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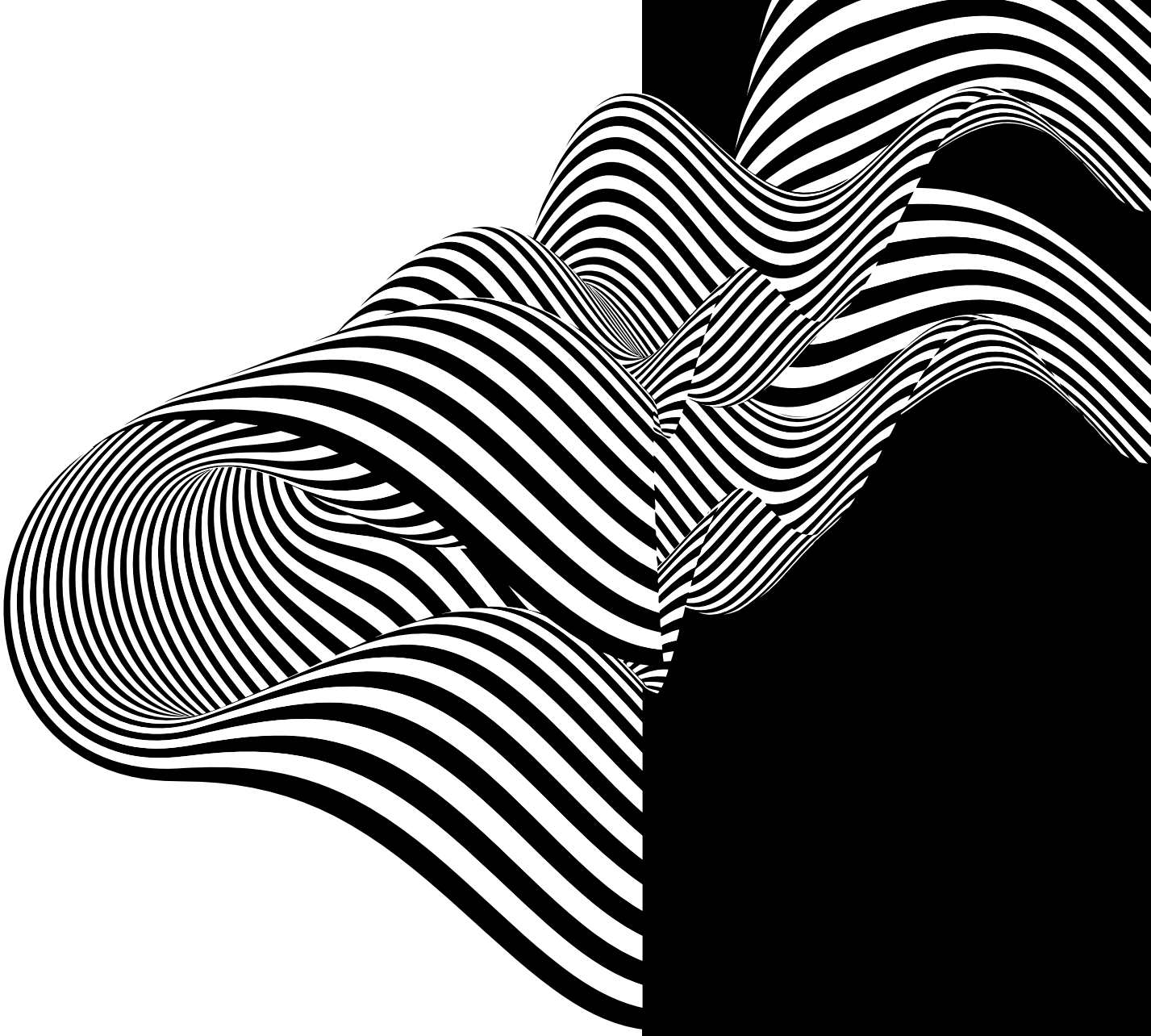

INNOVATION RIPPLE EFFECT

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PYMNTS queried 29 payments execs to get a sense of the most important payments innovations of the last ten years.

JUNE 2019

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29 Executives On The Most Significant Innovations Moving Payments Forward

The 2010s are almost over. Get ready for the 2020s. PYMNTS queried 29 payments execs to get a sense of the most important payments innovations of the last 10 years. Hindsight is 20/20 and useful as we get ready for 2020.

A decade is a nice round number, a convenient marker for has come and what's coming. We as humans tend to measure our lives in decades, referring to ourselves as children of the '60s, perhaps, or pining wistfully for the synthesized pop sounds of the '80s.

In payments, 10 years is a long time — where everything can change, where new ways of transacting become ubiquitous when once they were fanciful notions. We are still in the last few months of 2019 — at the six-month mark, to be exact — and a new decade looms.

Call it the sunsetting of the 2010s, an opportune time to rear-view and preview everything from eCommerce to AI, from A to Z — here, we can term it APIs to Zelle.

To get a sense of the most significant seismic shifts that have pushed payments innovation inexorably ahead through the past 10 years as well as what lies over the horizon, we queried 28 C-level executives who have a collective thumb on the pulse of innovation. Each of these men

and women was asked to name the single most important innovation that has had a ripple effect through the ecosystem. The answers were varied, ranging from blockchain to instant payouts.

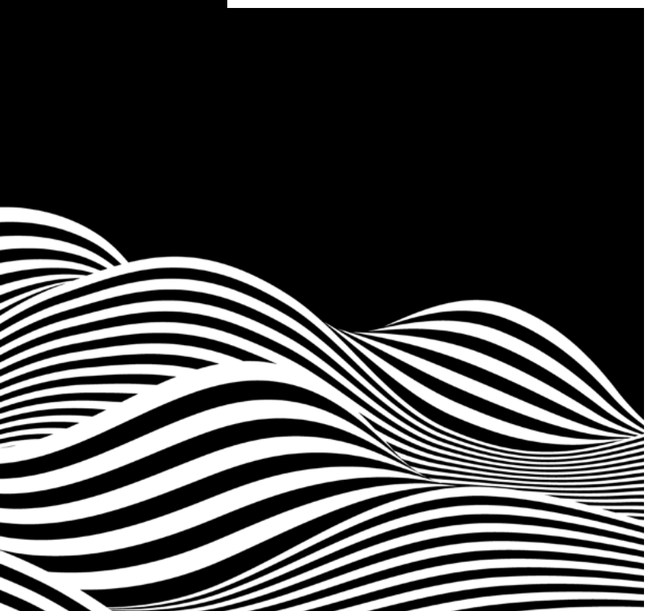
The particular innovations spotlighted might be varied, and tied, say, to consumer-specific or B2B-specific cases. But the common threads running through the tapestry lie with technology's very transformation, marked by speed ... and intelligence ... and mobility.

It can be argued that the consumer experience has been leading by example through the past few years — giving merchants and financial institutions a roadmap of what to do and what not to do when it comes to satisfying demand and creating as frictionless a commerce experience as possible.

The flip phones of earlier in the millennium are, largely, a memory. Now the smartphone in your hand can help you shop whenever and wherever, transacting by tapping. Machine learning and artificial intelligence help merchants tailor relevant offers — in real time and in context. Technology also proves invaluable in the ongoing fight against fraudsters, who are increasingly moving online as consumers are doing the very same. One laggard that's been catching up a bit: B2B, where the paper chase is becoming a bit more streamlined, a bit more digital, as transactions move across borders and currencies and time zones. No matter the application, risk analysis is crucial, especially in an age where knowing your customer is as much a mandate as it is good business sense.

If there is one constant in innovation — especially payments innovation — it is that innovation is constantly evolving. We may look back on the relative clunkiness of what went before, and chuckle, and say it was "obvious" that we'd wind up where we are now, given the road we've traveled. Past, as they say, is prologue, even if it is not a specific predictor. Hindsight may be 20/20, but it's crucial as we get ready for 2020. Read on.

INNOVATION RIPPLE EFFECT



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SCOTT HARDY
Vice President

APIs: The Fuel For Payments Innovation

When selecting the most significant creation that has moved payments innovation forward in the past 10 years, advancements of the smartphone, biometric authentication and eCommerce all come to mind as compelling answers. However, with a focus more on what happens in the background of payment processing and business operations as a whole, the rapid maturity of APIs — formerly private resources that have grown into an open-source market — comes into focus as the single most prominent innovation.

A decade ago, Application Programming Interfaces (APIs) were private and proprietary; developers had to purchase rights to use them, and

outside use was strictly limited. Much has changed in the past 10 years.

An open source market to APIs has had a profound ripple effect within the payments ecosystem. By opening access to their APIs, developers allow other developers to create FinTech solutions that promote connectivity and efficiency for very specific verticals and markets. APIs form the building blocks of modern payment solutions and have evolved to become fully integrated with front- and back-end development.

Emerging as the focal point of modern software development, APIs allow organizations to realize their business goals more efficiently. In the wake of large corporations that have allowed access to formerly private APIs, other businesses followed suit in creating an open source for API development over the years, leading to the formation of a large ecosystem of developers.

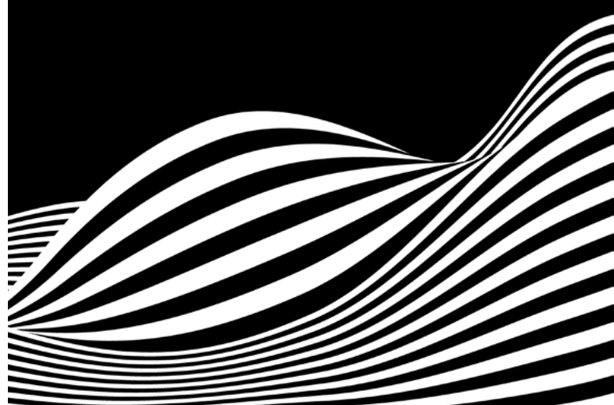
The API market has served and continues to serve as a springboard for countless developers to bring creative ideas to life and design niche services for specific industries. APIs offer crucial endpoints for developers to create what they want. The options to create custom solutions using APIs are without limit, and API accessibility only continues to grow.

Take Shopify, for example. Shopify offers a range of APIs off of which developers may build custom integrations or seamlessly adjunct a plethora of other apps. In doing so, it has become one of the largest and most popular eCommerce platforms for online stores. APIs make platforms such as Shopify the central hubs around which business operations can spin, all the while making those operations more streamlined and easier to manage for business owners.

The dawn of the open API has allowed businesses to simply plug in and use SaaS resources to suit their business — and deploy them quickly. They allow retail POS systems to connect to eCommerce platforms, stores to "talk" to each other and developers to build their own apps with a head start (API documentation and even guides and tutorials for custom developers). This sort of availability, where use of open APIs is not only accessible but encouraged, is a dramatic shift from the once private API market.

Payment gateways such as Authorize.net have opened their APIs to developers to allow payments to be accepted anywhere, on any platform, with any device. In the past, a business has been limited to only what one POS or platform was designed to do. Open APIs now allow a business to easily work with multiple software systems at once, enabling them to tie together payment processing, fraud prevention, analytics, invoicing, loyalty programs, and more with the "universal plug" APIs have come to provide.

The dawn of the open API has allowed businesses to simply plug in and use SaaS resources to suit their business — **and deploy them quickly.**



bitpay

STEPHEN PAIR
CEO

Blockchain Technology: Changing Payments From The Ground Up

In the last 10 years, nothing has been as significant for payments as blockchain technology.

Satoshi Nakamoto published the bitcoin white paper on Aug. 18, 2008, and the first block of the bitcoin blockchain was confirmed on Jan. 3, 2009. These events marked the next step in the evolution of money.

Humans have been improving and refining how we transfer value for thousands of years. We moved from commodities like gold and silver to paper money for the convenience it provided. In the 1950s we started moving to digital payments like credit cards for even more convenience.

Unfortunately, traditional payment methods have serious vulnerabilities

that the rise of card-not-present (CNP) fraud and identity theft show. These vulnerabilities grow more apparent and severe as commerce continues to move online. Today, businesses and consumers are in desperate need of a payment system that works seamlessly online with both speed and security. **Blockchain payments are that solution.**

Blockchain technology reduces fraud by allowing for secure digital push payments (which require user authorization to initiate). This is in contrast to the pull payments used by traditional payment methods today that transmit the same sensitive data needed to authenticate transactions. This creates severe vulnerabilities which are easy for criminals to exploit. On the other hand, blockchain technology allows for online payments that are as fast and fraud-resistant as paying with cash at a physical store. Blockchain payments almost entirely eliminate the need for chargebacks that are all too common for businesses today (although additional work can be done to add reversibility on top of blockchain payments).

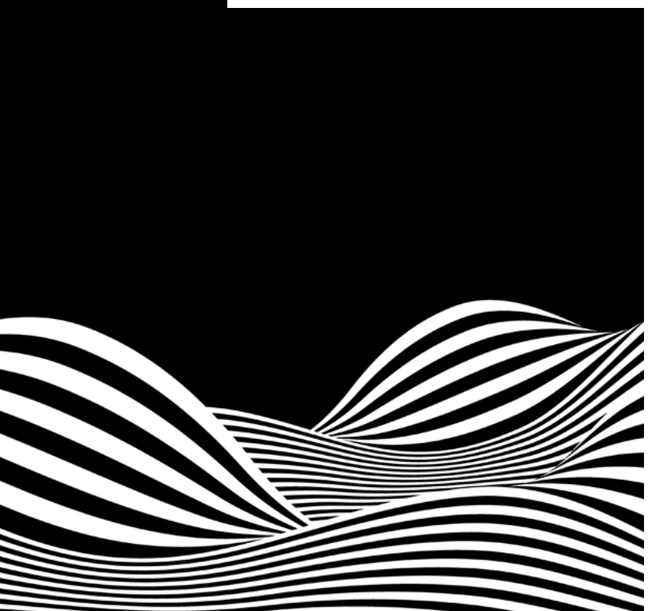
For international commerce, blockchain payments are fast, efficient, and provide transparency, consistency, and certainty for senders and recipients. Sending a blockchain payment internationally costs less than traditional payments and is faster than any other payment system to come before.

Blockchain payments are helping international commerce today. Blockchain payments are equipping a Fortune 500 company to overcome Nigeria's liquidity problems and poor banking infrastructure. Now they can accept funds from their subsidiary in the country to their bank in Europe. One Colombian call center has started accepting blockchain payments from clients, clearing the hurdle of slow and expensive traditional payments to Latin America. This has allowed them to further expand to more international markets.

However, blockchain technology is not just about making payment systems faster and cheaper. Blockchain technology allows the creation of programmable money that can do things that were never before possible.

For example, a business or individual can store blockchain payments using multi-signature wallets. These wallets allow one to split access across multiple devices or people. This prevents any one person or operating system from being a single point of failure. Also, ethereum and similar blockchains make smart contracts possible. A smart contract is a contract in which an algorithm determines the transmission of funds instead of a third party. Businesses are just beginning to explore the possibilities of programmable money, which will continue to improve the payments ecosystem.

In short, blockchain payments are creating a world where anyone, anywhere can send and receive payments with fewer costs, risks and delays. Much like no one in the 1990s could have predicted the impact the internet would have in 2019, it is hard to imagine the enormous potential blockchain technology has for payments.



Bottomline

ROB EBERLE

President and CEO

Driving Change And Consumer Expectations

The iPhone is the single biggest driver of change in business payments in the past 10 years. Digital transformation is driven by customers' expectations and habits as much as or more than it is driven by technology. The iPhone profoundly changed the expectation of consumers and the manner in which we all conduct our lives. Whether reserving a table, calling a car or booking a flight, the expectation is a simple, seamless experience, driven by smart, interconnected, intuitive applications. It has fundamentally changed the way we live our lives and conduct business — every single day.

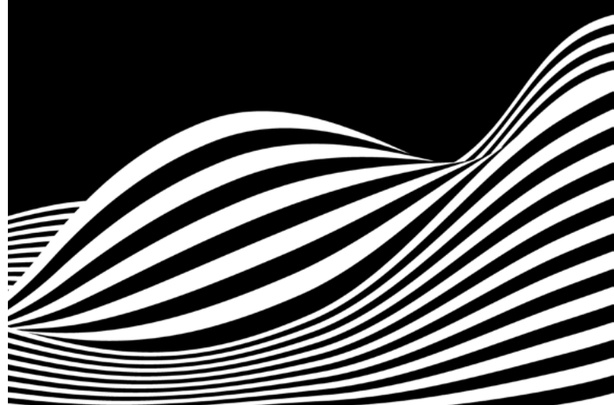
We are all very familiar with how the iPhone and mobile capabilities in general have changed consumer

banking and payments. We can now transfer money to anyone, anywhere, at any time, either through traditional banking channels or consumer payment applications like Square and Venmo. The iPhone consumer experience has changed the way traditional business payment processes are viewed. Paper-based processes, systems that are not integrated, and platforms that are not intelligent, integrated, and easy to use are no longer accepted as "the way things have always been done." The acceptance of, desire for, and even mandate for new technology for business payments has been driven by our experience as consumers.

