The U.S. has seen tremendous technical innovation over the past 25 years. The rise of the internet and the broad adoption of smartphones have helped to facilitate fundamental changes to the way we buy and sell products and services.

Software development and cloud based services have led to disruption in many industries. Technological advancements have led to shortened product development times, faster products to market, better distribution systems and streamlined purchasing. Famously, Moore’s Law states that the amount of computer processing power that fits on a chip doubles every two years. It has held true for decades and has served as a proxy for innovation. And yet, as processing power has increased and the pace of business has quickened, the speed of payments has not increased at the same rate.

The good news is that change is coming. U.S. banks and regulatory bodies recognize the need for the payments system in general — and the B2B payments system in particular — to adapt to keep up with the increased speed of doing business. The industry expects real-time payments (e.g., payments where settlement happens immediately and confirmation is made within seconds) to grow exponentially in the coming years. B2B real-time payments volume is projected to rise from 0.5 billion in 2017 to 2.9 billion in 2023.1

The U.S. has some catching up to do relative to other parts of the world in terms of the transition to faster payments; as of October 2015, 18 countries had implemented same-day payments, but the U.S. was not one of them. In 2008, the United Kingdom introduced its Faster Payments System, which is now available 24x7 and processing more than one billion transactions per year. Faster Payments claims an annual growth rate of 20%, with 60% of that growth coming from transactions migrating from other systems.2
INVESTING IN FINANCIAL TECHNOLOGY

FinTech has emerged in recent years as an industry focused on creating new technologies with the potential to transform the financial sector. While banks and FinTech providers can at one level be seen as competitors, there is increasing recognition by both sides of the strengths and limitations each possesses.

<table>
<thead>
<tr>
<th>Bank Strengths</th>
<th>FinTech Strengths</th>
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<tbody>
<tr>
<td>Extensive distribution network</td>
<td>Innovation</td>
</tr>
<tr>
<td>Financial strength</td>
<td>Flexibility</td>
</tr>
<tr>
<td>Large customer base</td>
<td>Rapid product development</td>
</tr>
<tr>
<td>Experience and expertise in addressing consumers' and businesses' financial needs</td>
<td></td>
</tr>
<tr>
<td>Reputation for security and protecting customer privacy</td>
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</tbody>
</table>

This mutual recognition of their relative strengths and limitations is leading to increased collaboration between the two.

While many FinTech companies emerged as ‘banking industry disruptors,’ we are seeing a lot of them shift their focus to partnering with banks for a mutually beneficial outcome.

Mike Lyons
Head of Corporate & Institutional Banking

PNC continues to invest in technology-based solutions to enable faster, more accurate and more efficient payments. It is also vital that companies prepare for a real-time payments future. This includes ensuring that the technology is in place to support real-time payments and other payment innovations, as well as working with vendors to update their platforms to match new payment requirements.

U.S. banks are now pursuing a multi-faceted approach to delivering real-time payments. This includes:

• Industry Collaboration to Develop Faster Payments
• Investing in Financial Technology (FinTech)

CREATING INDUSTRY STANDARD PROTOCOLS

There are numerous examples of financial industry stakeholders (including banks, associations and the Federal Reserve) coming together to agree on standards around faster payments, as well as to develop and implement faster payment solutions. Faster payments initiatives include:

In May 2015, NACHA (the National Automated Clearing House Association) adopted rules to allow Same Day ACH transactions.

• The initial deployment on September 23, 2016 will support same day settlement of credit transactions up to $25,000.
• The next phase in September 2018 will allow debit transactions.

According to NACHA, 95% of the top banks are on track to originate same-day ACH payments in 2016. Though same day origination is optional, it is mandatory for all financial institutions to accept and post same day transactions on the current day, assuring same day availability of all transactions.

Note: As one of the largest originators and receivers of ACH payments, PNC is at the forefront of this enhancement to the ACH network and will be supporting same day ACH origination and receipt on the September implementation date.

