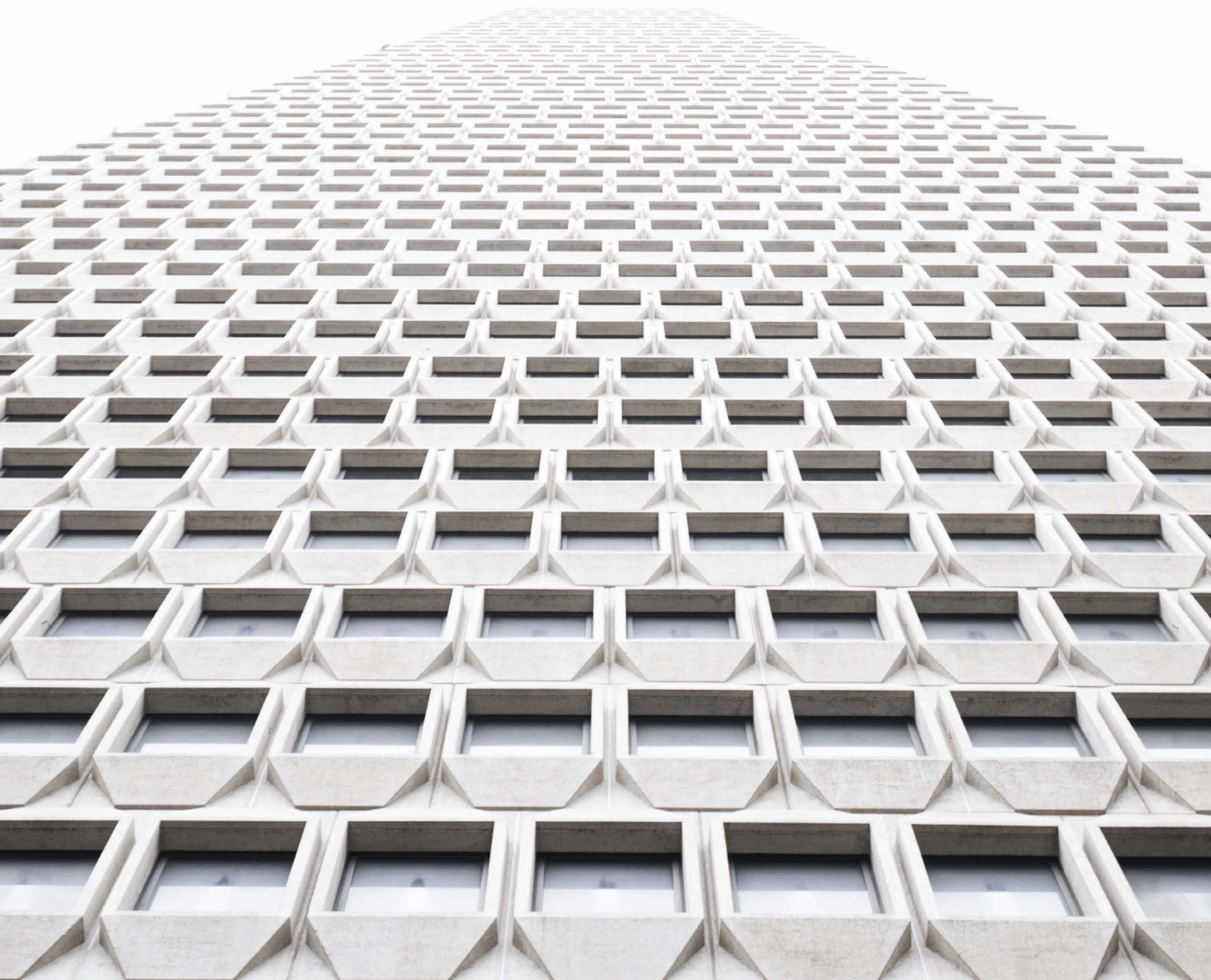


narrative  science

The Rise of AI in Financial Services

RESEARCH BRIEF





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INTRODUCTION

As pressure mounts due to factors like rising regulatory requirements, competition from new market entrants, heightened expectations from consumers, increasingly sophisticated digital threats, the financial services industry is expanding its use of artificial intelligence (AI) technologies. Everything from business operations, customer service and marketing to risk management and compliance is starting to benefit from the applications of AI. Although AI was originally introduced in the 1950s, it has achieved new prominence recently as computational power has increased and the amount of and access to data has exploded.

