

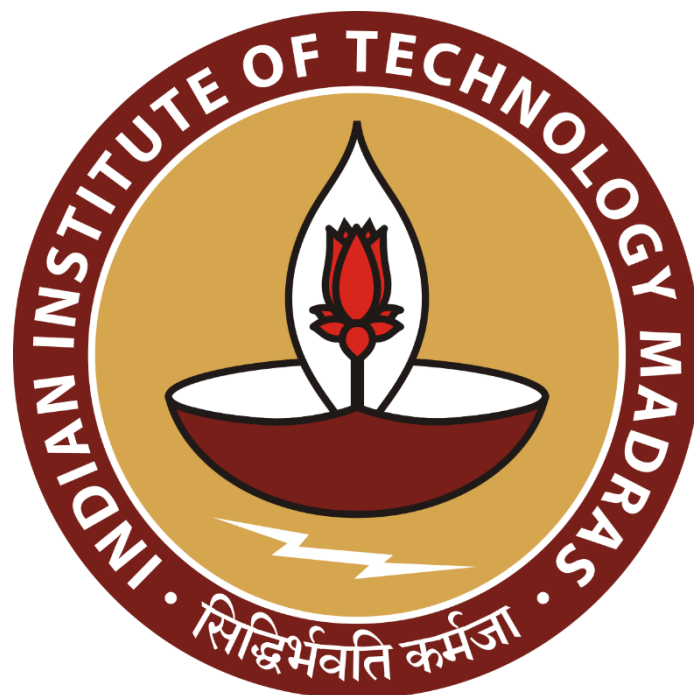
Data-Driven Optimization for B2B HVAC&R Operations

Mid-Term report for the BDM capstone Project

Submitted by

Name: Yash Mishra

Roll number: 21f1006461



IITM Online BS Degree Program,
Indian Institute of Technology, Madras, Chennai
Tamil Nadu, India, 600036

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Declaration Statement

I am working on a Project titled “Data-Driven Optimization for B2B HVAC&R Operations”. I extend my appreciation to **Blue Star**, for providing the necessary resources that enabled me to conduct my project.

I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analysed to assure its reliability.

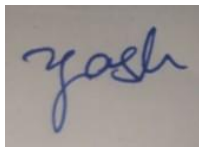
Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the principles of academic honesty and integrity, and I am receptive to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. I thus affirm that I am not engaged in any form of collaboration with other individuals, and that all the work undertaken has been solely conducted by me. In the event that plagiarism is detected in the report at any stage of the project's completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I understand that all recommendations made in this project report are within the context of the academic project taken up towards course fulfilment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Signature of Candidate:



Name: Yash Mishra

Date: December 12, 2023

1 Executive Summary

Mr. Pravesh Upadhyay, the Area Manager of Blue Star's Uttar Pradesh branch office, actively seeks to expedite the adoption of data-driven decision-making within his team. Recognizing the pivotal role of data in informed decision-making, Mr. Upadhyay is actively delving into the intricacies of data collection, cleaning, and visualization. His objective is not only to comprehend these processes but also to adopt simplified and reliable techniques and practices that can enhance the overall efficiency of his team.

Having already shared meticulously collected sales data for the fiscal year 2022-23 through the SAP software, Mr. Upadhyay is actively exploring ways to leverage this data effectively. These discussions have initiated a comprehensive exploration of methodologies and tools to harness the potential insights embedded in the sales data.

Mr. Upadhyay is specifically focusing on actively evaluating the performance of retailers within the HVAC&R sector using data-driven metrics. Additionally, he aspires to actively gain insights into the demand and supply dynamics inherent in the B2B sector of the HVAC&R industry, actively enhancing the strategic positioning of Blue Star.

By actively spearheading these initiatives, Mr. Upadhyay envisions not only improving the data-driven decision-making capabilities of his office but also fostering a culture of adaptability and efficiency. Through this active approach, he aims to fortify Blue Star's foothold in the competitive HVAC&R industry, ensuring sustained growth and active strategic excellence.

