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## Generative Artificial intelligence Applications in Banking and Finance sector

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### Abstract

In the changing financial environment, improving customer experience is essential for banks. A fundamental aspect of this experience is Customer Support Services (CSS). The banking business has traditionally utilized technology tools such as Interactive Voice Response (IVR) Systems and chatbots; nevertheless, their rule-based design frequently limits their adaptability. This study investigates the capacity of Generative AI to revolutionize Customer Support Services within the banking sector. In contrast to conventional systems, Generative AI's capacity to produce original material facilitates a more tailored and contextually aware engagement. We have evaluated traditional approaches against sophisticated Generative AI capabilities using a scenario-based methodology. The findings elucidate how Generative AI may transform Customer Support Services across digital platforms, ensuring an enhanced customer experience.

**Keywords:** Generative AI; Customer Support Services; Banking; Interactive Voice Response; Finance

### 1. Introduction

In the rapidly evolving financial sector, banks emphasize innovative Customer Support Services (CSS) as crucial for corporate success [1]. They have progressed from voice systems to CRM to chatbots to address varied client requirements and improve loyalty [2]. Conventional chatbots, constrained by rule-based frameworks, encounter difficulties with intricate queries and linguistic subtleties, frequently necessitating explicit user inputs [3]. Generative AI can readily surmount these limits, providing a more dynamic, personalized, and contextually aware solution [4]. Generative AI possesses distinct promise in the heavily regulated banking industry, optimizing compliance, providing tailored financial guidance, and improving security and fraud detection. It caters to various degrees of technological literacy, distinguishing it within the competitive financial sector. In today's networked and data-centric environment, precise client identification is essential for banking institutions and government comptroller agencies. Financial institutions depend on accurate client identification to achieve regulatory compliance, manage risks, prevent fraud, and deliver personalized services.

Likewise, government comptroller offices require precise identification to successfully handle public monies, promote transparency, and uphold faith in public administration. Nonetheless, attaining precise client identification is laden with difficulties, chiefly owing to the disjointed nature of client data across many applications and systems. Clients frequently engage with banks and government agencies across several channels and platforms, leading to fragmented and inconsistent data sets. These discrepancies may result in duplicate entries, incomplete profiles, and erroneous client information, which present considerable hazards and inefficiencies.

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### Challenges Presented by Disparate Data

- Data Inconsistency

Client information may differ across many systems, resulting in conflicts that are challenging to resolve.

- Duplicate Records

Numerous records for the same client may exist across several applications, complicating the acquisition of a singular, precise representation of the customer.

- Incomplete Profiles

Disjointed data may lead to deficient client profiles, obstructing the provision of comprehensive services and precise evaluations.

- Regulatory Compliance

Inaccurate client identification hinders adherence to regulations such as Know Your Customer (KYC) and Anti-Money Laundering (AML) mandates.

- Operational Inefficiencies

The management and reconciliation of fragmented data require substantial resources and may result in operational inefficiencies.

The Capability of AI and GNNs in Tackling These Challenges Artificial Intelligence (AI) and Graph Neural Networks (GNNs) present viable answers to the issues arising from fragmented customer data. Artificial intelligence methodologies, including generative models and machine learning algorithms, can improve data processing and pattern recognition, facilitating more precise and efficient client identification. Generative AI models, such as Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs), may synthesize and augment data, hence enhancing the quality and comprehensiveness of customer profiles.

Graph Neural Networks (GNNs), a category of artificial intelligence tailored for graph-structured data, are especially adept for this purpose. They can represent intricate interactions among entities (customers, accounts, transactions) and discern patterns that older approaches struggle to identify. By modelling client data as a graph, with nodes denoting clients and edges signifying relationships and interactions, GNNs can proficiently recognize and integrate diverse data elements, resulting in cohesive and precise client profiles [5] and [6].

This seeks to conceptualise AI augmentation in customer support service routines and develop a routine-based framework for GenAI augmentation. To our knowledge, our research is among the first to integrate the insights of customer support service experts regarding the function of GenAI. Consequently, we pose the subsequent research questions:

- How can the augmentation of AI in customer support services be generally conceptualised within the framework of FSE?
- In what ways may GenAI enhance the workflows of FSE in customer support services?

### Principal Advantages of Utilizing AI and Graph Neural Networks

- Improved Data Integration:

AI and GNNs may assimilate and standardize data from many sources, assuring uniformity and minimizing discrepancies.

- Enhanced Precision:

Sophisticated machine learning algorithms can effectively identify and consolidate duplicate records, yielding a singular, cohesive perspective of each client.

- Scalability:

AI-driven methodologies may easily manage substantial data volumes, rendering them appropriate for enterprises with big client databases.

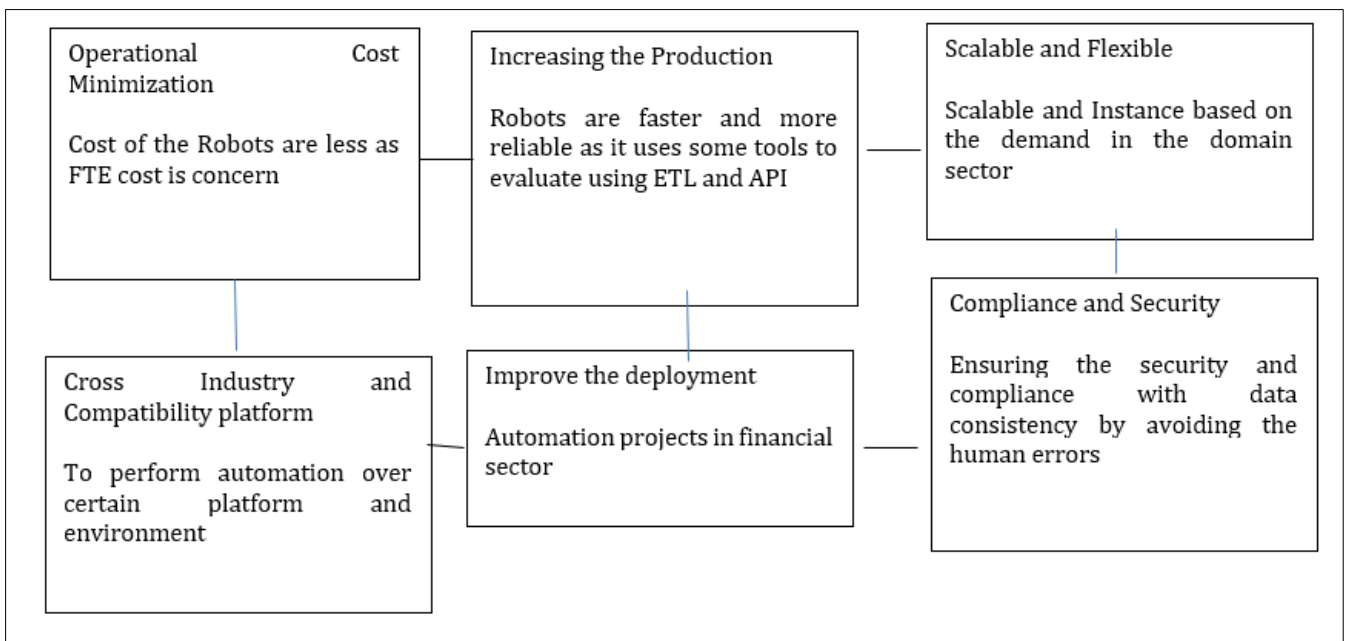
- Regulatory Compliance:

