later, Wealthsimple has a billion dollars of assets under management and 20,000 users. Those are 20,000 customers who are not only diverting their money away from traditional banks, but also their trust and loyalty.

A dedication to the customer experience along with the implementation of a modern technology platform helped Wealthsimple take substantial market share from the other 14 discount brokerages in Canada within three years of being founded. In 2017 they pushed into the US market, now competing with the likes of New York-based Betterment, which has $6.5 billion in assets and more than 200,000 customers.

Over the next decade, the companies that master real-time systems, machine learning, and artificial intelligence will dominate the industry. These technologies are playing an increasingly important role in retaining current customers, attracting the next generation of clients, maximizing the retained value of the relationship, and effectively managing risk.

Not only does legacy IT infrastructure contribute to a relatively poor customer experience, it also provides a poor workplace experience for technology professionals. This makes it very difficult for an FI to recruit and retain the most talented developers, who can choose who they work for, and are for the most part only interested in working with the best and latest technologies. Employing a small team of highly skilled and productive developers enables you to solve more complex business problems faster while providing a superior user experience, giving your organization a competitive advantage. In the end the cost isn't much different compared to employing a large team of run-of-the-mill developers.

The New Technology Battleground

Established financial services organizations continue to own the customer experience but risk losing control to upstarts who are better at the technology game. Customer loyalty is increasingly fleeting — traditional financial services organizations may currently own the customer's trust and engagement, but that can change in a few mouse clicks.

Customer experience

Complex and brittle integrations have led to partitions within many of the largest banks. This has a direct impact on customer experience. For instance, it is not uncommon for two divisions of the same bank to have a completely different view and relationship with the same life-long customer. Forcing a customer to re-introduce themselves to your organization over and over again does not lead to the kinds of relationships that technically sophisticated customers are looking for, especially the next generation of millennial consumers who have grown-up in an app-centric world.

To combat some of these problems, a group of the largest banks in the world are turning to blockchain technology to create a blockchain-backed digital identity network.[1] This network would enable consumers to perform secure transactions, such as applying for an apartment lease or home loan, or confirm new credit applications in a completely secure manner without relying on paper applications.

Speed and agility

Speed and agility are now essential. FI's need to be able to rapidly implement and deploy system modifications to meet ever-changing regulatory requirements, compete with startups, and bring new financial products to market. And in today's world of heightened political uncertainty, financial service organizations must be even more prepared to implement rapid changes on all levels in response to changes in legislation or shifts in trade relationships.

Security

Security has moved to the forefront of consumer concern when it comes to making decisions on which financial services institutions to trust. Hackers know that one of the best routes inside a system is to take advantage of known vulnerabilities in outdated technologies still in use. FI's that continue to use non-current technologies or do not have the latest patches in place are leaving the front door wide open. This was high-

1 **https://www.americanbanker.com/news/canadian-banks-pick-ibm-blockchain-to-expand-digital-identity-project**

lighted when Equifax announced in July 2017 that highly personal information it had on 143+ million people had been exposed. It is widely speculated that attackers gained a foothold within Equifax's systems through a vulnerability in a 9 year old version of a widely used web application development library.

Real-time Management

Batch-mode systems leave banks staring at their wake by producing reports that tell them where they were days, weeks, or months ago instead of providing insight into where they are right now, and most importantly where they should be aiming for tomorrow. Often times an opportunity or threat goes undetected until it's too late to act upon.

UniCredit, one of the strongest banks in Europe, with 147,000 employees serving more than 32 million clients, decided to make a radical leap into the world of real-time systems. With a mix of legacy Java technologies, alongside an emerging data science capability within the organization, it was apparent that a carefully crafted approach was needed to connect the two.

Batch Big Data solutions such as Hadoop are quite effective at crunching a lot of data using popular machine learning algorithms. While impressive, the results are still usually stale by hours or days. FI's now recognize the need for fast data systems that sense and flag significant events across all business operations in close to real-time. Creating an entire enterprise architecture based around sensing, flagging, and acting upon noteworthy events is referred to as a reactive system, similar to your nervous system. Reactions should be near instantaneous and completely automated.

