Assessing the Dynamics of AI Driven Technologies in Indian Banking and Financial Sector

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Deepthi. B[1], Priya Gupta[1], Pratibha Rai[2] and Himanshu Arora[3]

Abstract

Providing quality customer service is one of the crucial matters of concern for any organization as it ensures the best customer satisfaction levels. Organizations all around the globe are widely using newly evolving technologies like artificial intelligence (AI) and machine learning applications to provide the best customer experience. The banking and financial services industry is on the front line to adopt AI-driven technologies in various departments worldwide. However, the adoption rate of these technologies is low in India in comparison with developed economies. In this article, we discussed the significance of various factors (customer satisfaction, AI knowledge among employees, and third-party tie-ups) on implementing the AI-driven technologies from employees' perspectives at various levels of the organization. We analysed the usefulness of these newly evolving technologies to increase customer satisfaction and studied the role of crucial factors like data security issues and third-party tie-ups on AI technology implementation. The study is based on the primary data collected from 97 employees working in the Indian banking and financial sector across various metro cities of India (Hyderabad, Mumbai, Delhi) in various departments. We identified and analysed various factors that could impact the implementation of the AI-driven technologies at various departments, and we used logistic regression to investigate their significance. Chi-square test was used to check the associations between different factors. The study identifies and examines three key factors—customer satisfaction, AI knowledge among employees, and third-party tie-ups—that could impact AI-driven technologies implementation. According to this study, AI technology considerably decreases the cost and improves the customer experience of services. However, despite of many advantages the adoption rate of AI technology in the Indian banking and financial sector found extremely low. The implications of this study can be extended to the organizations for 360 degrees comprehensive understanding about the AI implementation and repercussions as there is a limited study about this topic from the bottom of the organizational verticals. This analysis is purely based on survey responses received from banking and financial sector employees across various metro cities of India (Hyderabad, Mumbai and Delhi).

Key Words

Banking and Financial Industry, Artificial Intelligence, Technology, Chatbots, Logistic Regression, Customer Satisfaction

Introduction

The banking and financial sector is one of the key domains, and it is like the lifeline of the economy as the development of the banking and the financial sector represents the overall development of the economy. In recent years the Indian banking and financial sector has experienced many ups and downs and is heavily burdened by the losses. As per Reserve Bank of India (RBI, 2019) data, the gross NPA (GNPA) of Public Sector Banks (PSB) rose from ₹2,670,650 million as of 31 March 2015 to ₹8,454,750 million as of 31 March 2018 (PIB, 2019). In addition, the COVID-19 pandemic has brought many changes to the banking and investing practices (Kavas, 2021). The usage of digital banking services and the popularity of online banking apps have increased tremendously due to COVID-19 lockdown restrictions (Perwej, 2020). In these crucial times, it has become essential for the Indian banking and financial sector to enhance customers' confidence levels by providing reliable services and the best customer experience. According to various studies, the adoption of AI-driven technologies is highly helpful in processing gigantic data quickly and efficiently (Goudarzi et al., 2018).

[1] Atal Bihari Vajpayee school of Management and Entrepreneurship, Jawaharlal Nehru University, New Delhi, India
[2] Maharaja Agrasen college, University of Delhi, Delhi, India
[3] Delhi School of Economics, University of Delhi, Delhi, India

Corresponding author:
Deepthi. B, Atal Bihari Vajpayee school of Management and Entrepreneurship, Jawaharlal Nehru University, New Delhi 110067, India.
E-mail: deepthy.spandan@gmail.com

Faster adoption of these upcoming global trends has become inevitable to all emerging economies such as India as it helps in global integration. The banking and financial sector has immensely benefited from the adoption of AI-driven technologies all around the world. Providing quick services with accuracy and precision, better risk management, and efficient fraud detection are some of the most important benefits of AI-driven technology applications in the banking and financial sector (Goudarzi et al., 2018). However still, the implementation of these technologies in the Indian banking and financial sector is not prominent. This is largely because AI implementation requires banks to operate outside of the traditional privacy framework (Balakrishna., 2020). Even though the implementation is taking place, issues related to data quality and concerns among customers related to data privacy pose challenges to the organizations (Mehra, 2021).

Moreover, employees' perceptions and knowledge regarding AI-driven technologies at various levels have become a matter of concern as the implementation of AI technology requires the knowledge of AI tools. In addition, the role of third parties needs attention as they provide all the necessary AI infrastructure to the organizations. For instance, many credit scoring start-ups (Capital float, Crediwatch, Perfios, Creditvidya, etc.) provide the necessary support to banks and financial institutions to provide alternative credit scoring (Chawla, 2020). Various prior studies have identified the benefits and challenges of AI-driven technologies implementation from both organization's and client's perspectives. Literature on implementation dynamics, on the other hand, is lacking. To better understand the dynamics of AI-driven technology implementation from the perspectives of professionals at various levels of management, we conducted a study in the Indian banking and financial sector to identify and analyse some critical factors (customer satisfaction, data security/privacy concerns, third-party associations). As a result, the research sought to accomplish the following objectives.

1. To understand the underlying associations like responses received concerning increased customer satisfaction and implementation of the AI-driven technologies in any of the departments of their organization.
2. To understand the associations like responses received concerning concern for data security and implementation of the AI-driven technologies at different levels/departments of their organization.
3. The associations in implementing AI-driven technologies/or no implementation and their opinion about third-party associations, if any sought by their organization, were subject of interest.
4. To gauge association between the varied responses about employees' perception concerning AI-driven technologies implementation being expensive, time-saving, and easing out operations and its application at different levels of the organization.
5. The association in the employees' responses working at different levels of hierarchy and their familiarity with the AI-driven technologies application in their organization was also a subject of inquiry.

We have used the chi-square test to check the associations between various factors (customer satisfaction, data security concerns, help from third-party tie-ups) and implementing AI-driven technologies in an organization. We also gauged the strength of these factors by using Logistic regression (LR) analysis.

This article discusses the importance of several factors (customer satisfaction, employees' knowledge regarding AI tools, data security concerns, and third-party tie-ups) from the employees' perspective in adopting AI-driven technology in the Indian banking and financial sector. This study strengthens and voices in favour of the usefulness of AI-driven applications in various departments at various levels of an organization based on empirical research.

Literature Review

Artificial Intelligence (AI) refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem-solving, and decision making (Copeland, 2020). Machines can organize, process, and analyse gigantic data to solve possible problems only with the higher intellectual capabilities of humans. In simpler words, AI is the intelligence demonstrated by machines. Machine learning (ML) is a subset of AI which means 'the ability of machines to learn without programming'. Deep learning (DL) is also an AI function that replicates the human brain's processing of data to identify objects, recognize speech, translate languages, and make choices. Figure 1 shows that the three concepts are related to each other. DL is a subset of ML, a subset of AI (Nicora, 2019).