Enhancing data accuracy and completeness with AI and GNNs enables institutions to fulfill regulatory obligations more efficiently.

- Operational Efficiency:

Automated data reconciliation methods diminish the necessity for manual intervention, conserving time and resources [7].

This study evaluates the potential influence of advancing Generative AI on the CSS in the banking sector. A defining characteristic of Generative AI is its capacity to generate original content from various structured data. This encompasses functionalities such as text-to-image, image-to-text, text-to-video, text-to-audio, and text-to-text [8]. These capabilities surpass conventional technology-based customer care systems (e.g., chatbots) commonly employed in the banking sector and has the potential to significantly enhance customer service frameworks. The research question (RQ) we intend to examine is: RQ: In what ways might Generative AI influence Customer Service Strategies in the banking industry? Although numerous studies have acknowledged the potential of Generative AI to increase CSS [9], a significant vacuum exists in the literature regarding its specific capabilities for improvement within the banking sector in Figure 1.



**Figure 1** Intelligent Automation

This research fills this gap by elucidating how Generative AI improves CSS, so enriching the literature on technology adoption and consumer satisfaction. In this study, CSS denotes multi-channel digital customer support, encompassing phone, email, and web platforms, augmented by advanced tools and specialized skills, in alignment with Saberi’s perspective [10]. The following section of this paper examines CSS in banking, emphasizing the potential of Generative AI to improve it. The discussion employs a scenario-based methodology to examine the ramifications of diverse Generative AI models. The study additionally delineates associated hazards, implications, limits, and prospective research avenues.

## 2. Generative ai for operational efficiency in the USA banking sector

The advent of the generative pretrained transformer 3 (GPT-3) has garnered interest for its applications in generative artificial intelligence (AI) [3, 23]. Nevertheless, there is a paucity of research about the application of generative models to real-world issues. Current endeavours concentrate on implementing prompt-tuning methodologies to pretrained language models (PLMs) [11]. Nonetheless, the efficacy of prompt-tuning methodologies in particular domains and business processes may be constrained. Hallucination can provide challenges in sectors such as customer service within banking or healthcare. Addressing these restrictions can improve the operational efficiency of a Customer Service Centre (CSC) by educating the model in product knowledge, problem-solving, and managing emotional consumers. Moreover, choosing the appropriate model scale is essential for economical execution in extensive CS activities. The expansion of generative AI model size has beyond the capability of graphics processing units. Fine-tuning the most recent pre-trained language models and retaining all parameters is costly and unfeasible [12].

The banking sector must prioritise privacy and safeguard client data while employing AI. Developing AI systems internally is pragmatic, utilising publically accessible PLMs as foundational models and refining them to align with company objectives. Parameter-efficient fine-tuning is standard in language model application [13], and we want to enhance AI-driven CSC by fine-tuning PLMs containing billions of parameters.

As of the first quarter of 2023, KakaoBank caters to about 21.2 million clients, representing 73% of the employed population in South Korea (<https://eng.kakaobank.com>). KakaoBank offers fee-based banking services, including deposits, loans, and debit cards, with platform-related operations such as cobranded credit cards, loan referrals, securities broking, and advertising. KakaoBank processed a substantial number of transactions, totalling 4.8 billion in 2022. Functioning as an exclusively online bank, customer enquiries are sent to a specialised Customer Service Centre, which manages an average of 15,000 customer service calls each day.

Upon concluding the customer service calls, the customer service agents are tasked with cataloguing the principal consumer grievances from the interactions with clients and summarising the resolutions implemented. Furthermore, they must ascertain the precise domain of the complaint or query, including deposits, loans, remittances, or debit cards, and choose the relevant category for system entry to complete the CSC procedure [14].

Pre-trained Language Models (PLMs) are a pivotal technology in artificial intelligence, vital for addressing a diverse range of downstream tasks. Significantly, pre-trained language models (PLMs) with a substantial number of parameters, like GPT-3, PaLM, and OPT, demonstrate exceptional performance across many general-purpose tasks. Nonetheless, their training mostly depends on knowledge-based resources, including books, web pages, and academic papers, while insufficiently integrating data obtained from private interpersonal encounters [15].

No examples have been uncovered in which PLMs were trained on conversational data including exchanges between customer service professionals and clients. Nonetheless, numerous research have investigated the influence of generative AI on chat-based customer service operations, analysed fine-tuning strategies that incorporate human feedback, and assessed prompt-tuning methods designed to summarise conversational information.

### 2.1. AI-Enhanced Customer Service Centre

Consumer service operations are essential for addressing consumer enquiries and issues, thereby greatly influencing a company's reputation. Despite the fact that the majority of customer service agents receive training to engage with consumers according to established norms and protocols, significant disparities in productivity are evident among them [29]. Initiatives have been undertaken to utilise AI helpers to enhance the efficiency of managing these customer service duties. A study examined a generative AI model that was fine-tuned using real chat discussions from around 5,000 customer service personnel, assessing its implementation into a customer service system [16]. The results indicated that AI significantly assisted low-skilled individuals in enhancing their task performance and increasing their capacity to participate in chat-based customer service duties. Notably, employees in the low-skill category shown substantial enhancements in their capacity to participate in chat conversations, achieving proficiency levels akin to those of high-skill employees when utilising AI assistants. It was noted that competent personnel, already adept in their responsibilities, exhibited favourable outcomes regarding chat volume per hour but showed no enhancements in average handling time [16].