While the iPhone, or any technology by itself, does not change the complex nature of business payments — which have much more significant security and liability considerations, varying terms, and much greater requirements around accompanying data — it has forever changed the expectations of how businesses pay and get paid. In the 2019 B2B Payments survey conducted by Bottomline Technologies and Strategic Treasurer, 90 percent of banks reported that mobile apps are important or extremely important to their B2B payment offerings. Compared to last year's survey findings, 13 times more corporates indicated that their comfort with mobile apps has improved, with both treasury and AP groups adopting this functionality. The survey also found that while banks view payment execution as the greatest opportunity for mobile app enhancement, corporates said security features were of utmost importance. With 76 percent of banks indicating that their corporate customers are interested in leveraging solutions that can help automate B2C payments such as PayPal, Zelle, Venmo and Visa Direct, the lines between the technologies that businesses and consumers use to make payments are already blurring. While banks and FinTechs may have a greater understanding of the real opportunities around mobile in payments, it is clearly important that they work together to address the security concerns of businesses to ensure these solutions are adopted.

We are just at the beginning of the digital transformation of business payments, and the next five years promise to bring massive change to the market as banks, businesses and FinTechs continue to embrace new technologies and payment schemes. New solutions leveraging faster payment types, open banking, integrated ecosystems and intelligent applications will emerge and be quickly adopted. New regulations and increasingly sophisticated fraud schemes will drive innovations in compliance and risk and fraud mitigation. Machine learning will automate repetitive, manual tasks and drive new levels of efficiency for finance departments. Increasingly, the speed, simplicity, and security of business payments will need to keep pace with the pace of business. There is no going back — just full speed ahead.

Increasingly, **the speed, simplicity, and security** of business payments will need to keep pace with the pace of business.



Brighterion
mastercard

DR. AKLI ADJAOUTE
Founder, President and CEO

The Age Of **Mission-Critical** AI Deployment

The next generation of mission-critical artificial intelligence (AI) systems will increasingly impact our lives by making personalized decisions on our behalf. AI has moved from research labs to real-world applications, thanks to the unprecedented levels of data availability combined with advances in computational power and the new "factory type" AI platform, allowing broad accessibility of these technologies to non-AI experts.

From cyber defense to banking, IoT, autonomous driving, biotech and robot-assisted surgery, AI will be at the center of these mission-critical applications that are essential to our well-being.

Next Generation AI Must Be Smart, Self-Learning and Adaptive

These mission-critical applications will require adaptive and self-learning AI that provides real-time insight in dynamic environments even with the presence of adversaries and unexpected inputs and events. Unfortunately, most of today's AI systems, including the hyped "deep neural networks" — being marketed as "deep learning" — lack the essential feature of adaptive learning. This is despite the great results achieved by deep neural networks in speech and image recognition, language translation, and other applications that result in sensational media coverage and lead the average citizen of the world to believe that these algorithms are sentient. However, if you have a certain level of expertise in the field of AI, you know that they cannot handle anything that requires reasoning, no matter how much data you train them with, as they rely only on patterns, with absolutely zero thinking. Can vectors of weights (numbers between 0 and 1) represent learning and thinking? Of course not! Even learning the basic sorting algorithm is extremely challenging for a deep neural network.

Additionally, deep neural networks' models are black boxes; they don't have any understanding of their input. They are unable to perform any general¬ization and cannot provide any explanation required in mission-critical applications.

Collective Intelligence with Hybrid AI Models

Consider the challenges of two important fields, fraud prevention and network security, both of which are perpetually changing and never remain static. Fraudsters and hackers are criminals who continuously adjust and adapt their techniques. Controlling fraud and intrusion within a network environment requires a dynamic and continuously evolving process. A static set of rules or a machine learning model developed by learning from historical data has only short-term value. In network security, we know dozens of new malware programs with ever-more sophisticated methods of embedding and disguising themselves appear on the internet daily. In most cases, vulnerabilities are discovered and a patch is later released to address the vulnerability. This is why tools that autonomously detect new attacks against specific targets, networks or individual computers are vital. They must be able to change their parameters to thrive in new environments, learn from each individual activity, respond to various situations in different ways, and track and adapt to the specific situation/behavior of every entity of interest over time. This continuous, one-to-one behavioral analysis provides real-time actionable insights. In addition to the self-learning capability, another key concept for the next generation of AI and machine learning (ML) systems is being reflective. Imagine a plumbing system that autonomously notifies the plumber when it senses water dripping out of a hole in a pipe and detects incipient leaks.

To achieve this level of proactive intelligence, the best approach is to use an AI factory-type platform to build hybrid models that would incorporate several supervised learning techniques, including deep learning as well as unsupervised learning and smart agents. By using a suite of various AI and ML techniques, we are able to introduce the benefits of each technology while compensating for their weaknesses. For example, by using data mining and case-based reasoning alongside other technologies, models are able to provide explanations meaningful to humans that are required in payments, security, and healthcare applications.

Using an AI factory-type platform can handle any data in any format from

any source and automatically discover important features, create new fields, enrich data, and build and test in parallel thousands of AI models. The best models are then merged to create production-ready models that are extremely accurate and durable.

By using the power of Smart Agents technology, we no longer need to anticipate every possible scenario. Instead, Smart Agents create profiles specific to each entity and behave according to their goals, observations and the knowledge they continuously acquire through their interactions with other Smart Agents. Each Smart Agent pulls all relevant data across multiple channels, irrespective of the type or format and source of the data, to produce robust virtual profiles. The Smart Agents will then extract the necessary knowledge and information from the data in order to automatically update, in real-time, and the resulting intelligence is shared across the other Smart Agents. This one-to-one behavioral profiling provides unprecedented, omni-channel visibility into the behavior of an entity.

Smart Agents can represent any entity and enable best-in-class performances with minimal operational and capital resource requirements. Smart Agents automatically validate the coherence of the data and perform the features learning, data enrichment and one-to-one profiles creation. Since they focus on updating the profile based on the actions and activities of each entity, Smart Agents store only relevant information and intelligence rather than the raw incoming data they are analyzing, which achieves enormous compression in storage.

Legacy technologies in machine learning generally rely on databases, which use tables to store structured data. However, tables cannot store knowledge or behaviors. Smart Agents bring a powerful, distributed file system specifically designed to store knowledge and behaviors. This distributed architecture allows lightning-speed response times on entry-level servers as well as end-to-end encryption and traceability. The distributed architecture allows for unlimited scalability and resilience to disruption, as it has no single point of failure.

Finally, mission-critical applications require a secure AI that prevents attackers from intercepting and interpreting the data or compromising the integrity of the decision process.

Smart Agents can represent any entity and enable best-in-class performances with minimal operational and capital resource requirements.

MANISH KOHLI

Global Head,
Payments and Receivables,
Treasury and Trade Solutions

UPI:
Leveraging Instant To Innovate For The Future of Payments

With so much active innovation across the payments industry as a whole, it is a challenge to pick out the single advancement that has done the most to drive the payments industry forward over the past 10 years. Indeed, after a number of years in which innovation in the payments industry has frankly trailed the industries it serves, it could now be argued that we are squarely in a golden age of innovation. Advancements in technology and consumer expectations have set the bar higher — and importantly, the most critical and meaningful changes are taking place within the traditional world of fiat currency.

So, whether you consider the deployment of Instant Payments' schemes in numerous markets around the world, significant advancements in the quality of cross-border payments through SWIFT gpi, or more generally the fundamental improvements in messaging standards and connectivity, there are many pivotal advancements to select from. But we have to pick one — and in the age of an always-on, always-connected digital economy, I am drawn to the compelling immediacy of Instant Payments, and specifically the monumental achievement of Unified Payments Interface (UPI) in India. I also place this high on the list of innovations due to its ability to serve as a platform to fuel further innovation — and also for its ability to be replicated in other markets, interconnected with other instant payment systems and to help us deliver our vision of enabling a world where payments can be made as if there are no borders, no currencies and no constraints.

So why UPI?

UPI has demonstrated to us that the potential of a fiat currency-based resurgence that will deliver payments innovation fit for the digital age is a reality, and that it is here at our doors.

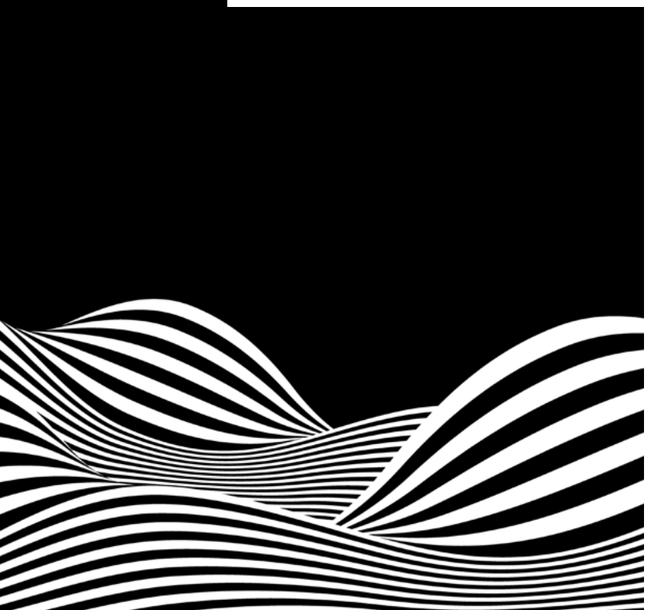
At Citi we typically consider that you can measure the quality of a payment across five main dimensions: speed, transparency, convenience, cost and security. All of these dimensions have seen considerable upside as UPI has been deployed in India. In addition to the inherent economic impetus delivered through instant payment, UPI offers opportunities to greatly reduce transactional friction through single-click payment and immediate confirmation.

UPI is just one component part of a much broader innovation: the "India Stack." This began with the issuance of Unique Identification Numbers (UID), commonly known as Aadhaar — a part of the most ambitious digital identity project anywhere in the world, covering 1.2 billion people. UPI is illustrative of a broader trend in evidence across the payments industry — namely, the active intervention of regulators to drive progress toward instant payments and open banking in different markets across the globe. Similarly, within the EU the PSD2 is a broad regulation that aims to encourage competition in financial services, and in particular, participation from non-banks. The results are in the form of an innovation platform for FinTechs and banks alike to help businesses create and deliver reimagined products, services and experiences. It also shows us the power of what governments can achieve as they intervene to improve the payments landscape in a country.

Instant Payments isn't the end of the innovation — rather, it can be the start. Beyond enhancing the speed of payments, the immediacy of Instant Payments creates opportunities to drive enhancements in the client experience, particularly when considering instant redemption opportunities.

At the outset, an Instant Payments scheme is typically domestic in scope. However, we see enormous potential in connecting these domestic payment schemes to effectively create cross-border Instant Payments. With 19 countries already live on Instant Payments, which is set to increase to approximately 35 by next year, this capability promises to be highly relevant. At Citi we are building for a future in which we offer a seamless FX transaction that connects two legs of an International Instant Payment.

By the end of 2020, more than 80 percent of the world's economy will soon have access to Instant Payments. As the payments industry continues to drive common messaging standards and common connectivity through APIs, the future is bright for further rapid innovation over the next 10 years. We are moving to a future where fiat currency payments, through connected instant schemes and technological progress, can flow quickly, clearly, cheaply, easily and safely.



COGNITO

CHRIS MORTON

President and
Chief Operating Officer

Backing Businesses: Revising Risk Evaluation

Business options for financial services have become plentiful in the past decade. Begging your bank for a merchant account, setting up a gateway, having transaction limits, and having funds withheld to account for risk have largely gone away. PayPal paved the way for the current innovators like Stripe, WePay and others to provide nearly turnkey card acceptance — even for newer businesses.

With business credit, we are starting to see movement in how credit is underwritten for venture-backed businesses. When our company first needed a credit card, we had to deposit money into a secured account to fully underwrite the risk or secure the account with our own personal credit.

With companies like Brex, business credit risk is frequently re-checked without holding a separate balance just to fully underwrite the credit limit.

What do these have in common? Businesses were perceived to be more risky than they actually were. As a result, financial institutions were more conservative in doing business with newer businesses and smaller businesses, and they would want to reduce the risk by holding collateral or shift it to the founders of the company by getting personal guarantees. Let's not forget that one of the old ways of lessening risk for a financial institution, a way still used by banks today, was to require a business owner to show up in person with a mountain of paperwork while an agent of the bank made a subjective determination about the person's demeanor.

Even with modern challengers, the problem that continues to linger is the business onboarding process. Sign up for any financial account for your business, either in person or online, and you still have to send a mountain of paperwork. That paperwork goes to a human to review, extract information, collect data from third parties by hand, and make a determination. This takes hours of time for both parties and limits the rate at which businesses are onboarded.

In recent months we at Cognito have spent significant time interviewing companies on their business onboarding process to understand their future needs and exactly where pain points lie. The overwhelming tone in our interviews have been a lack of a modern solution. Compliance and regulatory teams are having to conduct tedious manual review, daily. In an age of automation, there are very few companies able to devote resources to automating business verification or compliance, yet everyone says they wish they had it — an opportunity for unprecedented workflow automation.

Much like signing up for a financial account has been streamlined for individuals, we expect the next wave of financial innovation to be automated onboarding for businesses without personal guarantees or collateral requirements.

In an age of automation, **there are very few companies** able to devote resources to automating business verification or compliance ...

DATAVISOR

YINGLIAN XIE

CEO and Co-founder

Change, Challenge And Opportunity: **Finance In The Mobile Era**

The payments space has always been a breeding ground for innovation — but over the past decade, we've witnessed unprecedented levels of disruption and transformation. At the center of the revolution sits the most impactful force of all — mobile. Look behind virtually every innovation introduced into the payments ecosystem in the last 10 years, and you'll find a mobile device making it possible. From Apple Pay to Zelle, technology has transformed how we both make and spend money.

It's vitally important to understand that the impact of mobile on the payments sector has been more than merely technical. Mobile has changed human behavior. We don't just use money differently. We think about it differently.

Our approach to earning and saving has changed. Our ideas about what constitutes financial stability have changed. Our work lives have changed. Business operations have changed. Investment has changed. Banking has changed. Everything has changed.

Speed, scale and scope are the hallmarks of our mobile-powered global economy. The importance of brick-and-mortar financial institutions has faded, and geographic boundaries have melted away. Money, payments, finance, commerce — it's all online now. While online banking may predate mobile banking, that experience was very different. The global digital economy came of age with mobile. The rise of open banking — and recent regulatory action in support of it — are but one example of how mobile is having an impact.

In more advanced economies, mobile is all about convenience. It's about making everything easier, faster, and friction-free. In developing economies, it's more about inclusion. Mobile is empowerment. It enables participation in the modern economy, even for those without access or proximity to anything resembling financial infrastructure.

These are positive changes, but mobile brings challenges as well. The more we optimize for ease of use, the harder it is to maintain effective levels of scrutiny when it comes to fraud prevention. The wider we open the door to our modern economy, the more room we make for bad actors to enter alongside law-abiding digital citizens. Emerging technologies like artificial intelligence and machine learning give us new powers to build and maintain a safe financial world, but these technologies are accessible to fraudsters as well. For every positive, there is seemingly a corresponding threat to address.

Mobile brings with it a level of immediacy that is the antithesis of how things were done previously, during what we might think of as "the credit card era." Credit cards, by definition, introduce a delay between purchase and payment. Mobile removes that delay in favor of real-time completed transactions. In many ways, mobile payment capabilities return us to pre-credit card days, when our financial lives were dictated by what we physically had in our wallets. Mobile represents a kind of "New Old" in this way — we're back to what's in our wallets, only now that wallet is digital.

In China, where DataVisor has a wide range of clients, the credit card era was only in its infancy when mobile arrived. Seemingly almost overnight, it was a new era yet again. Today, when I go to China for business, I don't carry cash. I don't carry cards. I carry my phone. In the U.S., while card-not-present (CNP) fraud had been a significant concern for many years, a large part of our current focus is on solving mobile transaction fraud. In China, CNP has been comparatively less of an issue, because mobile has taken hold so rapidly and so completely.

This evolution to mobile payments and digital wallets has significantly changed how we manage financial and

The payments ecosystem is notable for its **flexibility, resilience, and pliability.** Innovation and disruption are welcomed and encouraged.

payments risk. Lending institutions, for example, used to rely heavily on credit histories to make their decisions. However, in a post-credit-card world, there is no credit history — at least, not in the traditional sense. Assessing lending risk requires an entirely different approach — one that relies on a broad array of complex digital signals. In developing economies, credit systems have often not been very mature or well-established. Mobile payment history is providing information to establish a different kind of credit record, and large mobile payment providers are becoming popular user acquisition channels for lending institutions.

