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Modernizing Payments:

The Digital Twin Approach

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Meet the Author

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James helps financial services clients understand the evolving digital payments, crypto and digital currency space. Drawing on his more than two decades of experience in research, marketing and communications in payments, technology and financial services, James provides the insights and information financial institutions and their technology providers need to build successful products and services around digital assets, cryptocurrencies, and tokens.

Foreword

This report, sponsored by Matera, focuses on a novel approach to helping financial institutions navigate the vexing problem of updating outdated, legacy core banking systems while at the same time providing seamless, always-on payment experiences that their customers increasingly demand. It is an issue many banks are facing as they look at the ongoing evolution of payments.

Javelin Strategy & Research maintains complete independence in its data collection, findings, and analysis.

Overview

The rapid pace of change in financial services and payments has created a challenge for financial institutions, one that must be met quickly if they are to remain competitive; FIs must modernize their systems to meet the rising consumer demands for instant payments and mobile transactions. Driven by access to new payments rails offering easier access and faster settlement, consumers now see payments through the same lens they evaluate their favorite social media apps. However, legacy technology hinders ability of financial institutions to provide the seamless, real-time payment experiences consumers now expect. A promising solution is the digital twin approach to payments. It offers banks the opportunity to satisfy user demands immediately without replacing aging core banking platforms, and also puts those FIs on a path towards modernizing their critical systems.

Executive Summary

Modern, open payment platforms and tools have evolved to meet new customer demands. Technology designed to offer customers a consistent, seamless experience across all touchpoints, from brick-and-mortar locations to website to mobile app, are available, and they have an eager audience of consumers.

These payment systems provide the necessary foundation for the coming evolution in payments. The future will include systems that harness artificial intelligence, utilize payment data, incorporate digital assets, and enable new products through embedded financial services.

New payment platforms require financial institutions to be fully modernized across their entire tech stack. The overhaul needs to happen from the front office to the back office, including the ever-crucial core system.

Many financial institutions rely on legacy systems that remain slow and siloed across lines of business, continuing to process updates to account balances in batches at the end of the day. For these banks, the options for truly modernizing their core systems are limited to difficult rip-and-replace efforts or a more incremental migration that can lead to complex implementations, long timelines, multiple vendors, and the possibility of running inefficient parallel core systems.

Enter the "digital twin" approach. A digital twin is a proxy for the account balance that can interact with the services and platforms that control the rules affecting those balances, in real time and across the applications used by the bank, while the core banking system remains the ultimate record, updated and managed in the usual manner.

The digital twin approach is not meant to be a complete solution to every issue posed by an outdated core banking system. It does not replace the legacy core, but it does offer financial institutions several immediate benefits as they approach the challenge of giving their customers a better payment experience.

Ultimately, the primary beneficiary of digital twins is the end user, the customer. Though unaware of the technology driving their experiences, bank customers, retail and commercial, can access new payment rails offering faster and cheaper settlement options, new endpoints and devices, now and as new rails become available. What's more, by separating the balance from the underlying account, financial institutions can provide customers with immediate visibility into balance changes, not only allowing for a better user experience but also offering more control over finances, balances, and accounts.

Recommendations

Begin now. For the financial services sector, the time to begin modernizing critical core and payment systems is now. Many institutions have taken a wait-and-see strategy to modernization and digital transformation, but the coming advances in financial technology and payments will require banks to be fully ready with flexible, modern core systems.

Understand the stakes. Regardless of whether financial institutions pursue a strategy of replacing their systems all at once or through stages, the demands of customers for real-time payments, flexibility, and control over their financial transactions and accounts are only growing. Finding a method for meeting those demands, even before core infrastructure needs are fully addressed, is imperative. A creative approach like a digital twin for accounts is one way to address these immediate needs, satisfy customer demands, and provide an incremental first step toward solving larger system issues.

Maintain balance while moving ahead. FIs and their technology vendors are in the difficult position of finding a long-term solution to their modernization needs while trying to stay on budget and on time. It is also important to demonstrate an immediate benefit to larger projects. Finding a strategy like a digital twin approach solves for both short-term and long-term challenges.