### 2.2. Refinement

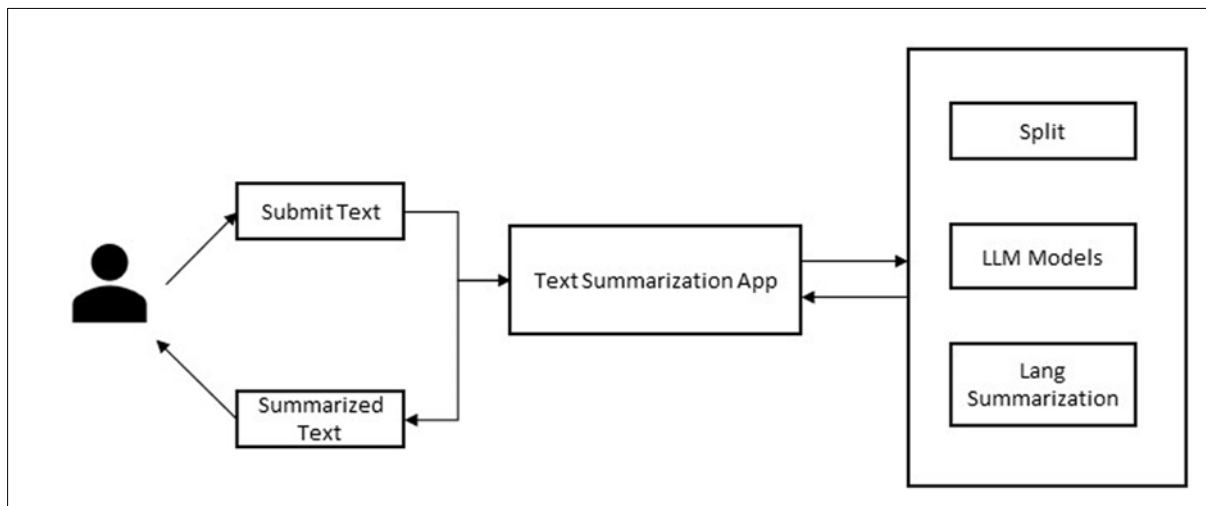
Generative AI models have ongoing difficulties in producing damaging or hazardous content. Researchers have investigated the application of instruction-tuning strategies utilising human input or machine-generated datasets to

resolve this issue. Acknowledging the constraints of extensive language models like GPT-3, which possesses over 100 billion parameters and may encounter difficulties with particular tasks such as mathematical problem-solving, a recent study examined the fine-tuning of an LLaMA baseline model utilising specialised datasets tailored for adept mathematical problem-solving [17]. Their findings demonstrated a remarkable performance that exceeded current big language models, especially in numerical operations like addition and subtraction.

Moreover, researchers discovered that fine-tuning language models with instruction datasets markedly improves their capacity to execute unexpected tasks, even in the absence of prior experience to such tasks. Researchers employed fine-tuning techniques on a domain-specific dataset to improve sentiment classification performance in the finance sector [1]. The efficacy of fine-tuning with imitation datasets was empirically assessed and determined to be unsuccessful in improving model performance. Moreover, fine-tuning with imitation datasets demonstrated inadequate performance, even in particular downstream tasks [11]. These findings underscore the importance of optimising with high-quality, real-world datasets.

### 2.3. Summarisation of Conversations

The production of prompts is crucial in summarising conversational content, as it influences result stability and may result in unstable outputs marked by factual discrepancies and hallucinations [12]. To tackle these issues, a study included few-shot learning into GPT-3-based models [18]. Researchers improved the efficacy of abstractive summarisation by utilising a dialogue-structured evaluation system and implementing fast adjustments informed by high-scoring talks. A separate study employed meta-transfer learning to execute an abstractive summarisation assignment [5]. The other study utilised the conversion of nondialogue (i.e., document) data to enhance the efficacy of dialogue summarisation models. While there are studies on abstractive summarisation, there is a deficiency in research focused on language models designed for summarising CSC in the financial sector as in Figure 2.



**Figure 2** Text Summarization

Generative AI applications in banking and financial services are transforming the industry environment, providing unparalleled improvements. Generative AI is revolutionising the operations of financial institutions and their customer service through personalised experiences, risk assessment, and fraud detection. The following are many notable applications of generative AI in banking and financial services:

#### 2.3.1. Detection and prevention of fraud

Generative AI dramatically improves fraud detection and prevention skills within the banking and financial services industry. Generative AI solutions can detect nuanced anomalies and fraud tendencies that may elude conventional rule-based systems by examining extensive transaction data, consumer behaviour patterns, and past fraud incidents. It can identify anomalies in real-time, facilitating prompt intervention. Generative AI can adapt to emerging fraud strategies by continuously learning from incoming data and remaining proactive against evolving threats. Furthermore, it may produce authentic fraud scenarios to evaluate current security protocols and assist financial institutions in proactively enhancing their defences [19]. This technology's capacity to analyse and comprehend intricate, multidimensional data facilitates precise risk evaluations and diminishes false positives, enhancing the overall efficacy of fraud protection initiatives while minimising interruptions to genuine consumer activities.

2.3.2. Customised client experience

Generative AI examines extensive client data, encompassing transaction history, browsing behaviour, and demographic details, to formulate comprehensive customer profiles. It subsequently employs these insights to produce tailored product suggestions, individualised financial guidance, and focused marketing communications. This technology enables intelligent chatbots and virtual assistants to deliver round-the-clock customer service by addressing enquiries, facilitating transactions, and providing financial advice. Furthermore, generative AI may produce customised financial reports and projections derived on past data, assisting clients in comprehending and managing their finances more effectively.

2.3.3. Evaluation of risk and credit evaluation

Generative AI systems can revolutionise risk assessment and credit scoring in the financial sector by delivering highly detailed and precise evaluations of creditworthiness. It can evaluate a wider array of data points beyond conventional financial measurements, encompassing social media engagement, expenditure trends, and the language utilised in loan applications [20]. This complete method provides a more integrated perspective on an individual’s or business’s financial stability and dependability. Generative AI systems may discern intricate correlations among diverse aspects that human analysts may neglect, resulting in more accurate risk profiles. This technology allows financial institutions to provide more customised products and interest rates, potentially increasing credit accessibility while upholding strong risk management protocols. Furthermore, generative AI solutions may perpetually revise evaluations utilising real-time data, yielding dynamic credit ratings that more closely represent current conditions than static, regularly updated scores.