2 Proof of originality of the Data

Photos



Mr. Pravesh Upadhyay
(+91 7081990111)
Area Manager
Uttar Pradesh Branch Office
Blue Star



The Team



Awards and Medals



Best Branch Winner 2021-22



The Office

[The video link of the conversation with Mr. Pravesh Upadhyay is here.](#)

[The dataset link is here.](#)

3 Metadata

In total sixty-two columns were present in the sales data. After extensive discussions with Mr. Upadhyay we concluded to narrow down our approach to eight columns. They are as follows:

1. **Retailer:** The entity involved in the sale of HVAC&R products provided by Blue Star. A unique numeric code is allotted.
2. **Sales Unit:** A unit responsible for generating leads.
3. **Segment:** A classification system categorizing HVAC&R products based on specific criteria such as type, application, or target market.
4. **Sales Order Date:** The date on which the sales transaction was initiated or recorded.
5. **Total Sales Value:** The monetary value of the total sales transaction for HVAC&R products.
6. **Material:** The specific HVAC&R product model being sold by Blue Star.
7. **Ship to Party Name:** A unique identifier associated with the customer to which the HVAC&R products are shipped.
8. **Number of Missing Values:** Column-wise count of data points within the dataset where information is absent.

4 Descriptive Statistics

Total Sales Value

The office has generated a **total of ₹12,02,53,441.23** in the fiscal year 2022-23 averaging around ₹1,36,962.92 per order. The managed to sell **2.4 products every day**. The sales distribution varies significantly, as reflected in the **standard deviation of ₹1,97,103.65**. The sales value reached a **maximum of ₹1,78,50,000.00** and a minimum of ₹490.00 which is intriguing. They also recorded negative sales of ₹59,71,040.91.

Sales Unit

Data of only transactional sales unit were recorded, in which EA, the top performer generated **715 leads** of **total ₹10,86,36,564.65**, that is **90.33% of the total sales value**. Worst were FT2, accomplishing only 1 lead of ₹5,600.00.

Retailer

There were total 5 Retailers, in which the **most successful, “095”** accomplished 439 orders, 50% of total sales volume, of **worth ₹5,93,27,853.96**, that is, 49.33% of total sales value. Lowest total sales volume recorded was 19 by “082” and lowest total sales value generated was ₹13,74,850.00 by “083”.

Segment

A total of **15 segments** were observed where the **top segment was Food Processing** marking **29.95% of total sales volume** by selling **263 product** of **worth ₹3,06,14,117.20** contributing **25.45% in total sales value**. Lowest total sales volume were of “Hospitals” and “Non-Specific(Others)” each contributing 1.

