TEESSIDE UNIVERSITY

School of Computing, Engineering & Digital Technologies

Big Data and Business Intelligence

CIS4008-N

Supermarket Sales Analysis Report

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SUPERMARKET SALES ANALYSYS

A. Executive Summary

1. Introduction

This report analyzes supermarket sales data from January 2019 to March 2019, identifying key trends and providing actionable recommendations to enhance business performance. The analysis focuses on sales trends across different branches and cities, the performance of various product lines, the impact of customer demographics on sales, the influence of purchase time on sales, the popularity of different payment methods, and customer satisfaction levels.

2. Key Findings

- **Sales Trends Across Branches and Cities:** January has the highest sales, with Naypyitaw leading in total sales and net profit.Net profit remains stable despite a dip in February. Naypyitaw slightly leads in balanced sales and profits among the three cities.
- **Performance of Various Product Lines:** Top-performing lines: Food and Beverages, Sports and Travel. Health and Beauty products have high customer satisfaction but lower sales, indicating growth potential.
- **Impact of Customer Demographics on Sales:** Female customers lead in transactions, sales, and net profit. Members, especially female members, have higher average sales per transaction.
- **Influence of Purchase Time on Sales:** Evening hours (6:00 PM to 8:00 PM) have peak sales; early morning hours (10:00 AM) have the lowest. Saturday has the highest transactions; Monday has the lowest. High sales on the 15th, likely due to mid-month salary payments; low sales on the 31st.
- **Popular Payment Methods:** Cash and Ewallet are the most popular, with Cash leading in sales and net profit. Credit cards have lower average sales per transaction compared to Cash and Ewallet.
- **Customer Ratings and Satisfaction:** High satisfaction with Food and Beverages, Fashion Accessories, and Health and Beauty products. Opportunities for improvement in lower-rated categories like Home and Lifestyle.

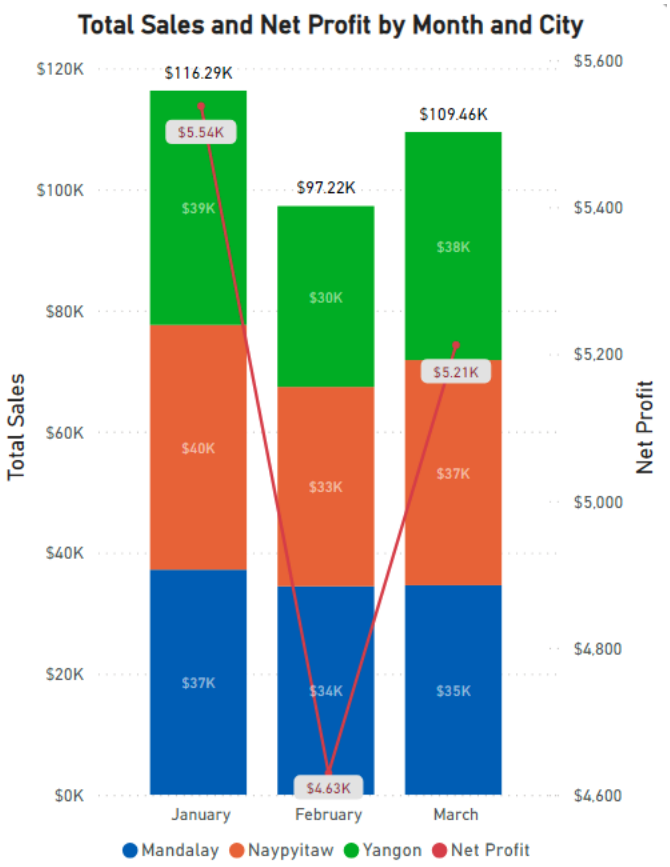


Figure 1. Total Sales and Net Profit by Month and City

3. Recommendations

- **Enhance Marketing Strategies:** Focus on Naypyitaw, especially in January. Target female customers and promote membership sign-ups.
- **Optimize Inventory Management:** Stock top-performing product lines adequately. Promote high-satisfaction, lower-performing products.
- **Improve Operational Efficiency:** Align staffing and store hours with peak times. Streamline checkout processes for popular payment methods.
- **Leverage Data-Driven Insights:** Continuously monitor sales data for trends. Use advanced analytics for predictive capabilities and informed decisions.

B. Body

In today's highly competitive retail environment, understanding sales patterns and customer behavior is crucial for optimizing business strategies and driving growth. This report aims to address several key business questions using supermarket sales data, which will help in identifying sales trends, understanding customer demographics, and evaluating product performance.

The dataset, sourced from Kaggle, represents historical sales data collected over a three-month period from three branches of a supermarket in Myanmar, located in Yangon, Mandalay, and Naypyitaw. The data includes various aspects of sales transactions, such as product categories, customer types, payment methods, and more, providing a comprehensive view of the supermarket's operations.

By analyzing this data, the supermarket aims to address several challenges:

1. Identifying sales trends across different branches and cities to allocate resources more effectively.
2. Understanding the performance of various product lines to optimize inventory and marketing strategies.
3. Evaluating the impact of customer demographics (type and gender) on sales to tailor promotions and customer service.
4. Analyzing the influence of purchase time on sales to optimize staffing and store hours.
5. Determining the most popular payment methods to streamline the checkout process and improve customer satisfaction.
6. Assessing customer ratings to understand satisfaction levels and improve product offerings and services.

Through this analysis, the supermarket seeks to gain actionable insights that can inform decision-making processes and enhance overall business performance.

1. Dataset Overview

1.1. Data Source

The dataset, sourced from Kaggle, includes 1,000 rows and 17 columns detailing various aspects of sales transactions. These aspects include Invoice ID, Branch, City, Customer type, Gender, Product line, Unit price, Quantity, Tax, Total, Date, Time, Payment method, COGS, gross margin percentage, gross income, and Rating.

Collected over a period of three months, the data covers three different branches of a supermarket located in Yangon, Mandalay, and Naypyitaw. It captures a variety of transactions involving different product lines, customer demographics, and payment methods, providing a comprehensive view of the supermarket's sales activities and customer preferences.

The growth of supermarkets in the most populated cities is increasing, and market competition is also high. This dataset represents historical sales data of a supermarket company, recorded across three different branches for a period of three months.

Source: https://www.kaggle.com/datasets/aungpyaeap/supermarket-sales

1.2. Data Description

No	Column Name	Description
1	Invoice ID	Unique identification number for each sales transaction, generated by the system
2	Branch	Identifier for the supermarket branch where the transaction occurred (A, B, or C)
3	City	The city where the supermarket branch is located. (Note: Branch and city represent the same information.)
4	Customer type	Category of customers, either 'Member' for those with a membership card or 'Normal' for non-members
5	Gender	Gender of the customer
6	Product line	Category of products purchased, such as 'Electronic accessories', 'Fashion accessories', 'Food and beverages', 'Health and beauty', 'Home and lifestyle', and 'Sports and travel'
7	Unit price	Price per unit of the product in USD
8	Quantity	Number of units purchased by the customer
9	Tax 5%	5% tax applied to the purchase
10	Total	Total price of the purchase, including tax
11	Date	Date of the transaction (available from January 2019 to March 2019)
12	Time	Time of the transaction (between 10 AM and 9 PM)
13	Payment	Method of payment used by the customer (Cash, Credit card, or Ewallet)
14	cogs	Cost of Goods Sold, representing the direct costs of producing the goods sold
15	gross margin percentage	Percentage of the total sales revenue that exceeds the COGS
16	gross income	Total income generated from sales after deducting the COGS
17	Rating	Customer satisfaction rating for their shopping experience, on a scale from 1 to 10

Table 1. Data Columns and Descriptions

A screenshot of the dataset:

1	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax 5%	Total	Date	Time	Payment	cogs	gross margin percentage	gross income	Rating
2	750-67-84	A	Yangon	Member	Female	Health and beau	74.69	7	26.1415	548.9715	1/5/2019	13:08	Ewallet	522.83	4.761904762	26.1415	9.1
3	226-31-30	C	Naypyitaw	Normal	Female	Electronic acce	15.28	5	3.82	80.22	3/8/2019	10:29	Cash	76.4	4.761904762	3.82	9.6
4	631-41-31	A	Yangon	Normal	Male	Home and lifest	46.33	7	16.2155	340.5255	3/3/2019	13:23	Credit card	324.31	4.761904762	16.2155	7.4
5	123-19-11	A	Yangon	Member	Male	Health and beau	58.22	8	23.288	489.048	1/27/2019	20:33	Ewallet	465.76	4.761904762	23.288	8.4
6	373-73-79	A	Yangon	Normal	Male	Sports and trav	86.31	7	30.2085	634.3785	2/8/2019	10:37	Ewallet	604.17	4.761904762	30.2085	5.3
7	699-14-30	C	Naypyitaw	Normal	Male	Electronic acce	85.39	7	29.8865	627.6165	3/25/2019	18:30	Ewallet	597.73	4.761904762	29.8865	4.1
8	355-53-59	A	Yangon	Member	Female	Electronic acce	68.84	6	20.652	433.692	2/25/2019	14:36	Ewallet	413.04	4.761904762	20.652	5.8
9	315-22-56	C	Naypyitaw	Normal	Female	Home and lifest	73.56	10	36.78	772.38	2/24/2019	11:38	Ewallet	735.6	4.761904762	36.78	8
10	665-32-91	A	Yangon	Member	Female	Health and beau	36.26	2	3.626	76.146	1/10/2019	17:15	Credit card	72.52	4.761904762	3.626	7.2
11	692-92-55	B	Mandalay	Member	Female	Food and bever	54.84	3	8.226	172.746	2/20/2019	13:27	Credit card	164.52	4.761904762	8.226	5.9
12	351-62-08	B	Mandalay	Member	Female	Fashion access	14.48	4	2.896	60.816	2/6/2019	18:07	Ewallet	57.92	4.761904762	2.896	4.5
13	529-56-39	B	Mandalay	Member	Male	Electronic acce	25.51	4	5.102	107.142	3/9/2019	17:03	Cash	102.04	4.761904762	5.102	6.8
14	365-64-05	A	Yangon	Normal	Female	Electronic acce	46.95	5	11.7375	246.4875	2/12/2019	10:25	Ewallet	234.75	4.761904762	11.7375	7.1
15	252-56-26	A	Yangon	Normal	Male	Food and bever	43.19	10	21.595	453.495	2/7/2019	16:48	Ewallet	431.9	4.761904762	21.595	8.2
16	829-34-39	A	Yangon	Normal	Female	Health and beau	71.38	10	35.69	749.49	3/29/2019	19:21	Cash	713.8	4.761904762	35.69	5.7
17	299-46-18	B	Mandalay	Member	Female	Sports and trav	93.72	6	28.116	590.436	1/15/2019	16:19	Cash	562.32	4.761904762	28.116	4.5
18	656-95-93	A	Yangon	Member	Female	Health and beau	68.93	7	24.1255	506.6355	3/11/2019	11:03	Credit card	482.51	4.761904762	24.1255	4.6
19	765-26-69	A	Yangon	Normal	Male	Sports and trav	72.61	6	21.783	457.443	1/1/2019	10:39	Credit card	435.66	4.761904762	21.783	6.9
20	329-62-15	A	Yangon	Normal	Male	Food and bever	54.67	3	8.2005	172.2105	1/21/2019	18:00	Credit card	164.01	4.761904762	8.2005	8.6
21	319-50-33	B	Mandalay	Normal	Female	Home and lifest	40.3	2	4.03	84.63	3/11/2019	15:30	Ewallet	80.6	4.761904762	4.03	4.4
22	300-71-46	C	Naypyitaw	Member	Male	Electronic acce	86.04	5	21.51	451.71	2/25/2019	11:24	Ewallet	430.2	4.761904762	21.51	4.8
23	371-85-57	B	Mandalay	Normal	Male	Health and beau	87.98	3	13.197	277.137	3/5/2019	10:40	Ewallet	263.94	4.761904762	13.197	5.1
24	273-16-66	B	Mandalay	Normal	Male	Home and lifest	33.2	2	3.32	69.72	3/15/2019	12:20	Credit card	66.4	4.761904762	3.32	4.4
25	636-48-82	A	Yangon	Normal	Male	Electronic acce	34.56	5	8.64	181.44	2/17/2019	11:15	Ewallet	172.8	4.761904762	8.64	9.9
26	549-59-13	A	Yangon	Member	Male	Sports and trav	88.63	3	13.2945	279.1845	3/2/2019	17:36	Ewallet	265.89	4.761904762	13.2945	6
27	227-03-50	A	Yangon	Member	Female	Home and lifest	52.59	8	21.036	441.756	3/22/2019	19:20	Credit card	420.72	4.761904762	21.036	8.5
28	649-29-67	B	Mandalay	Normal	Male	Fashion access	33.52	1	1.676	35.196	2/8/2019	15:31	Cash	33.52	4.761904762	1.676	6.7
29	189-17-42	A	Yangon	Normal	Female	Fashion access	87.67	2	8.767	184.107	3/10/2019	12:17	Credit card	175.34	4.761904762	8.767	7.7
30	145-94-90	B	Mandalay	Normal	Female	Food and bever	88.36	5	22.09	463.89	1/25/2019	19:48	Cash	441.8	4.761904762	22.09	9.6
31	848-62-72	A	Yangon	Normal	Male	Health and beau	24.89	9	11.2005	235.2105	3/15/2019	15:36	Cash	224.01	4.761904762	11.2005	7.4
32	871-79-84	B	Mandalay	Normal	Male	Fashion access	94.13	5	23.5325	494.1825	2/25/2019	19:39	Credit card	470.65	4.761904762	23.5325	4.8
33	149-71-62	B	Mandalay	Member	Male	Sports and trav	78.07	9	35.1315	737.7615	1/28/2019	12:43	Cash	702.63	4.761904762	35.1315	4.5
34	640-49-20	B	Mandalay	Normal	Male	Sports and trav	83.78	8	33.512	703.752	1/10/2019	14:49	Cash	670.24	4.761904762	33.512	5.1
35	595-11-54	A	Yangon	Normal	Male	Health and beau	96.58	2	9.658	202.818	3/15/2019	10:12	Credit card	193.16	4.761904762	9.658	5.1

Figure 2. A Screenshot of Dataset

2. Overview of Business Questions

2.1. Key Performance Indicators (KPIs)

The key performance indicators for this analysis focus on understanding sales performance, customer behavior, and product effectiveness. The critical business processes measured include:

- **Total Sales:** To evaluate the overall revenue generation.
- **Sales by Branch and City:** To assess the performance of different locations.
- **Product Line Performance:** To identify top-selling and underperforming product categories.
- **Customer Demographics Impact:** To understand how customer type and gender affect sales.
- **Sales by Time:** To determine peak shopping hours and days.
- **Payment Methods Usage:** To identify the most preferred payment methods by customers.
- **Customer Ratings:** To assess customer satisfaction across different product lines and services.

2.2. Business Questions/Problems

The report aims to answer the following business questions and solve related problems:

1. **Sales Trends:** What are the sales trends across different branches and cities? This helps in resource allocation and regional marketing strategies.

2. **Product Performance:** How do different product lines perform in terms of sales? This aids in inventory management and promotional efforts.
3. **Customer Impact:** What is the impact of customer demographics (type and gender) on sales? This assists in tailoring marketing campaigns and customer service initiatives.
4. **Purchase Timing:** How does the time of purchase influence sales? This information is crucial for optimizing staffing and store hours.
5. **Payment Preferences:** Which payment methods are most popular among customers? This helps streamline the checkout process and improve customer satisfaction.
6. **Customer Ratings:** How do customer ratings vary across different product lines and customer segments? This provides insights for enhancing product quality and customer service.

2.3. Key User Groups

The primary users of this data and report include:

- **Business Analysts:** To gain insights into sales patterns and customer behavior.
- **Marketing Teams:** To develop targeted marketing campaigns and promotions.
- **Sales Managers:** To optimize store performance and manage resources effectively.
- **Inventory Managers:** To ensure efficient stock levels and reduce wastage.
- **Customer Service Teams:** To enhance customer satisfaction based on demographic insights.

2.4. Strategic Importance of the Information

This information is needed to make informed business decisions that can improve overall performance and profitability. By understanding sales trends, product performance, and customer preferences, the supermarket can:

- Allocate resources more efficiently.
- Optimize inventory and reduce stockouts or overstock situations.
- Develop targeted marketing and promotional strategies.
- Improve customer service and satisfaction.
- Streamline operations and enhance the shopping experience.

C. Findings and Insights from Data Analysis

This section covers the key findings based on the analysis and evaluation of the supermarket sales data. It includes Power BI visuals with descriptions of the type of data and charts used, the reasons for using these metrics, and the business questions they answer. Additionally, the key findings from these charts are discussed to provide actionable insights.

1. Location Sales Trends Analysis

Visual 1: Total Sales and Net Profit by Month and City (Stacked Column Chart)

Visual 2: Total Sales and Net Profit by Month and City (Table)

Type: Stacked Column Chart, Table
Data: Total Sales and Net Profit by Month and City
Purpose: To visualize and provide detailed breakdowns of total sales and net profit across different cities and months. This helps in understanding how sales and profitability fluctuate over time and across different locations.

Why Use This Metric: To visualize and provide detailed breakdowns of total sales and net profit across different cities and months. This helps in understanding how sales and profitability fluctuate over time and across different locations.

