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University of Mumbai

A Study On Opportunities and Challenges Of

ARTIFICIAL INTELLIGENCE

In Indian Banking Sector.

Project Submitted to

University of Mumbai for partial completion of the degree of

Bachelor of Banking and Insurance

Under the Faculty of Commerce

By

Krishna Khakhar

Roll no. 7408

Under the Guidance of

Prof Ella Gaglani

THAKUR COLLEGE OF SCIENCE & COMMERCE

March-2023

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Certificate

This is to certify that **Krishna Khakhar** has worked and duly completed her Project Work for the degree of Bachelor of Banking and Insurance under the Faculty of Commerce in the subject of Finance and her project is entitled ,

A STUDY ON OPPORTUNITIES AND CHALLENGES OF ARTIFICIAL INTELLIGENCE IN INDIAN BANKING SECTOR.

under my supervision.

I further certify that the entire work has been done by the learner under my guidance and that no part of it has been submitted previously for any Degree or Diploma of any University.

It is her own work and facts reported by her personal findings and investigations

10/3

Name and Signature of guiding teacher

ELLA GAGLANI

Date of submission: **09- 03-2023**

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Declaration by learner

I the undersigned **Krishna Khakhar** here by, declare that the work embodied

In this project work titled

A STUDY ON OPPORTUNITIES AND CHALLENGES OF ARTIFICIAL INTELLIGENCE IN INDIAN BANKING SECTOR. forms my own contribution to the research work carried out under the guidance of

Prof Ella Gaglani is a result of my own research work and has not been previously submitted to any other University for any other Degree/ Diploma to this or any other University.

Wherever reference has been made to previous works of others, it has been clearly indicate as such and included in the bibliography.

I B here by further declare that all information of this document has been obtained and presented with academic rules and ethical conduct

Krishna

Name and signature of learner

Krishna Khakhar.

Name and Signature of guiding teacher

ELLA GAGLANI

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I would like to acknowledge the following as being idealistic channels and fresh dimensions in the completion of this project.

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CHP 1. INTRODUCTION

Introduction:

Artificial intelligence is the future of banking as it can prevent fraudulent transactions and improve compliance through advanced data analytics. Artificial intelligence in the financial services industry helps banks process large amounts of data and predict the latest trends in markets, currencies and stocks. Advanced machine learning techniques help gauge market sentiment and suggest investment options.

JOHN MCCARTHY was one of the most influential people in this field. He is known as the "**Father of Artificial Intelligence"** for his fantastic work in computer science and artificial intelligence. **McCarthy** coined the term "**artificial intelligence"** in the **1950s**. He defined it as **"the science and art of making intelligent machines".**

John McCarthy

- 1955 Develop the phrase "Artificial Intelligence"
- 1960 First LISP implementation
- 1971 Turing Award Recipient
- 2001 Professor Emeritus of Computer Science at Stanford University

Artificial Intelligence is a method to make a computer, or a robot, or a product to reflect how smart human think. AI is a learning of how human brain thinks and act, learn, decide and works. It attempts to solve problems and it outputs the intelligent software systems.

In computer Artificial intelligence sometimes is also referred as machine intelligence where it is an intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans. The term Artificial intelligence is often used to define machines that mimic cognitive functions that humans associate with the human mind, such as learning and problem solving. The objective of AI is to improve computer functions which are related to human knowledge, for example, reasoning, learning, and problem-solving. Artificial intelligence can be classified into three different types of systems: analytical, human-inspired and humanized artificial intelligence. Analytical AI has only characteristics consistent with cognitive intelligence generating cognitive representation of the world and using learning based on past experience to inform future decisions. Human-inspired AI has elements from cognitive and emotional intelligence, understanding human emotions in addition to cognitive elements and considering them in their decision making

In computer science and the field of computers, the word **artificial intelligence** has played a very prominent role, and of late, this term has been gaining much more popular due to the recent advances in the field of artificial intelligence and machine learning. Machine learning is that sphere of artificial intelligence where the machines are responsible for ending daily chores and are believed to be smarter than humans. Robotics and integration with the **IoT devices** have made machines think and work on a whole new level where they outsmart humans with their cognitive abilities and smartness. They have been known to learn, adapt and perform in a much faster way than what humans are supposed and programmed to do. In this article, we are going to read about the vast importance of artificial intelligence.

AI is a technology that mimics human intelligence, allowing computer applications to learn from experience via iterative processing and algorithmic training. AI systems get smarter with each successful round of data processing since each interaction allows the system to test and measure solutions, and develop expertise in the task it's been set to accomplish.

Since this can be completed rapidly, much faster than the rate a human being would be able to perform similar work, AI systems can become experts far faster than humans, making them incredibly effective options for any process requiring intelligent decision making. This makes AI an incredibly powerful, and extremely valuable technology, since it essentially allows computers to think and behave like humans, but at much faster speeds and with much more processing power than the human brain can produce. In many cases and for a variety of different applications, AI systems are capable of significantly outperforming humans, and that's the primary reason why AI technology has become so important to the modern economy

WHERE IS ARTIFICIAL INTELLIGENCE TECHNOLOGY BEING APPLIED?

- Healthcare - AI applications are being used to deliver personalized medicine, providing patients with reminders about when to take their medicine, and suggestions about which specific exercises they should perform.
- Retail - AI technology is applied in retail environments to handle stock management, design more effective store layouts, and provide personalized shopping recommendations via Amazon's "You May Also Like" suggestions, as well as personalized viewing suggestions via Netflix's machine learning-driven recommendation algorithm.

- Manufacturing - AI solutions are used to forecast load and demand for factories, ensuring they're run as efficiently as possible by helping to make better decisions about logistics and planning for materials ordering, timetables to project completion, etc.
- Banking - AI systems are being used to review financial transactions to detect fraudulent activity, assess credit scores with greater accuracy, and automate tasks requiring manual data input and data management.
- Life Sciences - AI technology is being applied to test new medicines, allowing organizations to bring them to market sooner, and to analyze large and complex data sets that help discover new, more effective therapies and pharmaceutical drugs.

Clearly, AI has already been applied to a whole host of important processes, but there are hundreds or even thousands of additional applications for virtually every sector of the modern economy.

1.1 WHY TO USE ARTIFICIAL INTELLIGENCE?

Technology is the face of this generation. There is a growing demand for answers to all of this generation's problems. And find solutions at your fingertips. On the other side of the screen there might be a computer handling the problem or someone working as a communications manager.
Big data is the industry standard today, and all sectors are working to make the most of unstructured data stores. The application of big data in banking is already transforming the industry. And then there's artificial intelligence.

Not only utilizing the benefits of AI in extracting and structuring the data in hand, finance, and banking sectors are stepping in to use this data to improve customer relations.

Today the amount of data that is generated by both humans and machines, far outspaces humans ability to absorb, interpret, and make complex decisions based on that data. Artificial Intelligence forms the basis for all computer learning and is the future of all complex decision making. Computers are extremely efficient at calculating these combinations and permutations to arrive at the best decision. AI (and it's logical evolution of machine learning) and deep learning are the foundational future of business decision making.

What Makes AI Technology So Useful?

Artificial intelligence technology offers several critical benefits that make it an excellent tool for virtually any modern organization, including:

1. Automation - AI is able to automate a repetitive task that was previously done manually, without feeling any fatigue or having to take breaks like a human employee would need to do.
2. Enhancement - AI can make products and services smarter and more effective, improving experiences for end-users, via capabilities like optimizing conversation bots or customer service menus, and delivering better product recommendations.
3. Analysis - AI can analyze data at a much faster rate than humans, allowing it to find patterns much more quickly, and it can also analyze much larger datasets than humans, allowing it to uncover patterns humans would simply miss.

4. Accuracy - AI can be trained to become more accurate than humans, utilizingits ability to harvest and interpret data to come up with better decisions for tasks like picking financial investments or identifying cancerous growths on x-rays.
5. ROI - AI maximizes the value of data since it's able to do a better job analyzing complex, multi-variate relationships, without having to take any breaks and with fewer mistakes, making it an incredibly important technology for any business that relies on data and operates at scale.

1.2 ROLE OF ARTIFICIAL INTELLIGENCE IN BANKING INDUSTRY :

Artificial intelligence (AI) includes machine learning and natural language, it can be used in the banking industry, Machine learning is a method of data analysis which automates analytical model building, Machine learning occurs when computers change their parameters/algorithms on exposure to new data without humans having to reprogram them. Natural language processing (NLP) refers to the ability of technology to use human communication, naturally spoken or written, as an input that prompts computer activity, natural language generation (NLG) refers to the ability for technology to produce human quality prose, It sorts through large amounts of available data to produce a human-sounding response, NLG can take the form of speech, or of a multipage report summarizing financial results.

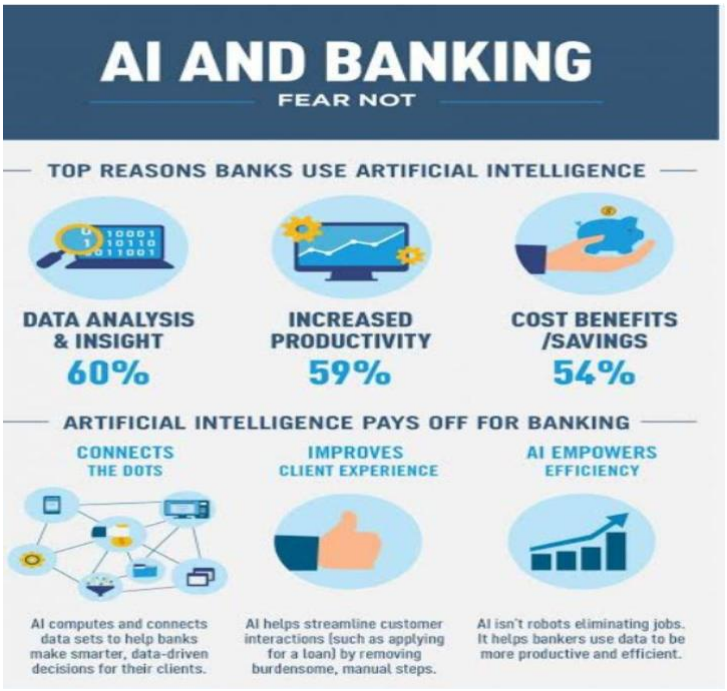
Artificial Intelligence AI is fast evolving as the go-to technology for companies across the world to personalize experience for individuals. The technology itself is getting better and smarter day by day, allowing more and newer industries to adopt the AI for various applications. Banking sector is becoming one of the first adopters of AI. And just like other segments, banks are exploring and implementing the technology in various ways. The rudimentary applications AI include bring smarter chat-bots for customer service, personalising services for individuals, and even placing an AI robot for self-service at banks. Beyond these basic applications, banks can implement the technology for bringing in more efficiency to their back-office and even reduce fraud and security risks. Unsurprisingly, research firms are bullish on the potential of AI in banking. 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.

Artificial Intelligence is the future of banking as it takes the power of advanced data analytics to contest fraudulent transactions and improve
compliance.

AI algorithm achieves anti-money laundering activities in few seconds, which otherwise take hours and days.

1. AI also allows banks to manage huge volumes of data at record speed to derive valuable perceptions from it. Features such as AI bots,
   digital payment advisers and biometric fraud detection mechanisms lead to higher quality of services to a wider customer base.
2. All this explains to increased revenue, reduced costs and boost in profits.
3. Artificial intelligence Technology systems used in banking sectors are :
   - Robotics.
   - Computer vision.
   - Language.

- Virtual agents.
- Machine learning.



Digital disruption is redefining industries and changing the way businesses function. Every industry is assessing options and adopting ways to create value in the technology-driven world. The banking sector is witnessing groundbreaking changes: foremost being the rise in customer-centricity.

Tech-savvy customers, exposed to advanced technologies in their day-to-day lives, expect banks to deliver seamless experiences. To meet these expectations, banks have expanded their industry landscape to retail, IT and telecom to enable services like mobile banking, e-banking and real-time money transfers. While these advancements have enabled customers to avail most of the banking services at their fingertips anytime, anywhere, it has also come with a cost for the banking sector.

Coming together of banking and sectors like IT, telecom and retail has increased the transfer of critical information over virtual networks that are vulnerable to cyber-attacks and fraudulence. These incidents not only affect the profitability of banks, but also hamper banks' trust and relationship with customers.

The rise of online security threats in banking transactions has tightened government regulations. Though these regulations are useful to monitor online financial transactions, it has curbed banks' capability to keep up with digital transformation. Banks are unable to invest in technology, as they have to maintain capital adequacy ratio as per international regulatory framework guidelines. Thus, banks fall prey to the competition posed by nimble Financial Technology (FinTech) players, which do not have to maintain capital adequacy ratio. According to World Retail Banking Report of 2016, about half of the customers around the world have reported an increased likelihood to switch their banks with these players[1].

Harnessing cognitive technology with Artificial Intelligence (AI) brings the advantage of digitization to banks and helps them meet the competition posed by FinTech players. In fact, about 32% of financial service

providers are already using AI technologies like Predictive Analytics, Voice Recognition, among others, according to a joint research conducted by the National Business Research Institute and Narrative Science[2].

Artificial Intelligence is the future of banking as it brings the power of advanced data analytics to combat fraudulent transactions and improve compliance. AI algorithm accomplishes anti-money laundering activities in few seconds, which otherwise take hours and days. AI also enables banks to manage huge volumes of data at record speed to derive valuable insights from it. Features such as AI bots, digital payment advisers and biometric fraud detection mechanisms lead to higher quality of services to a wider customer base. All this translates to increased revenue, reduced costs and boost in profits.

AI is strengthening competitiveness of banks through:

Enhanced customer experience: Based on past interactions, AI develops a better understanding of customers and their behavior. This enables banks to customize financial products and services by adding personalized features and intuitive interactions to deliver meaningful customer engagement and build strong relationships with its customers.

Prediction of future outcomes and trends: With its power to predict future scenarios by analyzing past behaviors, AI helps banks predict future outcomes and trends. This helps banks to identify fraud, detect anti-money laundering pattern and make customer recommendations. Money launderers, through a series of actions, portray that the source of their illegal money is legal. With its power of Machine Learning and Cognition, AI identifies these hidden actions and helps save millions for banks. Similarly, AI is able to detect suspicious data patterns among humungous volumes of data to carry out fraud management. Further, with its key recommendation engines, AI studies past to predict future behavior of data points, which helps banks to successfully up-sell and cross-sell.

Cognitive process automation: This feature enables automation of a variety of information-intensive, costly and error-prone banking services like claims management. This **secures ROI, reduces costs and ensures accurate and quick processing of services at each step.** Cognitive process automation fundamentally automates a set of tasks that improvises upon their previous iterations through constant machine learning.

Realistic interactive interfaces: Chatbots identify the context and emotions in the text chat and respond to it in the most appropriate way. These cognitive machines enable banks to save not only time and improve efficiency, but also help banks to save millions of dollars as a result of cumulative cost savings.

Effective decision-making: Cognitive systems that think and respond like human experts, provide optimal solutions based on available data in real-time. These systems keep a repository of expert information in its database called knowledge database. Bankers use these cognitive systems to make strategic decisions.

Robotic automation of processes: AI reviews and transforms processes by applying Robotic Process Automation (RPA). This enables automation of about 80% of repetitive work processes, allowing knowledge workers to dedicate their time in value-add operations that require high level of human intervention

1.3 REASONS FOR ADOPTION OF ARTIFICIAL INTELLIGENCE IN BANKING SECTOR :

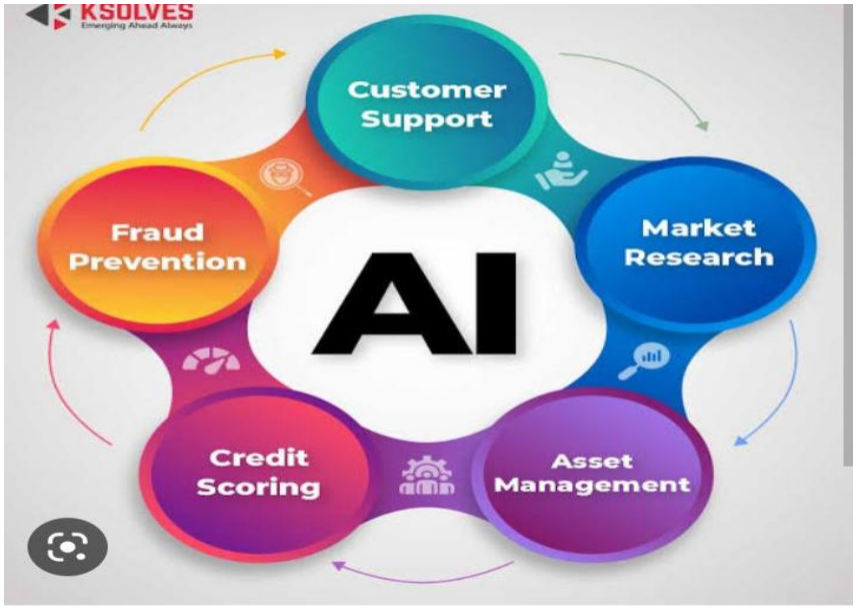
- To improve operational efficiency.
- To recognize fraud and security risk .
- To accomplish large volume of data.
- To make decision successfully.
- To assist the customer for their queries.
- Easily find the credit worthiness of an individual and a company.

- Generates compliance report for fraudulent transaction Easily capture the data from KYC document using OCR technique.

1.4 AREAS OF ARTIFICIAL INTELLIGENCE IN BANKS :

Many areas where banks are UTILIZING Artificial Intelligence to efficient the processes:

- Fraud and cyber security.
- Customer service.
- Compliance .
- Financing and loan (credit assessment)
- Business process management.
- Marketing.



1.5 List of some common uses of Artificial Intelligence in banks :

- **Fraud Detection:**

Anomaly detection can be used to increase the accuracy of credit card fraud detection and anti-money laundering.

- **Support and Helpdesk:**

Humanoid Chatbot interfaces can be used to increase efficiency and reduce cost for customer interactions.

- **Risk Management:**
  Tailored products can be offered to clients by looking at historical data, doing risk analysis, and eliminating human errors from hand-crafted models.
- **Security:** Suspicious behaviour, logs analysis, and spurious emails can be tracked down to prevent and possibly predict security breaches.

