A Study of AI in Banking System

Prof. Krutika Sawant,

Assistant Professor, Department of Finance

Universal Business School, Karjat, Raigad,

krutika.sawant@ubs.org.in

Harshvardhan Soni, PGDM in Finance

Universal Business School,

Karjat, Raigad, Maharashtra, 410201.

[harshvardhan.soni@ubs.org.in](mailto:harshvardhan.soni@ubs.org.in)

Parthraj Maharaul, PGDM in Finance,

Universal Business School,

Karjat, Raigad, Maharashtra, 410201.

[parthrajsinh.maharaul@ubs.org.in](mailto:parthrajsinh.maharaul@ubs.org.in)

Saurabh Agarwal, PGDM in Finance,

Universal Business School, Karjat,

Raigad, Maharashtra, 410201.

[saurabh.agarwal@ubs.org.in](mailto:saurabh.agarwal@ubs.org.in)

**Abstract:**

The banking industry is undergoing ground-breaking reforms, with a focus on the client as the primary driver. Customers that are tech aware and often interact with cutting-edge technologies want banks to provide smooth experiences. With services like mobile banking, e-banking, and real-time money transfers, banks have expanded their industrial landscape to include retail, IT, and telecom in order to satisfy these demands. While these developments have made it possible for clients to access the majority of banking services at anytime, anywhere, they have also come at a cost to the banking industry. The deployment of AI in banking and financial services, however, also has drawbacks, such as concern about data security and privacy, algorithmic bias, and possible job effects. It is crucial to address these issues and make sure that AI is used in an ethical and responsible way as it becomes more commonplace in banking and financial services.

This research paper aims to explore the current state of AI in banking and financial services, as well as its potential impact on the industry as the banking and financial services sector has seen major operational changes as a result of the growing usage of artificial intelligence (AI). Many industries,

including customer service, fraud detection, risk management, and investment management, are using AI technology.

1. **Introduction**

The ability to sense, interpret, evaluate, and infer logically in order to come to logical conclusions or solve issues, and then to learn from its own experience, improve, and evolve, is natural intelligence as it appears in humans. The similar traits when demonstrated by a machine are called Artificial Intelligence (AI) and Machine Learning. John McCarthy, a computer and cognitive scientist from Stanford University in the United States, coined the term "artificial intelligence," which refers to the most notable ability of a machine to mimic a natural person in thinking as a natural person does and making a rational and the best decision from among the available alternatives aimed at achieving a specific goal. Artificial intelligence (AI) has emerged as a disruptive technology in the banking industry, transforming the way financial institutions operate and serve their customers. The integration of AI-powered solutions in banking has brought about significant improvements in efficiency, accuracy, and customer satisfaction. This research paper aims to explore the impact of AI on the banking industry, with a specific focus on its applications in areas such as fraud detection, customer service, risk management, and personalized marketing. Through a comprehensive analysis of industry reports, academic research, and case studies, this paper will examine the benefits and challenges of AI adoption in banking, as well as the future implications of this technology on the industry. Ultimately, this research paper seeks to provide insights into how AI can help banks to enhance their competitiveness, drive innovation, and create value for their stakeholders.

1. **Learning Objective**

* **To study and analyze the key applications of AI in banking and impact on its operations and performance.**
* **To identify the challenges associated with AI adoption in banking.**
* **To analyze the future outlook of AI , its sustainability and adoption in banking industry.**

1. **Research Methodology**

For the purpose of study, The data is collected from secondary source from various journals, articles, research papers, internet portals, company reports and so on. Books have also been referred for theoretical information on the topic as required. Regardless of the nature of the exploration field, there is a wealth of material available from these sources concerning our area of investigation in professional education or learning. We have study from different articles of companies like Deloitte, PWC, Wipro etc. , and 10 research papers and has been arranged according to the flow of the paper. Also only those sources were referred which focuses on impact of AI on banking system only in order to be specific to the study. Books have also been referred for theoretical information on the topic as required. We have done theoritical as well as statistical research on banking system and its operations.

1. **Literature Review**

(Hickam Sadok, 2022) this article teases out the ramifications of synthetic intelligence (AI) use withinside the credit score evaluation system through banks and different financing institutions. These limits name for the established order of a brand-new era of economic law introducing the certification of AI algorithms and of facts utilized by banks.