2.3.4. Asset management

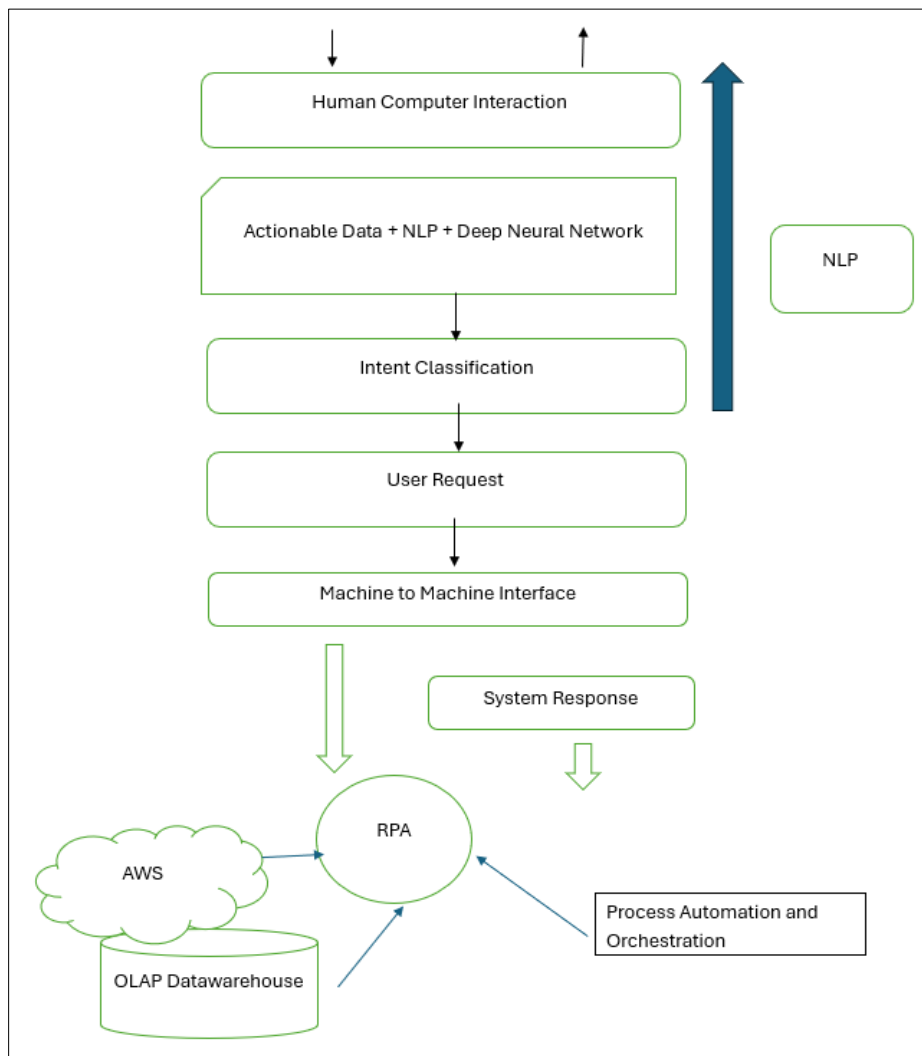


Figure 3 Generative AI integration

Generative AI can substantially improve investment management by automating research and analysis, enabling the processing of extensive financial data, news articles, and reports to discern trends and deliver actionable insights. Generative AI can assist fund managers in optimising asset allocation and diversification strategies by discovering complex patterns and connections across global markets. It can replicate market scenarios, facilitating more rigorous stress-testing of investment portfolios and enhanced risk management. Generative AI facilitates the development of highly customised investment strategies aligned with specific customer objectives, risk appetites, and preferences. Generative AI in investment banking facilitates the development of intricate financial models and simulations, enhancing strategic planning as in Figure 3.

### *2.3.5. Client Assistance*

Generative AI enhances customer care by augmenting the functionalities of chatbots and virtual assistants within the banking and financial services industry. These AI-driven solutions can now conduct natural, contextually aware dialogues with customers, offering personalised financial guidance and assistance continuously. They are capable of interpreting intricate enquiries, comprehending subtle financial lingo, and providing comprehensive elucidations of banking products and services. Generative AI empowers virtual assistants to evaluate a customer's financial history and present circumstances to deliver customised advice on savings, investments, or debt management [21]. They can assist users with navigating intricate procedures like loan applications or account openings, thereby streamlining these chores and minimising the necessity for human involvement. By managing common enquiries and transactions effectively, they liberate human personnel to concentrate on more intricate customer requirements, so improving overall service quality and operational efficiency.

### *2.3.6. Adherence to compliance and regulatory reporting*

Generative AI is revolutionising compliance and regulatory reporting in the finance and banking sector. This system examines intricate regulatory documents, interprets novel regulations, and produces precise, compliant results. It tracks regulatory modifications across countries, notifies compliance teams of updates, and recommends policy revisions. GenAI automates the generation of compliance documentation and regulatory reports by aggregating data from multiple sources and discerning pertinent information. It performs risk assessments, identifies potential compliance issues, and aids in responding to regulatory enquiries, all while conforming to the stringent regulatory standards of the financial sector.

### *2.3.7. Cybersecurity and risk management*

Generative AI is markedly improving cybersecurity and risk management within the financial and banking industries. Through the analysis of extensive network traffic, transaction data, and user behaviour patterns [22], generative AI may identify abnormalities and potential security concerns in real time. It can forecast and model diverse cyber-attack scenarios, enabling banks to proactively enhance their defences against emerging threats. In risk management, generative AI assists financial organisations in modelling intricate risk scenarios by accounting for various aspects, such as market volatility, geopolitical events, and regulatory changes. It may produce comprehensive risk reports and projections, facilitating more informed decision-making at both operational and strategic tiers. Furthermore, generative AI improves fraud detection by developing intricate models of typical financial behaviour and identifying anomalous variations. It can aid in regulatory compliance by perpetually monitoring transactions for possible infractions and producing detailed audit trails.

