EXPLORING THE POWER OF GenAI FOR INNOVATIVE BANKING SOLUTIONS

Abstract

GenAI is an innovative technology that will significantly enhance banking through automation and decision-making processes. GenAI will not alter banking, but will transform the way banking works. This study, employing a qualitative approach, explores areas that have yet to be thoroughly investigated, highlights the innovative applications of GenAI within the banking industry, outlines prospective opportunities, and discusses the challenges, along with the strategies to overcome them. Several prominent banks have already identified practical applications for GenAI in routine operations, aimed at enhancing customer experience, reducing costs, and accelerating growth. This study, therefore, focuses on the diverse GenAI applications in banks for process automation, conversational AI for customer service, content creation, and data analysis that increase efficiency. The main challenges related to data privacy and security, algorithmic bias, and regulatory compliance are identified. The study emphasises the importance of ethical frameworks and responsible AI practices in harnessing GenAI's potential in banking. It will help organisations leverage this transformative technology to alleviate risks, create value, and bolster stakeholder trust.

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Introduction

Artificial intelligence (AI) is gaining recognition because of its significant potential to transform several industries, including the banking sector. Among the various branches of AI, Generative AI (GenAI) stands out as a promising tool for revolutionising banking operations and customer interactions (McKinsey, 2023). This technology can generate original content, provide innovative solutions, and automate repetitive tasks (Deloitte, 2023). GenAI integration is becoming increasingly significant as banks work to improve customer service, generate financial reports and compliance documents, optimise operations, and seize new opportunities.
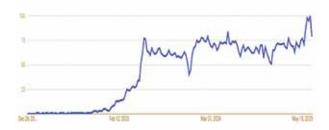
Figure 1: Google Trends popularity index of the term "GenAI" over the last three years (2022-2025)

The Google Trends image highlights how the popularity of GenAI has soared in the past three years. The trendline displays a sharply increasing upward slope that reflects the significant advancement and rapid adoption of text, pictures, and code-generating models such as ChatGPT.

Banks worldwide are rapidly adopting GenAI to improve efficiency, personalise customer experiences, and reduce operational costs. In the United States, JP Morgan Chase developed its Large Language Model (LOXM) for investment advice and contract analysis (JPMorgan, 2023). European institutions such as ING and BNP Paribas emphasise responsible AI use, aligning with the European Union's AI Act, which promotes transparency and risk-based regulation (European Commission, 2023). In the Asia-Pacific region, Bank of China leverages GenAI in customer service and smart credit decisions (Stanford AI Index Report, 2024). In India, banks such as ICICI and HDFC use AI for customer interaction, document verification, and loan processing in collaboration with fintech startups and supported by the RBI's digital innovation framework (RBI, 2024). These approaches reflect how regional priorities, regulations, and innovation ecosystems shape the adoption of GenAI in banking.

Prior research highlights the potential advantages of GenAI in areas like content creation, image and video generation, and natural language processing. However, its specific applications and implications in banking remain underexplored, which justifies the need for additional research. While the potential benefits are acknowledged, a clear understanding of its practical use, challenges, and prospects in the banking sector is still lacking.

Objective

This study aims to achieve the following objectives:

- ⊙ To explore the possible applications of GenAI in the banking sector.
- ⊙ To assess the benefits and challenges linked to integrating GenAI in banking processes.
- ⊙ To investigate how the banking industry can ethically and responsibly harness GenAI's potential.

Research Methodology

This study employs a qualitative approach, including content analysis, text mining, and semi-structured interviews with banking professionals, supplemented by case studies to elucidate practical use cases of GenAI in banking, thereby enabling readers to gain a comprehensive understanding of how the bank navigated various real-world scenarios.

The results from the qualitative data analysis provide a comprehensive overview of the current applications, associated challenges, and emerging practices related to the adoption of GenAI in the banking sector.

Application of GenAI in Banking

⊙ *Customer Service and Engagement*

Conversational AI, such as virtual assistants and chatbots using generative language models, can provide 24/7 support, answer customer queries, and give custom-made advice, all in a "human-like" way. It can understand natural language, grasp contextual nuances, and provide coherent and relevant responses. Thus, such systems help increase customer loyalty and reduce the human load (McKinsey, 2023). This will help enhance the efficiency of their agents and improve their overall customer experience.

