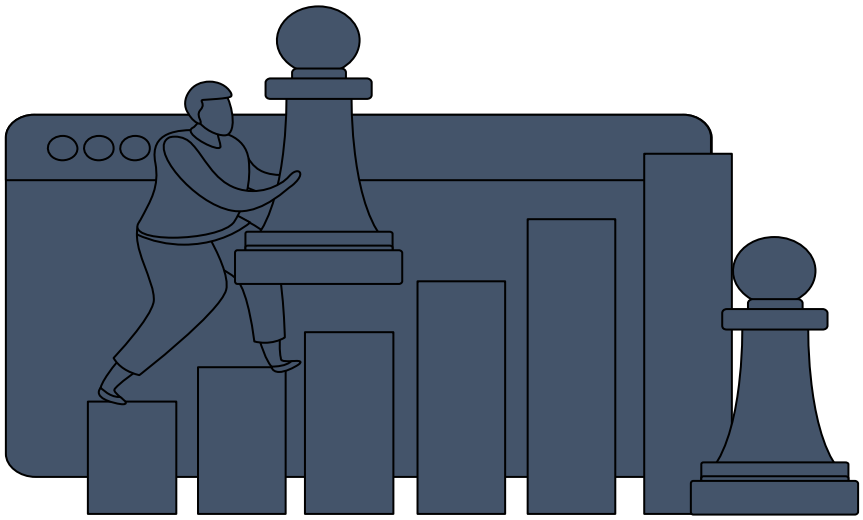


Sales Analysis Methodology

SQL Version

Busile Ndhlovu

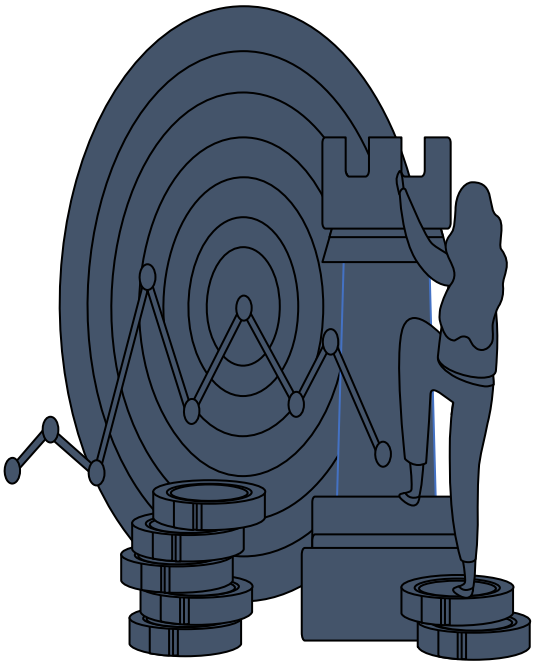


Table of contents

Objective

Develop key metrics that will help analyse sales performance and profitability for a single product in a large retail store. By examining daily pricing, profit margins, and promotional impact, you can uncover patterns that drive better decision-making.

Data Overview

- The dataset provided covers:
  - **Date** – The specific trading day
  - **Sales (Rand Value)** – Total revenue generated from this product.
  - **Cost of Sales (Rand Value)** – The total cost associated with sell
  - **Quantity Sold** – Number of units sold daily.
- The dataset provided is from the year 2014 to 2016

Tools and Techniques

- Planning: Miro for Data Flow & Architecture Diagram.
- Data Analysis Tools: SQL on Snowflake and MS Excel for statistical analysis and visualization.
- Visualization Tools: PowerPoint for visualization.

Understanding the dataset

1.Handle Missing Values:

No Null values were found.

```
15
16  -- checking for NULL values
17
18  SELECT * FROM Sales
19  WHERE sales IS NULL OR cost_Of_Sales IS NULL OR quantity_sold IS NULL;
20
```