In early 2015, the Federal Reserve established a Faster Payments Task Force comprised of more than 300 organizations and individuals to develop a faster payments model in the U.S. A number of organizations—including The Clearing House—have submitted proposals that are currently being evaluated by the task force.

The Clearing House is a trade group and payments company began building a real-time payments system in 2015. The Clearing House entered into an agreement with Vocalink (a UK-based international payments systems provider, which introduced UK’s real-time payments system in 2008) to develop national real-time payments services in the U.S. It is expected that the initial phase of Real Time Platform will be piloted in early 2017.

PNC is one of the banks that own The Clearing House.
Banks like PNC are pursuing FinTech investments that include acquiring FinTech firms, building in-house FinTech solutions, and partnering with FinTech firms:

- **Investment in FinTech Firms**
  - Made an investment in electronic billing and payment company Transactis in April 2016.\(^7\)
  - Joined with a number of firms to invest in Digital Asset Holdings in January 2016.\(^8\) Digital Asset Holdings is a developer of distributed ledger technology and is looking to build blockchain services.
  - Partnered with six other leading banks to invest in Early Warning Services (EWS), a provider of fraud prevention and risk management services. At the same time, EWS acquired clearXchange, a person-to-person payments network.

- **In-House Solutions Development**
  - Introduced Virtual Wallet, an innovation money management and online banking solution, in 2008.
  - Developed and continues to add functionality to our PINACLE® online treasury management portal.
  - Opened our Innovation Lab (iLab) in May 2015, a 10,000 square-foot facility that is designed to test new products and services and real-life environments.

- **Partnering with FinTech Providers**
  - Partnered with Tungsten Network to provide invoice automation through A/P Advantage. This partnership was featured in the Fall 2014 issue of PNC Payment Solutions News.
  - Recently added Microsoft Wallet to the PNC mobile payments lineup, which includes ApplePay™, AndroidPay™ and Samsung Pay™.

**IN THIS ISSUE**

- In the Product Spotlight, we discuss distributed ledgers, the technology behind blockchains, and its potential impact on banks, payments and more.
- This issue’s Industry Spotlight highlights the insurance industry and PNC’s long history of providing custom solutions to insurance clients.
- In By the Numbers, we look at the rise in FinTech firms and how they may impact financial services.

Discover how PNC can deliver ideas, insights and solutions to help you achieve your objectives. Contact your PNC Treasury Management Officer or Account Manager, or visit pnc.com/treasury.
Over the past year, there has been a lot of press coverage for various innovations within financial services. While FinTech firms are helping to accelerate the pace of technological advancement within the industry, banks are investing in new technologies to provide better/faster/cheaper and more secure services to a client base that is no longer tethered to a branch or ATM network. The results include innovations like mobile wallets, chip cards, faster payments and peer-to-peer payments.

One of the more significant developments has been blockchain technology and its potential applications in the financial industry. Blockchain is one of the technologies behind Bitcoin and it provides a distributed ledger for accounts and transaction. While the jury is still out on Bitcoin (and blockchain), distributed ledger technology offers a number of potential benefits for banks. Over $1.1 billion of venture capital has been invested in distributed ledger technologies as of 1Q16, up 60% since 1Q15.

Distributed ledger technologies record transactions in a decentralized network, which means that the record of each transaction is shared across a network of computers, as opposed to at a single entity (e.g., a bank or clearinghouse). Each participant in the network has an identical copy of the ledger, to which they can add encrypted transactions and, because it is decentralized, all participants are able to validate transactions. The end result is a highly efficient and secure method of performing transactions.

The World Economic Forum (WEF) predicts that 10% of global GDP will be stored on blockchains by 2025.
EVOLUTION OF BLOCKCHAINS AND DISTRIBUTED LEDGERS

The financial industry has rebranded blockchain “distributed ledger technology” and it is heading towards becoming core to how future financial markets will work. Indeed, DLT is fast becoming the new medium for the digital economy.10

In a recent paper published by the UK’s Government Office for Science, blockchain technology was characterized as just "the first, though very important step towards a disruptive revolution in ledger technology that could transform the conduct of public and private sector organizations.”11

Blockchain originally came to prominence in 2008 as the underlying technology behind bitcoin. However, these initial applications of blockchain technology involved unpermissioned nodes to validate transactions, which meant that bitcoin and other unpermissioned ledgers could not be owned. In contrast, many emerging distributed ledger-based financial applications require legal entities (permissioned nodes) to validate transactions. These permissioned ledgers have one or more owners, who can enforce rules on who is allowed to use the system.

