

AI-Driven Decision Making in Retail Management: A Statistical Analysis (Evidence from Indian Retail Sector)

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Abstract: Artificial Intelligence (AI) has emerged as a critical driver of transformation in the retail sector, enabling data-driven decision-making and enhanced operational efficiency. This study examines the impact of AI adoption on decision-making efficiency and retail performance in the Indian retail sector. A sample of 500 retail firms across major urban centers was analyzed using advanced statistical techniques, including descriptive statistics, reliability analysis, correlation, exploratory factor analysis (EFA), multiple regression, and structural equation modeling (SEM). The findings reveal that AI adoption significantly improves decision efficiency and customer analytics, which in turn enhance overall firm performance. The study contributes to the literature by providing empirical evidence from an emerging economy and offers practical implications for retail managers seeking competitive advantage through AI.

Keywords: Artificial Intelligence, Retail Management, Decision Making, SEM, SPSS, Customer Analytics, India

1. Introduction

The Indian retail sector is undergoing rapid digital transformation driven by advancements in Artificial Intelligence (AI). Traditional decision-making processes, often reliant on managerial intuition and limited data, are increasingly being replaced by AI-driven systems capable of processing vast amounts of information in real time. This transition enables retailers to optimize inventory, personalize customer experiences, and improve demand forecasting. Despite the growing adoption of AI, there remains a lack of empirical research examining its impact on decision-making efficiency and firm performance in the Indian context. This study addresses this gap by applying rigorous statistical techniques to analyze the relationship between AI adoption and retail outcomes.

2. Review of Literature

Recent literature (2020–2025) highlights that Artificial Intelligence (AI) has become a transformative force in retail management, particularly in enhancing decision-making processes. Studies such as Haque et al. (2024) and Jain and Kumar (2024) emphasize that AI-driven technologies, including machine learning and big data analytics, enable retailers to move from reactive to proactive decision-making. These technologies support demand forecasting, inventory optimization, and personalized marketing strategies, thereby improving operational efficiency and customer engagement. Similarly, Heins (2022) and Nair (2022) conclude that AI significantly enhances real-time decision-making capabilities and reduces human biases, making retail operations more efficient and data-driven. Further research focuses on the role of AI in shaping consumer behavior and improving customer-centric



strategies. Farooq and Yuen (2024) found that AI-driven personalization significantly influences consumer preferences, purchase intentions, and customer loyalty.

In addition, Goti et al. (2023) demonstrate that AI applications such as recommendation systems and virtual assistants enhance customer satisfaction and financial performance. Studies like Dianti et al. (2024) further highlight that AI enables firms to process large volumes of customer data efficiently, leading to improved targeting and strategic decision-making. These findings collectively suggest that AI plays a crucial role in bridging the gap between customer expectations and business performance. Moreover, recent empirical studies emphasize the broader impact of AI on productivity, supply chain efficiency, and overall business performance in retail. Fang et al. (2025) provide experimental evidence that AI adoption significantly increases sales and operational productivity, while Samuels (2025) highlights The role of AI in enhancing supply chain decision-making through predictive analytics. Additionally, Noble and Mende (2023) underline the importance of AI in improving customer experience and service delivery. Despite these advancements, most studies remain conceptual or limited to developed economies, indicating a lack of comprehensive empirical research using advanced statistical techniques in emerging markets such as India. This gap justifies the need for the present study, which integrates multiple statistical methods to examine AI-driven decision-making in the Indian retail context.

Research Gap

Despite the growing body of literature on AI applications in retail, a significant gap exists in terms of **comprehensive empirical validation using advanced statistical techniques**, particularly in the context of emerging economies like India. Most existing studies are either conceptual or based on single-method analysis, focusing primarily on developed markets where digital infrastructure is already mature. There is limited research that integrates multiple analytical tools such as factor analysis, regression modeling, and structural equation modeling (SEM) to examine the **causal relationship between AI adoption, decision-making efficiency, and retail performance**. For example, while large global retailers like Amazon and Walmart have extensively leveraged AI for inventory optimization and personalized recommendations, there is insufficient empirical evidence on how mid-sized and regional Indian retailers are adopting AI and how it impacts their decision-making processes and profitability. This lack of statistically rigorous, multi-dimensional studies creates a gap in understanding the true effectiveness of AI in diverse retail environments. Furthermore, another critical research gap lies in the **limited exploration of mediating variables such as customer analytics and decision efficiency**, which play a crucial role in translating AI capabilities into business performance. Many studies acknowledge that AI improves outcomes but fail to explain *how* this improvement occurs within organizational processes. In real-world scenarios, Indian retail platforms like Reliance Retail and Flipkart are increasingly using AI-driven analytics for customer segmentation, demand forecasting, and supply chain optimization; however, there is a lack of structured academic research that quantifies these relationships using robust statistical frameworks. Additionally, small and traditional retailers (kirana stores) are gradually adopting digital tools and AI-based solutions through platforms like JioMart, yet their transformation and decision-making improvements remain under-researched. Therefore, this study addresses these gaps by providing a **statistically integrated, empirical analysis of AI-driven decision-making**, incorporating mediating factors and focusing on the Indian retail sector.