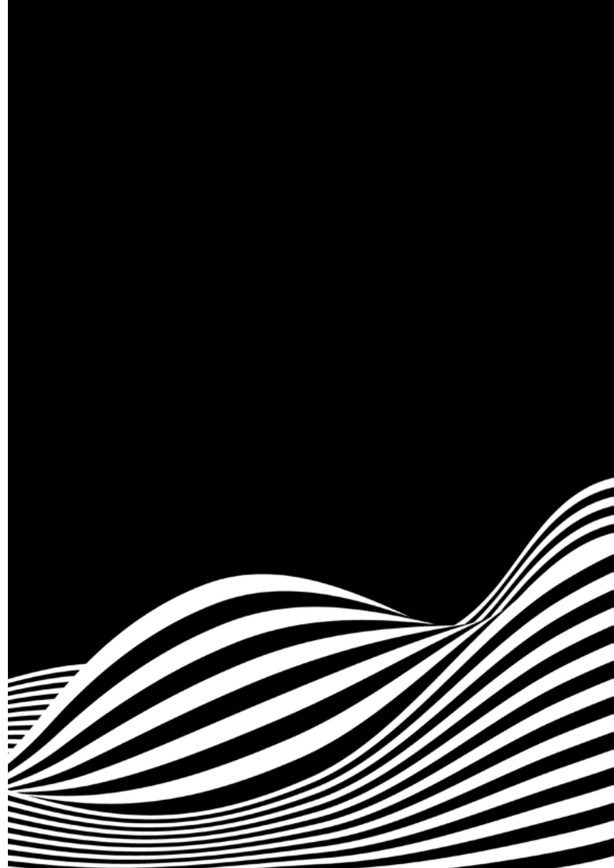
I want to return to the word "empowerment." When it comes to innovation in the payments sector, mobile may represent the single most important technological advance — but it's what mobile makes possible that is the real revolution. Mobile empowers.

Mobile empowers individuals to enter the economy, and to advance themselves. Mobile empowers daring young FinTech startups to challenge the financial status quo. Simultaneously, mobile empowers the banking sector to work with — and not against — these innovative challengers, to meet a wide range of goals ranging from efficiency and safety to financial inclusion and economic equality. Mobile puts payment power back into the hands of the consumer — literally and figuratively — yet also affords enterprise new growth avenues.

Regrettably, mobile also represents empowerment to fraudsters. Reports suggest that well over half of all fraudulent transactions today involve a mobile browser or mobile app. So payments innovation in the mobile age must be accompanied by innovation in the fraud prevention arena as well. Otherwise, the price of progress will be too high.

The payments ecosystem is notable for its flexibility, resilience, and pliability. Innovation and disruption are welcomed and encouraged. Mobile introduced a whole new world of possibilities — and if there's one thing I know from my experience in the world of modern fraud management, the only constant is change. Fortunately, we have the power to ensure these changes continue to be positive ones.

INNOVATION RIPPLE EFFECT



EKATA

ARJUN KAKKAR
VP, Strategy and Operations

Payment Innovation With The Highest Impact: **Open APIs**

What if you could monitor payments across all your financial accounts in one app, get online subscriptions without worrying about forgetting to cancel them, and get loans faster at fair rates? These are just a few innovations that are already taking shape thanks to open banking, which allows third parties to make payments on behalf of customers and get secure access to customers' financial transaction data. Open Application Programming Interfaces (open APIs) are the communication bridges that make this secure data access possible.

This unlocking of financial data, historically only available to banks, opens the door to large-scale innovation. The innovation will not

come from large banks that have been hoarding data, but from small firms competing to create real value for customers. Combine that with the customer's explicit consent about whom to share data with, and we have the potential to get to highly personalized and predictive services centered around the customer.

A Revolution at its Inflection Point

The concept of Open Banking has been around for over a decade. In the absence of regulation opening up data access, some innovative FinTechs use screen scraping, or stored customer passwords, to access relevant information. The resulting data is rich, but the potential for fraud is huge.

We need secure access to banking data — but in a world where customer data is the most valuable asset, it is not surprising that banks are not willing to share the data with third parties. Further, the real value for the customer comes from getting the full picture of transactions across banks, and almost nobody has complete access to all data. Regulators and industry bodies across the world are in the process of fixing this issue and leveling the playing field by forcing all banks to give external third-party providers access to their data. While PSD2 in the EU and Open Banking in the U.K. are getting more press coverage, several initiatives are underway in other regions including the U.S., India, Mexico, Canada, Australia and Singapore, to name a few. The result is a real hockey stick curve of available open APIs.

The revenue potential from open banking based on PwC estimates is almost $9B in the U.K. alone by 2022. We estimate the potential global revenue well north of $100B by 2022, opening the gates to more investment in more innovative use cases that benefit the customers.

Adoption — Current State and Hurdles

The access to rich data using screen scraping enables many valuable applications — Mint, for example — but the security risk means limited larger-scale adoption. Can open APIs succeed where screen scraping failed? We see two hurdles impacting adoption — and believe the innovators will overcome these hurdles.

Firstly, since we are in early stages of Open API deployment, currently available APIs only give basic account visibility and the ability to make payments. While this simplicity eases analysis, the best insights and innovation will come from richer data sets that banks own, but have not exposed to FinTechs.

As the innovators continue focusing on adding customer value, the banks will progressively expose more data when customers see the benefits. Thankfully, currently available data enables several valuable applications such as faster and cheaper money remittance, innovative credit scoring for the underbanked and aggregation of financial transactions across providers that are already getting customer traction.

As the innovators continue focusing on adding customer value, **the banks will progressively expose more data when customers see the benefits.**

Secondly, there is a more significant and secular hurdle to adoption: customer trust. In a recent survey, 38 percent of customers were concerned about the risk of fraud in cases of open banking, and it topped the list of concerns by a wide margin.

The Customer Trust Imperative

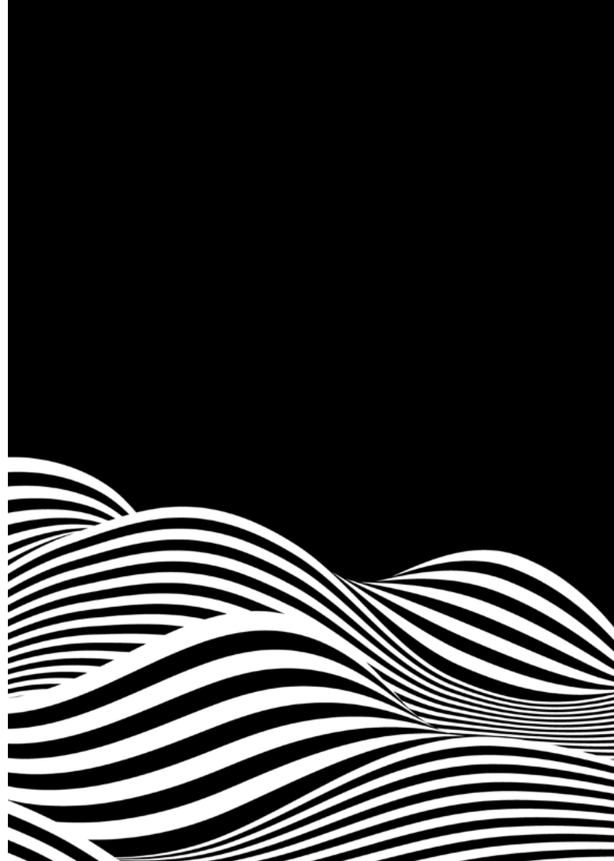
How do we drive customer trust? The answer differs by region, since it depends on the regional open banking and data privacy regulations. Let's use the EU region as an example since it has paved the way by providing an excellent framework, through PSD2 and GDPR, that puts the customer first, gives them control over their data, and focuses on safety and security. This framework, combined with a focus on excellent customer experience, will drive customer trust over time.

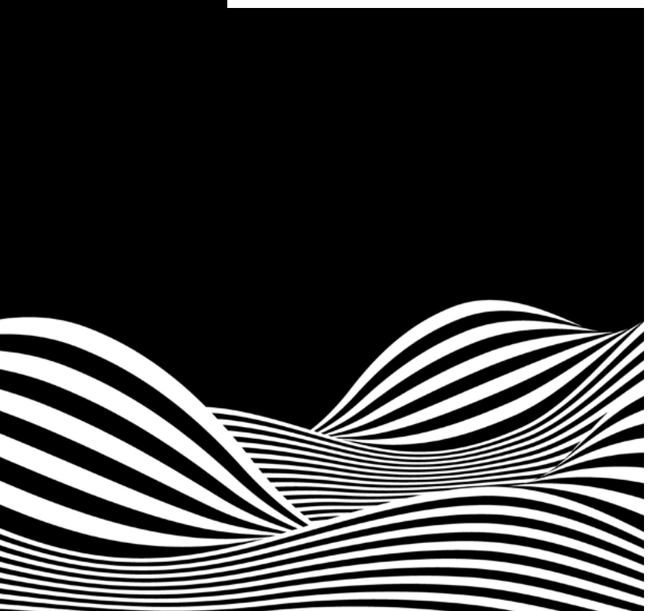
To ensure the safety and security of online transactions, PSD2 requires Strong Customer Authentication (SCA), a form of two-factor authentication. SCA negatively impacts the customer experience by adding friction to the normal account signup and checkout processes even for good customers. The bad customer experience also translates to reduced customer trust.

Luckily, PSD2 allows exemptions for SCA, and every player in the payments ecosystem should work toward minimizing the use of SCA for good customers. To balance the tradeoff between fraud and user experience, the Payment Service Providers (PSPs) can use transaction risk analysis (TRA) to identify less risky customers, as long as they keep their overall fraud rates in check. The key here is not just to build a TRA, but a good TRA.

Building a good TRA does not just need strong capabilities, but also strong data assets. Innovative PSPs are following two principles for getting access to the data. First, score risk using machine learning-based models using all available internal and third-party data, including behavior, device, IP, email, phone, address and network signals. Second, collaborate and share data with players across the ecosystem to get the best available risk signals and make the most reliable assessment. The resulting secure and frictionless customer experience will earn the customers' trust over time.

As open APIs continue to gain traction and enable innovative financial and payments applications, the most exciting outcome is to see the ecosystem working together to add value for the customer. What has started in the payments world should evolve into a broader open data API revolution across industries with the customer at its core.





JOURIK MIGOM
SVP, Strategy Acceleration

How The Rise Of The Smartphone Underpinned **A Payments Revolution**

The Smartphone Culture

When identifying one innovation that has most dramatically moved payments innovation forward in the past 10 years, it is almost impossible not to talk about the smartphone.

The increase of smartphone ownership (the raw numbers) and the relationship we all have with that device (the changed human behavior) have been so transformative that it has touched almost every industry and created entirely new ones.

The smartphone is a platform that has enabled a lot of change in the payments industry, so let's unpack that further to identify what made it so influential.

The Right Conditions for Disruption

While I pointed to the smartphone as the most significant innovation, in reality it is the combination of mobile internet, availability of 3G and 4G, cheaper data deals and the rise of the App economy that have driven a true payments revolution. All that technological change,¬ "sponsored" by abundance of Venture Capital (VC) and Private Equity (PE) money and endorsed by the start-up culture, has created a very fertile environment for change.

The Payment Ecosystem Shake-up

We have seen a shake-up of traditional industries by new business models that tap into the opportunity to do business with the smartphone-empowered consumer: *subscription models* locked in consumers — think Spotify for music; *direct-to-consumer retailers* started selling online, circumventing traditional channel partners or the need for expensive retail shops — think Caspar for matrasses; *on-demand businesses* started billing customers in a PAYG mode, often having a default credit card stored in their app — think Uber for transportation.

This new way of doing business has put the incumbent payment players under pressure. Their businesses were built in an age where the payments industry was very much an infrastructure play, with complex legacy powering a secure but much slower-moving number of interactions between a less complex pool of players. Today's scattered payments landscape has unbundled a lot of that legacy and has created more nimble and specialized players providing services to each other. They do one thing — or a couple of things — extremely well and are built for an API economy rather than as a change request to a legacy payment system of a massive organization.

The Empowered Consumer Has Compounded the Effect of Technological Change

Consumers with smartphones have started behaving dramatically differently over the past ten years. New features developed for the smartphone operating systems, combined with the apps operating on top of iOS and Android, have created a ripple effect in payments innovation.

Contactless payments happen predominantly through cards, but an increasing number of consumers have started using the NFC functionality on their phone or the in-app payments functionalities of their favorite apps.

Payment cards have become invisible in this world of mobile wallets, and the way micro-payments are facilitated to ensure safe and correct billing between a consumer's smartphone, a merchant and the banks involved has created a new level of complexity that is handled more effectively and more cheaply by next-gen technology-powered players.

Past Innovation Doesn't Explain the Future — What's Next?

While the enabler of lots of the change for the last 10 years can be linked to the rise of smartphone adoption, the ripple effect wouldn't have been so massive without the behavioral change we have seen with digital consumers and the tolerance that millennial audiences have with technology-enabled payments. The changed role of payments — where the trade-off between security and convenience has constantly been tested — might as well push us to the next big thing in payments: cryptocurrency and a systemic shift towards more distributed and abstracted forms of payment where identity becomes the new currency. The use of quantum computing, the availability of 5G and the rise of more IoT will power a lot of those next innovation cycles. Let's talk again in 10 years' time.

Entersekt

GERHARD OOSTHUIZEN
Chief Technical Officer

The Vanishing Act

Of The Decade

In an age when "innovation" leans in favor of more, not less, isn't it ironic that the downtrend of a rote set of actions we hardly question anymore could constitute the acme of progress? Gerhard Oosthuizen, CTO of Entersekt, explores why this could be the case with the increasing seamlessness of payments as an experience over the last 10 years.

No one goes out for a night on the town looking forward to finally paying the bill. It's not normal, either, to go on a shopping spree and then take pleasure in producing your credit card at the till. Yes, money gives us the freedom and ability to experience nice things and create good memories — even priceless ones, as Mastercard would say. But paying for these things sometimes brings with it an anti-climax

of sorts: a moment of doubt, and a sense of loss.

Perhaps that is why payments have, over the last decade, started taking their rightful place, somewhere far in the background, just close enough to feel comfortable and in control, but not too close to spoil the moment …

Effortless Innovation

Payments can be cashless, easy and instantaneous — sometimes even invisible, to a degree. We have a handful of successful vendors to thank for these seamless new payment innovations that have crept into our lives without us even realizing it.

Amazon started it all with its famous one-click buying functionality, 1-Click, which enabled users to bypass the shopping cart and checkout process entirely. While the rest of the industry struggled with fussy payment processes and average cart abandonment rates of up to 70 percent, one click to say "I want this now" was all Amazon required before it retrieved previously entered payment information and processed the transaction. There was no entering of card details or confirming some secret code that just couldn't be remembered or found at the time. The magic just happened, allowing users to enjoy the moment of acquiring something new while maintaining a sense of control.

Then there's good old Uber. It allows customers to catch a ride and not click at all when it comes to paying. All the hard work is done when the app is first installed: users are forced to set up their profiles in full and enter their credit card details before being allowed to proceed. By accepting the app's terms and conditions and agreeing to a set rate when ordering and confirming a ride, a user essentially gives Uber permission to charge them automatically.

While the somewhat cumbersome set-up process is begging for innovation, what Uber's process has done is pave the way for an experience that frees users completely from making payments at the end of their rides — without them even knowing it.

Ushering In a New Era

As subtle as the innovation has been, it's clear that we've moved into a post-payment space where we're becoming less and less involved in making physical payments.

Going forward, that's not to say that we won't still have our "moment of truth" when it comes to paying for goods or services — but that it will more than likely be a "moment of decision" within a payment journey, not to be derailed by thoughts around how to actually pay.

Pressure mounts on the compliance side with the likes of GDPR and PSD2, so banking apps — and the trust we establish during setup — hold the key to the next phase of innovation: striking the perfect balance between a seamless payment experience and that all-important sense of control.

Payments can be cashless, easy and instantaneous — **sometimes even invisible, to a degree.**

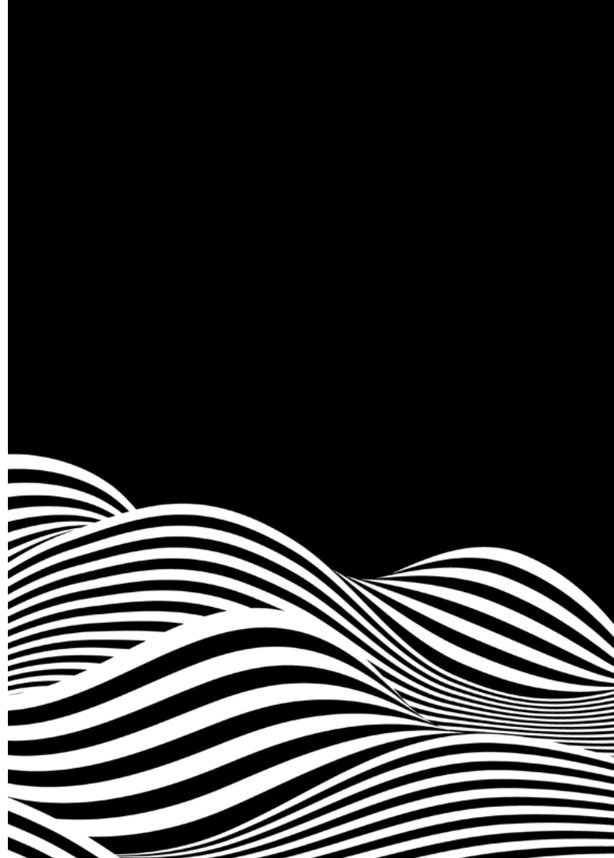
Take Samsung Pay. As innovative as the payment method is, what if your banking app — having established a trust channel between you and your bank — could take the experience one step further? What if it recognized your phone's compatibility with Samsung Pay and prompted you once for authentication before sending you on your way to one-click payment heaven?

Visa's partnership with Netflix is a great example of how tokenization is being used to create a secure and frictionless customer-merchant experience. By replacing card details with a unique digital identifier, payments are processed without having to share sensitive account information, which has proven to boost authorization rates.

