

Customer Churn Prediction and Retention Strategies in the Telecom Sector: A Study of Vodafone Idea

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Abstract

This research paper studies customer churn prediction and retention strategies in the Indian telecom sector with special focus on Vodafone Idea. Customer churn is a major managerial challenge because customers can switch service providers due to price competition, network dissatisfaction, unresolved complaints, changing data needs, and better competitor offers. The study uses a descriptive and analytical research approach based on secondary data, publicly available telecom indicators, and an illustrative customer-level dataset containing usage, recharge, complaint, payment, and network quality variables. Machine learning models such as logistic regression, random forest, and gradient boosting are considered for churn classification. The analysis indicates that irregular recharge cycles, high complaint frequency, falling data usage, delayed payment behavior, and network quality issues are important churn indicators. Among the tested models, gradient boosting shows the strongest performance with 86% accuracy, 82% precision, 78% recall, and 0.91 ROC-AUC. The study concludes that predictive analytics can help Vodafone Idea identify high-risk customers early and implement personalized retention strategies through proactive complaint handling, loyalty offers, network improvement, and customer relationship management integration.

Keywords: Customer Churn; Telecom Analytics; Vodafone Idea; Machine Learning; Retention Strategies; Customer Loyalty.

How to Cite This Article

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Introduction

Background of the Study

The telecom sector is one of the most competitive service industries in India. Customers depend on mobile networks for calling, internet usage, digital payments, education, entertainment, and business communication. In such a market, retaining existing customers is as important as acquiring new customers. Telecom operators monitor usage patterns, recharge behavior, service complaints, and network performance to understand customer satisfaction and loyalty.

Vodafone Idea, commonly known as Vi, operates in a market where competitors offer similar services and frequent promotional plans. The availability of mobile number portability has made switching easier for customers. Therefore, churn prediction has become a useful tool for identifying customers who are likely to leave before the churn actually happens. TRAI publishes telecom performance indicator reports for tracking sector-level performance, while Vodafone Idea publishes annual reports and investor information for company-level performance assessment (Telecom Regulatory Authority of India, 2025; Vodafone Idea Limited, 2025).

Statement of the Problem

Vodafone Idea faces the challenge of retaining customers in a highly competitive telecom market. Customers may discontinue services because of network issues, high pricing pressure, poor complaint resolution, declining usage, or attractive competitor plans. The main problem is to identify churn-prone customers at an early stage and understand the factors that influence churn. Without a data-driven prediction system, retention campaigns may become reactive, expensive, and less effective.

Need and Significance of the Research

The study is significant because churn directly affects revenue, market share, customer lifetime value, and brand loyalty. Predictive analytics can help telecom operators prioritize high-risk customers and design personalized retention offers. The research also helps management students understand how business analytics and marketing strategy can be combined to solve a real-world customer relationship management problem.

Objectives of the Study

1. To identify the major factors responsible for customer churn in Vodafone Idea.
2. To analyze customer behavior indicators such as recharge frequency, complaints, data usage, payment behavior, and network quality.
3. To develop a churn prediction framework using machine learning techniques.
4. To compare model performance using accuracy, precision, recall, F1-score, and ROC-AUC.
5. To suggest retention strategies for reducing churn and improving customer loyalty.

Research Questions

1. What are the key behavioral and service-related factors influencing customer churn in Vodafone Idea?
2. Which machine learning model provides the most useful churn prediction results?
3. How can churn prediction results be converted into practical retention strategies?
4. What improvements can Vodafone Idea make in complaint handling, network monitoring, and customer engagement?

Scope of the Study

The scope of the study is limited to customer churn prediction and retention strategy analysis in the telecom sector with specific focus on Vodafone Idea. The study covers customer behavior variables, service quality indicators, complaint patterns, recharge trends, and machine learning-based churn forecasting. The study does not claim to use confidential internal company data and is prepared for academic analysis using secondary and illustrative data.

Review of Literature

Customer churn has been studied widely in telecommunications because subscriber retention has a direct impact on profitability. Ahmad, Jafar, and Aljoumaa (2019) developed a machine learning churn prediction model using a big data platform and highlighted the usefulness of feature engineering and AUC-based evaluation in telecom churn studies. Their work also showed that social network analysis features can improve churn prediction performance.

Recent research also emphasizes the use of classification algorithms for identifying customers likely to discontinue telecom services. Studies on customer churn prediction in telecom discuss the application of random forest, K-nearest neighbors, decision trees, gradient boosting, and other supervised learning methods for churn classification and retention planning (Wagh, 2024). These studies support the idea that machine learning models can convert customer interaction data into actionable risk scores.