Consider customers first. The challenges facing FIs all sprout from the evolution of customer expectations and the need to stay competitive. That's another way using an approach like digital twins is beneficial: It satisfies customers' demand for better payment experiences and provides lower transactions costs while core system upgrades or replacements are happening.

Faster Payments are Here, and Consumers Want Them

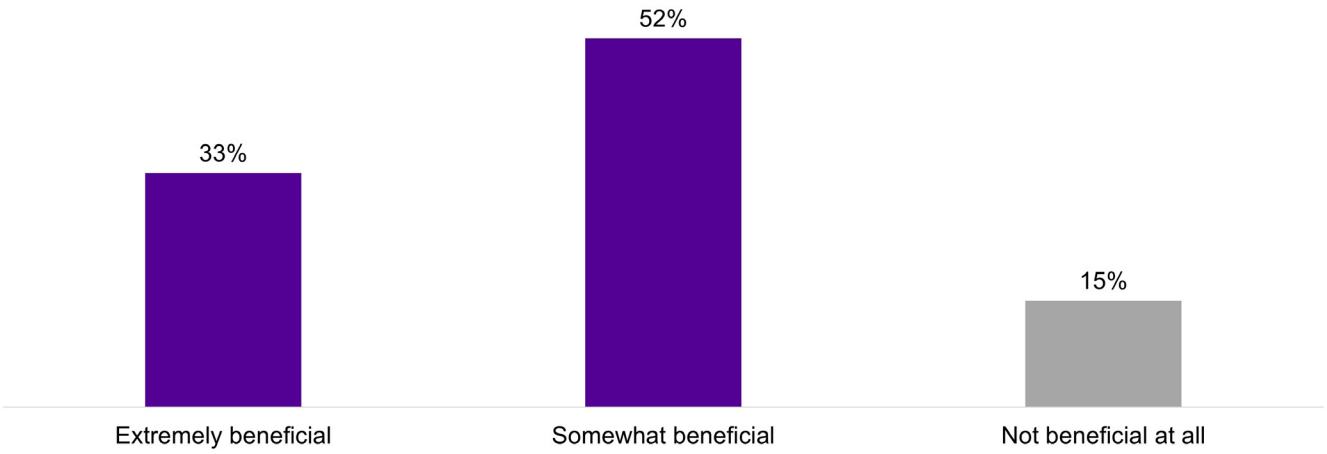
Financial institutions face an urgent challenge: modernize critical systems to meet the ever-rising demands of today's consumers. Instant payments are becoming the norm. New payment rails like Zelle already drive significant increases in transaction volumes. Consumers want to move money immediately, preferably by using a mobile device. And when consumers receive a payment, they want their balances to reflect those changes instantly.

Legacy technology at financial institutions prevents their technology leaders from being able to provide the always-on payments experiences consumers expect—experiences that work at the speed of their favorite social media app. There is a solution: a digital twin approach to payments is a simple strategy that satisfies user demands while also modernizing back-office systems without replacing aging core banking platforms.

The good news for banks is that modern, open payment platforms and tools have evolved to meet new customer demands. Technology designed to offer customers a consistent, seamless experience across all touchpoints, from brick-and-mortar locations to website to mobile app, are available, and they have an eager audience of consumers (see Figures 1 and 2). This technology not only allows for faster, cheaper, better payment experiences on the front end but also makes the lives of technology professionals in financial institutions easier through smooth integration to new rails and channels. What's more, these payment systems provide the necessary foundation for the coming evolution in payments that will harness artificial intelligence, utilize payment data, incorporate digital assets, and enable new products through embedded financial services.

