
The era of connectedness: How AI will help deliver the future of banking

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Abstract How will the future model of financial services be delivered, and how can analytical tools leveraging artificial intelligence (AI) and machine learning create new forms of customer value? This paper begins by providing historical context around modern technological conveniences and explaining how this bring new forms of contextual interactions utilising personalised data and emerging technologies. Through examples from global technology firms, the authors explore how the absorption and optimisation of customer data lead to more pertinent advice centred around everyday life events, and where innovations in financial services could transform the banking industry. The paper uses pertinent industry use cases that demonstrate how financial institutions can build trust and empathy to create a deeper, more emotional connection between brand and customer. The paper reviews how modern applications of AI are collectively creating a more inclusive and equitable financial services ecosystem. These innovations will help deliver new value on top of evolving service platforms to create symbiotic relationships between health and wealth that could have significant multigenerational impacts. The paper concludes that there should be greater societal value derived from the financial services sector as it develops new algorithmic pathways towards broader and systematic financial security for the greater good.

KEYWORDS: AI, artificial intelligence, banking, digital, financial services, FinTech, innovation, technology

We will all choose what the future looks like by our beliefs and our actions . . . nothing is decided. None of us are spectators. The game is under way and we are all on the board. The only way to win is to think bigger and to think deeper.

— Garry Kasparov

Ever since the post-war industrial era of the fifties, modern conveniences have continually colonised our homes in the form of dishwashers, washing machines and microwave ovens. It must therefore have felt magical to simply wake up and have coffee already prepared. Subsequent changes in household consumption, the perception of leisure, the flight to the suburbs and the expansion of the American Dream towards one of home ownership and white picket fences were all part of the societal evolution of the last 70 years. As these day-to-day consumer innovations advanced into the lives of people, they increased their personal efficiency and freed up more time to pursue life's more meaningful pleasures — raising their 2 to 3 children, buying that new car, going on vacations, pursuing the greater arts, as well as enjoying that evening cocktail. Today's levels of convenience, however, have been made possible through technological advances and artificial intelligence (AI) that occupied the minds of only science fiction authors, not the scriptwriters of *Mad Men*.

Once promised flying cars, the world is now at the earliest stages of an era akin to that of the Robinson family of *Lost in Space* or more likely that of *Star Trek* — albeit one that is a bit more grounded. Rather than perpetually trying to find their way home or discovering new galaxies, home here on earth has become a central focal point of people's lives in ways that could not have been imagined decades ago. While science fiction focused on escaping earth's daily routines through exploration,

it turned out there was still much more to discover back home. Beyond creating simple conveniences and efficiencies, today's technological advances revolve around perpetual optimisation and mass personalisation, self-directed to create forms of customised value, where one's *true home* becomes a combination of shared physical space, cloud-based centralised identity and an array of platform-driven preference engines. Personal technology then begins to act as a focal point of a new form of ancient storytelling — entertainment, community, exchanging wisdom and education. People's *homes* — whether physical or virtual — will become increasingly surrounded by screens, voice-driven devices, augmented reality (AR), virtual reality (VR) and other technological layers that will provide a perpetual feedback cycle to (hopefully) improve other aspects of their lives.

This trend is already taking shape in real time. Smart homes dotted with intelligent devices like Amazon Echo and Google Home (over 40 million smart speakers are in use today), connected lighting and sound, cloud-driven security, smart thermostats like Nest, and Internet of Things (IoT)-driven home appliances, are all becoming more indispensable and normalised than not. At the recent Google I/O 2018, the search firm demonstrated an astonishing new capability with its Google Assistant to make calls on the user's behalf. Google envisions this new technology, named Duplex, will be able to carry out sophisticated conversations and complete the majority of its tasks fully autonomously. Not to be outdone, Microsoft chief executive officer (CEO) Satya Nadella recently showed off Xiaoice, a social chatbot, which can call and chat with users. While it was once hard to visualise what the Internet, cloud computing, or nascent elements of AI would become, a world of connected devices

feels much more personal and far more tangible with recent advances. It is easier than ever to imagine waking up with an intelligent system that takes care of many things for the householder, from making sure everything is working within the house itself to helping navigate daily activities. We can visualise this connected platform bridging all aspects of people's physical and digital lives, growing and learning their preferences and routines, and placing the family unit squarely at its centre. It is true that J.A.R.V.I.S. exists only for Tony Stark in Iron Man movies, but fragments of his all-knowing system are beginning to form a part of today's reality too.

An important element of this new era is how and where consumer finances will come into play. While financial institutions may be seen on the periphery of these technological advances (voice, AR, VR, AI, natural language processing [NLP] and machine learning), the question of *where* banking is heading into this future connectedness is one of critical importance — not only to its business model but to the groups of increasingly global and diverse consumers and their rapidly changing needs. Global and regional banks, many already considering themselves technology companies, need to be heavily involved *and invested* in the technological developments occurring within AI. The challenge here is that the global tech-driven businesses — Google, Apple, Facebook, Amazon, Tencent, Alibaba, Baidu and others — are already more advanced in leveraging these technologies, have deep relationships with most consumers, and increasingly pose a threat to banking's sprawling and less efficient business model. Most banks need to start at the beginning.

THE EVOLVING HEART OF MASSIVE INTELLIGENT INTERCONNECTED SYSTEMS

Despite the current zeitgeist around AI, it is hardly something new.¹ The academic discipline focused on a machine's ability to

match (or even surpass) human intelligence was born after the brilliant English mathematician Alan Turing published his groundbreaking paper 'Computing Machinery and Intelligence' in 1950. The 'Turing Test', developed the same year, evaluated a machine's ability to exhibit intelligent behaviour equivalent to that of a human. The race to build even faster and more intelligent machines was on. John McCarthy, an American inventor and computer scientist pioneer, coined the term 'artificial intelligence' in 1956 at the Dartmouth Conference, the first conference devoted to supercomputational intelligence. McCarthy and his peers soon established research laboratories at MIT and Stanford to take the field even further, but breakthroughs have taken time.

