

CUSTOMER GRIEVANCE REDRESSAL IN E-RETAILING: A DATA MINING APPROACH

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Abstract:

In the rapidly evolving e-retail sector, efficient customer grievance redressal is crucial for maintaining competitive advantage and customer loyalty. This study introduces a novel approach by leveraging data mining techniques, specifically clustering and causal analysis, to revolutionize the grievance redressal process in e-retailing. Using a comprehensive synthesized dataset of 1,000 customer grievances, we implemented advanced text pre-processing methods and applied clustering algorithms such as K-means to categorize grievances into meaningful clusters. Our innovative integration of causal analysis with clustering results revealed systemic issues, providing actionable insights into the underlying causes of customer dissatisfaction. This research not only uncovers critical patterns in customer complaints, but also proposes targeted interventions to address these issues effectively. The expected contributions of this study extend to various stakeholders, including e-retailers, who can enhance their customer service strategies; data scientists, who gain insights into the application of advanced data mining techniques; and customers, who benefit from improved service quality and satisfaction. By addressing common grievances related to delivery, product quality, and service efficiency, this research offers a transformative framework for elevating the standard of customer grievance redressal in the e-retailing industry. In future work, the researcher plans to employ machine learning to develop a hybrid predictive model, further enhancing the capability to identify and address potential grievances preemptively.

Keywords: Customer Grievance Redressal, Clustering, Data Mining, Casual Analysis.

I. INTRODUCTION

In the highly competitive e-retail industry, addressing customer grievances effectively is crucial for maintaining customer satisfaction and loyalty. Data mining techniques provide powerful tools to analyze customer feedback, identify patterns, and uncover systemic issues. This study focuses on utilizing clustering and causal analysis to enhance the grievance redressal process for e-retailers. Shift focus to complaint management for improved business intelligence, AI analyzes 297k tweets to predict online complaint types based on content, interactions, traits, emotions. Machine learning offers novel complaint management model [Dobrucalı Yelkenci]. Online shopping risks include lack of physical verification, deceit, and

poor service. Limited consumer protection laws necessitate customer vigilance to avoid fraud [Keerthana Thangavel (2022),]. Addressing complaints is crucial for evaluating performance and enhancing consumer experience. By analyzing customer reviews, we aim to identify key themes and root causes of grievances, enabling e-retailers to implement targeted strategies for improvement.

II. Literature Review-

After Systematic analysis researcher traced that future of customer grievance redressal need technical focus and so identified GAP as:

Rashika Narain discussed the advancements in large language models and the issues in incorporating AI for consumer protection. The absence of standardized solutions hinders integration, leading to consumer protection gaps in digital commerce. Encouraging standardized solutions and integrating AI can enhance grievance resolution for consumers.

Many big e-commerce companies have ineffective grievance redressal systems, leading to a power shift favoring sellers [PTI]. Data mining helps businesses analyze online customer complaints to understand and manage issues effectively. While satisfying all customers may not be possible, data mining can help address and manage complaints efficiently [ERDURAN, G. Y., & LORCU, F. (2020)]. Advancements in technology and internet usage create a need for more storage and analysis of data for businesses. Online customer complaint channels are now crucial for addressing complaints and enhancing customer satisfaction, using text mining for efficient complaint analysis [Kiraz, A., Eski, H., & Geçici, A. Ö. (2020)].

The combined use of sentiment and SPC analyses is suggested for monitoring online customer complaints to enhance service quality. Automated methods are effective in resolving issues, as shown in a mobile game service case study. Future research can further improve lexicon features for different service industries [Kim, J., & Lim, C. (2021)]. Globalization increases competition, focusing on CRM and managing complaints for customer relationships. The study uses ML to predict complaint management on Turkey's top online platform. Random forests excel in performance prediction [Peker, S. (2022)]. Novel fraud detection framework with NLP and ML identifies digital marketplace fraud, improving text processing and classification [Mutemi, A., & Bacao, F. (2024)]. Study emphasizes importance of Data Analytics Capabilities in Customer Relationship Management for marketing decisions, focusing on retail industry performance [Jabado, R., & Jallouli, R. (2024)].

The rise in e-commerce transactions has highlighted the absence of standard technical solutions for customer grievance redressal. This gap drives the need to analyze customer

reviews using data mining techniques such as clustering, with the aim of identifying and analyzing key patterns and root causes in e-retailing.

III. RESEARCH METHODOLOGY

III.1. Research Questions

1. What constitute typical patterns and trends in customer reviews for e-commerce stores?
2. In what manner can methods of clustering discover unique groupings of consumer grievances?
3. What be the real reasons of the detected grievances and their influence on customer satisfaction?

