CHAIN OF DEPARTMENTAL STORES ANALYSIS

A REPORT BY

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About the Dataset

Case Study Overview

Objective

The purpose of this case study is to understand current market and develop BI dashboard for a Chain of Departmental stores. There was no data pipeline/warehouse available as such. Weekly data is extracted using a data tool connected to the POS at every store. Every week the Senior Assistant extracts the number of files and demands to update the dashboard and then send it to the CEO via a link or otherwise.

Dataset

The dataset is divided into to two excel workbooks such as “Department.xlsx” and “stores data-set.xlsx” and one sales folder containing weekly sales.xlsx files for two years.

Context

The dataset contains detailed information about various stores, department, weekly sales. We will use this dataset for EDA and BI dashboard development.

Data Analysis

Data Cleaning and Preparation

The dataset contains information about weekly sales for a Chain of Departmental stores. Here are the critical columns/features about various listings in the dataset:

- ‘Department Number:’ An integer representing the unique identifier for each department.
- ‘Department Name:’ A string representing the name of the department, such as "Women's
- Fashion", "Men's Fashion", "Kids' Clothing", etc.
- ‘Store:’ An integer representing the unique identifier for each store.
- ‘Store Name:’ A string representing the name of the store, such as "Lakeview Mart", "Parkdale
- Mart", etc.
- ‘Manager Name:’ A string representing the name of the manager for each store.

- ‘Store:’ An integer representing the store's unique identifier, which aligns with the Store column
- in the stores data-set.csv.
- ‘Dept:’ An integer representing the department number within the store, likely corresponding to
- the Department Number in the Department.xlsx.
- ‘Date:’ A string representing the date on which the sales were recorded.
- ‘Weekly_Sales:’ A float representing the total sales in a week for a given store and department. 10. ‘IsHoliday:’ A boolean indicating whether the week included a holiday.

Data Cleaning Process

The data cleaning process was crucial in preparing the Chain of Departmental stores dataset for further analysis. This method ensured the accuracy, consistency, and usability of the data.

Handling Missing Values

- The datasets didn’t have any missing values for any columns.

Handling Data Inconsistencies

- The date column was transformed from whole number to date data type.

Duplicate Data Handling

- There were no duplicate rows in the dataset.

Normalization

- ‘Sales’ dataset had the date column. I created a date dimension table separately for better analysis and comparisons such as “Year to Date” YTD, “Same Period Last Year” SPLY sales. The separate date dimension table reduced the redundancy in the dataset.

‘Sales’ Data Set Folder

- All weekly sales data sets were placed in a same folder ‘Sales’. The ‘Sales’ folder was directly imported in Power BI. Moreover, the upcoming weekly sales data can be added to the folder and BI can be refreshed to update the dashboard.

Data Analysis

Sales Performance over Time

The ‘sales performance over time’ graph aggregates sales data on a monthly basis separated by year, provides insights into seasonal trends:

- There’s a clear pattern of seasonality in sales. Sales tend to increase towards the end of the year, likely due to the holiday shopping season surrounding Black Friday, Christmas, and New Year’s Eve.
- While there are fluctuations from year to year. However, the seasonal trend remains consistent, with peaks towards the end of the year.
- There are noticeable peaks in sales at certain times of the year, which could correspond to holiday seasons or promotional events.
- Weekly sales shows fluctuations which is expected in retail due to factors like promotions, seasonal changes, and consumer behavior.