Since the study of AI began, the subsequent sixty years of research and development appear to pale in comparison with the success and progress seen in innovations powered by Silicon Valley's venture capital — the silicon chip and Moore's Law, personal computing, the Internet, e-commerce, cloud computing, social platforms and Satoshi's paper on cryptocurrency. Woven throughout the path of this digital revolution, of course, are breakthroughs in machine learning, NLP, learning algorithms, deep learning and other forms of AI. As with any science, the cycle of learning and deployment of AI rides on layers of knowledge and experience, often challenged and improved upon, and often done in ways the creators never imagined.

Innovative deployments of AI by Google, Apple, Facebook, Amazon, Tencent, Alibaba and Baidu are rapidly changing our daily lives. Today's technology platforms owe much to the decades of research and experimentation developed by Turing, McCarthy and their successors. These companies are doing more than getting people to click on more ads; they are now part of the creation of the *fourth industrial age*, powered by a growing ecosystem of intelligent devices, robotics and other

human-mimicking machines that will have a tremendous impact on the evolution of people's future selves. How people are first experiencing AI is very telling.

The power of AI and automated machine learning is already being felt in daily life. Anyone who has bought merchandise on Amazon would have come across its powerful recommendation engine that provides suggestions on what else to buy based on his or her buying history and the shopping behaviour of other such customers. AI is also prevalent in navigation applications, streaming services, virtual assistants, chatbots, ride-sharing and smart home devices. According to a Northeastern University and Gallup study, five out of six Americans already use these services today. While many households also experience daily voice interactions with Alexa, Google Home or Siri, it will not be long before these (and other) platforms assume a physical form too. Personal robots will soon be as much a part of people's lives as smartphones are today. For decades has this day been looked to with keen anticipation and preparation.

While sentient robots mostly existed in science fiction and popular culture (Hal from *2001: Space Odyssey* or Robot from the aforementioned *Lost in Space*), the space has seen ongoing innovation. One of the early notable robots was named Shakey, the first general-purpose mobile robot capable of reasoning about its own actions. Shakey was funded by Defense Advanced Research Projects Agency and developed between 1966 and 1972. Other types of robotics and AI machines have coexisted with humans over the past decades. Some of the more well-known examples include the IBM supercomputer Deep Blue, the first computer to beat the world chess champion, Garry Kasparov; Furby, the first domestic robot; IBM Watson, the computer that competed and won on *Jeopardy*; Google DeepMind's AlphaGo, which was programmed to be capable of teaching itself and defeated Go champions Lee

Sedol and Ke Jie; and those that are now powering Waymo autonomous vehicles (Figure 1).

AI AND A TRIO OF INNOVATIVE CATALYSTS

The latest advancements made in AI have not happened by accident. They have been propelled by a trio of innovative catalysts: investment, computational power and a continuous loop of more intelligent insights. While most skilfully used by global technology platforms, banks like Chase, Commonwealth Bank of Australia, BBVA, USAA and Santander are rapidly deploying solutions that leverage AI across a variety of business applications. What is now being witnessed in AI is only the very rudiments of what it can potentially do, and a multitude of young companies and venture capital firms want to be part of this wave.

The influx of startups focused on AI is simply staggering: 2,300 globally, half of which did not exist two years earlier. The number of venture transactions funding AI startups increased nearly 4.7 times, from 150 in 2012 to 698 in 2016. According to CB Insights,² total AI funding in 2017 reached US\$15.2bn, representing a 144 per cent increase from the previous year, spread over 1,349 deals (Figure 2).

Technology giants such as GAF A (Google, Apple, Facebook, Amazon) are making additional investments of tens of billions of dollars in both in-house development and acquisition. Of the nearly 120 AI startups that existed for the first time in 2017 (up 44 per cent from the previous year), 115 were acquired. Google is leading this race, with 14 acquisitions so far, followed by Apple, Facebook and Amazon. Intense competition for people, products and patents has erupted between the United States, China and other technology centres. International Data Corporation (IDC) forecasts³ that spending on AI and machine learning will grow from US\$12bn in 2017 to US\$57.6bn by 2021. Separately, research firm

