



# Powering Innovation in Financial Services with Artificial Intelligence

The Business Case for AI Applications  
Built on MongoDB



# Table of Contents



AI investments in the financial services industry	3
Addressing the challenges of AI in finance	4
Use cases for implementing AI for financial institutions	5
Relationship Management Support with Chat Bots	5
Risk Management and Regulatory Compliance	6
Financial Document Search and Summarization	8
ESG Analysis	8
Transforming Credit Scoring with AI	10
Emerging use cases for AI in payments	12
Other Notable Use Cases	14
Next steps with MongoDB	15

# AI investments in the financial services industry



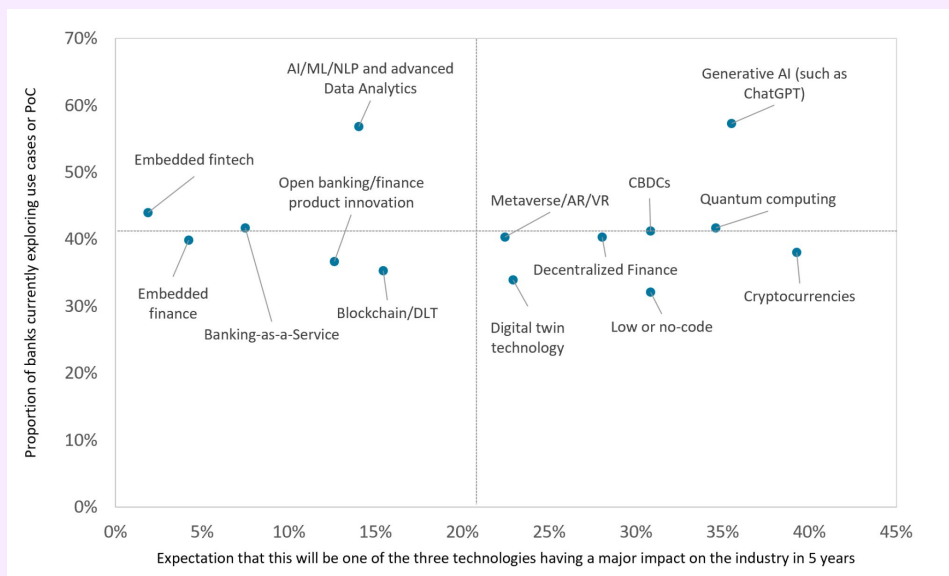
Financial Services is seen by Celent and McKinsey as one of the most affected industries from the [artificial intelligence](#) (AI) revolution. Already an integral part of the industry in areas such as risk, fraud, and compliance for example, the use of AI has been commonplace for years and continues to deepen, while there is a long (and growing) list of other use cases for which banks are also making use of AI.

AI technologies are used today to address a wide range of different workflows and customer-facing services from process automation and optimization in the middle and back office, to areas such as real-time risk and service personalization in the front office. However, it is to be expected that the benefits will be first in internal process optimizations and will only slowly start to be seen in direct customer engagement and interaction.

The conversation around Generative AI became more nuanced through the latter part of 2023. This is understandable given the complexities of applying large language models (LLMs) to sensitive customer data, as well as broader regulatory concerns over the explainability of LLM outputs. That said, there are many areas in which genAI is already being used to support advisors and relationship managers, with further innovation expected. According to Celent's [Harnessing the Benefits of AI in Payments](#) report, 58% of banks are evaluating or testing Generative AI in some capacity (as shown below) while a further 23% have projects using this in their roadmap.

**This ebook unpacks how major players in the financial services industry are starting to leverage AI to improve operations, deliver better outcomes for customers, and realize innovation.**

Many are also exploring Generative AI



# Addressing the challenges of AI in finance



While the industry has always had to deal with persistent issues like risk management and governance, adopting generative AI and machine learning introduces new challenges that AI specialists have always dealt with, like inherent biases and ethical concerns. One challenge that stands out for generative AI is hallucination – the generation of content that is not accurate, factual, or reflective of the real world.