⊙ *Automated Underwriting and Loan Processing*

GenAI models can extract relevant information from loan documents, automatically fill in forms, and generate personalised loan offer letters. This may simplify the process by analysing the applicant's data, producing a risk assessment, and

suggesting a credit decision within the established framework. Banks use GenAI to rapidly process loan applications, reducing manual workload and turnaround times while improving the accuracy of creditworthiness assessments. Ultimately, this results in quicker decisions, lower operational expenses, and increased customer satisfaction.

⊙ *Risk Management and Fraud Detection*

GenAI models continuously analyse transaction data to identify unusual or suspicious activities in real time. Analysing vast amounts of historical transactions with fraud schemes has helped identify inconsistencies and further prevent them from happening. GenAI models are significantly more efficient because they acquire knowledge of both new and old patterns of fraud, enabling them to provide more advanced solutions for reducing risks.

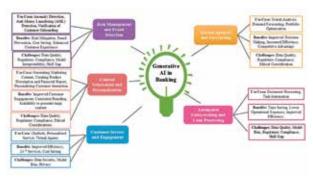⊙ *Content Generation and Personalisation*

GenAI can be used to automate the generation of many types of content, including marketing collaterals and financial reports, as well as product descriptions (BCG, 2023). It can create personalised content for individual customers. As a result, Marketing processes have become more efficient, significantly enhancing targeting and customer engagement.

⊙ *Market Analysis and Forecasting*

GenAI can analyse large datasets and generate insights by identifying patterns and trends that may not be apparent to humans. These models are capable of generating summaries, reports, and visualisations from complex data, making it easier for decision-makers. In investment banking, GenAI assists in portfolio optimisation by analysing market data and generating scenarios for risk management. It enables dynamic risk assessments and responsive asset allocation, enhancing investment strategies and outcomes for clients.

Figure 2 is a pictorial illustration of how GenAI can be applied across different banking operations. The central node represents GenAI in banking, branching out to key use cases. Each use case node can further branch into specific use cases, benefits, and challenges associated with that area.

Figure 2: Application of GenAI in banking

Use cases of GenAI in banking

The banking sector, which relies heavily on the concepts of security, trust, and customer focus, is about to undergo a significant transformation with the emergence of GenAI. The case studies below show how banks use GenAI.

Customer Service Chatbots
➤ Bank of America uses virtual Assistant Erica to handle customer queries. It uses natural language processing, which is trained on large datasets of customer interactions and financial information.
➤ Benefits:
  ▪ It provides continuous 24/7 assistance, offering tailored advice and recommendations based on individual customer profiles and financial behaviours.
  ▪ Daily, Erica is handling nearly 1.5 million clients.
  ▪ Erica contributed to a 19% increase in revenue by recommending new services and products during conversations.

Loan Application Processing
➤ JP Morgan has implemented a GenAI-powered Contract Intelligence Platform (COIN) to review and extract crucial information from loan agreements, significantly reducing the time required for this task. This has improved operational efficiency and reduced human errors in analysing complex legal documents.
➤ Benefits:
  ▪ COIN can perform the task of 360,000 hours in a few seconds.
  ▪ It has helped to save $6 million per year by cutting down the time and resources required for reviewing the document.

Fraud detection and risk assessment
- ➢ HSBC Bank has implemented a GenAI-powered trade finance solution called Tradeforce to analyse data from trade documents and accelerate the approval process. It streamlines and automates the processing of import-export documents.
- ➢ Benefits:
  - ▪ It understands and categorises document content.
  - ▪ It can identify potential discrepancies, generate risk assessments, and provide recommendations for decision-making.
  - ▪ It can spot suspicious transactions.
  - ▪ It reduces compliance risks associated with manual document processing.

Content Generation and Personalisation
- ➢ An AI model has been launched by Morgan Stanley to provide financial advisors with instant access to a comprehensive repository.
- ➢ Benefits:
  - ▪ It enables investment professionals to locate and compile answers to finance and investing queries swiftly.
  - ▪ It delivers tailored, real-time analysis.