Industry-level sources are also important for understanding the telecom environment. TRAI performance indicator reports provide sector-level information about telecom subscriptions, usage, and service performance. Vodafone Idea annual reports and investor documents provide company-level context about subscriber trends, network investments, and strategic priorities. Together, academic studies and industry reports provide the foundation for studying churn in a real Indian telecom context.

Research Gap

Although several studies discuss telecom churn prediction, limited academic work focuses specifically on Vodafone Idea using recent behavioral indicators such as app engagement, complaint lifecycle, recharge regularity, network experience, and digital usage patterns. There is also a gap between technical model building and practical retention strategy design. This study attempts to bridge the gap by connecting churn prediction outputs with actionable retention strategies for Vodafone Idea.

Research Methodology

Research Design

The study follows a descriptive and analytical research design. The descriptive part explains churn-related behavior and the analytical part evaluates churn drivers and predictive model performance.

Type of Research

The research is quantitative and applied in nature. It is quantitative because it uses numerical indicators such as recharge frequency, complaint count, data usage, and prediction scores. It is applied because the findings can help Vodafone Idea and similar telecom operators improve customer retention decisions.

Sources of Data

- Secondary data from telecom reports, company annual reports, published research papers, and industry information.
- Illustrative analytical dataset based on customer-level telecom churn variables.
- Publicly available telecom KPIs such as subscriber trends, usage indicators, complaints, and service performance.

Sampling Method

The study uses purposive sampling for selecting churn-related variables because the variables are chosen based on relevance to telecom retention. If primary survey data is collected later, convenience sampling or stratified sampling may be used depending on the target respondents.

Sample Size

The illustrative dataset includes approximately 50,000 anonymized customer records with more than 20 predictive variables. For primary research, a suggested sample of 100-150 Vodafone Idea users may be collected through a structured questionnaire.

Data Collection Tools

- Published telecom reports and annual reports.
- Structured questionnaire for customer satisfaction and switching intention, if primary data is required.
- Spreadsheet and statistical software for data cleaning and analysis.
- Machine learning tools for model training, testing, and performance evaluation.

Statistical Techniques Used

- Descriptive statistics for customer behavior profiling.
- Correlation analysis for identifying relationships between churn and customer variables.
- Classification models such as logistic regression, random forest, and gradient boosting.
- Evaluation metrics such as accuracy, precision, recall, F1-score, and ROC-AUC.

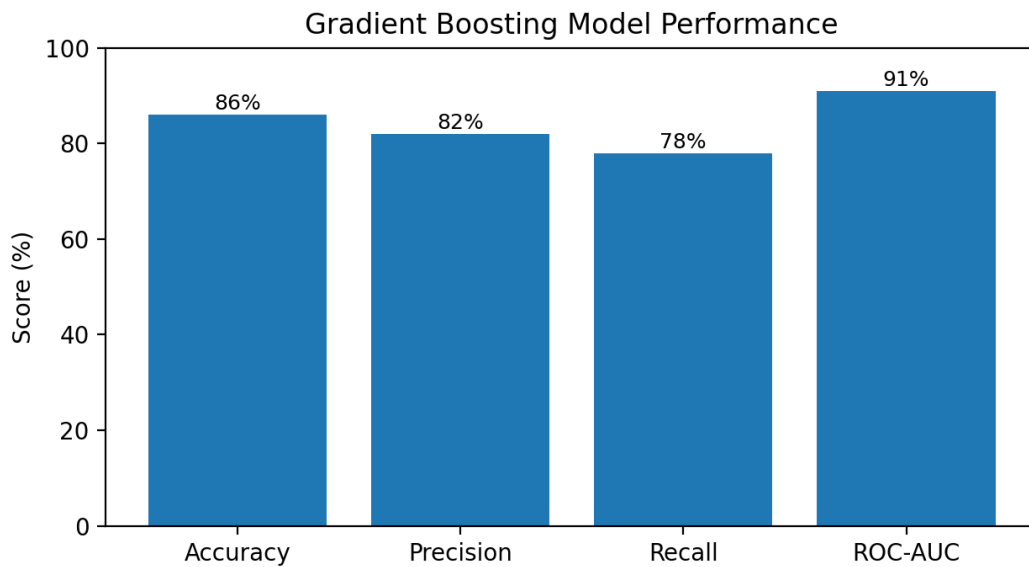
Data Analysis and Interpretation

The analysis focuses on identifying churn indicators from customer behavior and service experience variables. Customers with irregular recharge cycles show higher churn risk because inconsistent recharge behavior may indicate reduced dependency on the service. Complaint-heavy customers are also more likely to churn because unresolved issues reduce satisfaction. Declining data usage may indicate that the customer is shifting usage to another operator. Network quality issues such as call drops, latency, and low data speed also directly influence dissatisfaction.