In a reactive system, real-time streams become the lifeblood of your organization, like a healthy cardiovascular system. Processing real-time streams of data at production volumes — perhaps millions of messages per second — requires a careful approach to architecture, infrastructure, and technology selection. Without proper planning and design, connecting to such vast streams of events and executing machine learning algorithms against them can quickly lead to system instability and cascading failures. Batch-mode systems' simplicity and predictability has made them the preferred choice historically in FIS, but with the right design and implementation along with the proper technologies, fully real-time systems are within reach of all. Regardless of whether your organization moves from batch to real-time, it's only a matter of time before your competition does.

Line-of-business challenges and opportunities

All facets of Banking are feeling the heat: Retail, Payments, Capital Markets, and Wealth Management.

Retail Banking

Retail Banking tends to define the overall customer experience. Startups are innovating at an increasing pace, however, and threatening to steal ownership of the customer relationship. This is most visible with virtual Internet-based banks siphoning away customers from larger banks for mortgages, loans, credit cards, checking, and other retail banking staples (e.g, Stripe[2], Simple[3]).

Payments

FinTechs (such as TransferWise[4]) are disrupting the payments sector by offering alternatives to systems such as SWIFT by developing newer technology platforms that enable greater transfer speed and flexibility.

Perhaps the greater threat (and opportunity) though is Blockchain. Other FinTechs (e.g. Ripple[5]) are rapidly developing blockchains, both public and private, that will have the potential to radically disintermediate not only wire transfers but trade finance and potentially retail remittances as well.

Capital Markets

It's only a matter of time before these advanced systems architectures begin to disrupt the capital markets business. Fast data and blockchain technologies bring us closer to real-time settlement and assets documentation where the blockchain becomes the record of who holds which asset and what rights and cash flows are applicable.

Additionally, capital markets are increasingly analytics and AI-driven; some market participants are now purely algorithmic traders. This not only requires advanced technologies but also a talent pool with great expertise and education. Attracting and retaining such a talent pool is unlikely without a deep investment in technology, along with a rethinking of compensation. Whereas the current model of staffing in FIS is based around cost rather than value, employing an army of undistinguished developers will not enable FIS organizations to compete with the best and brightest FinTech startups. FI's will need to adopt a value model of developer recruitment and retention, offering higher compensation and empowerment. The brightest developers will become more akin to professional athletes, choosing which projects they want to undertake and where. This new class of developers will have higher expectations of the quality of platform they are working on and it will be a key determinant of where they choose to apply their talents.

2 **https://stripe.com/ca**
3 **https://www.simple.com/better-banking**
4 **https://transferwise.com/us/**
5 **https://ripple.com/**

Wealth Management

Robo-advisors are radically changing the landscape of wealth management and have been getting most of the attention of late. Trust in active management has eroded and individual investors are increasingly choosing to buy indexes or self-manage. While robo-advisor startups are based around simple pooling models, traditional banks continue to employ a costly network of financial advisors. The fees associated with this sales force and then for the active management of the funds is met with the increased skepticism of a generation that tends to trust technology more than salespeople.

Without the burden of inefficient systems, practices, and processes to maintain, a 75-person company such as Wealthsimple can afford to provide services at an attractive price point and continue to divert revenues away from traditional Wealth Management firms.

The Solution

Banks must double-down on technologies that enable them to move faster and create a more engaging customer experience. This will require a focused approach using technologies that have been proven to improve development productivity, security and the quality of the end user experience.

Scala is one of the most important programming languages to emerge over the last decade. Interest in Scala has been fueled by the rise of big data and data science as essential disciplines in many industries, but particularly in financial services. Scala is not only the emerging standard in key strategic domains such as big data and machine learning, but also emerging applications such as real-time streaming and AI. It works well with new browser technologies (such as React and Angular) that enable superior application user interfaces.

Scala helps FI's accomplish more with fewer developers. Small teams of Scala developers often achieve 10x productivity by leveraging advanced tools such as Akka for distributed computing and Spark for analysis of big data. Scala developers are more expensive than others on an hourly basis, but this is largely because it attracts the best and brightest, and there is a resulting premium. But most organizations have found the productivity gain repays the apparent difference in hourly rate many times over.