DISTRIBUTED LEDGER BENEFITS AND APPLICATIONS

Financial firms have become increasingly interested in (distributed ledger technology) DLT and smart contracts as a way to reduce post-trade settlement time, improve liquidity, improve compliance recordkeeping...and develop a platform to help deliver new products and services.12

Distributed ledger security, as well as transparency, a decentralized nature and multi-party access mean that there are a number of potential financial applications for distributed ledgers, particularly as financial transactions become increasingly digital.

One of the key benefits of a distributed ledger is fraud protection. By using encrypted transactions and a shared environment, distributed ledgers are considered to be much more tamper-proof than more traditional transactional platforms and even blockchain-based transactions recorded on unpermissioned ledgers.

Financial areas where distributed ledgers and blockchains have significant potential include:

<table>
<thead>
<tr>
<th>Capital Markets</th>
<th>A report by Goldman Sachs Investment Research estimated that capital markets could save $2 billion annually in the U.S. by adopting distributed ledger technology.13</th>
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</thead>
<tbody>
<tr>
<td>Trading</td>
<td>11 banks are currently testing a distributed ledger-based trading system. These banks are part of a larger consortium of 42 banks that are studying ways to leverage distributed ledgers in financial markets.14</td>
</tr>
<tr>
<td>Payments</td>
<td>Visa’s EVP of innovation and strategic partnerships claims that distributed ledger technology could have useful applications in the areas of loyalty and rewards. Visa® is an investor in Chain, a provider of distributed ledger technology for financial institutions.15</td>
</tr>
<tr>
<td>Trade Finance</td>
<td>A December 2015 Global Finance Magazine article discussed distributed ledger’s potential in trade finance, highlighting its ability to create “trade transactions that are secure with digital records of related data visible to various participants in the trade transaction.”16</td>
</tr>
<tr>
<td>Banking</td>
<td>According to research commissioned by Pegasystems and Cognizant, 36% of financial industry executives expect distributed ledger technology to significantly disrupt the checking accounts market.17</td>
</tr>
<tr>
<td>Wealth Management</td>
<td>John Hancock’s Lab of Forward Thinking (LOFT) is applying distributed-ledger technology to enhance the onboarding of new wealth management clients.18</td>
</tr>
</tbody>
</table>

To leverage this potential, financial firms are increasing their focus on distributed ledger technologies. Some examples of this financial involvement include:

- A growing number of events that discuss distributed ledger-based financial solutions, such as the Consensus 2016 Conference (held in New York in May 2016, with 1,500 attendees), and American Banker’s third annual Blockchains + Digital Currencies conference in New York in July 2016.
• Industrywide initiatives to develop distributed ledger standards for the industry. These include the Linux Hyperledger Project (an initiative that brings together banks and technology firms to create open-source distributed ledger software), the Open Ledger Project, Chain Open Standard 1 (Chase OS1) and R3CEV.
• Financial firms joining the growing investment in distributed ledger startups. As an indication of the growth of overall investment in distributed ledger firms, venture capital firms invested $173 million in 39 distributed ledger-related deals in the first quarter of 2016, which exceeded the total invested in the second half of 2015.¹⁹

PNC’S INVESTMENT IN DISTRIBUTED LEDGER TECHNOLOGIES

PNC is among the leading banks taking an active and growing interest in distributed ledger technologies. In response to a question at PNC’s 4Q15 earnings conference call, CEO Bill Demchak said, “We’re interested in distributed ledger blockchain technology...in terms of our focus and where we think about growth opportunities and how to deploy capital, it would be much more focused in that area than it would be in a traditional bank deal.”²⁰

Our interest in blockchain technology led PNC to become one of 12 financial firms that invested $50 million in Digital Asset Holdings, a developer of distributed ledger technology for the financial services industry, in January 2016. In February 2016, Digital Asset partnered with Accenture to help companies assess and implement distributed ledger solutions.²¹ Digital Asset is a founding member of the Linux Hyperledger Project.

