

AI's Effect on Indian Private Sector Banks' Performance

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ABSTRACT

In the financial industry, artificial intelligence (AI) has emerged as a game-changing technology. Artificial intelligence (AI) techniques like chatbots, predictive analytics, machine learning models, and robotic process automation are being utilized more in banking to enhance decision-making, risk management, operational efficiency, and customer service. The purpose of this study is to determine whether banks that use AI technologies perform better financially as shown by their return on equity (ROE) and return on assets (ROA). This study looks at how the financial performance of a few Indian private sector banks is affected by the deployment of artificial intelligence (AI). The study creates an AI Usage Index to gauge the degree of AI deployment using secondary data for ten private banks from 2019 to 2024. The paper adds to the expanding body of research on banking's digital transformation and offers guidance to bank management and policymakers.

Keywords: Artificial Intelligence (AI), Private Sector Banks (PVBS), Banking Performance, ROE, ROA

1.INTRODUCTION

The incorporation of artificial intelligence (AI) technology has become a game-changer in the constantly changing banking and finance scene, transforming conventional methods and altering industry dynamics (Subburayan, Sankarkumar, Singh, & Mushi, 2024). The use of AI innovation to improve banks' financial performance has drawn attention as financial institutions throughout the world traverse the digital transformation path. (Shiyyab, Alzoubi, Obidat, & Alshurafat, 2023). The financial sector is about to undergo a technological revolution, with artificial intelligence (AI) poised to change conventional banking practices and advance previously unheard-of efficiency enhancements and ideas that are client focused. A new era of opportunity and competitiveness for banks globally has been brought about by the growth of AI-driven applications, which range from fraud detection and customer service to risk management and predictive analytics (Chaudhary, Eni, Raparathi, & Reddy, 2023). Increased smartphone usage and government programs like Digital India have sped up the uptake of digital banking, promoting greater financial inclusion. Banks are using blockchain and artificial intelligence (AI) to

expand their services to far-flung locations, giving underprivileged groups access to safe and effective financial facilities.

A total of twelve public sector banks, twenty-one private sector lenders, forty-six foreign banks, and the widely dispersed urban cooperative banks make up the Indian banking system (IBEF, 2023), which also includes 96,508 rural cooperative banks. The banking industry has grown at a compound annual growth rate (CAGR) of 3.34% between 2016 and 2024. This expansion has been fueled by several causes, including the expanding economy, rising disposable income, easy loan terms and documentation, rising consumption, and, most importantly, easy access to banks. Over the past ten years, the Indian banking industry has been using technology more and more to provide flawless services.

Researchers were motivated to investigate the effects of artificial intelligence (AI) on the financial performance of India's banking industry by the body of literature already accessible on the country's transformation into "Digital India" and the most recent banking reforms.

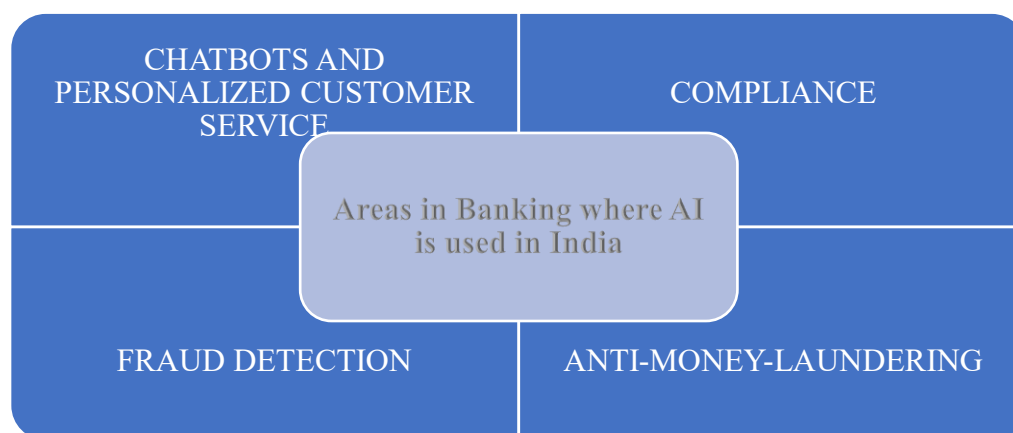
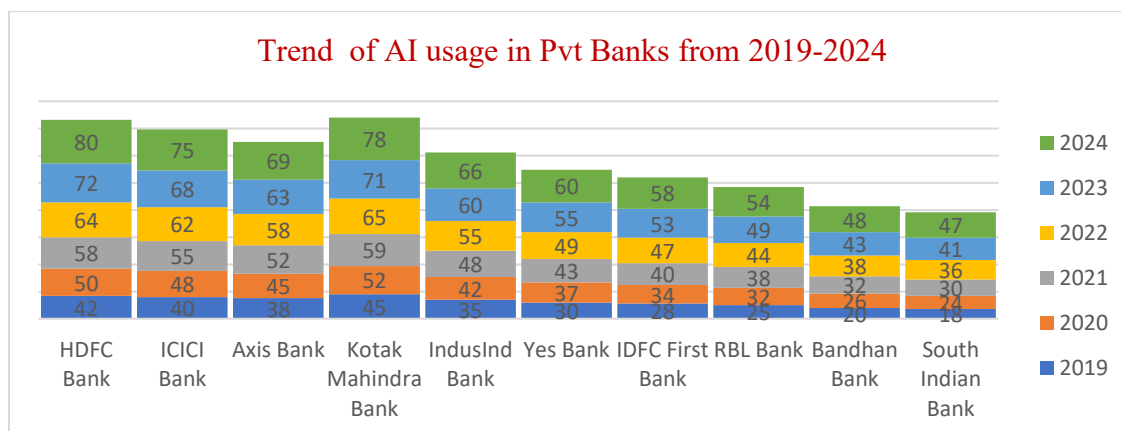