Data Analysis
- ➢ By analysing vast datasets beyond traditional credit scores, Zest AI enables fairer lending decisions and improved risk assessment.
- ➢ Benefits:
  - ▪ It improves the credit underwriting model while ensuring compliance.
  - ▪ The auto-decisioning systems can expand access to affordable credit, ensure consistency in decision-making, effectively manage risk, and ultimately optimise resources.

Challenges of GenAI in banking

⊙ *Data Privacy and Security*

Banks handle vast volumes of sensitive personal and financial data. This raises concerns about data privacy, unauthorised access, and the risk of data breaches or inadvertent data leakage through AI model outputs. A bank using GenAI for customer service must ensure data anonymization and compliance with data protection laws. Any failure can lead to legal penalties or reputational harm.

⊙ *Model Bias and Fairness*

GenAI models can perpetuate or even exacerbate historical biases present in training data, risking unfair outcomes in areas such as loan approvals or credit scoring. When a GenAI model is trained on biased lending data, it might systematically discriminate against certain demographic groups, leading to unequal access to loans or unfavourable terms for minority applicants.

⊙ *Cybersecurity Threats*

While GenAI can enhance fraud detection, apprehensions exist about the vulnerability of AI systems to cyberattacks and the implications of AI on the overall health of the financial system. Cybercriminals can exploit GenAI to craft sophisticated phishing schemes, generate fake identities, or bypass security measures. Fraudsters use GenAI to generate deceptive messages or simulate user behaviour, making it harder for banks to distinguish legitimate transactions from fraudulent ones.

⊙ *Ethical Considerations*

The use of GenAI in banking sparks ethical apprehension regarding potential job losses from automation, the dilution of human judgment, and the risk of decisions that lack empathy or fairness. GenAI models are prone to producing confident but factually incorrect outputs, known as "hallucinations," which can be catastrophic in the banking industry. To tackle this problem, banks must incorporate human expertise into their decision-making processes at every step (Königstorfer, 2020).

⊙ *Regulatory Compliance and Transparency*

Banks operate within a strict regulatory framework. A key challenge is balancing automation with regulatory compliance, especially since many GenAI models function as "black boxes" with limited explainability and interpretability, which complicates regulatory audits and customer trust. Additionally, this may hinder the meeting of transparency and accountability requirements in decision-making processes.

⊙ Integration and Technical Complexity

Banking systems are complex, with legacy architectures that may not be easily integrated with advanced GenAI solutions. Incorporating GenAI into legacy banking systems can be complex, costly, and resource-intensive. Technical challenges include data fragmentation, system incompatibility, and the need for scalable and robust AI infrastructure.

⊙ Talent and Skill Gaps

There is a shortage of professionals with the technical, ethical, and regulatory expertise required to implement and govern GenAI effectively. A mid-sized bank struggles to deploy GenAI tools effectively because it lacks in-house expertise to train, fine-tune, and monitor the models.

Discussion

The insights gathered from semi-structured interviews with banking professionals revealed a growing shift toward GenAI adoption across banking services. Respondents have affirmed that GenAI is no longer experimental but a core enabler of operational excellence, innovation, and customer-centricity in the banking sector.

Banking professionals have highlighted several high-impact use cases of GenAI that are already being implemented, including customer service automation, fraud detection, risk analysis, document verification, KYC automation, and market forecasting. The respondents emphasised that GenAI is not merely a tool for process improvement, but also a strategic necessity. It enhances efficiency, personalisation, and security— the three pillars of modern banking. With rising customer expectations and operational complexity, GenAI is considered instrumental in achieving scalability, innovation, and competitive differentiation.

Despite its potential, GenAI adoption is accompanied by critical implementation and ethical challenges. Key barriers include regulatory compliance, integration with legacy systems, limited in-house AI expertise, and data security concerns.

To prepare effectively for the future, banks should adopt comprehensive frameworks that outline key short-term and long-term steps for harnessing GenAI effectively.

