

## Artificial Intelligence in Banking: An SOR-Based Ethical Framework for Risk Management, Fraud Detection and Customer Experience

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### Abstract

Artificial Intelligence (AI) is transforming the banking sector by enhancing operational efficiency, reducing fraud risks, and improving customer experience. This study develops a conceptual and empirical-ready model integrating the Stimulus–Organism–Response (SOR) framework with an Ethical AI Hybrid Performance Framework (EAHPF). The model explains how AI capabilities influence internal banking mechanisms and ultimately drive performance outcomes. The study proposes testable hypotheses and a structural model suitable for PLS-SEM analysis. The findings provide theoretical and practical insights into ethical AI adoption for sustainable banking performance.

**Keywords:** Artificial Intelligence, Banking, Risk Management, Fraud Detection, Customer Experience, SOR Model, PLS-SEM

### 1. Introduction

The banking sector is undergoing rapid digital transformation driven by advancements in Artificial Intelligence (AI). AI technologies such as machine learning, natural language processing, and predictive analytics are enabling banks to enhance decision-making, optimize operations, and deliver personalized services.

In recent years, the increasing volume of digital transactions and the rise of financial fraud have made AI adoption essential for banking institutions. AI-based systems can analyze vast datasets, detect anomalies, and provide real-time insights, thereby improving operational efficiency and security.

However, the deployment of AI in banking raises critical concerns related to data privacy, algorithmic bias, and transparency. Therefore, integrating ethical considerations into AI systems is essential to ensure sustainable and responsible banking practices. This study proposes a novel framework combining the SOR model with an ethical AI approach to analyze the impact of AI on banking performance.

### 2. Literature Review

Artificial Intelligence has emerged as a key driver of innovation in the banking sector. Existing literature highlights its applications across multiple domains.

#### 2.1 AI in Risk Management

AI enhances credit scoring and risk prediction by analyzing historical data and identifying patterns (Jagtiani & Lemieux, 2018). Machine learning models improve the accuracy of financial risk assessment (Li et al., 2020).

## **2.2 AI in Fraud Detection**

AI-based systems detect fraudulent transactions by identifying anomalies in real time (Ngai et al., 2011). Advanced algorithms improve fraud detection efficiency and reduce financial losses (Bhatia et al., 2021).

## **2.3 AI in Customer Experience**

AI improves customer engagement through chatbots, personalized recommendations, and automated services (Huang & Rust, 2021).

## **2.4 Ethical AI in Banking**

Ethical considerations such as transparency, fairness, and accountability are critical for AI adoption (OECD, 2021; Rai, 2020).

Artificial Intelligence (AI) has emerged as a transformative technology in the banking sector, significantly enhancing operational efficiency, decision-making, and customer engagement. Early studies highlight that AI-driven systems enable banks to process vast amounts of financial data with greater speed and accuracy compared to traditional methods, thereby improving service delivery and reducing operational costs (Davenport, 2018; Brynjolfsson & McAfee, 2017). The increasing adoption of AI technologies such as machine learning, natural language processing, and predictive analytics has allowed financial institutions to automate routine processes, enhance data-driven decision-making, and improve overall performance (Kasula, 2023).

One of the most significant applications of AI in banking is in risk management, where machine learning models are used to predict credit risk and assess borrower behavior. Studies indicate that AI enhances risk prediction by analyzing historical data and identifying complex patterns that traditional models often fail to capture (Jagtiani & Lemieux, 2018; Li et al., 2020). AI-driven analytics also enable real-time monitoring of financial transactions, thereby improving the accuracy and efficiency of risk assessment systems (Kovacevic et al., 2024). Furthermore, AI contributes to reducing human errors and biases in credit decision-making, leading to more reliable and objective financial evaluations (Karim et al., 2022).

In the domain of fraud detection, AI has proven to be a critical tool in combating financial crimes. Traditional rule-based systems are increasingly being replaced by AI-powered models capable of detecting anomalies in real-time. Machine learning algorithms, including supervised and unsupervised techniques, are widely used to identify suspicious transaction patterns and prevent fraud (Ngai et al., 2011). Recent systematic reviews reveal that hybrid AI models combining deep learning and anomaly detection techniques offer superior accuracy in identifying complex fraud patterns (George et al., 2025). Additionally, AI-based fraud detection systems significantly reduce financial losses and enhance operational efficiency, making them indispensable in modern banking systems (Moura et al., 2025).

Another important area where AI has made a substantial impact is customer experience. AI-powered chatbots, virtual assistants, and recommendation systems enable banks to provide personalized and real-time services to customers. Research suggests that AI improves customer satisfaction by offering tailored financial products and enhancing service responsiveness (Huang & Rust, 2021). Natural language processing (NLP) technologies further enhance customer interaction by enabling seamless communication between banks and customers, thereby improving engagement and retention (Gerling & Lessmann, 2024). Moreover, AI-driven personalization helps banks better understand customer preferences, leading to improved loyalty and competitive advantage (Kasula, 2023).

Despite its numerous benefits, the adoption of AI in banking is not without challenges. Ethical concerns such as data privacy, algorithmic bias, and transparency have gained significant attention in recent years. Studies emphasize that the lack of transparency in AI algorithms can lead to trust issues and regulatory challenges (OECD, 2021). Additionally, AI systems are vulnerable to cybersecurity threats, including data breaches and adversarial attacks, which can compromise financial data and system integrity (Waliullah et al., 2025). The dual-use nature

of AI technologies also poses risks, as they can be exploited by malicious actors for fraudulent activities (Kovacevic et al., 2024).