(Chandrima Bhattacharya, 2022) through this paper we understood that literature evaluation and theoretical studies is completed for diverse worldwide and Indian banks with admire to the combination of AI to enhance client interactions and inner banking processes. Chatbot use-instances on banking systems are ranked primarily based totally on client experience. Practical/Theoretical implications: Based at the entire image of AI integration with banking operations, evolving Indian banks should recognition at the maximum famous use-instances to draw customers. The correlation among Chatbot use-instances can also additionally gain the installed Indian banks to similarly amplify business.

As discussed in (Board, 2017) the loss of interpretability or “auditability” of AI and gadget getting to know techniques may want to come to be a macro-stage danger. Similarly, a significant use of opaque fashions can also additionally bring about unintentional consequences. As with any new product or service, there are vital problems round suitable danger control and oversight. It might be vital to evaluate makes use of AI and gadget getting to know in view in their dangers, which include adherence to applicable protocols on information privacy, behaviour dangers, and cybersecurity. Adequate checking out and `training` of equipment with impartial information and remarks mechanisms is vital to make sure programs do what they're supposed to do. Overall, AI and gadget getting to know programs display full-size promise if their unique dangers are well managed. The concluding phase offers initial mind on governance and improvement of fashions, in addition to auditability through establishments and supervisors.

(Neeraj Gupta, 2020) as they discussed here about the analyses and effect of diverse financial institution-precise elements like financial institution size, capital ratio, risk, price to earnings ratio, investment price, sales diversification, labour productiveness and financial institution age on financial institution overall performance. Additionally, the consequences of the have a look at display that financial institution size, non-appearing mortgage ratio and sales diversification are the primary determinants of the economic banks’ overall performance in India. Furthermore, the consequences monitor that in the disaster length the effect of financial institution size, financial institution age, labour productiveness and sales diversification at the overall performance of the Indian banks is robust.

(Report, 2020) says that these technologies have the ability to disrupt the manner we have interaction with every other, function our businesses, or even how governments paintings for his or her citizens. Although the adoption of AI varies substantially throughout geographies, there are wallet of industries even in the evolved nations which might be more and more adopting AI to higher carrier their clients and produce in efficiencies of scale. The authorities have said that for banks to fulfil India`s developing needs, they should harness technology along with AI and huge data. Whether to enhance typical client experience, take extra knowledgeable selections on credit score underwriting, come across frauds and defaults early, enhance collections or boom worker efficiency, AI has the ability to convert India`s banks.

(Ankur Aggarwal, 2022) explained that once all of the banking offerings had been revolving across the salaried or earners, it emerge as a crucial part of our life. Present look is primarily based upon the scope of synthetic intelligence in client revel in and robot technique automation in banking zone in India. Most of the client revel in associated factors confirmed right correlation with AI primarily based total offerings through banks.

(Saloni Tripathi, 2022) points out the dynamics of AI platforms in the banking industry and how they are becoming a significant disruptor. Banks are facing challenges from current technology that uses intelligent algorithms to replace human labour. Companies must integrate AI into their business strategies and practises to stay competitive.

(Omar H. Fares, 2022)The findings demonstrate how the literature on AI and banking extends to three key areas of research: Strategy, Process, and Customer. He also mentioned in his research work about a systematic customer credit solution application blueprint(Service Blueprint) which explains about customer journey, front stage back stage, support process in bank.

(Sindhu J, 2019) this paper focuses on the implementation of Artificial intelligence (AI) in 5 Indian commercial i.e., SBI, ICICI bank, Axis Bank, HDFC, HSBC bank with reference to Cost Benefit analysis. In order to identify the information used in banking industry, the data is collected from secondary source based on literature. And find AI technology service which are providing in India.

(Mehrotra, 2019) in this he discusses about possibility of AI replacing people in the banking and financial service es industry, unwittingly ushering in the end of the personalized service and personal touch that are the foundation of client satisfaction and delight in sectors like banking and financial services, which are known for their fiduciary and responsible nature. He also told that AI cannot completely replace human because there is no match to human intervention when it comes to handling complex personalized requests, understanding sentiments, building trust and establishing an emotional connect with the customer to capture his attention and to secure his brand loyalty.