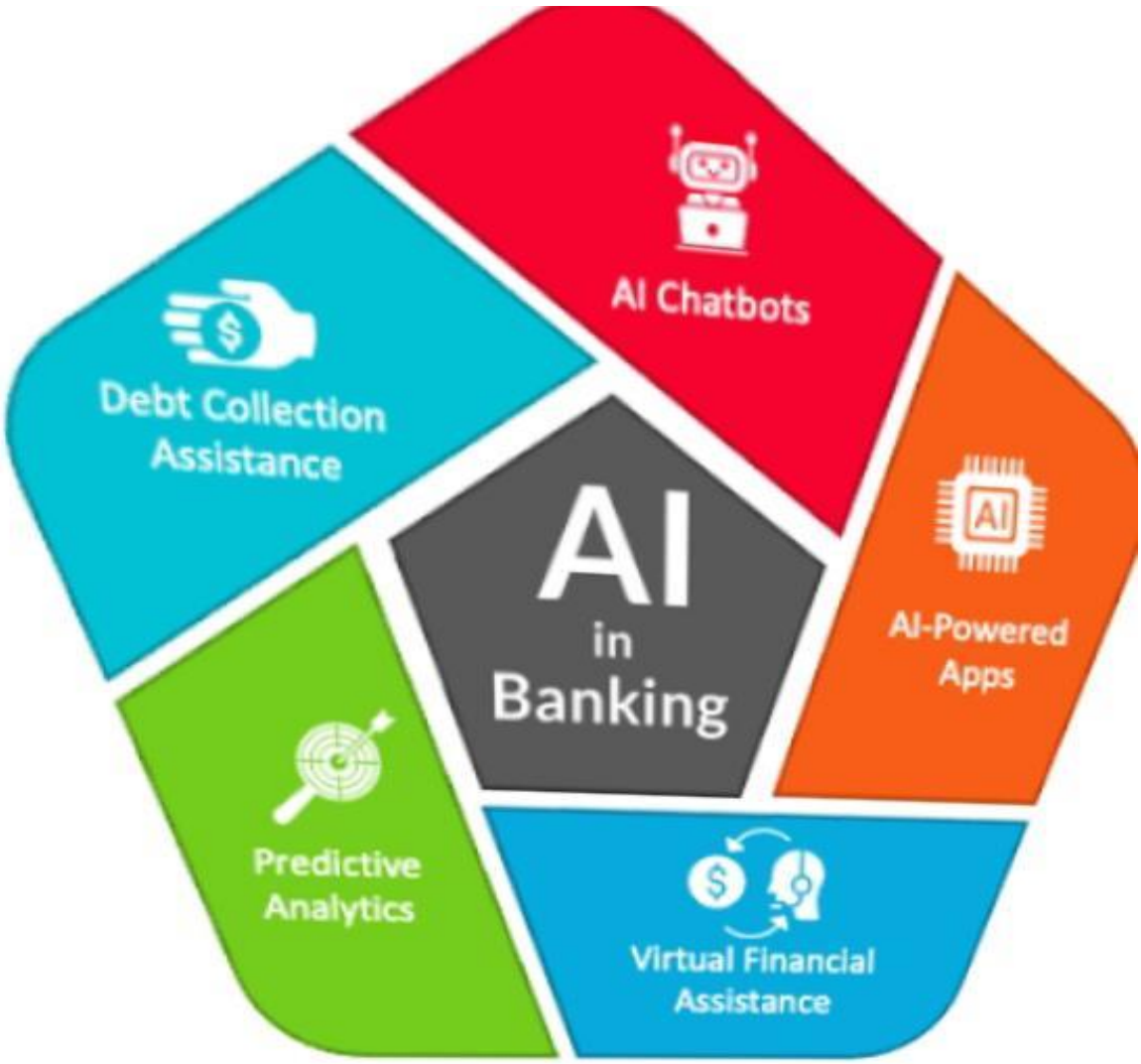
- **Digitization and automation in back-office processing:**

Capturing documents data using OCR and then using machine learning/AI to generate insights from the text data can greatly cut down back-office processing times

- **Wealth management for masses:**

Personalized portfolios can be managed by Bot Advisors for clients by taking into account lifestyle, appetite for risk, expected returns on investment, etc.

- **ATMs:** Image/face recognition using real-time camera images and advanced AI techniques such as deep learning can be used at ATMs detect and prevent fraud.



1.6 CHATBOT: The main form of ARTIFICIAL INTELLIGENCE:

Chatbots is a form of artificial intelligence (AI). This tool helps convenience for customers they are automated programs that interact with customers like a human. In banking sectors, Chatbots allow customers to manage requests quickly and efficiently while acting as a listening network so that banks can better understand user behaviours, customer actions and deliver personalized offers and facilities.

Undoubtedly, chatbots are one of the best examples of practical applications of artificial intelligence in banking. Once deployed, they can work 24*7, unlike humans who have fixed working hours.

Additionally, they keep on learning about the usage pattern of a particular customer. It helps them understand the requirements of a user in an efficient manner.

By integrating chatbots into banking apps, the banks can ensure that they are available for their customers round the clock. Moreover, by understanding customer behavior, chatbots are able to offer personalized customer support and recommend suitable financial services and products accordingly.

One of the best examples of AI chatbot in banking apps is Erica, a virtual assistant from the Bank of America. This AI chatbot can handle tasks like credit card debt reduction and card security updates. Erica managed over 50 million client requests in 2019.

1.7 BANKING AND ARTIFICIAL INTELLIGENCE :

Artificial intelligence is being used in the banking industry to scale new heights in customer relationship management. This sector is implementing this from the ground level with a principal aim of climbing heights in customer – centric approaches . A significant part of the banking industry concerning its customers is customer relationship management , which includes communicating with them. Banking saw a shift in preferences for visiting the locations with the introduction of ATMs. These machines allow cash deposits and withdrawal directly communicating with input points on the Device thus, not requiring man assistance at all .

It was a revolution that led to increased demand for artificial intelligence.
AI technology is increasingly being used by banks and other financial institutions for a variety of purposes, such as improving customer service by using virtual assistants or credit scores to accurately identify borrowers' risks. However, fighting fraud and money laundering is one of the biggest applications of AI in the banking sector.

1.8 OPPORTUNITIES OF ARTIFICIAL INTELLIGENCE IN INDIAN BANKING SECTOR :

Banks are capturing the artificial intelligence by administering it into daily operational workflow by including changes in the values, employment and information patterns. Some of the application areas of artificial intelligence in the banking industry are listed as follows:

1. Refining Consumer Participation :

Artificial intelligence helps understand the customers better. The data gathered from the customer’s choices and preferences enable AI to lead machines to decode the next decisions and thus create a personalized container of information for each customer. This, in turn, is helpful for the banks to customize the buyer experiences as per their choices, in turn improving satisfaction and loyalty towards the institute.
Interactive Voice Response System (IVRS) are examples of such AI-led systems that include voice assistance to customers. It guides the customers by understanding their queries in the right direction by routing calls to the correct department as well as assisting them with the transaction and other banking-related issues in real time.

2. Wealth supervision :
These customized plans for customers not only benefit the banks by increasing their customer-base but also helps the user to manage their wealth in hand with personalized inputs and advice on risk and investment plans. Involving AI-led customer service to meet the front office standards is a challenge with the diverse language set in countries like India.

3. Examining Data To Enhance Defence :

AI has the power to foretell future trends by interpreting data from the past. This property, when associated with machine learning, will help produce data driven predictions to counter cases of capital laundering and identifying fraud.

4. Upgrading Security:

Unusual data pattern recognizing property of AI led machines help banks tighten security and recommend changes by identifying loopholes in existing processes. Deceptive emails and log reports, patterns flows can be tracked by Artificial Intelligence to provide better security in the existing methods.

4. Security Modernization:

Unusual data patterns recognizing the attributes of AI machines help banks identify loopholes in existing processes to strengthen security and recommend changes.
Misleading emails and log reports, process flow disruption patterns can be tracked by artificial intelligence, providing better security than traditional methods.

4. EMOTION INTERFACE:

The AI machine uses technology to detect customer emotions based on the text they use to enter their requirements. Based on this, the device responds according to the pitch and invention of the words used by the customer. Natural language processing helps make this a reality.
Not only is this a realistic experience, it helps banks save huge human resource costs and long term. Chatbots are examples of AI in the banking industry replacing scenes at bank front desks. These AI machines provide customers with next-generation digitized and customizable interactive experiences.

6 Using the Knowledge Base:
Artificial Intelligence The LED system in the banking sector is a huge data report. It has all details about all users on the board. This database enables better decision making based on enhanced strategic and business planning models. AI-powered repositories are like human experts in cognitive thinking. The ATM's real-time facial detection and cameras and other similar interventions help banks enhance security measures and provide a clear and distinct view of user behavior and practices.

7. Risk Control:

With a vast databank accessible from the AI -based system, banks can manage risk by analyzing plans, learning from the failures of previous strategies, and eliminating human error.
AI is expanding into the roots of banking security processes to encrypt each step with codes that authenticate transactions, provide understanding to the companies on anti-fraud and anti-money-laundering activities. Regulatory checks like Know Your Customers (KYCs) help heightens security measures.

8. Expanding Through Front-office :
By offering to be personalized financial guides to customers and strengthening security against fraudulent activities, artificial intelligence is paving its path, strengthening not only in the front-office operation (customer interactions) but into the middle-office(security) and back-end development (underwriting banking service applications) as well.

1.9 CHALLENGES OF ARTIFICIAL INTELLIGENCE In Indian Banking sector :
The financial services industry has seen a surge in artificial intelligence (AI) investments, which has raised new concerns about data security and transparency.
Overcoming these and other AI-related challenges in financial services has become particularly important as data management practices change with the introduction of new AI solutions. Organizations should be aware of the upcoming challenges listed below and take security measures to maintain progress.

AI for Good is an ITU initiative supporting institutions employing AI to tackle some of the world's greatest economic and social challenges. For example, the University of Southern California launched the Center for Artificial Intelligence in Society, with the goal of using AI to address problems such as homelessness. At Stanford, researchers use AI to analyze satellite images to identify high poverty areas.

1. Many banks face the challenge of an unwillingness to improve or adapt to new methods. Standardized with set practices in conventional ways, some locations in tier two and three cities across the country face this challenge. These units also lack the level of commitment required to upskill their labour force and human resources skills.

2. With the lack of supporting data to implement operational changes, the banking sector is facing a disconnect between the need and response from customers. The banks adopt to a switch that fails to comply with the actual requirement of the masses.

3. Banks with upscaling use of Artificial intelligence need to keep up with the regulatory standards of government. The increasing services like net banking and online transactions come under the ambit of privacy regulation policies as well, which necessitates compliance from the banks end.

4. There is also an evident lack of training witnessed in existing work force associating with the advanced tools and applications of the use of AI in banking. With the increasing use of Artificial Intelligence, there is an apparent demand for a skilled workforce. Proficient and experienced engineers in streams like data science and machine learning are needed to provide credibility to the data in hand.

5. Security and compliance is one of the main challenges of AI in financial services is the amount of data collected that contains sensitive and confidential information requires additional security measures to be implemented. The right data partner will offer a variety of security options, have strong data protection with certifications and regulations, security standards to ensure your customer data is appropriately handled.

6. Localization is especially vital within the financial services industry . Because financial companies often need to design models with the multiple markets they serve in mind, it's essential to factor in the challenges of AI in financial services across different languages, cultures and demographics to properly customize the customer experience.

7. Transparency, Explainability , and Trust creates AI model that provides accurate predictions will only be successful if explained to, understand by, and trusted by customers. Because customer information is likely being used to develop these models, they'll want to be sure that their personal information is being collected responsibly, handled and stored securely.

Building the future is complicated enough with the above challenges of AI in financial services, and that doesn't even factor in data pipelines. By Looking Ahead when it comes to launching world class AI, the opportunity for the financial services industry is massive whether you're working to improve conversational AI experiences with a chatbot and site search or build models to support your customer agents.

1.10 POSITIVE IMPACT OF ARTIFICIAL INTELLIGENCE FOR INDIAN BANKING SECTOR:

AI can help the bank understand the expenditure pattern of the customer, The bank can come up with a customized investment plan & assist the customers for budgeting, banks can send the notification about the advice for keeping a check on the expenses and investments based on the data, The transactional & other data sources can be tracked to help understand the customer's behavior and preferences to improve their experience. Artificial intelligent can sift through massive amounts of data and identify patterns that might elude human observers, One area where this capacity is particularly relevant is in fraud prevention, Artificial intelligence and machine learning solutions are deployed by many financial service providers to detect fraud in real time.

- **Improvement in online and mobile banking:**

Online banking and mobile banking become increasingly popular as a tool for 24/7 transaction, AI enables Banks to access customer data, such as detailed demographics, website analytics & records of online and offline transactions, machine learning can integrated & analyze information.

- **Risk assessment process**

while giving loans requires both accuracy & confidentiality, It is a very complex & critical process, Artificial intelligence can handle & simplify this process by analyzing relevant data of the prospective borrower, Artificial intelligence can combine & analyze data related to the latest transactions, market trends, and the most recent financial activities to identify the potential risks in giving the loan.

- **Security & Swifting Transactions.**

Banks must be bankable for presenting secure & swift transactions, Artificial intelligence is designed to detect the fraud in the transactions on the basis of a pre-defined set of rules, the mobile app can detect any suspicious activity in the customer's account on the basis of behavior analysis, any online transaction of a huge amount from the customer's account which has a history of small transactions can be detected instantly.

- **Protection in personal Data :**

Artificial intelligence plays a vital role in protecting personal data, As we witness a rapid rise in the instances of cybercrimes, AI-based fraud detection can prevent such attempts, So, for the banking and finance sector , AI has a tremendous scope in the domain of cyber security, the mobile app and development services can detect the issue of fraud and data breach for the banks.

- **Hedge Fund Trading & Management**

Hedge fund trading & management can be done on the move with the help of AI-based mobile app solutions for the banking sector, AI-related tools can fetch real-time data from various financial markets across the world, AI models can analyze different financial markets, so, AI models can assist the users to take decisions quickly.

- **Offering High Security:**

AI can offer high security to the banking sector, AI-based mobile applications can make the transaction quicker & safer, the bank and financial institutions can understand the user's behavior and offer personalized experience through an app, Banks handle customer-oriented operations easily while reducing the cost of hiring additional employees.

- **Shifting tasks from Humans**

Artificial intelligence can shift tasks from humans to AI, so, it can reduce costs, it can speed up response time, keep humans apprised of the latest regulatory changes, and save time by preparing reports, The Bank has computer programs that carry out repetitive tasks ranging from automated programs to respond to data requests from external auditors.

- **Employee Effectiveness & Customer Experience**

Artificial intelligence improves employee effectiveness and enhances customer experience through targeted emails and other offers, It increases revenue, It increases the productivity of sales reps, AI offers greater precision & accuracy, From cash transfer to bills payment, cards management, and other support, AI can enrich the satisfaction level of your customers, All of these operations can be easily managed through desktops, smart phones, and other mobile devices.

- **Identification of Fraudulent Transactions :**

The finance industry is harnessing machine learning to lower operational costs & drive profitability, This field involves both front-and back-office activities across multiple institutions, Machine learning algorithms can analyze thousands of data points in real time and flag suspicious or plain-right fraudulent transactions, stopping many fraudulent claims in the process.

- **Increase in Efficiency, Accuracy :**

Artificial intelligence increase efficiency, accuracy, and speed of mathematical calculations, it can handle large quantities of data, banks can find the best combination of the initial margin reducing trades at a given time based on the degree of initial margin reduction in the past under different combinations of those trades.

- **Better Customer Support :**

Several pieces of evident advocate that the customers willingly prefer self- service options which allow them to chat with a virtual assistant as if it were a live customer representative. Most leading banks have already added virtual assistants to their instant website chat bots , voice response systems, and mobile applications. Artificial Intelligence considers each interaction as a teachable moment, so the chat bots (virtual assistants) keeps getting better while understanding customers. With AI , virtual assistants can deliver better customer support. It also

allows sentiment analysis, so the virtual assistant can determine when individuals are getting frustrated and instantly transfer them to a live agent .

- **Enhanced Banking Services :**

AI streamlines the banking process while giving customer service a new level of comfort ability. It allows banks to meet customers' expectations with comprehensive digital support. With Artificial Intelligence, you can achieve greater precision and accuracy. From cash transfer to bills payment, cards management, and other support, AI can significantly enrich the satisfaction level of your customers. All of these operations can be easily managed through desktops, smart phones, and other mobile devices.

- **Scam Recognition:**

With an immense growth of banking fraud, scam recognition and reduction has become challenging for the banking sector. Several banks tried to identify the factors and powerful solutions but couldn't succeed. However, AI makes it easier to detect the factors involved in frauds and support investigators. It improves financial security with advanced fraud prevention tactics. Artificial Intelligence works as a real-time scam solution for the banking sector while handling complex situations and tactics. Based on advanced data crunching, AI can detect fraud by flagging unusual transactions. It also feeds back into the consumer's profile which subsequently builds a secure environment.

- **Advanced Data Analytics :**

One of the main advantages of AI is its ability to complete tedious tasks through intricate automation, resulting in better productivity. Based on a machine learning algorithm, AI can quickly consume and process a massive amount of data at an expedited level. The enormous speed brings efficiency to financial services, providing scope for personalized offerings to consumers. What's even more, AI makes faster decisions while carrying out actions quickly.

1.11 NEGATIVE IMPACTS OF ARTIFICIAL INTELLIGENCE FOR INDIAN BANKING SECTOR:

- **High Costs :**

The production & maintenance of artificial intelligence requires high costs as they are very complex machines, AI consists of advanced software programs that require regular updates to meet the needs of the changing environment, In the case of critical failures, the procedure to reinstate the system and recover lost codes may require enormous time & cost.

- **Bad Calls :**

Though Artificial Intelligence can learn and improve, it still can't make judgment calls. Humans can take individual circumstances and judgment calls into account when making decisions, something that AI might never be able to do. Replacing adaptive human behavior with AI may cause irrational behavior within ecosystems of humans and things.

- **Distribution of Power** :
  There is a constant fear of AI superseding or taking over the humans. Artificial intelligence can give a lot of power to the few individuals who are controlling it. Hence, AI carries the risk and takes control away from humans while dehumanizing actions in several ways.

- **Unemployment :**

Replacement of the workforce with machines can lead to wide-reaching unemployment. Moreover, if the use of AI becomes rampant, people will be highly dependent on the machines and lose their creative power. Unemployment is a socially undesirable issue. Individuals with nothing to do can lead to the devastating use of their minds. Be it banking or any other sector; Artificial intelligence can effectively increase the unemployment rate.