Furthermore, recent literature highlights the importance of ethical AI frameworks in ensuring responsible AI adoption in banking. Transparency, fairness, and accountability are identified as key factors influencing trust and adoption of AI systems in financial institutions (Moura et al., 2025; OECD, 2021). Empirical studies also demonstrate that ethical considerations such as bias mitigation and regulatory compliance significantly impact the effectiveness and acceptance of AI-based systems (Alsharif et al., 2024).

Overall, the literature indicates that AI plays a crucial role in transforming banking operations by enhancing risk management, improving fraud detection, and delivering superior customer experiences. However, there remains a gap in integrating these dimensions within a unified theoretical framework, particularly with the inclusion of ethical considerations. This study addresses this gap by proposing an integrated SOR-based ethical AI framework to explain the relationship between AI capabilities and banking performance outcomes.

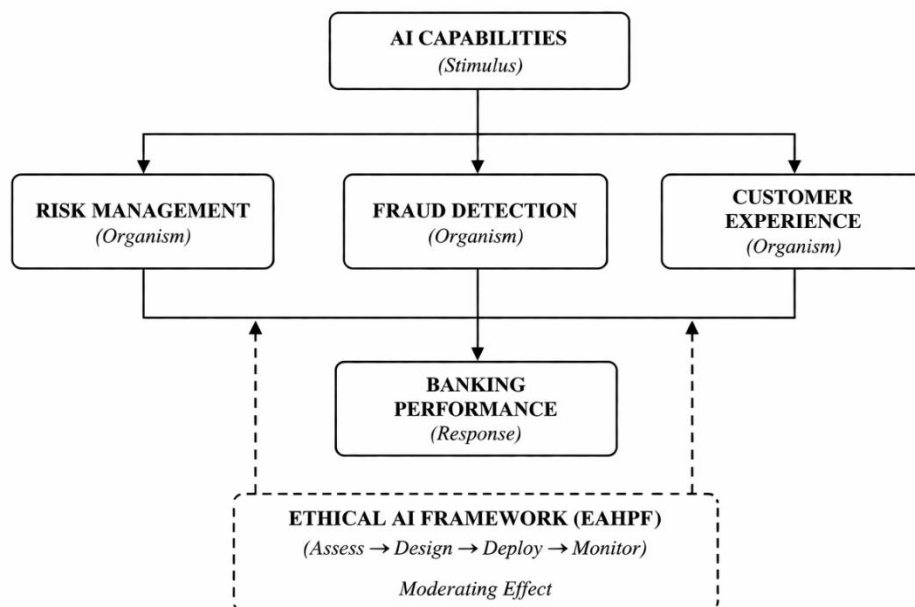


Figure 2: AI Capabilities and Banking Performance Model with Ethical AI Moderation

### 3. Research Gap

While prior studies have examined individual applications of AI in banking, there is limited research integrating risk management, fraud detection, and customer experience into a unified framework. Additionally, the role of ethical AI as a moderating factor remains underexplored.

### 4. Research Objectives

1. To analyze the role of AI in banking operations
2. To examine AI applications in risk management and fraud detection
3. To evaluate the impact of AI on customer experience
4. To develop a conceptual model integrating AI and banking performance

### **5. Theoretical Framework**

The study is based on the **Stimulus–Organism–Response (SOR) model**, which explains how external stimuli influence internal processes, leading to behavioral outcomes.

- **Stimulus:** AI capabilities
- **Organism:** Banking processes
- **Response:** Performance outcomes

### **6. Conceptual Model and Hypotheses**

#### **6.1 Conceptual Model**

The study proposes a model where AI capabilities influence risk management, fraud detection, and customer experience, which in turn affect banking performance. Ethical AI acts as a moderating variable.

#### **6.2 Hypotheses**

**H1:** AI capabilities positively influence risk management

**H2:** AI capabilities positively influence fraud detection

**H3:** AI capabilities positively influence customer experience

**H4:** Risk management positively affects banking performance

**H5:** Fraud detection positively affects banking performance

**H6:** Customer experience positively affects banking performance

**H7:** Ethical AI moderates the relationship between AI capabilities and banking outcomes

### **7. Research Methodology**

#### **7.1 Research Design**

- Quantitative research approach
- Cross-sectional study

#### **7.2 Data Collection**

- Target respondents: Banking professionals/customers
- Sample size: 200–400

#### **7.3 Measurement Scale**

- 5-point Likert scale

#### **7.4 Data Analysis**

- Partial Least Squares Structural Equation Modeling (PLS-SEM)

### **8. Measurement Model**

<b>Construct</b>	<b>Sample Indicators</b>
AI Capability	AI improves decision-making

<b>Construct</b>	<b>Sample Indicators</b>
Risk Management	AI enhances risk prediction
Fraud Detection	AI detects unusual transactions
Customer Experience	AI improves service quality
Performance	Banking efficiency improves
Ethical AI	AI systems are transparent and fair

### **9. Discussion**

AI adoption in banking significantly enhances operational efficiency and decision-making. The integration of ethical AI ensures transparency and reduces bias, leading to improved customer trust and sustainable performance.

### **10. Implications**

#### **10.1 Theoretical Implications**

- Extends SOR theory in banking context
- Introduces ethical AI as a moderating variable

#### **10.2 Practical Implications**

- Helps banks implement AI responsibly
- Enhances efficiency and customer satisfaction

### **11. Conclusion**

Artificial Intelligence is a transformative force in the banking sector. Its integration into risk management, fraud detection, and customer experience significantly improves performance. Ethical AI plays a crucial role in ensuring sustainable and responsible adoption.

### **12. Limitations and Future Research**

- Conceptual nature of the study
  - Limited empirical validation
- Future research can:
- Use PLS-SEM for validation
  - Explore industry-specific applications

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