1. **Artificial Intelligence in Banking service**

To increase productivity, humans have continually developed newer machines. Consider how human movement was dramatically altered by the introduction of bicycles and subsequently automobiles, which increased both the distance and the speed at which humans could move. These machines were built using internal combustion engines and wheels, which were both general-purpose technology. Artificial Intelligence (AI) is the latest general purpose technology that is being used to redefine the banking experience and business economics like the computer and Internet did before.(Accenture). A significant disruption in the financial services industry is being caused by the development of artificial intelligence, as more banks try to innovate under the aegis of AI powered technology in order to enhance current business processes.  For example, AI is transforming how we engage with technology and shifting the burden of understanding from humans to robots. Before, we had to know where to go and what to click in order to complete a task, but these days, you can probably just ask Google, Siri, or Alexa.

The banking environment has recently been more volatile and competitive as a result of globalisation and enhanced economic openness. Customers now demand superior treatment when using a company's products or services, or put another way, there is a greater focus on their satisfaction. Due to cutting-edge technology like artificial intelligence, which have become more prevalent in businesses over the past several decades, the banking industry has been thriving, and customer loyalty will continue to rise. Almost every business, from deposit-taking and lending to investment banking and asset management, depends on artificial intelligence applications because of the way that the modern corporate environment is structured. As a result, banks may gain a lot from autonomous data management that doesn't require human involvement to improve speed, accuracy, and efficiency. The various potential applications of AI in the banking industry can be divided into four categories. There are first front-office apps targeted at clients and back-office programmes targeted at operations. The second issue is with the regulations and laws governing trading and portfolio management. Most banks are still in the testing stage, however some have fully incorporated modern technology into their operations. Third, online banking fraud is investigated as a potential application for artificial intelligence. Credit card fraud has quickly emerged as one of the most prevalent forms of cybercrime with the advent of online and mobile payments. As a result, a lot of companies have started utilising artificial intelligence (AI) algorithms to compare the amount and location of current credit card transactions to historical ones in order to validate their legality in real time.

Financial institutions are also experimenting with AI technology in the field of chatbots. Chatbots are virtual assistants that can interact with bank clients via text or voice in an effort to meet their needs without employing a human employee. Financial institutions are also experimenting with artificial intelligence (AI) to present data from reports and legal papers, such as annual reports, to extract the necessary provisions. AI software may construct models by analysing data and using back testing to learn from previous errors. Several already-existing financial technology tools have evolved into precise AI solutions as time has gone forward. For example, robot advisers that enable complete automation in some asset management services and online financial planning tools that help consumers make smarter spending and saving decisions may be considered According to a recent analysis by PWC, by the year 2030, AI might account for almost $16 trillion of the global economy. It's estimated that over $5 billion has been invested globally in AI applications. By 2030, it is predicted that the banking industry would save $1 trillion thanks to the implementation of AI, primarily as a result of branch closures.

In more recent years, technological developments have made it possible for AI to enable enterprise cognitive computing, which entails integrating algorithms into apps to support organisational procedures (Tarafdar et al., 2019).This entails enhancing the efficiency of information analysis, producing more precise and trustworthy data outputs, and enabling staff to carry out high-level jobs. AI-based solutions have shown to be efficient and useful in recent years. Yet, a lot of corporate executives still don't know how to strategically use AI in their businesses. Ransbotham et al. (2017) Found that, only 39% of company leaders had a strategy plan for the use of AI because they were unsure how to apply it within their organisations, despite 85% of business executives viewing AI as a critical tool for giving companies a sustainable competitive advantage.

The application of AI in banking is across the board, with uses in the front office (voice assistants and biometrics), middle office (anti-fraud risk monitoring and complex legal and compliance workflows), and back office (credit underwriting with smart contracts infrastructure.

**Front Office**

Researchers have discovered that AI has had an impact on the whole banking industry. At this stage of banking operations, voice help, chatbots, and biometric systems, among many others. This task was previously carried out by people. These tasks must be allocated to an individual, however since AI has been used, things have changed. Chatbots are crucial because they can interact with users like real people can. After-hours tech support lines are now available 24 hours a day to respond to client questions. They are able to manage several queries. Even after working for a longer period of time, they are careful and incapable of making mistakes. The cost has decreased while the client experience has enhanced.