Given that the industry is undergoing significant change at a rapid pace, this brief is by no means a comprehensive analysis but a snapshot of the current use of AI in the financial services industry and some of the influencing factors. Based on a survey of over 100 financial services executives conducted by the National Business Research Institute combined with our own research, the brief outlines perceived challenges and opportunities along with notable companies disrupting the space.

SURVEY METHODOLOGY

National Business Research Institute deployed the survey online from April 25th to May 27th, 2016. When deployment ended, a total of 112 completed surveys were received. Statistically, the results of the present study reach an **87 percent confidence** level with a 5 percent sampling error. The respondents spanned a variety of titles including directors, vice presidents and members of the C-suite. This report reflects the key insights that we gathered from that survey and is supplemented with third-party research as noted throughout the document.



ADOPTION OF AI

AI is technology aimed at doing things normally done by people (specifically, people acting intelligently). It is a large ecosystem with many categories (see page 5 for a snapshot of the various techniques).

Traditional financial services firms are in the early stages of adopting AI technologies that can positively transform traditional processes for the better. Of our survey respondents,

32 percent of the group confirmed using AI technologies such as predictive analytics, recommendation engines, voice recognition and response.

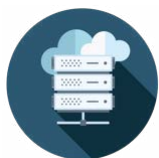


For those firms not adopting AI, challenges such as fear of failure, siloed data sets and regulatory compliance were cited.¹ Based on our survey, 12 percent of the overall group weren't using AI yet because they felt it was too new, untested or weren't sure about the security of it. Another key challenge for many financial

firms is that there is no clear internal ownership of testing emerging technologies — only 6 percent of those surveyed had an innovation leader or an executive dedicated to testing new ideas and processes. In the rapidly accelerating world of AI and the highly regulated environment of financial services, firms need someone, or preferably a dedicated team, to identify potential new solutions, track developments and run internal tests before widespread adoption.

It is an important time for financial services companies to understand how AI may fit into their strategy as the rate of competition and innovation accelerates across the business landscape.

Widespread adoption of cognitive systems across a broad range of industries will drive worldwide revenues from nearly \$8 billion in 2016 to more than \$47 billion in 2020 with banking named as one of the top two industries to lead the charge.²