The swift progress in generative AI prompts critical enquiries on the optimal ethical utilisation of this technology. In numerous areas, such as the financial services industry, the focus has shifted from merely what can be accomplished with generative AI to considerations of what should be undertaken and the appropriate timing for such actions.

- Ethical considerations:

Generative AI models may provide outputs that are biased or discriminating as a result of biases present in their training data, rendering their decision-making processes inequitable. Financial institutions must prioritise ethical considerations and implement procedures to ensure that generative AI models render choices that are equitable, transparent, and impartial.

- Data privacy and security:

Financial institutions manage sensitive and confidential information, including personal identifying data, account balances, and transaction histories. Protecting the confidentiality and security of this information is paramount.

Training a generative AI model with such data poses the danger of inadvertent exposure or misuse of sensitive information.

- Model output accuracy:

Considering the potential consequences of responses to financial enquiries on individuals, corporations, and society, these novel AI models must achieve maximal accuracy. They cannot fabricate or generate erroneous yet persuasive responses to essential enquiries regarding taxes or financial well-being, and they must exhibit significantly greater accuracy than the vague replies provided for popular culture questions or standard high school essays. It is advisable to involve a human for the final evaluation of an AI-generated response.

- Skills and expertise deficit:

The construction and implementation of generative AI models necessitate specialised knowledge from both the AI and finance sectors, rendering the acquisition of requisite skills difficult for financial institutions. Addressing this skill deficit by fostering collaboration among data scientists, AI experts, and financial professionals is essential for the effective deployment of generative AI.

- Scaling and integration

The integration of generative AI solutions within a financial institution can present significant challenges, and seamless scaling must not interfere with current operations or jeopardise ongoing system integration efforts. Meticulous planning is essential for achieving seamless scalability without interrupting current activities.

- Regulatory compliance

AI systems in the financial services sector must adhere to stringent regulations to protect sensitive consumer information and uphold ethical standards, including AML, GDPR, and KYC. However, generative AI models may not consistently fulfil these criteria, so exposing firms to legal and compliance vulnerabilities. Furthermore, new legislation concerning Consumer Duty will heighten the obligation on financial services providers to demonstrate due diligence and substantiate that they have acted in their clients' best interests.

In recent years, the banking sector has experienced a swift transformation propelled by technological breakthroughs, especially in the field of Artificial Intelligence (AI). The development of Generative AI is a transformational force that could revolutionise regulatory compliance. Statista projects that the banking sector's investment in Generative AI would attain \$85 billion by 2030, expanding at a remarkable annual pace of 55%. The regulatory framework for financial institutions has significantly evolved due to developing technologies and new market dynamics. Global regulators are progressively prioritising data privacy, cybersecurity, anti-money laundering (AML), and consumer protection. Conventional regulatory frameworks, despite their strength, frequently fail to keep pace with swift technological changes, resulting in financial institutions grappling with intricate compliance obligations that may not sufficiently tackle contemporary difficulties. The regulatory environment is swiftly evolving, particularly with ESG (environmental, social, and governance) aspects [23].

The constantly changing regulatory environment in banking requires compliance teams to be vigilant. Manual methods for analysing rules, pinpointing deficiencies, and revising policies are no longer sufficient. Conventional compliance approaches in banking generally depend on manual procedures, rules-based frameworks, and regular audits. These methodologies are progressively inadequate in the contemporary digital era. The vast quantity and intricacy of financial data, along with the rapidity of transactions and the sophistication of financial crimes, have overwhelmed conventional compliance capacities. Furthermore, the reactive characteristics of these methodologies frequently lead to postponed identification and response to regulatory violations, so exposing institutions to operational risks and regulatory sanctions.

- **Optimizing LLM Output with RAG:** "Retrieval-Augmented Generation (RAG) is a practical way to enhance Large Language Models (LLMs) by linking them to custom knowledge bases, keeping outputs accurate and relevant without needing model retraining."
- **Importance of High-Quality Context:** "RAG's effectiveness relies heavily on context quality, where embedding relevant metadata or restructuring queries can significantly boost response accuracy."



- **Advanced Retrieval Techniques in RAG:** "By using dense and sparse retrieval methods, RAG refines search results, balancing precision and computational efficiency based on query demands."
- **Prompt Management with Compression:** "Efficiently compressing prompts ensures concise instructions for LLMs, reducing token load while retaining necessary context for precise generation."
- **Applying RAG in Banking:** "RAG can greatly enhance customer support by equipping LLMs to access current, structured information, making interactions more personalized and context-aware."

## 2.4. Utilisation of Generative AI in Regulatory Compliance

Generative AI (GenAI) provides a transformational methodology that transcends mere automation. It not only analyses data but also generates wholly new content, such as text, code, or graphics. In the realm of financial compliance, this signifies a robust array of instruments [24]:

### 2.4.1. Automation of Regulatory Reporting

Generative AI algorithms can optimise data extraction from transactional databases, CRM systems, and financial spreadsheets, automating report production for regulatory compliance with frameworks like as Basel III, Dodd-Frank, or MiFID II, thus expediting reporting timeframes and minimising errors. AI-driven systems may execute automated validation assessments on the data to guarantee accuracy and completeness prior to submission, hence minimising compliance errors and regulatory penalties. It also offers a comprehensive audit trail of data validation procedures, enhancing openness and enabling regulatory oversight. Artificial Intelligence may incessantly observe alterations in data and regulatory modifications, autonomously revising reports to incorporate the most current facts and compliance standards. This mitigates the risk of non-compliance resulting from obsolete information.

### 2.4.2. Optimisation of KYC/AML Customer Onboarding

AI algorithms can authenticate customer identities by examining papers such as passports, driver's licenses, and utility bills. This encompasses facial recognition technology for biometric verification, which expedites the onboarding process and diminishes errors in identification verification, while assuring adherence to regulatory standards. Generative AI can evaluate historical transaction data and client behaviour to dynamically estimate risk levels. This facilitates the allocation of suitable risk scores and the surveillance of continuing consumer activities for anomalous behaviour.

AI-driven platforms can streamline workflows for KYC/AML procedures, encompassing case management, escalation of questionable actions, and reporting to regulatory bodies. Automated workflows provide a thorough audit trail, aiding in regulatory audits and inspections.

### 2.4.3. Scenario Testing and Stress Simulations

AI algorithms may generate realistic scenarios utilising historical data, market trends, and regulatory frameworks, offering insights into prospective risks and possibilities to inform strategic decision-making. It guarantees adherence to regulatory stress testing mandates, hence bolstering regulatory confidence.