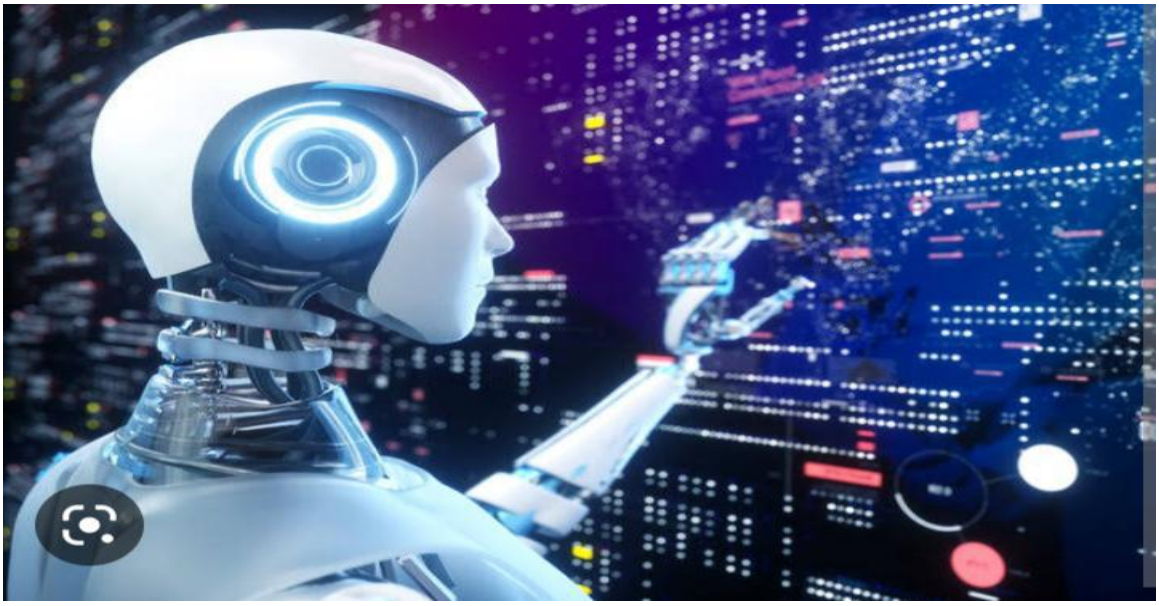
- **Irrational Behavior in Ecosystems :**

Although Artificial Intelligence can learn & improve, it still can't make judgment calls, Humans can take individual circumstances and judgment calls into account when making decisions, something that AI might never be able to do, Replacing adaptive human behavior with AI may cause irrational behavior within ecosystems of humans & things.

- **Risky Factors :**

AI can offer a lot of power to the few individuals who are controlling it, so, AI carries the risk and takes control away from humans while dehumanizing actions in several ways, Artificial Intelligence delivered to wrong hands can turn out to be a serious threat to humankind, If individuals start thinking destructively, they can generate havoc with these advanced machines.

Replacement of Workforce : Artificial intelligence allows you to replace the workforce with machines that can lead to wide-reaching unemployment, if the use of AI becomes rampant, people will be highly dependent on the machines & lose their creative power, Be it banking or any other sector, AI can increase the unemployment rate, Individuals with nothing to do can lead to the devastating use of their minds.



1.12 WORKING OF ARTIFICIAL INTELLIGENCE:

Large amount of data is first combined with fast, iterative processing and smart algorithms, which allows the system to learn from the patters in the data. AI is a vast subject and its field of study includes many theories, methods, technology, and it also has major subfields under it. They are:

1. **Machine Learning:**
   Machine Learning is the learning in which machine can learn by its own from the examples and the experience. The program for this machine need not be specific. The machine tends to change or correct its algorithm from the examples and experiences.

2. **Artificial Intelligence:**

   Artificial Intelligence and Machine Learning are the two most commonly misinterpreted words. They are not the same thing, but the understanding that they are, leads to some confusion. Both these terms arise repeatedly when the topic is Big Data or Data Analytics, or something related to these subjects which is making its rounds around the world.

1. **Neural Networks:**
   Artificial Neural Networks were inspired by the biological network, i.e. the animal brain. Artificial Neural Networks are one of the most important tools in machine learning to find patterns in the data, which are far too complex for a human to figure out and teach the machine to recognize.

2. **Deep Learning:**
   In Deep Learning a large amount of data is analysed and the algorithm would perform the task repeatedly, each time twisting/editing the algorithm a little to improve the outcome a little for the better.

4 **Computing:**
The ultimate goal of cognitive computing is to imitate human thought process in a computer model. Using self-learning algorithms, pattern recognition by neural networks, and natural language processing the computer can mimic the human's way of thinking. Cognitive computing systems are used to find solutions in complex situations where there are ambiguous and uncertain issues. Here computerized models are deployed to simulate the human cognition process.

5.Computer Vision:
Computer vision works on allowing computer to see, recognize and process images the same way as the human vision does, and then provides an appropriate output. Computer vision is very closely related with Artificial Intelligence.

6: Processing:
Natural language processing means communicating with the machines using natural language like English. Machines and algorithms in the workplace are expected to create 133 million new roles, but cause 75 million jobs to be displaced by 2022 according to a new report from the World Economic Forum. This means that the growth of artificial intelligence could create 58 million net new jobs in the next few years.

How does AI help prevent credit card frauds?

AI helps prevent credit card frauds in the following ways:
1. It allows banks to flag any suspicious activities and alert their customers. So, if you are trying to make out a charge with your credit card in some foreign country because you don't want to carry large currency with you, it might get declined because of AI implemented by your bank

2. AI allows banks to know if the customer is making repeated purchases online, which is a sure shot way of card fraud. Repeated purchasing is more often than not done by credit card thieves. The banks will notice the sudden trend and they might block your card.

How is AI being used in banking?

In the past few decades, artificial intelligence (AI) has produced significant impacts in many sectors, and the banking industry is no exception. AI, which is defined as the intelligence of machines and software with human-like smartness, has been applied to banking to expose risks, enhance customer services, identify fraud, and make wise business decisions. AI and its subfields, including machine learning and deep learning, are widely used in areas like wealth management, risk analysis, credit scoring, customer segmentation, customer service, big data analysis, and fraud detection.

Artificial intelligence is being used in the banking industry to scale new heights in customer relationship management. This sector is implementing this from the ground level with a principal aim of climbing heights in customer-centric approaches. A significant part of the banking industry concerning its customers is customer relationship management, which includes communicating with them.

Banking saw a shift in preferences for visiting the locations with the introduction of ATMs. These machines allow cash deposit and withdrawal directly communicating with input points on the device, thus, not requiring human assistance at all. It was a revolution that led to the growth and demand for artificial intelligence.

Artificial intelligence (AI) technology is being used more and more by banks and other financial institutions for a variety of purposes, such as improving customer service through the use of virtual assistants or credit scoring to correctly determine a borrower's risk. But the battle against fraud and money laundering is one of the most significant applications of AI in banking sector.

Artificial Intelligence has been around for a great deal of time now. The benefits of AI gradually improving our everyday life. The technology is being used for robots that greet at shopping centers or online search engines for offering suggestions.

AI simulates human reasoning in artificial intelligence systems. It is the ability of the computer program to think and learn. Everything can be taken to be AI if it involves a program that does something that we usually think depends on human intelligence.

Innovations in the Artificial Intelligence space have led to several benefits across multiple industries. Processes are effective and efficient, convenient technologies are extensively available, and forecasts are more accurate.

Automation

Automation is one of the most common benefits of AI. Technology has made a great impact on transportation, communications, service industries, and consumer products. With automation, businesses can enjoy increased productivity and higher production rates in the sectors mentioned before. However, it also ensures more efficient use of raw materials, reduced lead times, improved product quality, and better safety. Automation helps in freeing resources, which can be used for more crucial things.

Improved Customer Experience

AI-powered solutions help businesses to respond to grievances and queries of customers quickly and address them more efficiently. Chatbots combined with conversational AI with Natural Language Processing generates personalized messages for the customers that helps in finding the ideal solution for their requirement. AI tools help in reducing the strain on the staff of customer service. Ultimately, it helps in improving productivity.

Smarter Decision Making

The technology helps with smarter decision-making. AI coordinates data delivery, creates data consistency, analyzes trends, quantifies uncertainties, and provides forecasts to make the best decision for your company. As long as AI is unable to imitate human emotions, it is going to stay unbiased and can help make the right decision for supporting business efficiency.

Solves Complex Problems

The progress of AI technologies from basic ML to advanced DL models has made it easier to solve complex problems. From personalized customer interaction and fraud detection to medical diagnoses, AI is helping businesses across industries to find the right solutions to address the problems, adequately. Better efficiency in solving issues means reduced expenses and improved productivity.

Manages Repetitive Tasks

It can take a lot of time to perform recurring tasks. Moreover, when performed by humans, it can be monotonous and reduce their productivity with time. Robotic Process Automation powered by AI can automate interactions across various businesses. It helps in intimating human actions within the digital systems in the HR, marketing, IY, or sales departments for executing any business process without requiring manual effort.

Reduces Errors

Another great advantage of artificial intelligence is that it can help in reducing the chance of manual errors. Robotic Process Automation tools can take advantage of the data processing and entry jobs as it makes the systems more efficient and less likely to create any issues because of the data processing mistakes. It is good for businesses that can't afford to make even the smallest errors.

Improved Business Efficiency

AI helps ensure 24-hour service availability and delivers the same consistency and performance throughout the day. The benefit of artificial intelligence is that it takes care of all repetitive tasks. So, you can improve your business's efficiency and reduce stress on your employees. Your employees will be able to perform complex business tasks requiring manual intervention.

Strengthens the Economy

Irrespective of whether artificial intelligence is taken to be a threat to the world, it might contribute more than **$15 trillion** to the world economy by 2030. As per PwC's report, the progressive advances in AI are going to increase the global GDP by up to 14% between now and 2030. The most considerable economic growth from AI will be in North America and China. The two countries are going to account for about 70% of the global economic impact. Most technology giants are already in the process of using AI as a solution to laborious tasks. Nevertheless, the companies that are slow to adopt AI-based solutions are going to find themselves at a competitive advantage.

Enhances Lifestyle

Recently, Artificial Intelligence has evolved from a plot in a science-fiction movie to an important part of our daily lives. With the emergence of AI in the 1950s, we have experienced incredible growth in its potential. Today, we are using AI-based assistants, such as Cortana, Siri, and Alexa for interacting with your smartphones or other devices. It is also being used to predict deadly diseases, such as Leukemia and ALS. Some platforms monitor your browsing habits to suggest the products that they think you are going to like. Even though AI keeps being a constant threat, it keeps helping us in any way.

Artificial intelligence is a progressive technology and there are numerous benefits of AI in various industries. All industries are getting the impetus about how advantageous using the technology can be. Apps based on AI technology are already trending in different fields. Technology is bringing a digital transformation to the world.

By using AI, different industries and sectors will streamline operations and make them efficient. By introducing the technology to your business, you will enable you to reap the benefits of AI. Many businesses and companies are already leveraging it.

Education

Artificial Intelligence can be extremely beneficial in the education sector. The technology helps with the development and setup of many learning programs. It can also be used to develop games and software programs. With Artificial Intelligence, it is possible to redesign and reform the whole education system and techniques of teaching. It begins by issuing certificates and degrees in schools and colleges.

Not only institutions but also students can benefit from AI-based applications. By using them in the education field, you have the potential to change the teaching and learning process. This helps in improving the whole process. it improvises and changes learning activities for making all students better learners. Artificial Intelligence caters to the requirements of students having special needs.

AI tutors allow students to get one-on-one help. They can reduce anxiety and stress for students stemming from tutor labs or human tutors. AI can also create a dysfunctional environment with revenge effects such as technology that hinders students' ability to stay on task. In other scenario, AI can help educator for student early prediction in virtual learning environment (VLE) such as Moodle. Especially, during the COVID-19 pandemic, learning activity has been required to be conducted online to reduce the virus spread through face-to-face meeting.

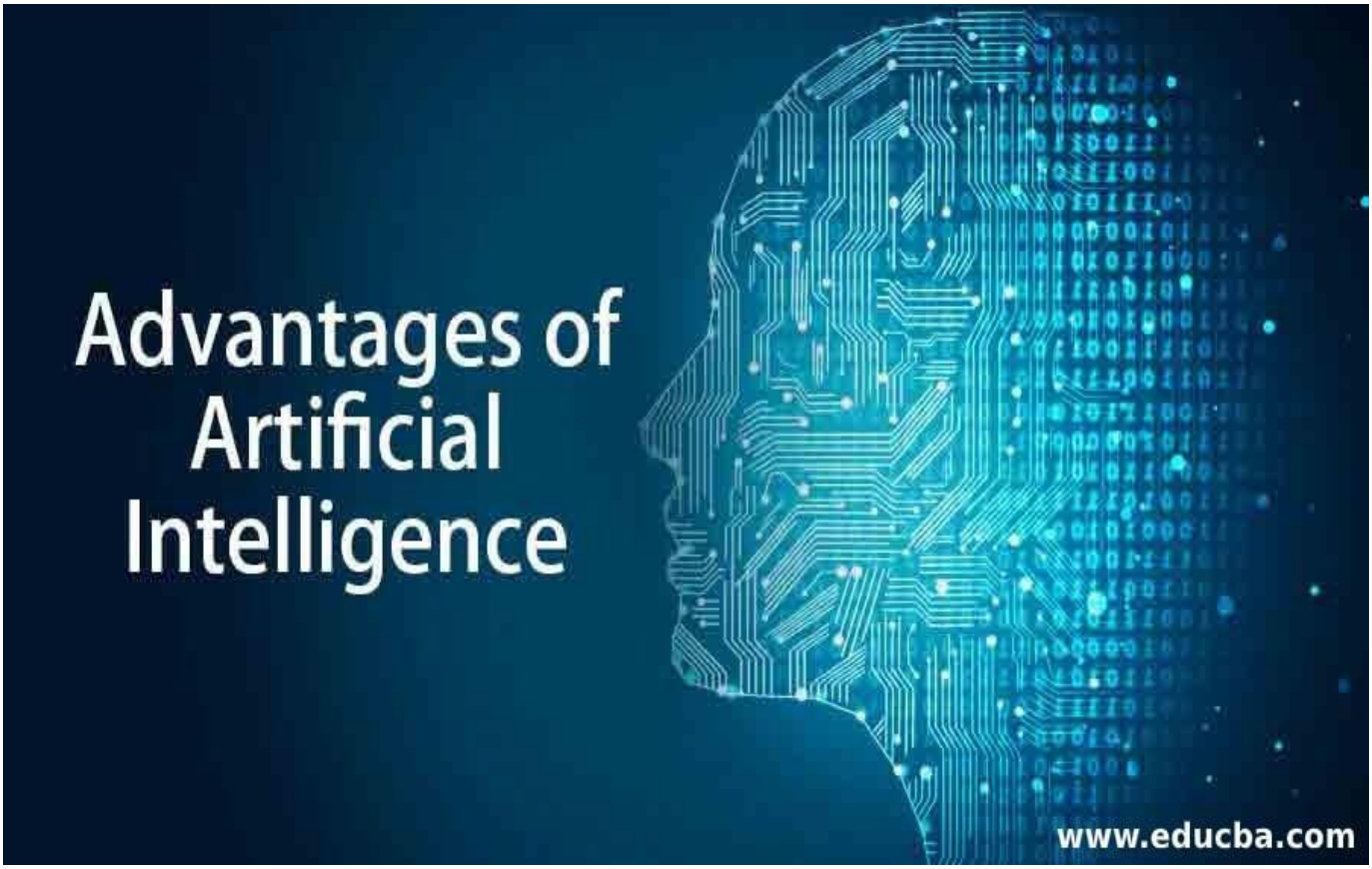
Business Intelligence

Artificial Intelligence also plays a significant role in the field of business intelligence. It is the technology that introduced the concept of prediction in this industry. With AI-powered tools and apps, business intelligence is making smarter decisions. Moreover, artificial intelligence uses its data efficiently and effectively to get improved results. Using AI, it is possible to fill up the technical gaps for users who are not that tech-savvy.

Travel and Transportation

AI has become a mega-trend in the travel and transportation industry. Not only does it suggest the company with the shortest route for the drivers but also helps in making travel arrangements remotely. Companies are using AI to get around. Furthermore, many travel companies implemented AI into their system to capitalize on their smartphone usage. This is because research has shown that **82%** of people use their smartphones for researching local landmarks and restaurants.

Surely, you must have heard about Google Maps but you might not have heard of AI in many areas. It can scan roads by using an advanced algorithm to look for more efficient routes and tell you about upcoming traffic conditions in real time regardless of whether you are on a bus, train, or foot.



Advantages of Artificial Intelligence

1. 24/7 Availability

Machines don't require frequent breaks and refreshments as like human beings. That can be programmed to work for long hours and can able to perform the job continuously without getting bored or distracted or even tired .Using machines, we can also expect the same kind of results irrespective of timings, season and etc., those we can't expect from human beings.

2. Day to Day Application

- In our daily needs, a smartphone also becomes the 4th necessity for the human along with dress, food & shelter.
- If you are using a smartphone, it indirectly means that you are enjoying the AI by knowingly or unknowingly.
- Design the methods for automation by using learning and perception have become a common phenomenon in our everyday lives.
- We have our lady Siri for iOS devices or Cortana for Windows devices to help us out.
- We also prefer the help from GPS for the long drives and trips.
- A smartphone is one of the apt everyday examples of how we utilize the power of AI to reduce the barriers in a day to day life.

- In the part of utilities, we can find that how they predict what we are going to type and provide the suggestion to correct the human errors in spelling. That is one of the most used machine intelligence at work irrespective of industries and freelancers.
- While coming to the social media users based utilities, the artificial intelligence algorithm identifies and detects the person's face and tags the individuals while we post the photographs on the social media sites.
- AI is widely deployed and utilized by the financial institutions and banking sectors to organize and manage data. Detection Of Fraud uses one of the best advantages of an artificial intelligence involvement in the smartcard-based system transactions

3. Digital Assistance

- Highly advanced organizations already implemented machines on behalf of humans to interact with their customers by using 'avatars'. It is the digital assistants or replicas which will help to reduce the need for human resources.
- For AI Machines, emotions only can be identified in the way of rational thinking.
- Robots can't identify the sentimental factor of the user. It actually programmed for only think logically and take the right program decisions based on the existing experience taught to the machine.
- Emotions can't be identifying by the machines that may be dissatisfying the customer. In that case, we need human intervention. This lagging tries to rule out for machine intelligence. But still, it helps in other aspects.

4. Handling Repetitive Jobs

- Repeated jobs are tedious in nature. That kind of jobs can be easily handled with the help of AI algorithms. These kinds of job don't require much intelligence in between the process.
- Machines can think much faster than humans and can perform multi-tasking to obtain the best results.
- Machine intelligence can be employed to carry out dangerous tasks which may cause injury to the human involved in that. Their parameters can be adjusted is the benefit here. Their speed and time can be customized based on the requirement calculation.
- Whenever human operates the machine-like playing a game or run a computer-controlled robot, it means that we are actually interacting with AI Machines.
- In the computer game, the machine itself plays the game like as an opponent based on our activity in the game. The machine plans its movement based on the user response. So, we can say gaming is one of the most common uses of the advantages of artificial intelligence.

5. Medical Applications

- One of the great advantages of Artificial Intelligence is utilized in the field of medicine. We can identify the numerous numbers of medical applications which rely on AI.
- Doctors/Physician assesses the patient's health-related data and intimates the risk factors to the customers via the health care devices with the help of artificial machine intelligence.
- It helps the patient to know about the side effects of different medicines and also behaves as personal digital care. Artificial surgery simulator is the great innovation part of the AI. The efficiency of that always prefers to utilize that simulator by the Professionals for the treatment.
- Currently, we have huge software to detect as well as monitor the neurological disorders. It can simulate the functionality of the human brain.
- Robotics is used often in the treatment for mentally sick patients to come out from their depression also make them remain active in the real world.

- The current medical industry has the popular application of artificial intelligence is Radiosurgery. It helps us to operate the tumors without damaging the unaffected surrounding tissues.