Screenshot:

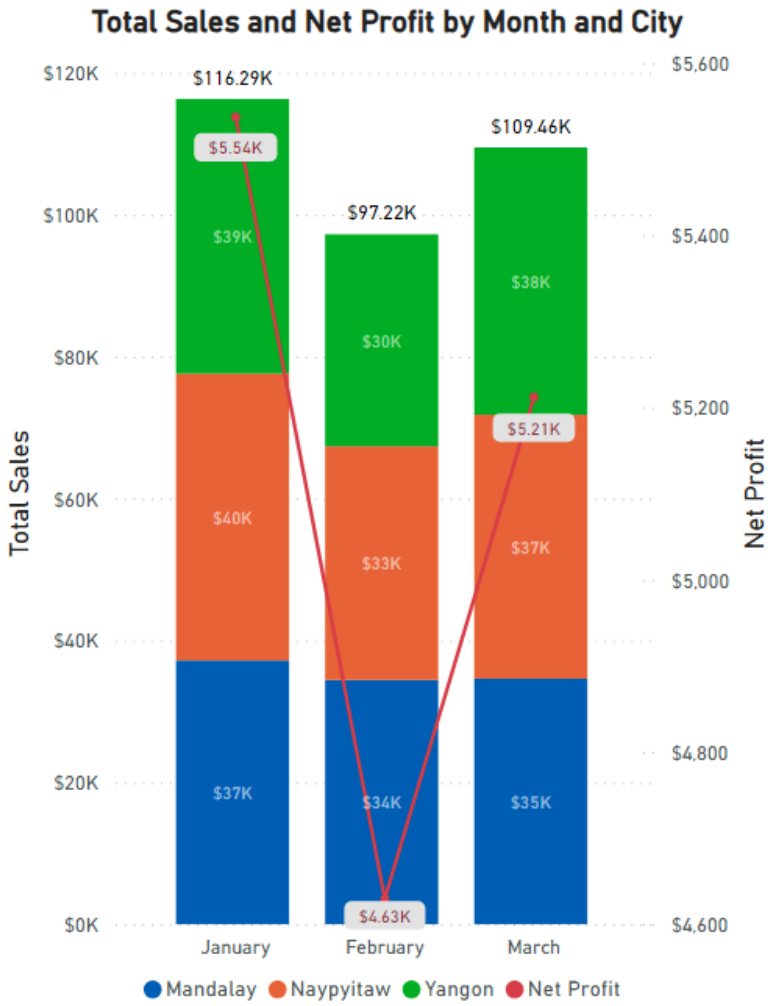


Figure 3. Total Sales and Net Profit by Month and City (Stacked Column Chart)

City/ Branch	Total Sales	Net Profit
Naypyitaw	**$110,568.7065**	**$5,265.1765**
C		
January	$40,434.681	$1,925.461
March	$37,199.043	$1,771.383
February	$32,934.9825	$1,568.3325
Yangon	**$106,200.3705**	**$5,057.1605**
A		
January	$38,681.1285	$1,841.9585
March	$37,659.1215	$1,793.2915
February	$29,860.1205	$1,421.9105
Mandalay	**$106,197.672**	**$5,057.032**
B		
January	$37,176.0585	$1,770.2885
March	$34,597.3425	$1,647.4925
February	$34,424.271	$1,639.251
Total	**$322,966.749**	**$15,379.369**

Figure 4. Total Sales and Net Profit by Month and City (Table)

Visual 3: Total Sales by City (Pie Chart)

Visual 4: Net Profit by City (Pie Chart)

Type: Pie Chart
Data: Total Sales and Net Profit by City
Purpose: To provide a visual representation of the contribution of each city to the overall sales and net profit. This helps in identifying which cities are the major contributors to the supermarket's revenue and profitability.

Why Use This Metric: These metrics provide a clear and immediate understanding of how each city contributes to total sales and net profit. They answer the business question: "What are the sales trends across different branches and cities?"

Screenshot:

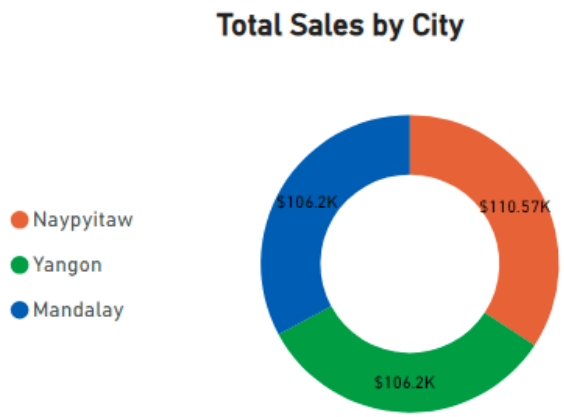


Figure 5. Total Sales by City (Pie Chart)

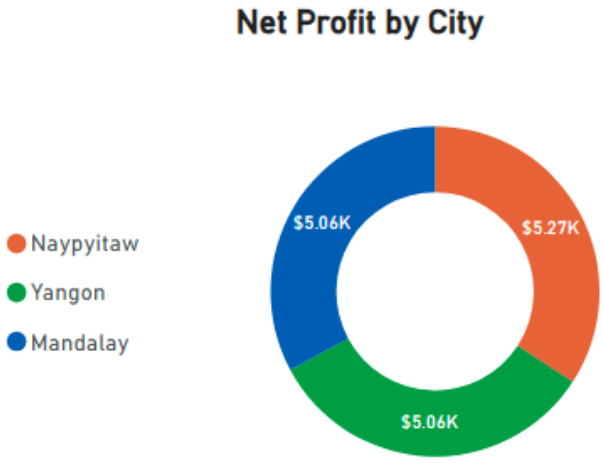


Figure 6. Net Profit by City (Pie Chart)

Visual 5: Number Of Transactions by City (Bar Chart)

Type: Bar Chart
Data: Number of Transactions by City
Purpose: To visualize the total number of transactions that occur in each city. This helps in understanding customer engagement and activity levels across different locations.

Why Use This Metric: This metric provides insights into the volume of transactions handled by each city, helping to identify which locations have higher customer activity. It answers the business question: "What are the sales trends across different branches and cities?"

Screenshot:

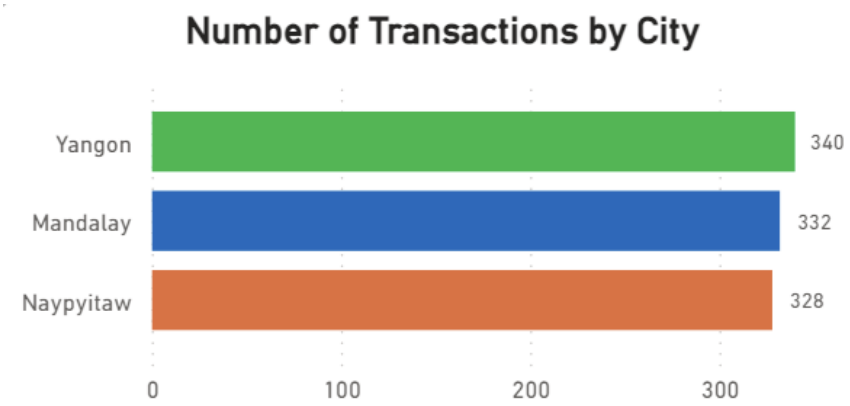


Figure 7. Number Of Transactions by City (Bar Chart)

Summary of Key Findings for Sales Trends Analysis

- **Highest Sales Month:** January shows the highest sales across all cities, with Naypyitaw leading in total sales.
- **Stable Net Profit:** Despite fluctuations, net profit remains relatively stable, with a notable dip in February.
- **Leading City:**
    - Naypyitaw leads in both total sales and net profit, making it the most profitable city.
    - Yangon has the highest number of transactions (340), indicating a high level of customer activity and engagement.
- **Sales Distribution:** There is a balanced distribution of sales among the three cities, with Naypyitaw slightly ahead.
- **Profit Distribution:** All three cities contribute significantly to the net profit, with Naypyitaw slightly ahead.
- **Overall Performance:**
    - Naypyitaw leads in both total sales and net profit, indicating strong overall performance.
    - Yangon and Mandalay have comparable total sales and net profit, showing consistent performance across these branches.
- **Monthly Trends:**
    - **Naypyitaw:** January is the strongest month with the highest sales ($40,434.68) and net profit ($1,925.46), followed by a dip in February and a slight recovery in March.
    - **Yangon:** January and March show similar sales figures, with January having the highest net profit ($1,841.96). February shows a dip in both sales and net profit.

- **Mandalay:** January has the highest sales and net profit, followed by a slight decrease in February and March.

- **Transaction Insights:**
  - Yangon leads in the number of transactions (340), followed by Mandalay (332) and Naypyitaw (328). This indicates that Yangon has the highest customer activity, which can be leveraged for targeted marketing strategies.

2. Time Purchase Analysis

Visual 1: Number of Transactions by Day of the Week (Line Chart)

Type: Line Chart
Data: Number of Transactions by Day of the Week
Purpose: To visualize the number of transactions that occur on each day of the week. This helps in understanding which days have the highest and lowest transaction volumes.

Why Use This Metric: This metric allows us to see trends in transaction volumes throughout the week, helping to identify peak shopping days. It answers the business question: "How does the time of purchase influence sales?"

Screenshot:

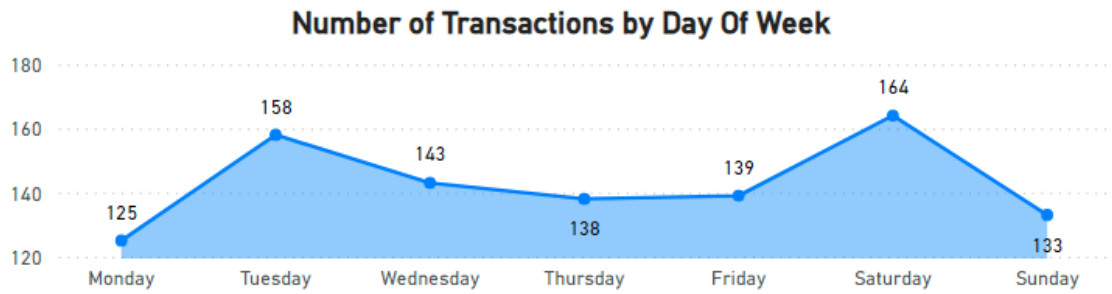


Figure 8. Number of Transactions by Day of the Week (Line Chart)

Visual 2: Total Sales by Day of the Month (Line Chart)

Type: Line Chart
Data: Total Sales by Day of the Month
Purpose: To visualize the total sales that occur on each day of the month. This helps in understanding daily sales trends.

Why Use This Metric: This metric provides insight into sales trends daily, helping to identify specific days with higher or lower sales. It answers the business question: "How does the time of purchase influence sales?"

Screenshot:

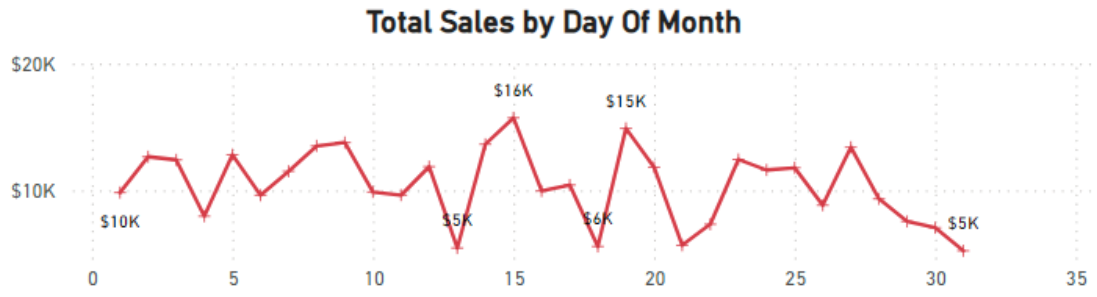


Figure 9. Total Sales by Day of the Month (Line Chart)

Visual 3: Total Sales by Day of the Week and City (Line and Clustered Column Chart)

Type: Line and Clustered Column Chart
Data: Total Sales by Day of the Week and City
Purpose: To compare the total sales across different days of the week and cities. This helps in understanding which days and cities contribute most to total sales.

Why Use This Metric: This metric provides a comparative view of sales performance across different days and cities, helping to identify patterns and trends. It answers the business question: "How does the time of purchase influence sales?"

Screenshot:

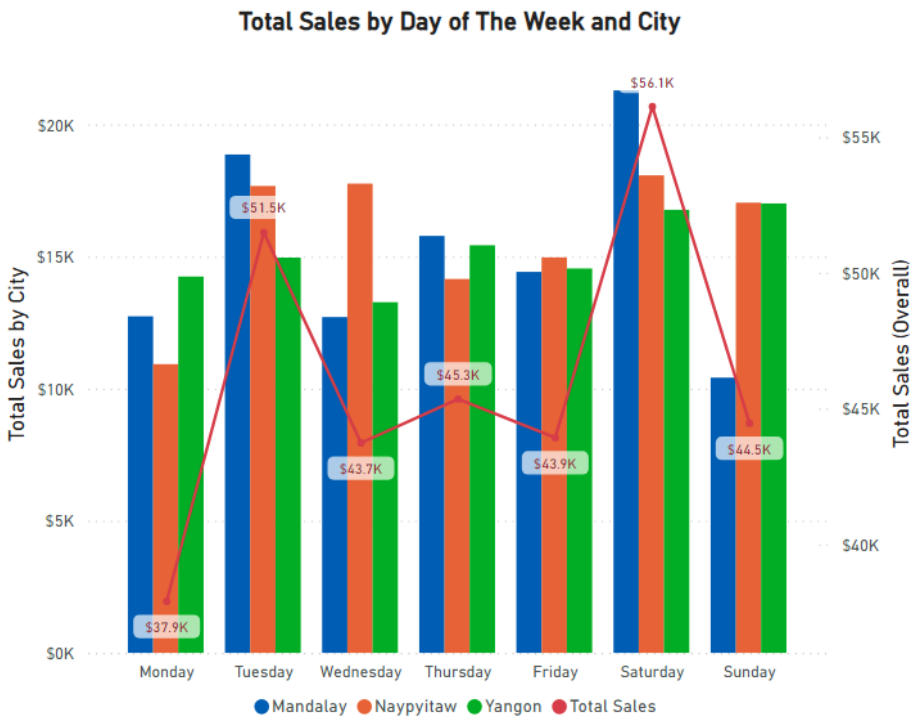


Figure 10. Total Sales by Day of the Week and City (Column Chart)

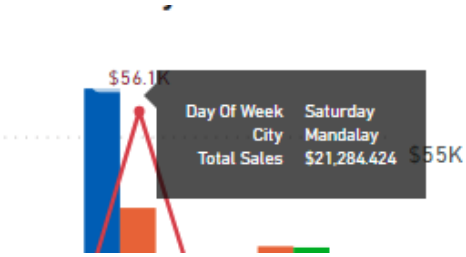


Figure 11. Tooltip with detailed numbers

Visual 4: Detailed Hourly Total Sales by City (Table)

Visual 5: Total Sales by Hour and City (Area Chart)

Type: Table, Area Chart
Data: Total Sales by Hour and City
Purpose: Table provides a detailed breakdown of total sales by hour for each city, this allows for a granular analysis of sales performance throughout the day. Area chart presents total sales throughout the day across different cities, this helps in identifying the distribution of sales over the course of the day.

Why Use This Metric: This combined approach allows us to see both granular and aggregate hourly sales trends across different cities, helping to optimize staffing and operational hours. It answers the business question: "How does the time of purchase influence sales?"