AI models evaluate simulated situations to determine their effects on essential financial parameters, including capital adequacy, liquidity ratios, and profitability. Insights derived from simulations facilitate proactive risk management techniques. Generative AI facilitates the real-time adaptation of risk models in response to fluctuating market conditions and regulatory frameworks. It facilitates adherence to changing regulatory mandates, enhancing regulatory results [25].

### 2.4.4. SAR Narrative Generation AI systems

Scrutinise transaction data to identify anomalous trends and autonomously produce SARs. This eliminates manual labour and accelerates the reporting procedure, guaranteeing prompt submission. AI-driven systems generate comprehensive narratives for Suspicious Activity Reports (SARs), encompassing transaction specifics, client profiles, and grounds for suspicion, thereby aiding regulatory examination and inquiry. SARs produced by AI can be effortlessly incorporated into case management systems for enhanced investigation and oversight. This enhances collaboration between compliance and investigative teams, improving efficiency in SAR processing. Generative AI also preserves a comprehensive audit record of Suspicious Activity Report generation and management operations, facilitating regulatory audits and enquiries.

### 2.4.5. Contract Analysis and Review Generative AI algorithms

It can autonomously analyse and extract essential information from contracts, encompassing provisions, conditions, dates, and obligations. This diminishes the time and resources needed for manual contract examination and mitigates

human errors in data extraction. AI-driven systems may discern provisions inside contracts (e.g., termination provisions, indemnity provisions) and evaluate their ramifications. Automated analysis detects potential dangers linked to contract terms, facilitating proactive risk mitigation techniques. Generative AI facilitates the automatic analysis of contractual provisions across several agreements or in relation to industry standards. This guarantees uniformity in contractual terms and conditions, minimising discrepancies and potential conflicts [26].

#### *2.4.6. Compliance with Data Privacy and Security Regulations*

Generative AI can autonomously categorise sensitive data within the organisation, including personally identifiable information (PII), financial records, and transaction details. This guarantees uniform and precise identification of sensitive information, hence mitigating the risk of data mismanagement.

Generative AI enables automated access control systems, guaranteeing that only authorised individuals can access sensitive information according to established permissions and roles. This mitigates the danger of unauthorised data access or exploitation, hence augmenting overall data security. AI-driven systems can identify anomalous behaviours or possible data breaches instantaneously, activating prompt response protocols to alleviate risks. This mitigates the consequences of data breaches and improves incident response efficacy.

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### **3. Usecase of gen AI**

Generative AI applications in banking and financial services are transforming the industry environment, providing unparalleled improvements. Generative AI is revolutionising the operations of financial institutions and their customer service through personalised experiences, risk assessment, and fraud detection. Presented below are many notable applications of generative AI in banking and other financial services:

#### **3.1. Detection and prevention of fraud**

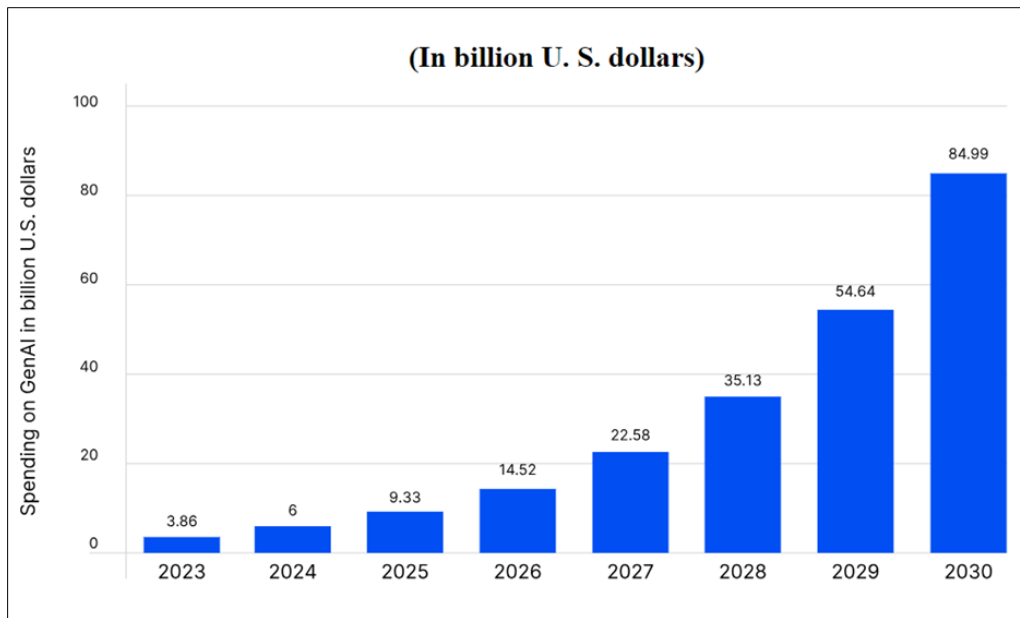
Generative AI markedly improves fraud detection and prevention in the banking and financial services industry. Through the analysis of extensive transaction data, consumer behaviour patterns, and past fraud instances, generative AI solutions can detect nuanced abnormalities and fraud tendencies that may elude conventional rule-based systems. It can identify anomalies in real-time, facilitating prompt intervention. Generative AI can adapt to novel fraud strategies by continuously learning from incoming data and remaining ahead of emerging threats. Moreover, it may create authentic fraud scenarios to evaluate current security protocols and assist financial institutions in proactively enhancing their defences [27].

The technology's capacity to analyse and analyse intricate, multidimensional data facilitates precise risk assessments and diminishes false positives, hence enhancing the overall efficacy of fraud protection initiatives while minimising interruptions to genuine consumer activity.

Generative AI examines extensive client data, encompassing transaction history, browsing behaviour, and demographic details, to formulate comprehensive customer profiles. It subsequently employs these insights to produce tailored product suggestions, individualised financial guidance, and focused marketing communications. This technology enables intelligent chatbots and virtual assistants to deliver round-the-clock customer service by addressing enquiries, facilitating transactions, and providing financial advice. Moreover, generative AI can produce customised financial reports and projections derived on past data, assisting clients in comprehending and managing their finances more effectively.