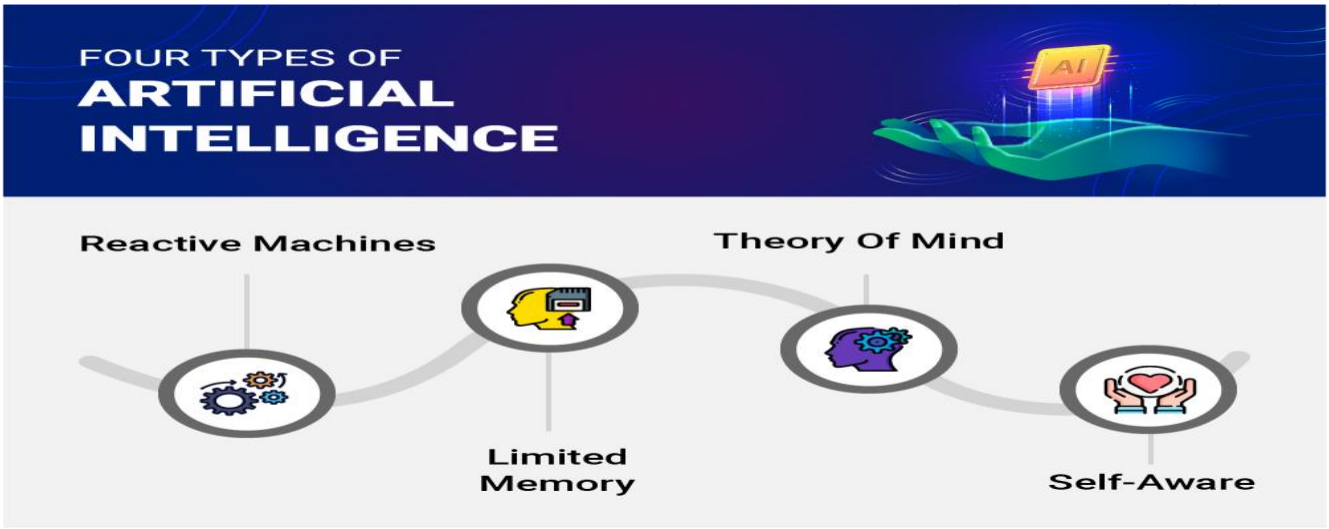
6. Hazardous Exploration

- Artificial Intelligence and the science of robotics are the fascinating advancements in technological development. Using this, we can able to handle the huge volume of data for storing and processing but not limited to as well as we can use that in the process of mining and other fuel exploration processes.
- These complex machines can be utilized to overcome human limitations. We can utilize these machines as a replacement for the humans wherever we felt the process done by the human is hazardous but can't neglect that because of the goodness or results received.
- They can perform difficult tasks and accurate work with greater responsibility without any lag. Moreover, they do not wear out easily.

7. Reduction of Error

- The advantage of using Artificial Intelligence is, it helps us for error reduction and increasing the chance of reaching higher accuracy with a greater degree of precision.
- It can be applied in various situations including the process called exploration of space.
- In that intelligent robots are fed with information because of the velocity of the data creation. Such kind of information forwarded to explore the space. Even though those are machines with metal bodies, those are the most resistant in nature also it has a great character which can help us to abide by the space and unfriendly atmosphere. Because of that, they used to create and acclimatize. It cannot be modified unknowingly or can't get disfigured or breakdown in a hostile environment. In this scenario, we can't neglect anything, by handling this we need to address this issue with the efficient solution like Artificial Intelligence.

Four Types of Artificial Intelligence



AI is a vast term covering different subsets. These subsets can be classified by the tech required. For instance, some need big data, machine learning, or natural language processing. Here, we classify AI into four separate types as similar to Maslov's hierarchy of needs. They are:

1. Reactive Machines

These machines perform basic operations and the simplest AI type. The type of AI reacts to some input with some output. They can't create memories or valuable info to influence future decisions. They can only respond to currently existing situations. This model saves no inputs; it performs no learning. Static ML models are reactive machines. They have simple architecture and can be found on GitHub repos. These models can be installed, exchanged, passed around, and easily loaded into a developer's toolkit.

2. Limited Memory

As the name suggests, this type of AI can retain some data learned from observing past events. It can develop knowledge using that memory jointly with pre-programmed data. Here, the ML model is slightly more complex. Every ML model needs limited memory to be created, but it can be used as a reactive machine type. AI is a vast term covering different subsets. These subsets can be classified by the tech required. For instance, some need big data, machine learning, or natural language processing. Here, we classify AI into four separate types as similar to Maslov's hierarchy of needs.

3. Theory Of Mind

This type of AI is not completely implemented yet. We are only at the nascent stage, and this type of AI model can be seen in self-drive cars. Here, AI interacts with human emotions and thoughts. Humans have emotions, feelings, and memories that influence their behavior. This is the psychology based on which researchers hope to develop robots able to imitate human mental models. Experts have yet to develop a theory of mind tech, without which Sophia is just a chatbot with a face.

4. Self-Aware

These are the most complex AI machines that are envisioned by the experts and are their ultimate AI goal. These machines have human-level awareness and understand their existence in the world. As a self-aware machine, it would not just know of its inner state but can predict the feelings of others around it. For example, as humans, if someone weeps before us, we know they are upset, as we understand how we feel when we cry. Self-aware machines seem like a sci-fi thing at present, and perhaps they might never exist. But you never know! Ages before, did we even know AI would exist? But certainly, the development of such an AI would be reaching the next level of innovation in the tech sector; it would be mind-boggling!

The emerging technologies adopted by the banks in private sector and public sector in order to increase their market share. All the banks in a bid to improve their revenues have started investing in AI through better customer engagement. The key focus of the banks is also to ensure compliance and proactively detecting and preventing the frauds. AI based Anti-money laundering applications are the solutions for the same. AI has also helped banks to explore the customer preferences and also serve their issues in real time. Besides customer service and operational costs, the banks have started using AI in risk management. Risk Management for banks includes compliance to Anti-Money laundering measures as specified by Reserve Bank of India and other regulatory bodies from time to time. The initiatives taken by the banks in the adoption of AI has been discussed in this paper. Anti-money laundering applications are programmed with a set of rules, process, laws and regulation helping the financial institutions to detect income from illegal sources. The banks have also benefited from AI enabled Chabot support system which responds to the identified query with most suitable reply. The

paper also discusses about the challenges in the implementation of AI which includes unwillingness to switch to new methods, up skilling of the workforce. Artificial Intelligence is a new normal for most of the industries. Financial industry is no exception. With the help of advanced technology, banks and non-banking finance companies have been able to lower their operational costs and surpass the customer expectations.

Five Application of Artificial Intelligence in Banking:

1. Customer service/engagement (Chatbot)
Incorporating chatbots provides very high ROI in cost savings, making them a popular application across many industries. Customers can easily solve their queries on chatbots, like balance inquiries, accessing mini statements, fund transfers, etc. This helps reduce the burden on contact center's, internet banking, etc.

2. Robo advice
A Robo-advisor makes an effort to understand a customer's financial health by analysing the shared financial history and data. The Robo-advisor gives investment recommendations for a particular product or equity based on the analysis and goals set by the client.

3.General Purpose/Predictive Analytics
AI's most popular usage is in general-purpose semantic and natural language applications and broadly applied predictive analytics. AI is leveraged to detect specific patterns and correlations in the data, which was otherwise impossible using legacy technology. These patterns help to identify untapped sales and cross-sell opportunities, or even metrics around operational data, which leads to direct revenue impact.

3. Cybersecurity
AI previous threats and then learns the patterns and indicators that may be unrelated to predicting and preventing attacks. AI also helps in monitoring internal threats or breaches and suggests corrective actions, resulting in the prevention of data theft or abuse.

Cyber security companies are adopting neural networks, machine learning, and natural language processing to improve their systems.

Applications of AI in cyber security include:

- Network protection: Machine learning improves intrusion detection systems by broadening the search beyond previously identified threats.
- Endpoint protection: Attacks such as ransomware can be thwarted by learning typical malware behaviors.
- Application security: can help counterattacks such as server-side request forgery, SQL injection, cross-site scripting, and distributed denial-of-service.
- Suspect user behavior: Machine learning can identify fraud or compromised applications as they occur.

4. Credit Scoring/Direct Lending
AI plays an important role in helping alternate lenders determine the creditworthiness of clients by analysing data from traditional and non-traditional data sources. This helps lenders to come up with innovative methods of lending systems that are backed by a robust credit scoring model, even for those individuals or entities with limited credit history. Indian banks have to move with time and help customers to adopt newer technologies with ease. Digitization and leveraging AI has helped both banks and customers in making the entire banking experience hassle-free.

Cybersecurity and fraud detection

Every day, huge number of digital transactions take place as users pay bills, withdraw money, deposit checks, and do a lot more via apps or online accounts. Thus, there is an increasing need for the banking sector to ramp up its cybersecurity and fraud detection efforts. This is when artificial intelligence in banking comes to play. AI can help banks improve the security of online finance, track the loopholes in their systems, and minimize risks. AI along with machine learning can easily identify fraudulent activities and alert customers as well as banks..

AI can also help banks to manage cyber threats. In 2019, the financial sector accounted for 29% of all cyber attacks, making it the most-targeted industry. With the continuous monitoring capabilities of artificial intelligence in financial services, banks can respond to potential cyberattacks before they affect employees, customers, or internal systems.

CHP 2 : RESEARCH METHODOLOGY

Objectives of the Study :

1. To study about Artificial Intelligence in Indian banking sector in perceptions of clients or consumers.
2. To study the areas and the application where the Artificial Intelligence is being used by banking sector.
3. To understand meaning and reasons of artificial intelligence.
4. To study implementation of Artificial Intelligence in banking industry.
5. To study the positive and negative impacts of Artificial intelligence in banking industry.
6. To study the existing AI enabled services available in the banking sector.

2.2 Scope of the Study:

The scope of Artificial Intelligence in India is still in the adoption stage but slowly it is being used to find smart solutions to modern problems in almost all the major sectors such as Agriculture, Healthcare, Education and Infrastructure, Transport, Cyber Security, Banking, Manufacturing, business, Hospitality, Entertainment. Artificial Intelligence is a classic example of disruptive technology, as it has affected on we go on about doing our daily work.

The scope of Artificial Intelligence in India is promising. Artificial Intelligence has immense potential to change each sector of the economy for the benefit of society. There is not just one technology under AI, but there are various useful technologies such as self-improving algorithms, machine learning, big data, pattern recognition. Soon, there would hardly be any industry or sector which would be untouched by this powerful tool in India. This is the reason why there has been an increasing demand for Artificial Intelligence online courses in India.

1. The main intend of having AI (Artificial Intelligence) in the banking sector is to get insight into the customers preferences, to make sure that the customers are happy with the services provided by the banks and help the customers understand their expectations from the banks.
2. The study has highlighted the basic modernism through the AI technology in the banking sector which helps the customers and the banking industry.
3. The study has identified the new trends of AI technology in the banking sector like customer support, past interactions, anti-money laundering pattern, voice assisted banking, underwriting, management decision making and reducing frauds.

2.4 Limitations of the Study:

With 90% of companies pursuing AI programs, businesses recognize the critical nature of AI for successful business processes. Spending money on AI programs will potentially reduce costs associated with time-consuming, repetitive activities that people would be required to perform.

It is a financial cost and a time cost since activities such as data collection and monitoring were traditionally completed by hand. AI enables unprecedented ease of access and speed to data procedures, which is why 96 percent of companies expect artificial learning programs to continue growing in the next two years .

Although AI creates some incredible opportunities across multiple markets, it also introduces a slew of new usage challenges. Previously, problems with AI execution were often attributed to employees' lack of engagement with the innovation, creating an expectation for industry experts to understand and adapt. Frequently, companies must seek outside talent to help them maximize the value of their investments. In any case, humans are not solely responsible for AI's shortcomings.

The use of data is a significant constraint on Artificial Intelligence. Any software needs data to run. It makes no sense if the program is in the preparation process or has progressed to the implementation phase; the demand for data is never satisfied. If you want to incorporate AI into a program, the process is as follows: first, the software robots must acquire specific cognitive abilities to become more sophisticated over time.

Additionally, advanced computational robotics use technology such as ML, OCR, NLP, and RPA to decipher the meaning of data that is restricted in papers. From that stage on, distinct functions often become the most vital component, such as automating critical reasoning or decision-making tasks .

Individuals are creatures of habit; as we find a method for performing a mission that seems to be viable and successful, we seem to stick with it. It often takes some influence to see that the disruption and expense associated with modifying methodologies or implementing new methods worth the overall benefits. It may be as simple as an inability to cede authority, whether to computers or to the human workers who oversee the technical system that enables AI.

Individuals and data both exhibit concealed bias, and data sometimes succumb to bias in light of people. Obligations cannot be fulfilled without details. Data collection can be done, and there will be a bias that the collector of data is not aware of. One model comes from the world of self-driving vehicles.

Though AI continues to improve in sophistication, we have reached a stage where computing capacity or speed is no longer a constraint. It's a perfect time to focus on AI's relational intelligence to interact more naturally with humans. NLP should be sufficiently accurate to grasp what a person is attempting to communicate and its emotions. In most short words, the AI can understand the meaning of the conversation.

The problem is that AI is emotionally immature since it is incapable of classifying individual emotions and mindsets into unique data points or profiles. In any case, things will begin to improve within the next few years.

It is an amalgamation of a few different obstacles – a lack of expertise, a lack of management buying, and an insufficiently saturated society with the interests and practicalities of AI and digital transformation. The result is

often AI operations that are not strategically organized, do not meet strategic business priorities, and do not work into a company's overall development and business development behavior.

Frequently, the reason for this is that, while organizations are well aware of the importance of adopting AI innovation and the benefits it can provide, they fail to approach it strategically; this requires an in-depth understanding AI operation. The response is straightforward; businesses should always ensure that a specific policy is in place before investing time and money in expensive and resource-intensive AI projects and pilots with no fair understanding of the benefits they may offer .

2.5 Significance of Artificial Intelligence :

1. AI Attains Phenomenal Accuracy

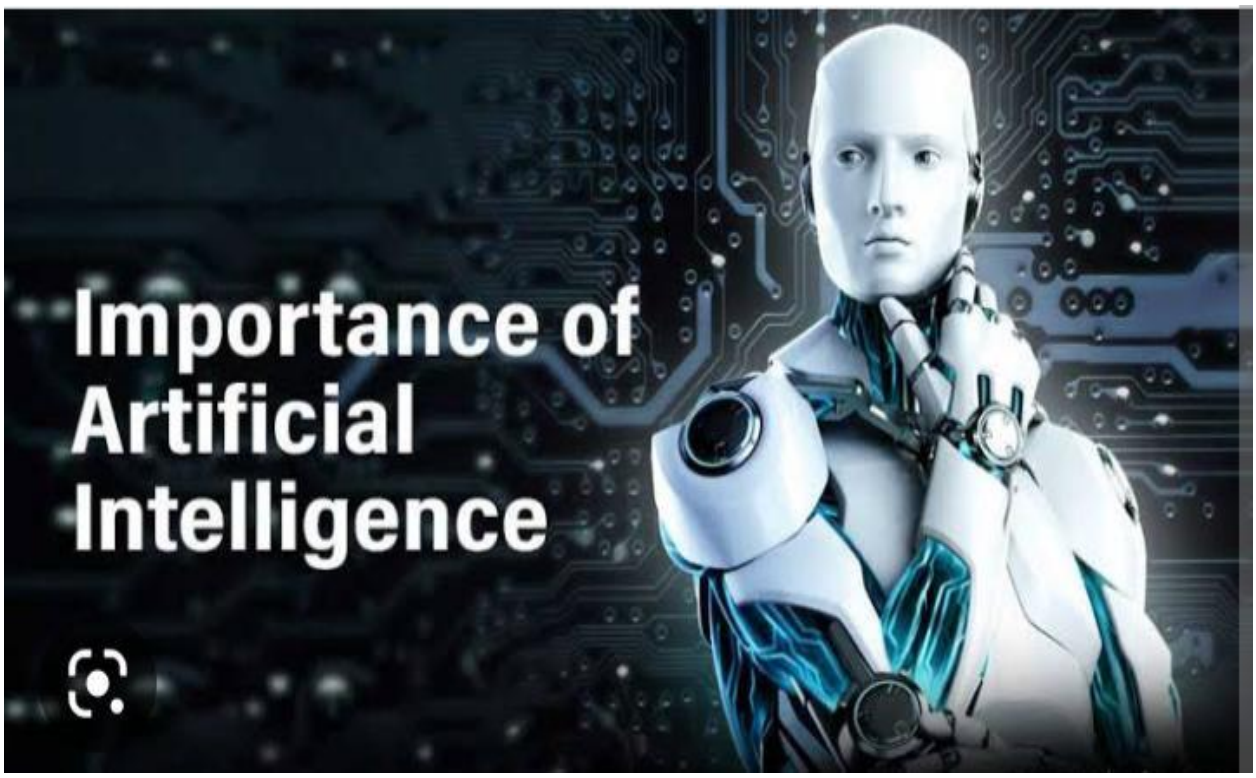
AI achieves remarkable precision through deep neural networks, previously impossible. For instance, your interactions with Google Search and Alexa are all deep learning-based that keep getting more precise the more we use them. AI techniques are even used in the medical fields to discover cancer cells on MRIs with high precision as highly trained radiologists.

2. AI Is Reliable & Quick

AI performs frequent, voluminous, and computer-generated tasks reliably. However, for this, human skills are required to set up the system & ask proper questions.

3.AI Adds Intelligence To Products

AI won't be sold as an individual product. Instead, products that you use will be enhanced with AI integration, such as Apple products created a buzz with the Siri feature. Chatbots, automation, and smart devices together with massive data can improve several technologies at home and the workplace.



4. AI Evaluates Deeper Data

With **big data** and computing power, it has been possible to develop a fraud detection system which was almost impossible a few years back. You require much data to train deep learning models as they learn straight from the data. The more the data, the more accurate they become.

5.AI Fully-utilized Data

You just need to implement AI in place to get the answers from the data. The role of data is more critical than ever before; it gives an edge over your competitors if you have the best data system in this competitive industry as the best data will win!

- Artificial Intelligence's importance and subsequent components have been known for a long time. They are being seen as tools and techniques to make this world better. And it'not like you have to go through to be able to use these fancy tech gadgets. You can look around, and I'm sure most of your work is smoothed out by artificial intelligence.
- Its importance lies in making our life easier. These technologies are a great asset to humans and are programmed to minimize human effort as much as possible. They can operate in an automated fashion. Therefore, manual intervention is the last thing that can be sought or seen during the operation of parts involving this technology.

- These machines speed up your tasks and processes with guaranteed accuracy and precision, making them a useful and valuable tool. Apart from making the world an error-free place with their simple and everyday techniques, these technologies and applications are not only related to our ordinary and everyday life. It is affecting and holds importance for other domains as well.

