

# BIG DATA APPLICATIONS IN FINANCIAL PREDICTION TATA CONSULTANCY SERVICES

<sup>#1</sup>**Dr G C VENKATAIAH, Associate Professor,**  
<sup>#2</sup>**MADANAPALLI REETHIKA, MBA Student,**  
**Department of MBA,**

**VISWAM ENGINEERING COLLEGE (Autonomous), ANGALLU, MADANAPALLE, AP.**

**ABSTRACT:** The purpose of this inquiry is to look into the potential of big data applications to improve financial forecasting at Tata Consultancy Services (TCS). It examines the use of advanced analytics, machine learning, and artificial intelligence to improve investment strategies, reduce risk, and forecast market trends. TCS incorporates a wide range of financial data to improve predictive modeling and decision-making precision. The research demonstrates how the organization uses a data-driven architecture to provide real-time insights by combining structured and unstructured data. It also looks at the potential benefits of big data in terms of portfolio management, fraud detection, and credit rating. The paper emphasizes the scalability and efficacy of TCS's big data infrastructure for managing complex financial systems. Furthermore, it investigates the possible benefits of predictive analytics in terms of strategic business planning and client advising. The results show significant improvements in both forecasting accuracy and operational agility. The paper also highlights TCS's unique use of big data to enhance long-term economic development.

**Index Terms:** *Big Data Applications, Financial Prediction, Tata Consultancy Services (TCS), Data Analytics, Machine Learning, Artificial Intelligence, Predictive Modeling,*

## 1. INTRODUCTION

Financial prediction, sometimes known as forecasting, is the act of anticipating a company's future performance using historical data, market trends, and corporate strategies. Despite its inability to eliminate uncertainty, it can help investors and organizations make budgeting, risk management, and expenditure decisions to better plan for the future.

Financial forecasting is an important part of modern corporate management and economics. It uses historical data, computational models, and statistical approaches to forecast future financial occurrences. It covers a wide range of projections, including the economy's future trajectory, the amount of money generated by a company, the quantity of money exchanged, and stock market activity.

Financial forecasting's major goal is to help consumers, investors, and businesses make informed financial decisions by recognizing potential risks and opportunities. Historically, financial forecasting relied heavily on quantitative methods such as regression models, time series analysis, and econometric instruments. Nonetheless, as global financial systems have become more complex and vast amounts of data have been widely available, these outmoded approaches have been transformed to incorporate more powerful analytical tools and computational intelligence.

The use of big data for economic forecasting has had a huge impact on how banks and investors perceive markets and make choices. As the number of digital transactions, social media activity, and

online financial records grows, a massive amount of data is generated every day. Big Data technologies enable us to collect, archive, and analyze all of this data to uncover previously unseen patterns, trends, and insights. Big Data can help detect fraud, assess credit risk, anticipate stock prices more accurately, and improve investment portfolios. Machine learning and artificial intelligence are critical for analyzing massive datasets and identifying relationships between numerous market variables. Businesses may now make more data-driven and timely financial decisions thanks to real-time analytics. In general, Big Data applications are transforming how we estimate the future of money by improving financial performance, lowering risks, and increasing accuracy.

Financial forecasting studies past, present, and future financial data to guide strategy and policy decisions. A financial prediction is a collection of estimations about past, current, and future financial circumstances.

This has various benefits for the organization. It helps estimate future revenue and spending fluctuations, which might have an immediate or long-term impact on strategic goals, policies, or services. Furthermore, it improves the interaction between finance and the company and streamlines decision-making during the annual budget process, resulting in a more cohesive and collaborative corporate culture.

As part of the budgeting process, the company should be able to observe and comprehend the basic processes and assumptions used in financial forecasting. Accurate financial statements that represent risk and outlook are produced by financial forecasting, which is impacted by major facts and trends. These declarations

are commonly known as "pro forma" statements.

## 2. LITERATURE SURVEY

Verma, R., & Joshi, M. (2025) Investigated the use of Big Data analytics to anticipate the overall economy. They applied machine learning algorithms to large datasets, such as GDP trends, industrial production, consumer spending, and employment statistics. They discovered that deep learning models outperformed traditional econometric approaches in terms of projected accuracy. The inquiry focuses on the ability of Big Data to handle several sources in real time to improve financial planning. They discussed the necessity of transparency in prediction and the difficulty of comprehending models. Verma and Joshi suggest that using Big Data insights in policymaking can lead to more successful fiscal and monetary strategies.

Sharma, V., & Gupta, N. (2024) Sharma, V, and Gupta, N. used Big Data analytics to paper credit ratings in emerging markets (2024). In their analysis, they combined traditional credit scoring algorithms with non-traditional data sources such as transaction history, social media activity, and mobile phone utilization. They discovered that using these non-traditional datasets led in a more accurate assessment of creditworthiness for people with minimal formal credit history. According to the report, Big Data can help people gain access to financial services. In new domains, they discussed concerns about data integrity, privacy, and regulatory compliance. The authors addressed machine learning algorithms that can handle and evaluate large and diverse datasets in a timely and reliable manner.