Generative AI models, especially in natural language processing, might generate text that is coherent and contextually appropriate but lacks factual accuracy. This poses challenges, for example:

- **Misleading financial planning advice:** In financial advisory services, hallucinated information may result in misleading advice, leading to unexpected risks or missed opportunities.
- **Incorrect risk assessments for lending:** Inaccurate risk profiles may lead to poor risk assessments for loan applicants, which can cause financial institutions to approve a loan with a higher risk of default than the firm would normally accept.
- **Sensitive information in generated text:** When generating text, models may inadvertently include sensitive information from the training data. Adversaries can craft input prompts to coax the model into generating outputs that expose confidential details present in the training corpus.

A strategic and comprehensive approach encompassing aspects of technology, data, ethics, and organizational readiness is critical to overcoming these challenges:

- **Hallucination mitigation:** One promising strategy is using [Retrieval Augmented Generation](#) (RAG) to mitigate hallucination in gen AI models – incorporating information retrieval mechanisms to enhance the generation process to ensure content is grounded in real-world knowledge. [Vector Search](#) is a popular mechanism to support RAG, which uses vector search to retrieve relevant documents based on the input query.
- **Data quality and availability:** Take a step back before adopting AI to ensure the quality, relevance, and accuracy of data being used for AI training and decision-making can be accessed in real time.
- **AI Education:** The key is to invest in training programs to address skill gaps, create a culture of learning and development, and promote awareness about vulnerabilities.
- **Develop new governance, frameworks, and controls:** Before going live, create safe and secure environments for testing.
- **Implement monitoring systems:** Measure and understand financial impacts, change impacts, scale, and complexity associated with AI.
- **Security and privacy:** Implement cybersecurity measures to safeguard AI models and the data they rely on.

# Use cases for implementing AI for financial institutions



## Relationship Management Support with Chat Bots

One key service that relationship managers provide to their private banking customers is aggregating and condensing information. Because banks typically operate on fragmented infrastructure, this can require a lot of detailed knowledge about this infrastructure and how to source information such as:

- When are the next coupon dates for bonds in the portfolio?
- What has been the cost of transactions for a given portfolio?
- What would be a summary of our latest research?
- Please generate a summary of my conversation with the client.

Until now, these activities would be highly manual and exploratory. For example, a relationship manager (RM) looking for the next coupon dates would likely have to go into each of the clients' individual positions and manually look up the coupon dates. If this is a frequent enough activity, the RM could raise a request for change with the product manager of the portfolio management software to add this as a standardized report. But even if such a standardized report existed, the RM might struggle to find the report quickly. Overall, the process is time-consuming.

Generative AI systems have been shown to be able to facilitate such tasks. Even without specifically trained models, [RAG](#)

can be used to have the AI generate the correct answers, provide the inquirer with a detailed explanation of how to get to the data, and, in the same cases directly execute the query against the system and report back the results. Similar to a human, it is critical that the algorithm has access to not only the primary business data, e.g. the portfolio data of the customer, but also user manuals and static data. Detailed customer data, in machine-readable format but also as text documents, is used to personalize the output for the individual customer.

In an interactive process, the RM can instruct the AI to add more information about specific topics, tweak the text, or make any other necessary changes. Ultimately, the RM will be the quality control for the AI's output to mitigate hallucinations or information gaps.

As outlined above, not only will the AI need highly heterogeneous data from highly structured portfolio information to text documents and system manuals to provide a flexible natural language interface for the RMs, it will also have to have timely processing information about a customer's transactions, positions, and investment objectives. Providing transactional database capabilities as well as vector search makes it easy to build RAG-based applications using MongoDB's developer data platform.