Figure1: showing areas where AI is used in Banks



Source: compiled by Author

2. LITERATURE REVIEW

Numerous studies have looked at several aspects that affect banks' financial success. These factors include government regulations (Batae, Dragomir, & Feleagă, 2021), economic growth (Alam, Rabbani, Tausif, & Abey, 2021), non-performing bank loans (Takahashi & Vasconcelos, 2024), regulatory capital in banks (DeBandt, Camara, Maitre, & Pessarossi, 2018), and ICT development (Al-Busaidi & Al-Muharrami, 2021). These studies offer a wealth of background for comprehending the potential effects of banking and finance AI technology innovation (BFAITI) on financial results.

Shiyyab et al. (2023) examined 15 Jordanian banks that were listed between 2014 and 2021 on the Amman Stock Exchange and discovered that AI greatly improves financial performance by increasing ROE and ROA.

Similarly, according to **Königstorfer and Thalmann (2020)**, AI improves payment security, lowers loan losses, automates compliance chores, and improves client targeting—all of which improve overall performance.

Ris, Stankovic, and Avramovic (2020) demonstrated how incorporating AI technology, like machine learning algorithms (MLA) and virtual assistants, enhances bank profitability and performance while lowering reliance on human labour. Additionally, these technologies help avoid fraud and enable better informed decision-making. This illustrates the operational improvements in the performance of banks brought about by AI.

SABHARWAL (2014) The main objective of this research project is to determine whether the chosen Indian banks are utilizing technical solutions based on artificial intelligence (AI) and, if so, what specific purposes they are serving. Branch heads from the 16 scheduled banks in Meerut (U.P.) were then interviewed in an organized manner.

Uma Maheswari & Valarmathi (2023) highlighted how AI-powered virtual assistants may boost performance, lower reliance on human resources, and increase profitability, especially in the banking industry. This demonstrates AI's virtual assistants and banking industry performance.

The benefits of fintech developments, such as the Internet of Things, big data, and artificial intelligence, on bank profitability were emphasised by **Chaidar, Abdelhedi, and Abdelkafi (2023)**. Using the fully modified ordinary least squares model, they examined 23 European banks between 2010 and 2019 and discovered a strong link between these technologies and improved financial performance.

Research Methodology

The research is both analytical and descriptive. Bank websites, RBI publications, and annual reports were the sources of secondary data. Ten banks from the private sector were chosen for the 2019–2024 timeframe. SPSS

was used for statistical analysis. Among the statistical instruments used were descriptive statistics, correlation analysis, regression analysis.

The research's objectives

1. To research how AI use is increasing in private banks.
2. To examine how AI affects ROE and ROA.
3. To use regression analysis and correlation to investigate the link.

Hypothesis:

H01: There is no significant relationship between AI usage and ROA.

H02: There is no significant relationship between AI usage and ROE.

DATA ANALYSIS

Data analysis was done by using AI usage index and considering ROA AND ROE of ten private banks from 2014-2024 and correlation is used.

Variables	AI Usage Index	ROA	ROE
AI Usage Index	1		
ROA	0.78	1	
ROE	0.81	0.84	1

The results indicate a strong and statistically significant positive relationship between AI adoption and ROA as well as ROE of private sector banks.

RERESSION MODE:

$$ROA = \alpha + \beta_1 AI + \beta_2 BankSize + \beta_3 NPA + \beta_4 CAR + \varepsilon$$

$$ROE = \alpha + \beta_1 AI + \beta_2 BankSize + \beta_3 NPA + \beta_4 CAR + \varepsilon$$

Model	R	R ²	Adjusted R ²	Std. Error
ROA Model	0.78	0.61	0.58	0.21
ROE Model	0.74	0.55	0.52	1.94

The regression results reveal that AI adoption has a statistically significant positive impact on both ROA and ROE even after controlling for bank size, NPAs, and capital adequacy. Bank size and capital adequacy positively

influence profitability, while NPAs have a negative effect. The models explain 61% and 55% variation in ROA and ROE respectively, indicating strong explanatory power.

CONCLUSION

The empirical results obtained through correlation and regression analysis demonstrate a strong and statistically significant positive relationship between AI adoption and financial performance. The correlation analysis revealed that increased AI usage is associated with improvements in both ROA and ROE. Furthermore, regression analysis confirmed that AI adoption positively influences profitability even after controlling important variables such as bank size, Non-Performing Assets (NPAs), and Capital Adequacy Ratio (CAR).

Overall, the study concludes that AI adoption has become a strategic tool for enhancing operational efficiency, improving decision-making processes, strengthening risk management practices, and increasing profitability in private sector banks. Therefore, banks should continue investing in AI-enabled technologies and digital infrastructure to maintain competitiveness and achieve sustainable growth in an increasingly technology-driven financial environment.

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