Figure 1 Net Sales Performance Over Time

Top Performing Stores and Department

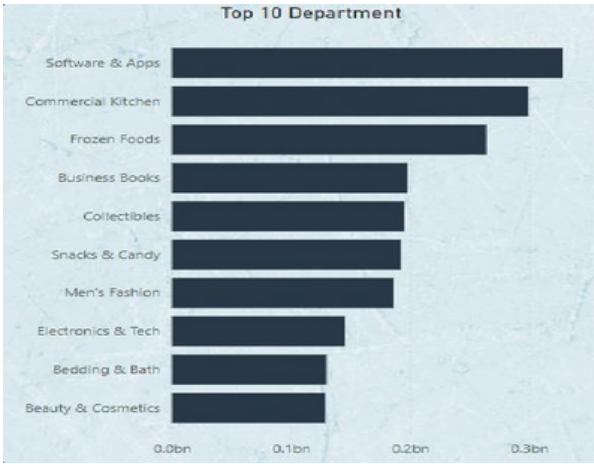

Figure 3 Top 10 Departments

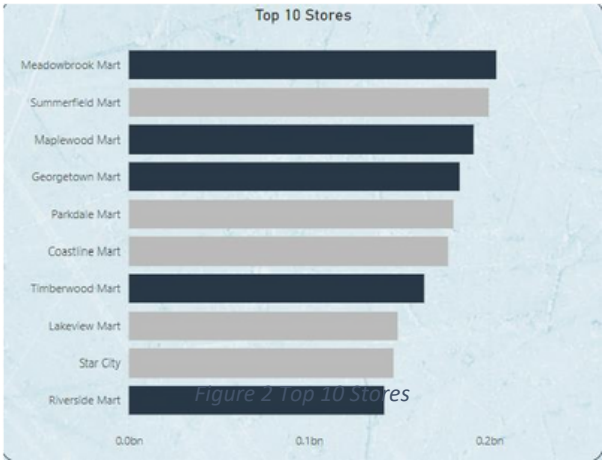

Figure 2 Top 10 Stores

Top 10 Departments:

- **Diverse Range:** The departments range from technology-focused (Software & Apps, Electronics & Tech) to everyday consumer goods (Commercial Kitchen, Frozen Foods, Snacks & Candy).
- **High-Value Products:** Software & Apps typically have high margins and may also represent digital sales, which could explain their position at the top. It's also a department that may require less physical inventory space compared to others.
- **Consumer Staples:** Departments like Frozen Foods indicate strong sales in essential goods, which tend to be more consistent and less volatile.
- **Discretionary Spending:** Collectibles, Beauty & Cosmetics, and Men's Fashion suggest that discretionary spending is also strong, potentially indicating a customer base with disposable income.

Top 10 Stores

- **Geographical Spread:** The names suggest a geographical diversity among the top-performing stores. Understanding regional preferences and market conditions could be key to replicating this success in other stores.
- **Potential for Cross-Promotion:** Stores with strong performance in specific departments can be leveraged to cross-promote products and increase overall sales, taking advantage of the foot traffic and popularity.
- **Size and Layout Factors:** Larger stores like Meadowbrook Mart and Riverside Mart might have a layout or size advantage that allows them to display a wider range of products and provide a better shopping experience.

Top 5 Stores Manager & their Commission

- 'Top 5 Stores Manager & their Commission' shows the managers of top 5 stores and their commission for current week.

  Where Commission is,

$$Commission = 0.5 \times Sales$$

Figure 4 Top 5 Stores Manager & their Commission

Questions.

1. Narrate pros & cons of pbi and streamlit? What will you recommend to the CEO and Why?

The pros and cons of pbi and streamlit is discussed below:

Power BI

Pros

Power BI seamlessly integrates with other Microsoft tools.

It has advanced data visualization and BI capabilities, and can handle the complex data transformation and modelling directly within the tool.

It can scale from small to large datasets, making suitable for businesses as they grow.

It provides security features such as row-level security and controls the user access.

It automatically refreshes the data, ensuring dashboard is always up-to-date.

Cons

It can be steep for users unfamiliar with BI tools and Microsoft ecosystem.

Depending upon business scale, the licensing cost can be significant.

Power BI has limited web deployment customization as compared to Streamlit.

Streamlit	
Pros	**Cons**
Streamlit is designed to share data scripts into shareable web apps quickly.	Streamlit is limited to reasonable amount of data and is not scalable for very large datasets as compared to Power BI.
It offers high level customization in terms of UI and interactive dashboards.	It requires third-party services for security deployment.
It is free of cost and feasible for startups or medium-sized businesses to create dashboards.	It requires manual effort or additional coding to refresh the data.
It is ideal for rapid development and sharing of dashboards irrespective of underlying infrastructures.	

Recommendation

As the organization is well aware of the Microsoft ecosystem and requires advanced BI capabilities, robust security, and scalability, Power BI is the recommended choice. It's particularly suited for more comprehensive dashboards with deep insights into sales performance across different stores and departments. It will cater to scalability of the large datasets as business grows, offering BI capabilities, and security features.