# Risk Management and Regulatory Compliance

## Regulatory Compliance and Code Change Assistance

The regulatory landscape for banks has grown increasingly complex, demanding significant resources for the implementation of numerous regulations. Traditionally, adapting to new regulations has required the manual translation of legal text into code, provisioning of data, and thorough quality control – a process that is both costly and time-consuming, often leading to incomplete or insufficient compliance. For instance, to comply with the **Basel III international banking regulations**, developers must undertake extensive coding changes to accommodate the requirements laid out in

thousands of pages of documentation. AI has the capacity to revolutionize compliance by automating the translation of regulatory texts into actionable data requirements and validating compliance through intelligent analysis. This approach is not without its challenges, as AI-based systems may produce non-deterministic outcomes and unexpected errors. However, the ability to rapidly adapt to new regulations and provide detailed records of compliance processes can significantly enhance regulatory adherence.

## Risk and Fraud Prevention

Banks are tasked not only with safeguarding customer assets but also with [detecting fraud](#), verifying customer identities (KYC), supporting sanctions regimes (Sanctions), and preventing various illegal activities (AML). The challenge is magnified by the sheer volume and complexity of regulations, making the integration of new rules into bank infrastructure costly, time-consuming, and often inadequate. For instance, when the EU's Fifth Anti-Money Laundering Directive (AML) was implemented, it broadened regulations to cover virtual currencies and prepaid cards. Banks had to swiftly update their onboarding processes, and software, train staff, and possibly update their customer interfaces to comply with these new requirements. AI offers a transformative approach to fraud

detection and risk management by automating the interpretation of regulations, supporting data cleansing, and enhancing the efficacy of surveillance systems. Unlike static, rules-based frameworks that may miss or misidentify fraud due to narrow scope or limited data, AI can adaptively learn and analyze vast datasets to identify suspicious activities more accurately. Machine learning, in particular, has shown promise in trade surveillance, offering a more dynamic and comprehensive approach to fraud prevention.

Modernizing fraud systems improves detection accuracy, increases flexibility and scalability, enhances security, and reduces the cost of operation. MongoDB's developer data platform is a great fit for [modern fraud prevention systems](#) due to:

**Data visibility:** MongoDB’s document model incorporates any kind of data no matter how often it changes, allowing you to create a holistic picture of customers to better predict transaction anomalies in real time. As well as process large amounts of data and analyze in real-time to identify suspicious activity. [Change streams in MongoDB](#) enable the monitoring of database changes in real time meaning immediate detection of suspicious activity or transactions. By receiving instant notifications, fraud prevention teams can quickly respond to potential threats.

**Real-time data processing:** By leveraging MongoDB as the [operational data store](#) (ODS) you can handle large amounts of data to effortlessly capture, store, and process high-volume transactional data in real-time. [MongoDB’s aggregation framework](#) allows for complex data processing and analytics directly within the database, crucial for implementing sophisticated, rules-based fraud detection algorithms.

**Integrating with modern AI/ML technologies:** MongoDB’s flexible data model makes it easier to integrate with AI/ML platforms to develop models for real-time, predictive fraud prevention that are trained on the most accurate and relevant data available.

**Regulatory compliance:** Compliance with regulations like PCI, GDPR, CCPA, and PSD2 is crucial in the finance sector. [MongoDB’s security features](#) ensure data handling meets these regulatory standards. Enhanced authentication and role-based authorization controls further fortify the system.

Below is an [example architecture of an ML-based fraud solution](#) leveraging MongoDB and Databricks. Key features include data completeness through integration with external sources, real-time processing, AI/ML modeling to identify potential fraud patterns, real-time monitoring for instant analysis, model observability for full data visibility into fraud behaviors. [Learn more here.](#)