Explosive Growth
in Big Data



Cheaper
Computational
Resources



Smarter
Algorithms



Cloud



Connected Devices

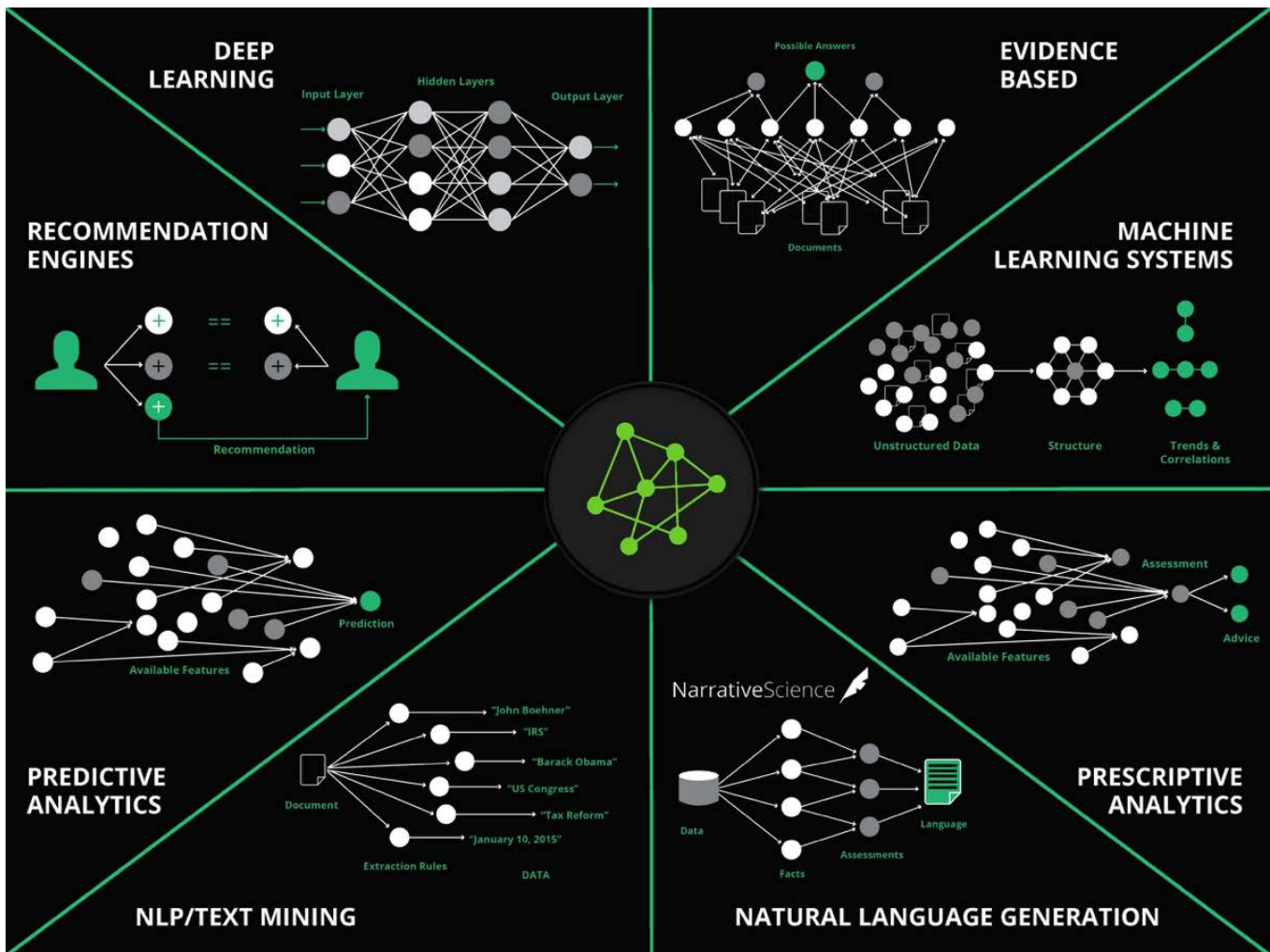
¹ Aite Group's "The Dawn of Inorganic Intelligence in Financial Services"

² <http://www.idc.com/getdoc.jsp?containerId=prUS41878616>

THE CURRENT CHALLENGES AND SOLUTIONS

AI has been creeping into financial services under a variety of names, assisted in no small part by related technologies such as digitalization, interactive voice response and image recognition and data mining for personal identity validation. Remote deposit capture³, for example, relies on AI to read the information on a smartphone's image of a check and it was first introduced to market in 2009 by USAA. NVIDIA, a leader in graphics processing units (GPUs), said that in just two years, the number of companies it collaborates with on deep learning has *jumped nearly 35x to over 3,400 while the speed of training deep neural networks increased by 50x in three years.*

Similarly, professional services giant Deloitte that engages 83 percent of financial services companies listed on the Fortune Global 500 launched Deloitte Catalyst⁴ to create a centralized and formal approach to tracking and implementing new AI technologies.



3 <http://www.nytimes.com/2009/08/10/technology/10check.html>

4 <http://www2.deloitte.com/us/en/pages/about-deloitte/articles/press-releases/deloitte-establishes-deloitte-catalyst-to-help-businesses-harness-transformative-technologies.html>

Siloed Businesses and Data

Many businesses have siloed divisions that have long defied being brought together either because of culture (e.g. capital markets) or regulation (e.g. medical care). Resulting siloed data pools present major obstacles for AI.⁵

AI relies on facile access to data, yet that data remains difficult to access. In fact, the bigger the data sets, the more intelligent the system can be as its' opportunity to learn and improve its' algorithms expands. *However, organizations faced common challenges when trying to leverage their data including a shortage of data science talent and data being distributed in silos.*



