

The Future of Indian Banking Sector-AI way

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Abstract- The aim of Artificial Intelligence (AI) is to imitate human intelligence in machines, Machine learning algorithms and software which self-improves as it gets fed with more and more data is the basis of AI. AI led computer develops numerous sets of inferences to solve problems in decision-making situations while acquiring and retaining knowledge. This AI movement is now attracting the financial industry as it can get immense benefits out of it. Globally, banks are the biggest buyers of technology. Indian banks are no exception. Our Financial sector is becoming one of the foremost explorer, adopter and implementer of AI. To name a few, the State Bank of India (SBI) conducted "Code for Bank" hackathon to inspire designers to build solutions leveraging ultramodern technologies such as AI and Blockchain into services of the banking sector. Private sector banks like HDFC Bank and ICICI Bank have already introduced chat-bots for customers' service. Some banks have even gone ahead with placing robots for customer's service. Previous year, Canara Bank installed 'Mitra' and 'Candi' robots at some of its offices. This paper is an attempt to see the transformation journey Indian banking sector through AI.

Keywords- Chatbots, Banking Sector, AI, Transformation

I. INTRODUCTION

"Artificial Intelligence is the science and engineering of making intelligent machines, especially intelligent computer programs". - John McCarthy, Father of Artificial Intelligence

Artificial Intelligence (AI) also called machine intelligence (MI) is the intelligence displayed by machines, in contrast with the natural intelligence (NI) exhibited by humans and animals. The concept of AI is based on the idea of building machines with capability to think, act and learn just like humans. AI makes it probable and feasible for machines to learn from experience, adjust to novel inputs and do man-like activities. It is accomplished by examining and exploring the working of human brain viz. How humans learn, decide and work while trying to understand a problem and then using the outcomes as a base for developing intelligent software and systems.

Artificial intelligence is the combination of three unconventional technologies – machine learning, natural language processing and cognitive computing. The idea behind this is to replicate the intelligence of humans to machines and to remove the obstruction of human intelligence. The only limitation with humans is speed. Artificial intelligence overcomes this limitation by transferring the human intelligence to logical machines with superlative computational competencies.

AI its applications are rising with an incredible pace, and will bring revolution in all sectors whether manufacturing or the service organizations in both public and private sector. The International Data Corporation (IDC) has forecasted that CAGR of global spending on AI will be 50.1%, at estimated spending of \$57.6 billion in year 2021 especially due to the retail, banking, healthcare and manufacturing sectors. The upspring of Big data and an exponential growth in computing have unlocked the doors for artificial intelligence to take off. With progressions in machine learning, neural networks and deep learning technology numerous companies are adopting AI as

it makes processes smarter and efficient. Banking industry is predicted to take maximum benefit of AI as it will enhance their performances exponentially, predominantly in the areas necessitating precision, accuracy, analysis and decision- making. Artificial intelligence manages front end operations which involve direct interaction with the customers. It provides applications and payment interfaces, digital wallets, chat bots, or interactive voice response systems (IVRS). Back-end operations are more intricate as they involve the systematic processing of large chunks or terabytes of data to afford security to the system, analyze deceitful transactions, and generate reports to improve compliance.

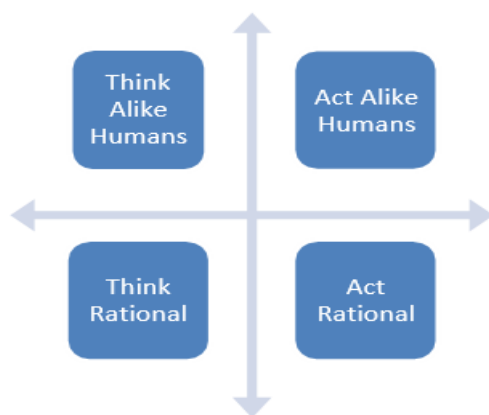


Fig. 1 Basic model behind AI.