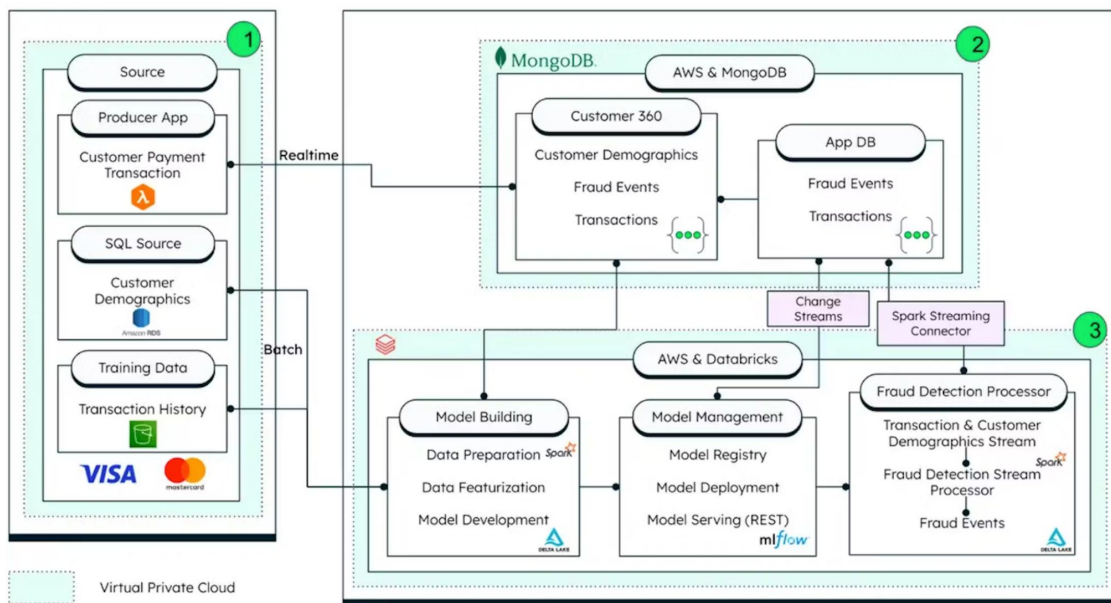


Figure 1. Example fraud detection solution leveraging MongoDB

## Financial Document Search and Summarization

Financial institutions, encompassing both retail banks and capital market firms, handle a broad spectrum of documents critical to their operations. Retail banks focus on contracts, policies, credit memos, underwriting documents, and regulatory filings, which are pivotal for daily banking services. On the other hand, capital market firms delve into company filings, transcripts, reports, and intricate data sets to grasp global market dynamics and risk assessments.

These documents often arrive in unstructured formats, presenting challenges in efficiently locating and synthesizing the necessary information. While retail banks aim to streamline customer and internal operations, capital market firms prioritize the rapid and effective analysis of diverse data to inform their investment strategies. Both retail banks and capital market firms allocate considerable time to searching for and condensing information from documents internally, resulting in reduced direct engagement with their clients.

Generative AI can streamline the process of finding and integrating information from documents by using natural language processing (NLP) and machine learning to understand and summarize content. This reduces the need for manual searches, allowing bank staff to access relevant information more quickly.

MongoDB can store vast amounts of both live and historical data, regardless of its format which is typically needed for AI applications. It offers Vector Search capabilities essential for [Retrieval Augmented Generation](#) (RAG). MongoDB supports transactions, ensuring data accuracy and consistency for AI model retraining with live data. It facilitates data access for both deterministic algorithms and AI-driven rules through a single interface. MongoDB boasts a strong [partnership ecosystem](#), including companies like Radiant AI and Mistral LLM, to speed up solution development.

**Discover more about MongoDB's full-text search and vector search capabilities**

## ESG Analysis

The profound impact of [environmental, social, and governance](#) (ESG) is evident, driven by regulatory changes, especially in Europe, compelling financial institutions to integrate ESG into investment and lending decisions. Regulations such as the EU Sustainable Finance Disclosure Regulation (SFDR) and the EU Taxonomy Regulation

are examples of such directives that require financial institutions to consider environmental sustainability in their operations and investment products. Investors' demand for sustainable options has surged, leading to increased ESG-focused funds. The regulatory and commercial requirements in turn, drive



banks to also improve their [green lending practices](#). This shift is strategic for financial institutions, attracting clients, managing risks, and creating long-term value. However, financial institutions face many challenges in managing different aspects of improving their ESG analysis. The key challenges include defining and aligning standards, processes and managing the flood of rapidly changing and varied data to be included for ESG analysis purposes.