2. How long it takes to refresh the data? Make a case to convince CEO for org data?

Assuming a moderate level of complexity and automation in Power BI, the data refresh process can be relatively quick. The entire process, excluding data cleaning and transformation can take few minutes depending upon the data size and complexity.

Recommendation

i. Implement scripts or use Extract, Transform, Load (ETL) tools to automate the extraction of new weekly sales data from the POS system and its loading to the dashboard tool. It will reduce the manual efforts and accelerates the refresh process.

ii. As the current process involves to insert new weekly sales data into the folder, moving towards a centralized data storage system like a data warehouse can significantly improve data management, scalability, and analysis capabilities. It supports data transformations and automatically refreshes the data.

iii. Data governance practices will ensure the data's accuracy, consistency, reliability, and reduces the time spent on validation and testing during each refresh cycle.

Case

If we implement on above recommendations, it will not only streamline weekly dashboard refresh process but also enhance the overall data-driven decision-making capability of the organization. It will ensure the CEO and other stakeholders have access to timely, accurate, and insightful sales performance data, which is crucial for strategic planning and operational efficiency.

By adopting sophisticated data infrastructure, the organization will be able to leverage advanced analytics, AI, and machine learning to uncover deeper insights, predict trends, and optimize operations. This strategic investment will make the company to better respond to the market changes, understand customer behavior, and drive business growth.

In conclusion, it will not only improve the efficiency of the weekly sales dashboard updates but also enhancing the overall data maturity and analytical capabilities of the organization.

3. What Top 10 stores are based on? Also, think about the worst performing stores/departments?

Assuming the current week is 19th to 25th October 2012. The top 10 department and stores are stated as below:

Top 10 Stores	
Store	**Weekly Sales**
Store 4	$2,097,266.85
Store 13	$2,018,010.15
Store 20	$1,999,363.49
Store 2	$1,847,990.41
Store 10	$1,734,834.82
Store 27	$1,620,374.24
Store 14	$1,590,274.72
Store 39	$1,577,486.33
Store 1	$1,508,068.77
Store 6	$1,436,883.99

The stores are the top performers based on total sales for the current week 19th to 25th Oct 2012. The high performance could be due to variety of factors such as location, store size, customer demographics, or effective sales and marketing campaigns.

Top 10 Department	
Department	**Weekly Sales**
Department 92	$3,570,802.32
Department 95	$3,017,913.92
Department 38	$2,648,561.32
Department 90	$2,106,716.25
Department 40	$2,007,722.10
Department 2	$1,879,765.40
Department 72	$1,785,404.42
Department 91	$1,492,627.75
Department 8	$1,395,014.79
Department 13	$1,357,757.18

These departments represent the highest sales volumes within the week, indicating strong consumer demand for their products or effective department management.