The CEO of Digital Asset, Blythe Masters, believes that the adoption of distributed ledger technology in the financial industry will take some time. In an interview with Bloomberg in March 2016, Masters claimed that the technology is in a phase that is analogous to the evolution of the internet in the early-to-mid-1990s. Digital Asset is currently developing its first set of systems and solutions for the Australian stock market, which would be the first large-scale deployment of a distributed ledger-based solution in a commercial financial services environment.
SOLUTIONS FOR THE INSURANCE INDUSTRY

In recent years, the insurance sector has grown sales at a steady rate, with a compound average growth rate of over 5% between 2009 and 2015; and insurance firms are expected to continue to benefit from the ongoing economic recovery. Along with this consistent growth, U.S. insurance firms are facing pressure on their bottom lines due to increased competition, low interest rates and regulatory changes.

One area where insurance firms can improve efficiency and capture growth opportunities is in better management of their commercial payments. Visa research has found that insurance firms remain heavily dependent on checks for claim payments (80% of healthcare claims are paid via check, and this rises to 85%-95% for dental claims).

By automating some or all of their claims payments, insurance firms can reduce their reliance on checks and open up a myriad of disbursement options for their clients, including ACH, prepaid cards and even same day or real time mobile solutions.

Insurance firms also have opportunities for improvement in receivables processing as well. Through automation, firms can accept premium payments and contributions to annuities or other investment accounts in a variety of formats.

Payments can be made via check, credit card, ACH and wire, and insurance clients receive consolidated reporting from PNC. The end results are greater speed and reduced administrative costs.

MEETING INDUSTRY CHALLENGES

PNC has provided specialized services for the insurance industry for more than 25 years through the bank’s Financial Institutions Group (FIG). Our dedicated insurance team serves clients across the U.S. in a range of industry sectors, including life, property & casualty, health and other specialty lines, as well as broker dealers.

Working within the industry to assist a diverse client base has helped to shape our understanding of the changing nature of the insurance market and put PNC in a position to anticipate the financial needs of our insurance clients.

PNC continues its legacy of strong risk management support of insurance clients and is continuously working to refine tools to improve compliance reporting, control and oversight in areas like know your customer and ’40 Act SEC requirements. To keep up with changes in the industry, we actively participate in trade groups and events, such as LOMA (sponsoring the LOMA Financial Inforum) and ANI.

Insurance companies are under incredible margin pressure and, as a result, must constantly seek greater operational efficiency and cost containment. PNC is helping with tools that not only streamline corporate payments through the use of card technology, but we offer working capital improvements through flexible settlement terms, a breadth of supplier technology enablers, and even ways to generate supplemental income streams through rebate programs.

Bob Testa, Senior Vice President
TM Financial Institutions Group Manager

Customer service is a priority for PNC. Our insurance team is comprised of treasury management officers (TMOs) and support associates who exclusively serve the industry. These dedicated staff provide expert support at all stages of the client relationship, including implementation of solutions for new clients, underwriting, product development, project management, ongoing client support and other specialty support.
The team combines deep industry knowledge and highly relevant experience with a consultative approach that tailors solutions to clients’ needs.

From a commercial payments perspective, PNC’s insurance clients are looking for solutions that meet a range of needs, and PNC provides a variety of solutions to meet them, as indicated in the chart on the following page.