Importance of Artificial Intelligence in different fields:

Today, the amount of data that is generated, by both humans and machines, far outpaces humans' ability to absorb, interpret, and make complex decisions based on that data. Artificial intelligence forms the basis for all computer learning and is the future of all complex decision making. As an example, most humans can figure out how to not lose at tic-tac-toe (noughts and crosses), even though there are 255,168 unique moves, of which 46,080 end in a draw. Far fewer folks would be considered grand champions of checkers, with more than 500 x 10^{18}, or 500 quintillion, different potential moves. Computers are extremely efficient at calculating these combinations and permutations to arrive at the best decision. AI (and its logical evolution of machine learning) and deep learning are the foundational future of business.

1.Medical science

- Artificial Intelligence has made an unprecedented impact in the medical industry and hence changed the face of the medical industry. Various machine learning algorithms and models have efficiently predicted various important use cases, such as determining whether a particular patient has malignant or benign cancer or tumor based on symptoms, health records, and history. It is also being used in future predictions where patients are well informed about their deteriorating health and what they should do to return to a normal and healthy life.
- Artificial intelligence has created a virtual care private assistant specifically built for people's needs. It is widely used to monitor, research different types of cases, and analyze past cases and their outcomes. It also seeks to improve their model's and assistants' efficiency by predicting what could be improved and making themselves smarter.
- The use of healthcare bots is another efficient move taken by the medical industry to work their way up in medicine, which is known to provide 24/7 assistance and take up the less important work of managing appointments. It has not have been possible without the intervention of these smart artificial intelligence-based machines.

2. In the Field of Air Transport

- One of the major systematic transport in the world is air transport, and there has become an urgent need to optimize their mode of operation. Here came the involvement of Artificial Intelligence, where the machine is involved in planning the routes along with the flight landing and take-off charts.
- Artificial intelligence has been used in many aircraft, navigation maps, taxing routes, and a quick examination of the entire cockpit panel to ensure the correct operation of each component. Hence, it gives very promising results and is being adopted very frequently. The ultimate aim of artificial intelligence in air transport is to give easier and more comfortable travel to human beings.

3.In the field of banking and financial institution:

- Artificial Intelligence plays a vital role in managing financial transactions and handling many other activities in the bank. The day-to-day operations of banks, such as transactions and financial operations, stock market money and their management, etc., are being handled more easily and efficiently by these machine learning models.

- Use cases such as anti-money laundering where suspicious financial transactions are being monitored and reported to regulators are a classic example of artificial intelligence in the banking and financial industry. Other use cases include credit systems analysis which is popular among credit card companies. Suspicious credit card transactions are tracked geographically and acted upon and resolved based on various parameters.

4. In the field of gaming and entertainment

- From virtual reality games to today's modern games, this is one industry where artificial intelligence has made the biggest leap forward. Bots are always there for you to play with, so you don't need another person to play.
- The level of personalized detail and graphics is also possible due to the advent of Artificial Intelligence and is taking this industry to a different level.

5. AI Achieves Unprecedented Accuracy

- AI achieves remarkable accuracy through deep neural networks, which was previously impossible.
- For example, Google Search and your interactions with Alexa are all deep learning-based, becoming more accurate the more we use them. AI techniques are also used in medical fields to search for cancer cells on MRI with high precision as highly trained radiologists.

6. AI Is Reliable & Quick

AI performs computer-generated tasks consistently, extensively, and reliably. However, human skills are required to set up the system and ask the appropriate questions.

7. AI Adds Intelligence to Products

- AI will not be sold as an individual product. Instead, your products will be enhanced with AI integration, like the Apple products discussed with the Siri feature.
- Chatbots, automation, and smart devices, combined with massive amounts of data, can improve many technologies at home and in the workplace.

8.AI Evaluates Deep Data

- With big data and computing power, it has become possible to develop fraud detection systems that were nearly impossible just a few years ago.
- It would help if you had a lot of data to train deep learning models because they learn directly from the data. The more data, the more accurate they are.

9. AI Fully Utilized Data

It would help if you implemented AI to get answers from the data. The role of data is more important than ever; Its gives you an edge over your competitors if you have the best data system in this competitive industry because the best data will win!

CHP 3 : LITERATURE REVIEW

1. **Adrian Lee (Jan 23, 2017)** Banking on artificial intelligence - The purpose of this article was to determine the most prominent forms of AI within the banking industry. AI-driven customer service,

real-time fraud prevention and risk management-it's the last one that might appeal most to those interested in industry disruption.
Emmanuel Mogaji, Taiwo O. Soetan, Tai Anh Kieu 2020 -The implications of artificial intelligence on the digital marketing of financial services to vulnerable customers. This paper examines the relationships between AI, digital marketing, and financial services in relation to vulnerable customers, highlighting key implications in the collection, processing, and delivery of information, as well as the importance of human connection for optimal customer experience and engagement with financial services providers. Understanding ethical implications, as well as data and modelling challenges, is necessary for the successful deployment of AI. This study provides a theoretical framework to financial services providers, AI developers, marketers, policymakers, and academics, aiding the understanding of the precarious conditions facing vulnerable customers, and the ways in which they can more effectively be reached.

2. **Ameer Awad Alzaidi (2018),** the author explores the impact of Artificial intelligence on performance of the banking industry in middle east. This paper aim was to analyse the application of AI in banking sector in middle east and this study presents a comprehensive review of the application of AI techniques in banking sector improving overall performances of the system and banking network. Shivkumar Goel and Nihaal Mehta(2017), the author discuss how AI is used in financial sector and what are the benefit that AI offers to FinTech and different ways in which it can improve a financial institute. The key use of AI in FinTech will be augmented decision making. It will allow analysts to make complex decisions with the help of machines which offer both pre and post decision making support, generated by analysing historical data and emerging trends. Bergstrom Stacey, Svenningsson P and Thoresson A (2018), The author explores the attitude that customer have towards AI in customer services, as a substitute to local brick and mortar offices within the Swedish bank industry, as well as uncover any significant factors that could influence these attitudes. Dr. Simran Jewandah (2018) this paper focus on the how AI is changing the banking sector. And study the areas where the AI is being used by the banks and the application of AI in banking sector and use in leading commercial banks in India SBI, HDFC, ICICI, AXIS. T.J.M. Bench-Capon, Paul E. Dunne (2017) this paper focus on the Arguments in AI and to place these contributions in the context of the historical foundations of argumentation in AI and subsequently, to discuss a number of themes that have emerged in recent years resulting in a significant broadening of the areas in which argumentation based methods are used
.
3. **Maryam Duygun Fethi, Fotios Pasiouras** European journal of operational research 204 (2), 189-198, 2010

This paper presents a comprehensive review of 196 studies which employ operational research (O.R.) and artificial intelligence (A.I.) techniques in the assessment of bank performance. Several key issues in the literature are highlighted. The paper also points to a number of directions for future research. We first discuss numerous applications of data envelopment analysis which is the most widely applied O.R. technique in the field. Then we discuss applications of other techniques such as neural networks, support vector machines, and multicriteria decision aid that have also been used in recent years, in bank failure prediction studies and the assessment of bank creditworthiness and underperformance.

4. **Khyati Kochhar , Harsh Purohit, Ravisha Chutani.**
The 5th International Conference on Educational Research and Practice (ICERP) 2019, 127, 2019

Technological development is ruling the world and artificial intelligence is one of the fastest evolving technologies across the globe. Industries are adopting artificial intelligence for various applications and banking sector is one among them. Artificial intelligence is the future of banking as it brings the power of complex data analytics to combat fraudulent transactions and improve compliance. AI will not replace the humans but it will help to enhance their work by making them more efficient and would help people to solve calculations in much quick and easy form that would be difficult to perform manually. Artificial Intelligence also helps the banking sector to alleviate risk and increases the revenue by improving the customer satisfaction. Now days, it is crucial for all the banks to adopt artificial intelligence into their strategy as there is high competition and innovation accelerates in the banking sector as well. Therefore, in this paper researcher has analyzed the application of artificial intelligence in the banking sector, how Artificial Intelligence is improving business results, implementation of AI in the banking sector and the impact of AI on Indian Banks. The methodology of this paper involves usage of primary and secondary data. An interview of 50 bank experts has been conducted by the researcher to know the impact of AI in Indian Banks. The present study is descriptive in nature and considered the first of its kind conducted on artificial intelligence with special reference to banking sector focusing Indian banks and foreign banks.

5. **Ahmad Ghandour TEM Journal 10 (4) ,1581-1587, 2021:**

The primary aim of this systematic literature review (SLR) was to identify, assess and synthesize the extant evidence about the opportunities and challenges concerning the use of Artificial Intelligence (AI) in the banking sector. From the SLR, it is evident that AI has several opportunities for the sector. There are many fin-tech start-ups that offer banking AI solutions, and banking regulators are fostering AI adoption through legislation and collaboration. Other opportunities include the following: personalized services, smart wallets, decision-making and problem-solving, customer satisfaction and loyalty, process automation (especially targeting repetitive tasks), transactional security and cybersecurity improvements, and promotion of digital financial inclusion. Nevertheless, the key banking industry stakeholders have to formulate appropriate strategies aimed at overcoming existing and prospect AI challenges. Among the AI challenges that should be prioritized we include the following: job loss and user acceptance concerns, privacy breaches, creativity and adaptability loss, restrictive implementation and operational requirements, digital divide, availability of vast quality data, AI-business strategy alignment, and loss of emotional “human touch”. However, existing studies are largely descriptive and based on secondary sources of data. This necessitates empirical studies to expand the existing body of knowledge regarding AI opportunities and challenges in the banking industry.

6. **Anli Suresh, N Jannifer Rani**

Journal of Information Technology & Economic Development 11 (2), 2020

The main intend of having AI (Artificial Intelligence) in the banking sector is to get insight into the customers preferences, to make sure that the customers are happy with the services provided by the banks and help the customers understand their expectations from the banks. The study has highlighted the basic modernism through the AI technology in the banking sector which helps the customers and the banking industry. The study has identified the new trends of AI technology in the banking sector like customer support, past interactions, anti-money laundering pattern, voice assisted banking, underwriting, management decision making and reducing frauds. The study was conducted with 100 respondents and the tools used were factor analysis and regression analysis. The concluding observation of the study is that there is no noteworthy relationship between educational qualification and reducing fraud. The results of the factor analysis were the two factor namely personal factors and societal factors which constitute the new trends of AI in the banking sector.

7. **Dr. Kr, Supriya Lamba Sahdev, Dr. Sharma, Laraibe Siddiqui**

International Journal of Management 11 (6), *2020*

Artificial intelligence (AI), from time to time called machine intelligence is simulation of human intelligence in machines. It is the intellect exhibited by machines, in contrast to the natural knowledge demonstrated by humans. From Siri to self-driving cars, AI is progressing at a rapid pace.

8. **Omar H Fares, Irfan Butt, Seung Hwan Mark Lee**

Journal of Financial Services Marketing, 1-18, 2022

This study provides a holistic and systematic review of the literature on the utilization of artificial intelligence (AI) in the banking sector since 2005. In this study, the authors examined 44 articles through a systematic literature review approach and conducted a thematic and content analysis on them. This review identifies research themes demonstrating the utilization of AI in banking, develops and classifies sub-themes of past research, and uses thematic findings coupled with prior research to propose an AI banking service framework that bridges the gap between academic research and industry knowledge. The findings demonstrate how the literature on AI and banking extends to three key areas of research: Strategy, Process, and Customer. These findings may benefit marketers and decision-makers in the banking sector to formulate strategic decisions regarding the utilization and optimization of value from AI technologies in the banking sector. This study also provides opportunities for future research.

9. **Tejinder Singh, Nitin Pathak**

Journal of Critical Reviews 7 (16), 1370-1373, 2020

For the understanding of a common man, Artificial Intelligence is nothing but the ability of machines to think on their own and do a task without the help of human beings. There are a number of state of the art technologies available in the arena of AI viz Machine Learning, interactive voice response (IVR), NLP (Natural Language Processing), Deep Learning, Speech Recognition, Image Analysis amongst others for the purpose collecting, cleansing and analyzing and disseminating massive amounts of data. As per the reports of Indian Brand Equity Foundation, as on September, 2019, there are 18 public sector banks, 22 private sector banks, 46 foreign banks, 53 regional rural banks, 1,542 urban cooperative banks and 94,384 rural cooperative banks in India. In the financial years starting 2007 to 2018, the compounded annual growth rate of the total advances was 10.94 per

cent and at the same time, the compounded annual growth rate of total deposits 11.66 per cent. India's retail credit market holds huge size of world markets and is the fourth largest in the emerging countries. The size of the retail credit market in India grew to US $281 billion as on December 2017 against US $181 billion as on December 2014. If we believe in Reserve Bank of India (RBI), there are literally no worries in capitalization levels of the banks. India's economic conditions are in a much better shape than any other country in the world. RBI has always played a crucial role in bringing dynamic changes in banking sector. The fact that India can boast of one the best digital payment systems at the international level can be verified with the fact that Immediate Payment Service (IMPS) in India is the only level 5 system in the Faster Payments Innovation Index. India has been able to adopt AI well by integrating majority of its functions with customer centric view. Whether it I advances, cross sell avenues, AI technologies have helped to make the processes better

10. **Chandrima Bhattacharya, Manish Sinha**

Australasian Accounting, Business and Finance Journal 16 (5), 89-105, 2022

In light of digital advancements, banks need to create customer experiences that strengthen loyalty and trust. For establishing a strong digital banking base, it is crucial for banks to make their processes efficient and fast. The purpose of the paper is to analyze the efficacy of banking functions on implementing Artificial Intelligence for enhancing customer engagement and improving customer satisfaction. It targets banks in metropolitan cities of India having tech-savvy customers, leading a fast-paced life who desire personalization and expect faultless and seamless services

11. **Ritu Tulisameer Salunkhe (2019)**-
    In paper title "Role of Artificial Intelligence in providing customer service with special reference to SBI and HDFC" tried to study the application of in banks and how it influence customer service and also tried to understand how government is influencing application of AI by investing in it. Study also covered the challenges faced by two banks in adopting the new technology. It was found that banks are facing challenges in terms of awareness, acceptance of new technology and strong policies governing AI. The study was concluded that major challenges are yet to be explored as are in early stage of its application but banks are putting great efforts successful application.

12. **Dr. Simran Jewandah(2019)**-
    In the study title "How Artificial Intelligence is changing the banking sector- A case study of top four Indian commercial banks" tried to study importance of technological adoption in banking industry. It covers the usage of AI and its implications in banking sector. Study found that AI is used to provide personalized financial services, smart wallets, voice
    assisted banking, application to assist in lending decisions, customers support and digitalization. And AI has assisted in detection of frauds, reduction of cost, increase in revenue and made better customer experience. The study concluded that banks have made in entering digital era through chat bot and usage of robotics software
    .
13. **Dr. K. Suresh Kumar, Aishwarya Lakshmi and Akalya**
    In their study title " Impact and challenges of Artificial Intelligence in Banking" tried to understand the impact and challenges in implementation of Artificial Intelligence and also benefits in Banking. They

also explored the possible areas where AI can be implemented. Study also covered the initiatives taken by banks to overcome challenges and study was concluded that future of banking sector is very bright as it enable easy transaction processing and also ensures personalised and high quality customers service for better customer satisfaction.

14. Dr. Navleen Kaur and Dr. Monika Sharma (2020)

- In their study title " Banking 4.0-The influence of Artificial Intelligence on the banking industry and how AI is changing the face of modern day banks" tried to understand the possibilities of witnessing revolutionary changes in banking industry and also its impact on human power. They tried to evaluate the challenges faced by banks and also the benefits which customers can obtain with the application of AI in banking sector. The study concluded that effective use of AI has positive effect on customer attraction which ensures growth and development of banks.

15.Dr. Manish Sabharwal-

In their study title "The use of Artificial Intelligence based Technological application by Indian Banks" tried to study reasons for application of AI in select Indian Banks. Study was descriptive in nature where structured interview of branch heads of 16 selected banks was done. Hypothesis was set with an assumption to prove that Indian banks do not use AI based technological application. The study was concluded that Yes Bank uses AI for employee performance evaluation, credit evaluation and portfolio analysis.

CHP 4 : DATA ANALYSIS,

INTERPRETATION AND PRESENTATION.

❖ DATA ANALYSIS :

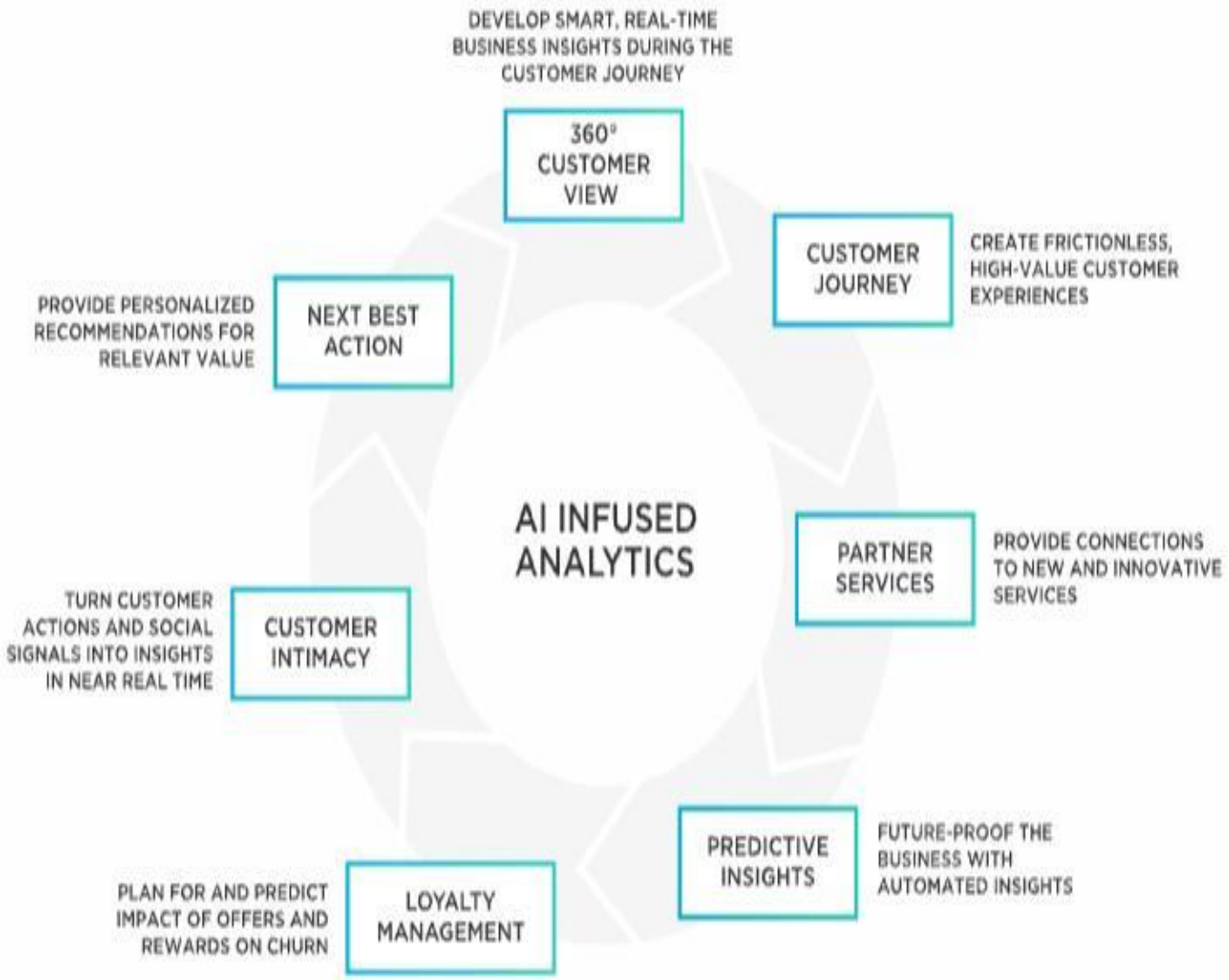
- The data is collected from both secondary and primary basis, for the secondary data various journals and literature review and publications have collected Stratified Random sampling has been analysed to collect the responses of the customer, qualitative method has been analysed and based on primary data of the customers field responses are taken.