III.2. Objective and Hypothesis

To identify and analyze key patterns and root causes in customer reviews for e-retailers using clustering and causal analysis.

III.3. Hypothesis: Systemic issues in product quality, delivery, and customer service are the primary drivers of customer dissatisfaction in e-retail.

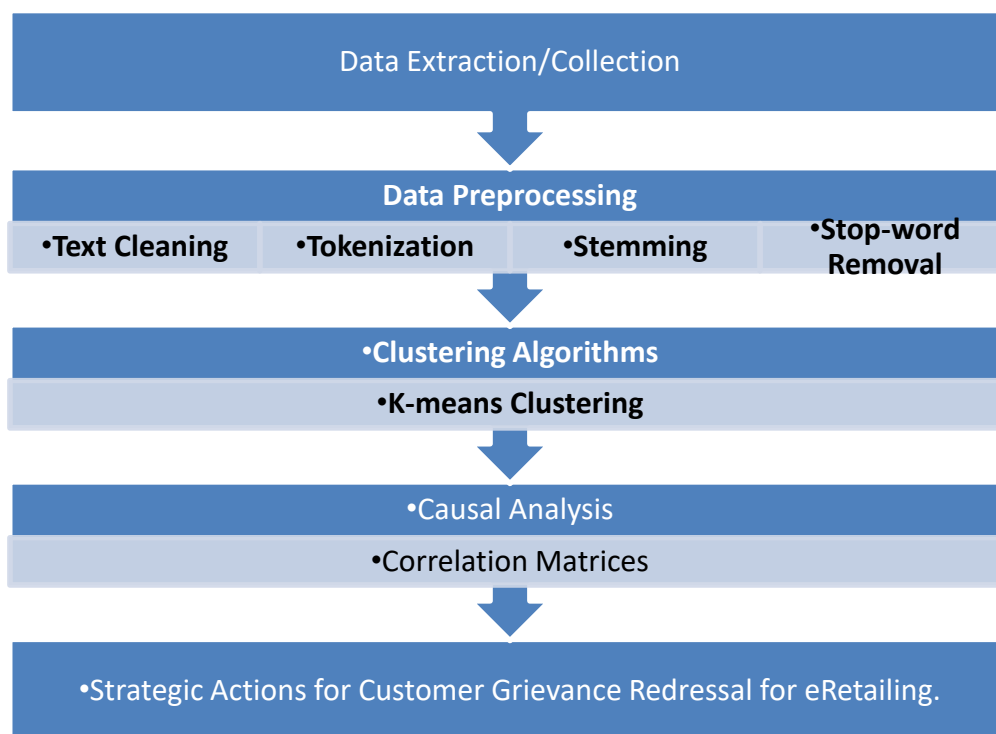
III.4. Sampling:

A dataset of 1,000 customer reviews from a prominent e-retailer was generated using synthetic data techniques. Each review includes details such as product ID, customer ID, review date, rating, review text, and the communication channel used.

III.5. Research Methodology Techniques:

The study employed data preprocessing techniques, including text cleaning, tokenization, stemming, and stop-word removal, to prepare the textual data. Clustering algorithms, specifically K-means, were applied to group similar reviews. Causal analysis, utilizing correlation matrices, was conducted to identify relationships between key terms and their impact on customer satisfaction.

General Framework for Customer Grievance Redressal for e-Retailing using Datamining is –



• **Figure 3: Customer Grievance Redressal for eRetailing Data Mining Framework**

Data mining approach for customer grievance redressal involves different steps as depicted in figure no.1. Data pre-processing involves several steps to ensure the accuracy of text analysis. These steps include text cleaning, tokenization, stemming, and stop-word removal. Text cleaning ensures uniformity and removes irrelevant information, while tokenization breaks down text into units for analysis. Stemming reduces words to their root forms, while stop-word removal eliminates common but uninformative words. K-means Clustering group similar reviews into distinct clusters, identifying common themes and patterns.

Causal analysis uses correlation matrices to identify relationships between key terms and their impact on customer satisfaction. This helps identify potential causal relationships between identified issues and overall customer sentiment. The combination of data pre-processing, clustering, and causal analysis provides a comprehensive approach to understanding customer grievances. This approach helps identify primary categories of complaints, while causal analysis reveals underlying causes and their impacts. Strategic actions include data-driven decisions, implementing targeted improvements in areas such as product quality, delivery processes, and customer service, and enhancing satisfaction by addressing identified root causes.