Material/Model

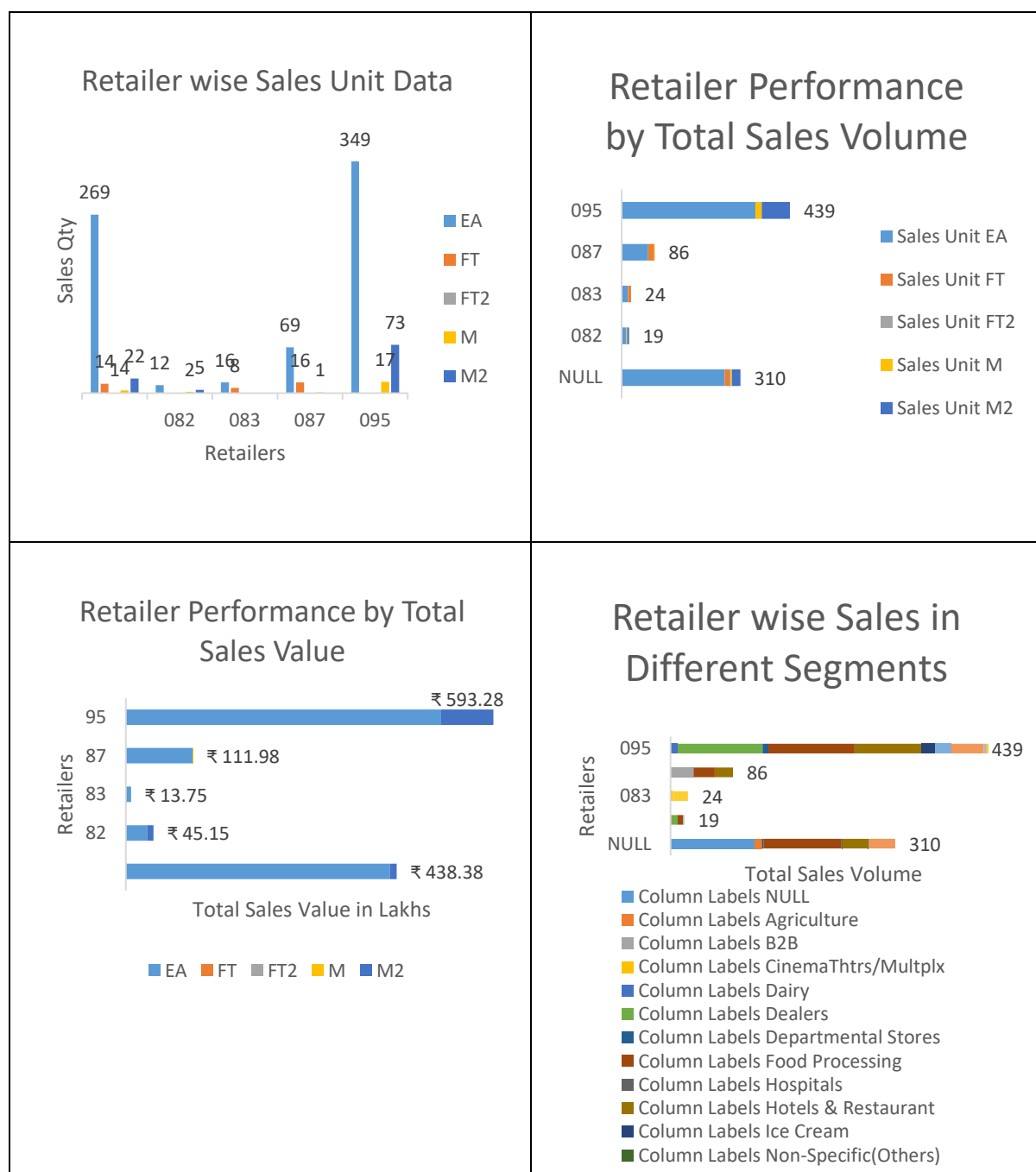
Total of 245 products across different categories were sold. Top performing models according to total sales volume were INPS-ZZ40ZZ050-00, KORAL12FGDP and KORAL18CDL each selling 60,

56 and 52 units. However, by total sales value KORAL18CDL and KORAL12FGDP were most successful generating ₹1,72,91,988.50 and ₹1,23,60,501.50 respectively.