- **Banking analytics** refers to the use of artificial intelligence and machine learning being applied to customer data to make decisions in the banking sector. Data is analyzed, trends identified, and predictions made. This helps managers to make better business decisions.

- Banking analytics is an important management tool that gives insight on current performance and highlights areas where improvement is needed. It can be difficult for banks to tell which areas need to be reviewed or improved without access to data backed metrics and predictive future outcomes. Banking analytics makes it possible for hidden performance issues to be identified and addressed.

- Banking analytics is used to identify trends that help management in decision making. Assessing and measuring historical data makes it possible for behaviors to be identified and future trends predicted and used as the basis of future decision making. By utilizing data analytics tools and processes, the bank is able to make informed decisions that can prevent errors and improve efficiency.

- While individual organizations will interpret and act on data outcomes differently, there are a number of standard ways that banking analytics is used.



- **SAMPLE SIZE: 70 RESPONSES**
- **FINDINGS:**

This part is divided into following sub parts as under:

1. Meaning and Reasons for Artificial Intelligence.
2. Implementation of Artificial intelligence in Banking Industries
3. Positive and Negative impact of Artificial Intelligence in banking industry.

Artificial intelligence (AI) is the basis for mimicking human intelligence processes through the creation and application of algorithms built into a dynamic computing environment. Stated simply, AI is trying to make computers think and act like humans. Achieving this end requires three key components:

1. Computational system

2. Data and data management

3. Advanced AI algorithms (code)

The more humanlike the desired outcome, the more data and processing power required. Throughout the study of how artificial intelligence has impacted the Indian banking sector and also various ways to apply A.I technology. The below are the some of the areas where artificial intelligence can be used.

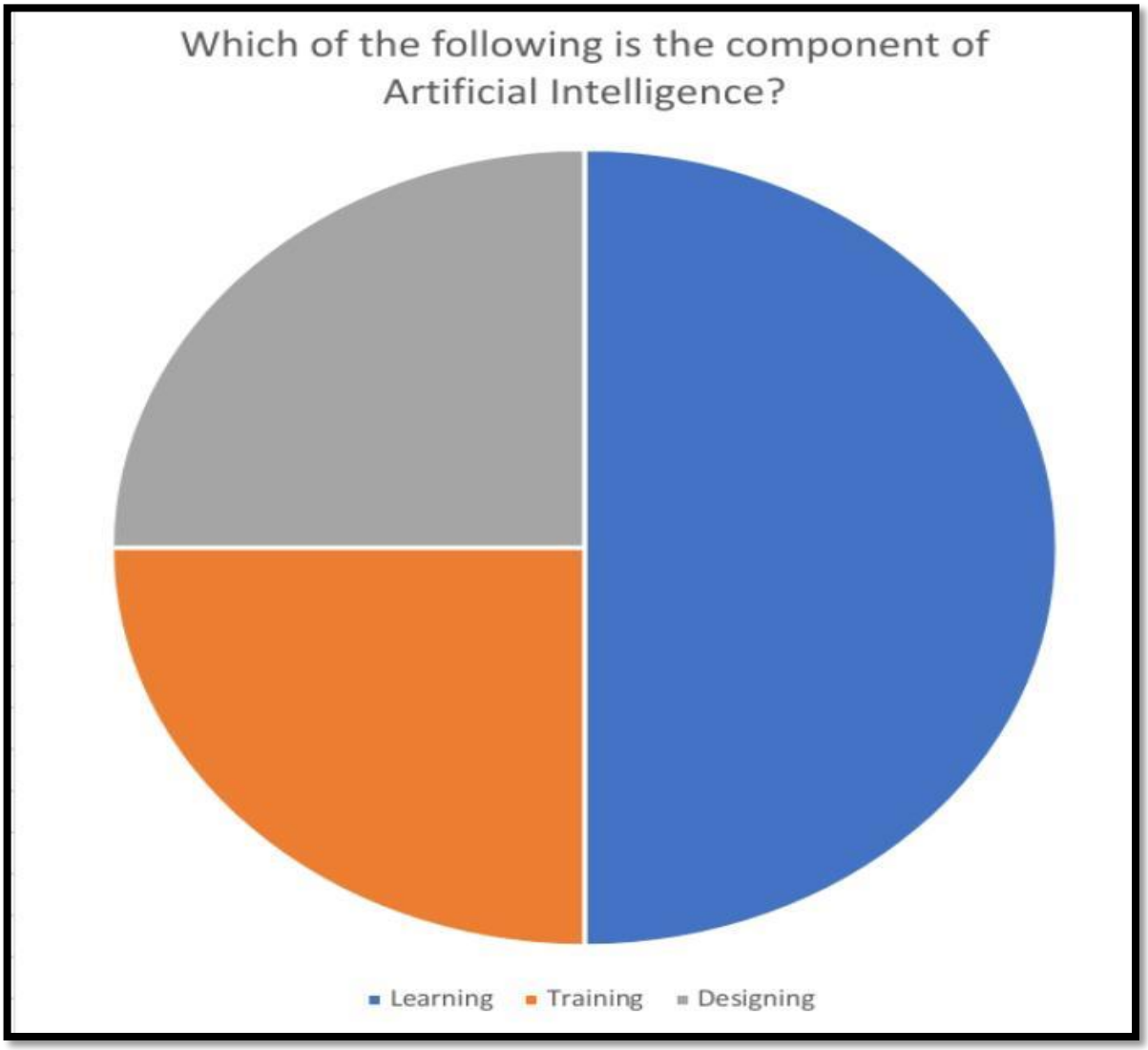
1) Personalized financial services are the one which focuses on the personalized connect with the customer to provide the automated financial advices and also provide expertise in assistance for making financial decisions. It also analyzes the market volatility and recommends the suggestions for the user's to manage their portfolios and to achieve the financial goals.

2) Digital wallets are promoting as the future of real-world payment technologies, with major players like Google, Paytm, PhonePe and others, stepping towards to take initiatives in order to develop their own payment gateways. This decreases the dependence on physical form of the cash and thereby expanding the reach of money to greater levels.

3) Physical presence is slowly fading away as technology empowers customers to use banking services with voice commands and touch screens. The natural language technology can process queries to answer questions, find information, and connect users with various banking services. This reduces human error, systemizing the efficiency.

4) Customers issues related to banking sector will be resolved efficiently, as speech processing and natural language processing technologies will be upgraded. We are getting closer to the day, when computers could handle most customer service queries. This would make the end to waiting in line and hence resulting in effective customer service.

5) The artificial intelligence has its impact on banking sector in India. The major players of the banking sector are implementing the artificial intelligence technology in some of its processes in order to make banking more efficiently, thus banking sectors will have more time invest various other tasks to improve banking businesses and freeing from the tedious tasks. The implementation of the artificial intelligence across globe is increasing rapidly in various sectors.



❖ **PRESENTATION AND INTERPRETATION:**

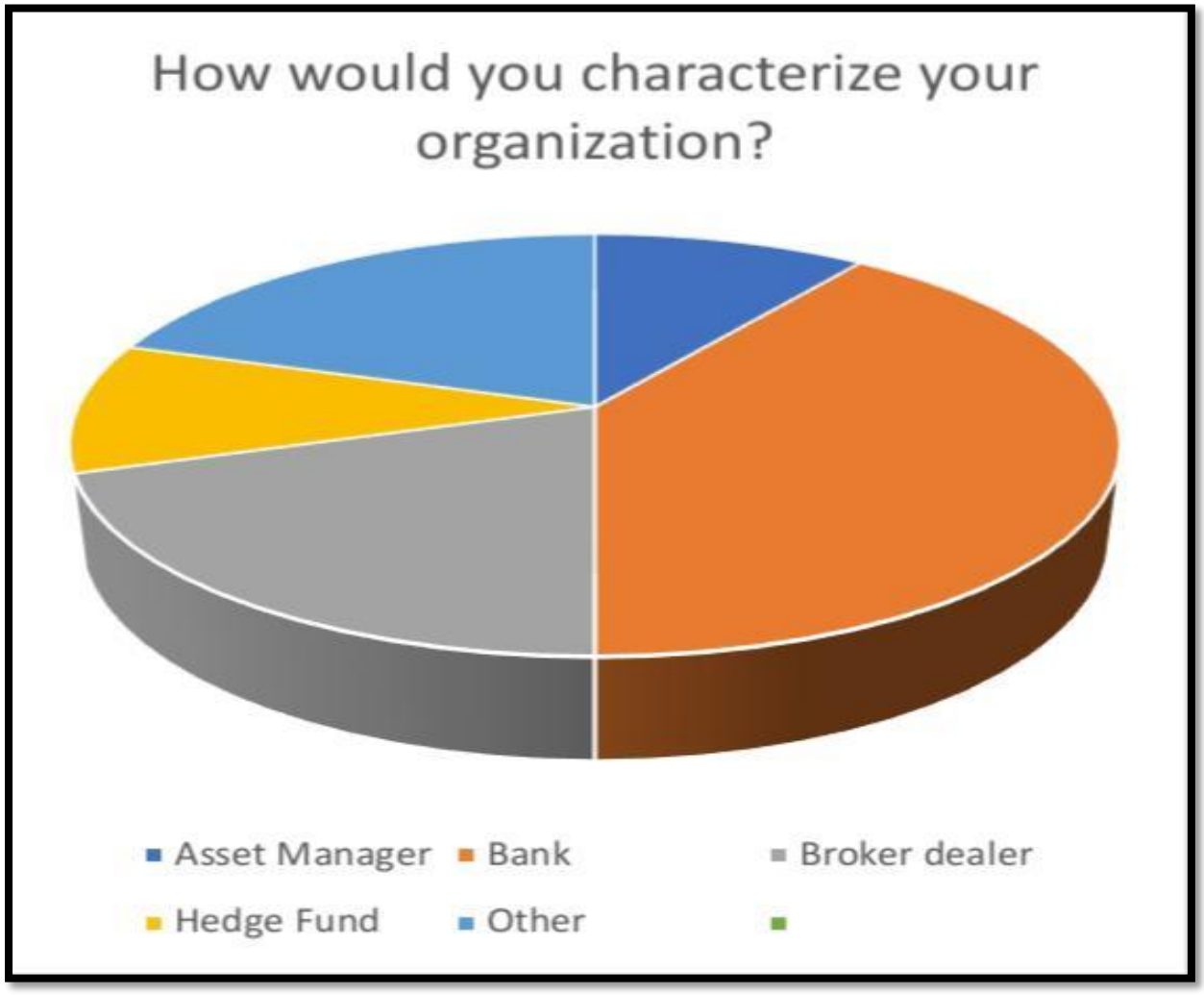
Learning – 50%

Training – 25%

Designing – 25%

1. **Interpretation :**

There are three components of Artificial Intelligence Learning, Training, Designing. According to the response, 50% people thinks that through Artificial Intelligence they are getting to learn New things. 25% people thinks that this is a new training or a kind of job to earn and lastly, 25% people thinks that this is designing the Banking Sector.



Asset manager – 10%

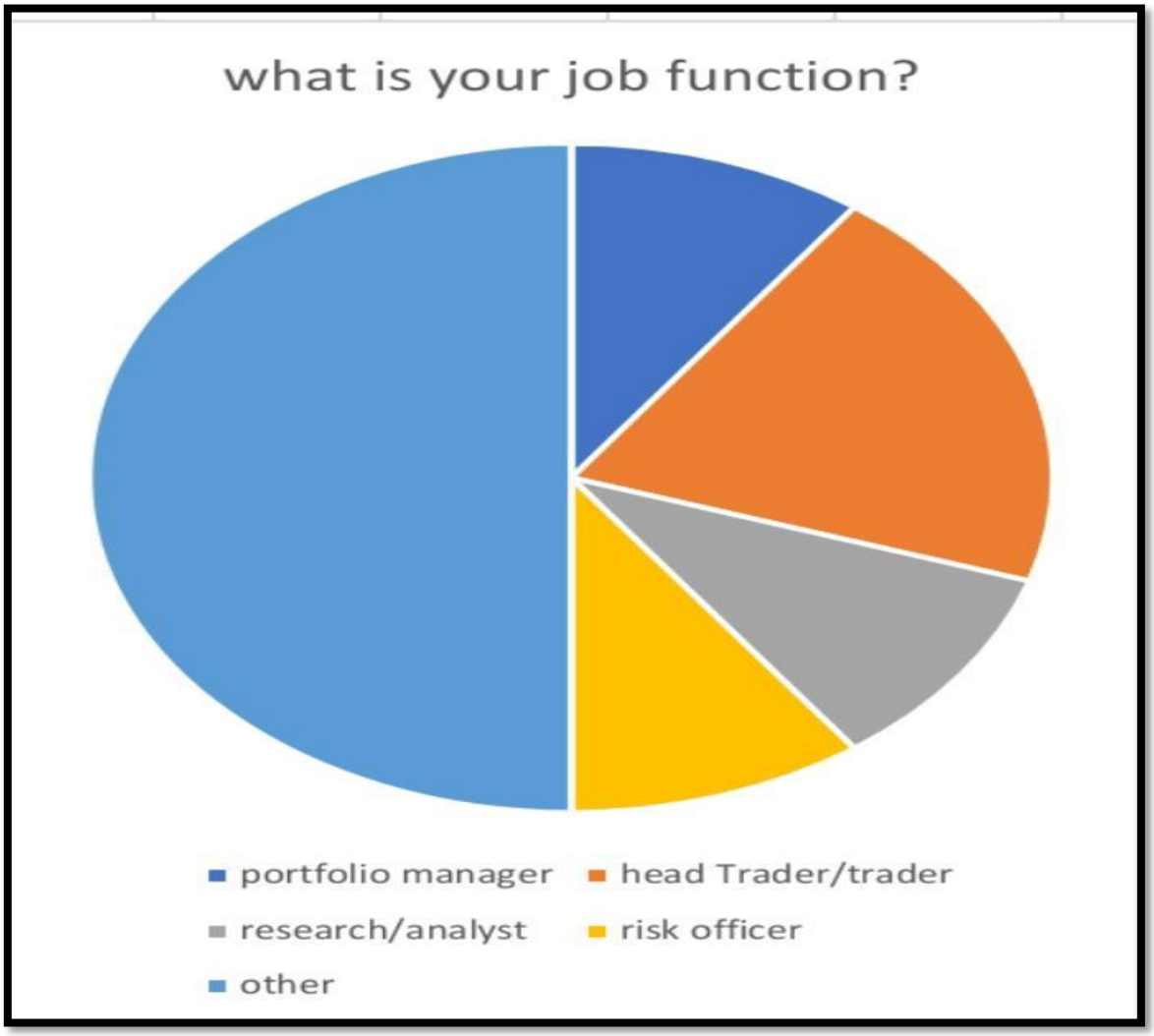
Bank- 40%

Broker dealer – 20%

Hedge Fund – 10%

Other- 20%

2. **Interpretation:**
   According to the above pie chart people characterize their organization as Bank, and also there are other organization which they characterize are Asset Manager, Hedge Fund, Broker dealer, etc. But as compare to other organization, bank is the institution where people are getting more across about Artificial Intelligence.



Portfolio Manager – 10%

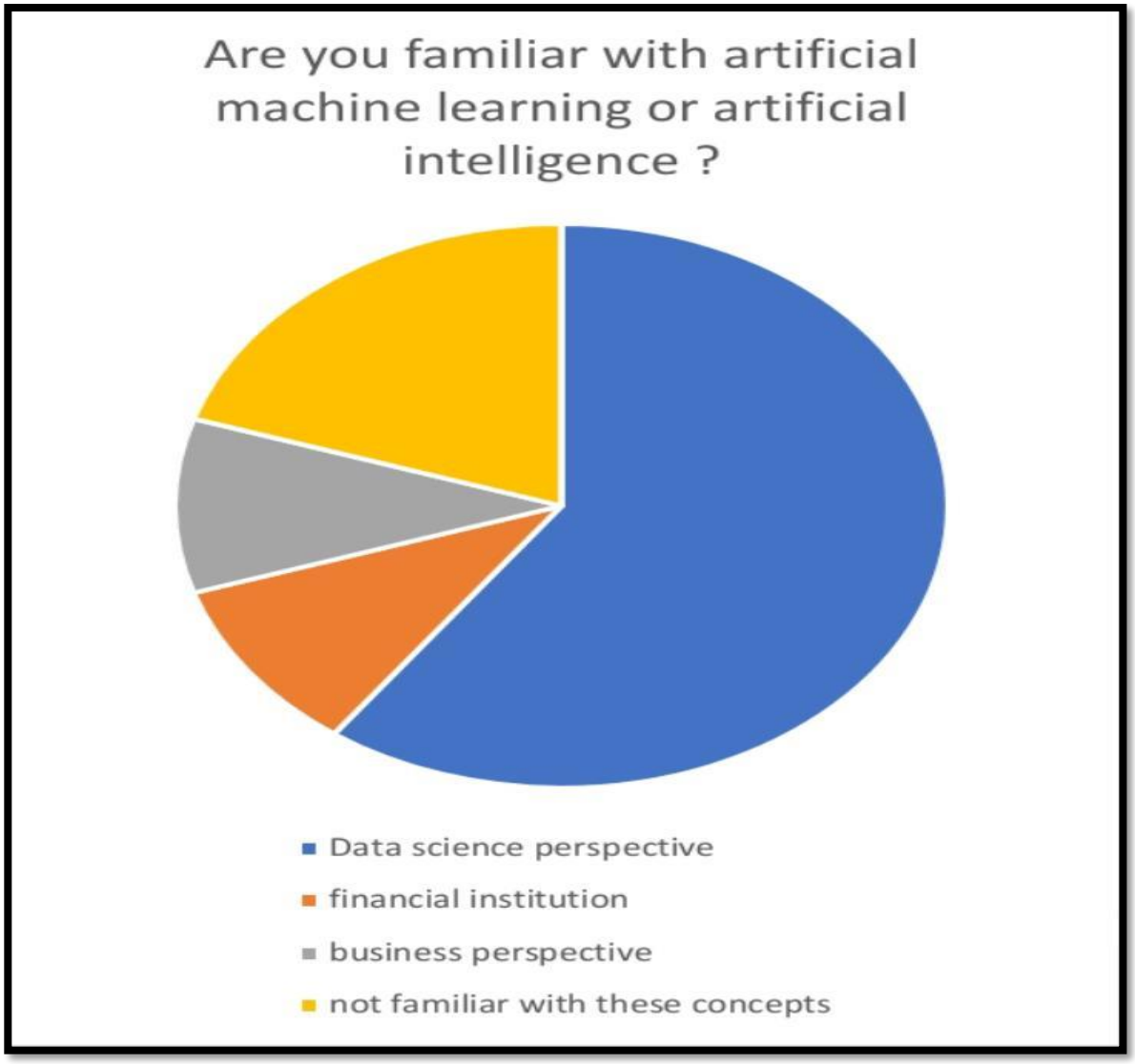
Head Trader/ Trader – 20%

Risk officer – 10%

Research/ Analyst – 10%

Other- 50%

3. **Interpretation:**
   According to the above pie chart all have their different job function, their different way of looking towards Artificial Intelligence. 50% of people are from other job background and 50% are from Head trader/Trader, portfolio manager, risk officer, research/analyst, according to their own assumption.