Screenshot:

Detailed Hourly Total Sales by City

Hour	Mandalay	Naypyitaw	Yangon	Total
10:00 AM	$8,865.843	$11,347.224	$11,208.414	$31,421.481
11:00 AM	$10,481.814	$8,545.6245	$11,349.891	$30,377.3295
12:00 PM	$8,475.411	$8,105.4015	$9,485.07	$26,065.8825
1:00 PM	$11,272.4115	$13,007.064	$10,443.7515	$34,723.227
2:00 PM	$11,694.564	$10,281.4215	$8,852.4135	$30,828.399
3:00 PM	$10,241.1645	$9,664.641	$11,273.703	$31,179.5085
4:00 PM	$4,123.56	$10,233.027	$10,869.7365	$25,226.3235
5:00 PM	$7,841.0535	$7,560.4305	$9,043.734	$24,445.218
6:00 PM	$9,555.2835	$9,028.0365	$7,447.02	$26,030.34
7:00 PM	$16,262.4525	$13,106.8035	$10,330.257	$39,699.513
8:00 PM	$7,384.1145	$9,689.0325	$5,896.38	$22,969.527
Total	**$106,197.672**	**$110,568.7065**	**$106,200.3705**	$322,966.749

Figure 12. Detailed Hourly Total Sales by City (Table)

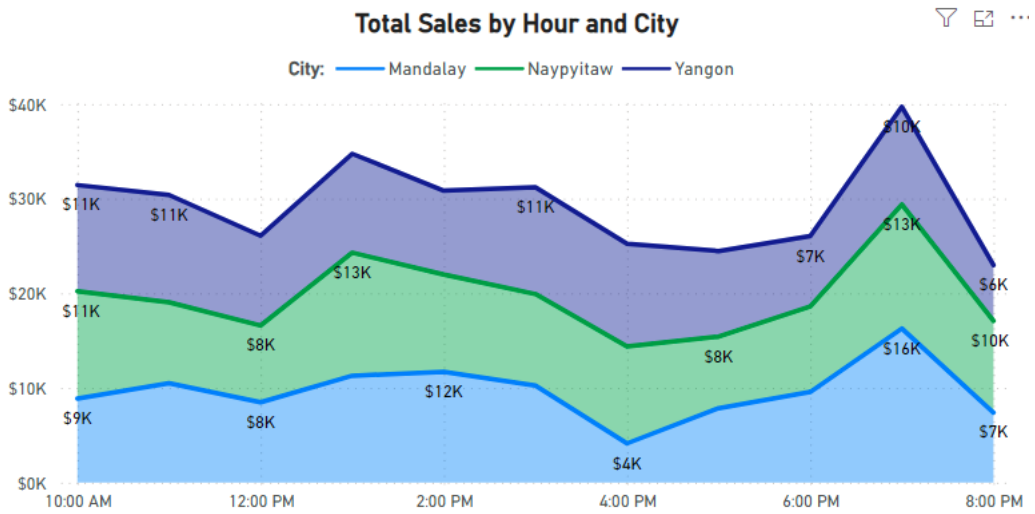


Figure 13. Total Sales by Hour and City (Area Chart)

Summary of Key Findings for Time Purchase Analysis

Hour Sales Trends

- **Evening Peak:** Sales peak during the evening hours (6:00 PM to 8:00 PM) across all cities.
- **Morning Dip:** Sales are lowest during the early morning hours (10:00 AM).
- **Peak Sales Hours:**
    - **7:00 PM:** Mandalay shows the highest sales during this hour with $16,262.45, followed by Naypyitaw ($13,106.80) and Yangon ($10,330.26).
    - **11:00 AM:** Yangon has significant sales at this time ($11,349.89), indicating strong morning performance.
- **Low Sales Hours:**
    - **4:00 PM:** Mandalay shows the lowest sales during this hour ($4,123.56).
    - **6:00 PM:** Naypyitaw shows a notable dip in sales during this hour ($10,233.03).
    - **8:00 PM:** Yangon has relatively low sales at this hour ($5,896.38).
- **City Comparison:**
    - **Mandalay:** Consistent high sales from 10:00 AM to 1:00 PM, with peaks at 11:00 AM ($10,481.81) and 7:00 PM ($16,262.45).
    - **Naypyitaw:** Strong sales performance from 10:00 AM to 7:00 PM, peaking at 7:00 PM ($13,106.80). Significant sales at 1:00 PM ($13,007.06) and 11:00 AM ($8,545.62).

- **Yangon:** Peaks at 11:00 AM ($11,349.89) and 1:00 PM ($10,443.75). Notable sales at 7:00 PM ($10,330.26).

Day Of Week Sales Trends

- **Highest Sales Day:** Saturday records the highest total sales overall ($56.1K), with Mandalay leading in sales ($21,284.42).
- **City Comparison:**
  - **Mandalay:** Highest sales on Saturday ($21,284.42), consistent high sales on Tuesday ($18,859.24) and Thursday ($15,778.62), indicating strong mid-week and weekend performance.
  - **Naypyitaw:** Highest sales on Wednesday ($17,755.82) and Sunday ($17,035.75). Significant sales on Tuesday ($17,667.79), suggesting mid-week and weekend peak sales periods.
  - **Yangon:** Highest sales on Saturday ($16,765.41), consistent high sales on Monday ($14,239.06) and Thursday ($15,422.27), showing a balanced distribution of sales throughout the week with notable peaks on weekends and early in the week.
- **Overall Sales Trends:**
  - **Weekdays:** Sales remain relatively stable on weekdays, with a noticeable dip on Monday ($10,925.31 in Naypyitaw) and higher peaks mid-week.
  - **Weekend Surge:** Significant increase in sales on the weekend, particularly on Saturday and Sunday.

Day Of Month Sales Trends

- **High Sales Days:**
  - The high sales on day 15 ($15,717.46) could be attributed to mid-month salary payments, leading to increased consumer spending.
  - Days 9 and 19 also show high sales, potentially due to promotional events or discounts driving sales on these days.
- **Low Sales Days:**
  - The low sales on day 31 ($5,232.50) might be due to it being the end of the month when customers have limited budget left.
  - Days 13, 18, and 21 show lower sales, which might be mid-month lulls when customers are between pay periods.

3. Customer Analysis

Visual 1: Transaction Distribution by Gender and Customer Type (Sunburst Chart)

Visual 2: Number of Transaction, Total Sales and Net Profit by Gender and Customer Type (Table)

Visual 3: Net Profit aby Gender and Customer Type (Sankey Chart)

Type: Sunburst Chart, Table, Sankey Chart.
Data: Transaction Distribution, Total Sales and Net Profit by Gender and Customer Type
Purpose: To provide a comprehensive analysis of customer demographics and their impact on sales and profitability. By using a combination of a sunburst chart, a detailed table, and a Sankey chart, this grouping aims to visualize the distribution of transactions, total sales, and net profit across different customer segments based on gender and customer type. This helps in understanding the demographic composition of the customer base and the financial contributions of each segment.

Why Use This Metric: This metric offers a multi-dimensional view of customer behavior and financial performance. The sunburst chart gives an overview of transaction distribution, the table provides detailed numerical insights into the number of transactions, total sales, and net profit, and the Sankey chart visualizes the flow of sales and profit between different customer segments. This combination answers the business question: "What is the impact of customer demographics (type and gender) on sales and profitability?" It enables businesses to tailor marketing strategies, improve customer engagement, and optimize resource allocation based on demographic insights.

Screenshot:

Gender	Number of Transactions	Total Sales	Net Profit
Female	**501**	**$167,882.925**	**$7,994.425**
Member	261	$88,146.9435	$4,197.4735
Normal	240	$79,735.9815	$3,796.9515
Male	**499**	**$155,083.824**	**$7,384.944**
Member	240	$76,076.5005	$3,622.6905
Normal	259	$79,007.3235	$3,762.2535
Total	**1000**	**$322,966.749**	**$15,379.369**

Figure 14. Number of Transaction, Total Sales and Net Profit by Gender and Customer Type (Table)

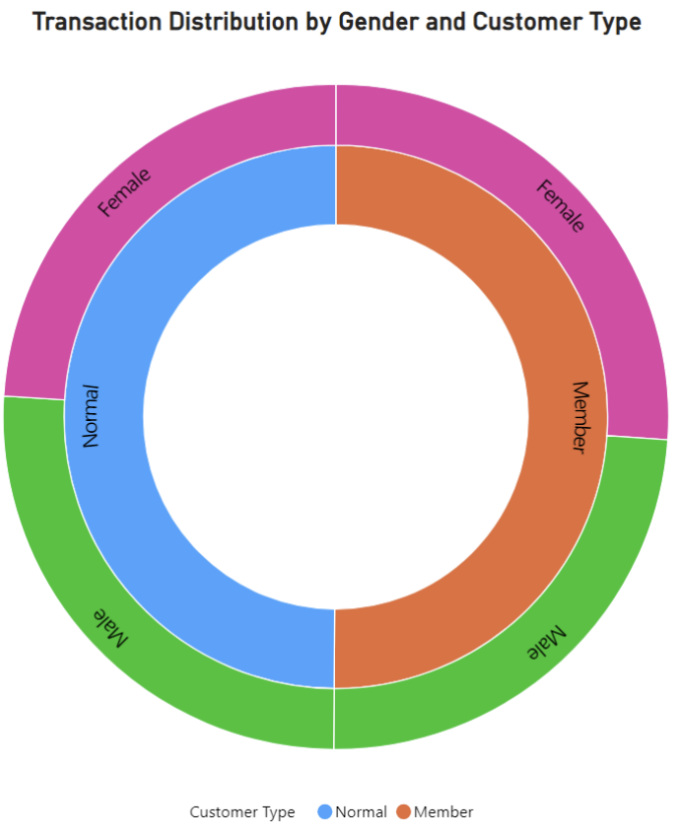


Figure 15. Transaction Distribution by Gender and Customer Type (Sunburst Chart)

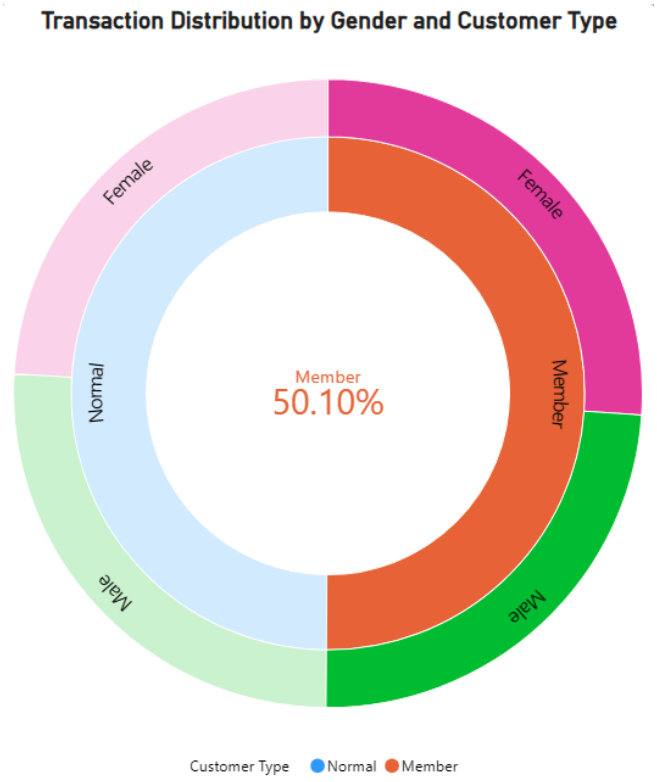


Figure 16. Transaction percentage is presented when selecting customer type

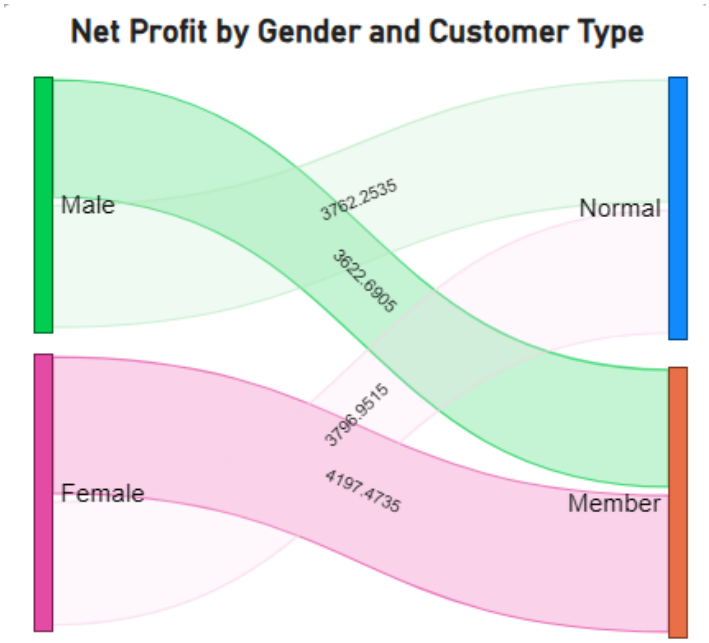


Figure 17. Net Profit by Gender and Customer Type (Sankey Chart)

Visual 4: Total Sales by Gender (Bar Chart)

Visual 5: Total Sales by Customer Type (Bar Chart)

Type: Bar Chart

Data: Total Sales by Gender and Customer Type

Purpose: To provide a visual comparison of total sales contributed by different genders and customer types. This helps in understanding the distribution of sales across these demographic segments.

Why Use This Metric: These metrics allow us to see how total sales are divided among different genders and customer types, which is essential for understanding customer demographics and their purchasing behavior. They answer the business questions: "What is the impact of customer demographics (type and gender) on sales?"

Screenshot:

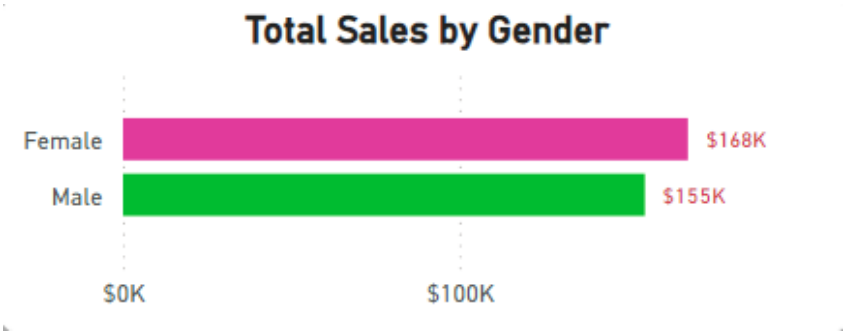


Figure 18. Total Sales by Gender (Bar Chart)

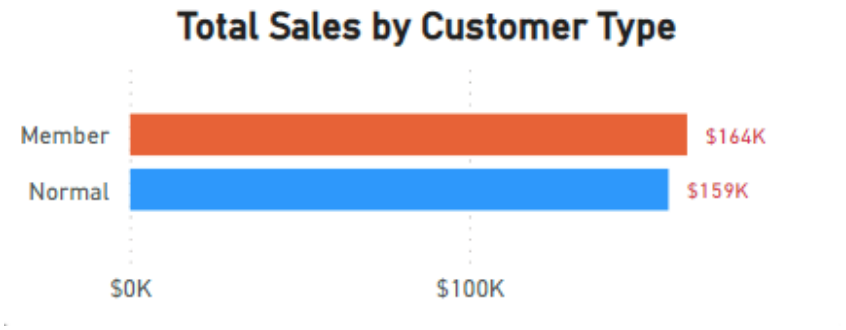


Figure 19. Total Sales by Customer Type (Bar Chart)

Visual 6: Average Sales per Transaction by Customer Type and Gender (Bar Chart)

Type: Bar Chart

Data: Average Sales per Transaction by Customer Type and Gender

Purpose: To compare the average sales per transaction among different customer types and genders. This helps in understanding the spending behavior of various customer segments.

Why Use This Metric: This metric provides insight into how much different customer segments spend on average per transaction. It answers the business question: "What is the impact of customer demographics (type and gender) on sales?"

Screenshot:

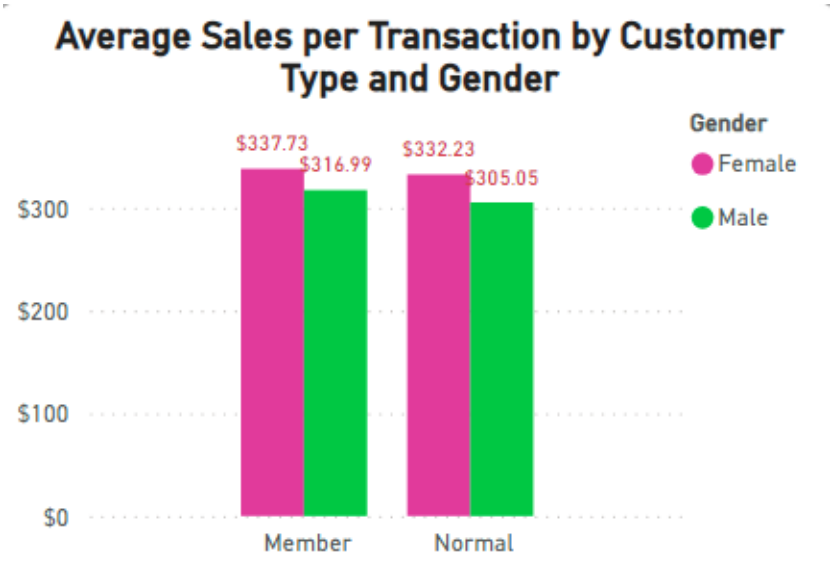


Figure 20. Average Sales per Transaction by Customer Type and Gender (Bar Chart)

Summary of Key Findings for Customer Analysis

Female Customers:

- **Number of Transactions:** Female customers have a total of 501 transactions, slightly higher than male customers.
- **Total Sales:** Female customers contribute significantly to total sales with $167,882.93.
- **Net Profit:** Female customers also lead in net profit with $7,994.43.
- **Member vs. Normal:** Within female customers, members account for $88,146.94 in total sales and $4,197.47 in net profit, while normal customers contribute $79,735.98 in total sales and $3,796.95 in net profit.
- **Higher Average Sales:**
    - **Member Customers:** Female members have higher average sales per transaction ($337.73) compared to male members ($316.99).
    - **Normal Customers:** Female normal customers also spend more on average per transaction ($332.23) compared to male normal customers ($305.05).
    - **Implication:** Female customers, regardless of their membership status, tend to spend more per transaction. This insight can be used to tailor marketing strategies and promotions to further engage and incentivize female customers.

Male Customers:

- **Number of Transactions:** Male customers have a total of 499 transactions, nearly equal to female customers.
- **Total Sales:** Male customers contribute $155,083.82 in total sales.

- **Net Profit:** Male customers contribute $7,384.94 in net profit.
- **Member vs. Normal:** Within male customers, members account for $76,076.50 in total sales and $3,622.69 in net profit, while normal customers contribute $79,007.32 in total sales and $3,762.25 in net profit.