**Back office**

They are an important component of banking services. The middle level activities of banks have been enhanced using AI. The intermediate level operations have a significant impact on all banking scams.  At this level, KYC, Antifraud ML, and other monitoring actions are carried out. AI is used to support past transaction-based notifications and CIBIL monitoring. Banks can benefit from more robotic process automation in areas such as loan approval, account opening, automated report generating, anti-money laundering, and KYC. Some application areas of AI in banking services include facial recognition for the initial transaction, micro-expression analysis with virtual loan officers, biometric authentication and authorization, machine learning to detect fraud and cybercrimes, and real-time transaction analysis to prevent fraud.

**A) AI Transform Banking for Customer**

Convenience is something that customers are always looking for. Customers could obtain a necessary service even when banks were closed, for instance, making the ATM a success. More invention has been stimulated by that degree of convenience. With the use of their cellphones, customers can now open bank accounts from the comfort of their couches. A decision management system (DMS) helps speed up the process of gathering Know Your Customer (KYC) data while also reducing errors, which can help businesses with their turnaround times. Also, company decisions can be rolled out without arduous procedures with the right business rules software. Virtual assistants and conversational interfaces used in front-office settings make up around 32% of all AI technologies, according to McKinsey's worldwide AI survey report. Client expectations are rising along with the use of digital banking. The use of online channels through the internet increased by up to 50% during the COVID-19 epidemic, and it is expected that this trend would continue even after the pandemic has passed. Up to 45% of customers may soon stop visiting branches on a regular basis. As a result, it is crucial to maintain and build a user-friendly digital banking platform. The 24/7 assistance and recommendations offered by chatbots dramatically improve the banking experience for customers.

**B) How AI helps in Detecting and preventing Frauds in banking sector**

**Fraud and Anti-Money Laundering**

Huge numbers of digital transactions happen every day as consumers utilise apps or online accounts to pay bills, withdraw money, deposit checks, and do much more. Therefore, there is a growing need for the banking industry to step up its cybersecurity and fraud detection efforts. Here is where banking artificial intelligence is useful. AI can assist banks in reducing risks, tracking system flaws, and enhancing the security of online banking. AI and machine learning can quickly spot fraudulent activity and alert both clients and banks. For instance, Danske Bank, the biggest bank in Denmark, replaced its previous rules-based fraud detection system with a fraud detection algorithm. AI provides the anti-money laundering tools to save the cash of their customers. AI develops various techniques to prevent the bank accounts from such fraudsters

Here are two popular AI anti-money laundering techniques.

* **SAS AML Solution**
* **Ayasdi AML Solution**

**Chart

Description automatically generated with low confidence**

**SAS AML Solution**

SAS AML solution is a detection software that identifies the source of information and provides all data and records to customers. It can detect any money laundering fraud method and alert customers about any threat or crime. AI offers complete security to the official account in the banking sector, making them more trust able. SAS AML solution tools are used by different Israel companies like Ayalon Insurance.

**Ayasdi AML Solution**

AI-based software analyses client behaviour to detect if they are willing to transfer payment to companies or not, allowing bank managers to create a specific strategy to prevent crimes or frauds. It also detects the behavioural patterns of the client and performs the following functions.

Behavioural Visions, Auto Feature Engineering, Contextual Alert Data, Intelligent Event Triage, Intelligent Segmentation

**Self-Learning AI and Adaptive Analytics**

AI and ML excels at securing customer accounts, which fraudsters make exceedingly challenging and dynamic. Fraud detection experts should take into account adaptive solutions intended to sharpen reactions, particularly on marginal judgements, for continual performance development. These transactions are either slightly over or slightly below the threshold, very close to the investigative triggers. Accuracy is especially important if there is a thin line between a false positive event (a lawful transaction that has scored too high) and a false negative event (a fraudulent transaction that has scored too low). This distinction is highlighted by adaptive analytics, which offers a current comprehension of a company's risk factors. Adaptive analytics solutions boost sensitivity to changing fraud patterns by automatically responding to newly established case disposition, leading to a more precise differentiation between frauds and non-frauds. The outcome of an analyst's investigation into a transaction, whether it is determined to be legal or fraudulent, is transmitted back into the system. By doing so, analysts are able to correctly depict the fraud environment they are working with, including fresh strategies and deceptive fraud patterns that have been dormant for some time. This adaptive modelling strategy automatically modifies the model. This adaptive modelling technique automatically modifies the predicted feature weights in the underlying fraud models. It is an effective method for enhancing fraud detection at the periphery and averting fresh fraud assaults.

