Cognizant

Digital Business

Digital Engineering: Top Three Imperatives for Banks and Financial Services Companies

Struggling to grow market share amid increased fintech pressure, banking and financial services organizations need a blueprint for building modern digital capabilities from the get-go — while significantly reducing legacy technical debt and accelerating data center cost-cutting via cloud migration. Here are some practical strategies for achieving these goals, as well as a look at some financial services organizations achieving success.

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Executive Summary

Banks and financial services companies are morphing in material ways into technology companies. These organizations are investing heavily in software development to improve service delivery, back-office operations and decision-making, and to personalize and modernize the experience they deliver to customers.

The pivot to digital is driving banks and financial services companies to embrace a lean start-up mindset.[1] The leaders are forming Agile product teams and adopting modern work patterns and digital technologies to recast the way they conceive, build and deploy their software products and portfolios. We call this "digital engineering."

In our work with banks and financial services organizations around the world, the top three goals we hear for digital engineering are:

▌ **Retain and attract customers by rapidly introducing innovative features, services and experiences.** Incumbent financial institutions (FIs) face a growing threat from fintech start-ups with fresh ideas and the luxury of starting software development from scratch. Established FIs must compete with new market entrants offering automated lending, zero-commission trading, robo-advising, artificial intelligence (AI)-informed personal loans, payment processing for Internet businesses and more.[2] New products need to appeal to millennials and Gen Z users (the 25% of the population born from the mid-1990s to the early 2000s), who have a mobile-first mindset.

▌ **Reduce or eliminate legacy technical debt.** Most legacy financial services applications include problematic code, often the result of poor engineering practices or repeated patching to add new features. Technical debt[3] erodes performance, escalates cybersecurity risk, impedes scalability and increases maintenance overhead.

▌ **Reduce data center costs.** Boards that have traditionally been skeptical of public and hybrid cloud security and benefits are now asking CIOs why migration is not already further underway.

This white paper describes strategies to successfully achieve these goals, as well as short descriptions of customer engagements to illustrate what success looks like.

GOAL 1

Become a digital leader with cloud-native development

Leading banks and financial services companies are gaining market share by introducing advanced features and new kinds of services, rapidly and incrementally. The advances are typically designed to be cloud-native, running and scaling in the cloud. Figure 1 lists examples of emerging opportunities in the areas of retail banking and wealth management.[4]

To quickly introduce advanced digital services, banking and financial services organization need a new technology stack and way of working. Traditional waterfall development is too slow to keep up with rapidly changing technology and consumer interests. In the time it takes to introduce a new feature using this older style of development, more nimble competitors can develop an even more innovative offering, conduct market testing and release it to customers.

Emerging banking and financial services software applications

Retail Banking	Wealth Management
▮ Voice interfaces for digital personal assistants (e.g., Alexa). ▮ Mobile interfaces for wearables (e.g., Apple Watch). ▮ Personalized product suggestions based on customer profile and history. ▮ Faster processes (such as home-loan closing) through automation and integration. ▮ Contact center sentiment analytics to recognize what callers say and how they feel, using a combination of audio-to-text conversion, natural language processing and auditory signatures.	▮ Digitized client experience (e.g., onboarding, risk and investment profiling, goal setting and portfolio creation and simulation). ▮ Multi-variable micro-segmentation for improving client retention and identifying "at-risk" clients. ▮ Interactive services for client engagement (e.g., gamification, simulation and scenario planning). ▮ Advisory analytics ("handholding") in situations such as periods of enhanced market volatility, etc. ▮ Guidance for investment advisors on "next best action," using advanced forms of AI, such as machine learning.

Figure 1

Strategy: greenfield product engineering

Building new applications without the constraints of a legacy system — greenfield development — enables fresh thinking and accelerates innovation. Using our Greenfield Product Engineering service, banks and financial services companies can retool themselves to become digital leaders.