Consumers See Value in Faster Payments Across a Range of Values

Figure 1. Degree to Which Consumers Perceive Benefits of Real-Time Payments



Source: North American PaymentInsights, 2023

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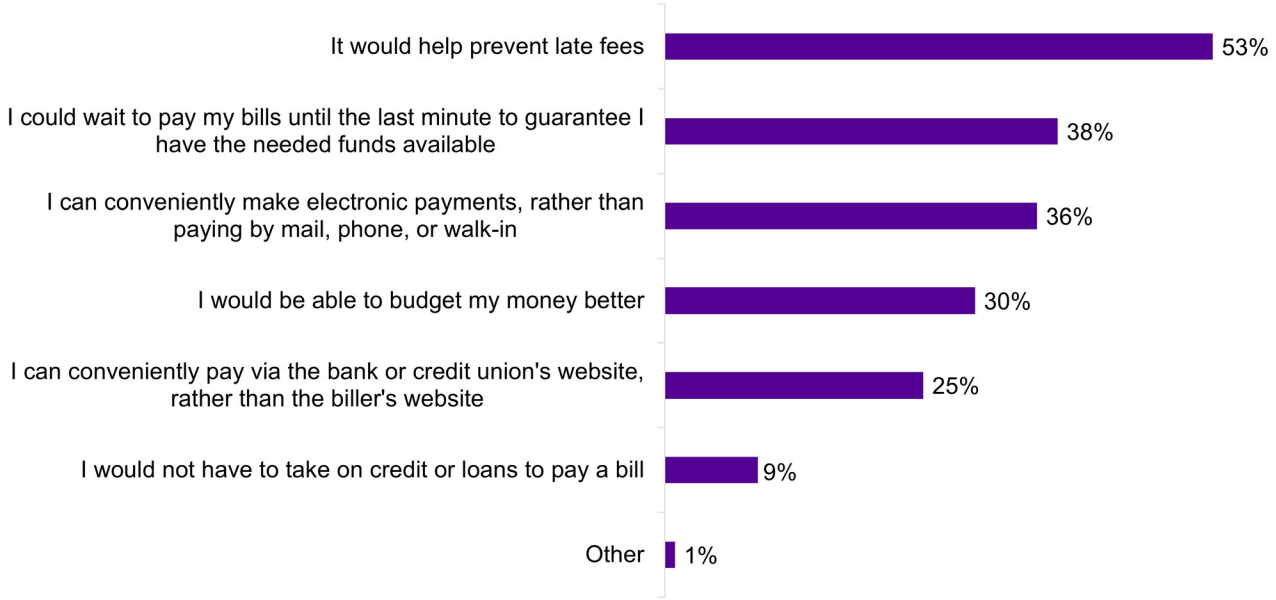
Figure 2. Consumers' Top Perceived Benefits of Real-Time Payments



Source: North American PaymentInsights, 2023

The bad news is that these new payment platforms require financial institutions to be fully modernized across their entire tech stack, from the front office to the back office, including the ever-crucial core system. Financial institutions in places like Brazil and India, markets that have leap-frogged the United States in upgrading their payment rails, have discovered the difficulties of using legacy core systems that lack the ability to keep up as the volumes of real-time payments increase. A similar prospect faces U.S. banks as volumes across new networks such as Zelle and FedNow grow.

Many financial institutions rely on legacy systems that remain slow and siloed across lines of business, continuing to process updates to account balances in batches at the end of the day. For these banks, the options for truly modernizing their core systems are limited; they can choose between an expensive and difficult rip-and-replace effort, one that must necessarily take priority over other infrastructure projects, or a more incremental migration that can lead to complex implementations, long timelines, multiple vendors, and the possibility of running inefficient parallel core systems.

The Outmoded Model

What makes this dilemma for financial institutions even more difficult is that the model for accounts used by outdated core systems are obsolete in the open, API-driven world of today's financial systems.

To understand this problem, it helps to reduce the modern bank to its essence. At its heart—the core around which a banking system is built—a financial institution is a central ledger containing the balances of accounts with the bank, such as demand deposit accounts (DDA), credit accounts, or wealth accounts. These accounts are simply a collection of balances. Different systems, like payment processing platforms, apply rules on how money is credited or debited to these balances based on activities such as interest calculations, late fees, spending limits, point redemptions, and more.

