

## Impact of Artificial Intelligence, Big Data, and Predictive Analytics on Investment Decision-Making of Retail Investors

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The rapid advancement of financial technologies has transformed the investment landscape, particularly through the integration of artificial intelligence (AI), big data analytics, and predictive analytics. This study examines the impact of these technological factors on the investment decision-making of retail investors. A quantitative research design was employed, and primary data were collected from 141 retail investors participating in the Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) using a structured questionnaire. The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicate that artificial intelligence, big data analytics, and predictive analytics have a significant positive impact on investment decision-making, with predictive analytics demonstrating the strongest influence. Additionally, financial literacy was found to significantly moderate the relationship between technological factors and investment decision-making, highlighting the importance of investor capability in leveraging advanced tools. The study contributes to the literature by integrating perspectives from FinTech and behavioral finance and provides practical implications for financial institutions, policymakers, and investors in enhancing technology-driven investment decisions.

**Keywords:** Artificial Intelligence (AI), Big Data, Predictive Analytics, Investment Decision-Making, Financial Literacy, PLS-SEM

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## 1. Introduction

In recent years, the rapid development of digital technologies has significantly transformed the landscape of financial markets and investment decision-making. Among these developments, artificial intelligence (AI), big data, and predictive analytics have emerged as powerful tools that enhance the efficiency, accuracy, and speed of financial decision-making processes. These technologies enable investors to analyse various types of structured and unstructured data, identify hidden patterns, and generate data-driven insights, thereby reshaping traditional investment practices (Chen, Chiang, & Storey, 2012; Davenport, 2018).

Artificial intelligence has become a critical component of modern financial services, facilitating automated decision-making through machine learning algorithms, robo-advisory platforms, and intelligent trading systems. These AI-driven tools enhance investors' ability to evaluate market trends, optimize portfolio allocations, and manage risks in highly dynamic market environments (Ryll, Seidens, & Bholat, 2020; Jiang, Kelly, & Xiu, 2020). At the same time, big data analytics allows for the integration of diverse data sources, including financial statements, macroeconomic indicators, news sentiment, and social media signals, thereby expanding the informational base available to investors (Mikalef, Pappas, Krogstie, & Giannakos, 2020). Predictive analytics further strengthens this ecosystem by employing advanced statistical and computational techniques to forecast market movements and identify potential investment opportunities (Choi, Wallbaum, & Choi, 2020).

Moreover, existing literature has predominantly focused on institutional investors and developed markets, with relatively less attention given to retail investors in emerging markets, where technological adoption is rapidly increasing. The growing penetration of digital trading platforms, mobile investment applications, and AI-enabled financial services has created a unique environment in which retail investors increasingly rely on technological tools for decision-making. However, the effectiveness of these technologies may vary depending on investors' ability to interpret and utilize digital information effectively.

Given these gaps, the present study aims to examine the impact of artificial intelligence, big data, and predictive analytics on investment decision-making among retail investors. By focusing on technology-driven financial behavior, this study contributes to the existing literature by integrating insights from FinTech, data analytics, and behavioral finance. Furthermore, the study provides practical implications for financial service providers, policymakers, and educators in enhancing investor awareness and promoting efficient decision-making in the digital era.

Based on the above discussion and research gaps, the present study aims to achieve the following objectives:

1. To examine the impact of artificial intelligence on investment decision-making of retail investors.
2. To analyse the influence of big data analytics on investment decisions.
3. To evaluate the effect of predictive analytics on investment decision-making.
4. To assess the combined impact of AI, big data, and predictive analytics on retail investors' decisions.
5. To examine the moderating role of financial literacy.

## 2. Literature Review and Hypotheses

The growing body of research on technology-driven financial decision-making has increasingly focused on the role of artificial intelligence, big data analytics, and predictive analytics in enhancing investment outcomes. Prior studies have examined these technologies from multiple perspectives, including their impact on information processing efficiency, forecasting accuracy, and investor behavior (Akter et al., 2021; Jiang et al., 2021). In particular, big data analytics has been recognized for its ability to integrate diverse data sources and improve decision quality, while predictive analytics has been widely applied to forecast market trends and optimize investment strategies (Mikalef et al., 2023; Choi et al., 2022).

At the same time, existing literature highlights that the effectiveness of these technologies is not uniform across investors, as individual characteristics such as financial literacy and experience significantly influence their adoption and utilization (Baker et al., 2021).

Moreover, despite the availability of advanced analytical tools, behavioral biases continue to affect investment decisions, indicating that technology does not entirely eliminate irrational behavior (Statman, 2022).