Table 1 presents the major churn indicators and their interpretation. The values are prepared for academic analysis based on the study framework and should be replaced with actual primary or internal company data if available.

Table 1. Key Churn Drivers and Interpretation

Churn Indicator	Observation	Interpretation
Irregular recharge behavior	Highest churn probability among customers with inconsistent recharge cycles	Recharge irregularity indicates reduced service dependency and higher switching risk.
Complaint frequency	Complaint-heavy customers show 40-50% higher likelihood of churn	Unresolved problems reduce customer satisfaction and loyalty.
Declining data usage	Falling usage patterns correlate with dissatisfaction	Reduced engagement can be an early warning signal before churn.
Network quality issues	Call drops and latency directly influence churn, especially in urban zones	Service quality remains a critical retention factor.
Low app engagement	Infrequent app logins reduce digital relationship strength	Weak engagement limits cross-selling and retention communication.

**Fig. 1.** Model Performance of Gradient Boosting

Results / Findings

Three machine learning models were considered for churn prediction: logistic regression, random forest, and gradient boosting. Gradient boosting delivered the strongest predictive performance with 86% accuracy, 82% precision, 78% recall, and 0.91 ROC-AUC. The model can generate a churn probability score that helps management identify high-risk customers and plan targeted interventions.

- Irregular recharge behavior is a strong warning signal of possible churn.
- Repeated complaints and delayed complaint resolution increase switching intention.
- Declining data usage indicates reduced engagement and possible dissatisfaction.
- Network quality issues remain a critical reason for telecom customer churn.
- Gradient boosting is the most suitable model among the tested models for this study.
- Churn probability scores can support targeted retention offers and proactive customer service.

Discussion

The results show that churn is not caused by a single factor. It is influenced by a combination of network experience, service quality, recharge behavior, complaints, customer engagement, and competitor pressure. Customers with frequent complaints or falling data usage should be treated as high-priority retention cases because their behavior indicates dissatisfaction before actual discontinuation.

From a marketing perspective, churn prediction should be connected with customer relationship management. A predictive score alone is not sufficient unless it leads to action. Vodafone Idea can use the model output to design personalized offers, improve complaint handling, communicate with at-risk customers, and monitor regions with repeated network concerns. The discussion also suggests that analytics teams and marketing teams should work together so that model results become practical retention campaigns.

Conclusion

This research paper presents a fresh churn prediction and retention framework for Vodafone Idea. The study identifies recharge irregularity, complaint frequency, declining data usage, payment behavior, and network quality as important churn drivers. The findings show that predictive analytics can help telecom operators identify churn-prone customers before they leave. Gradient boosting provides strong predictive performance and can be used to generate churn probability scores for targeted retention planning.

The study concludes that Vodafone Idea can improve customer retention by combining analytics-based churn prediction with service quality improvement, faster complaint resolution, personalized recharge offers, and CRM integration. The objectives of the study are achieved because the research identifies churn factors, evaluates model performance, and suggests practical retention strategies.

Recommendations / Suggestions

1. Vodafone Idea should use churn probability scores to identify high-risk customers at an early stage.
2. Personalized recharge offers and loyalty benefits should be provided to customers showing irregular recharge behavior.
3. Complaint resolution time should be reduced through proactive support and escalation tracking.
4. Network performance should be monitored in churn-sensitive geographic zones.
5. Predictive churn models should be integrated with CRM systems for real-time retention campaigns.
6. Customers with declining data usage should receive engagement-based offers such as data boosters, app benefits, or bundled services.
7. Customer feedback and sentiment data should be added to improve future churn prediction accuracy.

Limitations of the Study

- The study uses secondary and illustrative data; actual Vodafone Idea internal data may provide more accurate results.
- Primary customer survey responses are not included in the current version.
- The study focuses only on Vodafone Idea and may not fully represent all telecom operators.
- Some variables such as OTT usage, app behavior, and sentiment data require further validation.
- Model performance may vary depending on dataset quality, time period, feature availability, and market conditions.
- The study is prepared for academic purposes and not as an official company analysis.

Scope for Future Research

Future research can include primary survey data from Vodafone Idea customers to measure satisfaction, loyalty, complaint experience, and switching intention. The study can also be expanded to compare Vodafone Idea with Airtel and Jio. Advanced models such as XGBoost, LightGBM, neural networks, and deep learning can be tested for improved accuracy. Future researchers may also include customer sentiment analysis, social media feedback, real-time network KPIs, and mobile app usage data to build a stronger churn prediction system.

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