Artificial intelligence basically works on Think Alike Humans, Act Alike Humans, Think Rational and Act Rational .As stated by Russell and Norvig, 1995; Luger, 2002 AI has already proved its strength in these areas like Game playing, semantic modeling ,human performance modeling ,robotics, machine learning, data mining neural networks ,genetic algorithms ,expert systems .

II. OBJECTIVES OF THE PAPER

- What are AI applications being used by customers and employees in Indian banks.
- What are the benefits of these AI applications in Indian banks.
- Are there any challenges and threats posted by AI to Indian Banking sector and its future.

III. RESEARCH METHODOLOGY

For the purpose of present study, the data was extracted from the various newspapers, journals, articles and websites particularly from Fintech

reports, Niti Aayog etc. The data has been taken from various sources such as websites and reports and compiled as per the need of the study.

IV. ADVENT OF ARTIFICIAL INTELLIGENCE IN BANKING SECTOR IN INDIA

Accenture's Banking Technology Vision 2018 report, says "83% of Indian bankers believe that AI will work along with humans in the next two years i.e. a higher than the global average of 79%.93% bankers in India feel that they increasingly use data to drive critical and mechanized decision-making. More partner-supplied customer data means a higher degree of responsibility for banks. Yet, 77% Indian bankers agree that most firms are not prepared to confront impending waves of corrupted insights from falsified data."

As AI is not new to India, many Research institutions and Universities have been working with various AI technologies for decades, and chiefly in the field of societal transformation. Enabling technologies have now become more accessible and cheaper. AI is now mainstream as it is full of opportunities."Application of AI and ML (machine learning) to various functions in the banking industry has enabled them to offer a far more personalized and well-organized customer service. By achieving that, banks have also been able to gain enhanced insights into their customers' preference and expectations from the bank. Accordingly, automation of back-end workflows has shown better outcomes. According to various industry reports, more than 36% of large financial institutions are already investing in similar technologies, and close to 70% are planning to in the near future." (Darshan Shah , MD, South Asia, LenddoEFL, a Singapore- based Fintech Company)

V. USES/ APPLICATIONS/ SCOPE OF ARTIFICIAL INTELLIGENCE IN THE BANKING INDUSTRY

With the arrival of simple-to-use financial transaction mobile applications such as Paytm, Google Pay et al. , there's a large demand to make and maintain a bank account to run any form of industry or to access any form of service regardless of whether one is in an urban or rural location. Since banking is one among the most data-intensive industries, its

transformation into AI infrastructure is critical to surviving the next massive data revolution. In recent years, Artificial Intelligence has impacted the Banking industry most as it is a challenge to keep up with competition, and increase value in an innovation driven environment.

Here are the key applications of artificial intelligence in the Banking industry that will revolutionize the industry in the next 5 years.

1. Better Customer Interaction And Satisfaction

One of the most widespread utilities of AI is to improve client engagement and maintenance. By utilizing AI to modify several of the administrative tasks that the staff does, those employees can then divert their time and vigor on building relationships with customers and serving to customers with inventive solutions to issues. Automating user FAQ and tailored information feed will not only help consumer experience but will also save time for the bank customer executives.

2. Faster Account KYC Verification

KYC verification becomes an automated affair with artificial intelligence functioning at its core. Any attempt at meddling with personal data or employing a fake document to perform KYC will be found out in real-time with the aid of a well-devised AI. This will modify the account verification method by cross-checking the given KYC document to the adjoining government records to cross verify the credibility of the submitted documents.

3. Personalized Loan Sanction

Banks and financial establishments, with some noteworthy exceptions, are combating with bad loans problem. Artificial intelligence can process massive amounts of data that human underwriters would simply not be able to make sense of. Artificial intelligence brings the elasticity to capture and take advantage of patterns that are distinctive to the loan portfolios of various lenders.

AI may help to provide new solution to the ever existing bad loan problem that has been plaguing the banking system since long.