The applications of AI-driven 'applications' are highly enormous in the present-day business environment. Adopting these newly evolving technological trends has become almost mandatory for present-day financial institutions due to high competition upcoming challenges with increased globalization and digitalization of financial and banking services; banks provide AI and algorithm-based service interactions in mobile banking (Iberahim et al., 2016). According to Robinson (2000), providing online banking services helps banks build and expand client connections. In this context, many prior studies discovered that service quality aspects, including trustworthiness, responsiveness, efficiency, security, privacy, and fulfilment, are critical for delivering optimal e-service quality (Liao & Cheung, 2008; Loonam & O'Loughlin, 2008; Siu & Mou, 2005; Sohail & Shaikh, 2008; Sunayna, 2009; Yu, 2008). In addition, ease of use plays a significant role in adoption

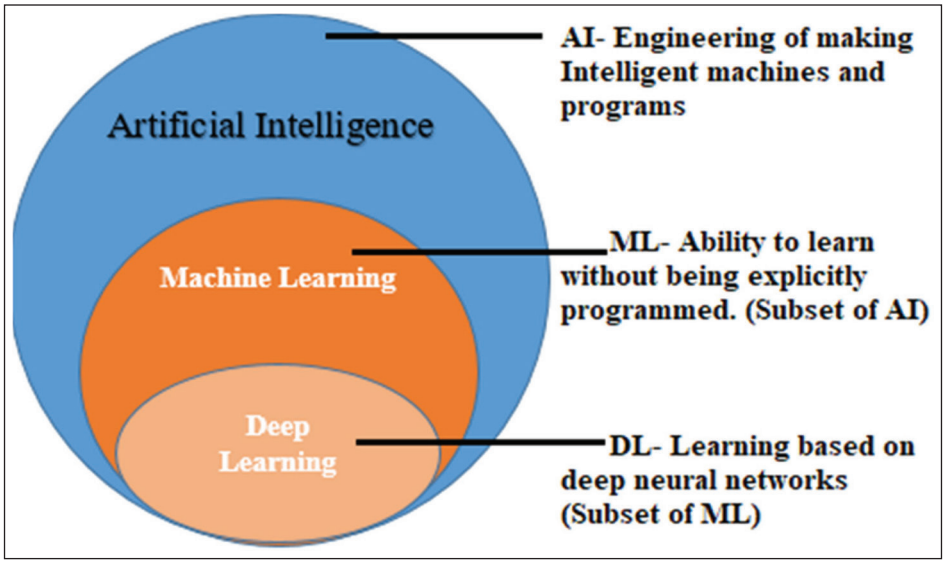

Figure 1. Difference Between AI, ML and DL

Source: The authors.

(Daniel, 1999; Sathye, 1999; Yang et al., 2004). To improve total user acceptance of digital banking services, banks must employ a straightforward and easy-to-use Internet Banking system so that potential customers feel at rest and peace once they realize that transactions through Internet Banking are painless, safe, and straightforward (Mann & Sahni, 2012). Thus, the banking and financial sector has become one of India's key adopters of AI-driven technologies. Naidu and Seshadri (2020) discussed the benefits of adopting new technological innovations in the banking sector. According to the study, Indian banks, by adopting the latest AI-driven technologies, significantly enhance the customer experience and increase the efficiency of the operations Singh and Agarwal (2019) have also discussed the pros and cons of AI technology banking operations. Even though the benefits are enormous, due to the lack of availability of good data and the requirement of diverse language use, the adoption of AI-driven technologies has become challenging in India. According to the Data Security Council of India (DSCI), the major challenges include data security/privacy issues, lack of AI expertise, lack of quality data, and lack of AI and cloud computing infrastructure (Mehra, 2021).

Many business entities widely use AI technology-based applications all around the globe primarily to provide the best customer-centric service experience. According to Accenture, automation, bots, automotive learning, and adaptive intelligence are becoming a part of the financial team facilitators operating at high speed. George and Kumar (2015) have highlighted in their study that customer service problems and web problems are the major contributors of customer dissatisfaction while using Internet banking services. Banks have significantly augmented the internet banking services experience (Baruah, 2020). Cheng and Jiang (2020) have studied the user experience with AI-driven chatbots, and their research revealed that chatbots play a significant role in affecting customer satisfaction. According to a case study, the State Bank of India's virtual assistant, SIA (interface.ai., n.d.), has reduced 52% of the support service costs. However, data security/privacy is significant, affecting customer satisfaction significantly (Cheng & Jiang, 2020). Today's other AI-related technological applications in the banking industry include customer service, tailored customer service costs. However, data security/privacy is significant and it affects the customer satisfaction significantly (Cheng & Jiang, 2020). Today's other AI-related technological applications in the banking industry include customer service, tailored customer service experience, better security, sample identification, and fraud detection (Kaya et al., 2019). The various uses of AI-driven technologies in the banking sector are summarized in Figure 2.

Even though AI-powered chatbots and virtual assistants are very prominently used by many organizations in the financial industry, the adoption levels of AI and ML-related technologies are low in other departments like fraud detection, KYC/AML automation.

Manali et al. (2020) have researched the applications of AI and related technologies in the Indian banking and financial industry. There is a need to improve AI-driven technology usage, especially in the middle and back-end operations of banks. These include risk assessment, fraud detection, KYC/AML, and so on. According to Salonia (2020), 51% of banks and financial institutions across the globe are still regulating KYC and AML processes manually. Salonia (2020) also mentioned in their article that the use of AI in the KYC/AML process significantly reduces the duration, cost and human errors.

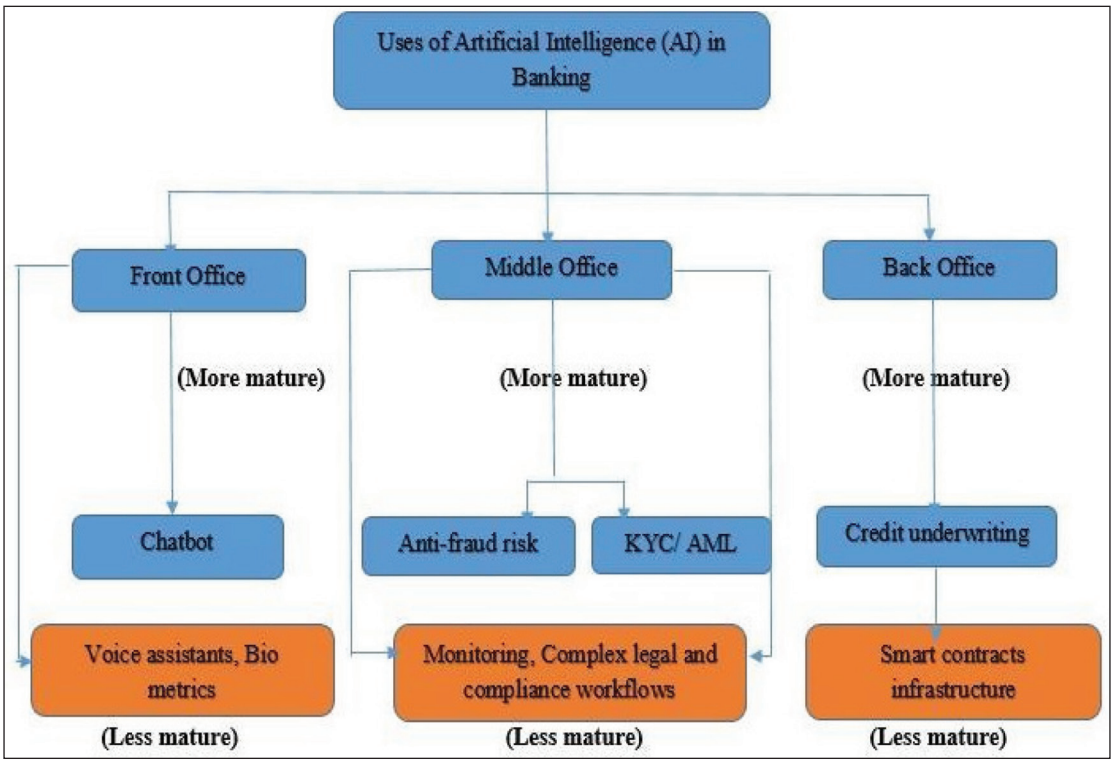

Figure 2. Uses of Artificial Intelligence in Banking (Modified Flowchart)

Source: Autonomous Next, 2019.

AI-related technologies can also help banks in reducing NPAs. Shaji (2019) has studied the role of AI in reducing Non-Performing Assets (NPA) of banks. According to the study, with the efficient use of technology and AI, the NPA of banks can be significantly reduced. As per the study conducted by Kaur et al. (2020), the implementation of AI and related technologies helps banks in cost reduction and business growth substantially. The research involved primary data collection from 112 respondents who are either clients or bank employees working in pan India. As the concerns regarding data privacy and security impact the customer's perception, there is a need to educate customers regarding AI technology benefits and usage. Sindhu and Namratha (2019) have conducted research, and their study highlighted that even though banks are adopting AI technology in chatbots and virtual assistants, the benefits are not reaching the customers. The study strongly recommends that banks focus on making their customers aware of AI technology and its far-reaching benefits.

