

Unleashing Customer Insights and Amplifying Business Growth: A Case Study of 'Family in Mart' Supermarket

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Abstract—This study investigates 'Family in Mart,' a supermarket, aiming to comprehend its services, customer behavior, and operational efficiency. Employing RFM analysis and market basket analysis, it offers actionable insights for decision-making, enhancing customer experience, and optimizing services. RFM analysis employs SPSS software and clustering techniques, while the Apriori algorithm drives market basket analysis. The study uncovers distinct customer segments, facilitating targeted marketing, and reveals product associations for improved inventory management and cross-selling. Despite limitations related to single-supermarket focus and real-world data constraints, the findings have practical implications for tailored marketing, inventory management, and customer engagement, demonstrating innovative data-driven approaches in supermarket optimization.

Keywords—Customer segmentation, Marketing strategies, Market basket analysis, RFM analysis, Supermarket analysis.

I. INTRODUCTION

The 'Family in Mart' Supermarket: Fulfilling Diverse Needs in Podumbu, Tamil Nadu

In December 2019, the bustling town of Podumbu, Tamil Nadu, welcomed a novel addition to its landscape - the 'Family in Mart' supermarket. Nestled within Chitrakavi Building on Plot No. 234, Main Road, Vasan Nagar Extension, this vibrant establishment swiftly emerged as an integral part of the community, catering to a myriad of essential needs under one roof.

Podumbu, like any thriving locality, thrives on the diverse requirements of its residents. The introduction of 'Family in Mart' supermarket came as a timely response to this burgeoning demand for a comprehensive shopping destination. With its strategic location at the heart of the town, it quickly gained popularity as a one-stop solution for various daily essentials.

At 'Family in Mart,' the commitment to excellence is evident through its diverse service offerings. The supermarket's array of services includes a well-stocked grocery section that caters to the culinary needs of households, ensuring that the freshest ingredients are readily available. Additionally, the establishment boasts a tea shop, providing a cozy space for socializing and refreshment.

Recognizing the significance of healthcare, 'Family in Mart' goes beyond the conventional retail experience by offering medical facilities in the form of an in-house lab and doctor's clinic, aptly named 'Family in Care.' This integrated approach to healthcare provides residents with accessible and personalized medical services.

Furthermore, the supermarket caters to the fashion-forward individuals of Podumbu with its clothing outlet, 'Family in Style.' This section resonates with local fashion preferences, offering a range of attire that meets diverse tastes and occasions.

The presence of 'Family in Mart' supermarket has undoubtedly transformed the retail landscape of Podumbu, presenting a holistic solution that reflects the town's ever-

evolving needs. This capstone project report delves into the supermarket's inception, its services, and its significance within the community. By exploring the supermarket's multifaceted offerings and its impact, we gain insights into how 'Family in Mart' has successfully become an indispensable hub for the people of Podumbu.

Through this comprehensive analysis, we aim to shed light on the various dimensions of 'Family in Mart' supermarket, showcasing its role in enhancing the lives of Podumbu's residents and illustrating its evolution as a cornerstone of the local community.

II. PROBLEM STATEMENT

The 'Family in Mart' supermarket is facing challenges in optimizing its customer segmentation and understanding the purchasing patterns of its shoppers. Without a comprehensive analysis of customer behavior and product associations, the supermarket is unable to effectively tailor its marketing strategies, improve customer satisfaction, and increase sales. Therefore, there is a need to conduct an in-depth study using RFM analysis and Market Basket Analysis to gain insights into customer segments and identify product associations, with the goal of enhancing the supermarket's marketing efforts and overall performance.

A. Challenge

Customer Segmentation and Understanding Purchasing Patterns

- 'Family in Mart' supermarket faces challenges in optimizing customer segmentation.
- Limited understanding of purchasing patterns hampers tailored marketing strategies and sales growth.

B. Lack of Insights

Customer Behavior and Product Associations

- Absence of comprehensive analysis impedes effective marketing strategies and customer satisfaction.
- Inability to identify customer segments and product associations leads to missed cross-selling opportunities.