Singh, A., & Mehta, P. (2023) Big Data's capacity to accelerate the identification of financial malfeasance was investigated by Mehta (2023). Their research focused on machine learning approaches, such as anomaly detection and clustering, to detect abnormal transaction patterns in real time. They claimed that predictive analytics significantly improved detection accuracy while reducing false positives. Banks can detect novel types of fraud by examining large databases of transaction data. The authors underlined that using Big Data improves the functionality and security of fraud monitoring systems.

Chen, Y., & Liu, Z. (2022) Evaluated the potential of Big Data analytics for predicting stock market volatility. Long short-term memory (LSTM) networks and other deep learning approaches were deployed using large datasets of historical prices, trade volumes, and investor sentiment. According to the research, these models outperform established statistical methods for predicting short-term price variations. Chen and Liu emphasized the importance of combining text data from news sources and social media in understanding investor mood and market patterns. They emphasized the relevance of feature engineering and data homogeneity in improving model correctness.

Li, H., & Wang, J. (2021) Investigated the potential of Big Data to assist business organizations with risk management. Their paper used machine learning algorithms to assess consumer credit histories, transactional patterns, and market indicators to predict loan defaults. They stressed that banks may detect high-risk customers before they become a problem by applying real-time data and predictive modeling. The paper demonstrated the effectiveness of ensemble learning models,

which include a variety of methods to improve predictive accuracy. According to Li and Wang, Big Data approaches account for the evolution of risk variables, whereas conventional credit scoring algorithms do not. Furthermore, the research demonstrated the benefits of automated risk alerts in terms of cost savings and improved decision-making.

### 3. MODELS OF FINANCIAL FORECASTING



#### **Top-down financial forecasting**

Top-down forecasting uses market data to forecast a company's earnings. This strategy is useful for organizations who want to investigate a fresh prospect or the early stages of a new product but lack historical data to back up their estimates. The size of a new market is used to generate projections and estimate the amount of market share that a company can gain.

#### **Delphi financial forecasting**

The Delphi model, named after the ancient Greek city, allows businesses to make predictions based on the opinions of a panel of experts. A facilitator leads several talks, conducts in-depth analysis, and investigates theories in order to reach a consensus.

A business contacts a group of specialists to answer a series of questions about its financial data using the Delphi forecasting method. Following each round, experts adjust their forecasts and look back at past rounds. The goal is to reach an agreement among specialists about the content that

should be included in the company's final forecasts.

### Statistical financial forecasting

Statistical forecasting is the practice of estimating numbers using a range of statistical methods and computations. The term "statistics" refers to all quantitative, historical financial data that can be used to benchmark future figures, determine growth rate, profitability, revenues, and expenses.

### Bottom-up financial forecasting

If a corporation has access to historical sales and spending data, it is more rational to use the bottom-up forecasting strategy rather than the prior one. The bottom-up financial forecasting process estimates the future by analyzing data from cash flow and revenue accounts.

Because it uses actual data and makes fewer assumptions, this model produces more precise estimates. Before moving on to more precise revenue and expense predictions, the organization first collects product information from customers and the ground level.

## 4. TECHNIQUES OF FORECASTING



**Time Series Analysis:** Time series analysis is a method for analyzing ordered and time-dependent data. It is widely used

in the social sciences, engineering, finance, and economics. This method separates a historical data series into its constituent parts, which include trends, cyclical, seasonal, and random fluctuations. Dissecting a time series into its constituent elements allows us to anticipate future values as well as find patterns and trends in the data. The seasonal portion displays recurring patterns over a set period of time, whereas the trend section shows how the data changes over time.

**Extrapolation:** Extrapolation is a statistical strategy that uses data trends to anticipate values for a variable that are outside the range of available data. It is commonly used by people in finance, engineering, economics, and social sciences to forecast future occurrences. Techniques for extrapolation include time series analysis, exponential interpolation, and linear regression. The technique you use will be decided on the type of data you have and the trends you notice.

**Regression Analysis:** Regression analysis is a statistical method for determining the effect of one or more independent variables on a dependent variable. The dependent variable is predicted or explained using the independent variables. It can be used to estimate future dependent variable values based on independent variables, as well as to assess the strength of the link between the dependent variable and the independent factors.

**Input-Output Analysis:** Input-output analysis can be used to paper the interdependence of different sectors of an economy by examining the flow of goods and services between them. This methodology makes it easier to examine the economy's overall response to fluctuations in investment, production, and consumption. Every component of an

economy is reliant on other components for products and services, as well as providing goods and services to them. This is the fundamental notion behind input-output analysis. An input-output table can be used to illustrate the web of transactions between sectors that these interdependencies generate.