Final Destination

No one really knows what the future holds. One thing is for sure, though: as more and more providers come into view, there's a level of trust that will need to be established for consumers to feel at ease and in control.

One anchor app that can do it all will be the order of the day — and what better choice out there than the place you already trust to store your funds? While mobile payment systems have already seen the light, there's an undeniable opportunity for banks to take control and drive the next era of innovation forward.



MIKE LAWRENCE

EVP and
Chief Information Officer

From A Smart(phone) Start To **A Payments Ecosystem Reimagined**

In the late 2000s Apple really hit its stride, releasing the iPhone in 2007; in its later iterations, this technology has paved the way for massive change across the payments ecosystem.

Most notably, the evolution of the iPhone, iPad and related smart-device technology have enabled faster and more convenient payments acceptance. It's applied across a variety of different mechanisms, with newer methods of adoption that continue to evolve each year. For one of the most prolific examples of how this technology has moved payments innovation forward, look at Amazon.

From the consumer perspective, we've become accustomed to buying what we need from the site (often via a

smartphone or tablet) and having it show up at our door — the convenience is such that payment is almost an afterthought.

This is an eCommerce gateway at work, enabling mass distribution product delivery through smartphone technology, and ushering forth smarter, faster payments right along with it.

This cultural shift in the way we prefer to shop and live has impacted our industry far more than a mere ripple effect. It has turned into an innovation tidal wave, significantly changing the outlook of how we conduct business and how we accept and process payments.

Consider just a few of the innovations this technology has helped bring forth.

Contactless Payments and Mobile Wallets

Every single process of purchasing goods or services is easier, faster and more seamless than it has ever been. Contactless payments and mobile wallets are on the rise. Just about anything can be ordered online with a few swipes and taps (and on your front doorstep same day). People aren't standing in front of a terminal swiping a card anymore; they're using the technology they have to get what they want.

Peer-to-Peer Payments

Peer-to-peer payment systems like Venmo and Cash App have been created for smartphone users to transfer money to each other with ease. PayPal, in particular, has experienced huge success in all realms of non-cash payments. As of Q1 2019 results, PayPal supports 277 million active accounts.

Enhanced Security Through Biometrics

This technology has also created the need for enhanced security, which led to biometrics becoming a critical part of the payment transaction process.

The systems embedded in these apps add an extra layer of security to protect both the consumer and the merchant. Fingerprint and facial recognition software are also used to ensure the identity of the consumer.

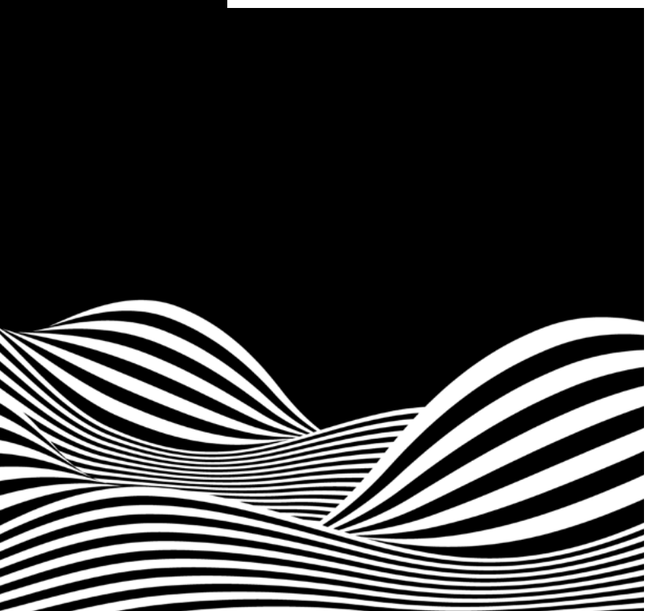
For a company like First American, all of this innovation has been transformative.

The solutions that have followed the introduction, and year-over-year evolution, of the iPhone and related tech enable companies like ours to make a huge difference for the small-to-medium sized business owner.

These merchants now have multiple avenues to make operations smooth and easy from a payment transaction perspective.

So, too, do the software developers who need integrated payment technology for their solutions. It's never been easier for a business owner to meet the payment preferences of its customers than it is today, or for a developer to envision, build, and start selling a fully integrated software solution.

The integrated payment technology driving all that was pioneered by year-over-year evolution of the smartphone; it has enabled countless software-based solutions for merchants to run businesses efficiently and profitably.



First Data

GUY CHIARELLO

President

Mobile Devices Unlock Unlimited Commerce And **Payments Possibilities**

When Steve Jobs introduced the iPhone 12 years ago, he touted it as a “music player, internet communicator and phone all rolled into one.” The audience roared in amazement.

What he didn’t know was that just a few years later the iPhone and similar smart-device concepts would turn the payments industry on its head.

Thanks to the smartphone, consumers would no longer be forced to use an ATM or bank teller to withdraw or deposit funds, nor access a website to complete an online transaction. Mobile technologies would soon create an entirely new financial experience.

Twelve years ago, it was impossible to imagine not needing our physical wallets to make a purchase or conduct any transaction we desired. Within a year of the iPhone and Google Android devices coming to market, banks introduced mobile apps. Initial versions offered basic financial information, but also served as a way for banks to create a foundation for future innovations that would strengthen the customer relationship.

As we have seen, consumers today can use their mobile device to make payments, create virtual deposits, move money between accounts, transfer money to peers and purchase goods anywhere and anytime. In short, in just over a decade the mobile phone has become the focus of digital commerce.

No Wallet, No Problem

Building on the paradigm of the smartphone as a digital "Swiss Army Knife," consumers can now upload all their credit, debit and gift cards to their phone, and use it to make payments at most retailers — as well as in taxis and, starting this year, on New York's transit system.

Not only does this eliminate the need to carry physical cards, but smartphone payments are highly secure, as actual card account data is never seen or transmitted. Instead, a one-time tokenized number is generated and sent to the payment clearing house.

If consumers learn that a card has expired, the mobile wallet comes to the rescue — with updated credentials. Similarly, banks, payments and technology providers have collaborated to enable instant payments, digital disbursements and peer-to-peer payments through these wallets, giving them ample options their physical wallets cannot.

Omnichannel Commerce Takes Off

The ubiquity of mobile payment options has changed the retail landscape, turning online purchasing from an appointment experience — available only when one is in front of a computer — to an increasingly impulse-driven exercise. Learn about some cool gadget from a friend while sitting in Starbucks? You can then buy it immediately with one simple click on a smartphone.

Mobile payment capabilities also give merchants an invaluable communications vehicle to engage their customers and increase loyalty. Offering a mobile app to their customers has helped merchants accelerate from the physical to the digital in just a few years.

Merchants no longer need to rely on physical cards and materials to keep track of loyalty program points and reward issuances. Today, they've created a near paperless footprint and transitioned these processes to the mobile app.

Merchants and payment providers have also made it easier to combine cards to enable a more seamless purchase process. Today, a consumer can pull up to the nearest drive-thru,

Twelve years ago, **it was impossible to imagine not needing our physical wallets** to make a purchase or conduct any transaction we desired.

INNOVATION RIPPLE EFFECT

open the restaurant's mobile app to pay for her meal and apply the balance of loyalty points and relevant coupons to complete the purchase in one click. Merchants can also intuitively capture and analyze data associated with these processes to provide real-time reward offers that compel customers to increase purchasing spend.

From Smartphone to Smart-POS

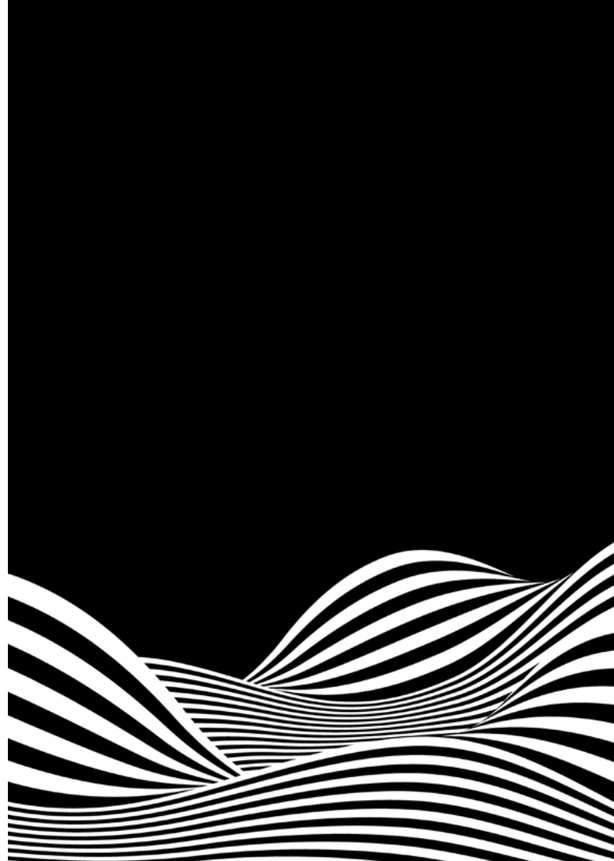
The iPhone was revolutionary — not just in the connectivity it brought through mobile devices, but for small business owners across the globe. The cloud-based, open architecture platforms which are synonymous with smartphones have revolutionized POS technology in the last decade.

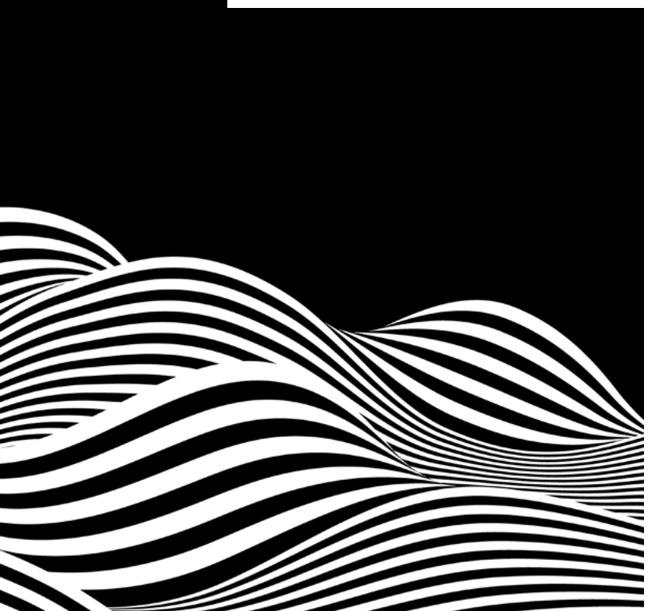
Take Clover for example, First Data's cloud-based POS which has shipped more than 1 million devices since inception. When First Data launched Clover just over five years ago, the vision was to transform the payment terminal into a full-service device that helped business owners run multiple parts of their business more effectively. Similar to how your pre-iPhone cellular device simply made calls and sent text messages, the payment terminals and cash registers of yesteryear were very limited compared to the smart POS devices we know and love today.

The advent of the iPhone made thousands of applications accessible instantly through an app marketplace, gave developers access to simple APIs to build on, and exposed users to endless possibilities directly through their smartphones. By following that evolution, Clover — and its competitors — are doing the same for small business owners. Pure payment functionality has been blown out to include applications for loyalty, gift cards, employee management, accounting, marketing, payroll and hundreds of other applications that can help businesses grow. And developers are building onto Clover's open architecture in a similar fashion.

Today, Clover has nearly 400 partners in its app marketplace, and hundreds of ISVs integrating their software onto Clover's platform — continuous innovation that may not have been possible without the rise of the smart phone a decade ago.

The advancements in mobile technologies have eliminated transaction pain points experienced for years by consumers, business owners and the payments industry. And the innovation of mobile technologies is still in its infancy. With the development of 5G next-generation wireless networks, the speed of commerce will only accelerate and the opportunities to further improve the customer experience will increase exponentially. The payments industry has never had it so good.





fiserv.

DEVA ANNAMALAI

Head of Payments Strategy
and Solution Consulting

How Faster Payments Accelerated **A Service Based-Gig Economy**

The last decade has seen a plethora of innovations that change the way we live. The smartphone, one of the greatest innovations of humanity, saw its adoption skyrocket. Of the 5.3 billion people in the world, 4 billion now have a smartphone. No other technology has managed to so quickly reach this level of ubiquity.

Smartphones have changed how users consume everyday services. Mundane activities like printing an airline boarding pass have become a thing of the past in the app economy. For traditional businesses as well as emerging businesses with never-before-seen operating models, the smartphone has become the gateway channel to reach their audience.

According to Fiserv CEO Jeff Yabuki, “the only thing moving faster than technology is consumer expectations.” True to this statement, consumers have embraced services that make their lives more convenient. The growth of Uber, Lyft, DoorDash, Amazon and Rover demonstrates that consumers expect services to be available and consumable immediately. This phenomenon has resulted in explosive growth of a service-based gig economy that has opened the workforce to anyone who has access to a smartphone.

As the demand for and delivery of services has changed, payments have evolved to address a new expectation: being able to pay and get paid in real time. As the demand for faster payments grew, industry players started to take notice. The birth of Visa Direct and Mastercard Moneysend enabled the movement of money to customer bank accounts in near real-time utilizing the existing card rail infrastructure — and industry giants like NACHA and The Clearing House (TCH) launched Same Day ACH and the RTP network, respectively. Financial services providers like Fiserv enabled real-time and instant money movement by offering a Digital Disbursement service that was agnostic to the underlying rails, allowing gig economy startups to capitalize on faster payments innovation as part of their service fabric.

A Gallup study has found 36 percent of U.S. workers are part of the gig economy in some capacity. With the right technology, a business in this space can provide their employees or contractors rapid access to their earned wages. Faster access to earned wages can help with real-world needs like unexpected medical bills, auto emergencies, childcare payments and other everyday expenses.

Uber revolutionized the rideshare experience by completely removing the need to explicitly perform payments at the end of a ride for a passenger. With faster payouts now becoming prevalent, Uber and Lyft have upped the innovation game by launching the ability to pay the driver in real time right after they complete the ride. And providing access to earned wages is now becoming a standard employee benefit from a growing number of employers like Walmart, FedEx and McDonald’s.

In addition, increased adoption and usage of real-time P2P payment services like Zelle have molded customer expectations for faster money movement. Businesses are seeing declining usage of checks and payout methods that may take many days to settle.

The launch of the smartphone facilitated the rise of the gig economy, which in turn has fed the fire for faster payments. The ability to move money in real time has disrupted existing business models and helped launch new services that have improved the quality of life for both consumers and producers. We are just beginning to scratch the surface of this exciting innovation, and the next few years will see exponential growth in this area.

Unlocking The Net Terms Economy

FUNDBOX

EYAL SHINAR
CEO and Founder

If I had to pick one innovation, I would say it's machine learning and its ability to unlock value. I'll explain how and why.

If you look at the more general trends around data and data culture, there's been a significant shift in how people and businesses use their data.
This shift started with the iPhone proliferation of smartphone apps, and it's moved into the business world, with apps for things like payroll, inventory management, CRM systems, ERP system, accounting software, analytics and so on. There's a whole new ecosystem today. The bigger trend is the migration to accessing data and doing business on the cloud.

The benefits of moving to the cloud are two-fold, from the perspective of

financial technology firms. One: by accessing this data, we have much more granular and relevant information about a business, rather than just a credit score for an individual. Two: all of this data is highly accessible through sets of APIs; every company has them today. Some have more than one, private or public, but the data is there. It's there, and it's accessible in ways it wasn't just a few years ago.

Machine learning-enabled risk evaluation means smarter, faster decisions, and those have vast implications for B2B commerce. For example, a buyer cannot reach checkout with a B2B eCommerce merchant and then take an hour — or even five minutes — to get approved for net terms or trade credit. If it takes that long, as a merchant, you're going to see abandoned carts.

Today's B2B sellers need to be very good at underwriting, fast. With the power of smart credit — and machine learning in the background, drawing on all that data in the cloud — you can live inside the checkout process and provide better user experiences and payment or credit options at the point of financial need.

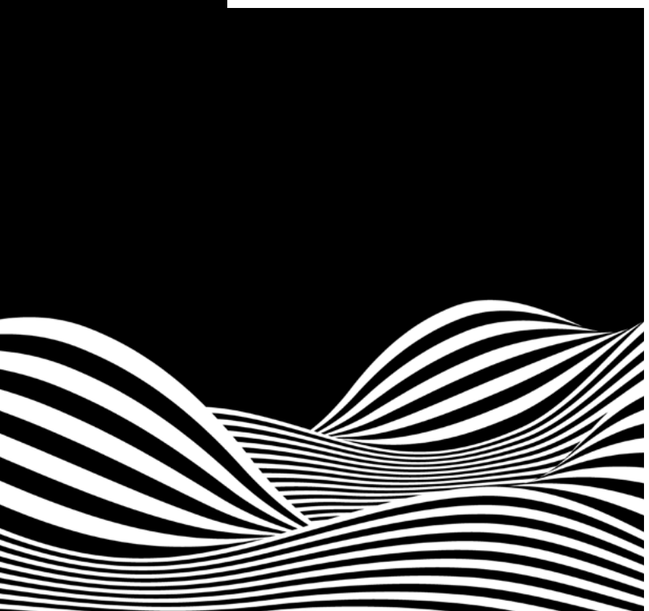
It's difficult to overstate how powerful this is for businesses. Remember that every business is really both a buyer and a vendor, and that the U.S. B2B market is over $3 trillion. This "Net Terms Economy" is enormous — and trapped in the past by slow credit and delayed payments.