C. Need for In-Depth Study

RFM Analysis and Market Basket Analysis

- 'Family in Mart' supermarket requires an in-depth study utilizing RFM analysis and Market Basket Analysis.

- Insights from these analyses will enhance marketing efforts and overall supermarket performance.

D. Importance of Tailored Marketing Strategies

- Generic marketing strategies fail to address individual customer preferences and needs.
- Tailored strategies based on RFM analysis and market basket analysis can improve customer engagement and loyalty.

E. Impact on Sales and Customer Satisfaction

- Inadequate understanding of customer behavior impacts sales growth and customer satisfaction.
- Analyzing customer segments and product associations will drive sales and enhance customer experience.

III. METHODOLOGY

A. RFM Analysis

In this research case study, we employed SPSS software to conduct an in-depth RFM (Recency, Frequency, Monetary value) analysis of our customer database. Our analysis followed a structured three-step approach, beginning with the assessment of customers' recency of purchase, followed by an examination of their purchase frequency, and concluding with an evaluation of their monetary value to the business. To quantify these metrics, we assigned scores to each customer based on their individual recency, frequency, and monetary value characteristics. Subsequently, we combined these scores to derive a comprehensive RFM Score for every customer in our dataset. Utilizing clustering techniques, we further leveraged the RFM Scores to identify distinct customer segments, enabling us to gain valuable insights and tailor our marketing strategies more effectively. This multifaceted approach allowed us to optimize customer engagement and enhance overall business performance.

B. Clustering of RFM Segments

- Applied clustering algorithms to group customers with similar RFM profiles.
- Utilized techniques such as K-means clustering.
- Determined the optimal number of clusters using method silhouette analysis.
- Analyzed and interpreted the characteristics of each cluster to understand customer segments.

C. Market Basket Analysis

- Conducted market basket analysis using association rules.
- Employed the Apriori algorithm, a popular algorithm for mining frequent itemsets and generating association rules.
- Determined frequent itemsets by setting appropriate support thresholds.
- Extracted strong association rules with high confidence and lift measures.

D. Key Findings from RFM Analysis

- Identified distinct customer segments based on RFM Score.
- Categorized customers into segments such as premium customers, loyal customers, potential customers, focusing customers and churn customers.
- Obtained insights into customer behavior, purchase patterns, and preferences for targeted marketing strategies.

E. Key Findings from Market Basket Analysis

- Discovered significant associations between products frequently purchased together.
- Identified cross-selling opportunities and popular product combinations.
- Generated actionable insights for product placement, promotions, and inventory management.

By using SPSS software, the project conducted RFM analysis to segment customers based on their purchasing behavior. Clustering techniques were applied to identify distinct customer segments. Market basket analysis was performed using association rules and the Apriori algorithm to uncover associations between products. These methodologies provided valuable insights into customer segments, purchase patterns, and cross-selling opportunities, enabling targeted marketing strategies and improved decision-making.

IV. DATA ANALYSIS AND MODELLING

A. RFM Analysis Model Development

- Developed the RFM analysis model using the SPSS software.
- Defined the variables and metrics for Recency, Frequency, and Monetary value.

- Calculated the RFM scores for each customer based on their purchase history.
- Established the criteria for segmenting customers into distinct groups based on RFM scores.
- Utilized clustering algorithms to assign customers to appropriate segments.

B. Model Evaluation for RFM Analysis

- Assessed the effectiveness and validity of the RFM analysis model.
- Conducted internal evaluation measures such as the silhouette coefficient
- Examined the coherence and homogeneity of customer segments.
- Analyzed the stability and consistency of the segments over time.

C. Market Basket Analysis Model Development

- Developed the market basket analysis model using association rules and the Apriori algorithm.
- Set appropriate support thresholds to identify frequent itemsets.
- Generated association rules based on confidence and lift measures.
- Established the criteria for selecting strong and actionable rules.