A greenfield approach to product development provides the benefits of a modern, cloud-native application architecture and platform with microservices, containerization, cloud enablement and API-driven development. Through training, organizations can adopt modern software engineering practices, such as Agile pods, lean start-up, hypothesis-driven and test-driven development, minimum viable product (MVP) increments, DevOps and extreme programming. The goal is to deliver prototypes in weeks and MVPs in weeks or months. Offerings are validated and evolved through A/B testing (split testing) and continous build-measure-learn cycles, incorporating the proven elements of design thinking.

Real-world engagement: succeeding in a fintech world

▌ **Challenge:** To stave off fintech competitors, a leading financial services provider wanted to create a new-age lending platform offering a completely online experience, even for transactions like pre-payments and withdrawals. Enabling the vast majority of customers to complete their lending journey from a browser or mobile app would create a competitive advantage while also reducing costs. To gain first-mover advantage, the FI needed to move quickly.

▌ **Solution:** We worked with the FI to understand the customer journey and co-create the experience. The online platform came to life in two parallel tracks. The infrastructure track, which produced a cloud-native architecture, was designed in conjunction with our cloud service provider partners. The innovation track generated ideas for new features, followed by rapid prototyping and user testing in order to identify which features were most appealing to customers.

▌ **Outcomes:**
  l   The service was introduced within an ambitious 12-month timeline.
  l   The FI quickly gained market share, with more than 10,000 customers signing up for the platform daily.
  l   The organization also captured 130% more leads compared with existing offline channels.
  l   The FI closed 20% more loans compared with offline channels in the same time period through automation.
  l   The goal of a fully online journey was realized, with 70% of customers accomplishing their desired transactions with no assistance, and 20% succeeding with online help such as chatbots and co-browsing.

Quick Take

Deliver New Customer Experiences

Banking and financial services customers can't always imagine what new software products they might want if they haven't seen them before, and they may not always understand their own behavior when it comes to managing their money. To gain deeper insights into customer behaviors, attitudes, motivations and desires, industry leaders are beginning to involve social scientists (psychologists, ethnographers, etc.) in their product planning.

Our partner ReD Associates observes banking and financial services customers at work and at home to gain insights into their actual behavior, beyond what they report.

In the fall of 2016, we worked with our partner ReD Associates to study the intersection of money and customer emotions. ReD Associates conducted an ethnographic study of 32 families in the U.S., England and Germany and surveyed 3,000 people in the U.S. and the UK to test the study's insights. The study identified eight different types of money, categorized as "fast" (bill payments and daily expenditures) or "slow" (investments, etc.).

The study revealed that slow money leaves many consumers feeling anxious and frustrated. What's more, FIs can improve consumers' emotional connection with all types of money — and tap new revenue opportunities — by delivering experiences that blend the human touch with smart automation and AI.

For five recommendations based on our study, see "How Financial Institutions Can Capitalize on the Emotions of Money."

To read more about placing humans at the center of software design, visit our Insight to Code website.

GOAL 2

Reduce legacy technical debt

To shift the technology budget from "running the business" to "changing the business," organizations need to reduce their legacy technical debt. Legacy applications inhibit agility in several ways:

I **Slow feature introduction.** To add a new feature or experience to a legacy application, software engineers need to understand the potential effects on a large monolithic codebase. This can take months.

I **Poor performance.** The code is often inefficient because of poor engineering choices that seemed expedient at the time the application was built.

I **Lack of a reliable knowledge base.** In many cases, many or most of the people who built the code have retired or left the organization, leaving the business reliant on a handful of people for critical application enhancements. What happens if they retire or leave?

To realize benefits quickly and at scale, FIs need to look beyond technology modernization, and adopt product-aligned Agile teams with full-stack engineers, as well as modern processes such as scaled Agile, lean Agile and DevOps.

Strategy: application modernization

Cloud-native applications take far less time to update than legacy applications because they are built from self-contained components (microservices or containers) — often one per feature — that communicate via APIs. As needs evolve, developers can add components and APIs without changing what's already there. (To learn more, read "Using Containers to More Effectively Manage DevOps Continuous Integration.")