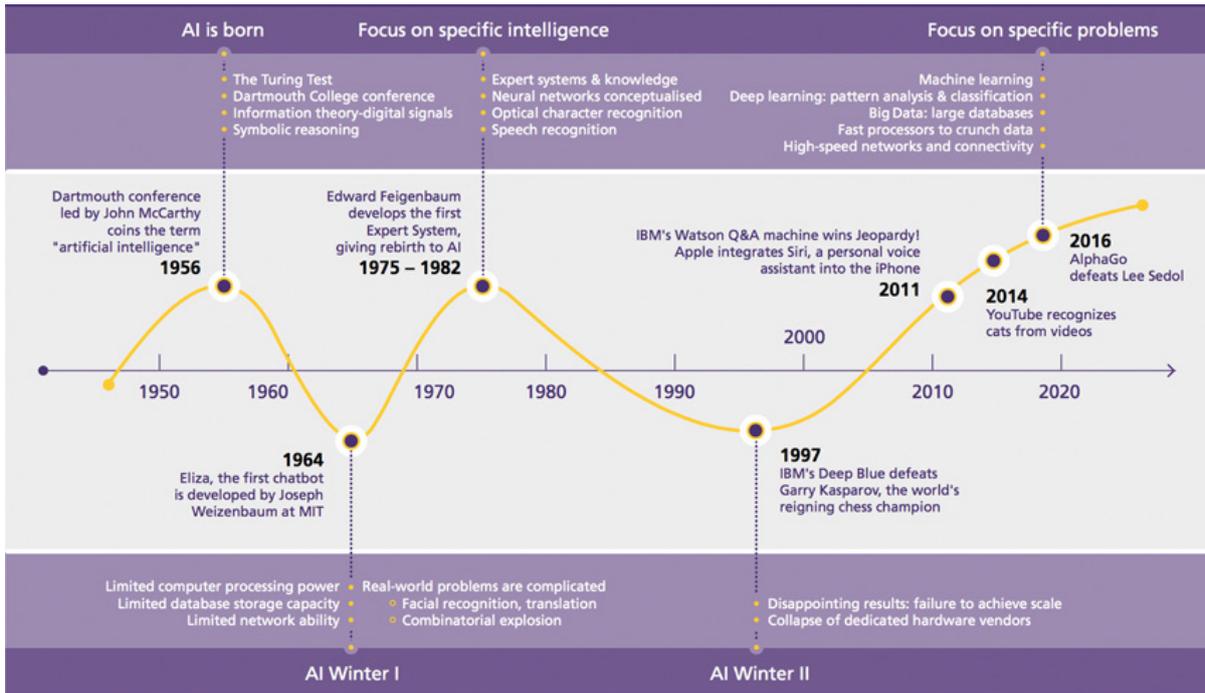


Figure 1: The rise of AI

Source: 'Artificial intelligence in logistics', *DHL Trend Research*, available at: <https://www.logistics.dhl/global-en/home/insights-and-innovation/insights/artificial-intelligence.html> (accessed 16th April, 2018).

AI sees 141% funding jump in 2017

Equity deals, 2013 – 2017 (excluding hardware-focused robotics startups)

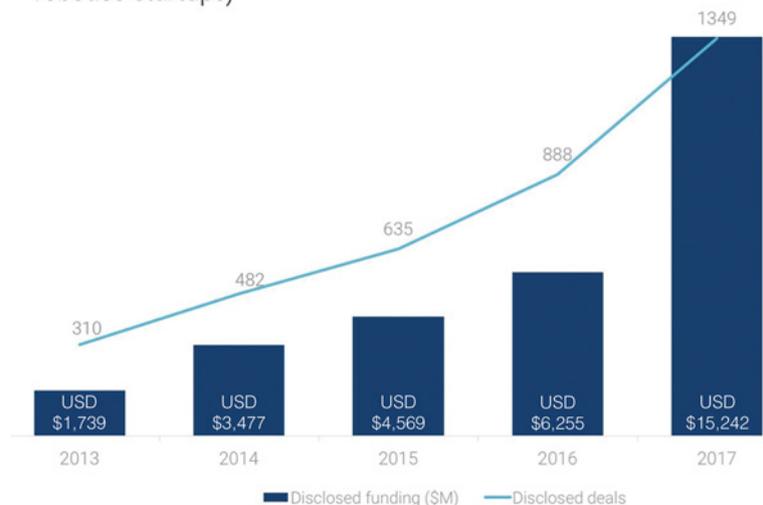


Figure 2: CB Insights — state of artificial intelligence 2018

Source: 'The race for AI: Google, Intel, Apple in a rush to grab artificial intelligence startups', *CB Insights*, available at: <https://www.cbinsights.com/research/top-acquirers-ai-startups-ma-timeline> (accessed 2nd March, 2018).

Tractica predicts⁴ that revenue generated from AI solutions will grow from US\$1.4bn last year to US\$59.8bn by 2025. While not all of these startups will be focused on financial services, banks are increasingly looking at AI startups, other industries and new types of data for sources of inspiration.

To understand how AI might be more fully leveraged the mechanism and computational power behind AI need to be understood. To characterise ‘data as the new oil’ is an understatement AI is the engine powered by data that gets more powerful and efficient the more it is fed. People can conceive of their daily lives as made up of all of their activities, which can be *translated* into sets of data points. With increased computational power all these data points can now be pulled together to create a profile of their behaviour (such as with a detailed understanding of individual spending patterns by looking at a subset of financial transactional data). Computers learn from these behaviours and not only call out anomalies but can increasingly predict outcomes to help consumers foresee what is most likely to occur, not what has already happened.

Massive technology platforms such as Facebook and Google rely on a business model built on harnessing personal data to drive digital experiences, display targeted advertising and cross-sell services to act as ecosystem reinforcements. While this type of product targeting has been at the heart of marketing efforts of financial services through statistical modelling and analysis for decades, such computational capability is now powering the apps on people’s phones using their personal data from the cloud in real time — this is a significant shift driven by the power of silicon and advanced algorithmic learning models. This same fundamental change can be seen in the type of *data exhaust* that people provide to these connected computational systems. In fact, fuelled by the massive amount of data, the marketing research industry is estimated

to be worth nearly US\$50bn according to *Visual Capitalist*.⁵ Everything from exercise, purchases, web browsing, social media posting, phone calls and text messages to biometric authentication, media download and financial transactions is tracked and logged. All of these digital breadcrumbs allow large tech companies to collect, analyse and construct detailed digital profiles of nearly every consumer.

Data is an integral part of everyday life, from the moment one wakes up to the moment one turns in for the night. Anyone going to bed with a digital health device such as a sleep tracker would be producing data even while asleep. According to IDC, data generation will total 44 zettabytes by 2020. Amid the abundance of data, however, ‘useful’ data and the imagination necessary to do something meaningful with it might be lacking. By itself, data is just 1s and 0s without much context. It needs to be cleaned, correlated, analysed — to be transformed into a critical input to algorithms and analytical engines, which yield insights and prompt actions. Unlike oil, there is seemingly no end to the sources of data that can feed AI. But much like the ancient elements that compose oil, financial services industry must continue to evolve to create new forms of value, or else it too will become extinct.