The issue is that each rule must act in some sequence, with updates to accounts—those credits and debits—happening in a predetermined pattern based on preset logic implemented by the financial institutions and defined by a host of priorities, from risk and compliance to user experience. Although it is a workable approach—indeed, it has functioned reliably at scale for financial institutions for decades—it is slow and inefficient at meeting the needs of today's customers and their access to real-time payments and settlement.

An additional problem is how legacy systems are deployed and managed. Most core systems are operated on-premise, meaning in a dedicated data center owned and maintained by the financial institution, or in a shared data center managed by a third party. Either way, the systems' physical footprint, energy needs, and maintenance requirements are significant. And they must be designed and provisioned to meet peak demands, meaning excess capacity during slower periods continue to require those same resources even when it's not being used.

The question for FIs looking to update these systems for a modern payment experience is this: How do they work with their outmoded models and outdated systems, especially if they lack the time, budget, or resources to update their core banking system? For these banks, the answer may be as simple as rethinking the DDA; that is, separate the balance, the ledger entry we consider an "account," from the rules that operate on that balance.

One intriguing new approach to rethinking the account is called a "digital twin," a digital proxy for the account balance that can interact with the services and platforms that control the rules affecting those balances, in real time and across the applications used by the bank, while the core banking system remains the ultimate record, updated and managed in the usual manner.

The approach is not meant to be a complete solution to every issue posed by an outdated core banking system—it does not replace the legacy core—but it offers financial institutions several immediate benefits as they approach the challenge of giving their customers a better payment experience.

- The digital twin approach takes one high-demand function from legacy systems, solving most of a bank's payment issues.

- Banks can continue to use their legacy core for now, allowing the core to do what it does best while it is being modernized: provide a stable, secure environment for maintaining the bank's accounts.

- The digital twin approach provides the basis for the continuing evolution of payments and financial services, such as additional real-time payment rails or artificial intelligence tools.

- Digital twins offer banks a cloud environment for testing new capabilities and increasing the speed of launching new products as they continue to run their businesses using existing core systems.

In short, customers can connect to the faster payment experiences they expect while banks take their first practical steps toward modernizing critical systems like payment processing platforms and core banking systems.

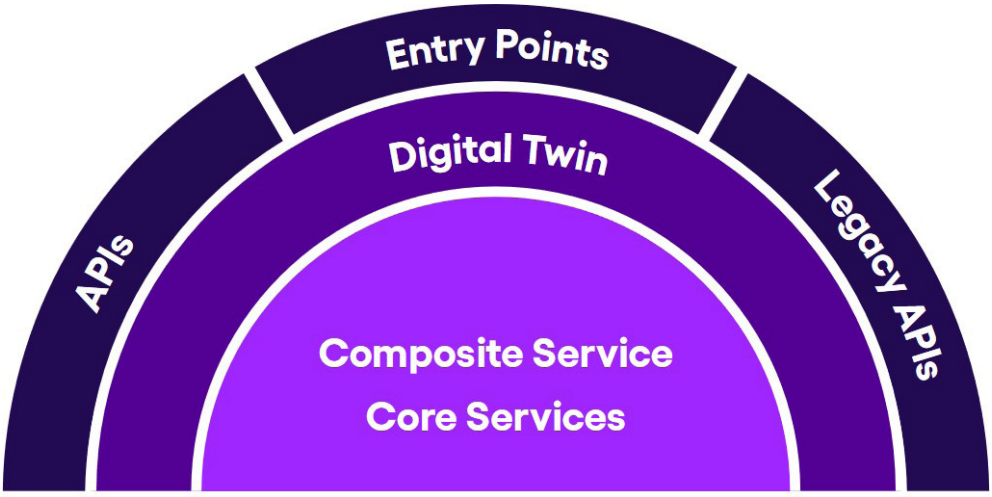
The Digital Twin Approach

The concept of a digital twin is not new; it has been around for several decades, mainly in applications for engineering, manufacturing, and supply chains. In those settings, a virtual version of a real-world asset can be managed in a digital environment for use cases such as design testing. The idea is simple and elegant: create a digital version of an asset that would be expensive, dangerous, or even impossible to build or maintain to simulate how it operates.

