

“Impact of AI-Based Decision Support Systems on Operational Efficiency of Public Sector Banks”

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Abstract: Artificial Intelligence (AI) is redefining how public sector banks operate in India by introducing smart *Decision Support Systems (DSS)* that enhance efficiency and accuracy in decision-making. This research paper investigates how AI-based DSS contributes to operational efficiency in public sector banks, especially in core banking operations, risk management, customer service, and process automation. The study context is grounded in the Indian banking landscape, where digital transformation has accelerated due to competitive pressures and customer expectations. The research synthesizes primary concepts of AI, DSS frameworks, and operational efficiency metrics to understand the depth of AI adoption and its practical effects on public sector banks. Review of recent Indian academic research shows significant positive correlations between AI integration and improvements in service delivery, workflows, risk mitigation, and back-office task optimization. However, implementation challenges such as data quality, regulatory constraints, technical know-how, and ethical considerations persist. By employing a mixed-method methodology combining descriptive analysis and inferential evidence from secondary sources, this paper discusses both qualitative and quantitative implications of AI-driven DSS. It concludes that while AI-enabled systems can considerably reduce processing time, errors, and operational costs, the banks need supportive infrastructure, skilled workforce training, and robust governance frameworks to fully leverage these systems. The study's findings provide actionable insights for policymakers, banking executives, and technology strategists to enhance operational efficiency and guide future research on advanced AI integration in public sector banking.

Keywords: Artificial Intelligence, Decision Support Systems, Public Sector Banks, Operational Efficiency, India

I. INTRODUCTION

Public sector banks in India are under immense pressure to modernize operations, improve efficiency, and deliver better services in an increasingly digital world. Operational efficiency is a vital competitive determinant for sustaining growth, reducing costs, and enhancing customer satisfaction. With the proliferation of data and the complexity of banking transactions, traditional approaches to decision-making are no longer sufficient. In this context, **Artificial Intelligence (AI)-based Decision Support Systems (DSS)** have emerged as transformative tools that can enhance operational efficiency by supporting complex, data-driven decisions. AI-driven DSS integrates machine learning (ML), predictive analytics, natural language processing (NLP), and automation to facilitate real-time insights that help in risk assessment, process optimization, customer service, and compliance monitoring. Within Indian public sector banks, the adoption of AI is transforming traditional banking workflows and enabling digital transformation initiatives aimed at improving operational performance, reducing human error, and improving turnaround time for service delivery. Understanding the impact of AI-based DSS is critical for stakeholders — including bank managers, policy makers, and technology providers — in designing strategies that optimize operational benefits while addressing challenges such as ethical considerations, regulatory compliance, and workforce adaptability.

II. REVIEW OF LITERATURE (INDIAN ACADEMIC RESEARCH IN APA STYLE)

2.1 AI Transforming Indian Banking Operations

Chaitanya, S., & Gowda, S. M. (2025). *A study on the impact of artificial intelligence in transforming public banking operations in India*. EPRA International Journal of Multidisciplinary Research (IJMR).

This study explores how AI adoption in Indian public sector banks enhances overall operations, service innovation, and decision-making. It emphasizes the importance of robust digital strategy and continuous employee training.



2.2 AI for Operational Efficiency and Risk Management

Alshi, S. (2025). *Integrating Artificial Intelligence with banking automation: A strategic analysis of operational efficiency and risk management in Indian banks*. Academy of Marketing Studies Journal.

Through a quantitative cross-sectional design in Mumbai banks, this research demonstrates that AI integration significantly improves operational performance, including risk mitigation and process optimization.

2.3 Transforming Customer Experience and Efficiency

Ramprasad, T. P., & Muralidharan Devi, S. (2024). *The role of artificial intelligence for enhancing customer experience – An empirical study in Indian banking sector*. Educational Administration: Theory and Practice.

This empirical study reveals how AI-enabled features such as chatbots and personalized services positively influence operational efficiency and customer satisfaction in Indian banks.

2.4 AI's Impact on Public Sector Bank Efficiency

Kumar, M., & Jain, M. (2025). *Impact of AI on operational efficiency: A study of SBI and PNB*. European Economic Letters.