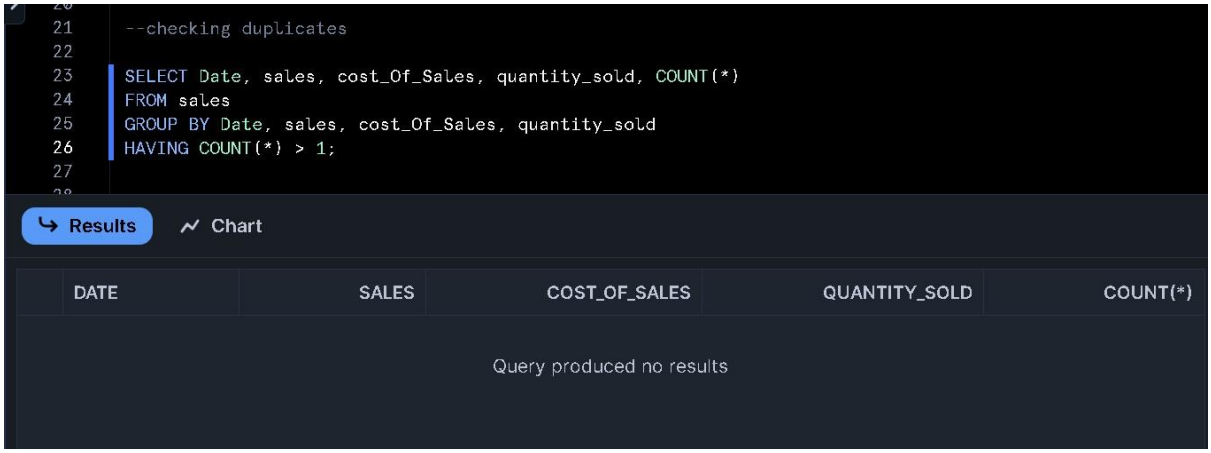
Results | Chart

DATE	SALES	COST_OF_SALES	QUANTITY_SOLD

Query produced no results

2.Handle Duplicates:

There were no duplicates found.



```
21  --checking duplicates
22
23  SELECT Date, sales, cost_Of_Sales, quantity_sold, COUNT(*)
24  FROM sales
25  GROUP BY Date, sales, cost_Of_Sales, quantity_sold
26  HAVING COUNT(*) > 1;
27
```

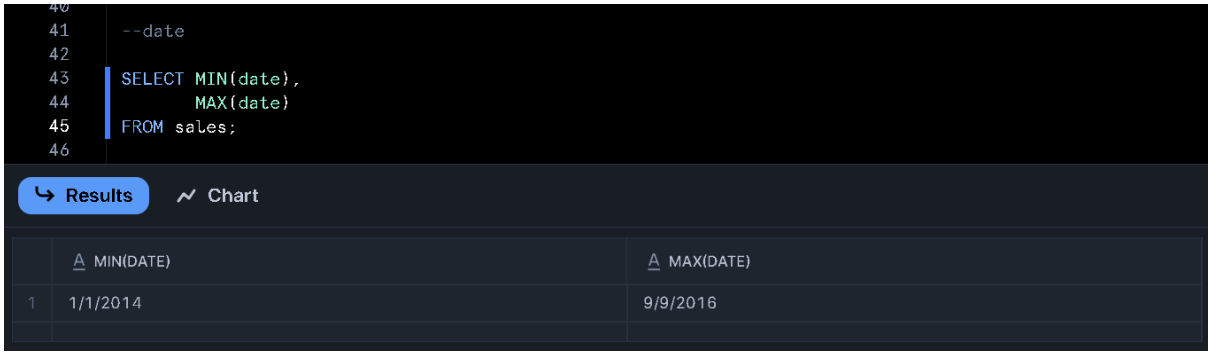
Results | Chart

DATE	SALES	COST_OF_SALES	QUANTITY_SOLD	COUNT(*)

Query produced no results

3.Checking min and max date:

This helps in understanding the dataset, the start date and the end date of the data provided.



```
41  --date
42
43  SELECT MIN(date),
44         MAX(date)
45  FROM sales;
46
```

Results | Chart

	MIN(DATE)	MAX(DATE)
1	1/1/2014	9/9/2016

Sales & Profit Analysis

4.Calculating Daily Sales Price per Unit:

Formula used

$$Daily\ sales\ per\ unit = \frac{Sales}{Quantity\ Sold}$$

This formula gives the selling price of a single unit for that particular day

Script:

```
--Daily Sales Price per Unit

SELECT
      ROUND(sales / quantity_sold, 0) AS sales_price_per_unit,
FROM sales;
```

Results | Chart

	SALES_PRICE_PER_UNIT
1	33
2	32

4. Average Unit Sales Price:

Formula used:

$$Avg\ Unit\ Sales = \frac{Total\ Sales}{Total\ Quantity\ Sold}$$

This formula reflects how much the product is typically sold for over the analysed period.