4. Signature Verification Gets Smarter

Signature verification automation software will play a crucial role here in fraud prevention ensuring that each document (cheques and other signed documents) undergo signature verification. This could be extremely high volumes of documents

many 100s of thousands daily if not more. AI will definitely help in managing these.

5. Transactions Get More Fool-Proof

On an average economic value of cyber-attacks stand at \$10.4 million for banking organizations across India as well as direct value, indirect reasons like jobs losses and economic science factors. The solution lies in integrating cyber security with the product and looking at it as an enabler for digital transformation method. Banking institutions should additionally leverage AI and automation in cyber security to achieve faster and accurate detection of threats. They're much more capable than humans when it involves identifying the blind spots, protecting privileged accounts, detecting the cyber threat, responding to the ongoing threat and providing the recovery resolution. AI will produce stronger algorithm to close the gap between thinking something that is in production is unsafe and knowing it's unsafe.

6. AML Pattern Detection "Anti-money laundering (AML) refers to a set of procedures, laws or regulations intended to stop the practice of generating income through illegal actions."

www.investopedia.com. Money launderers hide their actions through a series of steps that make it look like money that came from legal and ethical means. Maximum banks across the globe are shifting from conventional software systems to artificial intelligence based systems since the AI based systems are precise, meticulous, speedy, strong, innovative and intelligent enough to detect money laundering patterns.

7. Chat bots

Chat bots are artificial intelligence based automated chat systems. They simulate human chats without any human interferences. They work by identifying the context and emotions in the text chat by the human end user. They are capable of giving the suitable reply. As time passes a chat bot collects massive amount of data related to activities and habits of the users. He comes to know the behavior of user. Chat bots are already being extensively used in the banking industry. They have transfigured the customer relationship management all together.

8. Algorithmic Trading

A good number of Hedge funds across the world utilise high tech systems to deploy artificial

intelligence models. These AI based models self-learn from inputs drawn from several sources of financial markets fluctuations. They grasp the information about the market sentiment regarding an entity and thus guide investment decisions appropriately. Most of the trading today is essentially done by artificial intelligence structures. Examples of some of the hedge funds available in AI space : DE Shaw, Winton Capital Management, Ketchum Trading, Two Sigma, PDT Partners LLC, Citadel, Voleon, Vatic Labs, Cubist, Point72, Man AHL etc.

9. Fraud Detection

Intervention of artificial intelligence has helped in fraud detection in an accurate, excellent and superior style. FICO -Falcon fraud assessment system is the earliest example of successful deployment of data analysis techniques in the banking industry. It is based on a neural networks and implementation of intricate artificial intelligence systems. Today, fraud detection has come a long way and will grow further. Earlier banking frauds were lesser as the customers had restricted channels available to interact with the banks. The banking frauds restricted to loan defaults and theft. The explosion of technology has opened varied channels of interactions and transactions viz.- web site, mobile application, and ATM etc. etc. This has considerably given rise to modes and methods of fraud.

This gives rise to the need of technologies like artificial intelligence (AI) and Machine Learning (ML). These new technologies support humans in detecting fraud patterns and aid in judgments.

It is recommended that Banking and Financial Service Industry (BFSI) taps the entire potential of AI, Machine Learning (ML), Natural Language Process (NLP) and Pattern Recognition (PR) to detect and dissect frauds as well as catch the fraudsters before a major fraud occurs.

10. Customer Recommendations

Artificial Intelligence has given Recommendation Engines to the banking sector. Recommendation engine works in this manner :

- Checks data from the past about users needs and preferences
- Checks various offerings of that bank namely- credit card schemes, investment strategies, fund management, etc.

- Then make the most appropriate recommendation to the user.

Recommendation engines have successfully contributed to the revenue growth of some chief banks in current era.

Thus availability of Big Data, faster computation mechanisms coupled with accurate artificial intelligence algorithms are playing a key role in making recommendations in and about the banking sector.