This work examines the implementation of AI technologies across major public sector banks like SBI and PNB, and highlights improved speed, reduced error rates, and enhanced decision-making capacity.

2.5 Customer Adoption and AI Determinants

Sharma, V. K., & Singh, S. (2024). *Determinants of AI adoption in banking services in India: An empirical investigation*. Journal of Informatics Education and Research.

This paper investigates customer perspectives on AI adoption and identifies perceived usefulness, risk, and attitude as critical determinants influencing banking service use — indirectly linked to how AI impacts operational efficiency.

III. METHODOLOGY

3.1 Research Design

This study adopts a **descriptive research design** using secondary data on AI adoption and operational outcomes in Indian public sector banking. It synthesizes empirical evidence from recent academic research and industry reports.

3.2 Data Collection

Secondary data are collected from Indian research articles, journals, and published papers that examine the role and outcomes of AI in public banking operations and decision-making systems.

3.3 Objectives of the Study

1. **To investigate how AI-based Decision Support Systems enhance operational efficiency** in Indian public sector banks.
2. **To identify key areas where AI-DSS implementation has had measurable impact** on decision accuracy, process automation, and operational workflows.
3. **To examine challenges and strategic factors** affecting AI adoption and integration in public sector banking operations.
4. **To provide recommendations** for improving integration strategies for better operational outcomes.

IV. DISCUSSION AND ANALYSIS

4.1 Understanding AI-Based Decision Support Systems

AI-based DSS are technology systems that help in decision processes by analyzing complex datasets, forecasting future trends, and providing actionable insights. DSS applications in banking use machine learning algorithms, predictive models, and real-time analytics to support areas like credit risk assessment, fraud detection, customer relationship management, compliance monitoring, and back-office operations.

4.2 Influence on Operational Efficiency

AI-based DSS impacts operational efficiency in several key ways:

- **Process Automation:** By automating routine manual tasks such as data entry, document processing, and reconciliation, AI-DSS reduces processing time and human errors. This allows employees to focus on value-added tasks.
- **Real-Time Decision Support:** Predictive analytics and real-time data processing enable quicker and more accurate decisions for loan approvals, risk evaluation, and resource allocation.



- **Risk and Fraud Management:** AI models have improved the accuracy of fraud detection and risk assessment, thus reducing operational losses and enhancing compliance.
- **Customer Service Efficiency:** With chatbots and intelligent agents, customer queries are resolved faster, leading to shorter waiting times and higher service reliability. Research shows improved operational metrics across banks integrating these systems.

4.3 Empirical Insights from Indian Context

Evidence from Indian research suggests that operational efficiency gains are measurable when AI tools are systematically implemented:

- Shilpa Alshi's work indicates that operational performance is statistically higher in banks using AI compared to those that do not.
- Studies on SBI and PNB highlight AI's positive effect in reducing processing times and improving accuracy of transactions.
- Customer perspective research stresses that AI adoption influences customers' intention to use banking services, indicating efficiency and perceived usefulness as key drivers.

4.4 Challenges and Considerations

Despite clear benefits, adoption in public sector banks faces several challenges:

- **Data Quality and Integration:** Many legacy systems in public sector banks lack unified data platforms, complicating AI deployment.
- **Regulatory Compliance:** Banks must balance innovation with regulatory boundaries, ensuring data privacy and governance.
- **Skill Gap:** Staff training on AI systems is critical for maximizing the potential of DSS tools.
- **Ethical and Operational Risks:** Issues such as algorithmic transparency and ethical use of AI remain concerns, particularly in decisions affecting customers and compliance.

V. CONCLUSION

AI-based Decision Support Systems are proving to be a pivotal driver for enhancing operational efficiency in public sector banks. From automation of manual processes to intelligent risk assessment and real-time analytics, these systems reduce operational costs, improve accuracy, and enhance service delivery. Indian research indicates positive correlations between AI adoption and performance outcomes across multiple public banks. However, successful integration requires robust digital infrastructure, strong governance frameworks, employee training, and regulatory compliance to overcome existing challenges. Future research should focus on longitudinal studies, implementation strategies, and customer experience outcomes to further refine the understanding of AI-driven decision support in banking.

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