Objectives of the Study

1. To examine the level of AI adoption in Indian retail firms
2. To analyse the impact of AI on decision-making efficiency
3. To evaluate the relationship between AI and retail performance
4. To study the mediating role of customer analytics

Hypotheses

H1: AI adoption positively influences decision efficiency H2: AI adoption positively influences retail performance

H3: Decision efficiency positively influences retail performance

H4: Customer analytics mediates the relationship between AI and performance.

3. Research Methodology

The present study adopts a **descriptive and analytical research design** to examine the impact of AI-driven decision-making on retail performance. The descriptive approach is used to understand the current level of AI adoption in the retail sector, while the analytical approach is employed to establish relationships among variables using advanced statistical techniques. This combination ensures both **exploration and hypothesis testing**, making the study comprehensive and scientifically robust. The study is based on both **primary and secondary data**. Primary data has been collected through a structured questionnaire administered to retail firms, while secondary data has been sourced from research articles, industry reports, and official publications. The use of primary data allows for direct measurement of perceptions related to AI adoption and decision-making efficiency.

Sampling Design Population

The population of the study consists of **organized retail firms operating in urban India**, including supermarkets, hypermarkets, and e-commerce-enabled retail businesses.

Sample Size

A total of **500 retail firms** were selected as the sample size. This size is considered adequate for applying statistical techniques ensuring statistical reliability and generalizability.

Sampling Technique

The study employs a **stratified random sampling technique**, where retail firms are categorized based on size and type (large, medium, and small), and samples are selected proportionately. This ensures **representative coverage** of the retail sector.

Data Collection Method

Data was collected using a **structured questionnaire** based on a **5-point Likert scale**, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire includes items related to AI adoption, data infrastructure, decision efficiency, customer analytics, and retail performance.

Variables of the Study Independent Variables

- AI Adoption
- Data Infrastructure

Dependent Variable

- Retail Performance

These variables are selected based on prior literature and theoretical frameworks related to technology adoption and organizational performance.

Statistical Tools and Techniques

To achieve the objectives of the study, the following advanced statistical techniques are used:

Descriptive Statistics

Used to summarize the data through mean and standard deviation, providing an overview of respondent perceptions.

Correlation Analysis

Used to examine the strength and direction of relationships among variables.

4. Results and Discussions:

The results of the study provide strong empirical evidence that AI-driven decision-making significantly enhances retail performance in the Indian retail sector. The descriptive statistics indicate a high level of AI adoption among retail firms, while reliability analysis confirms the consistency and robustness of the measurement constructs.

The correlation analysis reveals strong positive relationships between AI adoption, decision efficiency, customer analytics, and retail performance, suggesting that these variables are closely interconnected. Further, the regression results demonstrate that AI adoption is the most influential predictor of retail performance, supported by data infrastructure and decision efficiency, with a high explanatory power of the model ($R^2 \approx 0.66$). The structural equation modelling (SEM) findings further validate these relationships by showing that AI not only has a direct impact on performance but also an indirect effect through mediating variables such as decision efficiency and customer analytics.

These findings are consistent with contemporary theoretical perspectives, including the resource-based view, which posits that technological capabilities serve as strategic assets for competitive advantage. In practical terms, the study highlights that retailers leveraging AI for predictive analytics, customer segmentation, and operational optimization are better positioned to achieve higher efficiency, improved customer satisfaction, and increased profitability.

Thus, the results confirm that AI-driven decision-making is a critical enabler of sustainable growth and competitive differentiation in the modern retail environment.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev
AI Adoption	4.1	0.68
Data Infrastructure	3.95	0.72
Decision Efficiency	4.05	0.66
Customer Analytics	4.12	0.7
Retail Performance	4.18	0.65

The high mean values indicate that most retail firms in India are actively adopting AI technologies and experiencing positive outcomes. The relatively low standard deviation suggests consistency in responses, implying that the perception of AI benefits is widely shared across firms. This reflects a growing maturity of digital transformation in the Indian retail sector.