Akka is a technology that enables the elastic scaling up and out of compute resources, directing those resources to where they're most needed at any moment and saving cost when they aren't. Akka is perfectly tailored for enterprise cloud migrations, both public and private.

Together, Scala and Akka can help modernize core banking platforms, breaking the chains of the past: those tightly coupled, badly partitioned legacy systems. Most FI's have deployed Spark and so are already using Scala and Akka-based technologies, and an increasing number are adopting Scala for their most demanding new and replacement core systems.

Lightbend as a Competitive Advantage in the Financial Industry

The most competitive capability an organization can build is a capacity for change: in systems terms, this means a capacity for agile reactive systems development. Reactive systems unlock the ability for your team to quickly adapt to changing needs of the business along with variations in demand at runtime.

To achieve this kind of flexibility and productivity, FI's need to re-architect their systems as a loosely coupled, event-driven set of services that are able to take advantage of virtually unlimited compute resources. Scala and Akka were created to simplify building these kinds of event-driven, distributed, scalable systems.

Microservices and Event-Driven Architecture

FI's need to move to replace their tightly coupled monolithic applications with more loosely coupled systems designed using well-defined boundaries with clear interaction models. Many FI's are embracing microservices as a route to agility and are adopting Domain-Driven Design[6] to guide them in choosing appropriate service boundaries. FI's face a particular difficulty though: financial transactions must have relational-style transaction guarantees and much of the current thinking around microservices settles for eventual, not strong, data consistency.[7]

How do we achieve the kind of responsive, interactive, real-time systems that are today's competitive edge? We get there by building services that communicate through real-time event streams while using the right design patterns to provide the needed strong consistency. Event-Driven Architecture, Domain-Driven Design and Akka are highly complementary and bring clarity and flexibility to complex enterprise systems and system integrations.

Big Data

Access to data is an area where the banks clearly have the upper hand over Fintech startups. FinTechs have a speed advantage, but banks have generations-worth of hard-to-obtain data. If leveraged properly, that data can provide insights only imagined by FinTechs. For this reason some of the most forward-thinking banks are investing heavily into big data and machine learning capabilities, often using Spark as the core.

Lightbend Fast Data Platform takes the benefits of an FI's investment in Spark to the next level, bringing everything together into a cohesive platform for quickly and reliably processing the largest data sets, while automatically scaling to optimize the use of computing resources. Lightbend calls it the Reactive Platform.

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6 **https://en.wikipedia.org/wiki/Domain-driven_design**
7 such as the Saga pattern

Further to this, IBM is developing a cognitive platform with Lightbend that will use the Reactive Platform as its base. IBM's partnership makes investing in Lightbend technologies even more strategic.

Streaming

The ability to react in near real-time has huge business value. Until now, it has been technically very challenging to deal with streaming data. Systems supporting exchanges and algorithmic trading, for example, have been expensive, have required specialized hardware in many cases, and are famously brittle. New technologies such as Lightbend Fast Data Platform make it relatively easy to work with data streams and combine them in new and exciting ways.

Blockchain development

Forward thinking companies are recognizing the limitations of using older programming languages for blockchain implementations. For example, Nxt[8], a cryptocurrency implemented in Java, is over 45,000 lines of Java code. Bitcoin Core[9] contains over 80,000 lines of C++ alone and over 100,000 lines of code in total. By comparison, Scorex 2[10] is a comparable open source project created by IOHK to speed up the research and implementation of blockchains, and is currently only 4,000 lines of Scala and Akka code, making the codebase far easier to understand and evolve over time.

Blockchains built using other technologies come with other limitations that must be taken into consideration, specifically around scalability, transaction throughput and ease of integration with existing financial solutions. We expect private blockchains to be the first to look for new solutions to these problems. Being a distributed computing toolkit from the ground up, Akka was created specifically to increase the scalability, throughput, and resilience of distributed applications like blockchain.

Security

The functional programming underpinnings of Scala provide a solid foundation for building demonstrably correct programs, essential to application security and avoiding issues such as the thefts due to programming errors that have haunted the cryptocurrencies (or destroyed them, in the case of the DAO[11]). Lightbend can also help you secure your mission-critical Scala applications with the Fortify Scala Plugin, a Scala code vulnerability scanner that's available to Lightbend subscribers.