D. Model Evaluation for Market Basket Analysis

- Evaluated the quality and relevance of the market basket analysis model.
- Calculated support, confidence, and lift measures for the generated association rules.
- Identified high-confidence rules with significant lift values.
- Assessed the practicality and feasibility of the discovered associations for cross-selling and promotions.

E. Validation and Iteration

- Validated the RFM analysis and market basket analysis models using holdout or validation datasets.
- Examined the performance of the models on new data and compared the results to the initial findings.
- Iterated and refined the models as necessary based on feedback and additional insights.

The model development and evaluation process involved creating and refining the RFM analysis and market basket

analysis models. Evaluation measures were employed to assess the effectiveness and relevance of the models. Validation and iteration ensured the models' reliability and applicability to the 'Family in Mart' supermarket data.

V. RESULTS AND INTERPRETATION

RFM Analysis

The RFM (Recency, Frequency, Monetary) analysis conducted for 'Family In Mart' supermarket yielded insightful customer segmentation. By evaluating each customer's recency of visits, frequency of purchases, and monetary expenditure, distinct segments emerged. High-RFM customers, who exhibited recent visits, frequent purchases, and substantial spending, represent a valuable core customer base. Mid-RFM and Low-RFM segments also surfaced, each showcasing varying levels of engagement and potential.

RFM Analysis Interpretation Report - Family In Mart Supermarket

Cluster Analysis Results

Based on the RFM analysis using SPSS, we have segmented the 1771 customers of Family In Mart Supermarket into five distinct clusters (Cluster 1 to Cluster 5) to better understand their purchasing behaviors and preferences.

A. Cluster 1 - Churn Customers

- Average Frequency: 2
- Average Monetary Value: 658
- Strategy: To retain these customers, personalized messages will be sent, emphasizing exclusive offers and discounts. A loyalty program will be introduced to encourage repeat purchases and re-engage these customers.

B. Cluster 2 - Focusing Customers

- Average Frequency: 3
- Average Monetary Value: 729
- Strategy: A proactive approach will be taken with these customers. Personal phone calls will be made to gain insights into their specific needs and concerns, thereby enhancing the overall customer experience.

C. Cluster 3 - Promising Customers

- Average Frequency: 5
- Average Monetary Value: 1572

- Strategy: Personalized thank-you notes will be sent to express appreciation for their loyalty. Referral programs and incentives will be introduced to leverage their potential to spread positive word of mouth.

D. Cluster 4 - Loyal Customers

- Average Frequency: 8
- Average Monetary Value: 2542
- Strategy: A personalized approach will be maintained to show gratitude to these loyal customers through thank-you notes. Cross-selling and upselling opportunities will be explored by providing tailored recommendations based on their purchase history.

E. Cluster 5 - Premium Customers

- Average Frequency: 24
- Average Monetary Value: 8203
- Strategy: Personalized thank-you notes will be sent to express gratitude for their substantial contributions. Encouragement will be given to share positive experiences on Google reviews to enhance the supermarket's online reputation.

Cluster Strategy Summary

Cluster 1: Retain customers through exclusive offers and a loyalty program.

Cluster 2: Understand customer needs for improved service.

Cluster 3: Encourage word of mouth through thank-you notes and referral programs.

Cluster 4: Focus on cross-selling and upselling through personalized recommendations.

Cluster 5: Engage premium customers through thank-you notes and positive reviews.

This cluster analysis provides actionable insights that will enable Family In Mart Supermarket to tailor its marketing strategies, enhance customer satisfaction, and drive business growth by catering to the unique preferences and behaviors of each customer cluster.

Market Basket Analysis

The market basket analysis unveiled compelling product associations and purchasing patterns among 'Family In Mart' customers. Notable item combinations were discovered, indicating cross-selling opportunities. For instance, customers purchasing milk frequently also tend to

buy eggs, highlighting a potential promotional strategy. Moreover, the analysis showcased the significance of complementary items, offering insights into optimizing store layout and product placement.

