

AI Adoption in Financial Services: Exploring Efficiency, Inclusion, and Ethical Challenges in Emerging Economies

*Annapoorna Barkur, **Samriddhi Roy, ***Dr. Patcha Bhujanga Rao

**USN. No. 25MCR00017, M.Com, School of Commerce,
JAIN (Deemed-to-be University), Bengaluru*

***USN. No. 25MCR00040, M.Com, School of Commerce,
JAIN (Deemed-to-be University), Bengaluru*

****Professor of Commerce & Management-PG Studies
JAIN (Deemed-to-be University), Bengaluru
prof.pbr@gmail.com*

Abstract:

Artificial Intelligence (AI) is transforming financial services by improving accuracy, efficiency, and the quality of customer interaction. Technologies such as machine learning, natural language processing, robotic automation, and biometric tools are widely used in fraud detection, credit scoring, compliance monitoring, and customer support. While these innovations open opportunities for financial inclusion and operational improvements, they also introduce challenges related to data privacy, cybersecurity, algorithmic fairness, and regulatory oversight. As emerging economies like India undergo rapid digital transformation, understanding how AI can be used responsibly becomes crucial. This study examines perceptions of AI adoption in finance, focusing on its influence on efficiency and inclusion, and evaluates the risks and governance issues associated with AI-driven financial systems. The findings aim to contribute to responsible AI governance and improved financial stability.

Keywords — Artificial Intelligence, Efficiency, Financial Inclusion, Digital Finance, Risk Management, AI Governance.

1. INTRODUCTION

Artificial Intelligence (AI) has evolved significantly since its origin in 1956 and is now a core technology in the fourth industrial revolution. With the growth of big data, machine learning, and generative AI models, the financial sector has adopted AI tools to improve risk management, fraud detection, credit evaluation, customer engagement, and decision-making processes. India, in particular, has seen rapid progress driven by increasing digital connectivity and financial innovation. However, the degree of AI adoption varies globally, and India is still developing its capacities compared to advanced economies like

the United States and China. International organisations, including the Financial Stability Board, acknowledge the potential of AI to reshape trading, portfolio management, compliance, and customer-centric services. Despite these advantages, concerns remain related to ethical use, data protection, algorithmic bias, and regulatory preparedness. These factors underline the need for balanced frameworks that support innovation while ensuring financial stability and consumer protection.

2. LITERATURE REVIEW

Research consistently shows AI is a major driver of change in the banking and financial services

industry. Malali (2020) highlights how AI supports new product development, automates routine tasks, and enhances customer interaction. Murugesan (2019) notes that financial literacy plays an important role in the adoption of technology-enabled financial services, especially in emerging economies. Achary (2021) explains that AI tools such as machine learning and natural language processing are now widely used for fraud detection, risk monitoring, and operational efficiency.

Periasamy (2024) observes that AI-powered chatbots, predictive analytics, biometric authentication, and robotic process automation have strengthened fraud detection systems, improved customer support, and reduced operational errors. Globally, Aldasoro (2024) highlights the impact of generative AI and advanced algorithms on payments, insurance, asset management, and financial intermediation, stressing the importance of updated regulatory frameworks. Rustandi (2025), through a systematic review of Scopus-indexed studies, identifies machine learning and risk management as dominant themes in AI-related financial research.

Further, Cao (2020) explains that next-generation AI tools have enabled smarter financial products and enhanced decision-making systems. Truby (2020) warns that although awareness of AI governance is increasing, regulatory systems are still evolving, and there is a need for proactive measures to ensure responsible use. Overall, the literature highlights that while AI significantly enhances efficiency, security, and accessibility, it also brings governance and ethical concerns that require systematic attention.

3. PROBLEM STATEMENT

Despite the increasing adoption of AI tools such as machine learning, robotic automation, and biometric systems in the financial sector, there is

limited understanding of how these technologies can be used responsibly and effectively. AI has improved fraud detection, credit evaluation, and customer service, but it also raises concerns related to privacy, cybersecurity, fairness, and regulatory oversight. In emerging economies like India, where financial inclusion and digital transformation are developing rapidly, the challenge is to use AI in a way that improves efficiency and access while ensuring transparency and public trust. This study aims to explore these issues and examine how AI can be adopted responsibly to support financial efficiency, inclusion, and ethical governance.