By reducing the time it takes a business to get paid or get credit, you reduce the time it takes for them to unlock those funds and then direct them back into the economy by hiring, purchasing inventory, experimenting with new initiatives and growing. There is a ripple effect throughout the entire economy, all tied to the speed at which credit and payments flow.

Every day at Fundbox, we're seeing the effect it has on businesses: how they expand, how they hire more people, and all the ways that removing uncertainty and waiting from credit decisions and payments positively affect their growth. Faster payments, enabled by machine learning, are solving the great majority of financial problems for businesses, namely the constant need for borrowing to bridge their cash flow gaps.

Getting paid right away is very powerful. It's almost too good to be true. This has a very powerful effect on the business itself. Over time, it's going to get better — and the impact for the whole economy will be similar to what the first credit card networks did for the B2C economy back in the 1950s and 1960s. Only instead of just consumer consumption, we'll be talking about business consumption, expansion and new jobs. It's extremely exciting, and it's only just begun.

There's a whole new ecosystem today. The bigger trend is **the migration to accessing data and doing business on the cloud.**



DREW EDWARDS
CEO

Need For Speed:

Faster Payments Driving Consumer Expectations

To quote from the movie "Top Gun" — or borrow the title of a popular '90s video game — one of the most important drivers of payments innovation has been a "Need for Speed." Namely, a need for internet and mobile connectivity speed.

Over the past decade, average broadband connections in the U.S. have quickly accelerated from slow DSL modems to cable and now to satellite or fiber optic systems. This has translated into an average connection speed of 26 Mbps in the U.S. in 2018.

Similar growth in connectivity speed is happening on a global stage, too, with average speeds rising 23 percent in 2018 to 9.1 Mbps. And the emergence of 5G technology promises leaps

in mobile connectivity, too, up from already lightning-fast connections for most customers.

These incredible speeds have conditioned customers to expect nearly everything instantly. From reading the daily news to watching the latest Netflix series to tracking our Uber Eats delivery, we are trained to operate in real time.

It was inevitable that those expectations transitioned to the payment ecosystem. Money movement has always lagged with outdated payment instruments like paper checks and ACH, requiring days for funds to arrive and fully settle.

But no one paid attention until life began moving at web speed. Over the last decade, it became painfully obvious just how slow our money traveled.

A number of countries around the world have begun efforts at the national or regulatory level to close those gaps in speed. Private enterprise has done its part as well. Regions like Asia Pacific are leading the way, with countries like the U.K. and others close behind.

Here in the U.S., despite peer-to-peer payment systems that have sped up personal payments, we remain a number of years away from institutional real-time money movement. However, innovators have stepped in with novel solutions like push payments that make real-time corporate disbursements possible.

These push payment systems operate on existing card networks and mobile wallets, just in reverse. They make it possible today to direct money to nearly any financial account, and to issue payment of guaranteed funds 24/7 to consumers — even on weekends and holidays. This is far superior to either paper check or ACH, and consumers have the convenience, certainty and choice of these payments.

This move to real-time money will continue to expand globally, informed and driven by consumer expectations of speed and instant gratification. Those companies that get on board early have a chance to stand out from the crowd and earn a competitive advantage.

Over the last decade, it became painfully obvious just **how slow our money traveled.**

INSTAREM

PRAJIT NANU

CEO

The Rise Of **Real-Time Payments**

I firmly believe that the phenomenon of real-time payments, or RTP, has been one of the most significant creations during the last ten years and has moved payments innovation forward.

Most of us are accustomed to our checks getting cleared in two to four days — and consider this delay as a given. However, the next generation of consumers has grown up in a real-time world. Along with changing dynamics of basics like education, entertainment and business, there has been a loud and clear demand for quicker payments within banks, companies, or also among individuals receiving payments. People and businesses worldwide have started demanding payment systems that can achieve the desired speed of transactions, minimize the cost of

transactions, reduce risks of fraud and bring satisfaction of service across different channels. Interestingly, faster or real-time payment solutions are available in some parts of the world for immediate transfer of funds, giving people an excellent money movement experience.

Interestingly, real-time payment systems started attracting attention at the beginning of the millennium due to their potential for faster and 24/7 service availability for low-value transactions. A real-time payment system is an instantaneous, irreversible, continuously available system which can facilitate higher volumes of transactions at a fraction of the cost for the end-user. The first national electronic banking system of fast payments was launched in South Korea in 2001, followed by Chinese Taipei, Iceland, Malaysia, and South Africa over the next five years. Notably, none of these is a developed economy. The U.K. became the first significant country to consider faster payments in 2008. Today, two of the most populous countries in the world — China (IBPS) and India (IMPS) — have adopted real-time payment systems in 2010, and the number of states has continued to grow since then. On the other hand, advanced economies such as Australia, the U.S., Saudi Arabia, Hong Kong, Hungary, and the Netherlands have been struggling to implement real-time payment systems.

Currently, around 40 countries worldwide have national RTP systems in place. The growth of RTP is being driven by the consumers' growing expectations to get done with transactions at the speed of social media posts and avoid transaction fees and by merchants' need to reduce frauds, receive funds quickly and improve their cash flow — as well as by increasing globalization that demands the presence of gateways across countries. Breakthroughs in communications and mobile technologies such as smartphones, internet, P2P payments and Social Payments offer great convenience to end-users. The massive growth of mobile-commerce has also catalyzed the need for faster payments.

IBPS in China and UPI model (based on IMPS) in India are the two most successful RTP systems in the world where the government (or a bunch of government-owned banks) has created a nationwide backbone that powers instant payments across both sides of the industry — banks and other compliant third parties. India's IMPS recorded over 1.5 billion transactions in 2018, up by a huge 52 percent compared to the previous year. The U.K. registered over 2 billion Faster Payment transactions in 2018, up 23 percent from 2017. At approximately 8.5 billion transactions in 2017, China's IBPS remained the most significant national RTP system in the world and has grown at a CAGR of 105 percent from 2013 to 2017. India's UPI, based on the IMPS system, recorded 790 percent year-over-year growth from 2017 to 2018 and clocked over 3.7 billion transactions in 2018. Payment systems India and China are incredibly useful as they welcome non-banking entities as well. However, in the U.S. — which has a large payments countrywide ecosystem that includes tech wallets, network wallets, bank wallets, FinTechs, and multiple merchant wallets — this is not practical due to a lack of interoperability.

Given their scope, real-time payments are of immense value for financial institutions, merchants, consumers and the countries as they offer enhanced visibility into payments by facilitating better cash management and by helping companies better manage their operations in terms of better liquidity. This can be more impactful to small and medium- size businesses, which were used to delayed payments so far.

While several countries have made significant progress in RTP, more such payments systems are being developed. Countries like Belgium, the Democratic Republic of the Congo, Hong Kong, Malaysia, Portugal, Slovenia and Spain have plans for their own faster payments systems later this year. Others like France, Hungary and the Netherlands have announced their national offerings to go live this year.

DEBBIE GAMBLE

Chief Officer, Innovation Labs and New Ventures

The Dawn of **Digitization**

The digitization of everything has impacted and disrupted nearly all facets of our life. It has changed the way we live, work and interact — and payments is no exception.

Exponential advances in technology, the low cost of telecommunications and the rise of the importance of the customer have all heightened the focus on digital engagement. The digitization of money and payments has had a profound impact on how we transact daily and how businesses interact with their customers and suppliers.

Over the past 10 years, retail payments have morphed from checks to a magnet-striped card, to a chip card, to a contactless card, to a mobile

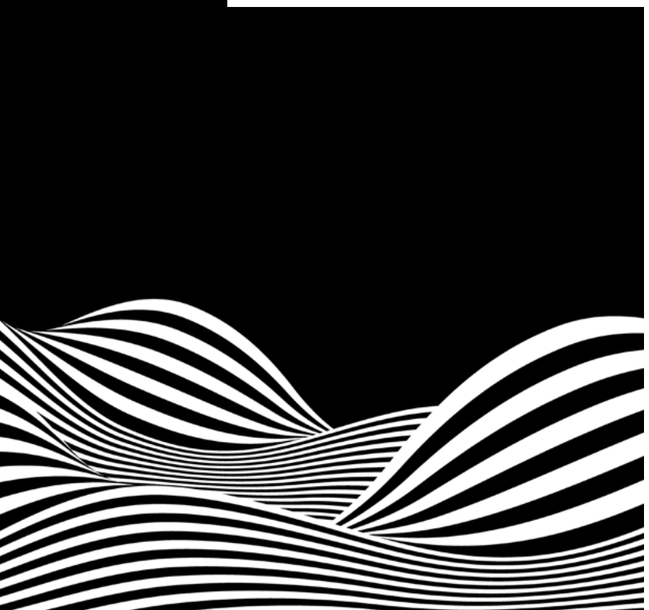
payment that doesn't require a card at all. And although Interac e-Transfer, our money movement platform, has existed for longer than 10 years, the last decade has seen a major surge in usage fueled by frictionless mobile and online capabilities. The greatest impact of the digitization of everything is that the mobile device has embedded the capability of a personalized experience into every user's hand. This digitization places the customer at the center of the experience and provides organizations with opportunities to redefine the customer relationship.

These changes have become a catalyst for companies to elevate the focus on innovation and digital strategies to ensure they can address potential disruption and future- proof their business to ensure their long-term competitive advantage. Companies are leveraging opportunities to focus on innovations such as open banking, blockchain, Digital ID, AI, IoT and much more. In my experience, it's never been a more interesting or exciting time to work in the FinTech space, as the pace of innovation continues to accelerate. We know that businesses will need to continue to prioritize collaboration with all partners, including large and small financial institutions, FinTechs and other technology companies in order to continue to design compelling, relevant solutions.

As we become hyper-digitally connected, the role of trust becomes increasingly important. Trust becomes a key element in the way we connect and interact — and for companies, establishing and maintaining trust with their customers is an imperative.

Looking forward, the pace of innovation will continue to accelerate. The digitization of everything has a rippling impact — not just in terms of convenience, but in the quality of our lives, through trust, inclusivity and connectivity.

As we become hyper-digitally connected, **the role of trust becomes increasingly important.**



PHILIPP POINTNER
Chief Product Officer

The Smartphone: The Biggest Innovation Advancing The World Of Payments

The popularity of the smartphone has had a profound impact in the world of payments.

Today, it is estimated that more than 5 billion people have mobile devices, over half of which are smartphones. Over the last decade, more and more of our daily lives has gone digital, making phones and connected devices the preferred payment tools for consumers — a preference causing digital payment volumes to explode worldwide.

There are a number of underlying trends fueling the growth of mobile payments, including:

Growth of P2P Apps: The emergence of P2P platforms, including Venmo and Zelle, will continue to disrupt the mobile

payments space. Curiously, only about a quarter of millennials in their 20s use Venmo — roughly the same percentage that smartphone-owning Gen Xers do, according to a consumer study by Q2 and Cornerstone Advisors. Overall, just 12 percent of respondents use Zelle. But Zelle has big upside in light of the fact that nearly 230 banking institutions signed up, but only 60 currently offer the service.

Growth of Mobile Commerce: Mobile commerce refers to the use of mobile phones, laptops and tablets to conduct transactions online. Mobile commerce sales are predicted to make up 44.7 percent of total U.S. eCommerce sales in 2019, up from 39.6 percent in 2018.

Growth of Personal Devices: Another growth driver is the emergence of mobile payment solutions such as Apple Pay that are based on near-field communication technology released alongside the iPhone 6 and iPhone 6 Plus in September 2014. Apple Pay launched with a few hundred thousand point-of-sale locations supporting the service and has grown to a service that is supported by more 2 two million retail locations in many countries.

Growth of Blockchain: By establishing a decentralized ledger for payments (e.g. bitcoin), blockchain technology could facilitate faster payments at lower fees than banks. With emerging crypto wallets, payment transactions happen in real time, and once a transaction is made, it cannot be undone.

Growth of Streamlined Onboarding: Many financial institutions are still largely tied between multiple processes for onboarding mobile payments, including a heavy reliance on manual legacy systems and practices. This takes time — both in a back-end sense in terms of data entry processes and manual reviews, but also from the client-facing dimension, resulting in application delays and confusion. But this is changing as mobile payment onboarding processes are becoming much more streamlined.

These innovations have propelled the mobile payments market, which was valued at $898 billion USD in 2018 and is expected to reach a value of $3.7 trillion USD by 2024, at a compound annual growth rate of 26.9 percent (source: Mordor Intelligence, 2019).

As consumers, we're reaping the benefits. Skyrocketing mobile device adoption has forced banks and FinTechs to digitally transform their operations and helped them to streamline their compliance and customer onboarding processes in order to provide a faster, simpler and far more convenient user experience.

The Flipside

But mobile payments has also introduced significant new threats.

While 58 percent of all digital transactions now originate from mobile devices worldwide, one-third of all fraud attempts now target this channel. According to a recent TD Bank survey, the risk of payment fraud is the top concern for 44 percent of financial

There were about **4.5 billion records exposed** in the first half of 2018 — that's a lot of fuel.

industry professionals this year — that's a 14 percent increase in just 12 months. Not surprisingly, the ability to process faster payments ranks as the second-biggest concern, at 37 percent of survey participants.

Over the past few years, consumers have been regularly alerted to news of data breaches by thieves hacking into insurance companies, health care providers and retailers. According to Juniper Research, online and mobile payment fraud is being fueled by identity and payment information stolen through the ongoing epidemic in data breaches.

There were about 4.5 billion records exposed in the first half of 2018 — that's a lot of fuel.

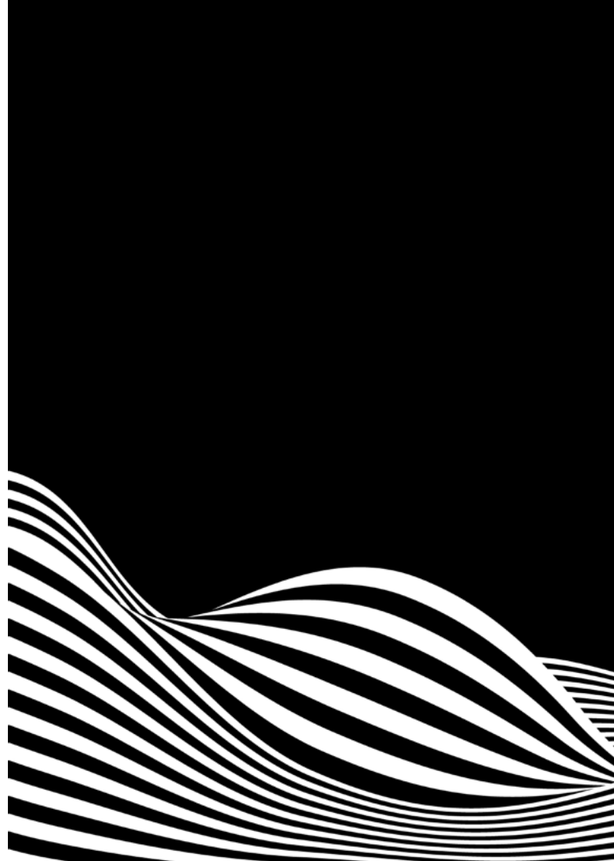
By the end of the year, mobile attack rates will surpass desktop rates for the first time as consumers, and therefore fraudsters, increasingly pivot to the mobile channel for a growing array of daily activities. Juniper estimates losses from online payment fraud will top $22 billion this year and could go as high as $48 billion by 2023.

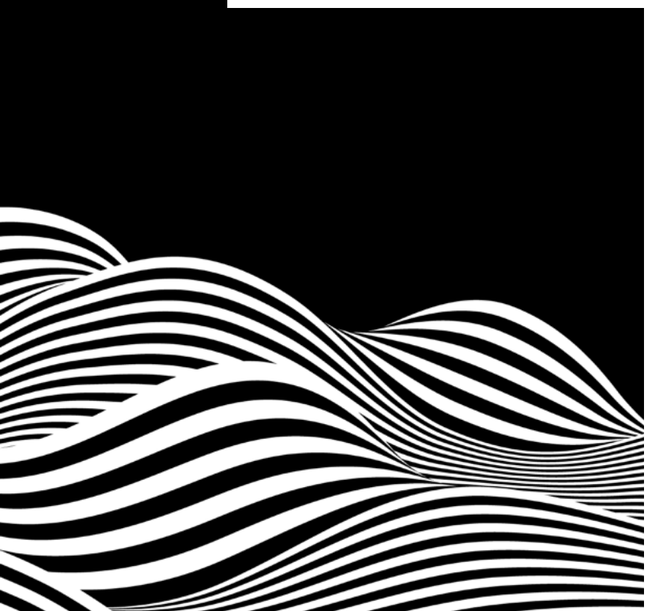
The Challenge: Are Your Users Really Who They Claim to Be?

It's clear that cyberattacks on payments will intensify in 2019, so payments companies need to embrace modern biometric methods of identity proofing and authentication to deter and prevent fraud and account takeovers.