Results and Discussions

Based on the clustering and root cause analysis, we can interpret the results as follows:

Cluster	Top Terms
1	amaz, arriv, better, buy, conveni, custom, damag, ...
2	better, conveni, custom, easi, exceed, excel, expect, ...
3	damag, disappoint, poor, product, qualiti, quit, ...
4	easi, exceed, love, recommend, satisfi, ...
5	good, money, overal, qualiti, recommend, ...

Table No.1: Cluster wise Top Terms

The cluster analysis reveals customer sentiments based on key terms extracted from reviews. The first cluster, Delivery and Experience Issues, primarily features terms related to delivery issues and overall Amazon experience. These issues include damaged goods or delays, leading to dissatisfaction. The second cluster, Convenience and Customization, emphasizes enhanced convenience and customization, with terms like "conveni" and "custom" suggesting customers appreciate the ease of use and ability to tailor their experience. "Better" and "exceed" indicate that these aspects are positively received, contributing to a better overall customer experience.

The third cluster, Quality and Damage Complaints, highlights significant negative feedback, focusing on quality and damage issues. Terms like "disappoint", "poor", and "qualiti" reveal customers are unhappy with product quality and condition. "Quit" might indicate a customer decision to stop using the service due to these issues. The fourth cluster, Positive Feedback and Satisfaction, focuses on the value customers perceive, with terms like "love", "recommend", and "satisfi" suggesting high levels of customer satisfaction. Customers in this cluster are inclined to recommend the product or service based on their perception of value.

Root cause identification shows that frequent issues with delivery and product quality are major concerns, which can be addressed by improving these factors. The presence of terms like "support" and "custom" highlights the importance of robust customer service and customization options. Recommendations include improving delivery and product quality by streamlining the delivery process and ensuring product quality to reduce issues related to damage and dissatisfaction. Investing in features that improve ease of use and customization is also recommended. Strengthening customer support is also crucial to address issues promptly and improve overall satisfaction.

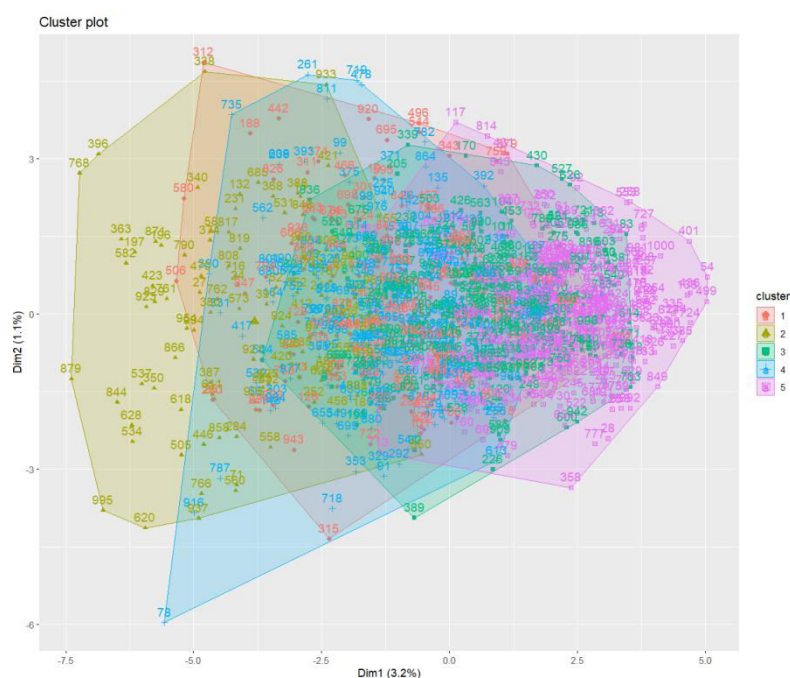


Figure 2 Clustering for Customer Review for Customer Grievance Redressal

The cluster plot represented in figure no. 2 of customer review data reveals five distinct clusters: Red (Red), Yellow (Yellow), Green (Green), Blue (Blue), and Pink (Pink). These clusters are identified based on the severity of issues, such as product defects or delivery failures, and the level of satisfaction with product quality and value. The clustering analysis reveals that these patterns provide valuable insights into the key areas that influence customer experiences in e-retailing. The variation in feedback emphasizes the need for tailored strategies to address specific issues pertinent to each cluster.