Comparison Between Customer Types:

- **Members vs. Normal Customers:** Member customers have higher average sales per transaction compared to normal customers for both genders. Female members spend $337.73 per transaction on average, while female normal customers spend $332.23. Male members spend $316.99 on average, while male normal customers spend $305.05.
- **Implication:** The higher spending by member customers highlights the value of loyalty programs in increasing customer spending. Strategies to convert normal customers into members could potentially increase overall sales.

Overall Distribution:

- **Total Transactions:** The total number of transactions is evenly distributed between female and male customers, with 501 and 499 transactions respectively.
- **Total Sales and Net Profit:** Both female and male customers contribute significantly to total sales and net profit, indicating balanced customer engagement and financial contribution across genders.
- **Members vs. Normal Customers:** Members, regardless of gender, tend to contribute more to both total sales and net profit compared to normal customers, highlighting the value of membership programs.

4. Product Performance Analysis

Visuals 1: Product Line Performance (Table)

Visual 2: Total Sales by Product Line (Pie Chart)

Visual 3: Net Profit by Product Line (Column Chart)

Type: Table, Pie Chart, and Column Chart
Data: Quantity Sold, Total Sales, and Net Profit by Product Line
Purpose: To provide a comprehensive view of the performance of different product lines in terms of quantity sold, total sales, and net profit. This helps in understanding which product lines are the most popular and profitable.

Why Use These Metrics: These metrics together give a full picture of the product performance, from sales volume to profitability, helping to identify top-performing and underperforming product lines. They answer the business question: "How do different product lines perform in

terms of sales and gross income?"

Screenshots:

Product Line	Quantity Sold	% Quantity Sold	Total Sales	Net Profit
Electronic accessories	971	17.62%	$54,337.5315	$2,587.5015
Food and beverages	952	17.28%	$56,144.844	$2,673.564
Sports and travel	920	16.70%	$55,122.8265	$2,624.8965
Home and lifestyle	911	16.53%	$53,861.913	$2,564.853
Fashion accessories	902	16.37%	$54,305.895	$2,585.995
Health and beauty	854	15.50%	$49,193.739	$2,342.559
Total	**5510**	**100.00%**	**$322,966.749**	**$15,379.369**

Figure 21. Product Line Performance (Table)

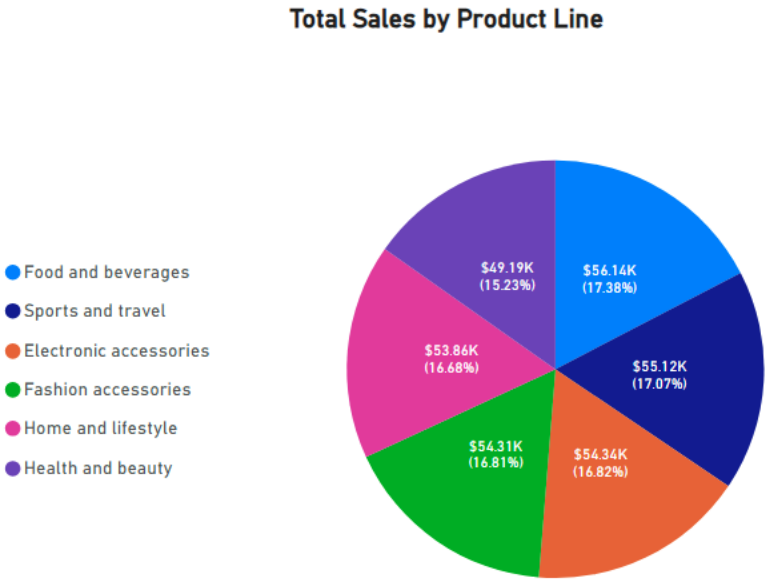


Figure 22. Total Sales by Product Line (Pie Chart)

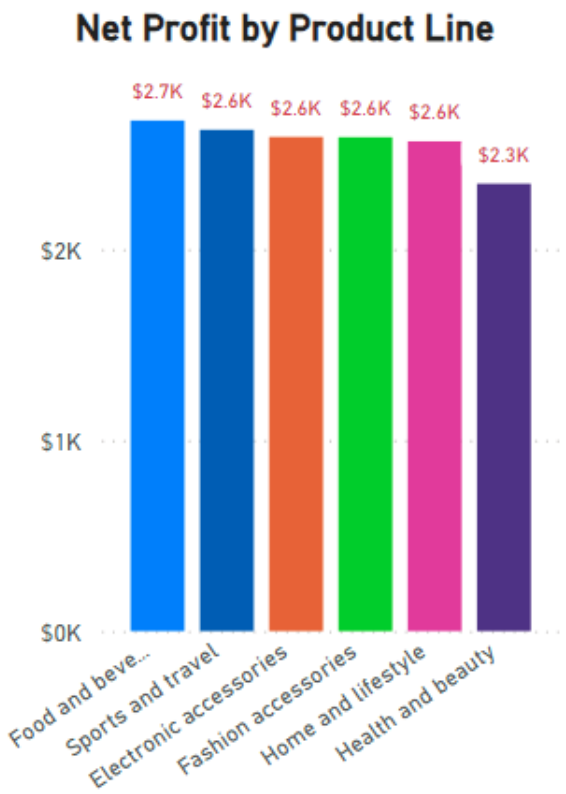


Figure 23. Net Profit by Product Line (Column Chart)

Visual 4: Total Sales by Product Line and Gender (Clustered Column Chart)

Type: Clustered Column Chart
Data: Total Sales by Product Line and Gender
Purpose: To visualize the distribution of total sales across different product lines and gender. This helps in understanding which product lines are preferred by male and female customers.

Why Use This Metric: This metric provides insight into gender-based preferences for different product lines, aiding in targeted marketing and inventory management. It answers the business question: "How do different product lines perform in terms of sales, and how does gender influence these preferences?"
Screenshot:

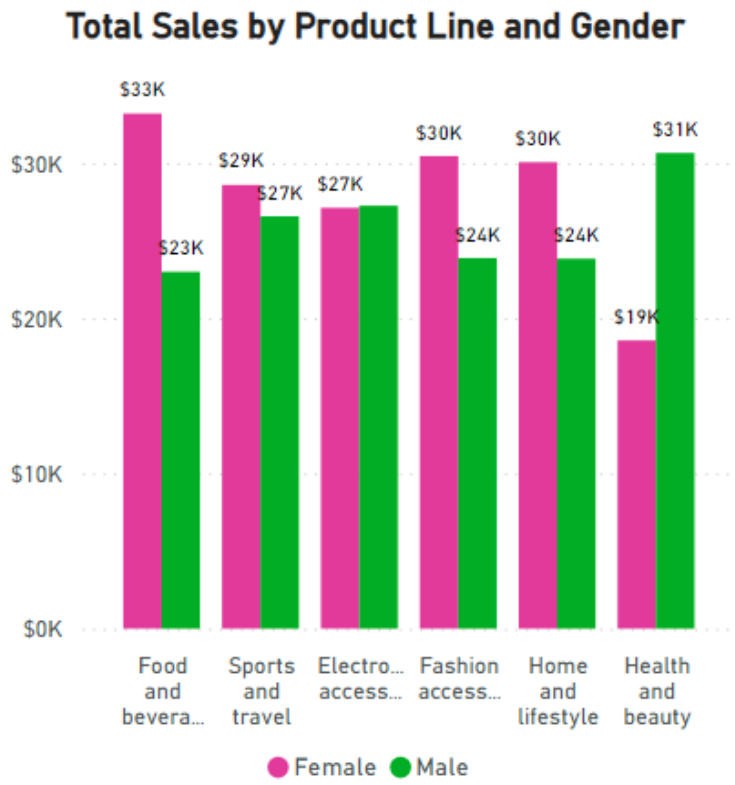


Figure 24. Total Sales by Product Line and Gender (Clustered Column Chart)

Visual 5: Average Rating by Product Line (Funnel)

Type: Funnel
Data: Average Rating by Product Line
Purpose: To visualize customer satisfaction by displaying the average rating for each product line. This helps in understanding customer preferences and areas for improvement.
Why Use This Metric: This metric provides insights into customer satisfaction levels across different product lines, aiding in quality control and customer service enhancements. It answers the business question: "How do customer ratings vary across different product lines?"
Screenshot:

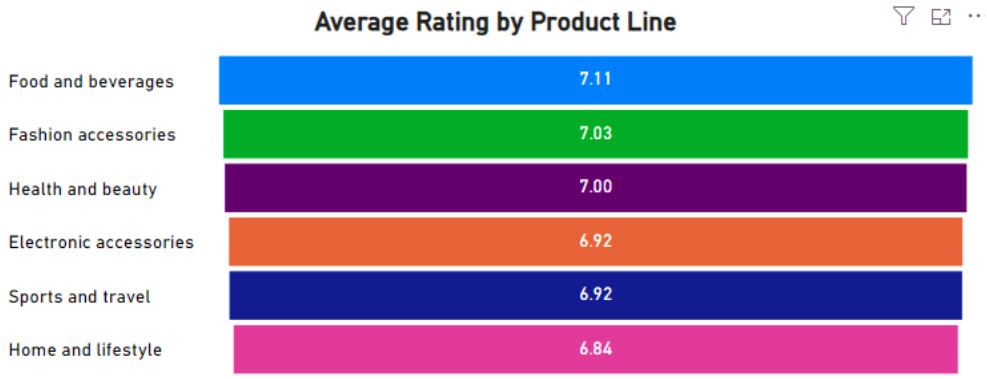


Figure 25. Average Rating by Product Line (Funnel)

Summary of Key Findings for Product Performance Analysis

Product Line Performance:

- **Top Performers:**
  - **Food and Beverages:** Leading in total sales ($56,144.84) and net profit ($2,673.56), with the highest average rating (7.11).
  - **Sports and Travel:** Strong performance with total sales ($55,122.83) and net profit ($2,624.90).
  - **Electronic Accessories:** High sales ($54,337.53) and net profit ($2,587.50).
- **Consistent Performers:**
  - **Fashion Accessories:** Consistent performance with total sales ($54,305.90) and net profit ($2,585.99), also showing high customer satisfaction with an average rating (7.03).
  - **Home and Lifestyle:** Total sales ($53,861.91) and net profit ($2,564.85), with the lowest average rating (6.84), indicating potential areas for improvement.
- **Lower Sales but High Satisfaction:**
  - **Health and Beauty:** Lowest in total sales ($49,193.74) but maintains a good net profit ($2,342.56) and average rating (7.00), suggesting strong customer loyalty and satisfaction.

Customer Gender and Product Line:

- **Female Customers:**
  - **Food and Beverages:** Highest sales ($33K), indicating a strong preference among female customers.
  - **Health and Beauty:** Significant sales ($31K), showing a strong inclination towards this product line.
- **Male Customers:**

- **Health and Beauty:** Leading sales ($31K), indicating high engagement in this product line.
- **Fashion Accessories and Home and Lifestyle:** Consistent high sales ($30K each), showing diverse interests.

Implications:

- **Top-performing Product Lines:** Food and Beverages, and Sports and Travel should be prioritized for inventory and promotions due to their high sales and profitability.
- **Customer Preferences:** Female customers show a strong preference for Food and Beverages and Health and Beauty, while male customers have diverse interests but show high engagement in Health and Beauty.
- **Customer Satisfaction:** High ratings in Food and Beverages and Fashion Accessories indicate strong customer satisfaction, while Home and Lifestyle needs focus on improving quality and customer experience.
- **Strategic Focus:** Investing in and promoting high-performing product lines, while improving the quality and customer experience in lower-rated lines, can enhance overall performance and customer satisfaction.

5. Payment Methods Analysis

Visual 1: Total Transactions, Total Sales, and Net Profit by Payment Method (Table)

Visual 2: Total Sales by Payment Methods (Pie Chart)

Visual 3: Net Profit by Payment Methods (Treemap)

Visual 4: Number of Transactions by Payment Methods (Column Chart)

Type: Table, Pie Chart, Treemap, and Column Chart
Data: Total Transactions, Total Sales, and Net Profit by Payment Methods
Purpose: To provide a comprehensive analysis of payment method usage, highlighting the number of transactions, total sales, and net profit associated with each payment method. This helps in understanding customer preferences and the financial impact of each payment method.

Why Use This Metric: Combining these visuals allows for a detailed comparison of how each payment method contributes to overall transactions, sales, and profitability. It answers the business question: "Which payment methods are most popular among customers and how do they impact sales and net profit?"

Screenshots:

Payment	Total Transactions	Total Sales	Net Profit
Cash	344	$112,206.57	$5,343.17
Credit card	311	$100,767.072	$4,798.432
Ewallet	345	$109,993.107	$5,237.767
Total	**1000**	**$322,966.749**	**$15,379.369**

Figure 26. Total Transactions, Total Sales, and Net Profit by Payment Method (Table)

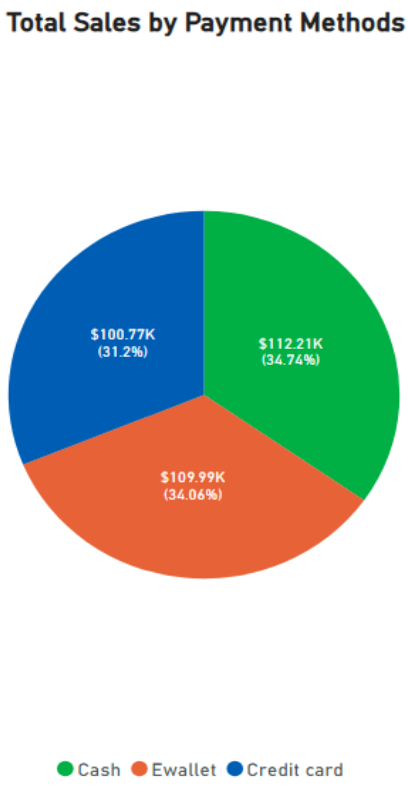


Figure 27. Total Sales by Payment Methods (Pie Chart)

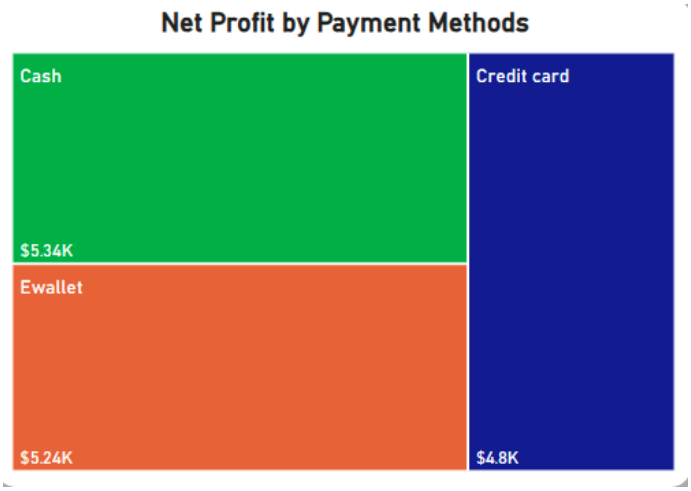


Figure 28. Net Profit by Payment Methods (Treemap)

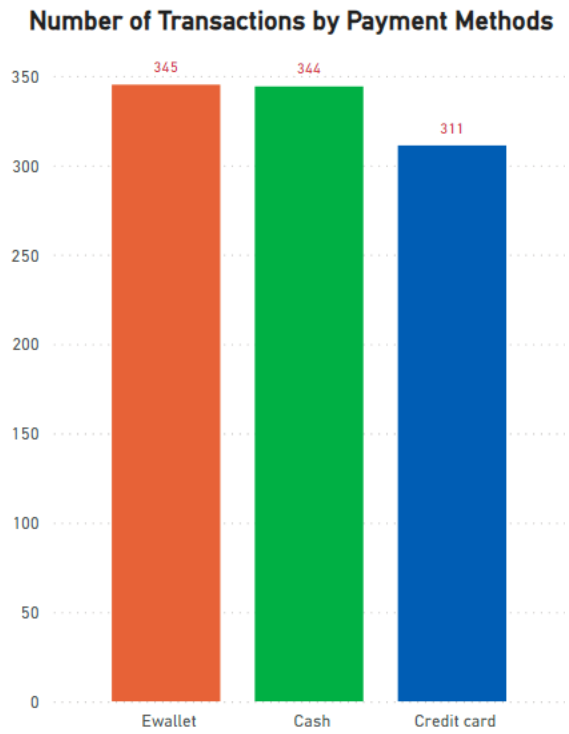


Figure 29. Number of Transactions by Payment Methods (Column Chart)

Visual 5: Total Sales by Month and Payment Methods (Area Chart)

Type: Area Chart
Data: Total Sales by Month and Payment Methods
Purpose: To visualize the distribution of total sales across different payment methods over the months. This helps in understanding how the preference for payment methods changes over time and its impact on total sales.

Why Use This Metric: This metric allows us to see trends in the usage of different payment methods over time, providing insights into customer preferences and helping to optimize financial and marketing strategies. It answers the business question: "Which payment methods are most popular among customers?"