**Using supervised and unsupervised AI models together for safeguarding**

**Supervised learning,** which is based on a large number of precisely "classified" transactions, is the most popular type of machine learning. Every transaction is classified as fraudulent or not fraudulent. Large volumes of labelled transaction data are ingested to train the models, which then look for patterns that most strongly suggest genuine activities. How much clean, pertinent training data was used to create a supervised model has a direct impact on how accurate it is. **Unsupervised models** are used to find abnormal behaviour when there is little or no annotated transaction data. In these cases, self-learning must be used to find the patterns in the data that conventional analytics overlook.

**C) Cost Benefits to banks by AI and ML**

The BFSI business is using artificial intelligence (AI) more and more. Around 85% of banks, according to IDC, installed AI solutions last year to allow intelligent choices and automated processes for corporate know-your-customer (KYC) procedures, significantly cutting the time it takes to authorise enrolments for new corporate accounts. Moreover, personalization, efficiency, and reaction time are all being enhanced by AI technology and conversational interfaces.

According to Autonomous Next study, banks may save an estimated $447 billion overall by 2023 thanks to AI applications, with $416 billion going to front and middle office costs.

According to the financial research firm Autonomous, there are an estimated 22 billion smart computing devices worldwide, outnumbering people by a factor of three. A recent study by Autonomous also shown that traditional financial institutions may save expenses by 22% by 2030 by utilizing artificial intelligence technologies. Today, banks have a huge chance to use artificial intelligence to advance their operations while also boosting client happiness.

According to Forbes, 51% of businesses consider cost savings as the main advantage of artificial intelligence technology. Moreover, a 2019 report by Juniper Research revealed that operational cost reductions from employing chatbots in banking will increase to $7.3 billion globally by 2023, from an expected $209 million in 2019.