Immediate Actions and Pilots	Strategic Transformation and Scaling
1. *Assess and Prepare Data Infrastructure:* • Audit data sources for quality, fragmentation, and regulatory compliance to ensure a foundation for AI projects. Unified and clean data is essential for sophisticated applications such as client identification and fraud detection. • Address data sensitivity and privacy issues by evaluating options for synthetic data, which can help banks test GenAI models while avoiding regulatory breaches.	*1. Scale GenAI Deployments Across Business Functions:* • Expand AI models for unified client identification, advanced fraud detection, risk management, and personalised customer offerings using frameworks that combine GenAI and Graph Neural Networks. • Use GenAI for continuous data augmentation to tackle imbalances and enable fair, interpretable, and unbiased credit models.
2. *Pilot Practical Use Cases:* • Launch limited GenAI pilots in low-risk, high-value areas such as generating synthetic data for testing, enhancing credit scoring models, or initial anti-fraud modules. • Identify and benchmark GenAI algorithms according to business objectives.	*2. Institutionalise AI Governance and Risk Management:* • Regularly update transparent and fair institutional policies regarding AI applications, building on lessons from initial pilot projects and evolving regulatory norms. • Monitor for new legislative directions (data privacy, explainability) and update governance frameworks to align with changing expectations.

3. *Build AI Literacy and Cross-functional Teams:* • Form multidisciplinary teams involving IT, data science, compliance, and business experts to handle AI design, ethical use, and integration. • Invest in GenAI literacy across the organisation.	3. *Holistic Modernisation and Integration:* • Move further towards microservices and advanced architectures, integrating AI-driven modules. • Ensure systems are robust, scalable, and secure so AI adoption doesn't introduce new technical debts.
4. *Establish Governance and Compliance Protocols:* • Develop guidelines for explainability and transparency in GenAI outputs. • Begin drafting policies around data augmentation, model retraining, and proper handling of synthetic outputs to support regulatory audits and minimise bias.	4. *Enhance Model Robustness, User Experience, and Trust:* • Develop user-friendly, transparent GenAI interfaces for customers and staff, focusing on clear output explanations, source citations, and seamless integration into existing workflows. • Incorporate transparent controls, human oversight loops, and clear communication to foster trust in AI-generated insights.
5. *Modernise Tech Architecture:* • Start small-scale modernisation from legacy systems to systems that are more compatible with AI-powered applications. • Test integrations with existing platforms and set up robust security frameworks to protect against vulnerabilities in AI workflows.	5. *Address Societal, Ethical, and Workforce Impacts:* • Conduct ongoing reviews and adaptation to minimise bias, prevent discrimination, and ensure inclusion as models become more central to operational decisions. • Prepare the workforce for augmented roles, prioritising upskilling and worker engagement as part of AI transformation strategies.

Conclusion and Policy Imperatives

In the rapidly evolving banking sector, embracing an AI-first approach is no longer an option, but a necessity. GenAI presents significant opportunities for the banking sector to enhance customer experiences, streamline operations, and drive innovation. However, the adoption of GenAI is not always smooth sailing; it must address issues related to data privacy, model bias, ethical considerations, and regulatory compliance. To address these challenges, the banking sector needs to establish robust governance frameworks, foster collaboration, invest in talent development, and continually improve its operations. Stay agile to emerging threats, such as social engineering, through advanced GenAI models by investing in proactive detection and cybersecurity training. Collaborate with industry peers, regulators, and technology partners to build common standards and share the best practices for responsible GenAI applications. By finding the sweet spot between risk and reward, banks can leverage the capabilities of GenAI and unlock unprecedented opportunities, foster financial inclusion, enhance customer experience, and drive innovation and sustainable growth in the digital age. MA

References

1. *BCG.(2023). Generative AI.*
2. *Deloitte.(2023). Generative AI: A New Frontier in Artificial Intelligence.*
3. *European Commission.(2023). Proposal for a Regulation laying down harmonised rules on artificial intelligence (Artificial Intelligence Act).*
4. *JP Morgan Chase. (2023). JP Morgan builds an in-house AI model for investment use.*
5. *Königstorfer, F.(2020). Applications of Artificial Intelligence in Commercial Bank - A research agenda for behaviour finance. Journal of behavioral and experimental finance, 27, 100352. doi: 10.1016/j.jbef.2020.100352*
6. *McKinsey.(2023). The economic potential of generative AI: The next productivity frontier.*
7. *Reserve Bank of India (RBI).(2024). Report on FinTech and Digital Banking.*
8. *Stanford Institute for Human-Centred AI.(2024). AI Index Report.*