That makes sense with prototypes of trains or trucks, cases in which altering, damaging, or destroying the original analog of the digital twin could be catastrophic or costly. But it also works as a model in financial services: create a digital version of an account that can be managed and manipulated in real time without affecting the original account in the core system. By creating digital twins of the accounts stored on a core banking platform, FIs can effectively have the best of their old core system—the reliability and scalability that FIs have come to rely on—and the ability to connect accounts to modern, open payment systems that provide their customers with better experiences.

A Digital Twin Acts as an Adjunct to the Core System

Figure 3. Digital Twin Architecture



Source: North American PaymentInsights, 2023

The fundamentals of a digital twin of demand deposit accounts used for payment modernization are fairly straightforward:

1. A digital twin is set up in a secure cloud environment and is adjacent to the financial institution's core systems.
2. The DDA balances are replicated to the digital twin.
3. When customers send or receive money, the digital twin authorizes the transactions in real time.
4. Balances are updated immediately to the digital channels.
5. The core system credits or debits the accounts in the system of record; if the core is unavailable, transactions are queued to be executed when it is back online.

Provided the digital twin leverages an API and event-driven architecture, it can facilitate real-time functionality for systems integrated with it. The digital twin replies to API calls immediately. Credits and debits, as well as account status changes, are communicated through events that can notify critical systems that need to act on those changes.

Additionally, the digital twin abstracts the account to create a balance that can interact with payment systems offering a compliant way to connect an older core with modern systems. (As an added feature, because it is replicating the account balance and not a new account itself, the digital twin does not have the same compliance requirements as a core banking system.)

The digital twin operates in an always-on, always-available environment provided by modern systems to deliver payment experiences expected by customers today, such as real-time payments available 24/7/365. Within this environment, the rules and processes that determine how the digital twins can be affected by account operations like payments and transfers but are separated from the account in the core banking system.

The environment can be deployed in a way that offers a path not only to payment modernization but also to modern, cloud-enabled core services that scale as demand requires, reducing operational risks and costs.

The Benefits of Abstraction

Ultimately, the primary beneficiary of digital twins is the end user, the customer. Though unaware of the technology driving their experiences, bank customers, retail and commercial, can access new payment rails offering faster and cheaper settlement options, new endpoints and devices, now and as new rails become available. What's more, by separating the balance from the underlying account, financial institutions can provide customers with immediate visibility into balance changes, not only allowing for a better user experience but also offering more control over finances, balances, and accounts. And, of course, that benefit to end users accrues to their financial institutions because a satisfied customer with access to better payment and financial services is more likely to access additional financial services.

Besides happier customers, banks derive a host of other benefits from an approach like a digital twin. For instance, digital twins offer an immediate path to meeting FIs' modernization needs quickly and effectively. While not solving every problem caused by a lack of a modern core, a digital twin approach addresses the "low-hanging fruit," meaning the clear opportunities to service customers in a simple, straightforward way. Additionally, a digital twin approach reduces the friction of implementing new payment methods and provides efficiency and liquidity gains not available through legacy payment systems.

For operations departments, that also means the benefit of reduced software maintenance and lower costs. A digital twin becomes the proxy value to control balances across multiple systems, so it can be used across siloed products or lines of business. The digital twin also provides a single connection point for data across disparate systems, meaning it can be used as a basis for future applications for payment data such as integrations with artificial intelligence.

Along with creating a path toward modernizing core banking and payment platforms, digital twins also provide a path toward implementing a cloud strategy. Financial institutions can gradually work toward deploying a modern tech stack with their user experience needs already addressed. By building out a cloud implementation, financial institutions can reap the benefits such as speed of deployment, the ability to scale to meet changing demands, and the advantages of variable costs based on volume versus the constant maintenance and management of solutions deployed to a data center.

Parties that work with financial institutions—IT consultants, cloud vendors, and professional services providers—also benefit from the digital twin approach. With digital twins, partners working with financial institutions on their payment modernization journey have a means for banks to begin solving their problems, even across multiple accounts and lines of business. It's a convenient alternative to more expensive engagements as it provides a solution to current payment issues and gives vendors a straightforward solution with an easy-to-quantify business case. Digital twins provide increased efficiency at a lower cost per transaction, and with short lead time to realizing gains. And because it provides a solid first step to modernization that shows immediate returns, it is a win for vendors and their client banks.