4. RESEARCH OBJECTIVES

1. To understand how AI is being used in financial services and how consumers perceive its adoption.
2. To examine the role of AI in improving efficiency and service delivery in the financial sector.
3. To analyse the risks linked to AI adoption, including privacy, security, and fairness concerns.
4. To explore how AI-driven tools support financial inclusion, particularly in emerging economies.
5. To identify the challenges faced by institutions integrating AI and highlight areas requiring governance and regulation.

5. HYPOTHESIS ANALYSIS

- H₁: AI adoption has a positive effect on operational efficiency.
- H₂: AI adoption significantly enhances financial inclusion.
- H₃: Security and privacy concerns influence public trust in AI-based financial systems.

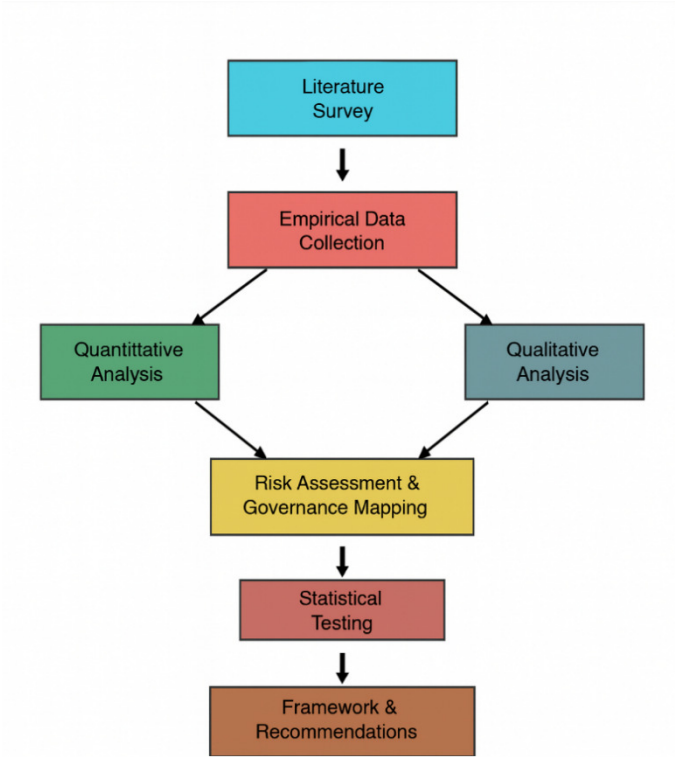
- H4: AI-driven tools reduce financial risks through better fraud detection and credit assessment.
- H5: Strong AI governance frameworks improve consumer confidence and support responsible adoption.

6. RESEARCH METHODOLOGY

This study follows a descriptive and fully quantitative research design to examine perceptions of Artificial Intelligence (AI) in financial services. Primary data were collected from 60 respondents using a structured questionnaire that included demographic questions and Likert-scale items on AI integration, efficiency, and financial inclusion. A convenience sampling method was used, targeting students, working professionals, and individuals familiar with digital finance. The data were analysed using descriptive statistics, Pearson correlation, independent samples t-tests, one-way ANOVA, MANOVA, and simple linear regression. These statistical procedures measure the strength of relationships between AI adoption and two primary outcomes—operational efficiency and financial inclusion. This quantitative approach ensures objective measurement and supports hypothesis testing with clear empirical evidence.

7. CONCEPTUAL FRAMEWORK

The conceptual framework illustrates the progression of the research from theoretical grounding to empirical validation. The study begins with a literature survey that identifies gaps and determines the variables to be examined. Structured questionnaires are then used to collect quantitative data on respondents’ perceptions of AI. The collected data proceed directly into statistical testing, including correlations, group comparisons, and regression modelling. Insights from this quantitative evidence support an assessment of how AI influences efficiency and inclusion in financial services. The framework concludes by providing recommendations to strengthen responsible AI adoption, improve service effectiveness, and enhance financial inclusion.