AI technology can help in achieving better financial inclusion. According to a study by Chawla (2020) many Fintech startup companies are widely using AI and ML technologies to generate alternative credit scoring models for banks to assess the creditworthiness of clients or firms in a short time. These credit scores are helpful to give loans to people who are not having formal credit scoring. Ravikumar et al. (2021) have studied the role of AI technology in increasing financial inclusion. As per the research, disruptive technologies like AI are very helpful to bring the people under the banking purview who are not having proper credit scoring. The scope of AI is not limited to the banking sector. The other financial service providers have also hugely benefited from AI adoption. Srikanth (2020) has discussed the various benefits of AI and ML technology applications for traders in stock markets. Lee (2017) has also highlighted that DL has tremendous potential in the stock market for predicting patterns. The COVID-19 pandemic has brought many changes in people's investment patterns, and the fund flows to the stock markets have grown exponentially during the last year. The author has discussed, at length, the use of AI in the stock markets for price predictions and risk mitigation.

Despite the many benefits of AI technology, the complete implementation of AI in organizations is not happening for various reasons. Employees' perception and knowledge levels play a vital role in deciding the pace of adoption of AI-driven technologies. Kochhar et al. (2019) studied the impact of AI on different banks. Findings clearly show that AI is helping the banking industry enormously in various ways. Yet, the fear of job loss among employees is a major cause of concern when it

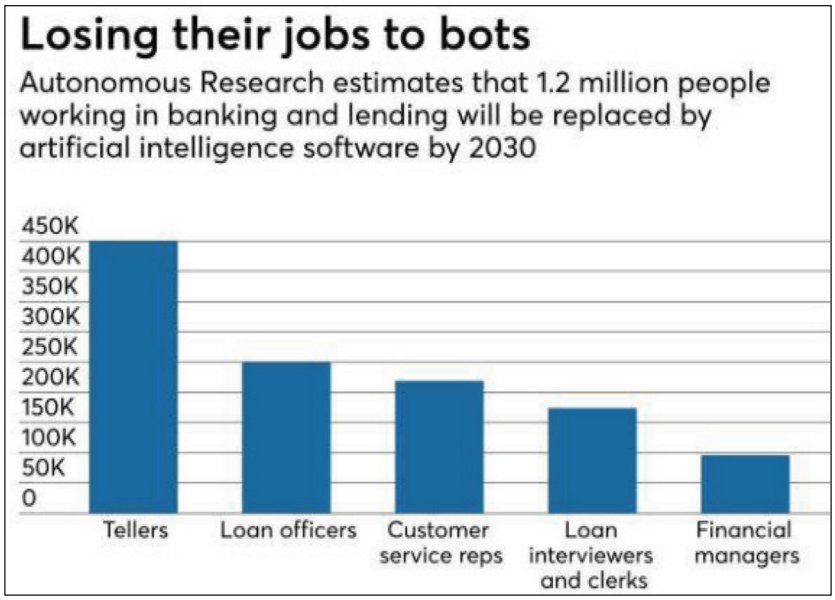

Figure 3. The Impact of AI Driven Technologies on Employment in the Banking Sector

Source: Crosman, 2018.

comes to the comprehensive implementation of AI in banks. According to the study by Crosman (2018), AI-driven technologies will replace 485,000 bankers, 219,000 fore agents, and 174,000 loan interviewers in banking. The impact of AI-driven technology applications on employment in the banking sector is shown in Figure 3. Gokul (2018) has also highlighted in his research that major ethical concerns arising in adopting AI and related technologies include fear of losing jobs and loss of human interaction. Hazarika (2020) has studied the impact of digitalization and technology adoption on employment in the banking sector in India. He studied the various level employees' contribution to the banks' profits. His study focused on numerous employees like officers, clerks and sub-level staff contribution to the bank profits. The contribution of all levels of employees is found significant in the banks' profit.

All-round adoption and efficient usage of AI is possible only through good AI infrastructure, efficient planning, and better strategy implementation. In this context, this study is designed to understand the issues related to AI-driven technologies implementation and the usefulness of these technologies from employees' perspectives at various levels of the organization. The highlights of the literature have been summarized in Table 1.

Methodology

The current study sought to examine the dynamics of AI-driven technology deployment from employees' perspectives at various levels of management in the Indian banking and financial industry. Several studies have been done focusing on AI-driven technology implications from the perspective of customers and organizations. The Secondary data was not available to understand the various crucial factors and their significance towards implementing AI-driven technologies from the employees' perspectives. Hence conduct of the survey was indispensable. Prior studies have identified the various benefits and challenges of AI technology implementation using secondary data and primary data from bank customers. However, in this study, we surveyed the professionals of banks and other financial institutions. They were in a better position as service providers to explain the crucial factors behind adopting AI-driven technologies in banks and other financial institutions. The quantitative analyses presented in this study are purely based on primary data generated from the Banks and other financial institutions.

The primary objective was to investigate the various factors that significantly influence the decision of the companies to implement AI and ML technology. Chi-square Test of Association was applied to test the association between various factors. Chi-square Test of Association was applied to test the above-stated objectives from 1(a) to 1(e).

The null hypothesis running from I(a) to 1(e) is that there is no association between the objectives stated.

H_0 = No association
H_1= Significant Association

Logit estimation technique was utilized to understand the role of the influencing factors.

Table 1. Highlights of the Literature Review

Author and Year	Sample Study and Techniques Used	Description of the Study	Findings
Ravikumar et al. (2021)	Data collected from secondary sources, descriptive study	Studied the importance of AI technology in financial inclusion. Discussed the benefits of AI usage	AI applications adoption will help in better financial inclusion (alternative credit scoring)
Srivastava (2021)	Data collected from secondary sources, descriptive study.	Investigated the various zones where the AI technology is being utilized in the Indian banking sector and its implications	Current applications of AI various departments in the banking sector, issues and challenges of implementation
Kaur et al. (2020)	Primary data collected from 112 clients from various Banks. Structured questionnaire method used	Investigated how AI is impacting the banking sector and its implications on human resources	AI and ML technologies applications in banking sector and customers perceptions about AI technology usage
Manali et al. (2020)	Secondary sources, descriptive study	Studied the dynamics of AI driven technology implementation in Indian banking and financial sector	Areas which needed more AI services implementation, importance of AI technology in Indian banking and financial industry
Singh & Agarwal (2019)	Data collected from secondary sources, descriptive study	Discussed the benefits and challenges of AI technology implementation in the Indian banking sector	Pros and cons of application of AI in the banking sector of India
Hazarika (2020)	Data collected from secondary sources. The author has applied the general linear regression model	Studied the effect of digitalization on employment in Indian banking sector	Findings concluded that the contribution of the number of officers, clerks and sub-staffs is significant on operational profitability of banks in 2017
Singh & Pathak (2020)	Data collected from secondary sources, and the description about the same has been presented.	Studied the various applications of AI in various domains of commercial banks in India	AI usage is being increased in fraud and risk management, ATM services, wealth management services, credit assessments
Cheng & Jiang (2020)	Primary data collected from 258 respondents. The author has used Cronbach Alpha, KMO-Barlett test, exploratory factor analysis, confirmatory factor analysis	Studied the customer using banking chatbots and their impact on brand love.	Significant impact found on customer experience by using chatbots. Data privacy is important to increase customer satisfaction.
Chawla (2020)	Data collected from secondary sources, descriptive study	Discussed about top credit scoring Fintech startups that are using AI	Top credit scoring Fintech companies using AI
Baruah (2020)	Data collected from secondary sources, descriptive study	Discussed the current AI applications in top Indian banks	Top commercial banks are using AI in various departments and highly benefited with the help of AI driven chatbots and virtual assistants
Srikanth (2020)	Data collected from secondary sources, descriptive study	How AI driven technologies are helping traders in the stock market and various applications of AI in capital markets	AI applications are highly helpful in stock markets for price prediction, pattern formation, trading support and their implications
Naidu (2020)	Data collected from secondary sources, descriptive study	Discussed various new technological innovations in the banking sector	New technologies adoption is highly advantageous for banks in the Indian sector
Kukreja et al. (2020)	Data collected from secondary sources, and description about the same has been presented	Discussed various newly evolving technological innovations in the Indian banking sector	Opportunities for the banking sector in new technologies adoption and challenges
Sindhu & Namratha (2019)	Primary data from bank customers and secondary data related to 5 leading commercial banks in India. Quantitative methods used for analysis (correlation, reliability test, Cronbach Alpha, hypothesis, Z-test)	It aimed to understand the impact of AI on selected commercial banks	AI services benefits are not reaching customers; Customers are ready to use AI applications if they are easy to use and data security is promised