11. Data Analytics To Predict Future Outcomes And Trends

Effortless and rapid processing of a massive data can assist banks to observe the patterns of customer behavior, predict future outcomes. AI can help banks to reach the right customer at right time with right product. As stated earlier also AI helps to recognize frauds, deceitful transactions, and also detect money laundering patterns on an instantaneous basis.

12. Wealth Management and Portfolio Management

Potential investors can benefit from AI-based systems for analyzing and predicting market trends and They can choose the right funds for their portfolio. All this is possible without visiting branches or hiring experts. Thus mutual funds, fixed deposits and other instruments can be generated at home, and the money be redeemed when necessary. AI can additionally be leveraged to alert customers promptly for any wary transaction(s) beyond their usual patterns.

13. Improved Operations And Efficient Cost Management

AI provides assistance to banks in improving efficiency and effectiveness of operations in the following manner:

- AI technologies enable banks to manage costs and profits .
- Robotic Process Automation (RPA) and Intelligent Process Automation (IPA) are enormously helpful in processing of financial deals on real time basis .
- Help in managing contracts and act as brokers.
- Routine tasks are managed with higher productivity and efficiency.
- Automation of repetitive works and processes helps staff and officials to devote time on value-

added operations that require a high level of human intervention. e.g. product marketing.

- Banks can make use of software robotics to ease back-end processes and attain a better functional design.

Robotic automation of processes can reshape the financial sector and make it more humane and intelligent besides increasing revenue, reducing costs and yielding high profits.

14. Risk Management

The mega fraud in Punjab National Bank brought about the fact that the banking sector is exposed to an enormous amount of risk. It shook the regulators, financial and stock markets, and the banking industry at large. Nonetheless AI and due diligence can point out such potential threats and aid banks in installing fool-proof scrutiny and fraud detection mechanisms. Surveillance in banks has been so far through audits and sampling. Some data sets and files that are capable of causing huge risks may be left in the audits and sample checks. The algorithmic approach without fail can monitor each and every file besides the machine learning techniques can maintain a database of all such files which pose a risk to the bank.

15. Insurance Underwriting and Claims

Due to availability of insurance facility in banks i.e. banc assurance; the customers are likely to approach banks rather than insurance agencies. Insurance sector AI assistance in:

- Underwriting of insurance,
- Claim-handling procedures,
- Fraud detection

AI aids in identifying unsafe behavior and thus prompts the insurer to charge higher premiums from individuals with sub-standard risk.

AI can help to scan the enormous amount of data lying with insurers using mathematical models and predict risky behaviors accurately. Such data can also be lent to banks to be used in customer risk identification. Lets take example of vehicle cover. Deep learning techniques can analyze the vehicle and calculate repair cost using predictive models before providing insurance cover.

VI. AI APPLICATIONS IN PRACTICE IN TOP COMMERCIAL BANKS IN INDIA

The four leading commercial banks in India, in partnership with Fintech startups, have pioneered in using AI to improve their customer's experience, reduce costs and improve overall efficiency.

Placed below is the snapshot of AI applications being used by our top commercial banks viz.: State Bank of India, HDFC, ICICI and Axis Bank

1. State Bank of India (SBI)

SBI, being the India's largest public-sector bank with approximately 420 million customers, pioneered in its AI journey from the point of view of both employees and customers. SBI launched a nationwide hackathon named, "Code For Bank", for developers, startups and students to come up with ground-breaking and state of the art ideas and solutions for the banking sector. The participants/teams focused on technologies such as:

- Predictive analytics,
- Fintech/blockchain,
- Digital payments,
- IoT- Internet Of Things
- AI and machine learning,
- BOTS and robotic process automation(RPA)

SBI is at present-day using an AI-based technologically advanced solution given by Chapdex, the winning team from its hackathon. This AI based solution examines cameras installed in bank branches and captures the facial expressions of the customers. Consequently it reports the customer perspective and feel on real time basis. From a customer perspective, SBI has launched chatbot SIA developed by PAYJO, a startup based in Silicon Valley and Bengaluru. Features of SIA are:

- It is an AI-powered chat assistant that handles approximately 10,000 enquiries per second or 864 million in a day
- It addresses customer enquiries instantly.
- Helps them with everyday banking tasks just like a bank representative
- It continuously learns with each interaction and gets better over time.