Screenshot:

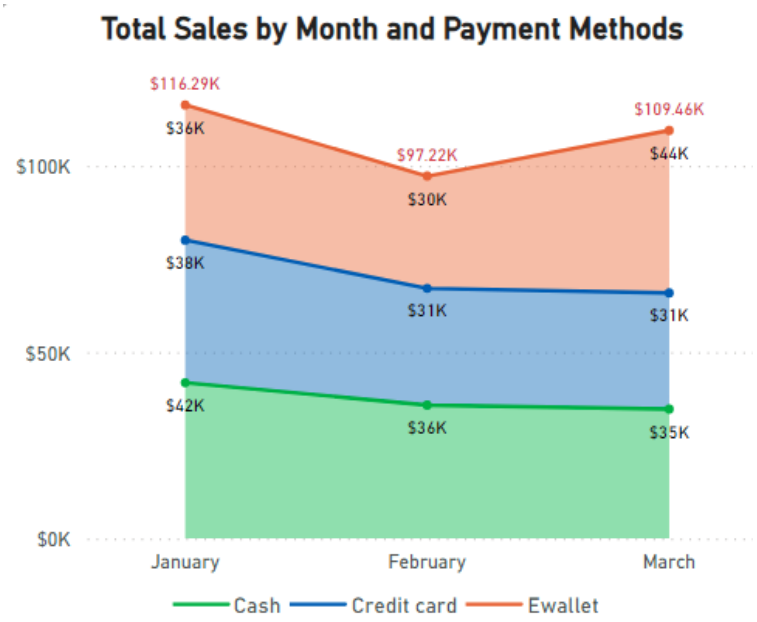


Figure 30. Total Sales by Month and Payment Methods (Area Chart)

Visual 6: Average Sales per Transaction by Payment Methods (Funnel)

Type: Funnel
Data: Average Sales per Transaction by Payment Methods
Purpose: To visualize the average sales amount per transaction across different payment methods. This helps in understanding which payment methods are associated with higher or lower average transaction values.

Why Use This Metric: This metric provides insights into the spending behavior of customers using different payment methods, helping to identify which payment methods drive higher average sales. It answers the business question: "Which payment methods are most popular among customers?"

Screenshot:

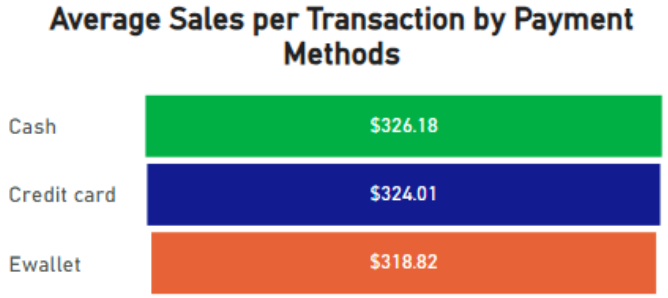


Figure 31. Average Sales per Transaction by Payment Methods (Funnel)

Summary of Key Findings for Payment Methods Analysis

Transaction and Sales Distribution:

- **Total Transactions:** Cash leads with 344 transactions, followed closely by Ewallet with 345 transactions, and Credit Card with 311 transactions. This indicates customer preference and trust in these payment methods.
- **Total Sales:** Cash transactions contribute the highest total sales of $112,206.57, followed by Ewallet at $109,993.11, and Credit Card at $100,767.07. This shows a balanced distribution of sales among the three payment methods.

Profitability:

- **Net Profit:** Cash transactions generate the highest net profit of $5,343.17, followed closely by Ewallet at $5,237.77, and Credit Card at $4,798.43. Each payment method contributes significantly to net profit, indicating overall profitability.

Sales Trends by Payment Methods:

- **Sales by Month:** January shows the highest total sales across all payment methods, with Ewallet sales peaking at $116.29K. February experiences a dip in total sales, followed by a recovery in March. Cash and Credit Card sales remain relatively stable, with a slight increase in March.
- **Sales Distribution:** Cash accounts for 34.74% of total sales, Ewallet for 34.06%, and Credit Card for 31.2%. The sales are evenly distributed, with a slight preference for Cash and Ewallet.

Average Sales per Transaction: Cash transactions have the highest average sales per transaction at $326.18, followed closely by Credit Card at $324.01, and Ewallet at $318.82. This indicates that while Ewallets are popular, customers tend to spend more per transaction when using Cash.

Comprehensive Insights:

- **Leading Payment Method:** Cash leads in total sales, net profit, and average sales per transaction, making it the most significant payment method for the supermarket.
- **Digital Payments:** Ewallets are a close second in total sales and transactions, indicating growing customer adoption of digital payment methods.
- **Credit Card Usage:** Despite having the lowest average sales per transaction, Credit Cards still contribute significantly to total sales and net profit, highlighting their importance.

D. Conclusions and Recommendations

Conclusions

Based on the analysis and evaluation, the supermarket sales data provide valuable insights addressing the six key business questions:

1. **Sales Trends Across Branches and Cities:**

- **Finding:** January shows the highest sales across all cities, with Naypyitaw leading in both total sales and net profit. Despite some fluctuations, net profit remains relatively stable, although there is a notable dip in February. Sales and profits are balanced among the three cities, with Naypyitaw slightly ahead.
- **Recommendation:** Allocate more resources and focus marketing efforts in Naypyitaw, especially during January. Monitor performance in February to identify and address factors contributing to the dip in net profit.

2. **Performance of Various Product Lines:**
    - **Finding:** Food and Beverages, along with Sports and Travel, are the top-performing product lines in terms of total sales and net profit. Health and Beauty products have lower sales but high customer satisfaction, indicating potential for growth.
    - **Recommendation:** Ensure adequate stock levels for top-performing product lines. Develop targeted promotions for Health and Beauty products to boost sales, leveraging their high customer satisfaction.
3. **Impact of Customer Demographics on Sales:**
    - **Finding:** Female customers lead in total transactions, total sales, and net profit. Members contribute more to total sales and net profit than non-members, with female members having the highest average sales per transaction.
    - **Recommendation:** Develop personalized marketing strategies for female customers and promote membership sign-ups. Tailor promotions and customer service initiatives to cater to the preferences of different customer demographics.
4. **Influence of Purchase Time on Sales:**
    - **Finding:** Sales peak during the evening hours (6:00 PM to 8:00 PM) across all cities, with the lowest sales in the early morning hours (10:00 AM). Saturday experiences the highest number of transactions, while Monday has the lowest. High sales are observed on the 15th of the month, possibly due to mid-month salary payments, with a significant dip on the 31st.
    - **Recommendation:** Adjust staffing levels and store hours to match peak shopping times, especially during the evening hours and weekends. Increase promotional activities on weekends to leverage high transaction volumes. Implement mid-month promotions and end-of-month clearance sales to drive purchases on low-sales days.
5. **Popular Payment Methods:**
    - **Finding:** Cash and Ewallet are the most popular payment methods, with Cash leading in total sales and net profit. Credit cards, while significantly used, have lower average sales per transaction compared to Cash and Ewallet.
    - **Recommendation:** Promote the use of Ewallet and Cash through incentives and streamlined checkout processes. Explore ways to increase transaction values for credit card users.

6. **Customer Ratings and Satisfaction:**
    - **Finding:** Customer ratings indicate high satisfaction with Food and Beverages, Fashion Accessories, and Health and Beauty products. Lower-rated categories, such as Home and Lifestyle, present opportunities for improvement.
    - **Recommendation:** Focus on maintaining high satisfaction levels for top-rated product lines. Implement strategies to improve the quality and customer satisfaction of lower-rated product lines through feedback and product enhancements.

Overall Recommendations:

1. **Enhance Marketing Strategies:**
    - Capitalize on high sales periods and peak shopping times with targeted promotions.
    - Develop personalized campaigns for different customer demographics, particularly female customers and members.
2. **Optimize Inventory Management:**
    - Ensure top-performing product lines are adequately stocked to meet demand.
    - Promote underperforming but high-satisfaction product lines to boost sales.
3. **Improve Operational Efficiency:**
    - Adjust staffing and store hours to align with peak shopping times.
    - Streamline the checkout process for popular payment methods to enhance customer satisfaction.
4. **Leverage Data-Driven Insights:**
    - Continuously monitor and analyze sales data to identify emerging trends and adjust strategies accordingly.
    - Utilize advanced analytics for predictive capabilities and more informed decision-making.

By implementing these recommendations, the supermarket can enhance operational efficiency, improve customer satisfaction, and drive overall sales growth. The insights derived from the data analysis provide a solid foundation for informed decision-making and strategic planning.

A. Data Pre-Processing or Data Cleansing

For the supermarket sales dataset, data pre-processing includes tasks: renaming columns for consistency and changing data types to appropriate formats. These tasks were accomplished using M language in Power BI.

- **Remove Missing Values**

  During the initial data exploration and quality check, it was determined that there are no missing values within the rows and columns of the dataset. Therefore, the step of removing missing values was not required for this analysis.

- **Rename Columns**

  Standardize column names to improve readability and consistency:

  - "Customer type" to "Customer Type"
  - "Product line" to "Product Line"
  - "Unit price" to "Unit Price"
  - "Tax 5%' to "Tax"
  - "cogs" to "COGS"
  - "gross margin percentage" to "Gross Margin"
  - "gross income" to "Gross Income"

M Language:

```
let
    Source = Csv.Document(File.Contents("C:\Mac\Home\Downloads\supermarket_sales - Sheet1.csv"),
    [Delimiter=",", Columns=17, Encoding=1252, QuoteStyle=QuoteStyle.None]),
    #"Promoted Headers" = Table.PromoteHeaders(Source, [PromoteAllScalars=true]),
    #"RenameColumns" = Table.RenameColumns(#"Promoted Headers", {
        {"Customer type", "Customer Type"},
        {"Product line", "Product Line"},
        {"Unit price", "Unit Price"},
        {"Tax 5%", "Tax"},
        {"cogs", "COGS"},
        {"gross margin percentage", "Gross Margin"},
        {"gross income", "Gross Income"}

    })
in
    #"RenameColumns"
```

Figure 32. Rename Columns using M Language

- **Change Data Types**

  Ensured all columns have appropriate data types:

  - Converted "Unit Price", “Tax”, “Total”, “COGS”, “Gross Income” Currency type.
  - Converted “Quantity” to Whole number type.
  - Converted “Date” to Date type.
  - Converted “Time” to Time type.
  - Converted “Rating” to Decimal number type.

M Language:

```
= Table.TransformColumnTypes(RenameColumns
,{{"Unit Price", Currency.Type}, {"Quantity", Int64.Type}, {"Tax", Currency.Type}, {"Total", Currency.Type}, {"Date", type date},
    {"Time", type time}, {"COGS", Currency.Type}, {"Gross Income", Currency.Type}, {"Rating", type number}, {"Gross Margin",
    Percentage.Type}})
```

Figure 33.Change Data Types using M Language

  - Converted “Gross Margin” to Percentage type.

M Language:

```
= Table.TransformColumns(#"Changed Type", {{"Gross Margin", each _ / 100, Percentage.Type}})
```

Figure 34.Change Gross Margin Data Type

Screenshot of the cleaned supermarket sales dataset in Power BI, showing the renamed columns, appropriate data types, removal of redundant 'Branch' column:

Invoice ID	City	Customer Type	Gender	Product Line	Unit Price	Quantity	Tax	Total	Date	Time	Payment	COGS	Gross Margin	Gross Income	Rating	Branch
123-19-1176	Yangon	Member	Male	Health and beauty	$58.22	8	$23.288	$489.048	1/27/2019	20:33	Ewallet	$465.76	4.76%	23.288	8.4	A
373-73-7910	Yangon	Normal	Male	Sports and travel	$86.31	7	$30.2085	$634.3785	2/8/2019	10:37	Ewallet	$604.17	4.76%	30.2085	5.3	A
252-56-2699	Yangon	Normal	Male	Food and beverages	$43.19	10	$21.595	$453.495	2/7/2019	16:48	Ewallet	$431.9	4.76%	21.595	8.2	A
636-48-8204	Yangon	Normal	Male	Electronic accessories	$34.56	5	$8.64	$181.44	2/17/2019	11:15	Ewallet	$172.8	4.76%	8.64	9.9	A
549-59-1358	Yangon	Member	Male	Sports and travel	$88.63	3	$13.2945	$279.1845	3/2/2019	17:36	Ewallet	$265.89	4.76%	13.2945	6	A
129-29-8530	Yangon	Member	Male	Sports and travel	$62.62	5	$15.655	$328.755	3/10/2019	19:15	Ewallet	$313.1	4.76%	15.655	7	A
635-40-6220	Yangon	Normal	Male	Health and beauty	$89.6	8	$35.84	$752.64	2/7/2019	11:28	Ewallet	$716.8	4.76%	35.84	6.6	A
287-21-9091	Yangon	Normal	Male	Home and lifestyle	$74.67	9	$33.6015	$705.6315	1/22/2019	10:55	Ewallet	$672.03	4.76%	33.6015	9.4	A
594-34-4444	Yangon	Normal	Male	Electronic accessories	$97.16	1	$4.858	$102.018	3/8/2019	20:38	Ewallet	$97.16	4.76%	4.858	7.2	A
865-92-6136	Yangon	Normal	Male	Food and beverages	$52.75	3	$7.9125	$166.1625	3/23/2019	10:16	Ewallet	$158.25	4.76%	7.9125	9.3	A
704-48-3927	Yangon	Member	Male	Electronic accessories	$88.67	10	$44.335	$931.035	1/12/2019	14:50	Ewallet	$886.7	4.76%	44.335	7.3	A
645-44-1170	Yangon	Member	Male	Home and lifestyle	$58.07	9	$26.1315	$548.7615	1/19/2019	20:07	Ewallet	$522.63	4.76%	26.1315	4.3	A
575-30-8091	Yangon	Normal	Male	Sports and travel	$72.5	8	$29	$609	3/16/2019	19:25	Ewallet	$580	4.76%	29	9.2	A
249-42-3782	Yangon	Normal	Male	Health and beauty	$70.01	5	$17.5025	$367.5525	1/3/2019	11:36	Ewallet	$350.05	4.76%	17.5025	5.5	A
827-26-2100	Yangon	Member	Male	Home and lifestyle	$33.84	9	$15.228	$319.788	3/21/2019	16:21	Ewallet	$304.56	4.76%	15.228	8.8	A
407-63-8975	Yangon	Normal	Male	Food and beverages	$73.88	6	$22.164	$465.444	3/23/2019	19:16	Ewallet	$443.28	4.76%	22.164	4.4	A
851-28-6367	Yangon	Member	Male	Sports and travel	$15.5	10	$7.75	$162.75	3/23/2019	10:55	Ewallet	$155	4.76%	7.75	8	A
400-60-7251	Yangon	Normal	Male	Home and lifestyle	$74.07	1	$3.7035	$77.7735	2/10/2019	12:50	Ewallet	$74.07	4.76%	3.7035	9.9	A
888-02-0338	Yangon	Normal	Male	Electronic accessories	$26.23	9	$11.8035	$247.8735	1/25/2019	20:24	Ewallet	$236.07	4.76%	11.8035	5.9	A
157-13-5295	Yangon	Member	Male	Health and beauty	$51.94	10	$25.97	$545.37	3/9/2019	18:24	Ewallet	$519.4	4.76%	25.97	6.5	A
478-06-7835	Yangon	Normal	Male	Fashion accessories	$89.69	1	$4.4845	$94.1745	1/11/2019	11:20	Ewallet	$89.69	4.76%	4.4845	4.9	A

Figure 35.Screenshot of the cleaned supermarket sales dataset

B. BI Data Modelling

In the process of developing a robust data model for the supermarket sales dataset, a Snowflake Schema approach is employed. This involves creating dimension tables and a fact table that together support efficient querying and reporting.

1. Creating Dimension Tables and Fact Table

1.1. Dimension table: City

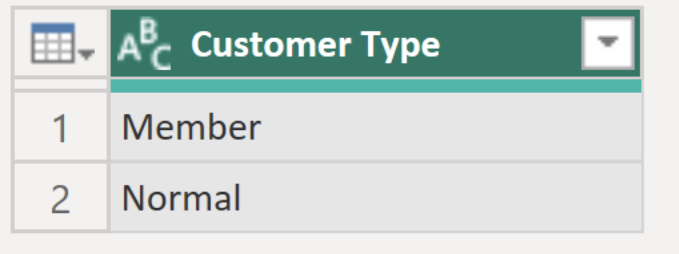
To create the **City** table, the original dataset is duplicated within the Power Query Editor. By right-clicking on the original table and selecting "Duplicate," the integrity of the original data remains intact while allowing modifications on the new table. Next, only the "City" column, which holds the relevant information for this dimension, is retained. To ensure that each city is uniquely represented, the "Remove Duplicates" option in the "Home" tab of Power Query Editor is used. Finally, the table is renamed to "**City**" to clearly signify its role as the city dimension in the data model.

	City
1	Yangon
2	Naypyitaw
3	Mandalay

Figure 36.Dimension table: City

1.2. Dimension table: CustomerType

Constructing the **CustomerType** table follows a similar process. After duplicating the original dataset, focus is placed on retaining only the column that pertains to customer information, specifically "Customer Type." This column provides valuable data for analysis. The "Remove Duplicates" option is used to ensure unique entries for each customer type. This table is then renamed to **CustomerType** to reflect its role in representing customer dimensions within the model.



	Customer Type
1	Member
2	Normal

Figure 37.Dimension table: CustomerType

1.3. Dimension table: ProductLine

For the **ProductLine** table, the process begins with duplicating the original dataset. The data is then filtered to retain only the "Product Line" column, which categorizes the different types of products sold. By applying the "Remove Duplicates" function, it is ensured that each product line appears only once in this dimension table. This table is then renamed to "**ProductLine**," indicating its purpose within the data model.