(Table 1 continued)

(Table 1 continued)

Author and Year	Sample Study and Techniques Used	Description of the Study	Findings
Subudhi (2019)	Secondary sources (Reports of RBI, IDRBT, NASCOM, Forbes, leading consulting companies. Qualitative method of data collection and analysis	Discussed various opportunities and challenges for banks with respect to AI implementation.	Major uses of AI in banks, developments from the world of conversational AI to the banking sector
Shaji (2019)	Data collected from secondary sources, descriptive study	Discussed the influence of AI in the management of NPA	Causes of NPA, by using AI banks can identify the root cause and implement appropriate solutions
Digalaki (2019)	Data collected from secondary sources, descriptive study	Studied the applications of AI driven technologies in various departments of banks	Banks are using AI in front office, mid office and in back-office in the form of chatbots, KYC/ AML automation and for credit underwriting
Kochhar et al. (2019)	Primary data—Interview method. Secondary data from RBI reports, articles, etc	Studied AI applications in the banking sector, AI usage benefits	AI applications have enormous benefits for the banking industry. In-depth interviews with bankers revealed the employee perceptions regarding fear of job loss
Crosman (2018)	Secondary sources	Studied the impact of AI driven technologies on employment	AI driven technologies will replace 485,000 bankers, 219,000 customer service agents, and 174,000 loan interviewers in banking
George & Kumar (2015)	Primary data collected from 460 bank customers	Investigated various problems affecting customer satisfaction while using the internet banking services	Identified four major problems: Customer service related, web-based issues, other service-related and password related

Source: The authors.

$$E(y) = p = \text{Exp}\,(\beta 0 + \beta 1X)/\ 1 + \text{Exp}\,(\beta 0 + \beta 1X)$$

$$Y = \text{Log}\,(\pi/1 - \pi) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots \beta_m x_m$$

Y = 1 If AI driven technologies implemented
0 = If not implemented

where β_0 represents the intercept and β_1 represents the x_1 regression coefficient. The coefficients are on a logarithmic scale, and the logit transformation is the log of the probability. Equation above shows that the model is a linear regression model with Y = 1 as the log odds. Table 2 illustrates different variables used in the study.

Table 2. Variables Used in the Study

Variable Name	*Type*
Dependent variable	Binary
AI implementation in organization	
Independent variables	
AI knowledge among employees (KAI)	Categorical
Data security and privacy concerns (DS)	Categorical
Customer experience (CS)	Categorical
Third-party tie-ups (TP)	Categorical

Source: The authors.

Survey Design

Causal research, which has been the main focus of this study, attempts to explain the cause-and-effect relationship between variables that the various stakeholders of this ecosystem have identified. The survey is designed to meet causal quantitative research objectives across two sectors, banking and the financial sector. Hence, a pre-planned structured survey was designed in close consultation with the service providers and credit-worthy institutional clients. The survey instrument chosen is a carefully designed questionnaire to capture four core aspects: customer satisfaction, data security/privacy concerns, third-party tie-ups, employees' knowledge, and perceptions regarding the implementation of AI-driven technologies.

Sample Size and Selection

The sample size was governed by two objectives—(a) convenience and feasibility of administering the survey; (b) minimizing the error in the results.

A pilot study was conducted with twenty data points to minimize the errors and do some revisions in the initial draft of the questionnaire. In order to converge at the most important factors that govern the AI implementation in this sector, the logit estimation technique was run on data

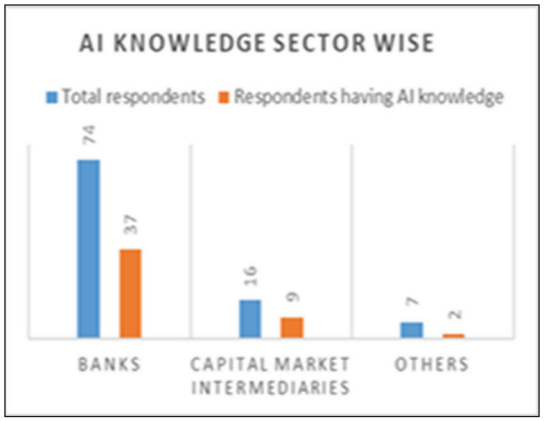

Figure 4. AI Knowledge Among Various Levels of Management

Source: The authors.

Table 3. Classification of Respondents Based on Employed Organization

Employed Organization	*No of Respondents*
Bank	74
Broking companies/capital market intermediaries	16
Others (insurance, AMCs, etc.)	7
Total	97

Source: The authors.

Table 4. Classification of Respondents Based on Gender

Gender	*No of Respondents*
Male	52
Female	45
Total	97

Source: The authors.

generated through twenty detailed responses received in the questionnaire.

The estimation results indicated five significant predictor variables determining the probability of implementing AI-driven technologies in the banking and financial sector. Since a comparative analysis between the two sectors was targeted, twenty respondents per predictor variable were considered appropriate, two times above the thumb rule of ten data points per predictor. This amounted to 100 data points (respondents) (VanVoorhis & Morgan, 2007). A statistical formula was not used to determine the sample size. The sample selection was based on a literature review and a rule of thumb. The number of responses received from the financial sector was only 23. Therefore, the scope of the article is limited to the banking sector.

A carefully structured questionnaire keeping in mind the study's objective (stated under the fourth section), was designed to collect the required data for the study. This online questionnaire (Google forms) was sent to respondents who were the employees of various public sector and private sector organizations in the Indian banking and financial sector (Capital market intermediaries, Asset Management Companies (AMC), Insurance companies), particularly located in Mumbai, Hyderabad and Delhi. The questionnaire was posted on popular social media groups (Facebook, WhatsApp and Telegram) and mailed to the participants. The purpose of the questionnaire was clearly stated on the cover page of the questionnaire. Hence, the respondents had a prior intimation that the data was being collected for academic / research purposes, and the information sought would be kept strictly confidential. After seeking the required permissions, it was floated among 12 banks, including both public and private sector and ten other financial institutions (AMCs, Insurance companies, and capital market intermediaries).

Analysis of Results

The questionnaire was sent to 150 respondents, and about 97 responses were obtained. A significant number of respondents belong to metro cities of India (Hyderabad, Mumbai, Delhi), and the majority of the respondents (76.3%) were employees of the banking sector, which includes both the public sector and private sector banks. Of the respondents, 16.3% are capital market intermediaries, and the remaining participants are working with various asset management and insurance companies. Out of 97 respondents, 56.7%, that is, 55 are working in the treasury of various banks and 11.3%, that is, 11 respondents are working as research analysts in capital markets (Table 3). Among total respondents, 53.6%, that is, 52 respondents were male and 46.4%, that is, 45 were female (Table 4).