#### **3.2. Evaluation of risk and credit scoring**

Generative AI systems can revolutionise risk assessment and credit scoring in the financial sector by delivering highly nuanced and precise judgements of creditworthiness. It can evaluate a wider array of data points beyond conventional financial measurements, encompassing social media engagement, expenditure trends, and the verbiage employed in loan applications. This complete method provides a more integrated perspective on an individual's or business's financial stability and dependability.



**Figure 4** Gen AI in Banking Sector Forecasting till 2030

Generative AI systems may discern intricate correlations among diverse aspects that human analysts may neglect, resulting in more accurate risk profiles. This technology allows financial institutions to provide more customised products and interest rates, potentially increasing access to credit while upholding stringent risk management protocols. Furthermore, generative AI solutions may perpetually revise evaluations utilising real-time data, yielding dynamic credit ratings that more closely represent current conditions than static, regularly updated scores as in Figure 4.

#### 4. GEN AI in Regulatory Compliance

The financial sector is experiencing a digital transition, with regulatory compliance in domains such as Anti-Money Laundering (AML) and Know Your Customer (KYC) being no exception. As the volume and complexity of data increase, financial institutions are using new technology to improve their compliance capabilities. Generative AI (GenAI) is a technology with significant promise to transform AML and KYC processes.

Primary Applications of Generative AI in Anti-Money Laundering and Know Your Customer

##### 4.1. Improved Customer Risk Assessment

Generative AI has the potential to transform customer risk profiling by examining extensive datasets from various sources to produce more thorough and nuanced risk evaluations. Conventional KYC systems frequently depend on static criteria including nationality, age, and transaction behaviours. GenAI can dynamically integrate a broader spectrum of data, including unconventional sources, to produce real-time risk insights. GenAI models may extract information from internal databases, governmental records, social media platforms, news sources, and unstructured data, including emails and scanned documents. These models can subsequently evaluate this information to discern potential risk factors such as financial instability, negative press references, or connections with sanctioned individuals.

A prominent global bank may employ GenAI to perpetually assess and revise the risk profiles of its affluent clientele. Should a client be identified in a negative news article or linked to a high-risk individual, the system is capable of autonomously modifying the customer's risk assessment, thereby notifying compliance teams for further investigation [28].

##### 4.2. Automating Compliance Reporting

Regulatory reporting is a crucial component of AML compliance; nevertheless, it can be laborious and susceptible to human error. GenAI can automate this procedure, guaranteeing that reports are precise, prompt, and fully compliant with applicable standards. GenAI can autonomously produce reports by scrutinising transaction data, identifying

questionable activity, and structuring them into established regulatory formats. These reports may encompass comprehensive analyses and data visualisations, providing enhanced insights for regulators.

A substantial payment processor may employ GenAI to autonomously produce Suspicious Activity Reports (SARs) for regulatory bodies, extracting data from its transaction monitoring system and encapsulating essential information such as transaction volume, potential money laundering techniques, and client risk assessments.

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## 5. Summarization tasks to reduce human Labor

The implementation of Generative AI in banking has numerous advantages, with certain problems that necessitate meticulous evaluation.

### 5.1. Enhanced Efficiency

Generative AI automates intricate operations, diminishing manual labour and accelerating processes. This efficiency enables banks to execute operations such as credit risk assessment, customer service, and fraud detection with greater speed and precision.

### 5.2. Improved Customer Satisfaction

AI-powered chatbots provide 24/7 assistance, resulting in expedited responses and enhanced service accessibility. Customised marketing and wealth management solutions yield increased customer satisfaction, as clients obtain personalised recommendations and tactics.

### 5.3. Enhanced Risk Management

Generative AI assists banks in more precisely identifying potential dangers. Credit risk assessments and fraud detection benefit from AI models' precision and agility, which reduces financial losses while retaining the institution's credibility.

### 5.4. Cost Reduction

The automation of routine processes and the optimisation of operations result in financial savings for banks. Furthermore, enhanced risk management mitigates the financial repercussions of fraud and defaults.

The banking and finance sector experienced substantial expansion in the worldwide generative AI market, attaining a valuation of around USD 712.4 million in 2022. By 2023 and 2032, this market is projected to expand at a compound annual growth rate (CAGR) of 33%, according to forecasts. By 2032, it is anticipated to attain a significant value of around USD 12,337.87 million. Generative AI revolutionises the banking industry by producing content and emulating human behaviour. It improves client engagement, offers immediate support, performs standard transactions, and increases organisational efficiency. Generative AI plays a crucial role in security by examining patterns and anomalies across extensive datasets, thereby establishing a strong framework for secure financial transactions. It also improves the overall customer experience by offering tailored financial recommendations based on the study of user data [29].

In the context of the banking industry's digital revolution, Generative AI serves as an essential innovation tool for financial institutions, allowing them to remain nimble, safe, and sensitive to the changing needs of their consumers. Customised financial counsel, product recommendations, or service offerings pertain to personalised suggestions given to specific clients, considering their distinct financial behaviours, preferences, and requirements. Utilising NLP, Gen AI can assess and comprehend client interactions, including chat logs, emails, and customer care calls. This allows the system to identify consumer preferences, issues, and objectives, facilitating more customised recommendations [31].

Customised recommendations in banking present chances to improve the overall banking experience through personalised financial guidance and product recommendations. Nonetheless, the execution of such recommendations presents significant challenges, including privacy issues, algorithmic biases, and the necessity for transparency and equity in recommendation systems. To ethically implement personalised recommendation systems, banks must reconcile the use of consumer data for customisation with the protection of sensitive financial information, while still guaranteeing impartial recommendations.

Loan approval occurs when a bank evaluates a borrower's creditworthiness and determines whether to accept or reject a loan application [32]. The manual loan approval process frequently suffers from inefficiency, unreliability, and limited scalability, resulting in extended processing durations, increased operational costs, inconsistency, compliance issues,

inferior customer experiences, and competitive disadvantages. Automating loan approval systems is essential for optimising operations, reducing expenses, assuring precision and equity, improving customer experience, performing comprehensive data analysis and risk evaluation, and sustaining a competitive advantage in the financial industry.

Generative AI can facilitate the automatic creation of loan agreements and contracts utilising established templates. This guarantees uniformity and precision in legal documentation. Data Processing and Pattern Recognition: Generative AI can effectively analyse extensive financial market data to uncover patterns and trends that may be challenging for humans to recognise. Generative AI can process and analyse data instantaneously, facilitating swifter responses to market fluctuations. This is vital in swiftly changing financial markets where prompt choices are required. Generative AI, powered by machine learning algorithms, employs historical data to predict future market movements, offering traders and investors critical information [33].