Application transformation rarely requires a full rewrite. It's generally more practical and cost-effective to reshape the existing legacy monolithic application into a cloud-native form (componentized, microservices-based and API-enabled) through a series of disciplined engineering steps. The process, called application transformation or application modernization, typically involves incrementally refactoring and reengineering monolithic code to a cloud-native form.

This process can preserve certain segments of legacy code that don't need to change to be part of a cloud-native software architecture. An example might be a complex calculation or model.

Advantages of application transformation include:

▮ **Increased agility.** A microservice in a modernized application might contain a small fraction of the tens of thousands or millions of lines of code in a monolithic legacy application. These bite-sized components can be understood and modified much more quickly, making the company less dependent on the developers who built the original application.

▮ **No single point of failure.** The components operate independently. A fault in one component of a cloud-based architecture doesn't affect the others. For example, if the mortgage component of an online banking service goes down, customers can still see their checking, savings and credit card information. The operations team can quickly restore the offline service by reverting to the previous version.

▮ **Lower cost of ownership.** Modernized applications can take advantage of cloud features such as auto-scaling and auto-recovery. Applications modified to support auto-scaling automatically pull in more resources when demand rises (e.g., during heavy trading periods for brokerages or during the holiday shopping season for payment processors) and release them when demand eases. These minor code modifications provide immediate ROI in public clouds because the application uses only necessary resource levels.

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Real-world engagement: becoming a digital leader

l **Objective:** A payment processing network provider wanted to become a market leader in digital products. To succeed, the IT organization needed to transition from being a service provider to performing as a digital product engineering group.

l **Solution:** The company is working to modernize its core mainframe application to a cloud-native application. This entails shifting to a modern digital technology stack, including infrastructure as a service; platform as a service; container orchestration; polyglot microservices and monitoring; scaled Agile program delivery; daily, automated deployments of new code into production; modern practices such as autonomous teams; full-stack skills; and site reliability engineering (SRE) operating models.[5]

l **Outcomes:**

  l The organization established more than 20 onsite and remote autonomous Agile pods aligned with key business capabilities.
  l Work is aligned with these autonomous pods, using a Scaled Agile Framework. The program supports 300-plus associates and 20-plus teams.
  l Using polyglot microservices, the organization avoided the delays and costs of training every team on a common microservices stack. Instead, teams can use a familiar technology if it is the best for the task at hand, such as Golang for processing-intensive tasks and Vert.x for high concurrency.
  l The payment processor achieved its goal of daily deployment through quality engineering, automation and test-driven development.
  l The organization expects to achieve 99.999% availability through a combination of SRE, site monitoring and a high-availability architecture.

Real-world engagement: achieving a competitive edge through modernization

l **Objective:** To compete with fintech start-ups and comply with complex regulations, a financial data provider needed to revitalize and modernize its IT systems and transition to a cloud-native architecture. Existing systems did not scale well and were costly and difficult to update.

l **Solution:** The provider is investing in new digital experiences for customers and employees, a cloud-native development platform and more streamlined and accountable ways of working through digital. The business transitioned to a product-focused engineering team to accelerate application transformation in the U.S. and India. Full-stack engineers work in pods with end-to-end ownership for each feature set, and the organization is implementing a DevOps pipeline across its business lines.

l **Outcomes:** The financial data provider improved its competitiveness and achieved compliance:

  l **Phase 1:** The organization shifted its legacy applications to a cloud-native architecture and introduced extreme programming, test-driven development and full-stack engineers into its culture.
  l **Phase 2:** The applications were migrated to a public cloud.
  l **Phase 3:** The business modernized the transactional data tier and transitioned from traditional relational databases to cloud-aware NoSQL engines.

Reduce data center costs

Leaders in the banking and financial services industry are looking to their data centers to realize significant cost reductions. By closing three of its data centers, for example, Bank of America expects to yield between $1 billion and $1.5 billion in annual cost savings.[6] Until recently, board members regarded the data center as a strategic asset, and CIOs who proposed cloud migration risked being seen as radicals rather than responsible stewards. Today, the same board members ask, "Why haven't we moved to the cloud?" The CIO is expected to spearhead a responsible cloud migration strategy.