**How is AI cutting cost by adopting AI?**

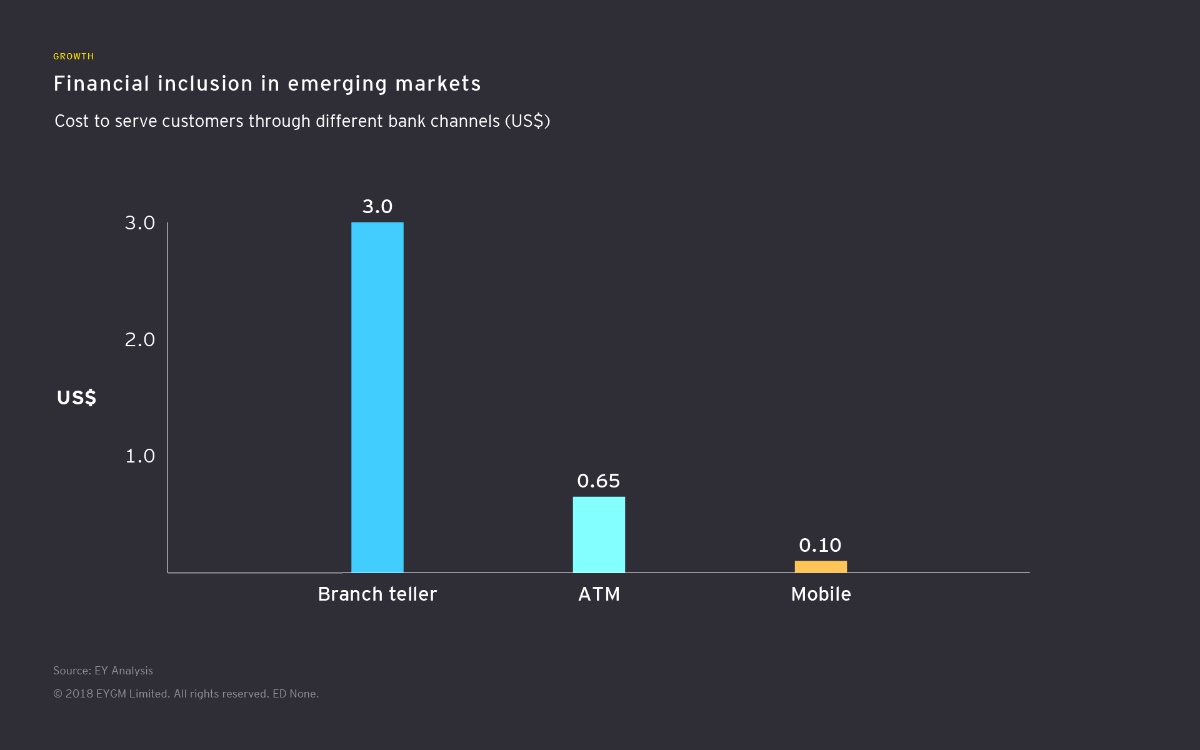
1. **Chatbots and Digital Banking**

A bank has to pay its expenses through physical offices, which include buying/renting the building, power consumption, and salaries of the human workforce. AI-supported Chatbots can be used to mimic the human representative, allowing banks to operate for an extended time without giving any over-time and handle multiple clients at the same time with the same accuracy.

**For example:** Ally Financial is a 100% online bank with a total revenue of US$6.394 billion and a net income of US$1.721 billion. It offers Self-Directed Trading, Managed portfolios, and home loans. Discover Bank is also is such example.

**2) Minimize Errors Afflicted by Human Workforce**

AI can help to minimize errors caused by human workforce, such as miscalculations and human error. **38% of banking losses** are due to human error, resulting in a reduction in revenue. If a bank can minimize the loss, it can increase its net income.

**Example:** OSP offers AI-driven Audit reporting, Audit planning systems, Role-Based Access Control, intelligent data sampling, and Journal Entry Testing. High Radius offers Bank Reconciliation Cloud.

**Source: EYGM Limited**

**D) AI for Credit Analysis**

Traditional credit decisioning relies on a limited number of data points, including scoring from credit bureaus and information from a borrower’s application. Credit risk has always been a difficult subject for banking majors because of the many variables that go into determining a person's risk profile. The process is more difficult for business borrowers because data from many time periods and attributes must be combined and analysed to produce an overall picture of risk. An AI system can build a more holistic borrower profile by incorporating alternative information like utility bills and rent payments, as well as regulation-permissible data like the borrower’s credit history with other lenders.

**ICICI Bank use ML and AI for credit analysis**

Techniques of Zero Credit Touch the Bank was attempting to create "Zero Credit Touch" (ZCT) solutions, wherein loan facilities could be granted without any credit intervention and additional information being obtained from consumers. The following difficulties arise when developing ZCT techniques using conventional credit underwriting models.

Many of the current ICICI Bank clients are not eligible for credit models that combine business rules and scorecards. Customers who don't have salary accounts with the bank may have their required amount supplied to them because their anticipated income is smaller in certain cases. Machine learning models have been developed to address these issues by taking into account all customer-related data that is currently available to the bank, including transaction data from savings bank accounts, credit card usage patterns, repayment history from credit bureaus, and other profile-related data recorded in various CRM / internal platforms. To forecast clients' income in situations where it is unavailable, a machine learning-based model of income prediction was developed. These initiatives caused a sizable part of credit card and personal loan sourcing to occur through ZCT tactics.

**E) Challenges for adoption AI in India**

AI is becoming increasingly popular in India, with 32% of financial service providers now using it. Banks like SBI, Bank of Baroda, HDFC, ICICI, Yes Bank, and others are using AI to simplify their operations. 83% of Indian bankers believe AI will coexist with humans in the next two years, and 77% agree that banks must develop and/or deploy AI solutions successfully.

**Trained Manpower:**

There aren't many strong data scientists who can work on AI. Along with a lack of qualified human resources, banks also lack personnel that is up to date on the newest equipment and software. The financial services sector must collaborate with Indian institutions to recruit qualified data scientists and create internal training programmes that would teach staff how to successfully deploy AI technology for banking operations. Offering undergraduate and masters programmes in fintech, universities throughout the world, including the US and UK, are starting to adjust to the changes that AI is bringing about in the banking sector.