	Product Line
1	Health and beauty
2	Electronic accessories
3	Home and lifestyle
4	Sports and travel
5	Food and beverages
6	Fashion accessories

Figure 38.Dimension table: ProductLine

1.4. Dimension table: PaymentMethod

Creating the **PaymentMethod** table involves duplicating the original dataset and focusing on the "Payment" column. This dimension table categorizes the various payment methods utilized by customers. After retaining the necessary column, the "Remove Duplicates" option is applied to ensure that each payment method is uniquely represented. This table is renamed to "**PaymentMethod**" to clearly define its role in representing payment methods within the model.

	Payment
1	Ewallet
2	Cash
3	Credit card

Figure 39.Dimension table: PaymentMethod

1.5. Dimension table: Branch

The **Branch** table is created by duplicating the original dataset and retaining columns related to branch information, specifically the "Branch" and "City" columns. This table is crucial for linking branches to their respective cities. By employing the "Remove Duplicates" function, it is ensured that each branch-city combination is uniquely represented. The table is then renamed to "**Branch**," clearly indicating its purpose within the data model.

	Branch	City
1	A	Yangon
2	C	Naypyitaw
3	B	Mandalay

Figure 40.Dimension table: Branch

1.6. Fact table: Sales

The **Sales** table serves as the core of the data model, containing the transactional data essential for analysis. This table was created by duplicating the original dataset and retaining columns relevant to sales transactions, including "Invoice ID", "Date", "Time", “Gender”, "Unit price", "Total", "Quantity”, “Gross Income", "Gross Margin", “Tax”, “COGS” and “Rating”. Additionally, columns such as "City," "Customer type" "Product Line, "Payment," "Branch," and were retained to establish relationships with the dimension tables. Unnecessary columns not required for analysis were removed to streamline the table. Finally, this table was renamed to "**Sales**" to signify its role in containing the primary transactional data.

Summary of Columns for Sales Table

- **Invoice ID:** Unique identifier for each transaction.
- **Date:** Date of the transaction for time-based analysis.
- **Time:** Time of the transaction for daily sales pattern analysis.
- **Gender:** Demographic information for marketing strategies.
- **Unit Price:** Price of each product sold for pricing analysis.
- **Total:** Total amount of the transaction for revenue analysis.
- **Quantity:** Number of items sold for volume analysis.
- **Gross Income:** Profit from each transaction for profitability analysis.
- **Gross Margin:** Profitability percentage for efficiency analysis.
- **Tax:** Tax amount applied to each sale for financial accuracy.
- **COGS (Cost of Goods Sold):** Direct costs for gross profit calculation.
- **Rating:** Customer feedback for satisfaction and quality assessment.
- **City:** Geographical location for regional performance analysis.
- **Customer Type:** Type of customer for behavioral analysis.
- **Product Line:** Product category for performance and inventory management.
- **Payment Method:** Preferred payment methods for checkout optimization.
- **Branch:** Branch information for comparative performance analysis.

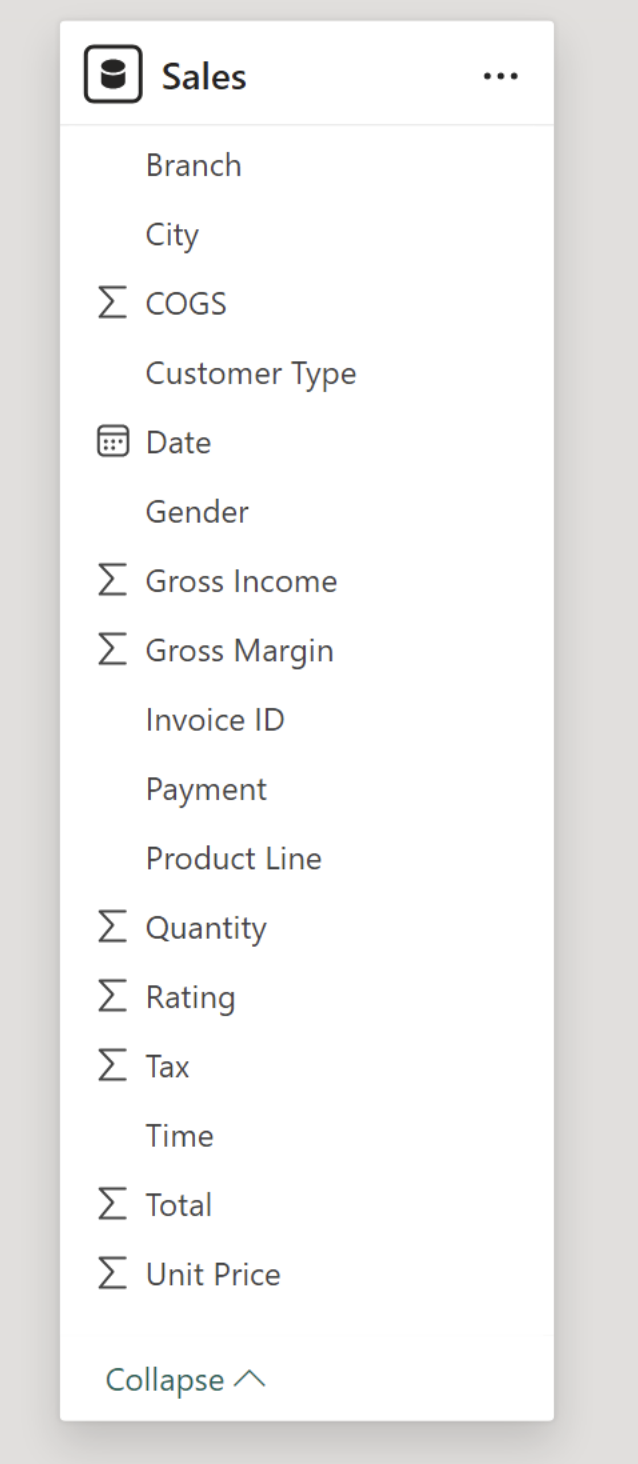


Figure 41.Fact table: Sales

After all the dimension tables and the fact table were created and validated, the original dataset was removed to clean up the workspace and ensure that only the necessary tables remain for analysis. This step helps in maintaining a clear and efficient data model.

2. Relationships Between Tables – Snowflake Schema

After creating the dimension tables and the fact table, the next step is to establish relationships between these tables to form a Snowflake schema.

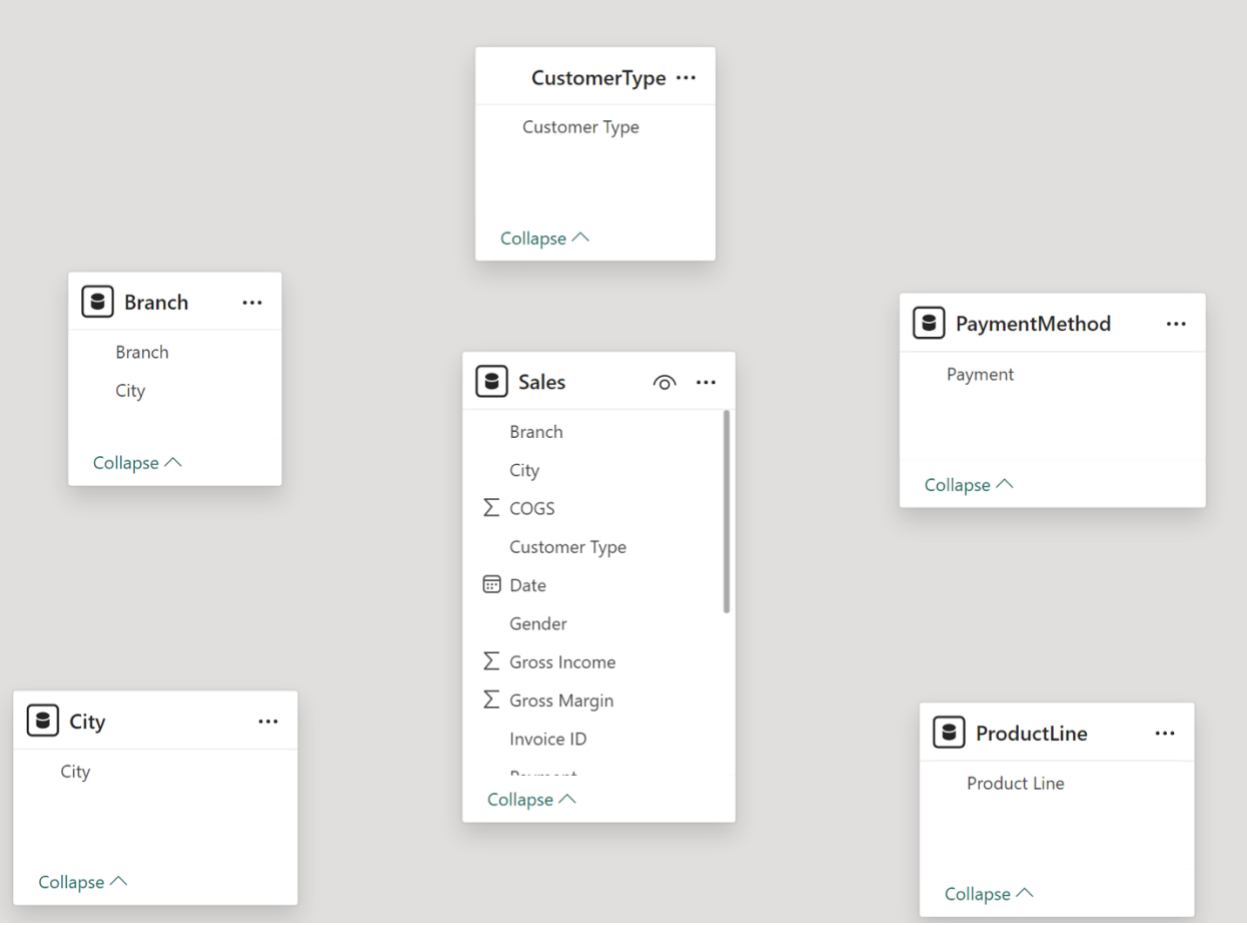


Figure 42.Data Model Before Relationships Are Created

- Relationship between Sales table and CustomerType table (1-Many)

  Drag the **Customer Type** column from the **Sales** table to the **Customer Type** column in the **CustomerType** table. This one-to-many relationship connects each sales transaction to customer demographic information, facilitating detailed customer behavior analysis.

- Relationship between Sales table and ProductLine table (1-Many)

  Drag the **Product Line** column from the **Sales** table to the **Product Line** column in the **ProductLine** table. This one-to-many relationship ensures that each transaction is associated with the correct product category, which is crucial for product performance analysis.

- Relationship between Sales table and PaymentMethod table (1-Many)

Drag the **Payment** column from the **Sales** table to the **Payment** column in the **PaymentMethod** table. This one-to-many relationship provides insights into customer payment preferences, aiding in optimizing the checkout process.

- Relationship between Sales table and Branch table (1-Many)

  Drag the **Branch** column from the **Sales** table to the **Branch** column in the **Branch** table. This one-to-many relationship enables analysis of sales performance across different branches, essential for resource allocation and branch comparison.

- Relationship between Branch table and City table (1-1)

  Drag the **City** column from the **Branch** table to the **City** column in the **City** table. This one-to-one relationship ensures that each branch is correctly associated with its respective city, providing comprehensive geographical context.

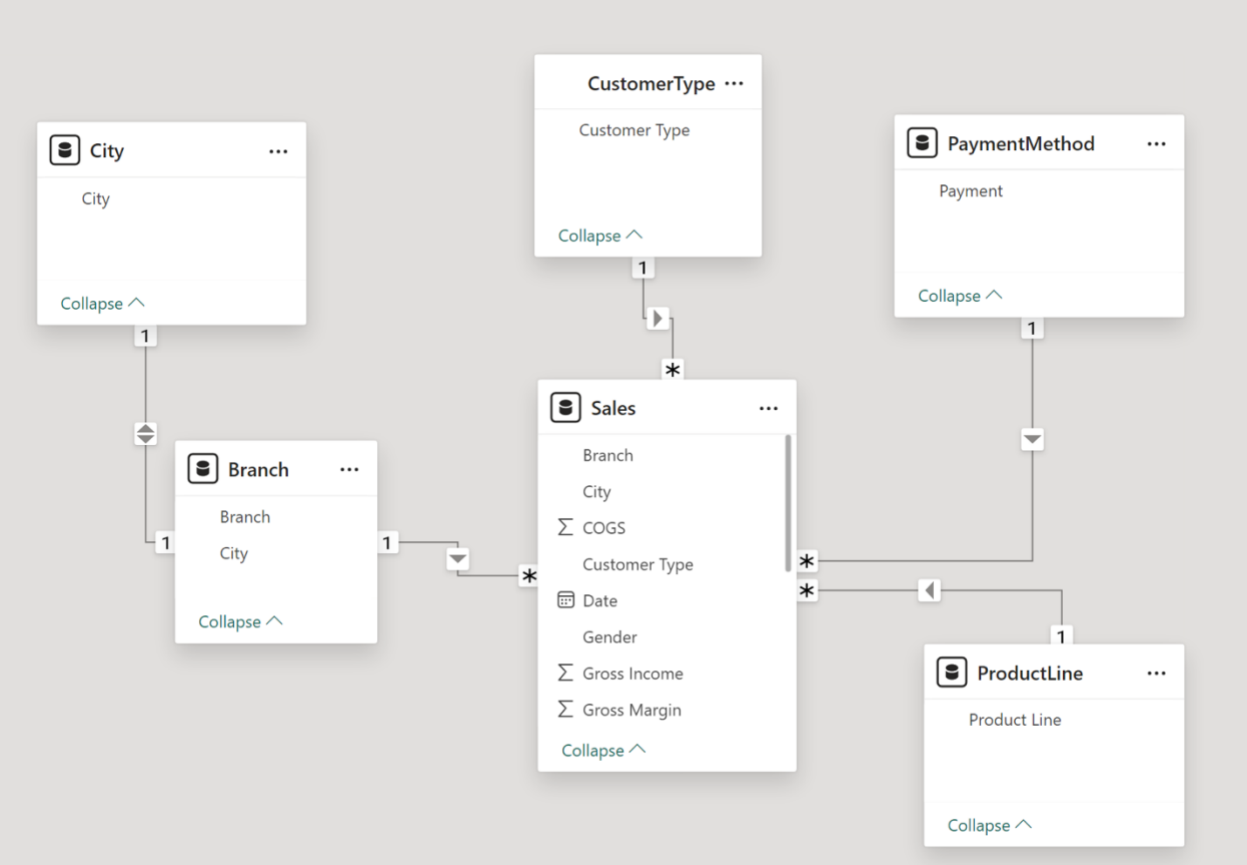


Figure 43. Data Model Show Snowflake Schema After Relationships Are Created

C. DAX and M Language

1. Measures

- **Measure: Total Sales**

Total Sales is a key performance indicator (KPI) used by sales departments to track the total amount of revenue generated from sales over a given period. It's also referred to as total revenue and is a good measure of business health (Marr, 2012).

DAX Formula:

```
Total Sales = SUM(Sales[Total])
```

- **Measure: Net Profit**

  In the dataset, Total Sales = COGS + Tax, resulting in a traditional Net Profit calculation of zero. To provide a meaningful profit metric, Net Profit is redefined as equivalent to Gross Income, excluding Tax from consideration.

  DAX Formula:

```
Net Profit = SUM(Sales[Gross Income])
```

- **Measure: Profit Ratio**

  Profit ratio, also known as profitability ratio, is a financial metric used to measure the profitability of a business. It represents the percentage of each dollar of sales that is kept as profit after deducting all expenses, including operating expenses, taxes, interest, and depreciation (Marr, 2012).

  DAX Formula:

```
Profit Ratio = DIVIDE([Net Profit], [Total Sales], 0)
```

- **Measure: Number of Transaction**

  This measure is created to track the number of transactions over time.

  DAX Formula:

```
Number of Transactions = COUNT(Sales[Invoice ID])
```

- **Measure: Average Sales per Transaction**

  This measure is created to calculate the average spending per transaction across different customer segments.

  DAX Formula:

```
Average Sales per Transaction = DIVIDE([Total Sales], [Number of Transactions], 0)
```

2. New Column for Grouped Hour (Sales Table)

To analyze sales trends based on the time of day, it is essential to group sales data by specific hours. The original dataset contains detailed timestamps for each transaction, but to gain

meaningful insights into hourly sales patterns, a new column called "Grouped Hour" is created. This column extracts the hour from each timestamp and groups transactions accordingly.

DAX Formula:

```
Grouped Hour = TIME(HOUR(Sales[Time]),0,0)
```

Explanation:

- **TIME Function:** The `TIME` function is used to create a time value. It takes three arguments: hour, minute, and second. By setting the minute and second to zero, the original time is effectively rounded down to the nearest hour.
- **HOUR Function:** The `HOUR` function extracts the hour component from the original `Sales[Time]` column. This function returns an integer value representing the hour (0 to 23).
- **Grouped Hour:** The result of the `HOUR` function is passed as the hour argument to the `TIME` function, with minutes and seconds set to zero. This creates a new time value that represents the start of each hour (e.g., 8:33 PM becomes 8:00 PM).