Frequent issues with delivery and product quality are significant contributors to customer dissatisfaction, while positive feedback on product usability and overall experience highlights areas of strength that can be emphasized in marketing and customer engagement efforts. Strategic implications include improving delivery accuracy and timeliness, optimizing supply chain processes, better coordination with delivery partners, and transparent communication with customers regarding delivery timelines. Implementing stringent quality control measures can reduce defects and damage, thus addressing the critical issues identified in Cluster 1. Enhancing customer service training and ensuring consistent service quality can mitigate mixed feedback observed in Cluster 3. Personalized and empathetic customer support can significantly improve customer perceptions. Maintaining a strong value proposition by offering high-quality products at competitive prices can continue to drive positive feedback in Cluster 5.

The findings from this study provide a foundation for developing a hybrid predictive model using machine learning techniques, which can predict potential customer grievances and proactively address them. Implementing real-time sentiment analysis and automated response systems can further enhance the efficiency and effectiveness of customer grievance redressal processes. so, understanding and addressing customer grievances in the e-retail sector is crucial for e-retailers to improve customer satisfaction and loyalty. By leveraging data mining techniques such as clustering and causal analysis, e-retailers can identify key patterns and root causes of customer dissatisfaction.

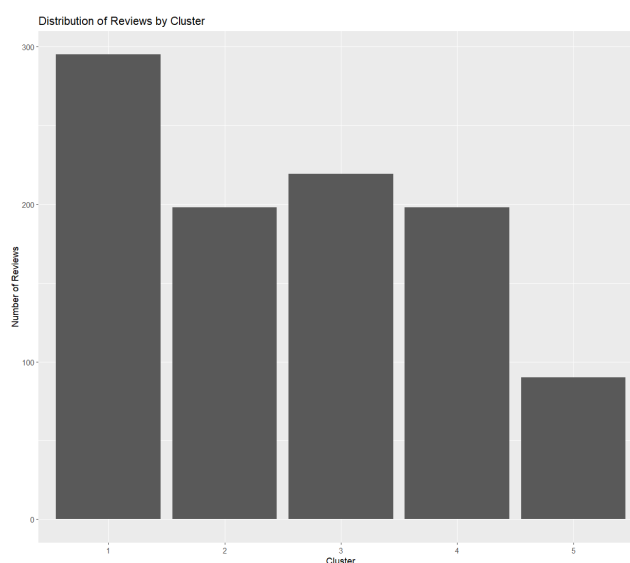


Figure 3: Cluster-wise Review Distribution

The histogram plot in the figure no.3 shows the distribution of customer reviews across five clusters. Cluster 1 (Highest Frequency) has the largest proportion of reviews, indicating common issues or themes experienced by customers. This cluster demands immediate attention from e-retailers, as resolving these issues can significantly impact overall customer satisfaction. Common issues include delivery delays, product quality problems, and poor customer service.

Cluster 2 has around 200 reviews, suggesting another set of prevalent issues faced by customers. This cluster also represents a significant portion of customer grievances that need to be addressed. Potential issues could include moderately common issues related to specific product categories, return processes, or service failures. Cluster 3 has slightly fewer than 200 reviews, indicating another group of common grievances. This cluster might reveal issues related to product usability, minor delivery problems, or less frequent customer service complaints. This cluster may consist of reviews highlighting positive feedback, indicating

areas where the retailer is performing well. Insights from this cluster can be used to reinforce successful practices and highlight the retailer's strengths.

Cluster 4 may consist of reviews highlighting positive feedback, indicating areas where the retailer is performing well. Insights from this cluster can be used to reinforce successful practices and promote areas where the retailer is performing well. Highlighting these strengths can enhance customer loyalty and satisfaction. Cluster 5 may contain specific and less common issues to ensure all aspects of the customer experience are optimized, even those affecting a smaller segment of the customer base. By systematically addressing issues identified in each cluster, e-retailers can develop a comprehensive and effective approach to customer grievance redressal, ultimately leading to improved customer satisfaction and loyalty.