5 Detailed Explanation of Analysis Process/Method

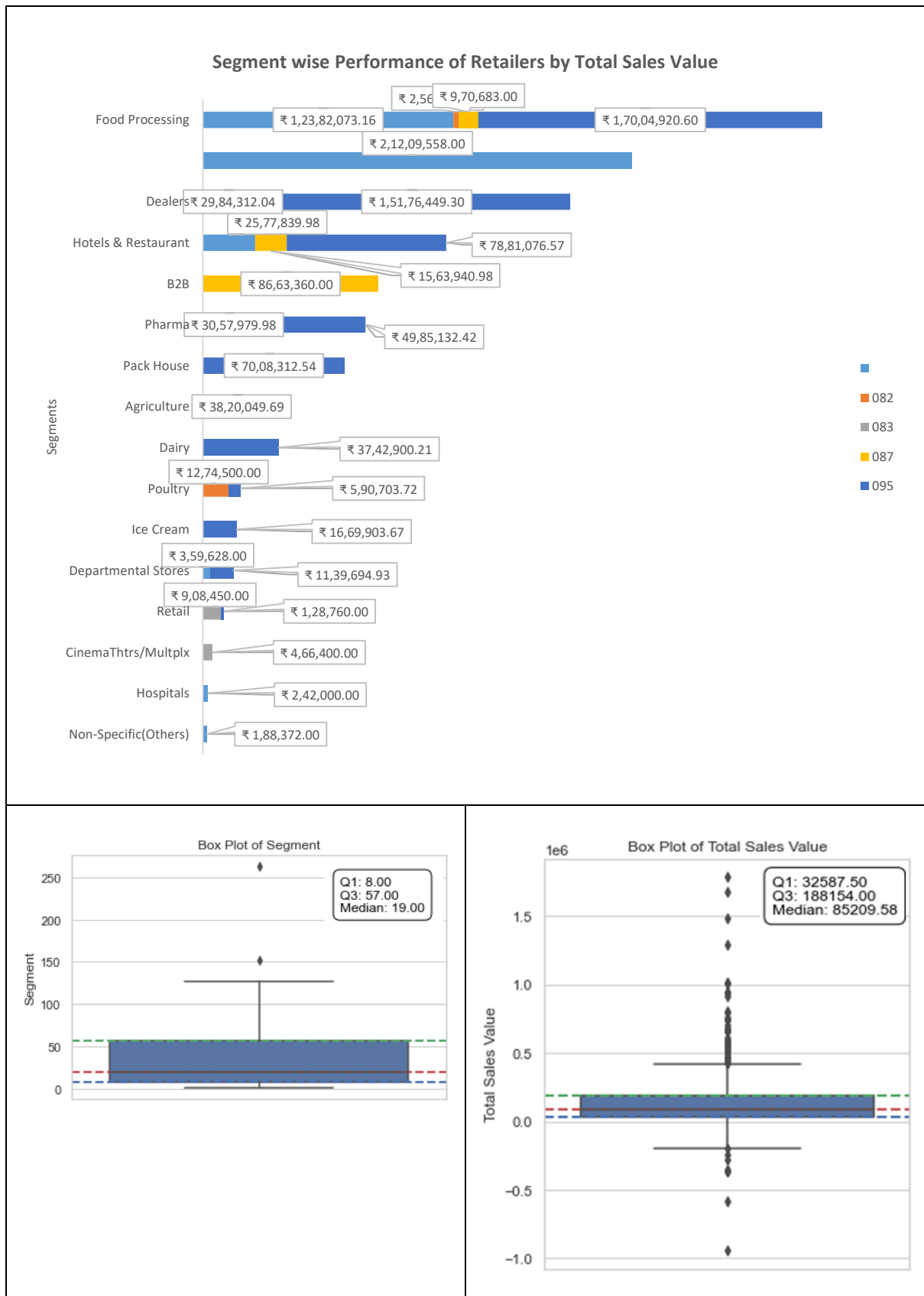
As Mr. Upadhyay wanted to get acquainted with different practices that are popular, both python and excel were used to draw inferences.

Performance of the Retailers



The analysis of retailer-wise sales unit data involves examining the distribution and performance of sales across various retailers. By scrutinizing this data, insights into the sales patterns, preferences, and trends specific to each retailer emerge. This analysis enables informed decision-making, allowing for targeted strategies and optimizations to enhance sales outcomes and foster stronger retailer relationships between sales unit and retailers.