BUILDING COMPREHENSIVE FINANCIAL SERVICES PLATFORMS WITHIN THE FINTECH ECOSYSTEM

AI and the umbrella of associated cognitive tools have proved to be a catalyst for both business model reinvention and increased efficiencies within the financial services industry. Advanced analytic tools are casting a wide net of influence on financial application development. These include improvements in KYC (Know Your Customer), regulatory and compliance requirements, portfolio management, algorithmic trading, security, collections and fraud detection, insurance and

credit underwriting, customer service and engagement, predictive analytics and product fulfilment. With the rapid consumerisation of AI, the way customers interact with financial brands is expected to undergo a significant transformation. The transition from desktop and smartphone to voice, personal robotics and ever-present home connectivity promises to create an opportunity to build a much deeper and always-on connection.

Through AI and advanced analytics, it is now possible to provide a hyper-personalised, fully integrated and contextual relationship with the customer. One must communicate in a manner that demonstrates a deeper understanding of individual constraints and opportunities. The creation of segments, personas and customer journey maps is less meaningful when the possibility exists of building a one-on-one relationship derived from intimate forms of data. Although one may choose to build virtual agents, chatbots or voice-driven experiences, it is far more important to interact empathetically with customers. How banks go about addressing this challenge is important as these digital experiences redefine how bonds are formed. Innovation and collaboration initiatives have become table stakes for global financial firms. The most successful deployments of advanced analytics will be those firms with the most open partnership models. As financial activity becomes more unbundled, partnerships with startups across the spectrum of services become more critical.

One global bank that clearly sees promise in AI and machine learning is the Spanish giant Banco Santander. InnoVentures, Santander's \$200m venture fund (now the most active bank-backed FinTech investor), recently invested in three AI-focused startups. Pixoneye leverages stored photos to build customer profiles and unearth customer needs (eg photos of travel destinations might get you a travel partner discount). Gridspace analyses voice patterns in real time and determines the mood of the customer during service calls to adjust agent

scripts accordingly. Curve links customers' debit and credit cards to a single app and a Curve-branded Mastercard to optimise payments and better manage everyday spending. InnoVentures also invested in Elliptic, Socure and Personetics, all of which leverage customer data and machine learning. Adding more intelligent experiences into its digital-application stack provides ways to engage its customers and differentiate its service offerings.

Other banks have made notable investments across FinTech — and, like Santander, increasingly in AI. The most active European-based bank-led corporate investors are Santander, UBS, Deutsche Bank, Société Générale, BNP Paribas, Credit Suisse, HSBC, BBVA (Banco Bilbao Vizcaya Argentaria), Barclays, ING, UniCredit, RBS (Royal Bank of Scotland) and Crédit Agricole. Interestingly, 70 per cent of investments from these European banks went to US-based FinTechs. The top US-based bank investors include Citi, Goldman Sachs, JPMorgan Chase, Morgan Stanley, Wells Fargo, Bank of America, TD Bank, Capital One, U.S. Bank and PNC. These American banks have participated in 72 rounds totalling US\$3.6bn to 56 FinTech companies, according to CB Insights. Clearly, these institutions are focused on combating external threats and their evolving business models — but investment alone does not equal innovation. True innovation involves a long-term focus to apply these investments, partnerships and rapid internal developments towards services that customers love and are willing to pay for. Consider the following example.

Starling Bank, a UK-based challenger bank, has built an online marketplace that acts as a hub where customers can get a variety of products and services from Starling Bank as well as its partners. Its application programming interfaces (APIs) allow the bank to recognise where the purchases are made and automatically link up to the retailers' loyalty rewards programmes. Location-based intelligence enables the bank

to know when the customer is travelling. Rather than being the sole provider of all services, Starling is providing a platform to enable it to collaborate and provide broader value-added services to its consumers. The upside is that the bank is now acting as the centre of the consumer's financial life — which then also provides access to crucial behavioural insights and data points.

The origin of open banking and more expanded use of APIs — stemming from regulatory mandates around payment flows, personal data and transferability within the Second Payment Services Directive (PSD2) and the tighter privacy standards of the General Data Protection Regulation (GDPR), as well as other state-sponsored regulatory shifts designed to open up competition and innovation within financial services (eg MAS FinTech in Singapore) — are now starting to create new business models and new client value. The recent funding rounds of challenger banks such as Revolut, N26, Atom Bank and Bud seem to unveil a new horizon for banking — one that seeks to be hyper-focused on customer experience, transparency and data analytics. In many ways, the platform of services they are building is mimicking banks' past form of customer relationship — albeit with the potential to deliver far more capabilities and value. But how will neo-banks (and traditional banks for that matter) replace the personal connectivity of branches? As in all other industries, a deeper digital to human connection must be developed.

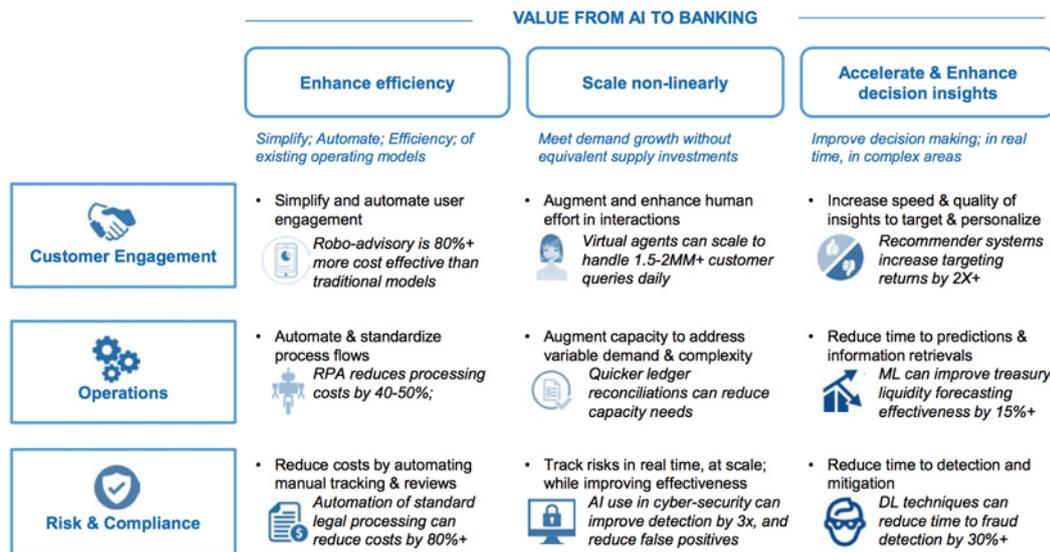
CREATING NEW FORMS OF CUSTOMER VALUE BY LEVERAGING PERSONAL DATA

'There is simply too much data out there than can be used to make better, more accurate, risk assessments which should translate into better pricing and services for everyone', Tadas Viskanta, founder and editor of investment blog *Abnormal*