	Time	Payment	Gross Margin	Gross Income	Rating	Tax	COGS	Grouped Hour
y 27, 2019	8:33:00 PM	Ewallet	0.04761904762	$23.288	8.4	$23.288	$465.76	8:00 PM
ry 8, 2019	10:37:00 AM	Ewallet	0.04761904762	$30.2085	5.3	$30.2085	$604.17	10:00 AM
ry 7, 2019	4:48:00 PM	Ewallet	0.04761904762	$21.595	8.2	$21.595	$431.9	4:00 PM
y 17, 2019	11:15:00 AM	Ewallet	0.04761904762	$8.64	9.9	$8.64	$172.8	11:00 AM
ch 2, 2019	5:36:00 PM	Ewallet	0.04761904762	$13.2945	6	$13.2945	$265.89	5:00 PM
h 10, 2019	7:15:00 PM	Ewallet	0.04761904762	$15.655	7	$15.655	$313.1	7:00 PM
ry 7, 2019	11:28:00 AM	Ewallet	0.04761904762	$35.84	6.6	$35.84	$716.8	11:00 AM
y 22, 2019	10:55:00 AM	Ewallet	0.04761904762	$33.6015	9.4	$33.6015	$672.03	10:00 AM
ch 8, 2019	8:38:00 PM	Ewallet	0.04761904762	$4.858	7.2	$4.858	$97.16	8:00 PM
h 23, 2019	10:16:00 AM	Ewallet	0.04761904762	$7.9125	9.3	$7.9125	$158.25	10:00 AM
y 12, 2019	2:50:00 PM	Ewallet	0.04761904762	$44.335	7.3	$44.335	$886.7	2:00 PM
y 19, 2019	8:07:00 PM	Ewallet	0.04761904762	$26.1315	4.3	$26.1315	$522.63	8:00 PM
h 16, 2019	7:25:00 PM	Ewallet	0.04761904762	$29	9.2	$29	$580	7:00 PM
ry 3, 2019	11:36:00 AM	Ewallet	0.04761904762	$17.5025	5.5	$17.5025	$350.05	11:00 AM
h 21, 2019	4:21:00 PM	Ewallet	0.04761904762	$15.228	8.8	$15.228	$304.56	4:00 PM
h 23, 2019	7:16:00 PM	Ewallet	0.04761904762	$22.164	4.4	$22.164	$443.28	7:00 PM
h 23, 2019	10:55:00 AM	Ewallet	0.04761904762	$7.75	8	$7.75	$155	10:00 AM
y 10, 2019	12:50:00 PM	Ewallet	0.04761904762	$3.7035	9.9	$3.7035	$74.07	12:00 PM
y 25, 2019	8:24:00 PM	Ewallet	0.04761904762	$11.8035	5.9	$11.8035	$236.07	8:00 PM

Figure 44. New Column "Grouped Hour" in Sales Table

3. New Column for Day of the Week (Sales Table)

To effectively analyze and display total sales by day of the week in Power BI, it is essential to create a new column that extracts the day of the week from the date of each transaction. This allows for aggregating and visualizing sales data based on the specific day, such as Monday, Tuesday, etc.

- **Extracting Day of the Week:**

DAX Formula:

```
Day Of Week = FORMAT(Sales[Date], "dddd")
```

Explanation:

- **FORMAT Function:** The `FORMAT` function converts the date into a text string representing the full name of the day of the week (e.g., "Monday").
- **Sales[Date]:** This is the date column in the Sales table from which the day of the week is extracted.
- **"dddd":** The format string "dddd" tells the function to return the full name of the day.

- **Sorting Day of the Week:**

  DAX Formula:

```
DayOfWeekNumber = WEEKDAY(Sales[Date], 2)
```

  Explanation:

  - **WEEKDAY Function:** The `WEEKDAY` function returns an integer representing the day of the week, where Monday is 1 and Sunday is 7.
  - **Sales[Date]:** This is the date column in the Sales table from which the day of the week number is extracted.
  - **2:** The second argument specifies that the week starts on Monday (1) and ends on Sunday (7).

- **Creating the Relationship and Sorting:**
  - **Relationship:** Ensure there is a relationship between the Sales table and any supporting tables (if necessary) that include the "Day Of Week" and "DayOfWeekNumber" columns.
  - **Sorting:** Use the "DayOfWeekNumber" column to sort the "Day Of Week" column correctly.

    Steps:

    - Select the "Day Of Week" column.
    - In the "Modeling" tab, choose "Sort by Column" and select "DayOfWeekNumber."

Date	Time	Payment	Gross Margin	Gross Income	Rating	Tax	COGS	Grouped Hour	Day Of Week	DayOfWeekNumber
Sunday, January 27, 2019	8:33:00 PM	Ewallet	0.04761904762	$23.288	8.4	$23.288	$465.76	8:00 PM	Sunday	7
Friday, February 8, 2019	10:37:00 AM	Ewallet	0.04761904762	$30.2085	5.3	$30.2085	$604.17	10:00 AM	Friday	5
Thursday, February 7, 2019	4:48:00 PM	Ewallet	0.04761904762	$21.595	5.3	$21.595	$431.9	4:00 PM	Thursday	4
Sunday, February 17, 2019	11:15:00 AM	Ewallet	0.04761904762	$8.64	9.9	$8.64	$172.8	11:00 AM	Sunday	7
Saturday, March 2, 2019	5:36:00 PM	Ewallet	0.04761904762	$13.2945	6	$13.2945	$265.89	5:00 PM	Saturday	6
Sunday, March 10, 2019	7:15:00 PM	Ewallet	0.04761904762	$15.655	7	$15.655	$313.1	7:00 PM	Sunday	7
Thursday, February 7, 2019	11:28:00 AM	Ewallet	0.04761904762	$35.84	6.6	$35.84	$716.8	11:00 AM	Thursday	4
Tuesday, January 22, 2019	10:55:00 AM	Ewallet	0.04761904762	$33.6015	9.4	$33.6015	$672.03	10:00 AM	Tuesday	2
Friday, March 8, 2019	8:38:00 PM	Ewallet	0.04761904762	$4.858	7.2	$4.858	$97.16	8:00 PM	Friday	5
Saturday, March 23, 2019	10:16:00 AM	Ewallet	0.04761904762	$7.9125	9.3	$7.9125	$158.25	10:00 AM	Saturday	6
Saturday, January 12, 2019	2:50:00 PM	Ewallet	0.04761904762	$44.335	7.3	$44.335	$886.7	2:00 PM	Saturday	6
Saturday, January 19, 2019	8:07:00 PM	Ewallet	0.04761904762	$26.1315	4.3	$26.1315	$522.63	8:00 PM	Saturday	6
Saturday, March 16, 2019	7:25:00 PM	Ewallet	0.04761904762	$29	9.2	$29	$580	7:00 PM	Saturday	6
Thursday, January 3, 2019	11:36:00 AM	Ewallet	0.04761904762	$17.5025	5.5	$17.5025	$350.05	11:00 AM	Thursday	4
Thursday, March 21, 2019	4:21:00 PM	Ewallet	0.04761904762	$15.228	8.8	$15.228	$304.56	4:00 PM	Thursday	4
Saturday, March 23, 2019	7:16:00 PM	Ewallet	0.04761904762	$22.164	4.4	$22.164	$443.28	7:00 PM	Saturday	6
Saturday, March 23, 2019	10:55:00 AM	Ewallet	0.04761904762	$7.75	8	$7.75	$155	10:00 AM	Saturday	6
Sunday, February 10, 2019	12:50:00 PM	Ewallet	0.04761904762	$3.7035	9.9	$3.7035	$74.07	12:00 PM	Sunday	7
Friday, January 25, 2019	8:24:00 PM	Ewallet	0.04761904762	$11.8035	5.9	$11.8035	$236.07	8:00 PM	Friday	5
Saturday, March 9, 2019	6:24:00 PM	Ewallet	0.04761904762	$25.97	6.5	$25.97	$519.4	6:00 PM	Saturday	6
Friday, January 11, 2019	11:20:00 AM	Ewallet	0.04761904762	$4.4845	4.9	$4.4845	$89.69	11:00 AM	Friday	5
Wednesday, January 23, 2019	2:04:00 PM	Ewallet	0.04761904762	$4.485	6.8	$4.485	$89.7	2:00 PM	Wednesday	3

Figure 45. Two new Columns were created to display Total Sales by Day of the Week

D. Dashboard

The Power BI dashboard provides a comprehensive overview of supermarket sales data, organized into six pages. Each page focuses on different aspects of the analysis, containing a collection of visuals that collectively address key business questions and provide actionable insights. The dashboard is designed to be intuitive and interactive, enabling users to explore data and identify trends and patterns effectively.

1. Overview Page

The Overview page dashboard provides a high-level summary of key metrics and trends in supermarket sales, allowing users to quickly grasp the overall performance and important insights at a glance. This page is designed to be the starting point for analysis, presenting a concise summary of the most critical data points.

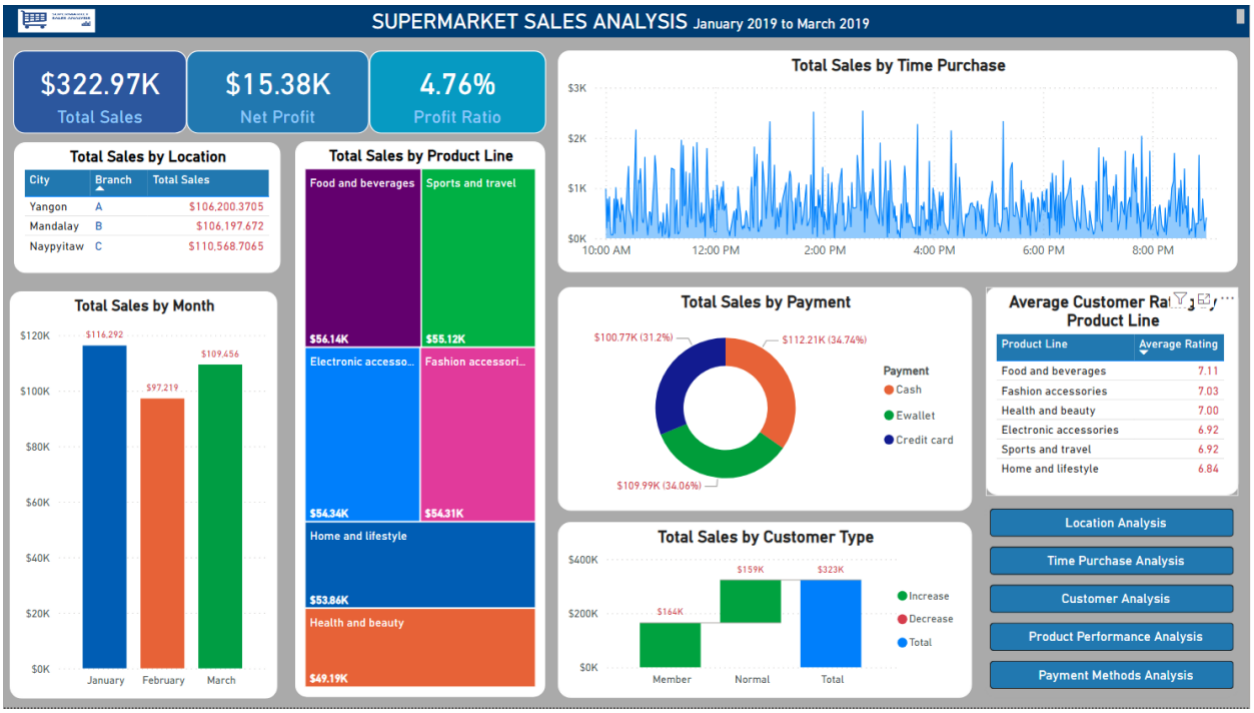


Figure 46. Overview Page

Content and Organization:

- **Key Performance Indicators (KPIs):**
  - **Total Sales:** Displays the overall sales revenue, which is $322.97K. This KPI helps users understand the total volume of sales generated during the period.
  - **Net Profit:** Shows the net profit earned, amounting to $15.38K. This KPI indicates the profitability of the supermarket operations.
  - **Profit Ratio:** Indicates the profit margin percentage, which is 4.76%. This KPI provides insights into the efficiency of converting sales into profit.
- **Visuals:**
  - **Total Sales by Location (Table):** This visual displays the total sales for each city and branch.
  - **Total Sales by Month (Column Chart):** This visual shows the total sales for January, February, and March.
  - **Total Sales by Product Line (Tree Map):** This visual provides a breakdown of total sales by product line.
  - **Total Sales by Time Purchase (Line Chart):** This visual illustrates the total sales throughout the day.
  - **Total Sales by Payment (Donut Chart):** This visual displays the distribution of sales by different payment methods.

    - **Average Customer Rating by Product Line (Table):** This visual shows the average customer rating for each product line.
    - **Total Sales by Customer Type (Waterfall Chart):** This visual compares total sales between member and normal customers.

- **Navigation and Content:**
    - **Location Analysis:** This button navigates to the page focusing on the analysis of sales trends across different locations.
    - **Time Purchase Analysis:** This button navigates to the page analyzing the influence of purchase time on sales.
    - **Customer Analysis:** This button navigates to the page evaluating customer demographics' impact on sales.
    - **Product Performance Analysis:** This button navigates to the page assessing the performance of various product lines.
    - **Payment Methods Analysis:** This button navigates to the page determining the most popular payment methods and their impact on sales and net profit.

  Each of these navigation buttons leads to a detailed analysis page with multiple visuals tailored to address specific business questions related to that aspect of the supermarket sales data. The organized layout ensures that users can easily find and interpret the data relevant to their queries, enabling informed decision-making.

2. Location Analysis Page

The Location Analysis page dashboard provides an in-depth view of sales and net profit across different cities and branches, helping users to identify trends and allocate resources more effectively. This page is designed to give a comprehensive analysis of how each location performs over time and its contribution to the overall business performance.

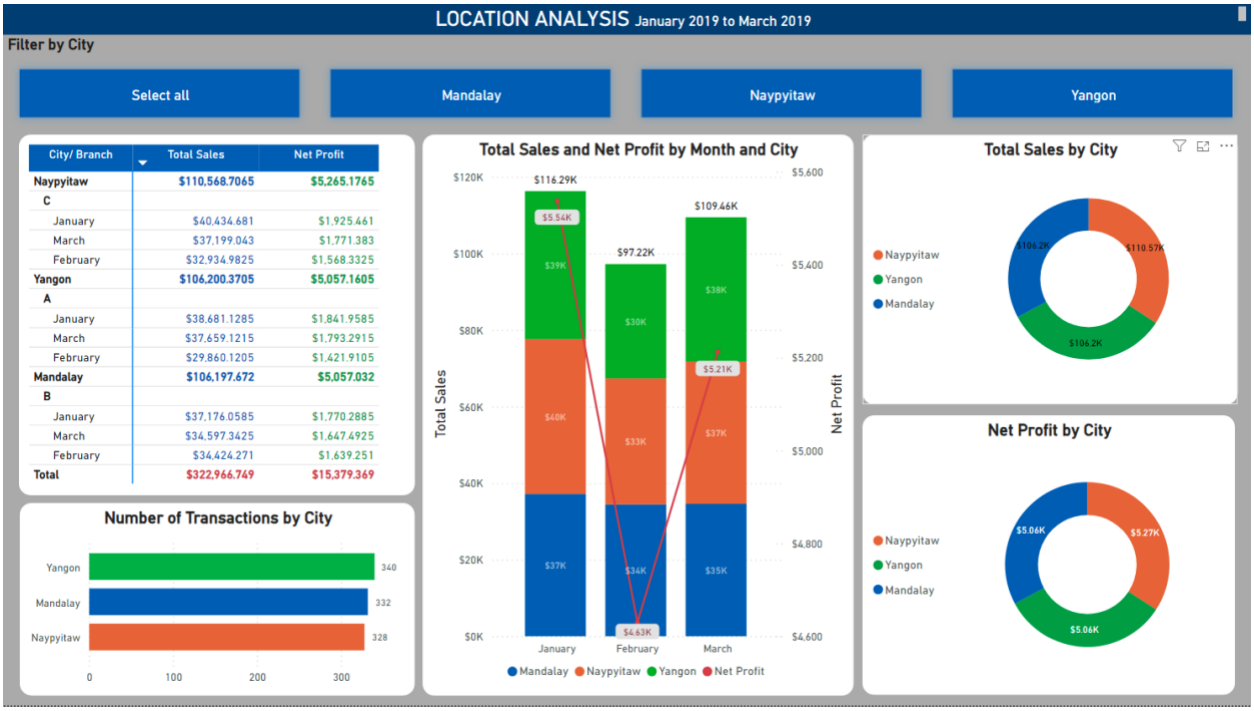


Figure 47. Location Analysis Page

Content and Organization:

- **Filters:**
  - **Select all:** Allows users to view data for all cities combined.
  - **Mandalay:** Filters the data to show metrics specific to Mandalay.
  - **Naypyitaw:** Filters the data to show metrics specific to Naypyitaw.
  - **Yangon:** Filters the data to show metrics specific to Yangon.
- **Visuals:**
  - **Total Sales by Location (Table):** Displays the total sales and net profit for each city and branch, broken down by month.
  - **Total Sales and Net Profit by Month and City (Line and Stacked Column Chart):** Illustrates the total sales and net profit across different cities for each month.
  - **Total Sales by City (Pie Chart):** Shows the contribution of each city to the overall sales in a pie chart format.
  - **Net Profit by City (Pie Chart):** Provides insights into the net profit generated by each city, displayed in a pie chart.
  - **Number of Transactions by City (Bar Chart):** Compares the number of transactions across different cities, highlighting the customer activity level in each location.