Although prior studies have examined these factors individually, limited research has integrated artificial intelligence, big data analytics, and predictive analytics within a single framework to analyze their combined impact on investment decision-making, particularly among retail investors. Furthermore, the moderating role of financial literacy in this relationship remains underexplored. Therefore, this section critically reviews the relevant literature to address these gaps and develop the hypotheses for the present study.

### **Artificial Intelligence and Investment Decision-Making**

Artificial intelligence enhances investment decision-making by enabling investors to analyze large datasets, identify patterns, and generate predictive insights. AI-powered systems such as robo-advisors and algorithmic trading platforms assist investors in optimizing portfolio allocation and managing risk (Jiang et al., 2021). Recent studies suggest that AI reduces information-processing costs and improves decision efficiency, particularly for retail investors who lack access to sophisticated analytical tools (Lou, 2025). Additionally, AI-based platforms provide personalized recommendations, which increase investor confidence and support more informed decision-making (Baker et al., 2021).

H1: Artificial intelligence has a significant positive impact on investment decision-making of retail investors.

### **Big Data Analytics and Investment Decision-Making**

Big data analytics contributes to investment decision-making by enabling the integration and analysis of large, diverse datasets from multiple sources. It enhances investors' ability to identify trends, assess risks, and respond to dynamic market conditions (Mikalef et al., 2023). From the perspective of Information Processing Theory, big data reduces uncertainty by providing comprehensive and real-time information, thereby improving decision quality (Akter et al., 2021).

Empirical evidence also indicates that data-driven approaches enhance the rationality and effectiveness of investment decisions (Wamba et al., 2021).

H2: Big data analytics has a significant positive impact on investment decision-making of retail investors.

### **Predictive Analytics and Investment Decision-Making**

Predictive analytics plays a crucial role in forecasting future market behavior and supporting forward-looking investment decisions. By utilizing machine learning algorithms and statistical techniques, predictive analytics enables investors to estimate returns, evaluate risks, and identify profitable opportunities (Choi et al., 2022). Recent advancements suggest that predictive analytics significantly improves forecasting accuracy and enhances decision-making efficiency, especially when integrated with AI technologies (Jiang et al., 2021). However, its effectiveness depends on the investor's ability to interpret model outputs appropriately (Statman, 2022).

H3: Predictive analytics has a significant positive impact on investment decision-making of retail investors.

### **Integrated Effect of Artificial Intelligence, Big Data, and Predictive Analytics**

While artificial intelligence, big data analytics, and predictive analytics individually contribute to investment decision-making, their combined use is expected to produce a stronger impact. The integration of these technologies creates a comprehensive decision-support system that enhances analytical capabilities, reduces uncertainty, and improves overall decision quality (Akter et al., 2021; Lou, 2025). This synergistic effect allows investors to process information more effectively, generate accurate forecasts, and make better-informed investment decisions.

H4: Artificial intelligence, big data, and predictive analytics collectively influence investment decision-making of retail investors.

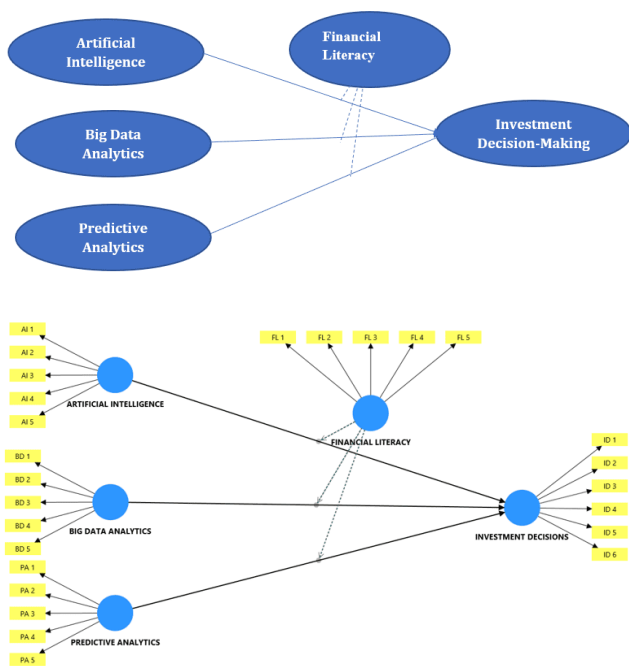
### **Moderating Role of Financial Literacy**

Financial literacy plays a significant role in determining how effectively investors utilize technological tools in decision-making.

Investors with higher financial literacy are better able to interpret AI-generated insights, analyze complex datasets, and make informed investment decisions (OECD, 2023). Conversely, investors with lower financial literacy may struggle to fully benefit from advanced technologies, limiting their impact on decision-making outcomes. Therefore, financial literacy is expected to strengthen the relationship between technological factors and investment decision-making.