Returns. Consider Wells Fargo's Overdraft Rewind feature roll out in November 2017 that will use data analytics to understand a consumer's spending pattern and alert them before they overdraft. Partnering with Personetics, banks can now provide information that helps customers avoid fees by simply walking a few blocks more to an in-network ATM. This is what banking should be about in the first place — to proactively serve the people in the community and help them attain their goals. The power of data and predictive analytics are their ammunition to achieve just that — and now the customer has the choice of creating positive outcomes in real time.

Gone are the days when customers would walk into the bank branch and deals were sealed with a handshake. Banks are closing branches at a rapid rate: in the US alone, the number of bank branches has dropped from over 99,000 in 2009 to less than 90,000 in 2017, according to the Federal Deposit Insurance Corporation. Consumers are increasingly conducting their transactions online and around the clock. The movement from high-touch in-person channel to faceless digital interactions necessitates a shift in mindset to meet the customers where they are, namely from Internet to mobile banking, and, most recently, voice banking. Citigroup's report⁶ 'The Bank of the Future' provides a good visual on where these areas of opportunity lie (Figure 3).

Digital-only transactions redefine the trust relationship that banks and their customers used to share. So how do financial institutions provide consistent and emotionally connective experiences across channels and touchpoints in this new era? With the dawn of the digital age, banks are no longer competing with other banks but with the likes of Amazon and Apple. These big tech entities have created a compelling customer experience that consumers have come to love — and expect — throughout their entire customer journey. And now



Source: Citi Digital Strategy, Citi Research

Figure 3: Value of artificial intelligence to banking

Source: 'The bank of the future', *Citigroup*, available at: <https://www.citivelocity.com/citigps/ReportSeries.action?recordId=72&src=Home> (accessed 18th April, 2018).

it is time for the banks to step up their game. One way they can do this is by truly leveraging customer's personal data in ways that are unexpected — by weaving a daily story from their transactions. First, however, they have to continue to prove they can protect it.

IDENTITY, TRANSACTIONAL DATA AND THE MACHINERY NECESSARY TO PROTECT THEM

As new business models emerge, the industry must leverage increasingly sophisticated forms of AI geared towards protecting growing forms of customers' personally identifiable information. Anomaly detection and customer profiling capabilities have been around for decades. When initial risk-based guardrails were created to spot potential fraudulent charges on credit cards, unless the customer explicitly contacted the financial institution to place a notice of travel on file, charges from out of the country would be flagged, and this transaction block limited

the liability of the cardholder and financial institution. Similar rules existed for charges that exceeded a certain amount or those done out of state. With globalisation and the proliferation of e-commerce, however, these proved to be insufficient. With more advanced computational power and analytics capabilities, financial institutions can now establish patterns based on historical transaction data and shared consumer and merchant activities. When abnormalities or uncharacteristic transactions are detected, account owners can be automatically contacted and further losses prevented.

Other improved methods of combating fraud are also available to banks: HSBC is incorporating technology from Ayasdi to tackle fraudulent activities such as money laundering and KYC. It is focused on gaining efficiencies from automating transactional data analysis and, like several other banking entities, seeks to gain a significant cost reduction by eliminating false positives in fraud detection. It has already seen a 20 per cent efficiency gain in initial pilots.⁷ Citi has

invested in Feedzai to detect and deter fraud within transactional applications. Like HSBC, Citi is working with Ayasdi (and Cylance) to learn how to leverage machine learning across its international networks. Wells Fargo has a range of new applications designed to identify payment fraud and employee misconduct by building out better digital product recommendations and fulfilment.

With more than two-thirds of all bank deposits and financial assets in their possession, totalling over US\$30tn of investable assets, financial exploitation is a problem especially for older adults because, among other reasons, they are more likely to suffer from cognitive decline. According to data from AARP's BankSafe initiative,⁸ as many as one in five older Americans are victims of financial exploitation, with each victim losing on average more than US\$120,000. Collectively, older Americans lose US\$3bn annually to financial exploitation, whereas financial institutions lose US\$1bn a year in bank deposits based on reported cases. Much of the financial abuse in the US is committed by family members, caregivers and friends. Earlier this year, Finra issued a new rule that requires brokers to ask customers to provide the name of a trusted contact and allow brokers to place a temporary hold on withdrawals from the account of a client suspected to be financially exploited, as part of an effort to protect seniors. But more can be done.

It is not just the older generation that are vulnerable. As reported by the *Financial Times*, in late 2017, Santander issued a warning that 74 per cent of its customers had been targeted by scammers with phishing e-mails, smishing texts and vishing calls. It is estimated that some 600 million scam attempts were made in the UK in the previous 12 months. Financial institutions need to put more measures in place to safeguard consumers' assets. One area the industry continues to explore is the use of voice identification as part of KYC and further personalisation.

