

Seven technologies shaping the future of fintech

In the next 10 years, seven key technologies will drive business model reinventions while shaping the competitive landscape of the financial industry.

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Technological progress and innovation are the linchpins of fintech development, and will continue to drive disruptive business models in financial services. According to McKinsey analysis, seven key technologies will drive fintech development and shape the competitive landscape of finance over the next decade:

1. Artificial intelligence will drive massive value creation

McKinsey estimates that artificial intelligence (AI) can generate up to \$1 trillion additional value for the global banking industry annually.¹ Banks and other financial institutions are tipped to adopt an AI-first mindset that will better prepare them to resist encroachment onto their territory by expanding technology firms.

In financial services, automatic factor discovery, or the machine-based identification of the elements that drive outperformance, will become more prevalent, helping to hone financial modeling across the sector. As a key application of AI semantic representation, knowledge graphs and graph computing will also play a greater role. Their ability to assist in building associations and identifying patterns across complex financial networks, drawing on a wide range of often disparate data sources, will have far-reaching implications in the years to come.

Finally, analytics that incorporate enhanced privacy protections will foster minimal data usage, or the use of only relevant, necessary and appropriately

sanitized information, in the training of financial models. These include federated learning, a form of decentralized machine learning that addresses the risk to privacy associated with centralizing datasets by bringing the computational power to the data, rather than vice versa. Advanced encryption, secure multi-party computing, zero-knowledge proofs, and other privacy-aware data analysis tools will drive a new frontier in consumer protection.

AI applications will penetrate the entire spectrum of financial industry operations across front, middle, and back offices. Customer-facing applications include tailored products, personalized user experience and analytics services, intelligent service robots and chat interfaces, market trackers, automated transactions and robo-advisors, as well as alternative credit ratings based on non-financial data, and facial recognition authentication. Middle-and-back office applications include smart processes, enhanced knowledge representation tools (epitomized by knowledge graphs), and natural language processing for fraud detection.

Many financial institutions still use AI in a sporadic and scattered way, often only applying the technology to specific use cases or verticals. But bank industry leaders are transforming their operations by systemically deploying AI across the entire lifecycle of their digital operations. Notably, the financial industry is coming to realize that algorithms are only as good as their data. Attention is turning to gaining competitive advantage from previously under-used customer

¹ Source: "AI in banking: Can banks meet the challenge?", September 19, 2020, McKinsey & Company

behavior data collected via conventional operations. This will unlock the hitherto untapped potential of ecosystem-based financing, in which banks, insurers and other financial services firms partner with non-financial players to facilitate seamless customer experiences in areas outside their traditional remit.

For banks, the “AI-first” institution will yield greater operational efficiency via the extreme automation of manual tasks (a “zero-ops” mindset), and the replacement or augmentation of human decisions by advanced diagnostics. Improved operational performance will flow from the broad application of traditional and cutting-edge AI technologies, such as machine learning and facial recognition, to (near) real-time analysis of large and complex customer data sets. “AI-first” banks of the future will also adopt the speed and agility enjoyed by “digital native” companies and users. They will innovate at a rapid clip, releasing new features in days and weeks instead of months and years. Banks will also collaborate extensively with non-bank partners to offer new value propositions that are integrated across journeys, technology platforms, and data sets.

2. Blockchain will disrupt established financial protocols

Distributed Ledger Technology (DLT) allows the recording and sharing of data across multiple data stores, and for transactions and data to be recorded, shared, and synchronized across a distributed network of participants at the same time.

Some DLTs use blockchains to store and transmit their data, as well as cryptographic and algorithmic methods to record and synchronize the data across the network in an immutable manner.

DLT will increasingly underpin ecosystem financing by allowing the storage of financial transactions in multiple places at once. Increasingly, cross-chain technology, will facilitate blockchain interoperability, allowing chains established on different protocols to share and transmit data and value across tasks and industries, including payments processing and supply chain management.

Technologies such as smart contracts, zero-knowledge proof, and distributed data storage and exchange, which are key to existing fintech innovations such as digital wallets, digital assets, decentralized finance (DeFi), and non-fungible tokens (NFT), will continue to play a prominent role.