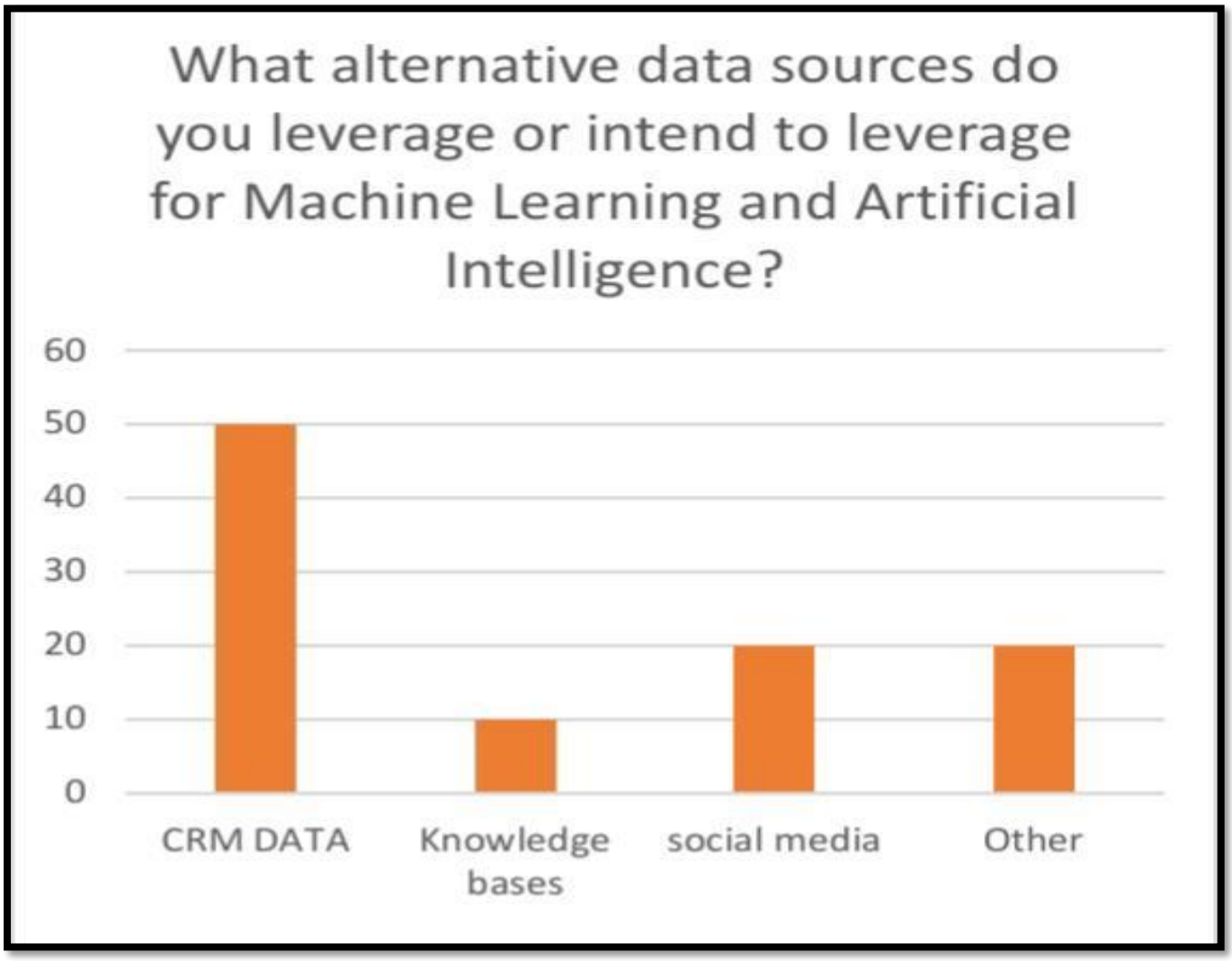
Data science perspective – 60%

Financial Institution – 10%

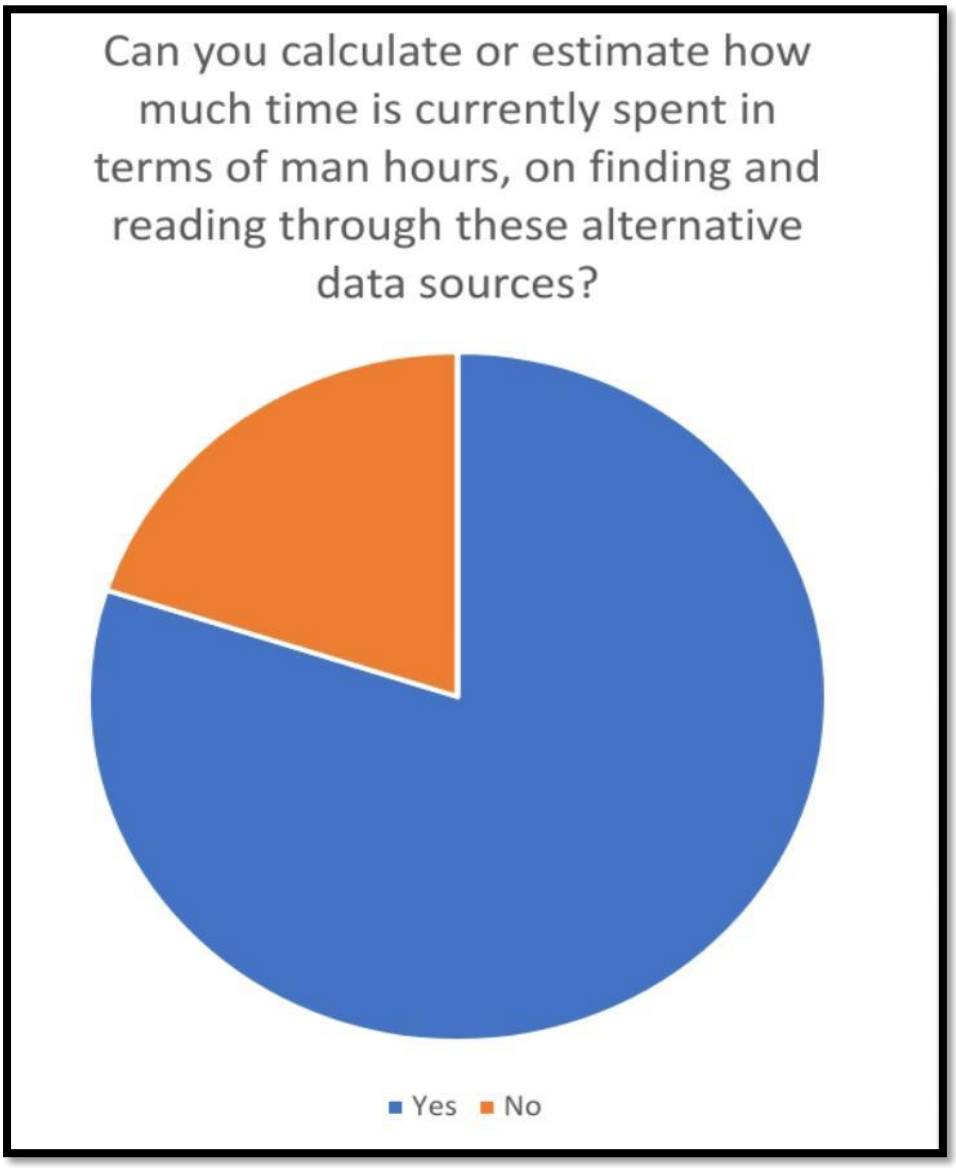
Business perspective – 10%

Not familiar with these concepts – 20%

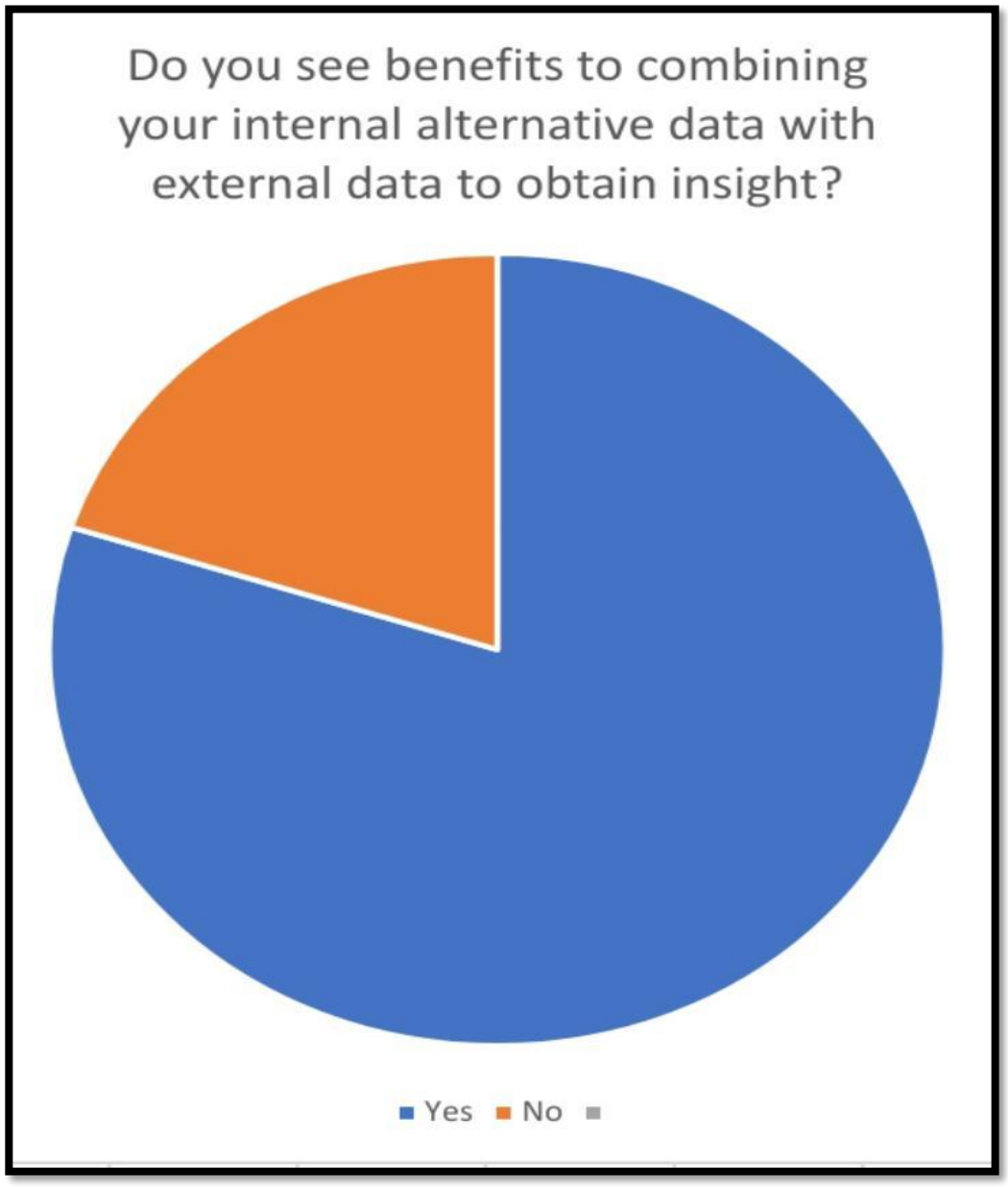
4. **Interpretation :** According to the above question asked in the survey, people are familiar with Artificial Intelligence according to their knowledge bases or their working sector they belong to. Here in the above pie chart we can see that 60% people are familiar from data science perspective, according to them Artificial Intelligence is a new invention in Indian banking sector, 20% people are familiar from their business and financial institution and 20% people are not familiar with these concepts, may be because they don't know to use the system or illiteracy.



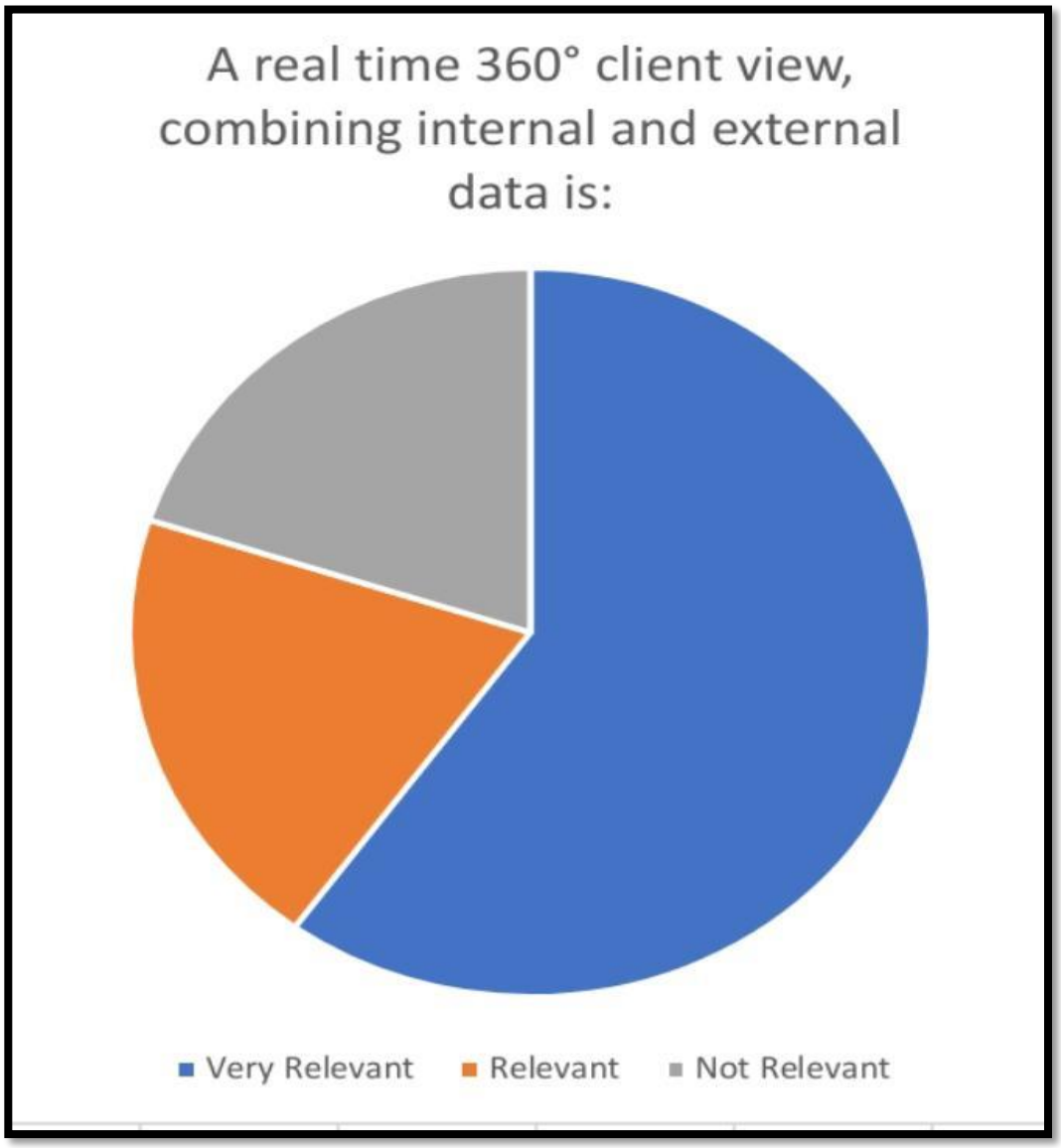
5. **Interpretation:**
   According to this question, responses of people says that they leverage Machine Learning and Artificial Intelligence applications CRM Data (Customer Relationship Management) is more, people think that because of this customer relationship will increase and Artificial Intelligence will become more famous in Indian banking sector. Other 50% people thinks according to their knowledge bases, social media and many other alternatives according to them they leverage for Artificial Intelligence.



6. **Interpretation:**
   According to this pie chart we come to know that nowadays technology is playing most important role in everyone's life , because it's saves time, reduces paper work, maintains all the data, records of the client and we can easily get , whenever required. By sitting at home they can do any transaction related to bank. But still 20% people likes paper work because according to their knowledge they can't trust on online mode, they have the fear of fraud and cyber crimes.



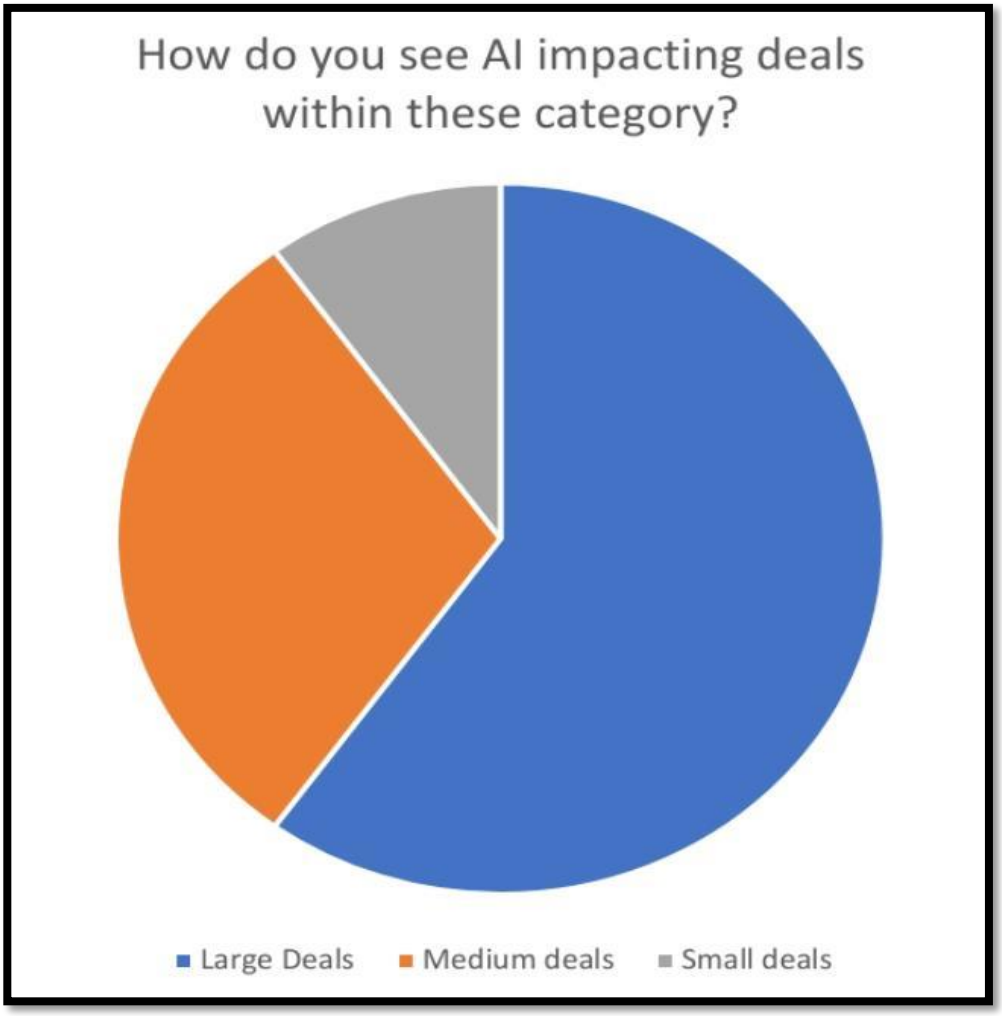
7. **Interpretation:**
   Data analytics techniques enable a business to take raw data and uncover patterns to extract valuable insights. As a result, data analysis helps companies make informed decisions, create a more effective marketing strategy, improve customer experienc**e,** streamline operations, among many other things. Because of this reason 80% people thinks that there are benefits of combining internal data with external data to obtain insights.