Strategy: lift & shift legacy applications to the cloud

When applications are moved from standalone servers to an on-premises or public cloud, their capabilities are not diminished. When executed correctly, lifting and shifting produces immediate ROI by eliminating the cost of overprovisioning to accommodate peak loads. (The automation tools dynamically allocate server, storage, network and other critical infrastructure resources to where they're needed.) Moving to a public cloud also gives companies the benefit of "pay as you go" economics for servers and storage.

We often recommend a hybrid cloud strategy — that is, hosting applications in both private and public clouds. Application components with less stringent security requirements can be run in a public cloud, and other applications or services can be added as the organization builds sufficiently rigorous security frameworks to meet regulatory requirements.

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Real-World Engagement: The Efficiency of the Cloud

l **Objective:** As part of a broad-based efficiency initiative, a large bank and financial holding company needed to modernize its IT infrastructure and applications. Adopting a cloud-first strategy, the bank set a goal of migrating its applications before the deadline for renewing its on-premises application licenses and upgrading the data center's security architecture.

l **Solution:** To complete the migration on schedule, two workstreams were designed:

  l Minor code changes (refactoring) were made to move applications into a cloud-ready state without changing their functionality.
  l The infrastructure and DevOps pipeline was developed for automated cloud deployment to two public clouds.

l **Outcomes:**

  l The organization avoided significant software license renewal costs by migrating 300-plus applications within 18 months.
  l The business is now on a path to reduce operational expenses by 20%.

Looking ahead

The rapid pace of innovation in the banking and financial services sector won't slow down any time soon. To maintain and increase market share, organizations will need the ability to very quickly add new services, features and experiences. This requires a combination of people (full-stack engineers), modern processes (Agile pods and DevOps) and technology (cloud-native application architecture, platform-as-a-service or containers-as-a-service and hybrid clouds).

In the digital era, the advantage goes to organizations whose application portfolio is predominantly cloud-native. A two-pronged approach is the best way for banks and financial services companies to make this journey. This double-lane approach includes moving legacy applications to a cloud-native architecture, and putting in place the technology platform, people and processes for cloud-native development of new greenfield applications that impart a competitive edge.

Endnotes

[1]   Eric Ries, *The Lean Startup*, Currency, 2011, http://theleanstartup.com/.

[2]   Becky Peterson, "11 Most Valuable Fintech Startups Worth Over $1 Billion," *Inc.*, Oct. 24, 2017, www.inc.com/business-insider/fintech-unicorn-startups-most-valuable-clover-health-stripe-coinbase-sofi-robinhood-oscar.html.

[3]   Wikipedia definition of technical debt: https://en.wikipedia.org/wiki/Technical_debthttps://en.wikipedia.org/wiki/Technical_debt.

[4]   "A 'Wealth' of Opportunities Beyond Robo-Advisory," Cognizant, Sept. 20, 2017, www.cognizant.com/perspectives/a-wealth-of-opportunities-beyond-robo-advisory-part2.

[5]   SRE is a path to DevOps. A team of engineers with operations skills continuously oversees the reliability of the product.

[6]   "Bank of America to Close Three Data Centers," Data Center Knowledge, June 2017, www.datacenterknowledge.com/archives/2017/06/05/report-bank-of-america-to-close-three-data-centers.