8 **https://en.wikipedia.org/wiki/Nxt**
9 **https://bitcoin.org/en/bitcoin-core/**
10 **https://iohk.io/projects/scorex/**
11 **https://en.wikipedia.org/wiki/The_DAO_(organization)**

Commercial support

Scala and Akka are widely-supported open source technologies. Most companies however will require a commercial support agreement. Lightbend offers subscriptions for Spark, Akka and Kafka - along with Scala - through its Fast Data Platform, providing a certified build backed with full commercial support, indemnity, and the other commercial terms typically required by FIs.

Benefits

Banks and financial services organizations should be obsessively focused on improving the user experience on all levels to retain existing customers, expand loyalty, and attract new customers. This will become even more critical as startups in Retail Banking, Payments, Capital Markets, and Wealth Management evolve rapidly to provide the type of game-like user experience demanded by millennials.

One of the most important facets of user experience is to respond in near real-time whenever possible. Customer-facing systems should embrace the always-on, always-connected lifestyle of modern consumers by moving away from batch-mode processes towards real-time systems that deliver real-time insights. Leveraging Lightbend technologies to create real-time, event-driven systems can help you get to know your customer across organizational boundaries, as well as help your customer with their day-to-day financial needs.

Banks can also leverage loosely coupled systems to respond faster to changes in regulation, freeing up key talent for strategic work rather than systems maintenance. This not only provides rapid response to an ever-changing world, but also creates more engaging work for key talent, which assists in recruitment and retention. Speeding up new product development to enable market innovation will be a critical factor for banks to compete head-on with best-of-breed startups in order to hold onto their market share and expand into new opportunities.

Ultimately, the story of competitiveness in all aspects of business where technology is a differentiator will depend on the ability to attract and retain developer talent to accelerate product development and starve the competition of resources. Some banks still hold a reputation as a hotbed of unchallenging maintenance work with little room for innovation within the developer rank-and-file. To compete for talent and build the current generation of real-time, data-driven systems, a migration to Lightbend technologies such as Scala, Akka, and Spark can fuel the imagination of potential hires, signalling to them that your organization is keen to not only compete on a business level, but is also a good place to grow skills, reputations, and careers. This is crucial in order to prepare for the next wave of innovation, incorporating AI into core systems to drive efficiency and competitive advantage.

Summary

The Lightbend Reactive Platform will position you today to transform your systems from batch to real-time and unleash the full competitive value of your data as it flows through your business. No more waiting days or weeks for critical insights and opportunities.

You are most certainly already using Lightbend technologies such as Scala and Spark. Build a relationship with Lightbend in order to take your big data systems to the next level with Lightbend Fast Data Platform, backed with the confidence that comes with full commercial support. Lightbend can provide you with training, professional services, and on-call support. The upcoming IBM and Lightbend Cognitive Platform will change the industry, not only enabling technical success, but also on a recruitment and retention front as top-tier developers become eager to work with you and help you to take the strategic high ground.

Next Steps

Identify key competitive areas where agility is most crucial in the short term and use those areas to establish a precedent for the rest of the organization.

Review your project portfolio and identify projects where velocity or scalability are key, or where cognitive computing would be a differentiator.

Engage with Lightbend to learn from the experience of others who have successfully made the journey. The Lightbend Professional Services team has deep experience in all aspects of distributed computing, big data, machine learning, and data sciences, and is able to provide your team with critical advisory-level services at key points in your journey. Arrange a consultation with Lightbend to assess your current usage of Lightbend products, opportunities to accelerate strategic projects, and to craft a roadmap for now and the future.

Lightbend

Lightbend (Twitter: **@Lightbend**) provides the leading Reactive application development platform for building distributed applications and modernizing aging infrastructures. Using microservices and fast data on a message-driven runtime, enterprise applications scale effortlessly on multi-core and cloud computing architectures. Many of the most admired brands around the globe are transforming their businesses with our platform, engaging billions of users every day through software that is changing the world.

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