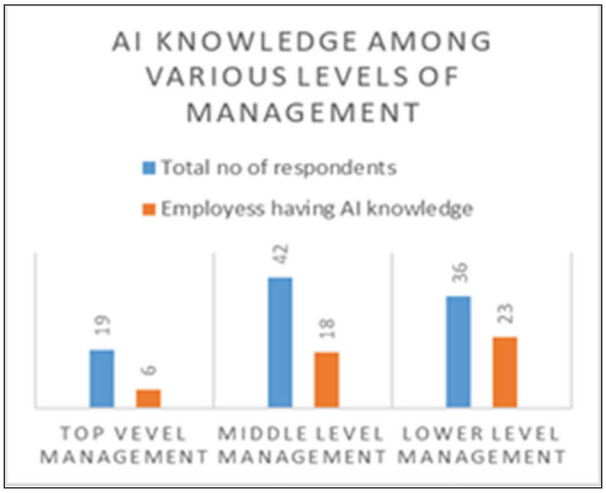

Figure 5. AI Knowledge Sector Wise

Source: The authors.

Out of 97 participants, 19.6%, that is, 19 participants belong to top-level management, 43.3%, that is, 42 participants belong to middle-level executive roles, and the remaining 37.1%, that is, 36 participants are in supervisory positions. Among the total of 97 respondents, 48.4%, that is, 47 participants, are well aware of AI-related applications, and 47.4%, that is, 46 participants are using AI-related applications in their organization (Figure 5); 6 out of 19 top-level management employees, 18 out of 42 middle-level management employees and 23 out of 36 supervisory level employees were knowing AI tools (Figure 4). Out of the total 97 respondents, 85 felt that the usage of AI technology is very important, and ten respondents were neutral regarding the usage of AI applications in the Indian Banking and Financial Industry; 67%, that is, 65 participants expressed concerns regarding data security-related issues; 72.2%, that is, 70 respondents were working in Public Sector Undertaking (PSU) organizations remaining 27.8%, that is, 27 participants were private sector companies. The majority of the organizations (57.4%) used AI technology to provide customer-centric services by deploying virtual chatbots on their websites. Of the companies, 19.1% use AI technology in the front office, mid-office, and back-end operations. Of the organizations, 70% are still using semi-automated KYC procedure, which involves human involvement majorly for verification. Only 8% of the organizations are using fully Automated KYC registration. Almost 24% of the organizations are still relying on fully human forces for KYC registration and verification. Only 23%, that is, 24 companies using complete in-built AI mechanisms and 22 organizations were using third-party services to provide AI-related solutions.

Chi-square test results from Table 2 to 6 show that there are significant associations. Each table result is interpreted sequentially.

Results in Table 5 shows that the calculated value of chi-square $\chi 2$ (1, N = 97) is 19.697 against the tabled value of 6.63, indicating that there is a significant association in the nature of responses received concerning customer satisfaction and implementation of the AI-driven technologies in any of the departments of their organization.

Table 5. Association Between Organizations Using AI Technology and Increased Customer Satisfaction

		Customer Satisfaction Levels Increased After the Implementation of AI Driven Technologies			
		No	Yes	Total	Chi square
Is your organization using AI and ML based applications in any department?	No	34	17	51	19.697**
	Yes	10	36	46	
	Total	44	53	97	

Source: The authors.
Note: **Significant at .01

Table 6. Association Between Organizations Implementing AI Technology and Data Security Concerns

		Data Security is a Major Concern in AI and ML Application Usage?			
		No	Yes	Total	Chi square
Is your organization using AI and ML based applications in any department?	No	4	47	51	30.762**
	Yes	28	18	46	
	Total	32	65	97	

Source: The authors.
Note: **Significant at .01

AI-related applications and increased customer satisfaction levels significantly. Companies that adopted AI technology-related applications have achieved better customer satisfaction levels by providing customer-centric services. Providing a better customer experience and increasing customer satisfaction is one of the major factors behind organizations' decisions to adopt AI technology. However, the study revealed that usage of AI applications is majorly found in front office operations in many organizations. According to the survey, increased use of AI-driven applications significantly improved employees' efficiency and helped reduce errors. Usage of virtual assistants and chatbots has significantly increased customer satisfaction by lowering query solving time.

The majority of the respondents expressed concerns regarding data privacy when applying and using artificial technology, as AI technology application usage involves the processing of high amounts of data. Participants in the survey felt that customers are often hesitant to share the information due to fear of data misuse in the organization's case server. However, despite concerns regarding data security, many participants felt that the adoption of AI technology is essential for business growth in this competitive industry. Results of the test (Table 6) show that the calculated chi-square value $\chi 2$ (1, N=97), 30.672 is higher than the table value of 6.63, indicating that there is a significant association like responses received to concern for data security and implementation of the AI and ML at different levels/ departments of their organization.

In Table 7, the calculated chi-square $\chi 2$ (2, N = 97) is 17.911 against the tabled value of 5.99, indicating a significant association in the responses of implementation and their opinion about third party tie-ups, if any sought by their organization. However, the results are not robust as the response rate for this questionnaire item is not very encouraging. The organizations which have moved to AI 33 responses are neutral type, very inconclusive.

Table 8 indicates that the calculated values of chi-square $\chi 2$ (2, N = 97) across all the three perceptions that is AI being expensive, time-saving, and easy in handling day to day operations, the calculated value is higher than the table

value of 5.991, indicating a significant difference in the perceptions and agreeableness of employees on the implementation of AI. However, on close examination of the cross tab, it can be seen that a sizable number of the respondents were neutral regarding the cost. Majority of the respondents were strongly agreeing with the helpfulness, and time-saving benefits of AI applications. From amongst the participants who have responded, they have indicated that the usage of AI is more helpful and time-saving in front-office operations.

The calculated value of chi-square $\chi 2$ (2, N = 97) is 6.127 against the tabled value of 5.99 in Table 9, indicating an association in the employees' responses working at different hierarchy levels and their familiarity with the AI and ML application in their organization. The knowledge regarding AI tools was found to be high among the middle-level management staff. However, employees felt the need for thorough training. It is essential for the efficient implementation of AI technology-related applications.

Table 7. Association Between Organization Adopting AI Applications and the Third Party Tie-Ups

		Help from Third Party Tie Up Association on the Implementation of AI Tools				
		No	Yes	No-idea	Total	Chi square
AI implementation in the organization	No	13	23	15	51	17.911**
	Yes	3	10	33	46	
	Total	16	33	48	97	

Source: The authors.
Note: **Significant at .01

Table 8. Associations Between AI Technology Being Helpful, Expensive and Time-Saving and AI Implementation in Organization

		Is Your Organization Using AI and ML Based Applications in Any Department			
		No	Yes	Total	Chi-square
Is AI helpful	Strongly agree	34	11	45	19.419**
	Agree	17	7	24	
	Neutral/no opinion	19	9	28	
Total		47	50	97	
Is AI time saving	Strongly agree	21	33	54	6.175**
	Agree	13	5	18	
	Neutral/no opinion	13	12	25	
Total		47	50	97	
Is AI Expensive	Strongly agree	17	10	27	18.977**
	Agree	22	10	32	
	Neutral/no opinion	8	30	38	
Total		47	50	97	

Source: The authors.
Note: **Significant at .05

Table 9. Association Between Employees' Knowledge Regarding AI Tools and Their Job Level

		Which One of the Following Correctly Represents your Current Job Function?				
		Managerial/ Top-level	Executive/ Middle-level	Operations/ Supervisory	Total	Chi square
Are you familiar with AI and ML technology applications?	No	13	24	13	50	6.127**
	Yes	6	18	23	47	
	Total	19	42	36	97	

Source: The authors.
Note: **Significant at .05

Based on the associations studied, Binary LR was attempted to gauge the strength of explanatory factors in determining the organization's decision to implement AI technology.