**User capacity:**

It might be difficult to formulate requests or questions in a way that is understandable to AI. Customers that utilise financial services come in a wide variety, and their degrees of digital literacy vary widely, which makes the issue more difficult to solve. Only when the customer-provided data is relevant and understandable by the AI algorithms in use can a financial/banking service be considered effective. They may then ask questions, and the AI systems will be able to recognise them and provide an appropriate answer.

**Multiple Languages**

Given the diversity of Indian languages, the AI-enabled communication systems that reach the majority of Indians in their first or preferred languages would be the most effective. Due to the small machine-readable corpus of vernacular languages available for the training of natural language processing and creation algorithms, this is currently a difficulty. At the moment, there are significant disparities between AI that can process and grasp local languages and AI that only works in English or bilingual mode. While offering banking or financial services, an AI-based communication platform must be able to understand the customer's spoken language and answer in the same language.

**Data privacy and protection:**

AI systems need a lot of training data as an input. Consumer data is gathered by monitoring customer behaviour both online and offline, archived, and combined with data from other sources to create big data sets. These data set often include details on transactions, emails, videos, search inquiries, health records, and activities on social media. Unauthorized access to this data frequently occurs due to security flaws and unsecured servers. Cyberattacks against India ranked second between 2016 and 2018, so it is important to use the same language as the consumer when communicating with them.

Source: Accenture Report,2021

**5) Findings**

**1)** Financial services that are focused on building a personal connection with the client in order to offer automated financial advice as well as professional guidance for helping clients make financial decisions. Moreover, it assesses market volatility and makes recommendations on how users can manage their portfolios in order to meet their financial objectives.

**2)** Since technology enables users to access financial services with voice commands and touch displays, physical presence is gradually vanishing. Natural language processing technology can process queries to provide information, respond to inquiries, and link consumers to other financial services. As a result, efficiency is systematized, reducing human error.

**3)** The Indian banking industry is being impacted by artificial intelligence. The major players in the banking industry are incorporating artificial intelligence technology into some of their processes to improve the efficiency of banking. As a result, the banking industry will have more time to devote to other tasks that will enhance banking operations and relieve it of tedious tasks.

**4)** When voice processing and natural language processing technologies are improved, customer concerns relating to the banking sector will be answered quickly. The time when computers might handle the majority of customer support inquiries is rapidly approaching. Due to the elimination of line waiting, effective customer service would ensue.

**5)** We have identified that banking system are lacking behind in its back-end operation with respect to protection as data suggests that around 15%-20% is being allocated to data privacy and protection and also reveals that bank focusing more on generating revenue.

**6)** Nowadays, the majority of Indian banks are either preparing to employ AI to boost customer effectiveness and/or operational efficiency, or they have already tried out certain AI/ML models. Yet, it is crucial for each organization to evaluate where they are in the AI process and what level of maturity, they have for building and owning a production-grade AI/ML system. The bank may then choose a course of action based on the assessed degree of maturity.

**7)** It has been identified that banks have major challenge of acquiring huge amount data of every customer because for the purpose of training AI algorithms, an organization must spend in the production and storage of substantial volumes of data. The quantity and quality of data that these businesses have captured or retained are connected to the AI dividends that have been generated.

**6) Conclusion**

From the above study we came to the conclusion that banks are experimenting with and utilising artificial intelligence (AI) to modify how customers are handled, as the technology is growing in popularity. The banking industry will benefit greatly from artificial intelligence in the future. Customers now have more flexibility to complete transactions whenever they want, wherever, without having to stand in huge queues at the bank thanks to the introduction of AI. The purpose of artificial intelligence is to provide highly customised, high-quality services that are also quick and efficient. With the help of AI bank has reduce the cost on the repetitive task by automation. AI has also help bank to reduce fraud and to analysis the credit risk but still there are many challenges in front of AI. Challenge of acquiring huge amount of data of every customer of bank. Bank has to spend money on the production and storage of data. But still AI has bright future in Banking sector as time will move forward there will be improvement in AI.

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