The old ways of identity verification and authentication — including credit bureau pings, knowledge-based authentication and SMS-based two-factor authentication — are no longer secure or reliable. This is why newer, mobile-centric approaches to identity verification that capture a picture of a government-issued ID with a corroborating selfie are increasingly being adopted in the payments space. And just as critical, payments companies need to start embracing biometric-based authentication for high-risk transactions and abandon traditional approaches, including the popular username and password paradigm which are increasingly being exploited by cybercriminals.

Thanks to mobile devices, change in payments has gone into overdrive, and will only get faster. From digital disruption and the race to innovate to customer demands, traditional payments players are being squeezed from all directions. Adding to this cocktail, cybercrime and account takeovers are nearing epidemic proportions, so payments companies must anticipate what's next — now.





Kount

BRAD WISKIRCHEN

CEO

How AI-Driven Fraud Prevention **Changes the Game**

Machine learning is the biggest game-changer in the evolving payments industry. Over the past 10 years, machine learning is a technology I have watched transform from a front-row seat: Kount has employed it as a tool to protect against digital fraud since the company's inception in 2007. The subsequent proliferation of machine learning in the fraud prevention space is a testament to its significance.

Today, it's a foregone conclusion that consumers and merchants expect there to be little to zero friction in digital commerce. Machine learning has helped businesses eliminate friction through faster processing times, because they are able to take the troves of data they collect and

analyze it, run it through algorithms, and make decisions based upon it. It's an important distinction: data in and of itself isn't the "be all and end all." Data combined with real-time decisioning and machine learning, which makes it actionable, is the differentiator.

The past decade has also illuminated the need for both supervised and unsupervised machine learning in payments fraud prevention. Unsupervised machine learning links bad actors together anywhere in the world and exposes fraud as it emerges. Supervised machine learning uses models to show the relative risk or safety of a transaction. This allows businesses to specifically weigh the risk of fraud against the lifetime value of the customer.

I often say that it's easy to stop fraud — just don't accept any orders. However, advanced machine learning has allowed us to not only control payments fraud, but also use the technology to advance digital innovation. Businesses that have a strong handle on payments fraud prevention are able to leverage data and machine learning to pursue new digital achievements. These businesses can turn to the data to inform marketing efforts, better understand their consumer, and even strategically introduce, or alleviate, friction based on risk signals. That sort of innovation has revolutionized the payment industry over the past decade and will continue to impact the industry in the decade to come.

As machine learning, payments and fraud prevention continue to evolve, the next advancement lies with artificial intelligence (AI). AI-driven fraud prevention emulates an experienced fraud analyst in weighing multiple factors against business-driven outcomes in a faster, more accurate, and more scalable manner than humans alone. This advancement frees up the fraud analyst to focus on more strategic initiatives for the business, and allows for outcomes such as more revenue, which translates to a lower decline rate, improved margins due to fewer chargebacks or lower operational costs from minimizing the number of manual reviews.

Today, it's a foregone conclusion that consumers and merchants expect there to be little to **zero friction in digital commerce.**

LISNR

ERIC ALLEN

CEO

Mobile Commerce Is Creating **The Future Of Payments**

In the past 10 years, payment options have exploded. From QR codes to NFC-based transactions to contactless credit cards, the ways consumers can pay are endless. Flexible payments are exactly what shoppers want, as long as they speed up the checkout process and keep their financial information safe.

Ten years ago, consumers still carried a good amount of cash in their pockets and sported debit and credit cards as well. There is no way anyone could have predicted that our phones would serve as a leading payment mechanism in just one short decade. But as of last year, 77 percent of American adults owned a smartphone, making it a near-ubiquitous instrument capable of transacting across merchants —

and that is why I think it's the most important innovation in payments over the past 10 years.

But payment innovation didn't stop there. As shoppers gained the ability to pay with their phones and tap their cards on a payment device to send a tokenized version, payment innovators continued thinking out of the box. Whether shoppers pay with an Apple Watch, a piece of jewelry, or by scanning their faces, the future of payments goes far beyond traditional methods. Businesses like Amazon Go and Sweetgreen even went as far as going cashless, but government regulation has forced businesses to accept cash in a growing number of cities. There is bound to be more regulation around the way we pay, but I don't believe this will stifle the creativity or payment innovation that was started by mobile phone adoption.

Payments Have Changed for Good

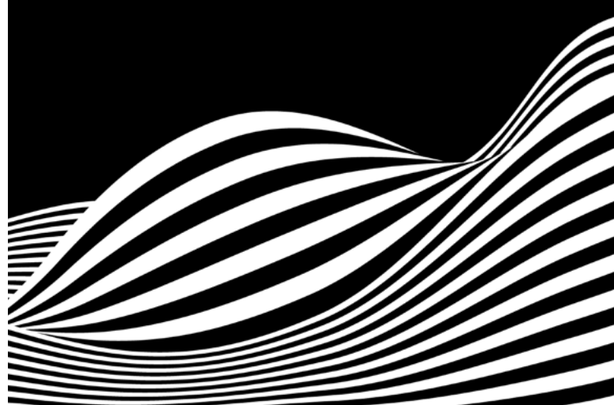
Payments have changed and will never go back to simple cash and card transactions. Consumers have grown to expect customized experiences within the retail ecosystem, and payment is no different. Compared to legacy payment options, mobile allows for customizable payment experiences — and the method leading the pack is ultrasonic payments. Using this technology, merchants can accept encrypted credit card information from any smartphone that can download their app straight to their point of sales system.

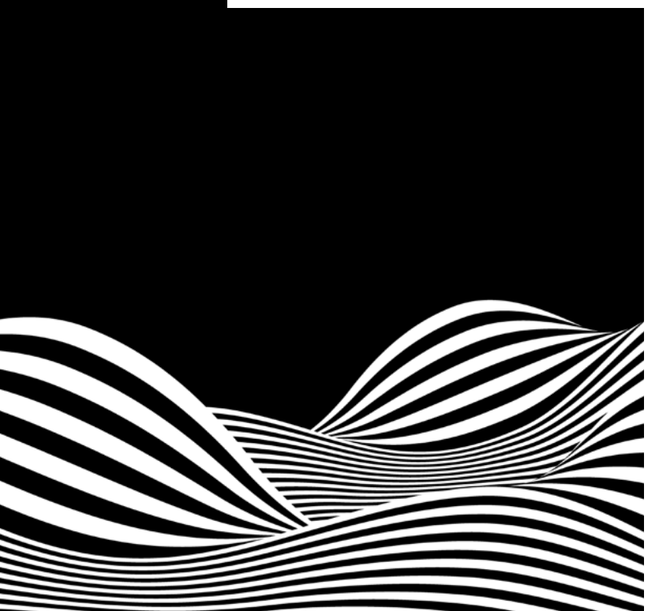
As the rise of Starbucks, Walmart and Target's apps have shown, mobile wallets — and using mobile phones for payments — are on the rise across the world. They are most popular in China and Africa, but they are also rising to popularity in the United States as leading retailers engrain payments into their already wildly successful retail apps. These apps enable shoppers to complete mobile orders and payments in-store, but their use of QR codes opens customers up to the potential for fraud. China learned the perils of the QR code the hard way and had to limit the amount consumers could use them to pay to around $75 in order to reduce the risk of fraud. This is why we know there is room for further innovation within mobile payments — and we are working with leading retailers to improve the customer experience when making mobile transactions.

Where Payment Innovation is Going

Over time, payments will continue to become more seamless. After all, consumers want to be able to pay for their goods and services in less time and get on with their day; this is supported by the growing need for faster checkout experiences. Standing in a long queue is no longer a requirement in an era of retail when Amazon Go's "just walk out technology" is upending the way we think about retail payments and customer checkout experiences in brick-and-mortar stores. The future of mobile payments will be flexible and customizable, and we've only just started on the journey toward what the customer experience of it all will be.

Consumers have grown to expect **customized experiences** within the retail ecosystem, and payment is no different.





Where Would FinTech Be Without **Tokenization?**

NICK STARAI
Chief Strategy Officer

In an industry full of technological innovations, there have been quite a few advancements over the past decade that have had a far-reaching impact. EMV certainly has driven a considerable amount of investment. Mobile payments are on track to alter the payments landscape forever. However, there's a technology that's played a critical role in nearly every aspect of electronic payments as we know it today. It doesn't find its way into as many headlines, but it's been a crucial part of moving the payments industry forward.

Tokenization.

Those who've been in the industry for 20-plus years will have witnessed the rise of eCommerce. Early adopters of this disruptive sales model were

pioneers and made do with what they had, even if that meant processing electronic payments and storing cardholder data in unsecure ways. Indeed, it was common for online merchants to store credit card data in spreadsheets.

These types of stories, where companies mismanage personal information, still pop up today. In fact, Facebook recently admitted to storing millions of Instagram passwords in an unsecured file for years.

Over the past 20 years we've also seen a rise in services — software or otherwise — that provide customers with something in exchange for a monthly payment. Early adopters lacked a technological solution to the dilemma of processing recurring payments each month.

Luckily, it didn't take long for some companies to apply the concept of tokenization (which had been around since the 1970s) to the payments space. Standards were quickly adopted — and merchants, consumers and those of us in the FinTech industry have been benefiting ever since.

Here are just a few examples of how tokenization has changed FinTech forever:

- The generally accepted best practice for secure payments, what NMI calls the Trifecta of Payment Security, includes a combination of EMV to reduce card fraud, point-to-point encryption (P2PE) to protect data at rest and in transit, and tokenization to "abstract" cardholder data. Without tokenization, payment security today would have a serious weakness.

- As most know, tokenization allows merchants to keep customers on file for future payments. Rather than storing the actual cardholder data (secured or otherwise), the merchant only has a token, which is worthless to would-be criminals seeking to harvest credit card numbers. NMI's Customer Vault service extends tokenization to include multiple payment methods (i.e., credit cards, ACH) and numerous payment instruments (e.g., a single customer token can include separate Visa, Mastercard, and American Express cards for the customer). In addition, the Customer Vault can also include other personal information such as the customer's address, social security number and more.

- Mobile wallets like Apple Pay and Google Pay rely on tokenization to function, as does contactless EMV.

- As merchants pursue the omnichannel business model to provide a more competitive and customer-friendly shopping experience, tokenization can be used to track customer shopping behavior across channels.

Because tokenization works behind the scenes, it's easy to overlook its significance. However, it's clear that everyone benefits from tokenization. Merchants can offer a variety of payment options in a secure manner. Payment companies like NMI have a powerful tool that can be turned into exciting new solutions. Finally, and most importantly, customers have their personal information and card numbers protected. With tokenization, everyone wins.

NOVOPAYMENT

ANABEL PEREZ

CEO and Co-founder

The Decade Of **The App**

Reflecting on the previous decade in the payments space, it's astounding to see how much we've been able to accomplish and innovate in only ten years. As end-users, we have much more control over our data and how we share it to simplify our day-to-day lives. As merchants and retailers, we can accept payments and pay our employees more easily than ever. And as financial institutions, we're able to streamline processes, remove bottlenecks and facilitate payments in ways our predecessors would have never imagined. And none of this would have been made possible this decade were it not for the rise of the smartphone and mobile apps.

There's an App for That™

At the very top of this decade, Apple secured a trademark for its buzz-worthy phrase, "There's an app for that," (originally used in a commercial for their smartphone), and today, with 3.9 million apps available for download between Apple and Android's app stores, the phrase has never rung more true.

The mobile app world has, in fact, become an entire ecosystem, supporting billions of smartphone users, millions of developers and a laundry list of businesses (both big and small). And while this advent brings unprecedented information, entertainment and simplicity to each user's fingertips, the infrastructure in place has also allowed us to take payments wherever issuers', acquirers' and merchants' dreams (and phones) may bring them.

Some key examples of how the smartphone changed the way we think about payments:

2009:
Venmo changes how we exchange money with our peers

2010:
Stripe payment processor begins to power eCommerce for retailers and individuals to accept payment over the internet

2011:
Starbucks introduces its payment app to streamline purchasing your daily cup of joe

2013:
Androids begin to support near-field communication applications to host payment accounts on the cloud

2017:
Zelle allows banks to get in on the peer-to-peer payments game

Decade of the App?
Meet the Decade of APIs.

While apps and the smartphone have certainly introduced society to new possibilities for payments, what has propelled the industry to new heights and vistas — and will continue to do so? APIs.

About halfway through this last decade, we witnessed companies like Airbnb and Uber focusing on improving daily user experiences and services on the front end, while relying on APIs to address the payments required to facilitate these experiences in the back end. This collaboration was able to support these companies' wide-scale growth and adoption without limiting the organizations to the traditional frictions associated with account creation, payment facilitation, accounts payable, etc. It's a model that's been able to be replicated and introduced possibly worldwide — for incumbent FIs, new kids on the block, and collaboration for all parties in between.

The power of APIs is the ability to provide greater business agility, facilitate innovation regardless of legacy software compatibility or tech silos and offer deeper and more meaningful value than superficial innovation on the front end. The middleware and orchestration that APIs offer today's companies allow for the digital transformation of payments that will continue to improve user experience in all types of value chains. And I'm excited to see what new directions the industry moves in.

pingpong

ANN CHANG
Chief of Staff

The Many Effects of **Mobile Technologies**

My pick would be mobile technologies. In the past decade, mobile has induced many fundamental changes in our society. For payments, it not only catalyzed technology innovations such as NFC and biometrics payment, but also significantly enhanced demands in new economy sectors which provided steady growth for the industry despite consecutive world economic downturns post 2008 financial crisis. Mobile also directly contributed to the rise and prosperity of numerous payment fintech firms worldwide that helped evolve the industry.

eCommerce

Much of the e-commerce growth has been driven by the rise of mobile. According to Capgemini, McKinsey and

related research findings, the number of worldwide noncash payment transactions has at least doubled in the past decade to approximately 500 billion per year, of which digital commerce growth was a fundamental driving force. Within digital commerce, mobile commerce, defined as in-app payments and mobile browser payments combined, has grown from single digit adoption to 48% in 2017 and is forecasted to reach 70% by 2022. Furthermore, it is worth noting that the growth of mobile-based consumption was not merely migrated demand from PC-based e-commerce; but fresh ones organic to smart devices that has converted much of consumers' fragmented idle time during commuting, waiting and slacking into potential buying opportunities.

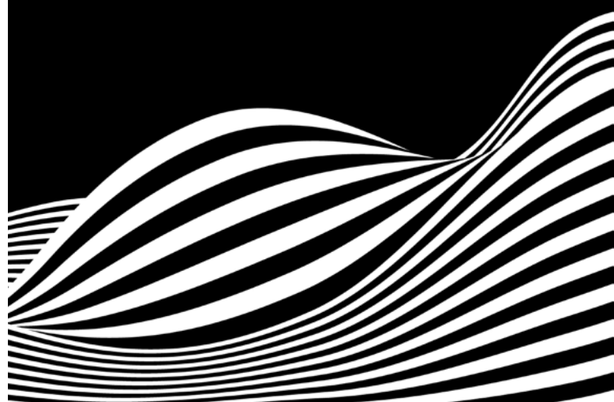
Social

The rise of the mobile era, as could be marked by the first launch of the iPhone in 2007, was also arguably the single most important social phenomenon in the past decade that has shifted social interaction paradigms for good. People have become so closely connected that the frequency and scenario of interpersonal "touch points" has been widely expanded. For payments, this meant the increased popularity of small value peer-to-peer transfers, especially in social contexts. China's WeChat Pay would be a typical example. Thanks to the over 1 billion DAUs of WeChat, China's largest mobile instant messenger application released in 2011, the in-app wallet launched two years afterwards has quickly grown to see more than 1 billion transactions daily, among which over 50% comes from peer-to-peer transfers for gifting among friends and family.

On-demand services, entertainment and travel

Indigenous to mobile, on-demand services such as Airbnb, Uber and Grab have gradually begun to reign our daily lives in the past decade. The nature of such new economy services mostly requires in-app payments, thus encouraging strong increase in noncash transactions and serving as a catalyst towards a less-cash society looking forward. Also in the past decade, we saw the fast and continuous rise of mobile-based entertainment sectors, including gaming, online music, video and instant streaming, contributing to the success of the hardware + app store + wallet model, such as Apple Pay and Samsung Pay. On the other end of the spectrum lies mature industries with the steady payment competitive landscape being disrupted by the addition of mobile devices as a vehicle for payment. Travel, particularly international travel, serves as a fitting example. Ten years ago, travel checks, along with cards and cash were the dominant payment methods in the sector. Today, the international expansion of mobile wallets, such as Apple Pay and Alipay, as well as rising popularity of mobile QR scan payment in certain world regions have become increasingly important. Cards and mobile are expected to be the major options in the next decade; and checks now belong to the past.