LR is a popular method for investigating the effects of explanatory variables on binary outcomes (Bonney, 1987). It is an extension of simple linear regression. When the dependent variable is dichotomous or binary in character, binary LR is employed. LR does not make many of the major assumptions made by linear regression and generic linear models based on ordinary least squares algorithms—namely, linearity, normalcy, homoscedasticity, and measurement level. LR does not require that the dependent and independent variables have a linear relationship. Second, it is not necessary for the error terms (residuals) to be regularly distributed. Third, homoscedasticity is not a necessary condition. Finally, in LR, the dependent variable is not quantified on an interval or ratio scale (Wright, 1995). Since the data collected meets the above said criterion, therefore binary LR is used to figure out how likely it is that an organization will use AI technology based on various dependent variables. Customer satisfaction, employees' knowledge of AI tools, concern for data security, and third-party tie-up were the explanatory factors. The dependent variable is dichotomous in nature and four explanatory variables coded as shown in the table (Table 10).

The dependent variable is binary in nature. Zero indicates no AI implementation, while one indicates that AI has been implemented in the organization.

The multicollinearity statistics between several independent variables are shown in Table 11. The variance inflation factor (VIF) indicates the existence and strength of association between independent variables. The VIF is always larger than or equal to 1. There is no standardized VIF value that can be used to determine the presence of multicollinearity.

Table 10. Variables Coding

Dependent Variable	Coding		Independent Variables	
AI implementation	No	0	Knowledge of AI among employees	KAI
			Importance of data security	DS
	Yes	1	Customer satisfaction levels	CS
			Third-party tie up	TP

Source: The authors.

VIF values greater than 10 are frequently interpreted as suggesting multicollinearity. VIF has a score of 1 VIF 5; this indicates that the variables are moderately connected with one another. The modest values of VIF corresponding to the variables demonstrate that no collinearity exists.

Tables 12 (a), (b) show the goodness of fit. Cox & Snell and Naglkerke R square, which are Pseudo R squares. The values of Cox & Snell R square and Negelkerke R square values are .552 and .736. The Hosmer and Lemeshow Test explain the goodness of the model. The model is a good fit for the data as p = .956 (>.05). The table shows a 2.166 chi-square value against the tabled value of 14.067, which supports the acceptance of null-hypothesis, which means there is not much difference in the observed and predicted values by the model. The two show that the model fit is reasonable.

The results of the LR model are significant. The final LR equation is estimated by using the maximum likelihood estimation to predict the AI technology implementation by a company:

$$Z = -3.800 + 3.301 \times KAI + 3.136 \times CS + .835 \times TP + (-1.839)DS$$

Table 13 provides the regression coefficient (B), the Wald statistic (to test the statistical significance), and the all-important Odds Ratio (Exp (B)) for each variable category. The ratio of B to Standard error squared equals the Wald statistic. It gives us information about the statistical significance of each independent variable. Wald coefficients indicate that all variables except data security concerns are significant to predict the dependent variable from the Variables equation table.

Table 11. Multicollinearity Statistics

Coefficients							
	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	–.298	.101		–2.959	.004		
Are you familiar with AI and ML technology applications?	.084	.064	.075	1.312	.193	.903	1.108
Is your company tied up with any third party to provide AI and ML based technology applications?	.023	.024	.055	.944	.348	.868	1.152
Customer satisfaction improved after the implementation of AI/ML based applications	.396	.034	.717	11.768	<.001	.794	1.260
Data security is a major concern in AI and ML application usage?	–.222	.062	–.209	–3.599	<.001	.874	1.144

Source: The authors.
Note: Dependent variable: Is your organization using AI and ML based applications in any department?

Table 12a. Model Summary

Model Summary			
Step	–2 Log Likelihood	Cox & Snell R Square	Negelkerke R Square
1	56.394[a]	.552	.736

Source: The authors.
Note: a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Table 12b. Hosmer and Lameshow Test

Hosmer and Lemeshow Test			
Step	Chi square	Df	Sig.
1	2.616	8	.956

Source: The authors.

Model Interpretation

Any fitted model must be interpreted in terms of the ability to derive practical inferences from the estimated coefficients. The calculated coefficients for the predictor factors represent the reliant variable's slope or rate of change per unit change in the explanatory variables. Thus, interpretation entails two steps: establishing a functional link between the study variables and accurately

Table 13. Variables in the Equation

	B	S.E	Wald	df	Sig.	Exp(B)
Step 1**						
Customer satisfaction (CS)	3.136	.931	11.335	1	.001	23.012
Data security (DS)	–1.839	.803	5.245	1	.022	.159
Third party tie ups (TP)	.835	.326	6.558	1	.010	2.304
AI knowledge (KAI)	3.301	.866	14.536	1	.000	27.132
Constant	–3.800	1.442	6.942	1	.008	.022

Source: The authors.
Note: **Significant at .05

characterizing the independent variable's unit change. The logit transformation is used as the link function in the LR model. In this model, the slope coefficient represents the change in the logit for a one-unit change in the independent variable x. Proper interpretation of the coefficient in a LR model requires that the difference between two logits be assigned a meaning. The exponent of this difference equals the odds ratio, which is defined as the ratio of the probability of the independent variable being present to the probability of it being absent. Thus, the relationship between the LR coefficient and the odds ratio serves as the foundation for interpreting the findings of all LRs. It is worth noting that odds greater than one enhance the chance of AI deployment in this study. Following are illustrations of how the model generated in this study was interpreted.

The co-efficient of AI skills among employees, according to the model, is 3.301.

The odds ratio (ψ) is = $e^{3.301} = 27.132$

This statistic suggests that the probability of an enterprise deploying AI is 27.132 times greater when employees possess AI skills and expertise.

The co-efficient of customer satisfaction, according to the model, is 3.136.

The odds ratio (ψ) is = $e^{3.136} = 23.012$

This figure suggests that the probability of a firm utilizing AI to improve customer satisfaction is 23.012 times greater.

The co-efficient of third-party tie-ups, according to the model, is .835.

The odds ratio (ψ) is = $e^{.835} = 2.304$

This statistic suggests that the probability of a business deploying AI is 2.304 times greater when third-party services are used. As a result of the proliferation of banking AI start-ups, banks now have access to a wider range of AI-based technologies than ever before (Vijai, 2019)

The co-efficient of data security concerns, according to the model, is –1.839.

The odds ratio (ψ) is = $e^{-1.839} = .159$

This statistic suggests that the likelihood of an enterprise deploying AI is 1.5 times lower when data security concerns exist among its personnel.

Classification Table 14 helps us understand the model's performance by comparing the observed cases with predicted cases. The classification table shows that the model correctly predicts 87.6% of the overall cases; 93.5% of companies using AI are rightly predicted and 82.4% of companies not using AI are correctly classified by the model.

Based on the LR results, an enterprise is more likely to utilize AI technology to boost customer satisfaction. Other elements influencing positive AI adoption include employee AI knowledge and third-party tie-ups. Concerns about data security and privacy are impeding AI implementation. In line with the past studies, this article shows that AI provides a compelling business case in India's banking and finance sector. Various Artificial intelligence-based technologies, including robots, predictive analytics, machine and deep learning, neural networks and big data analytics, among others, can automate and optimize both administrative and customer-service processes. Banks and financial institutions can use AI systems to build distinctive features that differentiate them from their competitors. An important facilitator of these competencies is the ability to make well-informed business decisions, optimize workflows, accurately foresee the future, and respond quickly to both internal and external changes (Königstorfer & Thalmann, 2020). Chatbots and robots are being used by banks to provide better customer experience and more engaging interactions via round-the-clock customer care (Kumar et al., 2020; Lui & Lamb, 2018). There are concerns that AI will replace human workers, yet it has the potential to modernize banking operations and allow professionals to do their daily responsibilities more effectively. Work that is repetitive and time—intensive may be made easier by AI-based solutions. This could save money over the long term. Having more time and energy for learning and experimenting

Table 14. Classification Table

Classification Table

			Predicted		
			Is your Organization Using AI/ML Applications in Any Department		
Observed			No	Yes	% correct
Step 1	Is your organization using AI/ML applications in any department	No	42	9	82.4
		Yes	3	43	93.5
	Overall percentage				87.6

Source: The authors.
Note: The cut-off value is .500

could also lead to new and more profitable job prospects for bank personnel. Nevertheless, AI-based solutions require a qualified workforce, which is why many firms choose to use AI when their staff have prior understanding of AI-based solutions. Third parties' role in AI adoption in the Indian banking and financial sector is critical, as AI technology adoption requires expertise and technical support. With numerous start-ups focusing on banking AI solutions, banks now have a pool of technology firms from which to contract and source AI-based systems (Vijai, 2019). However, privacy and security concerns pose significant obstacles, as the privacy and safety of consumers are jeopardized when AI is used. The capabilities of the majority of banking AI systems is enabled by accumulating and analysing massive amounts of consumer data, such as demographics, spending patterns, physical contact information, credit card and debit card information, and social media profiles (Caron, 2019; Königstorfer & Thalmann, 2020; Lui & Lamb, 2018).