8. ANALYSIS

Table 1: Demographic Profile of Respondents (N = 60)

Demographic Variable	Category	Frequency (N)	Percentage (%)
Age Group	Below 20 years	7	11.70%
	20–25 years	42	70.00%
	26–30 years	4	6.70%
	Above 30 years	7	11.70%
Educational Qualification	Undergraduate	36	60.00%
	Postgraduate	22	36.70%
	Doctorate	2	3.30%

Interpretation

The demographic distribution shows that the sample is dominated by young respondents, with 70%

belonging to the 20–25 age group. This suggests that the study captures the views of individuals who are highly familiar with digital tools. Educationally, 60% are undergraduates, followed by 36.7% postgraduates. Such a profile indicates that the respondents are academically active and digitally aware, making them suitable for assessing perceptions of AI in financial services.

Table 2: Descriptive Statistics for AI Perception Variables (N = 60)

Construct / Variable	N	Minimum	Maximum	Mean	Std. Deviation
AI Integration Score (overall)	60	2	5	3.69	0.81
AI has improved efficiency	60	2	5	3.90	0.86
AI helps financial inclusion	60	1	5	3.80	1.01

Interpretation The descriptive results indicate that respondents generally view AI positively in financial services. The overall AI Integration Score (M = 3.69) shows favourable perceptions. Efficiency received the highest mean rating (M = 3.90), suggesting that AI is seen as improving speed and performance. Inclusion also scored well (M = 3.80), indicating that respondents believe AI contributes to expanding access to financial services. The findings reflect a strong belief in AI’s usefulness in enhancing financial processes.

Table 3: Correlation Between AI Integration and Key Outcomes

Variables	AI Integration	Efficiency	Inclusion
AI Integration Score	1		
Efficiency		1	
Inclusion			1

Note: Correlation is significant at $p < 0.001$
Interpretation
The correlation matrix shows strong positive and statistically significant relationships. AI Integration

has a strong correlation with financial inclusion ($r = 0.86$) and efficiency ($r = 0.79$). This indicates that higher perceived AI integration is associated with greater confidence in AI’s ability to improve both service efficiency and financial access.

Table 4: Independent Samples t-Test (High vs Low AI Integration Groups)

(a) Financial Inclusion

Group	N	Mean	Std. Deviation
Low AI Integration	22	2.77	0.53
High AI Integration	18	4.72	0.57

$t (\approx 35.1) = -11.07, p < 0.001$

(b) Efficiency

Group	N	Mean	Std. Deviation
Low AI Integration	22	3.09	0.53
High AI Integration	18	4.83	0.38

$t (\approx 37.6) = -12.09, p < 0.001$
Interpretation

The t-test results show significant differences between high and low AI integration groups. Respondents with high AI perceptions scored much higher on financial inclusion (M = 4.72) and efficiency (M = 4.83) compared to those with low perceptions. This indicates that individuals who view AI positively also believe it has a strong impact on improving inclusion and operational performance.

Table 5: One-Way ANOVA for AI Integration

Source	df	Sum of Squares	Mean Square	F	Sig.
Between Groups	2	30.13	15.07	64.72	0.000
Within Groups	57	13.27	0.23		

Total	59	43.40				Constant	-0.14	0.31	-0.45	0.651	
(b) Financial Inclusion						AI Integration	1.07	0.08	12.99	0.000	0.74
Source	df	Sum of Squares	Mean Square	F	Sig.	(b) Dependent Variable: Efficiency					
Between Groups	2	40.33	20.16	59.63	0.000	Predictor	B (Unstd.)	Std. Error	t	Sig.	R²
Within Groups	57	19.27	0.34			Constant	0.80	0.32	2.52	0.014	
Total	59	59.60				AI Integration	0.84	0.08	9.96	0.000	0.63

Interpretation

The ANOVA results confirm that there are significant differences across Low, Medium, and High AI Integration groups for both efficiency and inclusion. Higher AI integration consistently corresponds with higher perceived benefits. This suggests that familiarity and confidence in AI lead to more positive evaluations of its impact.

Table 6: MANOVA – Combined Effect of AI Integration on Efficiency and Inclusion

Test	Value	F	Num df	Den df	Sig.
Wilks' Lambda	0.159	42.21	4	112	0.000
Pillai's Trace	0.875	22.17	4	114	0.000
Hotelling's Trace	5.073	70.63	4	~66.2	0.000
Roy's Root	5.031	143.38	2	57	0.000

Interpretation

The MANOVA test shows a strong multivariate effect of AI integration on the combined outcomes of efficiency and inclusion. This means that overall perceptions of AI significantly influence both dimensions simultaneously, reinforcing the idea that AI is viewed as impactful across multiple aspects of financial services.