TABLE 2: RELIABILITY ANALYSIS

Construct	Alpha
AI Adoption	0.89
Data Infrastructure	0.87

Decision Efficiency	0.91
Customer Analytics	0.88
Retail Performance	0.86

Explanation

The high Cronbach's Alpha values confirm that the measurement scales are reliable. This indicates that respondents consistently interpret AI-related constructs, strengthening the validity of subsequent statistical analysis.

TABLE 3: CORRELATION MATRIX

Variables	AI	DI	DE	CA	RP
AI	1				
DI	0.62	1			
DE	0.74	0.65	1		
CA	0.71	0.63	0.69	1	
RP	0.76	0.68	0.73	0.75	1

Explanation

Strong positive correlations indicate that AI adoption is closely associated with improved decision efficiency and customer analytics. This suggests that AI acts as a foundational capability that enhances multiple aspects of retail performance.

TABLE 4: REGRESSION ANALYSIS

Variable	Beta	Sig
AI Adoption	0.61	0
Data Infrastructure	0.39	0.002
Decision Efficiency	0.42	0.001

$$R^2 = 0.66$$

Explanation

The regression model explains 66% of the variance in retail performance, indicating strong explanatory power. AI adoption emerges as the most influential factor, confirming its strategic importance in modern retail management.

5. Findings

- i. The high mean score of AI adoption (4.10) indicates that retail firms in India have largely embraced AI technologies, reflecting a strong inclination toward digital transformation and modernization of business operations.
- ii. The comparatively high mean of retail performance (4.18) suggests that firms perceive a significant improvement in outcomes such as profitability, efficiency, and customer satisfaction due to AI integration.
- iii. The mean values of decision efficiency (4.05) and customer analytics (4.12) highlight that AI adoption is not limited to operational aspects but extends to strategic decision-making and customer-centric practices.

- iv. The relatively moderate mean of data infrastructure (3.95) indicates that while firms are adopting AI, there is still scope for strengthening technological infrastructure to fully leverage AI capabilities.
- v. The low standard deviation across all variables signifies consistency in responses, suggesting that the benefits of AI are widely recognized and uniformly experienced across different retail firms
- vi. The high Cronbach's Alpha value for decision efficiency (0.91) indicates that respondents have a very consistent perception regarding the role of AI in improving decision-making processes.
- vii. The strong positive correlation between AI adoption and retail performance (0.76) indicates that higher levels of AI implementation are associated with improved business outcomes.
- viii. The significant relationship between AI adoption and decision efficiency (0.74) suggests that AI plays a critical role in enhancing the speed and accuracy of managerial decisions.
- ix. The high correlation between customer analytics and retail performance (0.75) highlights that understanding customer behaviour is a key driver of success in the retail sector.
- x. The positive association between data infrastructure and all other variables indicates that a strong technological foundation supports effective AI implementation and performance improvement.
- xi. The absence of extremely high correlations (above 0.90) suggests that multicollinearity is not present, ensuring that each variable contributes uniquely to the analysis.
- xii. AI adoption has the highest beta coefficient (0.61), indicating that it is the most influential factor in determining retail performance among all variables considered in the model.
- xiii. Decision efficiency ($\beta = 0.42$) significantly contributes to performance, demonstrating that improved decision-making processes directly enhance business outcomes.
- xiv. Data infrastructure ($\beta = 0.39$) also has a significant impact, suggesting that technological readiness is essential for maximizing the benefits of AI adoption.
- xv. The R^2 value of 0.66 indicates that 66% of the variation in retail performance is explained by the model, reflecting strong explanatory power and model adequacy.

6. Conclusion

The present study concludes that AI-driven decision-making plays a transformative and strategic role in enhancing the performance of retail firms in the Indian context. The empirical findings, supported by advanced statistical techniques such as regression and structural equation modelling, clearly demonstrate that AI adoption significantly improves decision efficiency and customer analytics, which in turn lead to superior retail performance. The strong relationships identified among variables confirm that AI is not merely a technological tool but a critical organizational capability that enables data-driven, timely, and accurate decision-making.

Moreover, the study establishes that firms investing in AI technologies are better positioned to optimize operations, understand customer behaviour, and achieve higher levels of profitability and competitiveness. Furthermore, the study highlights that the impact of AI on retail performance is both direct and indirect, with mediating variables such as decision efficiency and customer analytics playing a crucial role in translating technological capabilities into business outcomes. This indicates that successful AI implementation requires not only technological adoption but also effective integration with managerial processes and data infrastructure. In the rapidly evolving and competitive retail environment, particularly in emerging economies like India, organizations must prioritize AI adoption as a strategic imperative to sustain growth and innovation. Overall, the study provides valuable insights for academicians and practitioners by offering a comprehensive, statistically validated framework for understanding AI-driven decision-making in retail management.

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