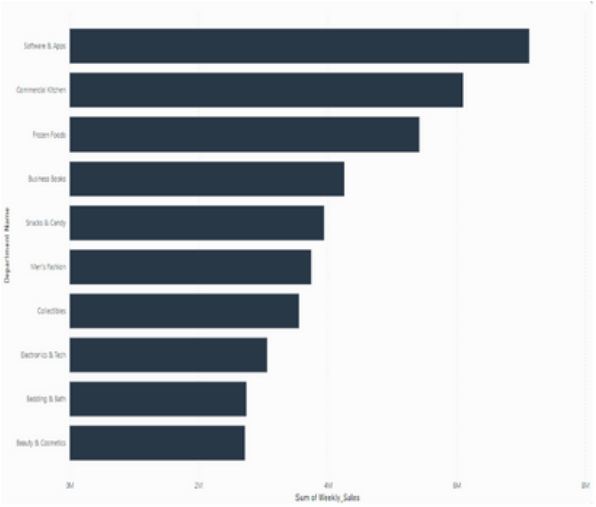

Figure 5 Top 10 Department

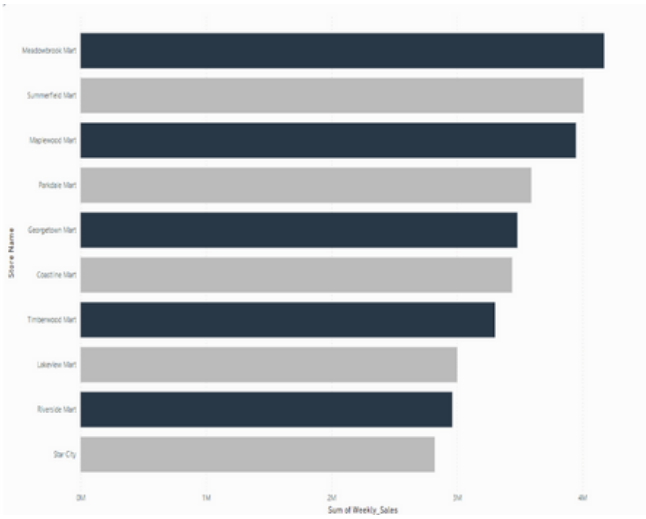

Figure 6 Top 10 Stores

The departments with the lowest sales for the same period are:

Bottom 10 Department	
Department	**Weekly Sales**
Department 99	$0.03
Department 39	$8.94
Department 38	$110.52
Department 45	$958.84
Department 54	$7,815.88
Department 59	$13,517.00
Department 60	$29,062.50
Department 50	$33,743.99
Department 28	$43,300.00
Department 48	$44,558.84

The below performing departments have lower sales volumes as compared to the top performers. This indicates of lower consumer demand, inadequate inventory levels within these departments.

Insights and Strategic Implications

The top-performing stores and departments can provide effective strategies that could be applied across the network. Identifying the below performers allows for targeted support and interventions to improve their sales, such as tailored promotions, staff training, or layout amendments. Resources can be optimized by investing more in high performing stores and departments while identifying potential ways to boost sales in lower-performing areas.

Basis for Top 10 Stores and Departments

Top 10 Stores

These stores have achieved the highest total sales for the current week. Factors contributing to their success may includes strategic locations with high foot traffic, a well-targeted product assortment, effective marketing and promotions, and superior customer service.

Top 10 Departments

The departments with higher sales indicates high consumer demand for their products, effective inventory management ensuring popular items are in stock, and possibly strategic assortment to attract customer’s attention.

Basis for Below Performing Stores

- Stores in less populous areas or markets with high competition may struggle to generate high sales volumes.
- Smaller stores with limited floor space might not offer space for products as in larger stores, potentially limiting sales.
- A mismatch between the product assortment and local market's preferences can cause lower sales.
- Inadequate marketing efforts or poor store visibility can potentially reduce sales performance.

The Way Forward for Store

Enhance Holiday Sales Strategies

The holidays have significant impact on sales, it is preferred to develop marketing and inventory strategies to capitalize on peak periods such as Black Friday, Christmas, and New Year's Eve. This can be achieved through special promotions, extended hours, and holiday-themed events to attract more customers.

Optimize Store and Department Performance

- **Top Performers:** Identifying best practices from top-performing stores and departments to distribute their success across the network. This can be achieved through analyzing staffing levels, product assortment, and customer service strategies.
- **Underperformers:** Provide targeted support to the bottom-performing stores and department. Conducting market research will better align their offerings with customer preferences, and store layout optimization will improve sales.

Implement Seasonal and Trend Analysis

Regularly review sales trend to align with customer needs and adjust inventory and marketing campaigns accordingly. Seasonality plays important role in shaping retail sales, and staying ahead of these trends can provide a competitive edge.

Utilize Promotions and Discounts

Use insights to tailor promotions and discounts more effectively, targeting them to drive traffic during slow periods or to clear out overstocked inventory without eroding profit margins unnecessarily.

Wrapping Up

This analytical report presented insights related to sales performance of various stores and departments, revealing trends and performance metrics. We have identified key areas where targeted efforts can drive improvements and have outlined strategies to capitalize on strengths. The top-performing stores and departments, characterized by robust sales figures, set benchmarks for success, while the lower-performing ones offer opportunities for strategic refinement. Moving forward, the company is advised to harness these insights to enhance decision-making, optimize inventory, tailor marketing efforts, and ultimately drive growth in a competitive retail environment. This focused approach will help align operations with consumer demand and business objectives, ensuring resilience and profitability in the dynamic retail landscape.