Moreover, traditional stakeholders, including institutional investors and funds, are gradually increasing the share of digital assets in their portfolios, broadening access to financing and elevating the potential of blockchain and DTL to disrupt established markets. For example, decentralized finance (DeFi), a form of blockchain-based finance that uses smart contracts to remove the need for a central intermediary, is taking off. The total locked-up value (TLV) of DeFi has surged by nearly 50 times in the past 10 months, with the sector now holding digital assets worth \$2.1 trillion. The fact that digital asset exchanges earned about \$15 billion in revenue in 2021 offers a further indication of blockchain’s mounting technological value.

DLT is also making a mark on government policymaking and regulation. According to a survey conducted by the Bank for International Settlements (BIS) in early 2021, about 60 percent of central banks said that they are testing or studying Central Bank Digital Currency (CBDC). The People’s Bank of China, for instance, has begun operational trials of a digital RMB effort based on permissioned DTL, paving the way for improved oversight of monetary policy and resource allocation at the macro level.

Other blockchain applications worthy of mention include:

- **Real-time transaction settlement:** Banks are using smart contracts to settle the collateral and cash part of a transaction at the same time. Transaction processing, securities lending, and equity trades can also be settled on the blockchain to improve the efficiency and scalability of cross-border sales. Meanwhile, trading securities supported by digital collateral on the blockchain makes for more efficient, transparent, and secure capital management, as well as post-transaction equity settlement.

- **Digital asset support services:** Institutional investors are seeking DLT capabilities, including tokenization for unlisted companies or private equity funds, spot exchange between established currencies and cryptocurrencies on digital exchanges, and custody services such as key escrow encryption on behalf of customers.
- **Authentication ecosystems based on zero-knowledge proof:** Customers are using agreed-to-share information from partner institutions to verify their identity online, face-to-face, or through phone calls, simplifying authentication procedures and offering streamlined access to health records and government services. Only information required for each specific transaction is shared, while all other data remains safely on the server of the trusted provider.
- **Decentralized finance (DeFi):** Decentralized non-custodial applications can replace intermediaries by automatically generating deterministic (or “always valid”) agreements. This makes it possible to obtain loans, make investments, or trade financial products without relying on financial entities under centralized management. DeFi adopts deterministic smart contracts, which eliminate counterparty risks and cut out the costs associated with rent-seeking intermediaries, while improving market efficiency with real-time transparency.

DeFi based on blockchain technology is ushering in a new era of opportunity, disrupting established traditional value chains and structures. As financial policies and regulations adapt, DeFi is set to massively expand.

3. Cloud computing will liberate financial services players

McKinsey research shows that by 2030, cloud technology will account for EBITDA (earnings before interest, tax, depreciation and amortization) in excess of \$1 trillion across the world's top 500 companies. Our research shows that effective use of the cloud can increase the efficiency of migrated application development and maintenance by 38

percent; raise infrastructure cost efficiency by 29 percent; and reduce migrated applications' downtime by ~57 percent, thus lowering costs associated with technical violations by 26 percent. At the same time, cloud can improve platform integrity through automated and embedded security processes and controls. Development, Security and Operations (DevSecOps), or the idea that security is a responsibility that can be actioned across an organization in step with the growth of its development and operations, is a primary example of a cloud-based feature that reduces technical risks through a consistent, cross-environmental technology stack.²

Financial institutions should be aware of three major forms of cloud services: public cloud, hybrid cloud, and private cloud. Public cloud means that the infrastructure is owned by cloud computing service providers, who sell cloud services to a wide range of organizations or the public. Hybrid cloud infrastructure is composed of two or more types of cloud (private, public) that are maintained independently, but connected by proprietary technology. Private cloud means that the infrastructure is built for an individual customer's exclusive use, deployable in the company data centers, or via other hosting facilities.

Looking ahead, we have identified several relevant cloud-computing trends:

- **Edge computing and edge cloud are essential:** Partition and development logic based on the relationship between edge devices, data centers, and the cloud is increasingly recognized in multiple industries. Development of the edge cloud is accelerating as 5G communication drives new interactions and synergy across the internet of things (IoT), cloud computing, AI and other technologies in areas like new retail, healthcare, industrial parks, smart cities, and industrial IoT.
- **Cloud containers are stimulating innovation.** Public cloud providers are actively pushing the implementation of container technology on cloud, allowing multiple workloads to run

² Source: "Cloud's trillion-dollar prize is up for grabs", February 26, 2021, McKinsey & Company

on a single operating system instance, and so reducing overheads and improving efficiency. This is driving innovation of cloud delivery models on the platform as a service (PaaS) layer. Cloud technology providers will increasingly focus on building platforms that incorporate container as a service (CaaS).