Script:

```
--Average Unit Sales Price

SELECT
    ROUND(SUM(sales) / SUM(quantity_sold), 0) AS avg_sales_price
FROM sales;
```

Results | Chart

	AVG_SALES_PRICE
1	35

5. Daily % Gross Profit:

Formula used:

$$Gross\ Profit = Sales\ \ Cost\ Of\ Sales$$

$$Daily\ \%\ Gross\ profit = \frac{Gross\ profit}{Sales} \times 100$$

This formula shows how much of the sales revenue is profit expresses in %.

Script:

```sql
--Daily % Gross Profit

SELECT
    TO_DATE(date, 'DD/MM/YYYY') AS Date,
    ROUND(((sales - cost_of_sales) / sales) * 100, 0) AS gross_profit_percentage
FROM sales;

--Daily % Gross Profit per Unit
```

Results | Chart

	DATE	GROSS_PROFIT_PERCENTAGE
1	2013-12-30	-3
2	2013-12-31	-2
3	2014-01-01	-1
4	2014-01-02	-1

6. Daily % Gross Profit per Unit:

Formula used:

$$Gross\ per\ unit = \frac{Gross\ Profit}{Quantity\ Sold}$$

$$Daily\ \%\ Gross\ Per\ Unit = \frac{Gross\ per\ Unit}{Sales\ Price\ Per\ Unit} \times 100$$

This formula show the profit made for each unit sold in %, helps understand how much od the unit price is retained as profit after accounting for the cost of sale.

Script:

```sql
--Daily % Gross Profit per Unit

SELECT
    TO_DATE(date, 'DD/MM/YYYY') AS Date,
    (sales - cost_of_sales) / quantity_sold AS gross_profit_per_unit
FROM sales;
```

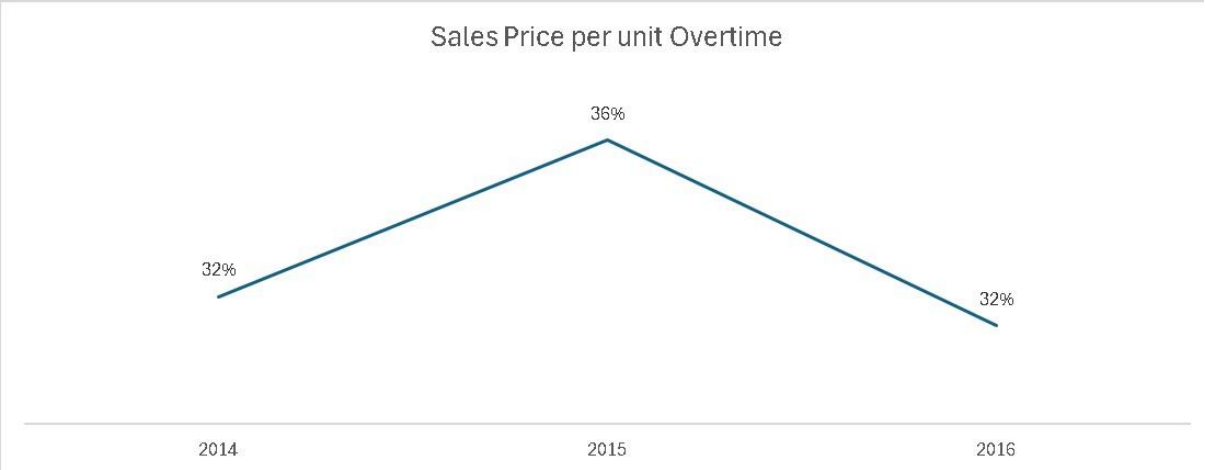
Results | Chart

	DATE	GROSS_PROFIT_PER_UNIT
1	2013-12-30	-0.89961228944
2	2013-12-31	-0.71651228960
3	2014-01-01	-0.44953341299

2014: Negative profit (-329.02) → Loss-making year.

2015: Profit dropped even further (-1435.84) → Bigger financial loss, Could be due to excessive rising costs.

2016: Recovery with positive profit (848.25) → Business improved, meaning adjustments were made—perhaps cutting costs, optimizing pricing, or improving demand.



The sales price per unit fluctuates slightly but remains within a close range (32% in 2014, 36% in 2015, and back to 32% in 2016).This suggests that pricing didn't change drastically over these years.

2014 & 2015 were financially challenging years, likely due to high costs, ineffective pricing, or weak demand. 2016 saw recovery, suggesting improvements in pricing strategy, demand management, or cost control.

Identifying Promotional Periods

6. Price elasticity od demand during promotion:

This graph was used to pick the three promotional periods, I looked for spikes in quantity sold which indicates a promotion period.