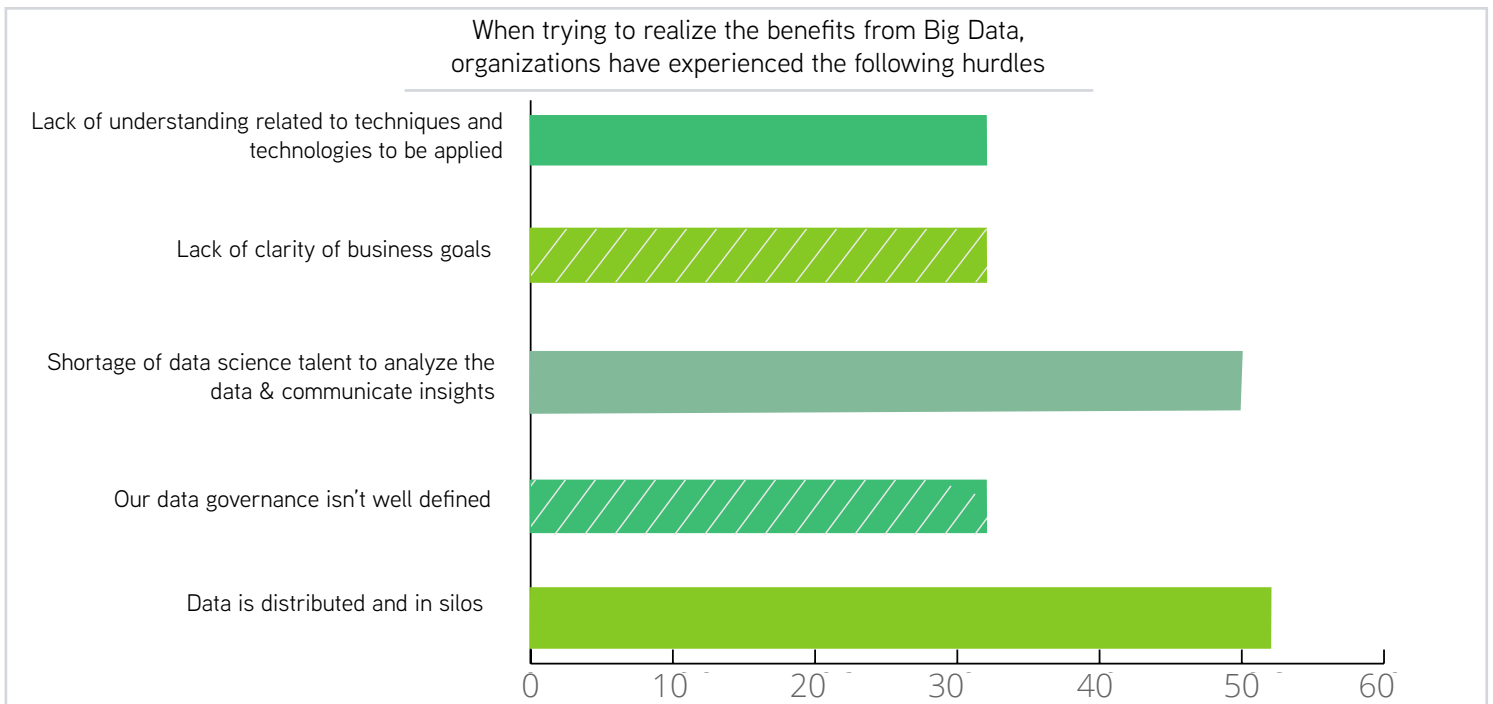
Given the vast quantities of data that financial institutions collect and generate every day, this most likely means these organizations lack a consistent data governance program. Banks, especially large banks that have grown through mergers and acquisitions (which is most of them),

often have customer data spread across multiple incompatible back office systems.

Solving the Data Divide

There are various ways to approach this problem. Several companies such as Teradata⁶ have developed ways to reach data wherever it lives in legacy systems and make it readily accessible for analytics. Teradata says they can reduce the time that data scientists spend on collecting data by 90 percent, leaving them to focus on analysis of data rather than organizing it.