VOICE- AND CHAT-DRIVEN CONVERSATION BECOMES THE NEW NORMAL

Banks around the globe are starting to leverage voice across their business line, and they include Chase, USAA, Santander, HSBC, ANZ, Abu Dhabi Commercial Bank and Barclays. One area of application is KYC — calling into the call centre where one's voice (and additional data attributes like location and device) identifies the caller as a customer and lets him or her bypass the dreaded set of (and extra time needed for) identity questions. Once authenticated, banks leveraging solutions from companies like Nuance or Ingenico can use automated voice prompts to listen to threads of a customer conversation to identify and fulfil fairly complex customer service needs, change languages midstream, cross-sell products and intelligently route calls to the appropriate service area — all without human intervention. They can also detect the mood of the caller based on their voice and determine when to escalate the call to a human customer service representative.

Banks are leveraging AI- and voice-driven customer workflows in other ways too. USAA, Atom, Gulf Bank and BNP Paribas employ services from companies like Daon, which uses voice (and additional biometrics) for authentication to gain access to their mobile apps, to provide alternatives for navigating between screens, and to provide responses to basic banking activities such as checking account balances. Similar to virtual assistants such as Siri or Alexa, these solutions still must get better at supporting more languages, dialects and accents (there are 7,106 spoken in the world, according to Day Translations⁹). As the ability to leverage voice becomes channel ubiquitous, better natural language processing and machine learning must ensure these solutions are inclusive.

AI-driven applications are also being added to chatbots, robots and physical locations. India-based City Union Bank customers can interact with its robot, named

Lakshmi, which can respond with basic account details. Mitsubishi created a robot, Nao, that analyses facial expressions and behaviour and can talk to clients in multiple languages. HSBC launched several learning chatbots (Andrew, Amy and Olivia) to answer client questions from various segments within the bank's internal and external social applications, such as Facebook. RBS leverages Luvo to help customers with simple financial tasks. Capital One and American Express customers can check their accounts and pay credit card bills through Amazon's Alexa.

And there is much more to Alexa than a simplified robotic voice. USAA has been experimenting with AI and machine learning for some time. Through its work with Cline, the bank has created a conversational interface that members can use to more fully understand their finances. Rather than requiring scripted requests about balances, USAA members can ask Alexa questions in more natural sentences, such as 'Can I afford the new iPhone?' or 'How much did I spend on that business trip to New York last September?' The key to what USAA has built is that it is experimenting with conversations around its members' money, not just a vocal command of online or mobile banking. How can the USAA Alexa app and similar efforts enhance day-to-day financial activities? The difference between algorithmic applications today and the learning systems of tomorrow will be time horizon and breadth of advice. Can the customer be told a compelling story with their data? Can attention and better outcomes be built over time? Rather than requesting information from the application, it can truly become an ongoing conversation around broader topics — whether they have immediate or much longer-term financial consequences. Everyday decisions, optimised towards a desired end state, all through a conversation.

As computational capabilities increase, life-enhancing applications will also proliferate, with likely significant societal

impacts. Like USAA's initial efforts with Alexa, the industry can create a deeper sense of intimacy that was not possible before. AI reinvigorates possibilities driven by customer centricity, by leveraging the data of the individual over time. It is no longer just current context, but an accurate roadmap to a desired future state. It helps build new forms of customer value — incremental steps towards further growing and stabilising new levels of financial opportunity. Much like social applications, how money is commonly used becomes a much larger part of this ongoing dialogue.

DAY-TO-DAY FINANCE FINALLY BECOMES A NATURAL PART OF THE CONVERSATION

While an average household has seven financial relationships across multiple providers, most consumers rarely switch their main bank and generally have three or more products with their primary provider. Through transactional data, one's primary financial partner theoretically should already have an understanding of the customer's financial goals. Many banks, perhaps fearing eventual competition from the engaging data-driven applications of FinTech players like Revolut, N26 or Monzo, are starting to work on ways to leverage AI to better predict consumers' financial needs. These include areas like helping customers better manage their cash flow and expenses and alert them before they overdraft — similar to recent services launched by Wells Fargo. Alternatively, AI can also be deployed to help consumers save more by detecting positive anomalies within direct deposits (Digit) or by rounding up transactions (Bank of America's Keep the Change). How can financial institutions leverage voice, chatbots and natural language understanding to study a consumer's behaviour and inquiries and help them achieve added financial security? It turns out that customers indicate what they need daily when they log in.

Chatbots are most commonly used for basic actions such as providing basic directions and answering simple questions. However, as the technology matures, it can do more. As suggested by Keith Armstrong,¹⁰ founder and chief operating officer of Abe.ai, AI-powered voice and chat applications can open up new engagement channels and act as a virtual financial coach for the consumers. For example, when a customer asks a chatbot about his or her account balance, the chatbot can in turn ask more questions to find the *real reason* behind the original request (perhaps the consumer wants to plan a vacation or invest money), turning the interaction into a more developed conversation and providing deeper insights for the consumers to act upon. CreditKarma, with its recent acquisition of chatbot Penny, plans to integrate a layer of advice on top of an aggregated view of an individual's finances. This can create an intelligent conversation around what the transactions of the day and week mean to larger goals.

To build trust through increasingly digital relationships, financial institutions must move beyond marketing products and create services that anticipate their customers' needs, help them achieve their goals and improve their financial well-being. Many banks already seem to be heading in this direction, including Goldman Sachs (with its purchase of Clarity Money) and Citibank (with its new app to aggregate finances to include non-customers). Morgan Stanley is also moving towards providing more tailored advice, via a new platform that aims to make their financial advisers more efficient. Most interestingly, its new system will include life events — a marriage, the birth of a child, special medical conditions, job relocation or other circumstances that create the need for particular financial strategies. Behind the scenes, this is all powered by AI.

Yet most financial applications still lack personally predictive properties because they work from incomplete data. If banks and FinTechs have failed to deliver insights

and value from first-party data within their own systems — the first principles of the customer relationship — the ability to predict the future will only get worse. While financial data alone can certainly be predictive — especially that which includes aggregated transactions across multiple relationships leveraging companies like Plaid, Yodlee, Quovo or MX — the types of *real value* that can be created come from the consideration of new subsets of information.