These are the top 3 selected periods with the highest sales:

- 2014/02/18 – 2014/03/06
- 2014/08/29 – 2014/09/14
- 2014/09/30 – 2014/10/16

What was the Price Elasticity of Demand during each of these periods?

Formula for Price Elasticity of Demand:

$$PED = \frac{\%\ Chnage\ in\ quantity\ demanded}{\%\ change\ in\ price}$$

In mathematical notation:

$$PED = \frac{(\frac{Q2 - Q1}{Q1} \times 100)}{(\frac{P2 - P1}{P1} \times 100)}$$

Code used to retrieve data to calculate PED:

```sql
--Calculating Price elasticity demanded

SELECT
    TO_DATE(date, 'DD/MM/YYYY') AS Date_1,
    SUM(quantity_sold) AS total_quantity_sold,
    REPLACE(CAST(ROUND(SUM(sales),2) AS VARCHAR), '.',',') AS total_sales,
    REPLACE(CAST(ROUND(SUM(cost_of_sales), 2) AS VARCHAR), '.',',') AS total_cost_of_sales,
    REPLACE(CAST(ROUND(SUM(sales) / SUM(quantity_sold), 2) AS VARCHAR), '.', ',') AS daily_sales_price_per_unit
FROM sales
WHERE TO_DATE(date, 'DD/MM/YYYY') BETWEEN '2014-02-15' AND '2014-03-09'
   OR TO_DATE(date, 'DD/MM/YYYY') BETWEEN '2014-08-25' AND '2014-09-18'
   OR TO_DATE(date, 'DD/MM/YYYY') BETWEEN '2014-09-27' AND '2014-10-19'
GROUP BY TO_DATE(date, 'DD/MM/YYYY')
ORDER BY Date_1;
```

Output:

	DATE_1	TOTAL_QUANTITY_SOLD	TOTAL_SALES	TOTAL_COST_OF_SALES	DAILY_SALES_PRICE_PER_UNIT
1	2014-02-15	11332	367729,27	373973,59	32,45
2	2014-02-16	4127	133913,84	136797,08	32,45
3	2014-02-17	4649	150800,35	152887,11	32,44
4	2014-02-18	1627	55591,93	53463,24	34,17
5	2014-02-19	3281	106427,19	107736,44	32,44
6	2014-02-20	2310	78940,55	75934,39	34,17
7	2014-02-21	9802	317916,32	322089,79	32,43

Calculations

- Period 1: 2014/02/18 – 2014/03/06

$$PED = \frac{(\frac{Q2 - Q1}{Q1} \times 100)}{(\frac{P2 - P1}{P1} \times 100)}$$

$$PED = \frac{(\frac{5072 - 1627}{1627} \times 100)}{(\frac{33{,}08 - 34{,}17}{34{,}17} \times 100)}$$

$$PED = \frac{211{,}78\%}{-3{,}19\%}$$

$$PED = -66$$

- Period 2: 2014/08/29 – 2014/09/14

$$PED = \frac{(\frac{Q2 - Q1}{Q1} \times 100)}{(\frac{P2 - P1}{P1} \times 100)}$$

$$PED = \frac{(\frac{2467 - 19317}{19317} \times 100)}{(\frac{35{,}04 - 30{,}75}{30{,}75} \times 100)}$$

$$PED = \frac{-87{,}22\%}{13.95\%}$$

$$PED = -6$$

- Period 3: 2014/09/30 – 2014/10/16

$$PED = \frac{(\frac{Q2 - Q1}{Q1} \times 100)}{(\frac{P2 - P1}{P1} \times 100)}$$

$$PED = \frac{(\frac{2591 - 11036}{11036} \times 100)}{(\frac{36{,}75 - 32{,}44}{32{,}44} \times 100)}$$

$$PED = \frac{-76{,}54\%}{13.28\%}$$

$$PED = -6$$

Period	PED Value	Elasticity Type
Period 1 (Feb-Mar)	**-66.43**	Highly Elastic
Period 2 (Aug-Sep)	**-6.25**	Elastic
Period 3 (Sep-Oct)	**-5.76**	Elastic

This product is extremely elastic

- All periods show high elasticity, meaning price changes strongly affect demand.
- When prices drop, demand skyrockets, but when prices rise, demand collapses.

Period 1 (-66.43 PED) shows extreme price sensitivity

- This is highly unusual—a price decrease of 3.19% triggered a 211.78% increase in demand.

- This suggests customers react dramatically to price reductions.
- This could mean price is the primary factor influencing purchasing decisions for your product.