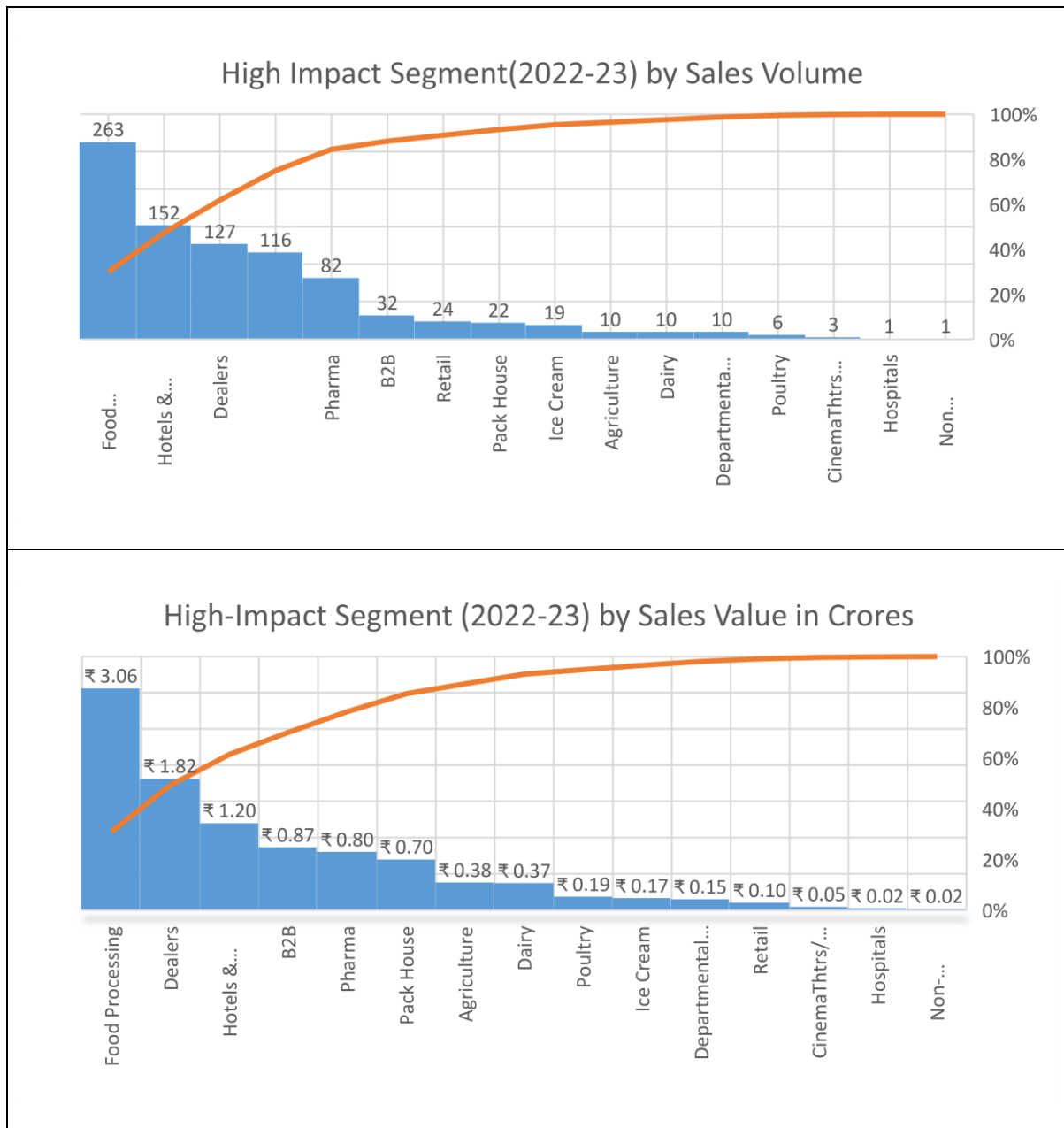
Demand and Supply Dynamics



For the box plot of segments, the focus is on visualizing the spread and central tendency of different segments, highlighting variations and potential outliers. Simultaneously, the box plot of total sales value provides insights into the statistical distribution of sales, helping identify trends and central tendencies.