VI. IMPLEMENTATION AND DEPLOYMENT

A. RFM Analysis Implementation

- *Data Collection:* Extract and preprocess transactional data from the GoFrugal software, including customer IDs, purchase dates, and transaction amounts.
- *RFM Calculation:* Calculate Recency, Frequency, and Monetary values for each customer based on their transaction history.
- *Segmentation:* Apply clustering algorithms to segment customers.
- *Strategy Formulation:* Develop personalized marketing strategies for each segment.
- *Deployment:* Integrate the segmented insights into the supermarket workflow and the strategy is followed throughout the process.

B. Market Basket Analysis Implementation

- *Data Preparation:* Prepare transactional data in a suitable format, listing items purchased in each transaction.
- *Association Rule Mining:* Apply algorithms like Apriori to identify frequent item sets and generate association rules.
- *Rule Filtering:* Filter and prioritize rules based on support, confidence, and lift measures to identify significant product associations.
- *Promotion Planning:* Design product bundling and cross-selling strategies based on discovered associations.
- *Real-time Implementation:* Generated actionable insights for product placement, promotions, and inventory management.

C. Deployment Considerations

- *IT Infrastructure:* Ensure sufficient computing resources and storage capacity to handle data processing and analysis.
- *Automation:* Automate the data extraction and analysis processes to ensure continuous insights without manual intervention.

- *Data Security:* Implement data encryption and access controls to safeguard customer information.
- *Monitoring:* Regularly monitor the effectiveness of implemented strategies and fine-tune them based on customer response.
- *Training:* Provide training to relevant staff members to effectively utilize the insights and tools generated from the analyses.

The successful implementation and deployment of RFM and market basket analysis will empower 'Family In Mart' supermarket to enhance customer engagement, optimize product offerings, and drive business growth through targeted marketing and improved customer experiences.

VII. CONCLUSION

A. Summary of Findings and Achievements

- RFM analysis helped identify distinct customer segments based on recency, frequency, and monetary value, allowing for targeted marketing strategies and personalized customer experiences.
- Market basket analysis revealed product associations and cross-selling opportunities, leading to improved inventory management and increased average order value.
- Implementation of RFM analysis and market basket analysis resulted in enhanced customer satisfaction and engagement at 'Family in Mart' supermarket.

B. Future Work for RFM Analysis

- Expand the implementation of RFM analysis beyond the 50 random customers to encompass the entire customer base, allowing for a comprehensive understanding of the customer segments and their behaviors.
- Incorporate additional variables or metrics into the RFM analysis model to gain deeper insights into customer preferences and purchase patterns.
- Explore advanced techniques such as RFM segmentation based on predictive modeling or machine learning algorithms to further refine customer segmentation and prediction accuracy.

C. Future Work for Market Basket Analysis

- Continue mining the transactional data to discover new product associations and analyze the effectiveness of existing cross-selling strategies.
- Explore other association rule mining algorithms or advanced techniques to uncover more complex patterns and associations among products.
- Implement personalized recommendations based on market basket analysis findings to enhance customer experience and drive sales.

D. Achievements through Customer Questionnaire

- In progress is the completion of a customer questionnaire to gather feedback and insights.
- Identified that Fear of Missing Out marketing technique has shown positive results, indicating its effectiveness in attracting customers and driving sales.
- Placement of name tags on racks improved product visibility and ease of locating items, reducing the need for employee assistance and improving customer satisfaction.

E. Promotion of Digital Marketing

- Leveraged insights from the questionnaire to promote digital marketing efforts.
- Explored digital marketing strategies based on customer preferences and behavior, leading to improved customer engagement and increased online sales.
- Recognized the importance of continuously adapting digital marketing strategies to align with changing customer needs and market trends.

The project's conclusion highlights the positive outcomes achieved through RFM analysis and market basket analysis, including improved customer segmentation, enhanced inventory management, and increased customer satisfaction. Future work involves expanding the analysis to a larger customer base, refining the models, and exploring advanced techniques. Achievements through the customer questionnaire indicate the effectiveness of Fear of Missing Out marketing and the positive impact of product placement. The promotion of digital marketing is an ongoing effort based on customer preferences.

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