Teradata and Facebook are working together on an open source development called Presto⁷, a distributed SQL query engine optimized for ad-hoc analysis at interactive speed and petabyte scale, according to Stephen Brobst, the chief technology officer at Teradata. Rather than requiring firms to integrate their data, Presto allows querying data where it lives, including Hive, Cassandra, relational databases or even proprietary data stores. A single



⁵ Aite Group's "The Dawn of Inorganic Intelligence in Financial Services"

⁶ <http://www.teradatamagazine.com/v15n01/Connections/5-Stages-in-Becoming-a-Sentient-Enterprise/>

⁷ <http://www.cio.com/article/2897605/facebook/facebook-releases-open-source-orc-reader-for-presto.html>

Presto query can combine data from multiple sources, enabling analytics across your entire organization's data sources. Although the adoption of Presto in financial services looks limited so far, Nasdaq⁸ and Kanmu⁹, a Japanese financial services startup, are both early users.

Overcoming regulatory hurdles with transparency

As financial services is a highly regulated industry. A 'black box,' or software where the analytical processes are hidden and not able to explain themselves, will not be acceptable to regulators. For AI to succeed widely in the financial services industry, a level of transparency is needed—one that allows the user to audit decisions made by intelligent systems.

The ability for intelligent machines to communicate their reasoning as to how and why they made the decisions they made will be essential. Stanford's recent study¹⁰ on AI's impact over the next 100 years states it well, "Design strategies that enhance the ability of humans to understand AI systems and decisions (such as explicitly explaining those decisions), and to participate in their use, may help build trust and prevent drastic failures, it's critical that engineers and designers create systems that communicate freely about how they work."

While transparency is lacking in certain AI technologies like machine learning, progress is consistently occurring with other AI technologies like natural language generation, a subfield of AI

that transforms structured data into explanatory language. Transparency will continue to grow as a matter of importance and it should be a part of protocol planning for any financial services organization considering building or implementing AI technologies now and in the future.

THE BENEFITS OF ARTIFICIAL INTELLIGENCE

Despite the challenges, AI is flourishing in some financial services firms as a variety of benefits stem from its use.

Enhancing customer engagement

At a time when the financial services industry needs to become increasingly focused on creating better customer experiences, the importance of high-quality, personalized communications has never been greater. AI can help make this possible—both automatically and at scale. The survey respondents with AI technologies deployed named personalizing communications at scale as a primary reason. Personalized communications and advice as enabled by AI are coming to bear in several ways.

There are robo advisors—online wealth management services that provide automated, algorithm-based portfolio management advice without the help of a human counterpart. Using AI, they collect information from users online and then develop an appropriate portfolio, usually using low-cost ETFs and passive index funds from companies like Vanguard. Algorithms can regularly

⁸<https://aws.amazon.com/blogs/big-data/nasdaq-architecture-using-amazon-emr-and-amazon-s3-for-ad-hoc-access-to-a-massive-data-set/>

⁹<https://code.facebook.com/posts/1713061232247212/building-the-presto-community/>

¹⁰ <https://ai100.stanford.edu/2016-report>

rebalance the portfolios to maintain the original investment guidelines and operate at costs less than 100 basis points, while advisors may charge 2 to 3 percent annually plus commissions on trades. Although the first were standalone operations such as Betterment and Wealthfront, robo advisors are now part of the offerings at leading fund companies such as Fidelity, Vanguard and Schwab.

Another example is the use of natural language generation but companies like USAA¹¹ that are applying the technology to generate tailored and actionable member communications explaining their investment portfolio and progress versus financial goals. When members interface with USAA digitally, they receive personalized write-ups detailing the performance of their individual portfolios in addition to top-level data about overall fund performance.