Cards and mobile are expected to be the major options in the next decade; **and checks now belong to the past.**



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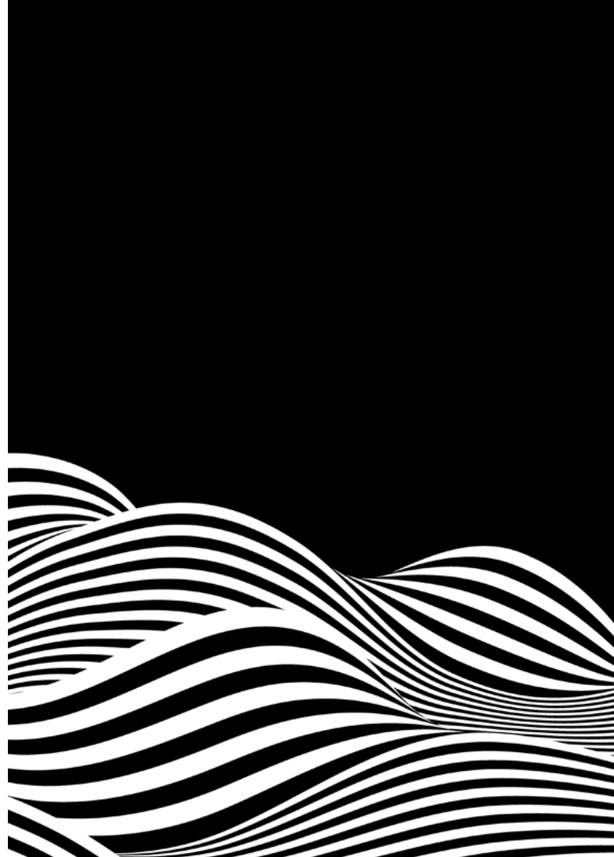
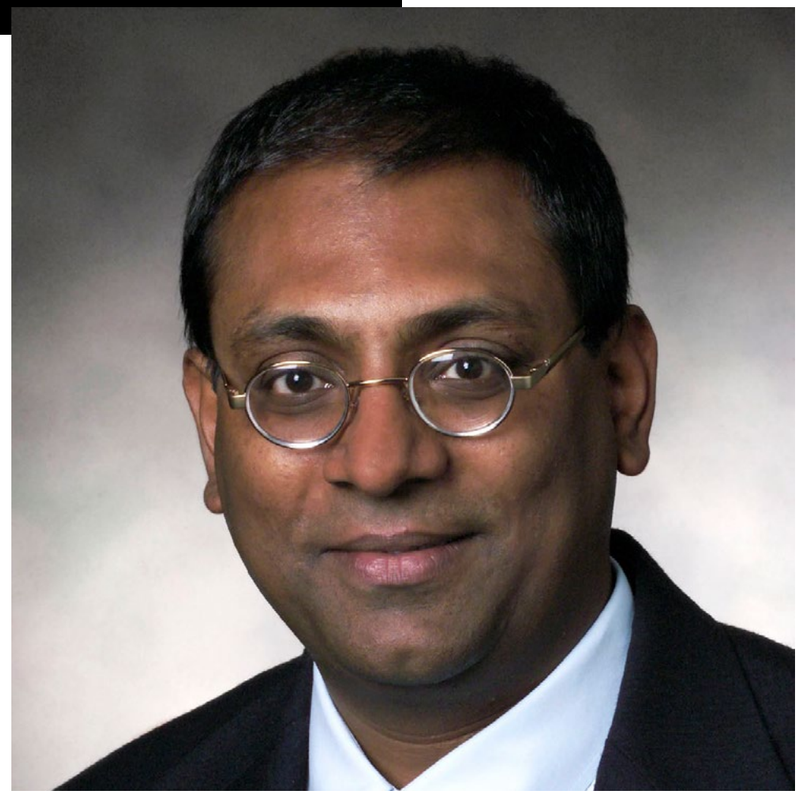
Cross-border activities

In my own view, perhaps the most fascinating effect brought by mobile payment lies in the cross-border payment space. Mobile has so thoroughly raised proximity between people, societies and countries with accelerated worldwide flow of information that we were truly closest to living in a global community in the past decade. Under this influence, the global cross-border e-commerce, much of which is mobile based, has also seen eruptive growth in the past decade. Just China alone, the volume of cross-border eCommerce, defined as Chinese or Hong Kong based merchants selling directly on overseas e-commerce marketplaces such as Amazon or eBay, has grown from a few million dollars in 2009 to over 1.1 trillion dollars in 2018. China is not alone. According to research, 36% of eBay's Top 1,000 sellers in 2018 were cross-border trade (CBT) sellers. For Amazon, over one-quarter of its global sales revenue came directly from cross-border transactions. For the payment industry, this rising sector represented both great opportunities and challenges. Different from conventional international trade, where the business cycle and hence transaction frequency is usually by months, cross-border e-commerce requires a much faster cycle with a myriad of small-value transactions that can happen simultaneously in several countries for the merchants.

The traditional payment products and services provided by banks, money transfer agencies or FX dealers no longer fully serve the needs of the new traders; thus leaving opportunities for fintech firms to provide a new layer of global payment network. On the other hand, the globalized nature combined with high transaction frequency also imposes strong entry barrier in global compliance, automation technology and globalized customer acquisition and support for payment companies entering the space. I am of the belief that cross-border e-commerce shall enjoy sustainable growth in the next decade; and it shall be very interesting to see further evolution of the payment landscape involving the sector.





BHARGHAVAN VADUVUR
President and CEO

Surviving The FinTech Revolution:

Big Banks, FinTechs and Regional/Community Financial Institutions

The biggest driver of payments innovation in the last decade is the rise of disruptive mobile apps between consumers and their financial institutions. This is playing out more slowly in mature markets, but emerging markets show us where payments are headed.

The Asia Looking Glass

In many Asian countries, payments have already been fully disrupted. In China, 86 percent of payments are made on a mobile phone, and almost all of those are through WeChat or Alipay, where the funds reside with the app — not with the bank. In emerging markets, consumers are skipping credit

cards completely and moving straight to mobile payments.

In the U.S., the change is more step-wise. Ten years ago, almost no bank had a mobile app, bill pay services or easy peer-to-peer payments. Today those things are table stakes. But more changes are coming, and big banks are not standing on the sidelines.

Big Banks vs. FinTechs vs. Everyone Else

Big banks see the FinTech revolution coming and are pouring billions into answering it. Bank of America alone recently announced a nearly half-billion dollar investment in digital innovation.

No example is more illustrative of big banks' intent to compete than P2P payment apps, perhaps the most visible success in American FinTech disruption. Venmo and Square Cash quickly grabbed the spotlight — and rapid user adoption. But big banks countered with Zelle, which is predicted to become the largest P2P payment app by next year due to easy integration with participating banks.

Regional and community financial institutions are already getting squeezed as large banks have increased share of deposits from 72 percent to 84 percent in the last decade. The growing FinTech threat puts more pressure on them to meet customer expectations for digital tools to stay relevant for the next generation of customers.

Convenience Drives Disruption

It's no mistake Zelle has been an initial success for big banks. Look at the last two decades of innovative companies and one major theme stands out: disruptive products make our lives easier.

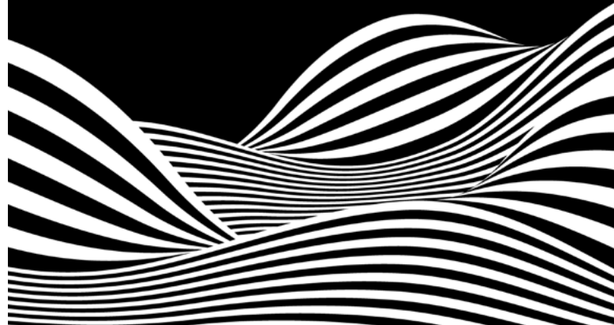
- Google made it easy to find information
- Facebook made it easy to stay in touch with friends
- Uber made it easy to get a cab and pay for it
- Netflix made it easy to watch movies at home
- Venmo, and now Zelle, make it easy to pay friends
- Even Amazon, which was successful for years, didn't become a massive dominant force until they launched free 2-day shipping

There's a reason that people have been predicting the demise of American banks for at least a decade. From account opening to paying someone to reviewing a statement, banking is rarely easy or convenient.

The Future for Mid-sized and Smaller Banks

Consumers say they want relationships with their bank, with 58 percent saying they prefer small banks and credit unions — but they keep choosing large banks. One of the key reasons is customer experience. 42 percent of

In emerging markets, consumers are **skipping credit cards completely** and moving straight to mobile payments.



large bank customers say they prefer their bank for its digital services. Finding a way to bridge the digital gap is critical for community financial institution survival. The customers mostly likely to care about digital and mobile customer experiences are today's profit drivers (the affluent) and tomorrow's profit drivers (millennials).

Having an App Is Not Enough

Customers care about easy-to-use products, and many startups are offering these experiences to small and mid-sized financial institutions. Financial institutions that meet the five needs below will be able to compete:

- **Instant gratification**

  Young people don't expect to wait. Make onboarding fast and easy and let them use a new card immediately.

  Examples: instant issuance; fast application process on mobile

- **Control**

  Customers want to feel like they know what is happening with their spending and that they are in control of their finances.

  Examples: card controls; alerts; spending insights

- **Micro-communication**

  Small, regular touchpoints add up to build relationships over time, whether account notifications, reminders of rewards or relevant offers.

  Examples: real-time offers; rewards build notifications

- **Easy service**

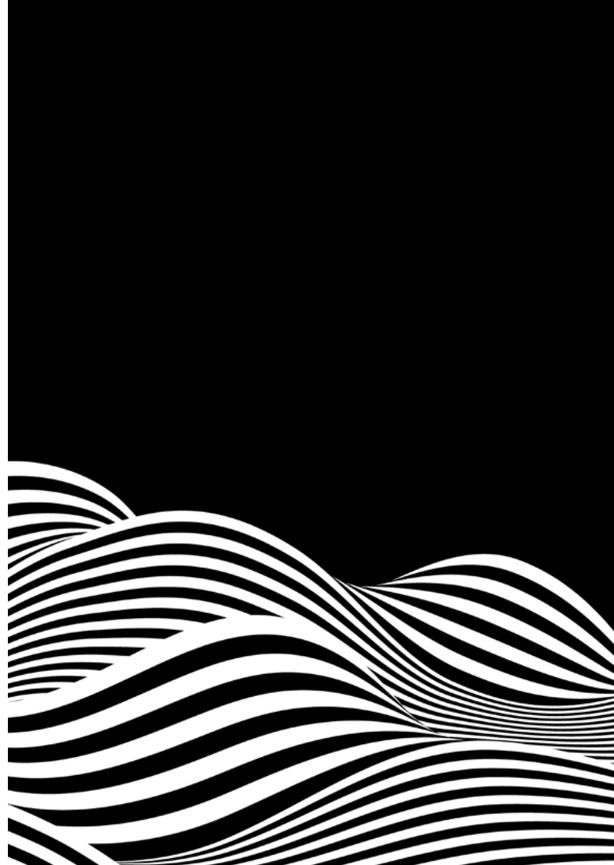
  The fastest service is self-service. Let customers easily solve their own problems. But when they need to contact you, make it fast and easy to do so.

  Examples: file a dispute right from the app; push button to contact customer service

- **Easy-to-use products**

  Make it intuitive to do simple things like recognize their purchases, use their rewards, or spend during travel. The best products will predict their needs before they have them.

  Examples: cleaned-up merchant information on statements; card works wherever they go



The Journey To **Omnichannel Delivery**

PSCU

DENISE STEVENS

SVP, Product Delivery and Innovation

Over the past decade, there has been a groundswell of consumer expectations surrounding financial services. Consumers began to expect — and even demand — that financial institutions provide the same type of experience they were getting from retailers, gaming companies or FinTechs. This shift has largely been driven by mobile devices and smartphones, which have completely changed people's lives — from how we interact to how we transact, and everything in between. Because this constant state of connectivity became non-negotiable, the financial services industry was forced to get on board.

It used to be enough for consumers to have access to online banking. But

suddenly, it became all about smaller devices that people carried with them everywhere and used at all hours of the day. Thanks to companies like Amazon and Etsy, consumers started to expect their bank or credit union to predict their behavior and anticipate what they wanted with regards to their financial needs. Making predictions based on previous behavior was not new for financial services, as the industry had been doing it for years in the area of fraud. But putting the concept into practice for the end consumer was a different story.

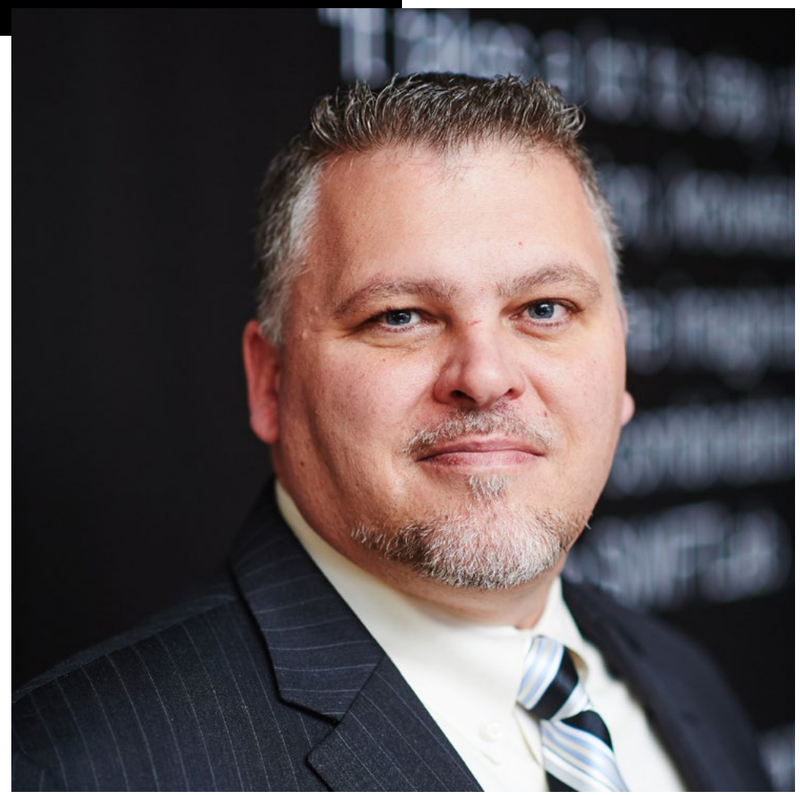
Big banks were the first to catch on to the importance of omnichannel delivery, and credit unions soon had to follow suit in order to compete. They realized consumers were starting to expect consistent experiences regardless of where they were interacting or transacting. But making this shift was easier said than done. Financial services got a pass for a very long time. It is hard to be flexible and nimble, even for smaller financial institutions, in part due to clunky legacy systems. The current state became unacceptable to consumers, which is when FinTechs entered the picture.

FinTechs were at an advantage over most banks and credit unions. They had the luxury of making a fresh start, armed with the knowledge of current pain points, and were able to use cheap, readily available technology to address them — they were able to be in the right place at the right time, faster and quicker than other financial institutions. What many of these FinTechs did not yet understand, however, was what they lacked: how payments transactions are routed, best practices for underwriting in lending, and much more. FinTechs made quite a few mistakes before realizing they needed more established players in the financial services space to help them solve the legacy factor of the equation.

Meanwhile, traditional financial services players slowly began putting the wheels in motion to modernize outdated systems. While it required a significant investment of resources, banks and credit unions finally caught up to FinTechs. And once they got there, they realized they could sometimes go faster and innovate more when they partnered with FinTechs. This trend is apparent when looking at increased partnerships between FinTechs and financial services providers over the last several years. Niche FinTechs are often a good match for more established institutions because they round out traditional financial offerings. Many big banks, in particular, are acquiring FinTechs with the fundamental mission of transforming their omnichannel offerings.

Learning gathered from data and analytics tools enables financial institutions to deliver the right products to consumers at the right time. Data and analytics can be used to see, predict and prescribe solutions to consumers that fit their current and future financial needs. Financial institutions have an opportunity to play a valuable role in consumers' economic future and promote financial well-being through the use of smart data collection and utilization.

Today, retailers and service providers across multiple industries are delivering seamless experiences — so much so that it has become the rule instead of the exception. Financial services providers must meet the consumer where they are, and all channels must deliver the value and activity consumers are trying to accomplish — when they are trying to accomplish it. Due to this omnichannel mentality, banks and credit unions have been compelled to focus on the consumer journey rather than a single interaction. This focus on omnichannel will continue to be a key factor in the payments industry and can be expected to spur payments innovation for years to come.



CRAIG YOUNG
Chief Information Officer

Transformations In An API-First World

Application Programming Interfaces are transforming the way business is done. Take Uber. It integrates a combination of services from third-party providers — map and location services from Google, payment services from PayPal and the credit card companies — to create an entirely new way to connect cars and drivers with passengers and to collect payments.

The underlying technologies, "Web APIs," are a simple way for one business to access the business value of another to create new value. API Mashups which consist of an integration of various APIs together, as a result of the co-creation culture inherent to most developers, have been around for about a decade now — but they are still just as important as ever, since they enable more product innovation and better user experiences.

The global financial services industry has been late to broadly adopt APIs but is catching up fast, encouraged by regulation such as PSD2, the U.K.'s Open Banking experience and by pressure from customers to provide more convenient ways to access their banking services.

Payments is a network business, with many institutions cooperating to complete a transaction.

End-to-end processing of an international payment, for example, requires interactions between at least two, but often three or more banks and a clearing system. When it works well, it works well because the interactions between these players are standardized at an industry level. When banks apply the global business standards and connect to each other through a globally standardized platform such as SWIFT, they do not need to negotiate how to interact with every other bank they do business with.