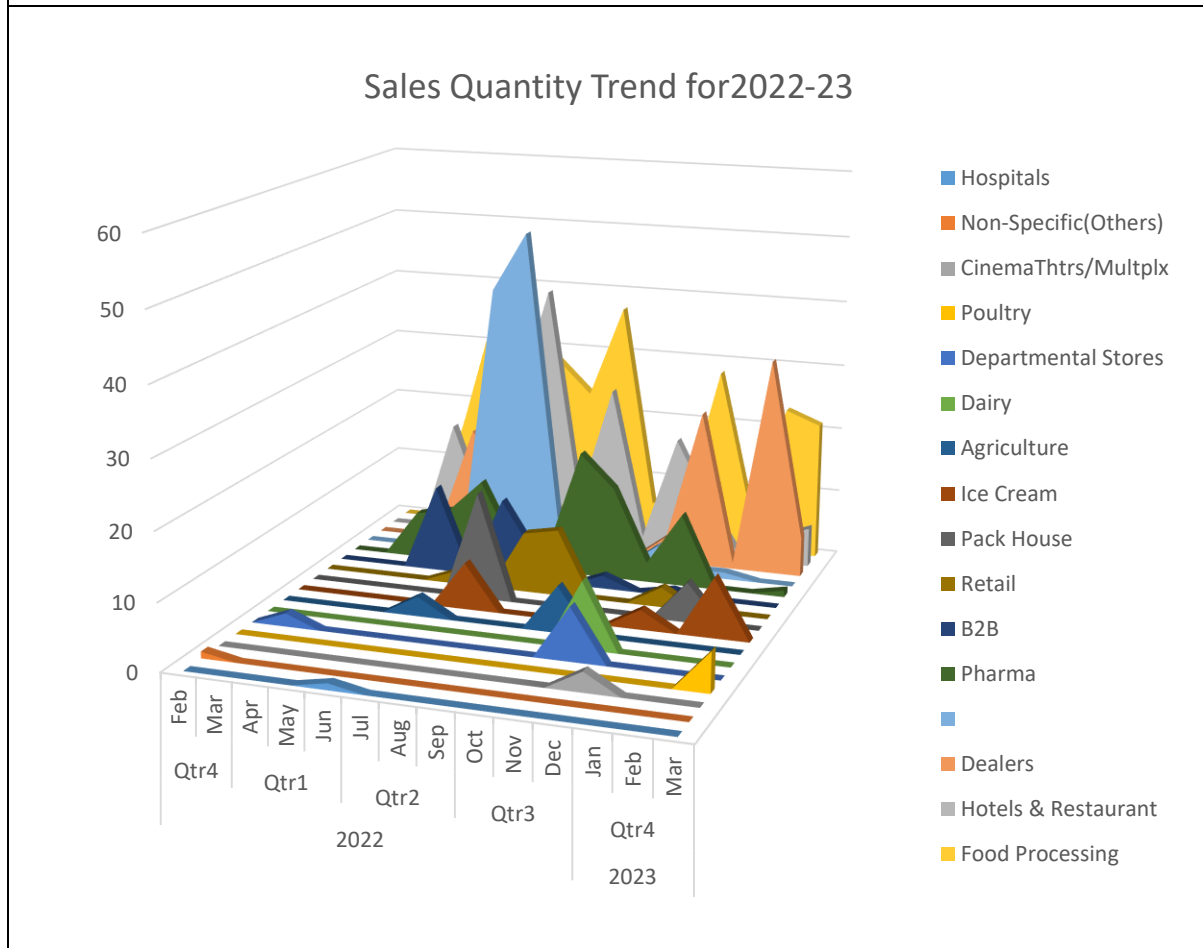
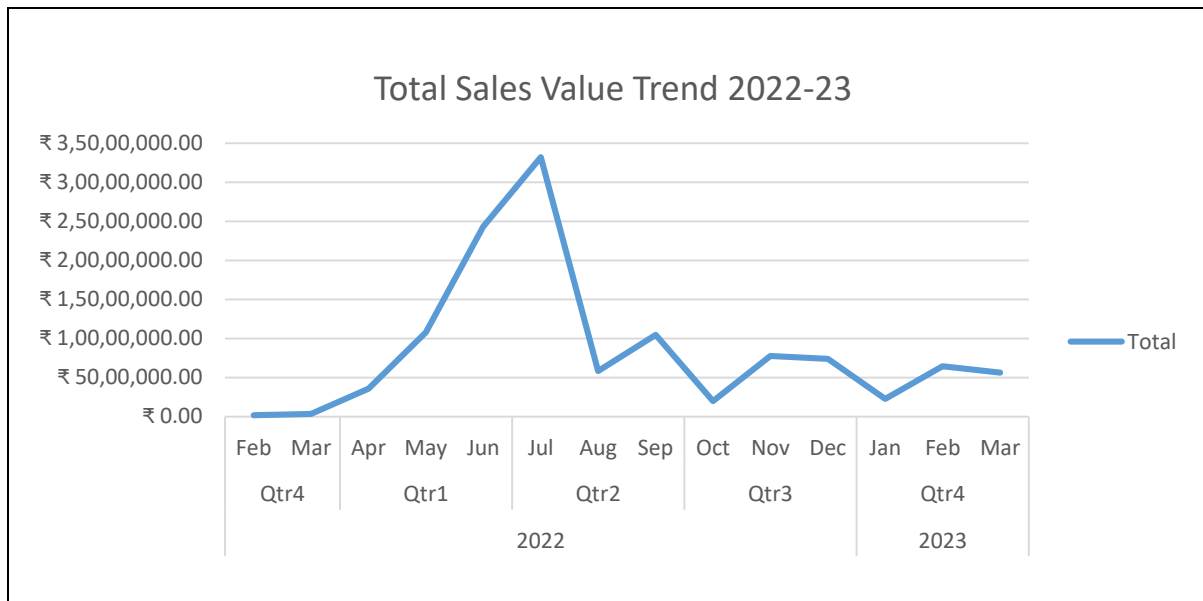
By using these plots, a comprehensive understanding of segment-wise performance and overall sales distribution is gained.