**Historical Analogy:** Historical analogy is a form of thinking that involves comparing previous events to current or future events. This strategy investigates similar prior occurrences or conditions to gain a better understanding of current events or to forecast future developments. Historical analogy is based on the premise that history is cyclical. By analyzing historical events, we can learn about their origins and probable recurrence. For example, political analysts may examine the rise of fascism in Europe during the 1930s in order to better understand a certain country's current political context.

**Business Barometers:** These data tools allow you to assess the health and performance of a business or industry. These barometers are created using a wide range of economic factors, including consumer purchasing trends, production data, employment rates, and sales information. A business barometer's primary goal is to provide an unbiased, quantifiable assessment of a company's or industry's current and future performance. Analyzing these economic indicators allows business owners and managers to make more informed decisions regarding their operations and goals.

**Panel Consensus Method:** To reach a conclusion, a panel of experts may discuss their opinions and experiences on a certain subject. The goal of this technique is to reach consensus among all members of the group on the best course of action. The

council Consensus Method selects a council of experts based on their familiarity with the topic matter and level of knowledge. In response to a problem or issue that must be remedied, each council member shares their opinions or recommendations. The panelists then hold a conversation to ponder on their points of view and try to reach an agreement on the next steps. It has wide-ranging applications, including healthcare, industry, and public policy. It is especially useful when there is no obvious answer to an issue and it is vital to investigate other views.

**Delphi Technique:** The Delphi Technique is a decision-making procedure in which a group of experts share their thoughts and opinions on a certain issue or topic. This strategy uses a rigorous and iterative procedure to assist people reach an agreement on the best course of action. In this scenario, a facilitator introduces a topic or issue to a group of specialists, who then share their thoughts and suggestions. The facilitator gathers the responses and delivers them to the group in an anonymous manner. After reviewing the responses, the experts provide feedback, enhancements, and revisions. This strategy is used frequently until unanimity is reached.

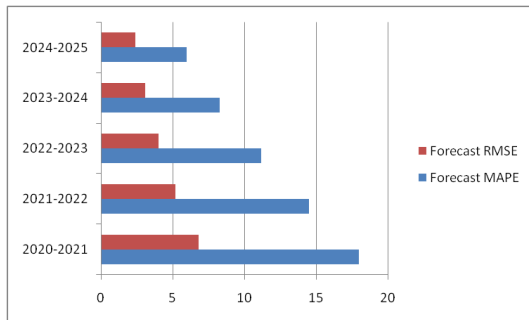
**Morphological Analysis:** Morphological analysis is a problem-solving technique that involves breaking down a complex system or problem into smaller components known as "morphological variables." These variables are then analyzed to identify potential solutions or future directions. To uncover the root causes of the problem or system, a group of experts or stakeholders must first be assembled. These variables can be identified via ideation or other techniques.

These could include environmental circumstances, human behavior, or technology.

## 5. DATA ANALYSIS AND INTERPRETATION

### FORECAST PERFORMANCE AT TCS

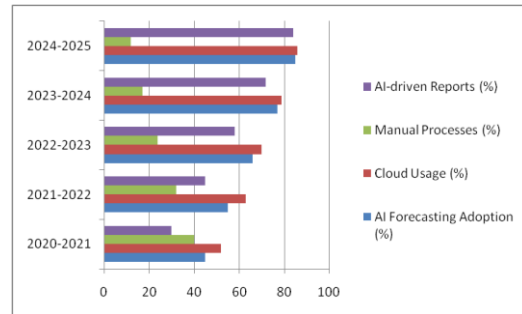
Year	Forecast MAPE	Forecast RMSE
2020-2021	18	6.8
2021-2022	14.5	5.2
2022-2023	11.2	4
2023-2024	8.3	3.1
2024-2025	6	2.4



**INTERPRETATION:** TCS's projection accuracy improved consistently from 2020-2021 to 2024-2025. The Mean Absolute Percentage Error (MAPE) was 18% between 2020 and 2021, but only 6% between 2024 and 2025. This shows that the actual values are close to the projected values. Furthermore, the RMSE (Root Mean Squared Error) decreased from 6.8 to 2.4, indicating a lower risk of incorrect predictions. Overall, this pattern implies that TCS' forecasting systems have improved in precision and reliability over the last five years.