Periods 2 & 3 (-6.25 and -5.76 PED) are still highly elastic

- While not as extreme as Period 1, both still indicate strong price sensitivity.
- Prices increased around 13-14%, causing demand to plummet by 76-87%.
- Customers appear very price-conscious—they strongly prefer lower prices.

Year-on-Year & Month-on-Month Comparisons

7. Year on Year and Month on Month calculations:

Month – on-Month:

Values	Column Labels Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Sum of SALES	13107462,47	15573874,38	16500726,29	19056617,46	21249505,22	18560186,91	11936228,66	18288376,08	15572895,07	13082831,13	11020532,05	12960592,41
Sum of COST_OF_SALES	13504323,11	15954538,47	16933086,26	19894049,22	22329336,98	19335118,61	12102480,73	19215147,45	16428252,03	13323166,46	11380431,16	13626179,13

Column1	JAN & FEB	FEB & MAR	MAR & APR	APR & MAY	MAY & JUN	JUN & JUL	JUL & AUG	AUG & SEP	SEP & OCT	OCT & NOV	NOV & DEC
M-o-M sum of sales	19%	6%	15%	12%	-13%	-36%	53%	-15%	-16%	-16%	18%
M-o-M sum of cost of sale	18%	6%	17%	12%	-13%	-37%	59%	-15%	-19%	-15%	20%

Year- on -Year

Values	Column Labels 1/1/2014	1/1/2015	1/1/2016	1/10/2014	1/10/2015
Sum of Sales	86782,46773	112161,4196	111650,2398	594438,2808	402312,333
Sum of Cost Of Sales	87986,31821	122170,4317	121448,2838	639306,5688	459285,804

Column1	2014 & 2015	2015 & 2016
Y-o-Y Sum of sales	29%	0%
Y-o-Y sum of cost o	39%	-1%

2014: Despite a negative profit (-329.02), YoY growth was strongest, meaning sales volume increased, but profitability remained weak (likely due to high costs or promotions).

2015: YoY growth was second highest, but profitability worsened (-1435.84). This suggests:

- Aggressive discounting or increased costs.
- Higher sales volume, but margins suffered.
- Possible over-expansion or inefficiencies.

2016: Lowest YoY growth, but profit recovered (848.25), meaning:

- Sales volume slowed, but profitability improved.
- Pricing strategy or cost control was optimized.
- Business may have focused on efficiency over aggressive growth.

The business seems to have prioritized growth over profitability in 2014 & 2015, but in 2016, profitability improved while growth slowed. This could mean: Promotions were excessive in previous years, leading to weak profit margins. 2016 was a correction year where discounts were optimized to restore profitability. High sales volume alone didn't guarantee strong profits—balancing pricing & costs was critical.

Conclusion: Insights & Strategic Takeaways

Through this analysis, we've uncovered critical insights about the role of pricing strategy in driving demand. The findings reveal that price elasticity plays a defining role in customer purchasing behaviour, with promotional pricing significantly boosting sales.

However, while discounts accelerate volume, they must be strategically managed to prevent profit erosion and maintain long-term brand value. The challenge lies in striking the right balance—leveraging price reductions effectively while ensuring financial sustainability.

Moving forward, these insights can guide data-driven pricing strategies that optimize both sales growth and profitability. By understanding how consumers respond to price shifts, we can refine pricing models that maximize revenue while reinforcing the product's market position.

I would recommend the following:

1. Optimized Promotional Strategy
    - Use Time-Limited Discounts → Avoid constant price cuts, so customers don't always expect lower prices.
    - Targeted Pricing Adjustments → Apply discounts only during high-demand periods or to specific customer groups.
    - Create Value-Added Offers → Instead of direct discounts, bundle products or offer incentives to maintain margins.
2. Dynamic Pricing Adjustments
    - Monitor Demand Trends → Use past PED insights to adjust prices strategically rather than applying flat discounts.
    - Seasonal Pricing → Identify peak demand periods where price changes will have optimal impact.
    - Competitive Analysis → Benchmark your pricing against competitors to ensure strategic market positioning.
3. Long-Term Profitability & Sustainability
    - Avoid Deep Discounts That Shrink Profits → Every price cut should increase overall revenue, not just drive volume.
    - Focus on Brand Value Beyond Price → If extreme elasticity exists, explore product differentiation to reduce price sensitivity.
    - Test Alternative Pricing Models → Consider subscription-based pricing, loyalty programs, or tiered pricing for better retention.

This analysis serves as a foundation for strategic decision-making, helping to shape an approach that aligns with both customer behaviour and business objectives.