Conclusion

AI-driven technology applications have great scope and potential in enhancing the efficiency of services in the Indian Banking and financial sector. The study revealed that the adoption of AI technology has highly enhanced customer satisfaction levels by increasing operations efficacy and customer experience. However, AI-driven technologies implementation in India is facing challenges related to the unavailability of reliant and quality data for analysis. The study has identified that better implementation of AI technology is possible with the help of third-party tie-ups. By using AI, banks and financial service providers can interact with their customers 24/7. Automation of KYC/AML processes can significantly reduce human errors and saves time. Apart from this, innovations in AI-driven technologies are efficient in fraud detection too. The study findings revealed that AI technology significantly reduces the cost and increases the experience of services. The LR results revealed that AI knowledge among employees, enhanced customer satisfaction, and third-party collaborations all have a favourable impact on the use of AI technology in an organization. However, Considerations about data security and privacy are important concerns for organizations considering implementing AI in the Indian banking and finance sector. The findings also indicated that despite many benefits, the adoption percentage of AI technology in the Indian banking and financial sector is significantly low. It was discovered that many firms use AI-based technology solutions in their front-office activities. The use of AI technologies in back-end and middle-office activities was found to be extremely low. However, the fear of data privacy and security was found among many respondents, negatively affecting the implementation of AI-driven technology applications. The majority of the respondents expressed that the adoption of AI technology is compulsory to survive in the present-day business environment. An investigation on the impact of customer satisfaction, data security concerns, and third-party tie-ups on AI implementation in Indian banking and financial institutions was conducted using a chi-square test of association. Logit estimation was used to examine the influence of the influencing elements in this study.

The present study is restricted to the sample size of 97 only. The majority of the respondents in the study belong to the banking sector and work in urban areas. As the data revolution and digital market are gaining popularity, it will be important to include respondents working in rural areas. The study has used a structured questionnaire method to gather the data; however, some aspects of the AI and ML implementation in these two sectors demanded in-depth interviews. Further studies using interview methods with experts in the domain may prove more helpful in increasing the accuracy and scope of the study. Content analysis of the qualitative data generated may be more focused and strategy-centric.

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ORCID iDs

Deepthi. B https://orcid.org/0000-0003-0622-5721
Priya Gupta https://orcid.org/0000-0002-4666-4203
Pratibha Rai https://orcid.org/0000-0002-9374-6324

References

Balakrishna, D. R. (2020). Banking on AI: The time is ripe for Indian banks to embrace artificial intelligence. *The Financial Express*. https://www.financialexpress.com/opinion/banking-on-ai-the-time-is-ripe-for-indian-banks-to-embrace-artificial-intelligence/2017963/

Baruah, A. (2020). AI applications in the top 4 Indian banks. *Emerj*. https://emerj.com/ai-sector-overviews/ai-applications-in-the-top-4-indian-banks/

Bonney, G. E. (1987). Logistic regression for dependent binary observations. *Biometrics*, *43*(3), 951–973.

Caron, M. S. (2019). The transformative effect of AI on the banking industry. *Banking & Finance Law Review*, *34*(2), 169–214.

Chawla, V. (2020). Top credit scoring startups in India that use AI. *Analytics India Magazine*. https://analyticsindiamag.com/top-credit-scoring-startups-in-india-that-use-ai/

Cheng, Y., & Jiang, H. (2020). How do AI-driven chatbots impact user experience? Examining gratifications, perceived

privacy risk, satisfaction, loyalty, and continued use. *Journal of Broadcasting & Electronic Media*, *64*(4), 592–614. https://doi.org/10.1080/08838151.2020.1834296

Copeland, B. (2020). Artificial intelligence. *Encyclopædia*. Britannica.

Crosman, P. (2018). *How artificial intelligence is reshaping jobs in banking*. American Banker.

Daniel, E. (1999). Provision of electronic banking in the UK and the Republic of Ireland. *International Journal of Bank Marketing*, *17*(2), 72–82

Digalaki, E. (2019). The impact of artificial intelligence in the banking sector & how AI is being used in 2020. *Business Insider*. https://www.businessinsider.in/finance/news/the-impact-of-artificial-intelligence-in-the-banking-sector-how-ai-is-being-used-in-2020/articleshow/72860899.cms

George, A., & Kumar, G. S. G. (2015). Validation of a scale for measuring problems in internet banking and their effect on customer satisfaction. *Vision*, *19*(4), 312–323. https://doi.org/10.1177/0972262915610856

Gokul, B. (2018). Artificial intelligence in financial services. *Sansmaran Research Journal*, *8*(1), 3–5.

Goudarzi, S., Hickok, E., & Sinha, A. (2018). AI in the banking and finance industry in India. *Centre for Internet & Society*. https://cis-india.org/internet-governance/blog/ai-in-banking-and-finance.

Hazarika, S. (2020). Impact of digitalization on employment of personnel in the banking sector: A case study of India. *International Journal of Management*, *11*(9). https://doi.org/10.34218/IJM.11.9.2020.092

Iberahim, H., Mohd Taufik, N. K., Mohd Adzmir, N. K., & Saharuddin, H. (2016). Customer satisfaction on reliability and responsiveness of self-service technology for retail banking services. *Procedia Economics and Finance*, *37*, 13–20. https://doi.org/10.1016/S2212-5671(16)30086-7

interface.ai. (n.d.). Meet SIA, State Bank of India's intelligent virtual assistant helping them offer industry leading customer experience. https://interface.ai/case-studies/sia-sbi-bank-virtual-assistant.

Kaur, N., Sahdev, L., Sharma, M., & Siddiqui, L. (2020). Banking 4.0: The influence of artificial intelligence on the banking industry & how AI is changing the face of modern day banks. *International Journal of Management*, *11*(6), 577–584. https://doi.org/10.34218/ijm.11.6.2020.049

Kavas, I. (2021). Council post: The pandemic has changed our banking habits—Now banks must change theirs. *Forbes*. https://www.forbes.com/sites/forbestechcouncil/2021/03/15/thepandemichas-changed-our-banking-habitsnow-banks-must-change-theirs/?sh=524d226b4917

Kaya, O. (2019). *Artificial intelligence in banking*. Deutsche Bank. https://www.dbresearch.com/PROD/RPS_EN-PROD/PROD0000000000495172/Artificial_intelligence_in_banking%3A_A_lever_for_pr.pdf?undefined&realload=-s~sxdmK~wL~Lqs24hTifpj7sultAUDrRYcUOsN4VNYrY3JzXOnYxGGui73Sze7rB

Kochhar, K., Purohit, H., & Chutani, R. (2019). *The rise of artificial intelligence in banking sector* [Paper Presentation (p. 127)]. 5th International Conference on Educational Research and Practice (ICERP) 2019. https://spel3.upm.edu.my/max/dokumen/ICERP_ICERP_2019_-_PROCEEDINGS_(REVISED)_compressed.pdf#page=142

Königstorfer, F., & Thalmann, S. (2020). Applications of artificial intelligence in commercial banks—A research agenda for behavioral finance. *Journal of Behavioral and Experimental Finance*, *27*, 100352. https://doi.org/10.1016/j.jbef.2020.100352

Kukreja, N., Arora, N., & Sawhney, S. (2020). Information technology reforms in banking: Changing the outlook of Indian banking sector for 2020.