Data from mobile devices and apps, people's payment choices, connected commerce and social platforms — all combine to tell unique stories as consumers create terabytes of data every day. A simple trip to the grocery store or an online shopping site delivers a treasure trove of data that can create ongoing insights. This data acts as parts of a puzzle that can help determine what a consumer's true goals really are and where advice can be best placed and most optimised. With modern analytics, it becomes possible to provide a hyper-personalised, fully integrated and contextual relationship with the customer. How one communicates must demonstrate a deeper understanding of individual constraints and opportunities. Creating segments, personas and customer journey maps is less meaningful when a one-on-one relationship can be built derived from intimate forms of data. The degree of empathy that goes into interaction with customers is critical.

Working alongside humans, AI-driven applications can collate siloed data sources among providers to provide a clearer overall financial picture and work to create both trust and empathy. The resulting tangible benefits will enable consumers to eventually place further levels of trust with the one-to-one advice from their financial institution. These broad financial developments enhanced with AI will help people make the right decisions at the right time, or, more importantly, over time. This is where real wealth and legacy are created.

THE CULTIVATION OF WEALTH AND THE HARVESTING OF VALUE BETWEEN GENERATIONS

Nothing is as certain as death and taxes, it is said, but surely there is more to consumers' personal legacy that financial services firms can provide as average lifespans move towards the century mark. Increasingly, digital solutions are lagging behind consumers' needs as they age. And those services that connect the assets and opportunities between generations are falling short. With advice driven increasingly by forms of AI, this must change. How can technology be blended with human empathy to provide the best services to meet consumers' needs — and the connectivity of those of subsequent generations?

A 50-year-old today is vastly different from a 50-year-old twenty years ago. As consumers change and adapt to longevity, should not the way they plan for finances change accordingly? 'Age is but a number' — more effective means of financial planning should be dynamic and based on life events, instead of an arbitrary age. The way people live, where they live, their career aspirations and their family commitments (eg college tuition, financial caregiving of parents) should be a factor in determining how long they would need to work and their strategy for longevity. Taking into account all the data points and presenting customised recommendations and plan of actions for consumers is a task that can be performed well by AI and algorithms. In some ways, this type of solution exists — but mostly for high net worth clients. Technology has democratised personalised financial planning for the mass market.

As people get older, they likely have assets across different financial institutions. As consumers, how do they best figure out how much they own, what they owe, and what they can afford to spend on a daily basis? How will they best maximise the return on their assets from both tax and investment perspectives and ensure that they

have sufficient resources at their disposal, especially towards their later years? How can financial institutions leverage the data points on their customers, both within and outside of the ecosystem, to act as their trusted guide and help them navigate their financial lives? It is not just an issue with age, but a growing gulf of solutions between gender.

On average, women live six and a half years longer than their partners. In fact, 82.8 per cent of people aged 100 and above in the US are women. While conventional wisdom would dictate that women need a bigger retirement nest egg owing to longer life expectancy, compared with that of their male counterparts, many women have accumulated less financial assets and investing experience. They are likely to have taken breaks throughout their career or chosen a less demanding job in view of the need to tend to young children or parents. As a result, they also get paid less, and accrue lower savings than do men. 'The median income of women 75 and older is about US\$13,000 less than of older men — US\$19,043 versus US\$32,572', as reported¹¹ by Kevin Prindiville, executive director of Justice in Aging.

Financial technology, in particular AI and algorithms, can help women better plan for longevity and invest in funds that are more in tune with what they are looking for (eg funds that are focused on sustainability and gender equality). As reported by NIRS (National Institute on Retirement Security), women are 80 per cent more likely than men to be impoverished at age 65 and older. Ellevest (led by Sallie Krawcheck and Charlie Kroll) is one of the startups that aim to address the gender wealth gap. Another is LearnVest, founded by Alexa von Tobel in 2009. With personalised wealth management and AI-driven advice, all firms must become more capable of understanding the differing financial needs derived from age, gender, culture, race and other factors.

One such retirement account product (Acorns Later) offered by fast-growing

FinTech startup Acorns paints a telling picture of the vital role technology plays. On the basis of the investor's age, income, gender and other factors, the engine automatically recommends a retirement account and portfolio to the customers. 'Acorns Later removes friction from the decision-making process, getting back to our central product philosophy: make big decisions small', explained Noah Kerner, CEO of Acorns. Leveraging forms of AI stitches seemingly less significant decisions together to improve the creation of wealth opportunities.

Another fascinating wealth startup, Pefin, based in New York, is doing just that. Founded by Wall Street veteran Ramya Joseph, its mission is to look after the financial best interests of each of its customers in a way that embraces the unique individuality of his or her life. They use AI to understand their customers' complete financial picture and goals like buying a home, having kids, sending them to college and retiring in comfort, taking into account their current spending patterns, debt and investments, the economy, markets, social security rules, federal and state taxes and much more.

As financial applications such as Pefin and Acorns extend their breadth of advice by learning from billions of potential paths, assistance can be envisioned across other types of life choices: where one chooses to live or visit (how frequently one travels); what educational opportunities one pursues for oneself and one's children; what type of health care is affordably available (one's expected longevity, health and related financial implications); what line of work one chooses (and how one takes opportunities to improve one's financial position through one's career); whether one is able to start a business; how one spends one's leisure time (and subsequently one's money); how one is accumulating assets and how one plans to decumulate wealth to extend it to subsequent generations? There are a never-ending series of

questions that become more interdependent as they become further intertwined.

The breadth of advice includes thousands of micro decisions that lead up to larger critical paths. What will become integral to these digital applications will be the ability to consume and delineate between what data is critical and what is mundane as the digital exhaust we mentioned earlier is only going to grow. With an expanding and more extensive collection of APIs, data can now be gathered, shared and analysed across industries and circles of care that were never previously connected.