Thus chatbot SAI can address enquiries related to the bank services and with its already fed

background of large set of past customer questions it can befittingly handle the FAQs.

2. HDFC Bank

HDFC Bank's chatbot, "EVA" is its AI based Virtual Assistant, built by Bengaluru-based Senseforth AI Research. It is said to have addressed, above 3 million customer queries, interacted with over 5,50,000 unique users, and held over 1.3 million conversations.

EVA can:

- Assimilate knowledge from thousands of sources
- Can provide simple answers in less than 0.4 seconds.
- Answer volumes of queries from thousands of customers from countries across the globe.
- Helps customers to get information on bank's products and services instantly.
- Removes the need to search, browse or call.
- Becomes smarter and smarter with more number of customer interactions.
- It soon may handle real banking transactions.
- Complements existing digital platforms to enrich customers' experience.

HDFC is also experimenting with in-store robotic applications IRA - Intelligent Robotic Assistant further improve customer experiences and reinvent its business scenario.

3. ICICI Bank

ICICI Bank has been a pioneer in deploying software robotics in its business processes across innumerable functions. ICICI has created these in-house software robotics by leveraging AI features such as facial and voice recognition, natural language processing, machine learning. The features/function of the same are:

- The software robot(s) emulates human actions to systematize and perform repetitive, high-volume and laborious operations.
- They reduce the response time to customers by up to 60 percent and increased accuracy to 100 percent.
- They improve bank's productivity and efficiency drastically.
- They has also enabled the bank's employees to focus more on value-added and customer-related functions.
- They capture and interpret information from systems, recognize patterns and run business

processes across multiple applications to execute activities,

- They perform functions like - data validation, automated formatting, multi-format message creation, text mining, workflow acceleration, reconciliations and currency exchange rate processing etc. etc. ICICI Bank also launched its AI-based chatbot, named iPal to interact with customers. iPal is said to have interacted with more than 3.1 million customers so far, answered about 6 million queries, with a 90 percent accuracy rate.

The services offered by iPal can be readily mapped to the iMobile app and be divided into three classes viz.:

Class 1- FAQs: iPal provides simple and structured answers for routine FAQs.

Class 2- Financial Transactions: iPal aids customers to do fund transfers, pay bills, recharge their mobile phone etc.

Class 3-New Features : iPal helps customers whether existing or prospective to discover new features.

The bank will perhaps integrate iPal with its existing voice assistants such as Cortana, Siri and Assistant.

4. Axis Bank

Axis Bank, India's third-largest private sector bank, recently launched its "Thought Factory", an innovation lab. Its purpose is to accelerate the development of innovative AI technology solutions.

This "Thought Factory" located in Bengaluru is an innovation hub with a world class innovation team. Through its accelerator program the AXIS bank engages with Shortlisted startups for 3-months Whereby it fine-tunes, validates and pushes their business.

Recently, Axis Bank launched an AI & NLP (Natural Language Processing) enabled app available on its Face book, website and mobile banking channel which thereby helps in:

- Conversational Banking activities,
- Other financial and non-financial transactions,
- Answer FAQs and
- Boosts process of bank loans and other products.
- Provides 24x7 assistance and ensures instant satisfaction and convenience to customers.
- AI powered BOT

Formerly if an employee spent 15 minutes in data entry and scrutiny while opening a savings account, now it takes two-three minutes since the AI powered BOT has been trained to extract, match and validate the data across documents.