Kumar, S., Aishwaryalakshmi, S., & Akalya, A., (2020). Impact and challenges of artificial intelligence in banking. *Journal of Information and Computational Science*, *10*(2) 1101–1109.

Lee, A. (2017). *Banking on artificial intelligence*. Maclean's.

Liao, Z., & Cheung, M. T. (2008). Measuring consumer satisfaction in internet banking: A core framework. *Communications of the ACM*, *51*(4), 47–51.

Loonam, M., & O'Loughlin, D. (2008). Exploring e-service quality: A study of Irish online banking. *Marketing Intelligence and Planning*, *26*(27), 759–780.

Lui, A., & Lamb, G. W. (2018). Artificial intelligence and augmented intelligence collaboration: Regaining trust and confidence in the financial sector. *Information & Communications Technology Law*, *27*(3), 267–283.

Manali, A. B., & Gopalakrishnan, S. (2020). Application of artificial intelligence and its powered technologies in the Indian banking and financial industry: An overview. *IOSR Journal of Humanities and Social Science*, *25*(4), 55–60.

Mann, B. J. S., & Sahni, S. K. (2012). Profiling adopter categories of internet banking in India: An empirical study. *Vision*, *16*(4), 283–295. https://doi.org/10.1177/0972262912460187

Mehra, S. (2021). Five challenges for AI adoption in India—and what are we doing about them. https://indiaai.gov.in/article/five-challenges-for-ai-adoption-in-india-and-what-are-we-doing-about-them.

Naidu, K. S., & Seshadri, A. (2020). *Technological innovations in banking sector in India* [Paper Presentation]. A Three-Day Virtual International Conference on Innovations for New Normal.

Nicora, R. (2019). AI, ML and DL: What's the difference? *Dative_io*. https://medium.com/dative-io/ai-ml-and-dl-whats-the-difference-86a8af387150

Perwej, D. A. (2020). The impact of pandemic COVID-19 on the Indian banking system. *International Journal of Recent Scientific Research*, *11*. https://doi.org/10.24327/IJRSR

PIB. (2019). *Rise in NPAs of PSBs*. Ministry of Finance, Government of India. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1578027

Ravikumar. T., Murugan, N., Suhashini, J., & Rajesh, R. (2021). Banking on artificial intelligence to bank the unbanked. *Annals of the Romanian Society for Cell Biology*, *25*(5), 129–132.

Reserve Bank of India. (2021). Statistical tables relating to banks in India. https://rbi.org.in/Scripts/AnnualPublications.aspx?head=Statistical+Tables+Relating+to+Banks+in+India

Robinson, T. (2000). Internet banking: Still not a perfect marriage. *Information Week*, *17*(4), 104–106.

Salonia, G. (2020). Transforming anti-money laundering and KYC controls with AI: Part I. *Infosys Consulting*. https://www.infosysconsultinginsights.com/2020/01/15/transforming-anti-money-laundering-and-kyc-controls-with-ai-part-i/

Sathye, M. (1999). Adoption of internet banking by Australian consumers: An empirical investigation. The *International*

Journal of Bank Marketing, *17*(7), 324–334. https://doi.org/10.1108/02652329910305689

Shaji, A. K. (2019). A Study on the management of NPA's in banking sector using artificial intelligence. *Think India Journal*, *22*(44), 118–126.

Sindhu, J., & Namratha, R. (2019). Impact of artificial intelligence in chosen Indian commercial bank: A cost benefit analysis. *Asian Journal of Management*, *10*(4), 377. https://doi.org/10.5958/2321-5763.2019.00057.x

Singh, S., & Agarwal, L. (2019). *Pros and cons of artificial intelligence in banking sector of India*. 14th Biyani International Conference. http://biyaniconference.com/proceedings-2019/Commerce-computer.pdf#page=64

Singh, T., & Pathak, N. (2020) Emerging role of artificial intelligence in Indian banking sector. *Journal of Critical Reviews*, *7*(16), 1370–1373.

Siu, N. Y. M., & Mou, J. C. W. (2005). Measuring service quality in internet banking: The case of Hong Kong. *Journal of International Consumer Marketing*, *17*(4), 99–116.

Sohail, M. S., & Shaikh, N. M. (2008). Internet banking and quality of service, perspectives from a developing nation in the Middle East. *Online Information Review*, *32*(1), 58–72. http://dx.doi.org/10.1108/14684520810865985

Srikanth, S. (2020). How machine learning and artificial intelligence helping traders/stock market. *Techiexpert*. https://www.techiexpert.com/how-machine-learning-and-artificial-intelligence-helping-traders-stock-market/

Srivastava, K. (2021). Paradigm shift in Indian banking industry with special reference to artificial intelligence. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(5), 1623–1629. https://doi.org/10.17762/turcomat.v12i5.2139

Subudhi, S. (2019) Banking on artificial intelligence: Opportunities & challenges for banks in India. *International Journal of Research in Commerce, Economics & Management*, *9*(7).

Sunayna, K. (2009). Managing service quality: An empirical study on internet banking. *The IUP Journal of Marketing Management*, *8*(3–4), 96–112.

VanVoorhis, C. W., & Morgan, B. L. (2007). Understanding power and rules of thumb for determining sample sizes. *Tutorials in Quantitative Methods for Psychology*, *3*(2), 43–50.

Vijai, D. C. (2019). Artificial intelligence in Indian banking sector: Challenges and opportunities. *International Journal of Advanced Research*, *7*(5), 1581–1587.

Wright, R. E. (1995). Logistic regression. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (pp. 217–244). American Psychological Association.

Yang, Z., Minjoon, J., & Peterson, R. T. (2004). Measuring customer perceived online service quality. *International Journal of Operations and Production Management*, *24*(11), 1149–1174.

Yu, C. (2008). Assessing and differentiating the quality of internet based services: A case of online banking in Taiwan. *The Service Industries Journal*, *28*(5), 581–602. https://doi.org/10.1080/02642060801988092

About the Authors

Deepthi. B (deepthy.spandan@gmail.com) is a PhD (Management) research scholar (UGC Net-JRF Qualified) at Atal Bihari Vajpayee School of Management, Jawaharlal Nehru University, Delhi. She has completed MCom from Dr B. R. Ambedkar University (2020). Her research interests include Financial markets, Information technology and entrepreneurship.

Priya Gupta (pgupta1902@gmail.com) is an Associate professor at Atal Bihari Vajpayee School of Management, Jawaharlal Nehru University, Delhi. She has completed PhD (Management), BIT (MESRA) Ranchi—Extension Center (NOIDA) (2013). She has more than 15 years of teaching experience and has published more than 20 research papers in the national and international journal of repute. Her specializations include Data science, Information technology and Marketing. She has authored three books *CRM System and Cross-Selling in Indian Banking Industry*, *Innovation in Payment Systems—An Approach towards Cashless Mandis* and *Banking the Unbanked—A Step towards Financial Inclusion in Indian Mandis*.

Pratibha Rai (rai.pratibha@gmail.com) is an Associate Professor in Maharaja Agrasen College, University of Delhi has professional experience of more than 28 years including Corporate exposure of 4 years (1991– 1995) and teaching experience of 24 years, specialization in Environmental economics and financial management. Have five publications in national journals and have written two edited books—*Spiritual Ecology and Sustainability: Practice and Confluence* and *Academic and Activist Perspectives on Biodiversity and Climate Change*.

Himanshu Arora (himanshuarorasrcc@gmail.com) is a Ph.D. (Commerce) research scholar (UGC Net-JRF Qualified in Commerce and Management) at the Department of Commerce, Delhi School of Economics, University of Delhi. He has earned Masters of Commerce degree (2020) from Shri Ram College of Commerce, University of Delhi, With a major in Finance and a minor in taxation. His research interests include Financial markets, Data science, Disability, and Human resource management.