This organized layout allows users to delve into the performance of each city and branch, providing valuable insights to make informed decisions regarding resource distribution and strategic planning.

3. Time Purchase Analysis Page

The Time Purchase Analysis page dashboard provides a detailed examination of how sales and transactions vary based on the time of purchase. This analysis helps in optimizing staffing, store hours, and promotional strategies by understanding customer purchasing patterns throughout the hour, day, week, and month.

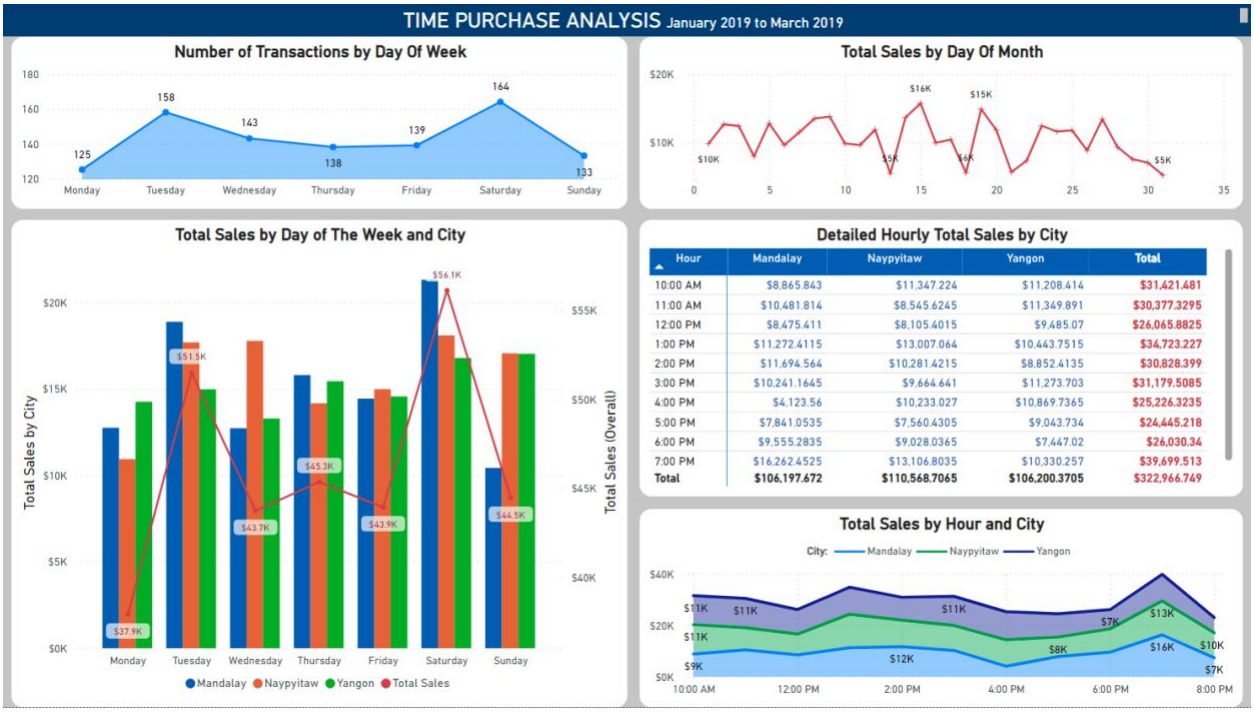


Figure 48. Time Purchase Analysis Page

Content and Organization:

- **Visuals:**
  - **Number of Transactions by Day of the Week (Line Chart):** Displays the number of transactions for each day of the week, helping to identify peak shopping days.
  - **Total Sales by Day of the Month (Line Chart):** Shows the total sales for each day of the month, highlighting specific high and low sales days.
  - **Total Sales by Day of the Week and City (Line and Clustered Column Chart):** Compares total sales across different days and cities, showing the distribution of sales by day and location.
  - **Detailed Hourly Total Sales by City (Table):** Provides a detailed breakdown of total sales by hour for each city.

- **Total Sales by Hour and City (Area Chart):** Visualizes total sales throughout the day across different cities, showing the distribution of sales over the course of the day.

This organized layout allows users to understand the impact of time on sales and transactions, providing valuable insights for optimizing store operations and marketing strategies based on customer purchasing patterns.

4. Customer Analysis Page

The Customer Analysis page dashboard provides insights into customer demographics, including gender and customer type, and how these factors impact sales and net profit. This analysis helps in tailoring promotions, improving customer service, and optimizing marketing strategies to better serve different customer segments.

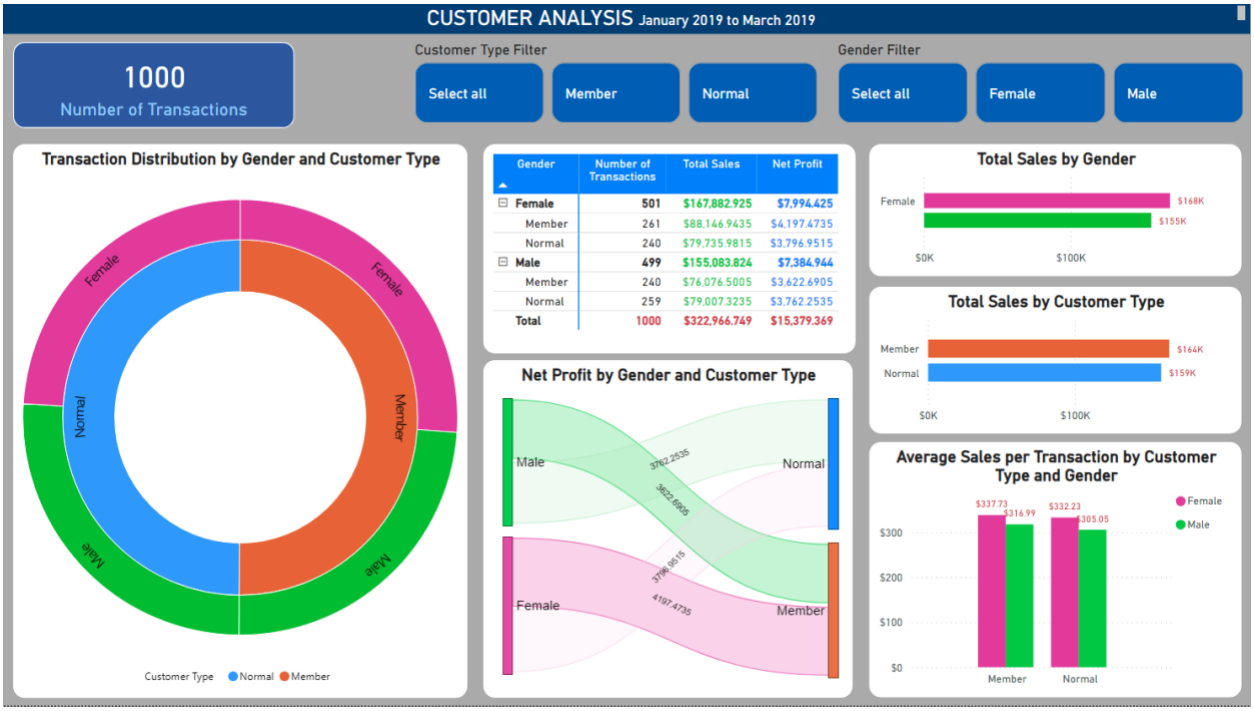


Figure 49. Customer Analysis Page

Content and Organization:

- **Filters:**
  - **Customer Type Filter:** Allows users to filter data by Member or Normal customers.
  - **Gender Filter:** Allows users to filter data by Female or Male customers.
- **Visuals:**
  - **Number of Transactions (Card):** Number of Transactions over the period of 3 months.

- **Transaction Distribution by Gender and Customer Type (Sunburst Chart):** Illustrates the distribution of transactions across different customer types and genders.
- **Number of Transactions, Total Sales, and Net Profit by Gender and Customer Type (Table):** Displays the number of transactions, total sales, and net profit for each customer segment.
- **Net Profit and Total Sales by Gender and Customer Type (Sankey Chart):** Visualizes the flow of net profit and total sales between different customer types and genders.
- **Total Sales by Gender (Bar Chart):** Compares total sales between female and male customers.
- **Total Sales by Customer Type (Bar Chart):** Compares total sales between member and normal customers.
- **Average Sales per Transaction by Customer Type and Gender (Column Chart):** Compares average sales per transaction for different customer types and genders.

This organized layout allows users to understand the impact of customer demographics on sales and profitability, providing valuable insights for optimizing marketing and promotional strategies to better cater to different customer segments.

5. Product Performance Analysis Page

The Product Performance Analysis page dashboard provides insights into the sales performance and profitability of different product lines, helping in optimizing inventory management and marketing strategies. This page allows users to assess which product categories are performing well and identify areas for improvement.

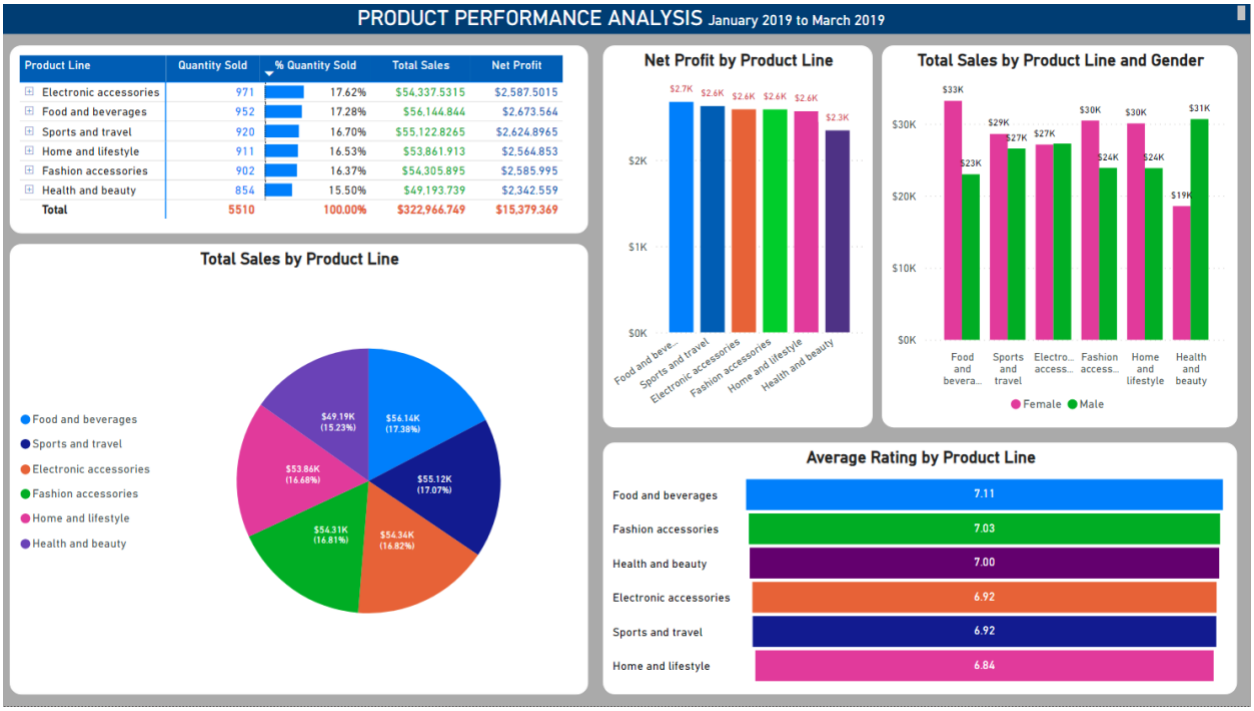


Figure 50. Product Performance Analysis Page

Content and Organization:

- **Visuals:**
  - **Product Line Performance (Table):** Displays the quantity sold, percentage of total quantity sold, total sales, and net profit for each product line.
  - **Total Sales by Product Line (Pie Chart):** Provides a visual representation of the contribution of each product line to the overall sales.
  - **Net Profit by Product Line (Column Chart):** Shows the distribution of net profit across different product lines.
  - **Total Sales by Product Line and Gender (Clustered Column Chart):** Compares total sales for each product line, segmented by gender.
  - **Average Rating by Product Line (Funnel):** Illustrates the average customer rating for each product line, providing insights into customer satisfaction.

This organized layout allows users to understand the performance and profitability of different product lines, providing valuable insights for optimizing product offerings, inventory management, and targeted marketing strategies.

6. Payment Methods Analysis Page

The Payment Methods Analysis page dashboard provides insights into the distribution and impact of different payment methods on sales and profitability. This page helps in understanding customer preferences for payment methods and their contribution to the overall financial performance.

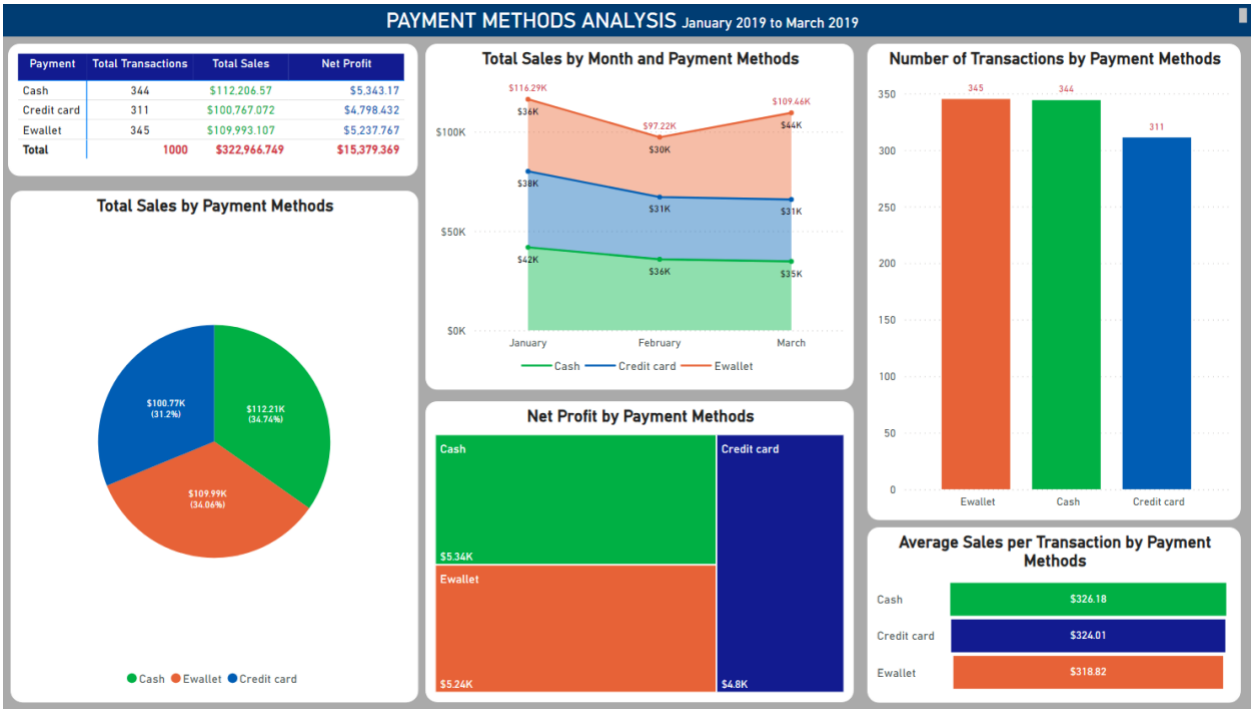


Figure 51. Payment Methods Analysis Page

Content and Organization:

- **Visuals:**
    - **Payment Method Performance (Table):** Displays the total transactions, total sales, and net profit for each payment method (Cash, Credit card, Ewallet).
    - **Total Sales by Payment Methods (Pie Chart):** Provides a visual representation of the contribution of each payment method to the overall sales.
    - **Net Profit by Payment Methods (Tree Map):** Shows the distribution of net profit across different payment methods.
    - **Number of Transactions by Payment Methods (Column Chart:** Compares the number of transactions for each payment method.
    - **Total Sales by Month and Payment Methods (Area Chart):** Illustrates the total sales for each payment method across different months.
    - **Average Sales per Transaction by Payment Methods (Funnel):** Displays the average sales amount per transaction for each payment method.

This organized layout allows users to understand the performance and customer preferences for different payment methods, providing valuable insights for optimizing payment processes, enhancing customer satisfaction, and improving financial performance.

E. Self-Assessment

Report Section	**Description**	**Grade your work from 0 to 100**
Report Structure	The report is well-written, and it contains all the relevant sections	100
Data Pre-processing and Data Modelling	Many pre-processing steps have been applied. The data model is well-structured	90
Dax and M language	Both DAX and M Language have been **extensively** used in the report	80
Dashboard Design	The dashboard contains a variety of charts, including advanced ones not covered in the module.	95
Average		**91**

REFERENCES

Marr, B., 2012. *Key Performance Indicators (KPI): The 75 measures every manager needs to know*. Pearson UK.