SWIFT has long been at the forefront of financial messaging standardization and is continuing this work in the API world. Globally, we are collaborating with the industry to create, maintain and implement the business and platform standards needed to efficiently process financial transactions. By publishing earlier this year an API standard called "Pay Later," SWIFT facilitates the widespread adoption of an innovative loan approval process, increasing payment and borrowing choices for customers. This standard for a "Pay Later" API has been developed in collaboration with banks, merchants and technology providers, representing a key step towards enabling the rapid adoption of an innovative new consumer payment model.

As the industry embraces API technologies, we believe that an ongoing effort will be required to avoid fragmentation and isolation, needless complexities that will frustrate attempts to build the value-added services customers want. The agility and simplicity afforded by APIs and the tooling around them mean that anyone can make their business services available to the whole world with just a few clicks.

A successful transition towards an API-based financial services ecosystem is possible if financial standards efforts converge towards a single, shared business standardization methodology and governance strategy for the use of APIs.

To counteract the effects of fragmentation and to promote interoperability, SWIFT is leveraging its global standards expertise to provide a neutral collaboration platform for the development, maintenance and publication of common API specifications. We further believe that use of ISO 20022 business definitions and data models as a baseline will ensure end-to-end consistency in business processes that encompass API and legacy technologies. This helps avoid significant challenges and complexity that the industry is already seeing across other open initiatives.

In support of these business standardization efforts, SWIFT is enabling users to expose their own API-based services via the SWIFT platform. We are also extending the range of SWIFT services that can be accessed via APIs, such as our financial crime compliance portfolio, reference data, gpi, and business intelligence. Customer and SWIFT APIs will benefit from SWIFT identity management and reach, which provides a common, secure global digital identity framework for financial institutions, their market infrastructures and global corporates. SWIFT is working on behalf of its users to deliver an API platform for the future of finance, but the transition to an API economy requires sustained engagement from across the industry: banks, market infrastructures, technology providers and standards organizations.

We urge institutions that are embarking on the API journey to take this opportunity to engage with SWIFT and the broader standards community to benefit from, and help evolve, a shared global platform for the financial services API economy.

Tipalti

CHEN AMIT

CEO and Co-founder

The New Economy Based On Robust **B2B Payables Automation**

One payment innovation of the last decade that has flown under the radar (but has a significant impact to nearly $20 trillion) is how B2B payments are made. Businesses and organizations traditionally have been encumbered by working directly with banks to pay their supply chain. This has limited their ability to scale payment operations and engage in more daring, global and transformative business models.

But large-scale payables automation — both as a technology and as an operational strategy — has made the integration of banking and FinTech a foundational capability for finance organizations as they modernize their approach or develop new lines of business.

Companies are rapidly adopting the digital marketplace paradigm we've seen work in the gig economy and making it part of our mainstream world. Taking advantage of the dynamic, scalable nature of crowds and service networks is now just another delivery vehicle for getting goods and services to markets.

To do this with traditional invoice-to-check methods is not only an operational nightmare, but it also magnifies the stress by literally a thousand times on the most time-consuming operation in finance: accounts payable. How efficient is it to ask a trusted corporate officer to sign every check or enter ACH and bank wire data into multiple bank portals for hundreds or thousands of payments each week? Yet to maintain controls and accountability, it's a requirement. The rise of payables automation eliminates much of that by integrating bank functionality with real financial operations (supplier onboarding, AP tax compliance, invoice processing, global payments workflows, payee communications, fraud and financial controls, regulatory compliance, payment reconciliation, etc.).

Any new venture that relies on a supply chain or service network must contend with a simple truth: the manual effort of paying when affordable, viable technology exists adds unnecessary risk and headache and jeopardizes successful go-to-market strategies. It is like building a sleek, custom race car, then putting on bargain-bin tires. You are only as strong as your weakest point.

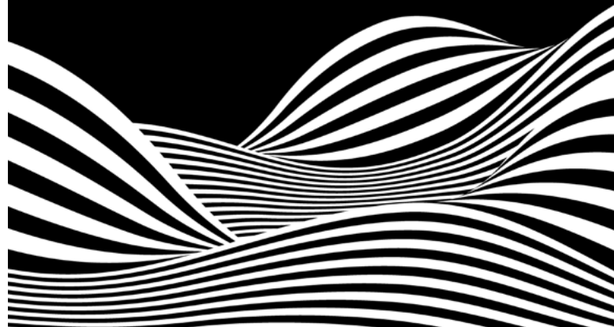
Even the unicorn-status disruptors that started with heavily optimized, automated business operations, today face a reckoning when it comes to payables. They may have built their own systems, essentially developing and maintaining their own internal FinTech. Or they simply hired their way to sustain their growth. Neither choice keeps that business agile enough to take on the next challenge (e.g. global expansion, additional business offerings, acquisitions, partner/supplier enrichment).

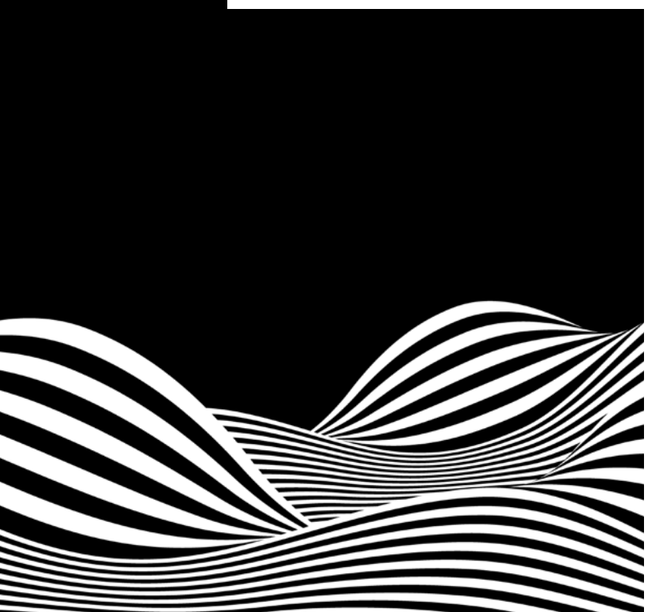
Here's another ripple effect: unless you have a monopoly on your supply chain, dissatisfaction with payment processes can lead to supplier attrition. According to our research, nearly 70 percent have said that they would leave a marketplace because of a payment issue. Supply chain loyalty is directly impacted by effective payments.

This impacts the partner/supplier, but it can also damage the end customer relationship. If they don't receive the service they were expecting or if the experience was sub-par because the partner is uninspired as a representative of your business, they will hesitate next time.

Meanwhile, a competitor that does right by the supplier and is able to grow and scale their payments operation can capture market share. In today's app-based culture, switching decisions are easy to make — and a poor payments experience can be the nail in the coffin of your partner relationships.

Companies are rapidly **adopting the digital marketplace paradigm** we've seen work in the gig economy and making it part of our mainstream world.





Trulioo

ZAC COHEN

General Manager

Mobile Adoption And Accessibility To The Digital World

Progress in the payments industry has been inextricably linked to progress in mobile adoption and access, the most significant innovation benefitting the payments industry. A recent report from GSMA, the mobile industry's trade body, on the state of mobile at the end of 2018 found all-time highs in the number of mobile subscribers (5.1 billion) and mobile internet users (3.6b). In 2018 the mobile ecosystem supported 31 million jobs and contributed over $3.9 trillion to the global GDP — all records, and all up from the previous year.

The rapid penetration and impact of mobile isn't just creating jobs and boosting revenues for the telecom giants — it's also been a key driver

for financial inclusion over the past decade. The math is simple: More financial services online + more mobile internet users = more access.

This has been especially true in developing countries where insufficient state infrastructures have left far too many deserving people without access to basic financial services. But where brick-and-mortar financial institutions in those regions (most notably sub-Saharan Africa and the Middle East) have fallen short, mobile adoption has stepped in to coincide perfectly with a boom of digital financial services that found success in blurring geographic boundaries by offering fast access to anyone anywhere.

Prior to the boom in mobile access, financial services was a highly segmented industry. Need a personal loan? Go visit your bank. Need to send money to family? Stop by Western Union. Want to trade a stock? Call your broker. As mobile adoption increased accessibility to the digital world, incumbent financial institutions and new FinTechs alike saw an opportunity to reach more people with more services and level the financial access playing field.

The most current data from the World Bank verifies the "mobile adoption + digital financial services = more access" equation: 515 million adults worldwide opened an account at a financial institution or through a mobile money provider between 2014 and 2017. As a result, today 69 percent of adults around the world have an account, up from 51 percent in 2011. In developing economies, the share rose from 54 percent to 63 percent. The world still has about 1.7 billion unbanked people, but two-thirds of them have access to a mobile phone, a proven key to unlocking financial access.

The adoption of mobile technologies and accessibility, however, has brought about a proliferation of compliance and regulatory hurdles to mitigate inevitable risk that comes with volume. Today's payments world is full of confusing acronyms like GDPR, AML, KYC and PSD2. For financial services companies navigating the global payments waters, compliance can look like giant icebergs.

For the general public, eye-catching headlines detailing missteps by financial institutions — like the latest data breach or massive compliance fine levied against them — have made many understandably wary, even if they do have access through a mobile phone.

It is this climate, in the wake of mobile technology innovations over the past decade, in which we've seen automated compliance technologies proliferate as well — which have not only allowed more access to the expanding payments ecosystem but also enabled transactions to occur much more swiftly, safely and securely across the globe.

This is why RegTech is also a significant payments innovation of the past decade, as it's provided much-needed compliance support for financial institutions needing to adhere to diverse identity verification requirements and simplify the digital user experience while maintaining privacy and establishing trust with customers.

worldnet payments

WILL BYRNE

President and CEO

How Technology Has Changed **Consumer Expectations**

So many things have changed over the past decade that it can be hard to pick out just one. Lots of exciting technologies and new business models have emerged, but the most fundamental change I have seen in payments has been in consumer behavior. People today interact with businesses in a very different way to the way they did 10 years ago, and I think that change has really been driven by the success of the smartphone. So the smartphone is my pick for the innovation with the biggest overall impact on payments.

The iPhone kicked it all off in 2007 and was such an incredible success that it spawned a host of imitators — notably Android, which sold in even greater numbers. The penetration of the

smartphone in the U.S. over the course of this past decade has grown from under 20 percent to an expected 92 percent. Virtually everyone uses them — and they use them for everything, from communication, to shopping, to finding jobs and doing business. They are constantly online.

Internet and retail giants like Amazon have put huge efforts into making the online buying experience as simple as possible and have perfected frictionless purchasing models. The buying experience people have on their phones now sets their expectations for interactions everywhere. This is particularly true of the younger generation, the millennials who have grown up immersed in a digital environment.

Younger consumers are now digital-first, and their expectations of how they interact with retailers and vendors are quite different from the previous generation. For instance, they are very comfortable with sharing their identity with retailers and brands, including their credit card details, profile, address and often their personal preferences. They share this in exchange for an easier and faster payment and delivery experience. They also expect automation — e.g. forms are completed automatically, and preferences are predicted — again, all in the service of a "frictionless experience."

A striking aspect of their online purchasing experience is that it is completely self-service, and this is the aspect of the experience which I believe is having the biggest impact. Consumers these days now expect to be able to have an automated, self-service experience wherever they are — whether online or offline. They don't see why they should stand in line in a store when they can make the purchase on their phone and simply pick it up in the store, for instance. Look at Uber — a prime example of how this change in expectations is completely disrupting the transport (and transport payments) market.

In payments parlance, the "unattended" world has traditionally been the world of vending machines and automated kiosks. Given that the online purchasing experience is also "unattended," traditional retailers are now experimenting with many ways of delivering the "unattended" online experience in the store, and they are using the tools of the traditional unattended world to do it. We are seeing lots of new retail models emerge — from smart kiosks who know who you are to fully-automated stores which track your activities using AI (e.g. Amazon Go) to using your phone as a POS device in the store.

This blending of the online and physical worlds, driven by consumer demand, is generating the change across the board in payments. Traditional POS hardware and software vendors are scrambling to add mobile and online capabilities. The big online vendors are making moves into the physical world, and the old unattended world is experiencing a re-birth as an enabler of new self-service experiences in all sorts of environments. The pace of these changes is accelerating, and every form of retail will be affected as a new "Intelligent Retail" model emerges.

The implications for the payments ecosystem have already been huge, but they continue to evolve. A merging of the old card-present and card-not present worlds is happening, and consumers are implicitly demanding omnichannel payments — and all the advanced features which can enable that frictionless experience: contactless, tokenization and advanced analytics.

All of these developments can be traced back to the change in consumer expectations, driven by the always-on smartphone. And as the cost of smartphone technology has dropped, it is now being embedded everywhere — into watches, cars, wearables and any area you can think of. Good luck predicting how that will affect consumer expectations over the next 10 years!

ABOUT

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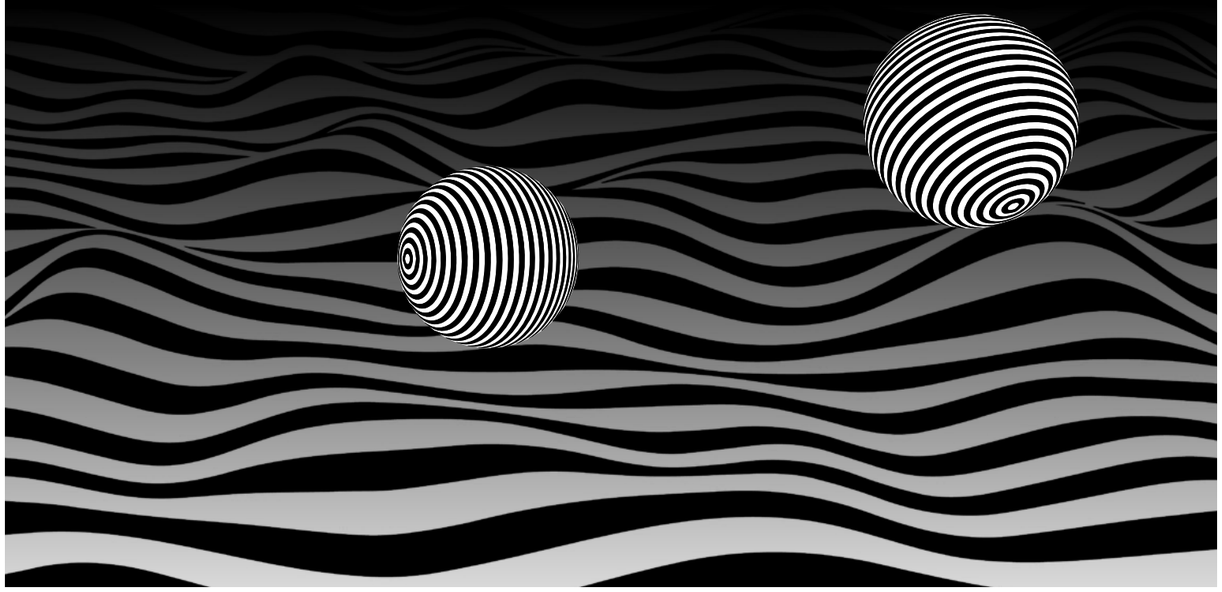
PYMNTS.com is where the best minds and the best content meet on the web to learn about "What's Next" in payments and commerce. Our interactive platform is reinventing the way in which companies in payments share relevant information about the initiatives that shape the future of this dynamic sector and make news. Our data and analytics team includes economists, data scientists and industry analysts who work with companies to measure and quantify the innovation that is at the cutting edge of this new world.



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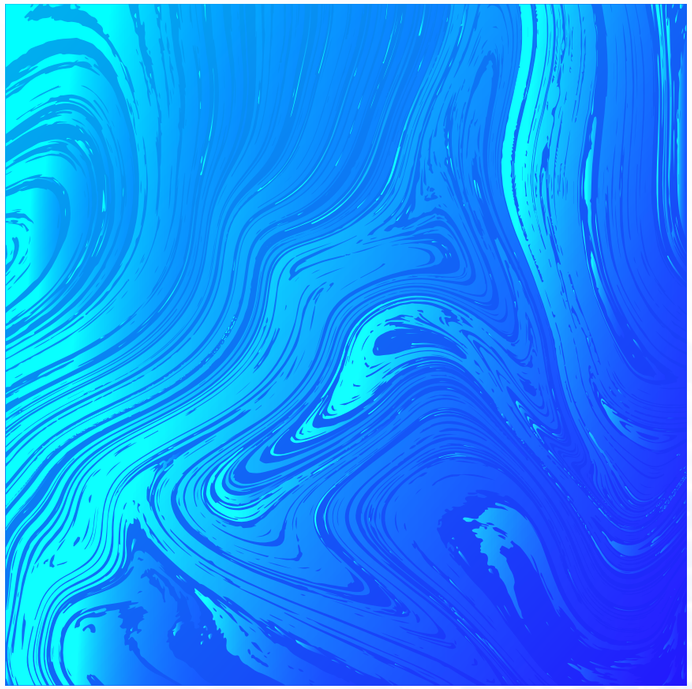

INNOVATION RIPPLE EFFECT

The 2010s are almost over. Get ready for the 2020s. PYMNTS queried TK payments execs to get a sense of the most important payments innovations of the last ten years, **where ripple effects still are being felt.**