Very Relevant – 60%
Relevant – 20%
Not Relevant -20%

8. Interpretation

A 360°customer view is a single, end-to-end picture of the customer's journey and experience with a company, and how they felt at steps along the journey. It is a strategic approach enabling businesses to offer the best customer experience across all channels, by allowing for a unified view of all customer touch points. For this reason 360° client view is very relevant for 60% of people and for 20% somehow is relevant.



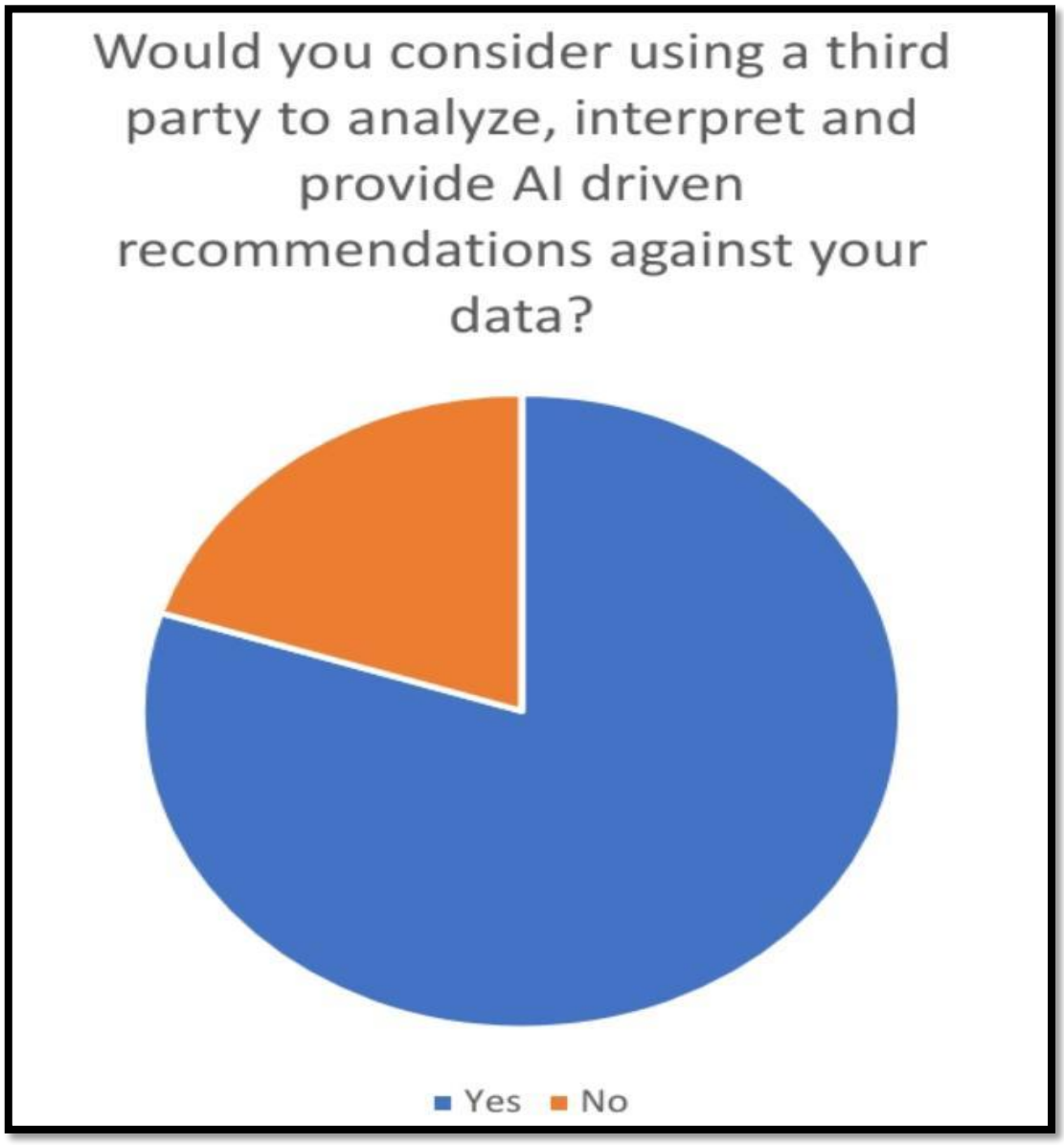
Large deals – 60%

Medium deals – 30%

Small deals – 10%

9. **Interpretation:**

AI is expected to take digital technology out of the two-dimensional screen and bring it into the three-dimensional physical environment surrounding an individual In business, artificial intelligence has a wide range of uses. In fact, most of us interact with AI in some form or another on a daily basis. Artificial intelligence is more helpful in large deals according to 60% people. 30% people thinks of medium deals and 10% people thinks in small deals, this is because awareness of Artificial Intelligence is lacking to make people aware about this technology is more important.



10. Interpretation

Protecting such privacy interests in the context of AI will require a change in the paradigm of privacy regulation. AI makes big data analytics simpler by automating and enhancing data preparation, data visualization, predictive modeling, and other complex analytical tasks that would otherwise be labor-intensive and time-consuming that is why 80% people says YES for this question and 20% NO according to their knowledge bases

CHP 5 CONCLUSION AND SUGGESTIONS

Conclusion:

The digital revolution is changing the functionality of every other business operating today. Just like all distinct industries that are focusing on leveraging the revolution to increase profits, banking is on the territories as well. The applications and examples present a clear picture of what is in store from the benefit's point of the use of artificial intelligence in banking.

Their focus on scaling new heights in customer relationship improvement through digitization is rising on the progress scale. Although with challenges like cyber threats from cybercrimes, conventional banking methods, lack of training, etc., the world of banking is picturing technology-faced services into the ground level banking operations.

Artificial Intelligence is gaining acceptance day by day and banks are discovering and executing this technology in changing the way customers are supported. So, the future of Artificial Intelligence in banking sector is very bright, it makes it even easier for a customer to do transactions from any place and at any time without waiting in lengthy queues at the bank. Hence, the aim of Artificial Intelligence is to provide personalized and high quality of customer fulfilment along with effective and time saving services.

Artificial Intelligence has numerous advantages to offer for the financial segment. Based on the findings, it can be concluded that Artificial Intelligence in Banking and Financial Services satisfying their clients or consumer's needs. Banking and Financial Services consumers have good awareness about Artificial Intelligence applications. Adoption of Banking and Financial Services AI in applications was highest followed by KYC/AML, Chatbots and Security Compliance and also helping to fulfil the customer demand faster and easier. The consumers more commitment from representatives to the banking and financial services by giving development innovative preparing to improve the AI procedures in the workplace. It is also being used to meet regulatory compliance, detect fraud, and assess individual creditworthiness.

AI is gradually proliferating the banking industry to reinforce financial services. In the time of social distancing and quarantine, people are more likely to take the digital route to stay up to-date with their bank accounts and make transactions. With such advantages, it is nearly obvious that the majority of banks and financial institutions will adopt AI to stay competitive and deliver better customer support. However, several cons are also associated with a machine learning algorithm. As it continues to learn and grow, the decision-making capabilities may create problems in the near future. Also, since the manual workforce is being limited, the role of AI is critical in ensuring that banks can serve their customers effectively. We hope that our article sheds light on the inevitable need for AI to reduce the dependency on humans in the banking sector.

A digitalization is certainly taking place across all segments of industry especially banking. Artificial intelligence is the field of science that deals with rivalling the capabilities of modern computer systems to resolve issues using human-like complex capabilities of reasoning, learning and self-correction. Currently artificial intelligence is used in detecting mismatching in transactions, providing personalised recommendations for the customers and developing solution for eliminating human errors. The traditional banking has evolved and more and more banks are adopting new technologies like AI, Cloud, block chain to cut down their operating expenses and improve efficiency. Improvement and development in the AI industry will increase productivity at a reduced cost. The banks are increasingly looking at emerging technologies such as block chain and analytics

in creating an active defense mechanism against cybercrimes. Artificial Intelligence could be the key to transforming many of these crucial customers facing processes and retaining the competitive edge. The bank should focus on making aware of their customer about the AI technology and benefit of the technology. This study uses stratified random sampling technique for the data collection. As result of the survey majority of the customer are accepting the new AI technology in banking sector but lacking is here most of the customer are not aware of the new technologies in the market and usage of the technologies. It necessary for the bank to focus on make aware of knowledge of the technologies and usage of it.

Technology tends to bring greater opportunities and creates challenges as well and Artificial Intelligence has brought new life in banking sector as it is creating automated processes and enhancing customer satisfaction to a greater extent. The authorities must ensure data privacy norms to protect client's credentials and also must collaborate with universities to develop data scientist. And wide network banks need to have artificial intelligence officers. AI has the potential to ensure speedy growth of banking sector.

Artificial Intelligence is slowly changing the way people think and act and it is taking our mind to the next level. Imagine a machine that has the ability to think, learn, create and form its own ideas and thoughts. With the benefits and potential of such platform, computer power has increased by massive amounts. Face recognition, finger prints or retina scan for unlocking entrance or access points are just some of the common applications of AI today. The potential and future development in this field is somewhat endless with ongoing research. Undoubtedly, the banks and financial institution that benefit most from AI will be those that are prepared to adjust their old age approach. Artificial intelligence will clearly have a huge impact on the financial services sector. Banks will redefine how they work, what they sell and how they interact with their customers and employees. They will redefine their operating structures for an AI-enabled process and operational efficiency. And new AI application will create growth for the bank through improved customer service and employee experiences.

AI technology has triggered a major digital disruption that has affected the entire banking sector in the 21st century. This is primarily because AI solutions have the capacity to help banking institutions to innovate, make more informed decisions, and solve complex problems with greater levels of efficiency and effectiveness. Furthermore, predictive analytics, neural networks, machine learning, and other AI technologies can be used to enable banks make more accurate predictions and respond to emerging issues in a timely manner and appropriately. Therefore, AI is a technology that can enable banks to stay ahead of market competition. However, there are many pitfalls that have to be addressed to ensure that the opportunities fronted by AI are optimally exploited. Notable ones include privacy violation, job loss, data availability and quality, and strategic AI-business alignment concerns. While there is a wide body of knowledge that pertains to AI opportunities and challenges in the banking context, existing studies are largely descriptive and based on secondary data sources. Therefore, future studies ought to employ thorough empirical investigation techniques to deliver concrete evidence concerning AI opportunities and challenges in the banking sector.

A digital boom is certainly taking place across all segments of industry especially banking, especially after demonetization .The traditional banking has evolved and more and more banks are adopting new technologies like AI, Cloud, block chain to cut down their operating expenses and improve efficiency. Though it is still in its nascent stage ,banks are still at cusp of an artificial intelligence revolution. Improvement and development in the AI industry, will increase productivity at a reduced cost. Managers across industries will have to raise their ante on skill-set up gradation.. There is no doubt that recent push towards digitalization is rapidly influencing the traditional banking models. However, it has also exposed the institutions to increasing cyber security threats and vulnerabilities. The banks are increasingly looking at emerging technologies such as block chain and analytics in creating an active defense mechanism against cybercrimes. Artificial Intelligence holds much more importance and importance than what we read in this article. It will continue to increase in the times to come.

Suggestions:

Artificial intelligence is changing the dynamics of businesses and the banking system is no exception. From mobile banking to customized customer service, the role of AI technology is transformational. The hassle of standing for long hours to get banking services is slowly becoming a thing of the past for retail consumers. Consumers' desire to reach banking services from the comfort of their homes has increased the demand for mobile banking. A recent study by Insider Intelligence showed that more than 45 percent of respondents considered mobile banking among the top three features that influence their selection of financial institutions.

The Big Tech billionaires of the world including Mark Zuckerberg, Elon Musk, and Bill Gates have given life to AI. They are using AI tools and apps in determining consumer preferences and are now influencing other businesses to adopt AI-based technologies. Consequently, banks are investing heavily in AI and predictive analytics to make better decisions and provide customized services.

Even banks that have been reluctant to use AI technology in their processes are using AI chatbots to handle customer queries. As predicted by Elon Musk, "there certainly will be job disruption because what is going to happen is robots will be able to do everything better than us."

Money laundering is an emerging issue for banks because these institutions, in most cases, are unintentionally facilitating such processes. The Financial Action Task Force (FATF) considers money laundering an international issue and stresses the importance of global cooperation. A study conducted by The United Nations Office on Drugs and Crime (UNODC) also highlighted this, stating that nearly 3.6 percent of global GDP, which is equal to $1.6trn, is being laundered each year. A recent report by Zippia showed that the US is dealing with money laundering worth $300bn each year. These figures are alarming for the banks and it is crucial that action is taken when the recessionary pressures on global economies are approaching 2008 levels.

Leading banks are using real-time AI risk management technologies to determine customer behaviours and transaction patterns to combat terrorist financing and money laundering. It closely monitors high-risk accounts by matching a customer's expected monthly turnover with their actual monthly transactions to raise red flags. This ultimately assists banks in implementing controls to safeguard against losses, fraud and in turn enhances ROI for their consumers.

However, it is worth noting that implementing AI technologies is not the end of the story. AI processes will need optimised frameworks and hardware accelerators to manage AI assignments. Furthermore, financial institutions also need to prepare processes and effectively communicate them with staff to achieve their AI goals rapidly. “Artificial Intelligence technology invariably needs human beings.

organizations that can communicate a bold vision with an AI strategy are approximately 1.7 times more likely to achieve high outcomes as compared to enterprises that do not. Thus, by using big and complex data sets, banks can create risk frameworks that can provide precise and timely analysis.

Banks offer services and products integrated with AI to customers based on their preferences and searches. One of the best features of AI in banks is its ability to learn. It matures and becomes more intelligent over time. Standard Chartered is using machine learning that helps the bank to decode complex data compilations and slim down the related information.

Banks are using these data analytics to develop their marketing strategies. “Ensuring transparency and Explainability in AI-based decision-making is not just a competitive advantage for us, but also the right thing to do by our client,” says In this way, they are identifying consumers’ preferences and offering targeted products and services, which has helped it to decrease costs and increase productivity.

However, data breaches are a continuing concern for banks that are using AI technology in their processes. Every bank records a large number of transactions daily. The collection of data is a never-ending task, one which raises considerable security issues. A recent data breach in Flagstar Bank, one of the largest banks in the US, has put its 1.5 million customers at risk.

Of course data protection remains a challenge for banks, but they cannot ignore the significance of AI in modern banking. Implementing robust data protection protocols is necessary to counter such threats. On the other hand, banking institutions need to lay the groundwork to support AI teams who can promise efficiency, consumer satisfaction, and improved ROI.AI offers tantalizing opportunities and modern banking must include accessible, secure, and consumer-driven data centers to accelerate data collection and analytics.

The present AI mechanism is set to undergo dynamism with the incorporation of robotic process automation, natural and vernacular language processing, advanced data analytics, predictive analytics and image analytics to enhance the customer experience manifold. Apart from imparting information about the banking functions, the chatbots and virtual assistants will progressively help in making financial decisions on behalf of the customers as well. There is a feature of biometric-cum-voice-cum facial recognition in AI technology that is also said to help in customized onboarding of customers based on customer categorization in banks. This will aid in the process of massive improvement in customer communication with the banks that will in-turn be a win-win situation by satisfying the customers and bringing business to banks simultaneously.

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APPENDIX:

QUESTIONNAIRE

1. Who is the investor of Artificial Intelligence?
   - Geoffrey Hinton
   - Andrew NG
   - John McCarthy

- Allen Newell

2. Which of the following is the branch of Artificial intelligence?
    - Machine learning
    - Cyber Forensics
    - Full- stock developer
    - Network design

3. Which of the following is the component of Artificial Intelligence?
    - Learning
    - Training
    - Designing
    - Puzzling

4. How would you characterize your organization?
    - Asset manager
    - Bank
    - Broker dealer
    - Hedge Fund
    - Other (please specify)

5. What is your job function?
    - Portfolio manager
    - Head Trader/Trader
    - Risk officer
    - Research/ Analyst
    - Trading technology
    - Trade support
    - Developer
    - Compliance
    - Management
    - Other (please specify)

6. Are you familiar with Machine Learning or Artificial Intelligence?
    - From a data science perspective
    - From a financial institution/ business perspective
    - Not familiar with these concepts

7. Regarding Artificial Intelligence (AI) solutions, have you ?
    - Deployed

- Evaluated
- Intend to pursue but not yet started
- Not planning to implement

8. What alternative data sources do you leverage or intend to leverage for machine learning and Artificial Intelligence applications?
    - CRM data
    - E-mails
    - Documents
    - Knowledge bases
    - News/ premium data sources
    - Social media
    - Core banking system

9. Can you calculate or estimate how much time is currently spent, in terms of man hours, on finding and reading through these alternative data sources?
    - YES
    - NO
    - IF YES, PROVIDE ESTIMATE

10. Do you mine this data for insight or client transparency?
    - YES
    - NO

11. A real time 360° client view, combining internal and external data is:
    - Very relevant
    - Relevant
    - Not relevant

12. How would you Prefer to consume AI driven recommendations? Please choose one.
    - Stand-alone dashboard
    - Dashboards integrated in your core banking system.
    - Through alerts (e-mails)
    - Mobile
13. How would you see AI impacting deals within these category? (Choose the impactful deal)
    - Large deals
    - Medium deals
    - Small deals

14. Would you consider using a third party to analyze , interpret and provide AI driven recommendations against your data?
    - YES
    - NO

15. What roles would you leverage AI for?

- Investment banker
- Corporate and institutional banker
- Real estate finance manager.