THE SYMBIOTIC RELATIONSHIP BETWEEN HEALTH AND WEALTH

How might the data be correlated between various aspects of a consumer's life and early warning be provided? How can siloed data from different devices and activities be processed to draw useful insights to enable behavioural change? Consider the startup Genivity, whose premise is based on connecting financial advisers to next generation heirs and their families through life stage, health risk and care cost planning. Its AI engine creates personalised projections on health and care costs based on the client's self-guided assessment on the platform, which then provides an opportunity for advisers and clients to revisit and revise their financial plans together.

Another potential area of innovation is around detection of cognitive decline. Many will develop a certain degree of reduced cognitive capacity as they age — especially now as more lives move beyond the century mark. The ageing can be expected to become forgetful; it might take them more time to pay a bill or they might make duplicate payments. Experts believe that mild cognitive impairment may be an early warning sign of memory disorders later in life. Imagine if such patterns are detected by a bank's systems; not only will the consumer

be able to take necessary precautions from health-care perspectives, but potential financial loss and exploitation may also be prevented.

The JPMorgan Chase Institute recently released their Deferred Care Report¹² that seeks to investigate how cash flow dynamics (in this case, tax refund payment) drives the timing of health-care spending. One of the important findings is that out-of-pocket health-care spending spikes when a tax refund payment is received, and a larger proportion of such spending by early tax filers, women and low-income Americans was deferred until a significant positive cash flow event. This raises two important questions worth exploring, as suggested by the Institute: Is it time to revisit the periodic disbursements of refundable tax credits? What are the ways to let families tap into excess payroll withholdings when they need them, as a cushion against an unexpected expense or larger than anticipated tax bill? How can technology and behavioural science principles be leveraged to smooth out income and help consumers save for emergencies? How will these intelligent systems improve financial services for broader segments of society?

ADVICE EVOLVES FROM BUILDING WEALTH FOR THE FEW TOWARDS ELEVATING BASIC NEEDS FOR THE MANY

How will the underbanked and financially underserved prepare for an extended lifetime without access to the same financial services as the wealthy? Millions of people remain locked out of the formal financial systems for want of credit histories. Machine learning and data analytics from non-traditional data sources (such as social media profiles) can help companies predict a borrower's ability to repay so they can extend fair credit to more people. The process is also more streamlined and automated as a result. An

example of this is Zest Finance's partnership with China's JD.com, where they turn shopping and other non-traditional data into credit data, creating credit histories from scratch. Startups like Bloom are also building a robust global credit infrastructure stored within the Ethereum blockchain to reduce fees, increase accessibility to credit and make credit scoring fairer. Additional efforts to widen the impact of technology on the global underbanked are being funded by organisations such as the Gates Foundation and the Omidyar Network. Progress has been made, but more work remains to be done.

As with most things in technology, however, this could have much longer-term implications. What if credit determination is only one part of the growing digital profile of global citizens? Similar machine learning techniques and algorithms can be used to analyse social worthiness among data points in all aspects of daily life, including how people behave through social media, in real-life activities, whom people choose to interact with, and how they all fit in with common aspirations. What if the outcome of this determines not only consumers' trustworthiness and the types of loans they have access to but what privileges and rights they are entitled to, what jobs and education they can get, and where they are allowed to live? The movie *Gattaca* and the sci-fi series *Black Mirror* imagined a world governed by such a system. The question is, how far along are we in the real world? Where do we draw the line, and what are the implications on global society when advanced analytics reduce opportunities rather than expand them? In April 2018, China announced it would roll out a plan to give all of its 1.4 billion citizens a personal score based on how well they behave. Will AI create a future that looks more like the movie *Minority Report*? Undeniably, financial services must be part of this critical conversation. There is simply too much at stake.

LOOKING TOWARDS A MORE INFORMED FINANCIAL FUTURE

As technology platforms like Amazon and Apple extend their reach into banking services, how should financial institutions respond? These firms have already gathered all the intimate details about the customers and have seduced them with their hyper-focus ‘free’ customer experiences. While finance is being reimaged by these big tech players, can big banks reposition themselves to stay relevant? As Chris Skinner wrote in his blog post,¹³ digital transformation is more than just an app. As AI helps usher in the fourth industrial age and becomes more embedded in people’s day-to-day lives, can a future be created that is less the apocalyptic world of *Blade Runner*, the dependent world of *Wall-E*, and one that is more like *Star Trek* — a utopian blend of met needs and exploration, a world where the concept of banking simply disappears — because it is no longer necessary.

With every cycle of technology disruption, there is inevitable talk of fear of the unknown and the impact it will have on humanity. Tech companies such as Facebook and Google are under scrutiny owing to the amount of data they are collecting and what they might be doing with these personal attributes — with, or without, public consent. What people are ultimately sacrificing in the name of personalisation and convenience is yet to be known; and society is still testing and learning. Before marching on towards the dystopian future, it may be time to pause and reflect.

How will banks and AI-embedded financial applications impact the greater good? As algorithms are playing an increasingly critical role in facilitating decisions and expanding access to people who have not been included in the formal financial system, it must be ensured that fairness and ethics are being upheld. While financial technology can help simplify people’s lives and nudge them towards better

behaviour and more desirable outcomes, can data privacy and security be maintained to ensure it is not used maliciously? Can transparency of decision-making be ensured to promote trust between humans and machines? Ultimately, how we leverage technology should be focused on understanding and meeting customers’ needs, not just creating more ways to sell additional products and expand the bottom line.

Financial services, like other transformative industries, must provide added forms of value for all members of society. To become true advocates, financial services firms must build new pathways to improve consumers’ financial security through an integrated set of tools, fair access to credit and financial education. Rapid technological advances have only begun creating an impact on humanity. Financial institutions act as both gatekeepers and enablers and have a critical role to play. Today’s footprint is tomorrow’s legacy. It is up to all in the industry to decide which path to take to ensure that what is done is most right.

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