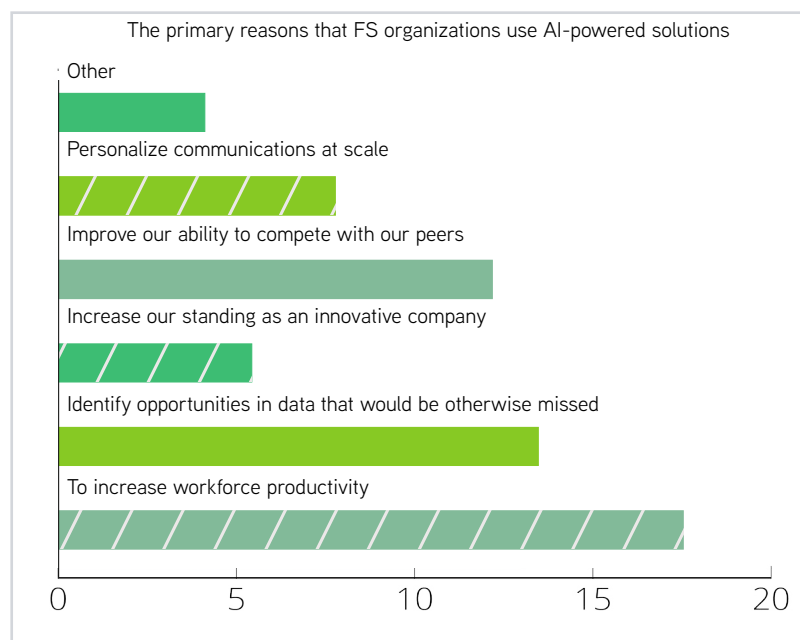
Achieving productivity gains with automation

Financial services firms have many highly repetitive processes that are oftentimes based on associated data like monthly client communications based on portfolio activity. These processes represent an excellent opportunity for AI-powered automation. This aligns with our findings as well—13 percent of survey respondents are using AI to enhance productivity.

Asset management firms like American Century

Investments use Advanced NLG to enhance the efficiency of writing its fund commentaries. By automating narrative reporting, asset management firms can scale delivery of more routine fund content and data updates across multiple strategies and markets, while allowing them to dedicate more of their expert resources to authoring in-depth investment perspectives and thought leadership material.

Another instance of AI enhancing productivity is IPsoft’s AI platform, Amelia, with natural language processing capabilities. The platform was fed a firm’s Q&A manuals and programmed to recognize patterns of common queries. By having access to the firm’s database of knowledge, it has learned the answers to the 120 questions most frequently asked by mortgage brokers and used in a bank to handle such financial queries, traditionally a time-intensive task.¹²



¹¹ <http://www.cnbc.com/2015/07/09/narrative-science-wants-to-kill-the-spreadsheet.html>

¹² IPsoft, “Amelia: Mortgage Broker Agent at a Global Bank,” 2016. [Accessed 29 June 2016].

Accelerating Fraud Detection and Minimizing Risk

For years, companies such as MasterCard¹³ have relied on AI to detect fraudulent transaction patterns and prevent card fraud but this trend is growing as more start-ups emerge that offer relatively low barriers to entry.

For example, Feedzai use machine learning to evaluate transactions and millions of data points in real-time. The company maintains an operational model and a challenger model that it constantly evolves as threats change. When the challenger model becomes more effective, it replaces the first model and a new challenger is created.

Another company, ThetaRay, offers a platform that enables financial institutions to detect threats such as lending fraud, ATM hacks, money laundering and cyber attacks. The company recently integrated with ING's standing risk engine to enable the bank to detect new instances of SME lending fraud hidden within massive amounts of transactional and organisational data—in real-time and with industry-low false positives. Beate Zwijnenberg, ING's director, fraud & cybersecurity, says that the team was impressed during a recent proof of concept with ThetaRay's ability to quickly identify a number of transactional anomalies.¹⁴ "The ability to detect fraudulent activity with this level of precision and accuracy is truly innovative," she comments.

Craig Muraskin, managing director for innovation at Deloitte, says that in risk management "the biggest challenge for risk is understanding and adjudicating what I need to pay attention to—whether I am an internal auditor or a chief risk officer."¹⁵ He adds, "There are limitations to what humans can do, what they can find. What we find as the opportunity here and is why we are so keen on the technologies, is that we think there is great opportunity to unearth levels of insight not previously possible when we are dealing with enormous volumes of data."¹⁶

Helping consumers spend more wisely

On the consumer side, AI is enabling people to make better financial decisions with augmented recommendations. Banking service apps like Moven and Simple let users track their spending and increase their savings with automated, personalized recommendations via a specialized debit card linked with their smartphone app. Brett King, CEO of Moven and the author of "Augmented Life in the Smart Lane", expects AI will take over many routine tasks associated with advice. He says, "For me, advice is the next big disruption. For instance, in banking you do need real-time advice. The ability of humans