AI can help to address these key challenges in not only an automatic but also adaptive manner via techniques like machine learning. Financial institutions and ESG solution providers have already leveraged AI to extract insights from corporate reports, social media, and environmental data, improving the accuracy and depth of ESG analysis. As the market demands a more sustainable and equitable society, predictive AI combined with generative AI can also help to [reduce bias in lending](#) to create a fairer and more inclusive financing while improving the predictive powers. The power of AI can help facilitate the development of sophisticated sustainability models and strategies, marking a leap forward in integrating ESG into broader financial and corporate practices.

[MongoDB's dynamic architecture revolutionizes ESG data management](#), handling semi-structured and unstructured data. Its flexible schema nature allows the adaptation of data models as ESG strategies evolve. Advanced text search capabilities efficiently analyze vast semi-structured data for informed ESG

reporting. Support for [vector search](#) enriches ESG analysis with multimedia content insights.

Incorporating Large Language Models (LLMs) enhances MongoDB's capacity to process ESG textual content, automating sentiment extraction, summarization, and trend identification. Combining LLMs with vector data management capabilities, generative AI applications can be created to interpret the complex and evolving sustainability taxonomy and guide the investment and financing processes in a compliant manner. This AI-driven approach, supported by MongoDB's robust data management, offers a sophisticated means of analyzing extensive narrative data in ESG reporting.

Furthermore, MongoDB supports geospatial and network graph analytics, providing a powerful combination of analytics to identify the physical risks associated with climate change (e.g., floods, wildfires) to assets financed by banks or investment firms and for assessing supply chain impacts of the climate risks. The risk analytics can then enable targeted strategies for risk mitigation and supply chain resilience.

MongoDB's value extends beyond ESG data management, accelerating productivity for developers and data science teams. Its intuitive data model, analytical tools, and AI integrations streamline the development and deployment of data-driven applications, making MongoDB pivotal for organizations advancing their ESG agendas efficiently.

Below is a diagram of an enterprise ESG solution architecture with the boxes labeled with the green leaf where MongoDB can be deployed to support the ESG data analytics related services.