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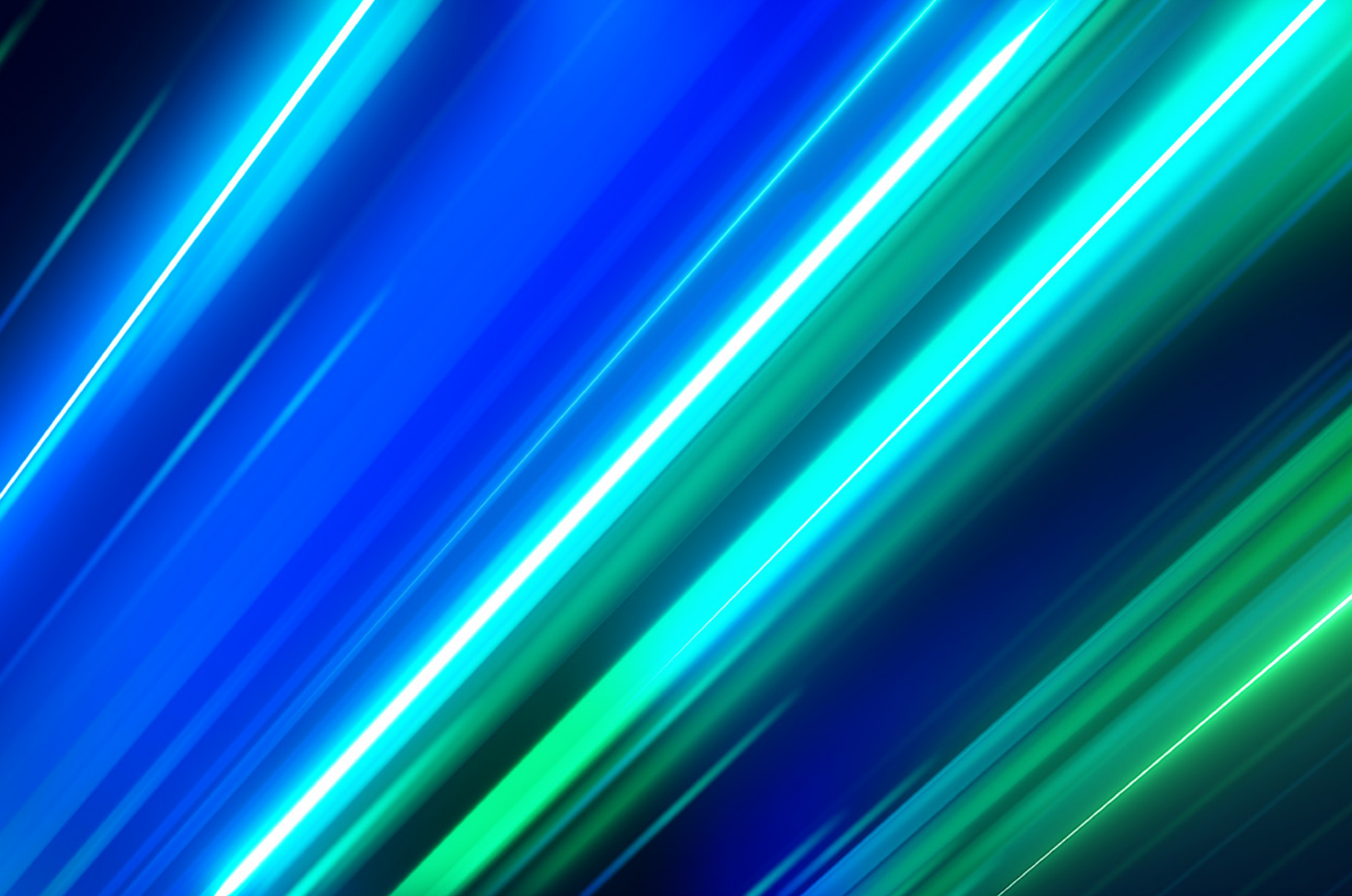
About Cognizant Digital Engineering for Banking and Financial Services

Cognizant Digital Engineering enables our banking and financial services clients to strategically reimagine themselves by reducing technical debt from legacy applications, accelerating the path to modern application development and creating new customer experiences by combining data science and human science.

Visit Cognizant Digital Engineering at www.cognizant.com/cognizant-digital-business/digital-engineering-services.

About Cognizant

Cognizant (Nasdaq-100: CTSH) is one of the world's leading professional services companies, transforming clients' business, operating and technology models for the digital era. Our unique industry-based, consultative approach helps clients envision, build and run more innovative and efficient business-es. Headquartered in the U.S., Cognizant is ranked 195 on the Fortune 500 and is consistently listed among the most admired companies in the world. Learn how Cognizant helps clients lead with digital at www.cognizant.com or follow us @Cognizant.

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