Impactful Performers

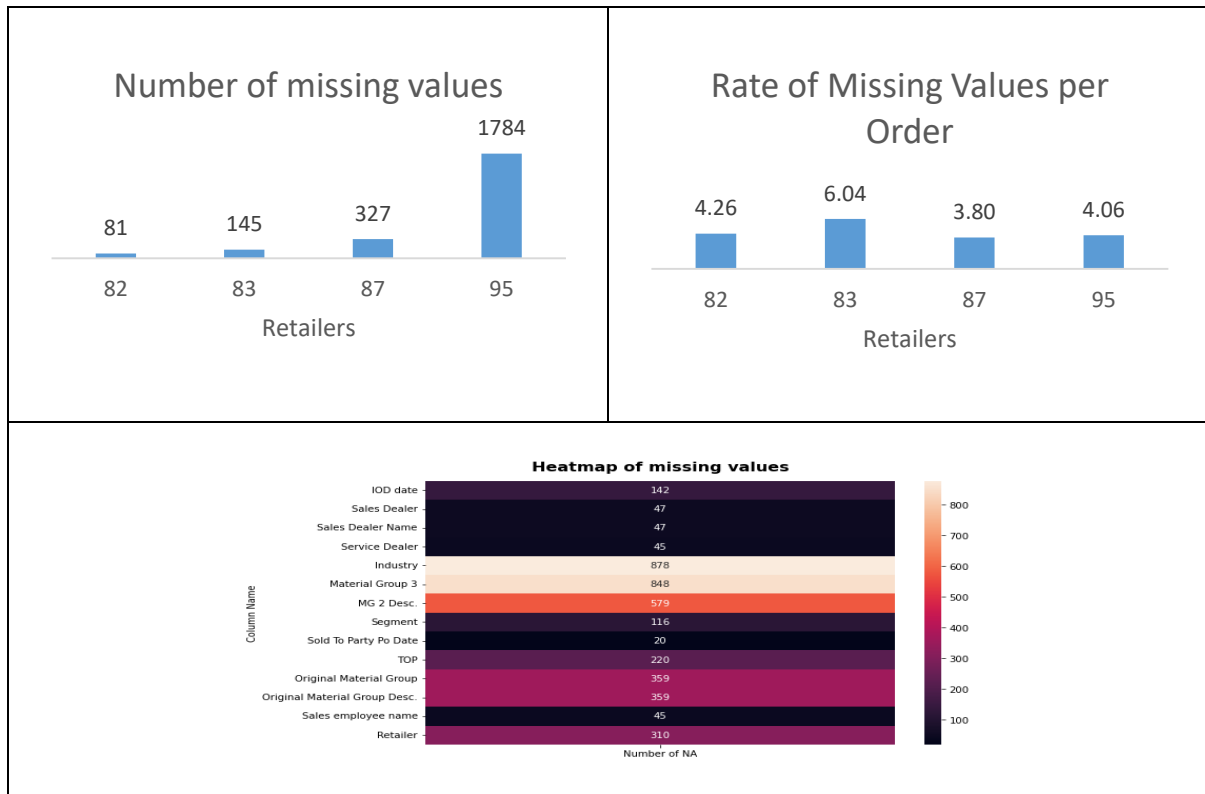


The Pareto charts of Segment by Sales Volume and Sales Value involves prioritizing and visualizing the key contributors within the dataset. For the Volume Pareto, the count of each segment is represented, highlighting the most significant contributors. Meanwhile, the Sales Value Pareto illustrates the cumulative contribution of each segment to the overall sales, emphasizing segments with the highest economic impact. This analysis aids in identifying critical segments for strategic focus. This also tells that most sellable segment is not that profitable.

Trends



The trend in total sales value reveals a fluctuating pattern across quarters. The significant increase in Qtr2 of 2022 and Qtr4 of 2023 stands out, suggesting seasonal variations or specific market events impacting sales. Though Sales Quantity trend justifies the peaks in summer months, but there are also segments whose growth have started after summer season such as Poultry, Cinema and Stores.



Though the “095” has the highest number of missing values, “083” has most frequently missed to record data. Which has missed the opportunity to study about the “Industry” specific data.

Hence, the analysis uncovers operational successes like the dominance of “EA” and retailer “095” using both python and excel to showcase different styles of data handling and visualization. However, challenges like high standard deviation in total sales, negative figures and missing data necessitate strategic focus. Addressing these issues is crucial for sustained growth in the B2B HVAC&R industry.