Finally, a digital twin solution is a novel approach to payment and system modernization. It is the type of solution that technology professionals within financial services, especially those working with legacy systems, are rarely exposed to. The opportunity to work on a digital twin implementation would heighten job satisfaction and talent retention as much as it affects customers' satisfaction and retention. That is an important consideration as financial institutions and their technology vendors compete for tech talent in a tight market.

Beginning the Modernization Journey

For the financial services sector, the time to begin modernizing critical core and payment systems is now. Many institutions have taken a wait-and-see strategy to modernization and digital transformation, but the coming advances in financial technology and payments will require banks to be fully ready with flexible, modern core systems. And those are the advances we can see; the next big thing in payments that still lies over the horizon may be hard to predict, but will certainly require modern, open systems.

Regardless of whether financial institutions pursue a strategy of replacing their systems all at once or through stages, the demands of customers for real-time payments, flexibility, and control over their financial transactions and accounts are only growing. Finding a method for meeting those demands, even before core infrastructure needs are fully addressed, is imperative. A creative approach like a digital twin for accounts is one way to address these immediate needs, satisfy customer demands, and provide an incremental first step toward solving larger system issues.

That recommendation is obviously easier said than done, and FIs and their technology vendors are in the difficult position of finding a long-term solution to their modernization needs while trying to stay on budget and on time. It is also important to demonstrate an immediate benefit to larger projects. Thinking of the customer experience first can help. And that's another way using an approach like digital twins is beneficial: It satisfies customers' demand for better payment experiences and provides lower transactions costs while core system upgrades or replacements are happening.

The technological challenges facing the financial services market are daunting, and innovative ideas are needed to solve them. Reimagining bank balances through digital twins is one such way, one that offers a real solution to the challenges faced by financial institutions as they deal with the shift in customer expectations toward faster, secure, always-available payment systems. Abstracting the account away from the core allows banks to meet these demands and their own needs to adopt modern core systems. The real challenge, of course, is that financial institutions must move quickly, and the additional benefit of digital twins is the speed with which results can be attained. Whether an FI is undertaking incremental changes or an overhaul, digital twins offer a practical starting point to meet customer expectations and lay the groundwork for broader, ongoing improvements as financial services and payments evolve.

Methodology

Data from "Javelin North American PaymentInsights, July 2023." A web-based survey was fielded between April 21st and May 4th, 2023, using a U.S. online consumer research panel of adults aged 18 and older. The survey of 3,001 U.S. adults focused on consumer attitudes and behaviors around latest payment technologies offered to consumers, identifies essential shifts in consumer payment preferences, and reveals consumer use and interest in emerging new payment products and services.

The panel of 3,001 respondents supports a sampling error of +/– 1.8% at the 95% confidence level for questions asked of all respondents, as well as at many sub- segment levels designed to approximate a random sample.

The online questionnaire used for this study was developed by Javelin Strategy in consultation with our clients, which represent a range of payments industry stakeholders.

About Matera

With over 30 years of experience, Matera is a trusted provider of technology solutions for financial institutions. Matera's Core Banking, QR Code Payment and Instant Payment solutions are used by 2 out of the top 3 global banks, 3 of the top 10 U.S. banks and 1/3rd of all banks in Brazil. With operations in both Brazil and the U.S., Matera has over 1,000 employees worldwide.

About Javelin

Javelin Strategy & Research, part of the Escalent family, helps its clients make informed decisions in a digital financial world. It provides strategic insights to financial institutions including banks, credit unions, brokerages and insurers, as well as payments companies, technology providers, fintechs and government agencies. Javelin's independent insights result from a rigorous research process that assesses consumers, businesses, providers, and the transactions ecosystem. It conducts in-depth primary research studies to pinpoint dynamic risks and opportunities in digital banking, payments, fraud & security, lending, and wealth management. For more information, visit www.javelinstrategy.com.

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