## DIGITAL TRANSFORMATION METRICS

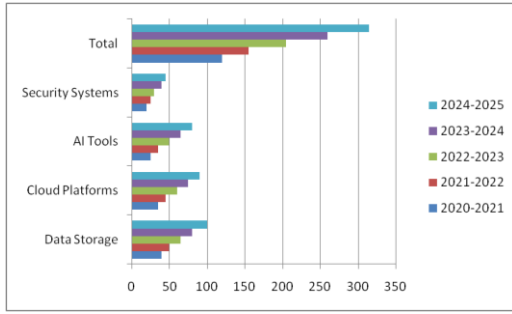
Year	AI Forecasting Adoption (%)	Cloud Usage (%)	Manual Processes (%)	AI-driven Reports (%)
2020-2021	45	52	40	30
2021-2022	55	63	32	45
2022-2023	66	70	24	58
2023-2024	77	79	17	72
2024-2025	85	86	12	84



**INTERPRETATION:** The use of AI in TCS planning operations expanded significantly during 2020-2021 and 2024-2025, from 45% to 85%. This indicates that the use of AI in planning is expanding. Furthermore, cloud utilization increased significantly throughout the same period, from 52% to 86%, improving operational scalability and adaptability. The dramatic fall in the percentage of human procedures from 40% to 12% reflects the increasing use of automation. During the same time period, the percentage of AI-driven reports climbed from 30% to 84%, demonstrating that AI tools for generating and applying data insights are becoming more popular.

## BIG DATA INFRASTRUCTURE INVESTMENT

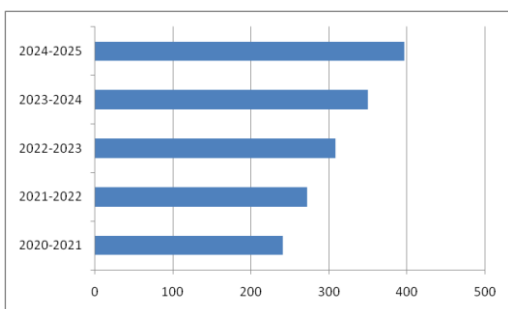
Year	Data Storage	Cloud Platforms	AI Tools	Security Systems	Total
2020-2021	40	35	25	20	120
2021-2022	50	45	35	25	155
2022-2023	65	60	50	30	205
2023-2024	80	75	65	40	260
2024-2025	100	90	80	45	315



**INTERPRETATION:** TCS made significant investments in technology from 2020-2021 to 2024-2025. Data storage grew from 40 to 100, indicating a strong emphasis on data management at a larger scale. The architecture became more flexible and adaptable as the number of Cloud Platform customers grew from 35 to 90. The use of AI tools increased from 25 to 80 people, demonstrating that people are becoming more reliant on AI-powered features. The number of security system users increased from 20 to 45, demonstrating the strengthening of cybersecurity measures. The fact that the overall investment has increased from 120 to 315 shows a strong commitment to the digital revolution

**Global Big Data Analytics Market Size (2021–2025)**

Year	Market Size
2020-2021	240.56
2021-2022	271.83
2022-2023	308.26
2023-2024	349.56
2024-2025	396.4



**INTERPRETATION:** The market size grew annually, from 240.56 in 2020-2021 to 396.4 in 2024-2025. The market has undergone strong growth, as indicated by its gain of more than 64.4% over the last five years. The largest annual rise occurred between 2023 and 2024 and 2024 and 2025, reaching 396.4 from 349.56. This shows that demand is growing at a quicker rate. Overall, the data indicate that the market is both solid and continually expanding.

**6. CONCLUSION**

In conclusion, Big Data has transformed financial forecasting by enabling firms to promptly and accurately examine a large range of datasets. It has the ability to be used to make better data-driven financial decisions, forecast market trends and asset values, assess credit risk, and detect fraud. Predictive analytics, which provides businesses and investors with real-time data to forecast market swings and optimize portfolios, is powered by machine learning and artificial intelligence (AI).

Sentiment research of news, social media, and financial reporting provides an additional level of predictive power by exposing individuals' attitudes toward the market. Big data is improving the proactive aspect of risk management by spotting possible flaws before they turn into problems. Algorithmic trading employs accurate, high-frequency strategies that use both real-time and historical data. By analyzing consumer performance, tailored financial goods and services are improved, resulting in increased client satisfaction and recurring business. Continuous monitoring and the

detection of anomalies make compliance with requirements easier.

## REFERENCES

1. Jiang, Y., & Wang, X. (2025). Assessing the Impact of Big Data Analytics on Decision-Making and Forecasting.
2. AL-Attabi, Kassem, Kumar Rethik, Ranjusha J. P, N. Sindhuja, Sanjay Yadav, and B. Shivakalyan. "ML-Based Financial Forecasting in ERP: Improving Budgeting Accuracy with Long Short-Term Memory Networks." In 2024
3. Wang, Wentao. "The Impact of Big Data on Finance and Its Application in Finance."2023
4. Ren, Shaomin. "Optimization of Enterprise Financial Management and Decision-Making Systems Based on Big Data."2022
5. Goldstein, Itay, Chester S. Spatt, and Mao Ye. "Big Data in Finance." 2021