Table 7: Regression – AI Integration → Inclusion & Efficiency
(a) Dependent Variable: Financial Inclusion

Predictor	B (Unstd.)	Std. Error	t	Sig.	R ²
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Interpretation

Regression results show that AI Integration is a strong and significant predictor of both financial inclusion and operational efficiency. AI Integration explains 74% of the variation in inclusion and 63% of the variation in efficiency. This indicates that positive perceptions of AI strongly influence how respondents evaluate its benefits.

8. KEY FINDINGS

- AI Integration strongly improves operational efficiency.** All statistical tests show that respondents who perceive higher AI integration also report significantly higher efficiency levels ($r = 0.79$; $t \approx -12.09$; $R^2 = 0.63$). This means that AI is clearly viewed as making financial services faster, more accurate, and more convenient.
- AI Integration significantly enhances financial inclusion.** The correlation between AI integration and inclusion is very strong ($r = 0.86$). The t-test and ANOVA further confirm that respondents with high AI perceptions report much higher inclusion ($M = 4.72$). This suggests that AI improves accessibility to financial services.
- High and low AI-perception groups differ substantially in their views.** Both efficiency and inclusion show large, significant differences across Low, Medium, and High AI groups (Efficiency: $F = 64.72$; Inclusion: $F =$

59.63). This means familiarity with AI directly affects how its benefits are perceived.

4. **AI Integration has a strong combined effect on efficiency and inclusion.** MANOVA results (Wilks' Lambda = 0.159, $p < 0.001$) show that AI's influence is significant when both outcomes are considered together, indicating a broad multi-dimensional impact.

5. **AI Integration is a strong predictor of both outcomes.** Regression results show that AI Integration explains 74% of variation in inclusion and 63% in efficiency. This confirms that AI plays a major role in shaping modern financial services.

9. DISCUSSION

The results of this study clearly show that AI is perceived as a major driver of positive change in financial services. Respondents strongly believe that AI improves efficiency by reducing manual errors, automating processes, and providing faster service—findings that support Periasamy (2024) and Malali (2020), who emphasized AI's role in strengthening operational performance in the BFSI sector. Similarly, the strong relationship between AI and financial inclusion aligns with research by Murugesan (2019), which highlights how digital technologies expand access to financial tools.

The substantial differences between high and low AI-integration groups indicate that awareness and familiarity with AI influence perceptions. This reflects Rustandi's (2025) conclusion that exposure to AI technologies shapes acceptance and confidence. Additionally, the strong predictive power of AI Integration on inclusion and efficiency agrees with global observations from Aldasoro (2024), who noted that AI contributes significantly to improving service quality and expanding financial access.

At the same time, the study reinforces the importance of responsible governance. Although the findings show strong perceived benefits, existing literature highlights risks such as privacy concerns, algorithmic bias, and regulatory gaps (Truby, 2020). Therefore, AI's benefits must be

supported by transparent and ethical frameworks to ensure long-term trust and stable financial development.

10. CONCLUSION

This study concludes that Artificial Intelligence plays a major role in enhancing both operational efficiency and financial inclusion in the financial sector. Respondents strongly associate AI with improved performance, faster services, higher accuracy, and greater accessibility. Statistical tests—including correlation, ANOVA, MANOVA, and regression—consistently support the positive influence of AI on financial outcomes. However, the findings also suggest that the success of AI adoption depends on user awareness, trust, and responsible governance. While AI offers significant potential for transforming financial services, careful attention to ethical issues, data security, and regulatory oversight remains essential to ensure that AI supports sustainable and inclusive growth in emerging economies like India.

11. SCOPE FOR THE STUDY

This study adds to the growing body of research on AI in financial services, particularly in the context of emerging economies. It provides insights into how users perceive AI's impact on efficiency and inclusion and identifies the statistical strength of these relationships. The study is based on a modest sample size, which opens opportunities for future research using larger and more diverse populations. Future studies can explore other AI applications such as robo-advisors, biometric authentication, fraud analytics, and blockchain-integrated AI. There is also scope to examine regulatory frameworks, ethical concerns, and cross-country comparisons to gain deeper insights into responsible AI adoption in financial systems.

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