**Learn how MongoDB makes it incredibly easy to collect, analyze, and visualize ESG data in real time**

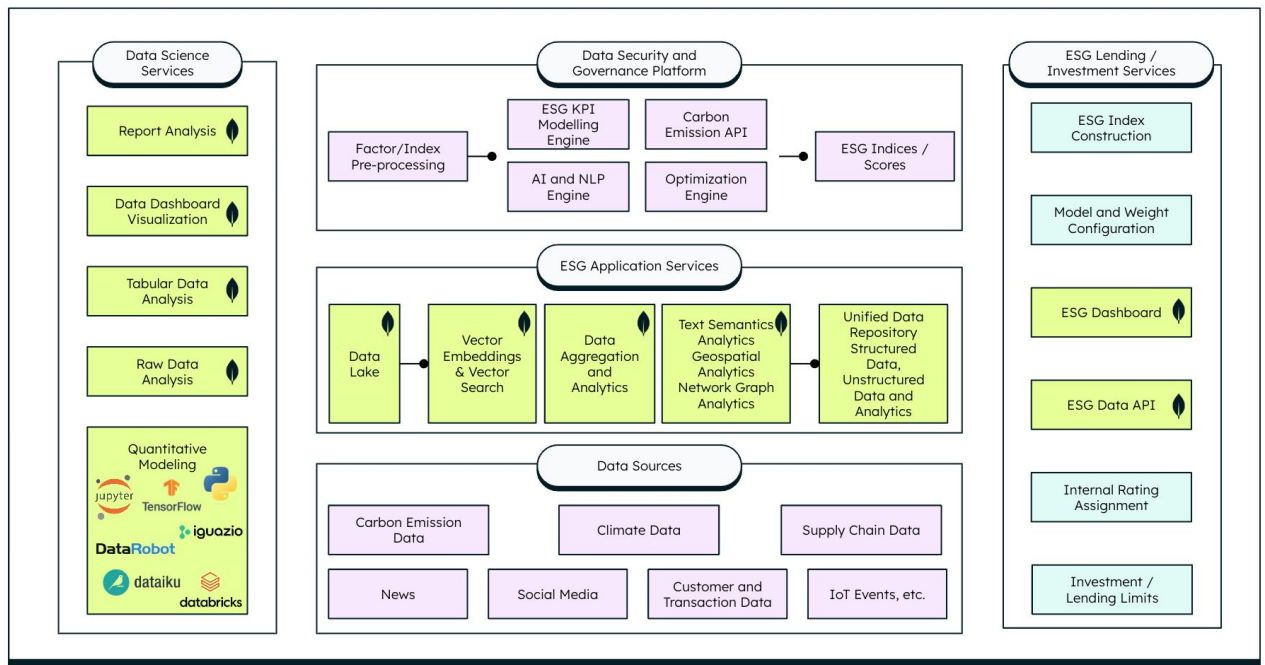


Figure 2. Blueprint for Enterprise ESG Solution Architecture Using MongoDB

## Transforming Credit Scoring with AI for the financial services industry

The convergence of alternative data, artificial intelligence, and generative AI is reshaping the foundations of credit scoring, marking a pivotal moment in the financial industry. The challenges of traditional models are being overcome by adopting alternative credit scoring methods, offering a more inclusive and nuanced assessment. Generative AI, while introducing the potential challenge of hallucination, represents the forefront of innovation, not only revolutionizing

technological capabilities but fundamentally redefining how credit is evaluated, fostering a new era of financial inclusivity, efficiency, and fairness.

The use of artificial intelligence, in particular generative artificial intelligence, as an alternative method to credit scoring has emerged as a transformative force to address the challenges of traditional credit scoring methods for several reasons:

**Alternative data analysis:** Unlike traditional models that rely on predefined rules and historical credit data, AI models can process a myriad of information, including alternative data such as utility payments and rental history, to create a more comprehensive assessment of an individual's creditworthiness, ensuring that a broader range of financial behaviors is considered.

**AI offers unparalleled adaptability:** As economic conditions change and consumer behaviors evolve, AI-powered models can quickly adjust and learn from new data. This continuous learning ensures that credit scoring remains relevant and effective in ever-changing financial landscapes.

**Fraud detection:** AI algorithms can detect fraudulent behavior by identifying anomalies and suspicious patterns in credit applications and transaction data.

**Predictive analysts:** AI algorithms, particularly ML techniques, can be used to build predictive models that identify patterns and correlations in historical credit data, forecasting the greater likelihood of loan defaults.

**Behavioral analysis:** AI algorithms can analyze behavioral data sets to understand financial habits and risk propensity. By monitoring real-time financial behavior, AI models can provide dynamic credit scores that reflect current risk profiles.

By harnessing the power of artificial intelligence, lenders can make more informed lending decisions, expand access

to credit, and better serve consumers (especially those with limited credit history). However, to mitigate potential biases and ensure consumer trust, it's crucial to ensure transparency, fairness, and regulatory compliance when deploying artificial intelligence in credit scoring.

The most common objections from banks to not using AI in credit scoring are transparency and explainability in credit decisions. The inherent complexity of some AI models, especially deep learning algorithms, may lead to challenges in providing clear explanations for credit decisions. Fortunately, the transparency and interpretability of AI models have seen significant advancements. Techniques like [SHapley Additive exPlanations \(SHAP\) values and Local Interpretable Model-Agnostic Explanations \(LIME\) plots](#) and several other advancements in the domain of Explainable AI (XAI) now allow us to understand how the model arrives at specific credit decisions. This not only enhances trust in the credit scoring process but also addresses the common critique that AI models are "black boxes."

GenAI has the potential to revolutionize credit scoring and assessment with its ability to create synthetic data and understand intricate patterns, offering a more nuanced, adaptive, and predictive approach. GenAI's capability to synthesize diverse data sets addresses one of the key limitations of traditional credit scoring – the reliance on historical credit data. By creating synthetic data that mirrors real-world financial behaviors, GenAI models enable a more inclusive assessment of creditworthiness.