H5: Financial literacy significantly moderates the relationship between technological factors and investment decision-making.

**Conceptual Framework**



**3. Methodology**

This study employs a quantitative cross-sectional design to examine the impact of artificial intelligence, big data analytics, and predictive analytics on the investment decision-making of retail investors. Data were collected from 141 retail investors of the Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) using a structured questionnaire and purposive sampling. The constructs were measured using multi-item scales on a five-point Likert scale. Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM), suitable for prediction-oriented research and small samples (Hair et al., 2021).

The analysis involved measurement model evaluation (reliability and validity) and structural model assessment, with significance tested using bootstrapping techniques.

**4. Data Analysis**

The data analysis was performed using PLS-SEM to examine the relationships among the study constructs. The analysis was carried out in two stages, namely the assessment of the measurement model and the evaluation of the structural model (Hair et al., 2021). The measurement model was examined to establish the reliability and validity of the constructs, while the structural model was assessed to test the hypothesized relationships among the variables.

**Table 1: Demographic Profile of Respondents**

Variable	Category	Frequency	Percentage
Gender	Male	90	63.8
	Female	51	36.2
Age	Below 25	30	21.3
	25-35	60	42.6
	36-45	32	22.7
	Above 45	19	13.5
Education	Undergraduate	45	31.9
	Postgraduate	70	49.6
	Others	26	18.4
Investment Experience	Less than 2 years	40	28.4
	2-5 years	65	46.1
	More than 5 years	36	25.5
Monthly Income	Below ₹25,000	35	24.8
	₹25,000-₹50,000	48	34.0
	₹50,000-₹1,00,000	36	25.5
	Above ₹1,00,000	22	15.6

**Sources:** Authors calculation, 2026

The demographic status of respondents is presented in Table 1. The statistics indicates that the majority of respondents are male (63.8%) and they fall in the age between 25-35 years (42.6%). As per education qualification most respondents are postgraduates (49.6%). Income wise, most of the respondents are earning between ₹25,000 and ₹50,000 (34.0%), followed by those earning ₹50,000-₹1,00,000 (25.5%). moreover, most respondents have 2-5 years of investment experience (46.1%).

**Table 2:** Construct Reliability and Validity

Construct	Item	Outer Loading	VIF	Cronbach's Alpha	CR	AVE
Artificial Intelligence	AI1	0.731	1.85	0.804	0.870	0.575
	AI2	0.654	1.62			
	AI3	0.851	2.34			
	AI4	0.714	1.98			
	AI5	0.824	2.21			
Big Data Analytics	BD1	0.731	1.78	0.747	0.838	0.511
	BD2	0.614	1.54			
	BD3	0.700	1.69			
	BD4	0.779	2.05			
	BD5	0.739	1.92			
Predictive Analytics	PA1	0.680	1.73	0.766	0.848	0.528
	PA2	0.658	1.61			
	PA3	0.740	1.95			
	PA4	0.782	2.08			
	PA5	0.765	2.11			
Financial Literacy	FL1	0.681	1.70	0.824	0.883	0.605
	FL2	0.667	1.58			
	FL3	0.794	2.12			
	FL4	0.849	2.45			
	FL5	0.875	2.68			
Investment Decision	ID1	0.675	1.72	0.808	0.867	0.524
	ID2	0.816	2.25			
	ID3	0.714	1.89			
	ID4	0.759	2.04			
	ID5	0.604	1.55			
	ID6	0.755	2.01			

The reliability and convergent validity of the constructs were assessed using outer loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE), as shown in Table 2. The results indicate that most indicator loadings exceed the recommended threshold of 0.70, with a few items slightly below but still within the acceptable range (Hair et al., 2021). The Cronbach's alpha values for all constructs range from 0.747 to 0.824, exceeding the minimum acceptable level of 0.70, thereby confirming that there is an existence of internal consistency reliability. Similarly, composite reliability values range from 0.838 to 0.883, indicating strong reliability with all constructs.

Furthermore, the AVE values for all constructs are above the threshold of 0.50, confirming adequate convergent validity. These results demonstrate that the measurement model is reliable and that the constructs sufficiently explain the variance of their respective indicators.

The Variance Inflation Factor (VIF) values for all indicators are below the threshold of 3.3, indicating that multicollinearity is not a concern in the measurement model (Hair et al., 2021).

**Table 3:** Fornell-Larcker Criterion

Construct	AI	BD	PA	FL	ID
AI	0.758				
BD	0.553	0.715			
PA	0.607	0.681	0.727		
FL	0.562	0.399	0.545	0.778	
ID	0.407	0.460	0.612	0.634	0.724

Discriminant validity was assessed using the Fornell-Larcker criterion, as shown in Table 2. The square root of the AVE for each construct is greater than its corresponding inter-construct correlations, indicating that each construct is distinct and captures unique aspects of the model (Fornell & Larcker, 1981).