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## 6. Risks and ethical considerations

Explainable artificial intelligence (XAI) encompasses a collection of techniques and methodologies that enable human users to understand and have confidence in the outcomes produced by machine learning algorithms. Explainable AI refers to the elucidation of an AI model, its anticipated effects, and possible biases. It assists in defining model correctness, equity, transparency, and results in AI-driven decision-making. Explainable AI is essential for an organisation to establish trust and confidence in deploying AI models in production. AI explainability facilitates an organisation in adopting a responsible methodology for AI development.

As AI advances, humans face difficulties in understanding and tracing the algorithm's path to a conclusion. The entire computation process is transformed into a "black box" that is inscrutable. These opaque models are generated straight from the data. Neither the engineers nor the data scientists who develop the algorithm can comprehend or elucidate the internal processes or the rationale behind the AI system's specific outcomes [34].

Comprehending the mechanisms by which an AI-enabled system produces a particular output offers numerous advantages. Explainability assists developers in verifying the system's functionality, may be essential for compliance with regulatory standards, and is crucial for enabling impacted individuals to contest or alter the outcome of decisions [35].

AI models are frequently perceived as opaque entities that defy interpretation. Neural networks employed in deep learning are among the most challenging for humans to comprehend. Bias, frequently rooted in race, gender, age, or geographic region, has persistently posed a problem in the training of AI models. Moreover, the performance of AI models may deteriorate due to discrepancies between production data and training data. It is essential for a corporation to consistently oversee and regulate models to enhance AI explainability while assessing the commercial impact of employing such algorithms. Explainable AI enhances user trust, facilitates model auditability, and fosters the effective utilisation of AI. It also alleviates compliance, legal, security, and reputational problems associated with production AI.

Explainable AI is a fundamental prerequisite for the responsible use of AI, a framework for the extensive application of AI techniques in real organisations, emphasising fairness, model transparency, and accountability [36]. Organisations must integrate ethical concepts into AI applications and procedures to facilitate responsible AI adoption, establishing systems founded on trust and transparency. Customised financial guidance, product recommendations, or service offerings pertain to personalised suggestions given to specific clients, considering their distinct financial behaviours, preferences, and requirements.

Customised recommendations in banking present chances to improve the overall banking experience by delivering personalised financial guidance and product recommendations. Nonetheless, the execution of such recommendations presents significant challenges, including privacy issues, algorithmic biases, and the necessity for transparency and equity in recommendation systems. To ethically implement personalised recommendation systems, banks must reconcile the use of consumer data for customisation with the protection of sensitive financial information, all while guaranteeing impartial guidance.

Generative AI models elucidate their decision-making processes, hence enhancing transparency in the formulation of recommendations. Establishing trust and ensuring consumer comprehension of the rationale behind personalised suggestions is essential in the banking business. Real-time monitoring in banking offers both advantages and obstacles. It can improve cybersecurity protocols and fraud detection [37] but necessitates a strong technology framework and advanced analytical capabilities. Privacy issues and legal obligations are paramount, as real-time surveillance necessitates the handling of sensitive client data. Achieving equilibrium between immediate reactivity and the reduction

of false positives presents an additional challenge. Nonetheless, addressing these difficulties can enhance financial decision-making and expedite transaction processing, hence improving customer experience.

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## 7. Conclusion

As far as we know, this is the first study looking into the potentially revolutionary effects of generative AI on CSS in the banking industry. Although several studies suggest that Generative AI has great potential to improve CSS [12, 19, 20, 31], previous studies have rarely provided the same contextualization of its use as we have. This study emphasizes how important CSS is to banking. It also looks at how generative AI may improve interactions with customers and raise satisfaction levels. To summarise, this paper explores an intriguing topic of Generative AI, which will broaden the scope of IS literature and stimulate additional investigation. AI is a potent tool for banking when used carefully and with a purpose. In order to thrive in the long run, banks must learn to embrace GenAI, which is the way of the future. Refusing to use the GenAI tools will give rivals a competitive advantage. To achieve the intended outcomes in the coming years and establish a strong relationship with Gen Z, who prefer new technology in all aspects of their lives, banks must develop strategies for the adoption and deployment of GenAI in their operational and marketing domains.

To prevent any potential data breaches or cyberthreats, banks must upgrade their cyber security measures and keep up with the rapid advancements in generative AI technology. Currently, banks and financial institutions in India are utilizing machine learning (ML) for features like fraud detection and voice assistants. State Bank of India subsidiary SBI Card uses machine learning and generative artificial intelligence to improve customer service.

To remain relevant in the future, current human capital assets must be reskilled in GenAI. Everyone needs to retrain and acquire new skills because doing so will make them more valuable in the future.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

If two or more authors have contributed in the manuscript, the conflict of interest statement must be inserted here.

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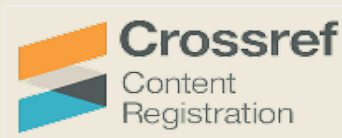
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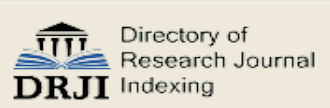
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## Generative Artificial intelligence Applications in Banking and Finance sector

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### Abstract:

In the changing financial environment, improving customer experience is essential for banks. A fundamental aspect of this experience is Customer Support Services (CSS). The banking business has traditionally utilized technology tools such as Interactive Voice Response (IVR) Systems and chatbots; nevertheless, their rule-based design frequently limits their adaptability. This study investigates the capacity of Generative AI to revolutionize Customer Support Services within the banking sector. In contrast to conventional systems, Generative AI's capacity to produce original material facilitates a more tailored and contextually aware engagement. We have evaluated traditional approaches against sophisticated Generative AI capabilities using a scenario-based methodology. The findings elucidate how Generative AI may transform Customer Support Services across digital platforms, ensuring an enhanced customer experience.

**Keywords:** Generative AI; Customer Support Services; Banking; Interactive Voice Response; Finance

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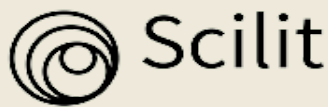
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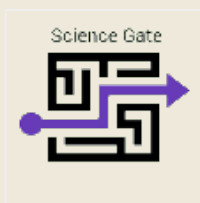
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