Adaptability plays a crucial role in navigating the dynamic nature of economic conditions and changing consumer behaviors. Unlike traditional models which struggle to adjust to unforeseen disruptions, GenAI's ability to continuously learn and adapt ensures that credit scoring remains effective in real-time, offering a more resilient and responsive tool for assessing credit risk.

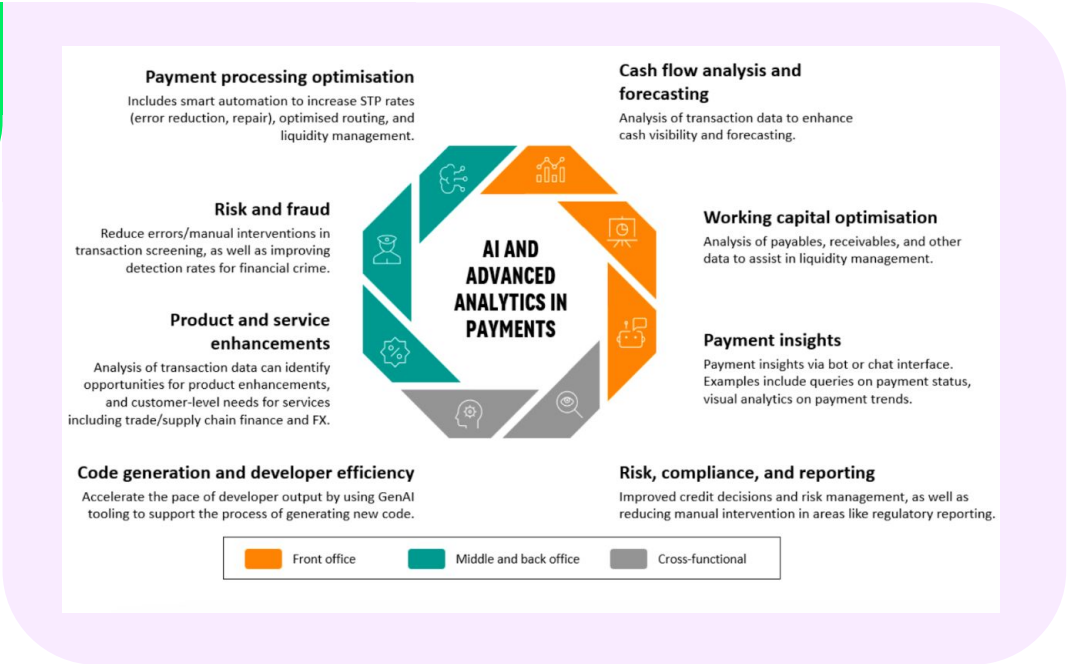
In addition to its predictive prowess, GenAI can contribute to transparency and interpretability in credit scoring. Models can generate explanations for their decisions, providing clearer insights into credit assessments, and enhancing trust among consumers, regulators, and financial institutions.

## Emerging use cases for AI in payments

A lack of developer capacity is one of the biggest challenges for banks when delivering payment product innovation. Banks believe the product enhancements they could not deliver in the past two years due to resource constraints would have supported a [5.3% growth in payments revenues](#). With this in mind and the revolutionary transformation with the integration of AI, it is imperative to consider how to free up developer resources to make the most of these opportunities. There are several areas in

which banks can apply AI to unlock new revenue streams and efficiency gains. The image below provides a high-level view on eight of the principal themes and areas. This is not an exhaustive view but does demonstrate the depth and breadth of current opportunities. In each example, there are already banks that have begun to bring services or enhancements to market using AI technologies or are otherwise experimenting with the technology.

### Use cases for AI in payments



Below are some areas [according to tech analyst Celent in which AI can be leveraged](#) across financial institutions in front, middle and back office operations.

### **Front office for new and richer insights:**

AI has huge potential to support value-added services making the most of payments data. Analysis of payables, receivables, and balance information in aggregate can be used to deliver a range of different insights and service improvements in real-time. Below are three areas where financial institutions can use AI to enhance their customer-facing services:

- **Cash flow analysis and forecasting:** Using the information in payment messages to provide granular and real-time insights into the cash position for a client.
- **Working capital optimization:** Using AI in conjunction with payments data can support a range of use cases around liquidity and management with insights and recommendations.
- **Payment insights:** Gen AI can support the delivery of payment and account insights to customers.