- **AI-cloud integration is on the rise:** AI-cloud platform applications are proliferating in fields like image and audio search, driving advances in high-value areas such as medical image recognition. Deep learning will continue to improve services for a broader range of users via cloud platforms.

Cloud computing liberates financial companies from non-core businesses such as IT infrastructure and data centers, while enabling access to flexible storage and computing services at a lower cost. At the same time, the cloud is spawning new formats such as open banking and banking-as-a-service, shaking up the age-old relationship between customers and financial service providers.

Financial institutions will continue to rely on the cloud as they onboard more agile capabilities, and launch new businesses that require high responsiveness to market and customers, and flexible scalability. Meanwhile, the at-scale application of big data analytics will boost demand for cloud-based elastic computing, which allows computing resources to be dynamically adjusted to meet shifts in demand.

Banks will also recognize the potential to adopt cloud-based microservice architecture at scale in the next few years, where application programming interfaces (APIs) unlock machine-to-machine communication, and allow services to scale independently without needing to enlarge the coding base of the overall offering. The next generation of core banking applications will spur a microservice-driven architectural transformation in banking.

4. IoT will drive a new era of trust in finance

After years languishing on the lower slopes of the hype cycle, IoT is finally coming of age, with important ramifications for financial services. IoT systems are composed of three layers – perception

and smart sensor systems, wireless communication networks, and application and operations support. On the sensor front, RFID labeling still has broad untapped potential to automate item identification and logistics management. IoT communication solutions are also expanding, casting a wider net for devices to communicate across wired and wireless networks, near-field communication solutions, low-power wide area networks, narrow-band IoT, connected end-point devices, and centralized control management. Finally, embedded-system and smart technologies are developing fast, enabling more intelligent communication with objects.

From the financial applications perspective, consider the fact that environmental, social, and corporate governance (ESG) considerations now govern many investment strategies and regulatory policies. For instance, several major countries have committed to achieving peak carbon emissions and carbon neutrality. Aside from broader use of renewable energy, success in achieving these goals will be predicated on the effective monitoring and management of industrial energy and power efficiency. This presents a perfect scenario for IoT applications. Carbon trading, for example, will be increasingly indexed to IoT measurements, opening new opportunities for astute players.

Meanwhile, insurers are using IoT to more accurately determine risk, while improving customer engagement and accelerating and simplifying the underwriting and claims process. Auto insurers, for example, have historically relied on indirect indicators to set premiums, such as the age, address, and creditworthiness of a driver. Now, data on driver behavior and the use of a vehicle, such as car speed and frequency of driving at night, are available thanks to IoT. The technology allows insurers to interact with customers more frequently, and offer new services based on the accumulated data. The sector is also ripe for efficiency gains, as customers often engage exclusively with agents or brokers; and only directly contact the insurer for policy renewal or claims handling. IoT can deliver benefits in the management of customer relationships, allowing insurers to establish more intensive and targeted customer contact.

In banking, IoT-based inventory and property financing, involving the integration of IoT and blockchain, is refining risk management by ensuring that accounting records match real-world transactions, facilitating a brand new system of trust. In shipping and logistics, IoT is shaking up traditional trade finance, allowing banks to develop new products based on goods flow tracking, such as on-demand liquidity, and other innovations delivered via smart contracts. Embedding banking services into wearables, for example digital payments, is another scenario under which IoT is bringing banks closer to their customers.

5. Open source, SaaS and serverless will lower barriers to entry

Speed and scalability are critical for new businesses and financial innovation, particularly amid the intense competition and winner-takes-all dynamics of the digital economy. Open source software, serverless architecture, and software-as-a-service (SaaS) have become must-haves for technology players and traditional financial institutions launching new fintech businesses.