### Insurance Company Needs

<table>
<thead>
<tr>
<th>Streamline processing of large payment volumes from a range of payment types</th>
<th>Met with PNC solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduce costly and inefficient check payments by replacing them with a more convenient and secure electronic payment settlement solution</td>
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<tr>
<td>• Keep account information confidential for both payer and payee by utilizing an email address or mobile phone number to initiate payment without the need for storing sensitive consumer banking information</td>
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<tr>
<td>• Provide banked and unbanked consumer clients with a choice of how they want to receive their payment</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Operate a fast, efficient and user-friendly claims settlement process</th>
<th>Met with PNC solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Card and other electronic payment solutions for claims settlement</td>
<td></td>
</tr>
<tr>
<td>• Automation of healthcare claims using the 835 format</td>
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</table>

In addition, our consultative approach means that we develop an in-depth understanding of our clients’ organization structures, systems and business development objectives to develop solutions that are tailored to their commercial payments priorities and needs.

PNC’s commercial payments and treasury management solutions are one part of an integrated suite of financial solutions that PNC offers to our insurance clients. Our solutions are backed by implementation and account management teams that combine experience, expertise and a commitment to meeting client needs at all stages of the relationship.
One notable recent trend in financial services is the rise of financial technology companies (FinTech) developing solutions for businesses and consumers. FinTech's significance is underscored by the exponential growth in venture capital investing in the sector in recent years.

Going forward, FinTech is expected to impact a broad mix of financial service categories, including payments. Many financial service providers are preparing for this new reality by making strategic investments in and partnering with FinTech firms, as well as developing their own solutions.

Financial Services Most Likely to be Impacted by FinTech Over the Next 5 Years

Payment Solutions News has covered a broad range of topics in commercial payments. The following is a list of recent news articles and trends discussed in previous editions.

<table>
<thead>
<tr>
<th>Commercial Payment Topic</th>
<th>Recent News/Trends</th>
<th>Topic Covered in Previous Issues of PNC Payment Solutions News</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMV</td>
<td>Visa reported that chip-activated merchant locations pass the 1 million threshold in March 2016.</td>
<td>Winter 2014 issue: summarized enhancements to PNC’s corporate card portfolio, including the incorporation of EMV functionality.</td>
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<td></td>
<td>In addition, the number of Visa chip cards issued rose from 97 million in May 2015 to 265 million in March 2016. During this period, Visa chip payment volume jumped from $1.4 billion to $18.4 billion.</td>
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</tr>
<tr>
<td>ACH</td>
<td>NACHA reported that ACH transactions rose 6.1% year over year in 1Q16.</td>
<td>In this issue and the Winter 2016 issue discussed the emergence of same-day ACH, including the initial rollout of same-day ACH for ACH credits in September 2016.</td>
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<tr>
<td></td>
<td>Business-to-business ACH transactions grew at a stronger rate. CCD and CTX B2B transactions rose 9.4% and 8.4% respectively in 1Q16.</td>
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</tr>
<tr>
<td>Fraud Prevention</td>
<td>The 2016 AFP Payments Fraud and Control survey found that 73% of U.S. companies experienced a payments fraud attempt in 2015. 48% of companies were exposed to wire fraud in 2015, up from 14% in 2013.</td>
<td>Fall 2015 issue: discussed commercial payments fraud, including products and strategies to reduce exposure to payments fraud.</td>
</tr>
<tr>
<td>Electronic Payments</td>
<td>A Moody’s Analytics study found that electronic payments products contributed $296 billion to worldwide GDP.</td>
<td>Spring 2015 issue: identified key trends related to the electronification of payments.</td>
</tr>
</tbody>
</table>
PAYMENT SOLUTIONS NEWS

3. “Same Day ACH: Moving Payments Faster in 2016,” Nacha infographic
4. PNC was the sixth-largest originator and the fourth-largest receiver of ACH payments in 2015, according to NACHA
5. “VocaLink and The Clearing House sign a groundbreaking deal to deliver national real-time payment services in the U.S.,” The Clearing House news release, December 12, 2015
18. “John Hancock’s LOFT to use blockchain to enhance the client experience Proof-of-Concept with ConsenSys and BlockApps,” Plus Company Updates, April 25, 2016
22. U.S. Bureau of Economic Analysis

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