¹³ https://www.mastercard.com/us/company/en/docs/Modeling_white_paper.pdf

¹⁴ <http://www.bankingtech.com/514602/ing-deploys-thetarays-analytics-solution-for-fraud-detection-in-sme-lending/>

¹⁵ <http://www.forbes.com/sites/tomgroenfeldt/2016/04/18/narrative-science-dynamically-automates-summaries-of-financial-information/3/#282e7d563f89>

¹⁶ <http://www.forbes.com/sites/tomgroenfeldt/2016/04/18/narrative-science-dynamically-automates-summaries-of-financial-information/4/#445ecb102348>

to provide that is poor and, as humans, we're inconsistent and we make mistakes. Artificial Intelligence will not."

Similarly, Simple uses machine learning combined with behavioral economics to understand a user's individual earning and spending to advise on what is safe to spend before the receipt of the next salary payment. By automating everything it can and going without brick and mortar stores, including providing online customer service that anticipates questions as a user types them into a phone, it has cut its costs and eliminated all fees, even for replacing lost debit cards.

According to research firm Gartner, nearly \$2 billion in online sales will be performed exclusively through mobile digital assistants by the end of 2016.¹⁷

The future of interactions

Popularized by Alexa, the charming voice of Amazon's Echo, talking to a bank, and receiving an intelligent, personalized response, is possible through apps such as Clinc or Personetics. At a leading industry event, Finovate Fall 2016¹⁸, several companies were demonstrating apps that could chat through Alexa or Facebook and this space is predicted to keep growing. Brian Roemmele, editor of The Payments Industry, thinks that in the next 10 years 50 percent of computer interactions will be by voice.¹⁹

Another firm, Kensho, combines highly scalable analytics and machine intelligence to understand complex issues—such as politics, financial reporting, natural disasters and regulatory actions—and their potential impact on financial market performance. It uses natural language for both queries and answers, and can complete its analysis in seconds at scale. NLG will play a huge part in making conversational-interactions possible whether is is conducting research, making transactions, getting advice or receiving real-time market data analysis.

Discussing the world of conversational interfaces, Narrative Science Chief Scientist Kris Hammond stated it well, "Going well beyond search, these systems will combine data analytics to determine the facts defined by the data with natural language generation to produce a more human interaction. And unlike most other conversational systems, these systems will actually know what you are asking about because they know what they are talking about."²⁰

While conversational-interactions as a universal interface with intelligence systems is still on the horizon, it isn't that far off as the substrate for interactive information access already exists in the form of advanced natural language generation systems. These systems already map data to meaning and language in order to generate their narratives. It won't be long before they are used to answer questions in real-time via conversation rather than generating complete documents as they're used today.

¹⁷ Gartner report "Predicts 2015: Digital Marketers Will Monetize Disruptive Forces" by Jennifer S. Beck, Mike McGuire, Adam Sarner, Andrew Frank, Jennifer Polk and Jake Sorofman.

¹⁸ <http://fall2016.finovate.com/>

¹⁹ <https://letstalkpayments.com/voice-commerce-voice-payments-the-future/>

²⁰ <http://www.computerworld.com/article/3094300/emerging-technology/conversation-as-interface-the-5-types-of-chatbots.html>

CONCLUSION

It is the early days of AI in the financial services industry but the technology is increasingly going to be more important to organizations to innovate and remain competitive. Based on our survey, roughly 10 percent of the organizations are using AI to compete with peers and identify opportunities in their data that would otherwise be missed. While this may seem like a small percentage as today, it is going to grow.


AI can improve communications with staff and customers, analyze data in multiple disparate locations to find patterns or connections that a human couldn't find and answer questions about investments in real-time via natural language. If you haven't already, it is time to start learning about AI technologies and strategizing for the future—better late than never.



Narrative Science is the leader in advanced natural language generation for the enterprise. Its Quill™ platform, an intelligent system, analyzes data from disparate sources, understands what is interesting and important to the end user and then automatically generates perfectly written narratives for any intended audience, at unlimited scale. A diverse range of companies such as USAA, MasterCard, American Century Investments, and the U.S. intelligence community utilize Quill to increase efficiency through the elimination of time-consuming, manual processes related to analyzing data and communicating insights, freeing employees to focus on high-value activities and better serving their customers.

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