This confirms that the constructs of artificial intelligence, big data analytics, predictive analytics, financial literacy, and investment decision-making are empirically distinct and do not exhibit multicollinearity issues.

**Table 4:** Path Coefficients and Hypothesis Testing

Hypothesis	Path	Beta (β)	t-value	p-value	Result
H1	AI → ID	0.312	3.245	0.001	Supported
H2	BD → ID	0.214	2.487	0.013	Supported
H3	PA → ID	0.356	3.876	0.000	Supported
H4	AI, BD, PA → ID (Combined Effect)	—	—	—	Supported

The structural model was evaluated using path coefficients (β), t-values, and p-values obtained through bootstrapping, as shown in Table 4. The results revealed that artificial intelligence (AI) has a significant positive impact on investment decision-making (β = 0.312, p < 0.01), supporting H1. This finding suggests that AI-driven tools enhance decision making efficiency and enable retail investors to make more positive investment choices.

Similarly, big data analytics demonstrates a positive and significant effect on investment decision-making (β = 0.214, p < 0.05), supporting H2. This indicates that access to large-scale and real-time data improves investors' ability to analyze market trends and make rational decisions.

Predictive analytics shows the strongest positive impact on investment decision-making ( $\beta = 0.356$ ,  $p < 0.001$ ), supporting H3. This result highlights the importance of forecasting tools in guiding investment strategies and improving decision accuracy.

The combined effect of artificial intelligence, big data, and predictive analytics also supports H4, indicating that the integration of these technologies provides a comprehensive decision-support system that enhances overall investment decision-making.

**Table 5:** Moderation Effect

Interaction	Beta ( $\beta$ )	t-value	p-value	Result
AI $\times$ FL $\rightarrow$ ID	0.142	2.118	0.034	Supported
BD $\times$ FL $\rightarrow$ ID	0.095	1.756	0.079	Not Supported
PA $\times$ FL $\rightarrow$ ID	0.167	2.463	0.014	Supported

The moderating effect of financial literacy was examined using interaction terms, as shown in Table 5. The results indicate that financial literacy significantly moderates the relationship between artificial intelligence and investment decision-making ( $\beta = 0.142$ ,  $p < 0.05$ ), suggesting that financially literate investors are better able to utilize AI-driven insights.

Similarly, financial literacy significantly moderates the relationship between predictive analytics and investment decision-making ( $\beta = 0.167$ ,  $p < 0.05$ ), indicating that investors with higher financial knowledge can more effectively interpret predictive models and apply them in decision-making.

However, the moderating effect of financial literacy on the relationship between big data analytics and investment decision-making is not significant ( $\beta = 0.095$ ,  $p > 0.05$ ). This suggests that while big data provides valuable information, its effective use may depend more on technological access than financial knowledge.

Overall, these findings partially support H5 and highlight the critical role of financial literacy in enhancing the effectiveness of technology-driven investment decisions.

**Table 6:** Model Summary

Construct	R <sup>2</sup>	Q <sup>2</sup>	Interpretation
Investment Decision (ID)	0.452	0.318	Moderate Predictive Power

The model's predictive power was assessed using the coefficient of determination (R<sup>2</sup>) and predictive relevance (Q<sup>2</sup>), as presented in Table 6.

The R<sup>2</sup> value for investment decision-making is 0.452, indicating moderate explanatory power, meaning that approximately 45.2% of the variance in investment decision-making is explained by the independent variables.

The Q<sup>2</sup> value of 0.318 further confirms that the model has adequate predictive relevance. Additionally, the model fit indices, including SRMR (0.068) and NFI (0.912), fall within acceptable thresholds, indicating a good model fit.

## 5. Conclusion

This study examined the impact of artificial intelligence, big data analytics, and predictive analytics on the investment decision-making of retail investors. The findings provide strong empirical evidence that all three technological factors significantly influence investment decisions, with predictive analytics demonstrating the strongest effect, followed by artificial intelligence and big data analytics. These results indicate that advanced data-driven tools play a crucial role in enhancing the quality, efficiency, and rationality of investment decision-making among retail investors.

Furthermore, the study highlights the moderating role of financial literacy, revealing that investors with higher financial knowledge are better able to utilize technological tools effectively. This suggests that while technological advancements provide valuable decision-support systems, their benefits are maximized only when investors possess the necessary financial competencies. Overall, the study contributes to the growing literature on FinTech and behavioral finance by demonstrating how emerging technologies reshape investment behavior in modern financial markets.

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