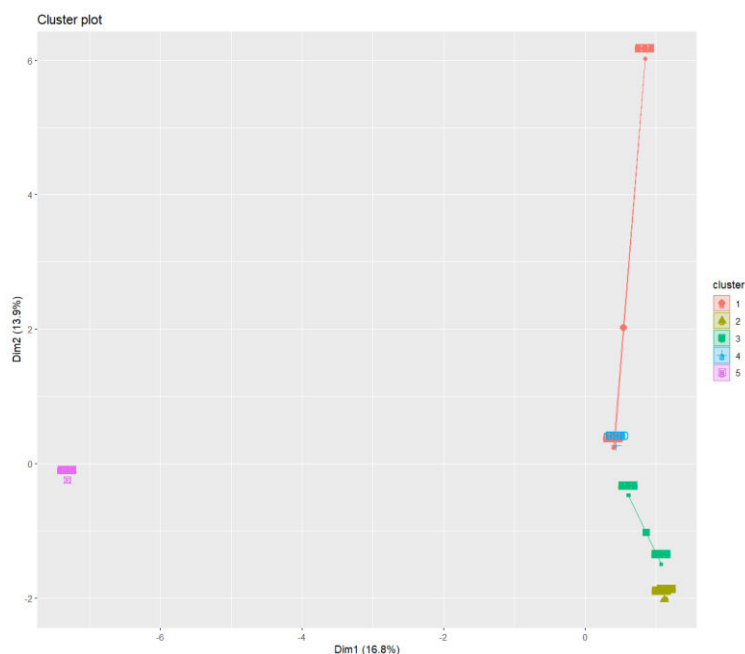


Figure 4: Reduced Dimensional Space Cluster Plot

The cluster plot in the figure no.4 is a visual representation of customer grievances in a reduced dimensional space, allowing for understanding the separation and relationships between clusters. Cluster 1 (Red Points) is significantly separated from other clusters, suggesting distinct issues and potential focus areas. This cluster represents extreme cases of dissatisfaction or specific problems that require targeted interventions. Cluster 2 (Yellow Points) is slightly closer to Clusters 3 and 4, indicating some overlap but maintaining distinct boundaries. It likely involves common but distinct grievances, such as specific product categories or moderate service issues. Cluster 3 (Green Points) is slightly lower and to the left of Cluster 2, suggesting related issues but having distinct features to form a separate cluster.

Cluster 4 (Blue Points) is central, indicating common issues that overlap with several other clusters. It likely represents moderately frequent grievances related to product quality, customer service, or delivery that are common across various customer experiences. Cluster 5 (Pink Points) is far left, indicating distinct but limited issues. Strategic recommendations include immediate action on unique issues (Cluster 1), focusing on the specific nature of grievances and implementing targeted solutions. Addressing common themes (Clusters 2, 3, and 4) should focus on improving areas common across these clusters, such as product quality and delivery services.

Niche problem solving (Cluster 5) involves identifying and resolving specific problems unique to this cluster and ensuring that niche grievances are not overlooked to maintain overall customer satisfaction. By understanding the distinct and common themes in customer grievances, e-retailers can develop more effective and targeted strategies for customer grievance redressal, leading to improved customer satisfaction and loyalty.

IV. Conclusion

The study uses data mining techniques to analyze 1,000 customer grievances and identify patterns and root causes of dissatisfaction. Five themes are identified: Delivery and Experience Issues, Convenience and Customization, Quality and Damage Complaints, Positive Feedback and Satisfaction, and Value and Recommendations. Key issues include delivery delays, product quality concerns, and mixed customer service experiences. Positive feedback highlights areas where e-retailers excel, such as product usability and overall satisfaction. Frequent problems with delivery and product quality are major drivers of dissatisfaction, while positive aspects like convenience and customization contribute to favorable experiences. Strategic recommendations include improving delivery processes, enhancing product quality, investing in customer service, leveraging positive feedback, and addressing niche issues. The results provide a foundation for further research, including a hybrid predictive model using machine learning and real-time sentiment analysis. The study identifies five clusters of customer reviews: negative, positive, quality, and value. Negative reviews highlight delivery issues and overall experience, while positive feedback on product usability and customer experience can boost sales. Quality and damage issues need addressing through enhanced quality control measures and better packaging. High satisfaction with products can be enhanced by leveraging customer testimonials. Value and recommendations are key drivers for customer satisfaction, and competitive pricing strategies might be effective.

The findings provide actionable insights to improve product quality, delivery processes, and customer satisfaction. Future research will focus on developing a hybrid predictive model,

real-time sentiment analysis, automated response systems, integration with Customer Relationship Management (CRM) systems, expanding the dataset and scope, and evaluating intervention strategies. These strategies will help e-retailers detect emerging issues and respond promptly, enhance customer satisfaction, and improve the overall grievance redressal process. The research will also include a larger dataset from multiple e-retail platforms for a more comprehensive analysis of customer grievances across different sectors and regions. Empirical studies will be conducted to evaluate the effectiveness of targeted interventions proposed, refining strategies and measuring their impact on customer satisfaction and loyalty. The aim is to develop more sophisticated tools and methodologies for customer grievance redressal, ultimately enhancing the overall customer experience in the e-retail industry.

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