SaaS allows companies to use software as needed without having to own or maintain it themselves, while serverless architecture removes the need for firms to run their own servers, freeing up time and resources for customers and operations. Serverless architecture also reduces cost because charges are linked to executed software code, and are not generated round-the-clock, regardless of business need. It also fosters flexible scaling that avoids idling and loss, improving development efficiency. Open source software is a godsend for companies looking to scale rapidly as it provides free-to-use source code that gives developers a head start in programming their own applications. In 2019, Quantum Black, McKinsey's analytics firm, released Kedro, an open-source tool for data scientists and engineers to create data pipelines, for example.

Each technology is value-generating in its own right, but they are most advantageous when used in combination; companies can quickly scale infrastructure, and develop and launch prototypes at low cost. However, traditional finance companies face significant challenges in leveraging the

technologies across IT organizational structures, development skills, and risk management capabilities. They will need to rethink their IT strategy, putting rapid response IT capabilities at the top of their fintech innovation agenda.

6. No-code and low-code will redefine application development

No-code development platforms (NCDPs), and their close relation low-code platforms, allow programmers and general users to develop applications through graphical user interfaces and configurations (e.g. drag-and-drop) instead of traditional computer programming. While still relatively immature, the platforms can reduce the need to hire scarce and expensive software talent.

From a technical point of view, NCDP is the combination and application of component reuse and assembly in software engineering, DSL (domain specific language), visual fast development tools, customizable workflow process orchestration, and design thinking. NCDP development is closely linked to the advance of cloud computing, DevOps, and other technologies that solve problems such as containerization, inflexible scaling, and maintaining high availability computing environments.

Companies often use NCDPs to accelerate the development of cloud-based applications while keeping business strategy synchronized. For example, as audit trails and document generation can be automated on no-code or low-code platforms, compliance can be maintained and improved. This is of great help for financial institutions and fintech companies that need to quickly respond to market shifts.

Google Cloud has invested in no-code software platform Unqork, and acquired AppSheet – one of the largest players in the low-code and no-code software market. Both services allow general staff to develop applications without having specialized coding skills. Alex Schmelkin, Unqork's Chief Marketing Officer, said that tasks that previously took years for financial services companies to complete can now be done within a few months after going "no-code". Unqork currently has about 100 programmers, mainly focusing on financial services.

No-code or low-code development platforms have the potential to liberate vital R&D resources to work on multiple projects at once, giving traditional financial institutions the advantage they need to compete with fintech start-ups, even as they pursue company-wide digital transformation projects.

7. Hyper automation will replace manual work

Hyper automation refers to the introduction of AI, deep learning, event-driven software, Robotic Process Automation (RPA), and other technologies and tools that improve decision-making efficiency and work automation capabilities.

RPA, which makes it easy for companies to deploy software robots such as chatbots at scale, is already a major component of digital transformation, but technology is constantly enlarging its boundaries. RPA's core function is to allocate the handling of workflow information and business interactions to robots, thereby automating and standardizing business execution. High repeatability, clear logic, and solid stability are the key criteria to validate RPA tech feasibility. In future, RPA will become more deeply integrated with AI, improving its effectiveness in dealing with more complex business scenarios, and further streamlining financial service provision.

RPA is already at work across middle and back-office operations, automating financial processes and accounting reconciliation for financial institutions. Areas where RPA is being deployed

include process automation for accounts receivable and payable, fund appropriation at shared finance and accounting service centers, work hour adjustment and review, automation of financial recording, reporting and treasury processes, and period-end accounting and settlement.

Replacing manual work with automation not only improves efficiency, but also reduces human errors, and allows businesses to respond to fluctuations in demand. While already well established among leading financial players, we expect RPA to penetrate more deeply throughout the industry. Accounts payable processes, for instance, have the potential to be 60 percent automated using robots that mirror human actions for basic paperwork and decision-making.

Unlocking future competitiveness

These key technologies and trends are becoming increasingly intertwined and integrated, giving massive impetus to fintech and financial industry innovation. As it stands, it is niche financial sub-sectors that are most adept at harnessing technological innovations to launch applications, generate value, and shape the competitive landscape. In future, traditional financial institutions will need to bring their considerable resources to bear to stay on top of the gathering wave of financial industry disruption.

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