### **Middle and back office for workflow and process improvements**

AI and advanced analytics are already commonplace across large areas of middle and back-office operations for payment processing, but many potential opportunities for further enhancement still exist:

- **Payment processing optimisation:** One use case for machine learning is to further automate the payments repair process. AI technologies to improve transaction routing is another

important opportunity. A third would be in message translation or conversion between older standards and ISO formats, e.g. to translate unstructured name and address in ISO 8583 messages to structured ISO 20022 messages.

- **Risk and fraud:** As with the use case for payments repair, applying AI technologies in transaction screening can reduce the need for manual intervention.
- **Product and service enhancements:** Personalizing services is a huge area AI can help.

### **Cross-functional capabilities to increasing agility and efficiency**

AI technologies can also be used to support several cross-functional use cases within a bank:

- **Using Gen AI to support code generation:** This is a huge opportunity for institutions to increase developer efficiency.
- **Risk, compliance, and reporting:** Technologies such as machine learning, NLP, computer vision, and GenAI can all be deployed in various combinations to support processes such as risk management and regulatory reporting.

**Dive into Celent's report to learn more about the use cases above and understand how you can harnessing the benefits of AI in payments**

## Other Notable Use Cases

Below are a few more examples of where AI can be leveraged in financial operations:

**Risk modeling:** AI can create synthetic scenarios and data that can be used to stress test financial systems and Models.

**Personalized wealth management:** The integration of AI empowers institutions to offer personalized advice and solutions. By analyzing vast data sets, AI can help provide valuable insights for making informed decisions and optimizing investment portfolios. Wealth managers can customize investment strategies to individual preferences, risk tolerance, and financial goals.

**Algorithmic trading:** AI algorithms can analyze public market data and execute trades at speed, optimizing trading strategies.

**Generating financial reports:** AI can analyze financial data including transactions, invoices, and account statements, to automate reports being generated. By using AI and ML techniques, relevant information can be extracted where required.

These examples highlight several avenues for integrating AI within financial institutions. Embracing AI in financial applications promises enhanced risk management, operational efficiency, and superior customer experiences.

Therefore, it is essential for financial institutions to grasp the profound technological implications, scale, and intricacies associated with AI, particularly in crafting a generative AI strategy. Adopting a strategic and holistic approach that addresses technological, data, ethical, and organizational dimensions is imperative for navigating this transformative landscape effectively.

# Next Steps with MongoDB



MongoDB's unique blend of speed, flexibility, and robust security offers a compelling proposition for modern financial institutions facing a rapidly evolving landscape. Our ability to provide a scalable, resilient, and efficient data management solution, coupled with its commitment to ACID compliance, deployment flexibility and support for multi-cloud strategies, positions it as a leader in database solutions.

The conversation about leveraging MongoDB within the Banking and Financial Services sector doesn't end here. We invite you to delve deeper into MongoDB's capabilities and discover how it can drive your institution's digital transformation.

## Let's Keep the Conversation Going

To further explore how MongoDB can transform your organization, visit the [MongoDB for Financial Services website](#) for resources, documentation, and ways to get started.

See MongoDB in action, reach out to become part of our [Atlas for Industries](#) program and arrange an innovation workshop and more with industry experts where you can discuss the art-of-the-possible.

[Contact us](#) today and [click here for MongoDB solutions](#).



**Joerg Schmuecker**  
MD, Financial Services Industry  
[j.schmuec@mongodb.com](mailto:j.schmuec@mongodb.com)



**Wei You Pan**  
Director, Financial Services Industry  
[weiyou.pan@mongodb.com](mailto:weiyou.pan@mongodb.com)



**Shiv Pullepu**  
Principal, Financial Services Industry  
[shiva.pullepu@mongodb.com](mailto:shiva.pullepu@mongodb.com)