- The TAT -the turnaround time been reduced.
- Customer experience has improved across processes.
- Human prone error and objectivity got drastically removed and compliances improved.
- Operational and credit risk can be detected with ease and quickness.

AI-enabled neural network has is found that 80 percent of the suspicious transactions arise from 5 percent patrons who are identified as high risk.

VII. CHALLENGES OF USING AI

An extensive implementation of AI in India is full of challenges. Some of the protuberant ones are entailed below:

- Availability of Right Data: Data is the lifeblood of AI. A key challenge is the availability of the right and credible data.
- Problem Of Language: Our country has a Multi-Lingual and multi-cultural populace, which itself is a challenge to handle .
- Need For Regulations: Data access and data privacy is a central aspect of working with AI. Banks in India must necessarily build AI systems with GDPR(General Data Protection Regulation) and other alike secrecy regulations in cognizance.
- Scarcity Of Trained HR : There is a drastic necessity of highly skilled engineers to drive the AI mission.
- Shortage of Right Data Science Skills: Good data scientists are needed to do AI work. The industry needs to motivate and collaborate with the Higher Educational Institutions to develop such courses, modules and training programs. The aptly trained candidates can then be absorbed by the Industry.
- Leakage and Misuse of Data: Complete transparency while venturing into new AI projects should be ensured so that banks don't have to face reputation risks.

VIII. THREATS POSED BY AI

"AI and big data were a threat to humans and would disable people instead of empowering them" Jack Ma, the founder of Alibaba, warned the

audience at the World Economic Forum 2018 at Davos. Undoubtedly a colossal deployment of AI in banks would bring huge risks along with the opportunities. Banks are increasing their annual investment. But risks that may arise cannot be ignored. Some of them are listed below:

- **Loss of Employment**-Automation of tasks can lead to loss of jobs of the tellers, customer service executives, loan processing officers, compliance officers, finance managers. Simultaneously banks also face the risk of upsurge from their employees due to risk of employment.
- **The Opacity of Processes**-Justice Srikrishna Committee on "Data Protection Framework" has cited that the biggest challenge in using Big Data and Artificial Intelligence is that they operate outside the context of traditional confidentiality axioms. This could now act in a contrary way and expose banks to hazards without their knowledge.
- **Reduced Customer Loyalty**-There is also a fear of reduced customer loyalty due to less customer contact. Also it is feared that the lack of "human touch" will also impact the business of the banks.

Summary

India is a flourishing hub for businesses. In recent times India is focusing on technology, realizing that it is a key component of economic development. The government is research, business incubators and parks. It has improved on the Global Innovation Index(GII) position since 2016. AI is thought to enhance business results exponentially as it is fast evolving as the go-to technology across the world and its applications are getting better and smarter day by day.

Banking sector is becoming one of the first adopters of AI and is exploring and implementing the technology in innumerable ways. The rudimentary applications of AI include smarter chat-bots for customer service, personalizing services for individuals, and even placing an AI robot for self-service at banks. Beyond these basic applications, banks can implement the technology enhance the efficacy of back-office and also reduce the fraud and security risks.

Unsurprisingly, research firms are optimistic on the potential of AI in financial sector especially the banks . According to Fintech India report by PwC in 2017, the global spending in AI applications touched \$5.1

billion, up from \$4 billion in 2015. There is a keen interest in the Indian banking sector as well. To stay forward on technology curve; financial organizations are adopting a holistic approach to reap benefits of Artificial Intelligence. By now various Indian banks have started implementing variety of AI applications including chatbots, risk monitoring, training, etc. However this is just the beginning. Strategic step by step approach can help to maximize the gain. It is suggested that AI be leveraged to bring perceptible WOW factor for customers. It should be integrated with other technologies present in the banking ecosystem to automate high volume and low complexity task and thus enhance manifold the workforce efficiency to bring seamless customer centric results. Nevertheless Artificial intelligence is set to become the sole determinant of the competitive position of Indian banks.

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