Profitability Analysis and Recovery Initiative

The Problem

> "Our company is growing revenue, but profits are shrinking. Leadership wants to identify what's causing this profit leakage and take corrective action. Which products, regions, or discounts are hurting us—and how can we fix it?"

Business Problem Framing

> "Revenue is growing, but profits are not. The company suspects some products, regions, or discount policies may be causing losses. The task is to uncover the reasons for shrinking profit and recommend fixes."

This project investigates the root causes of this profit leak and provides data-backed recommendations to reverse the trend.

The Data

Download the dataset: 📥 Superstore Dataset

Metadata

Column	Description
Row ID	Unique ID for each row
Order ID	Unique Order ID for each Customer
Order Date	Order Date of the product
Ship Date	Shipping Date of the Product
Ship Mode	Shipping Mode specified by the Customer
Customer ID	Unique ID to identify each Customer
Customer Name	Name of the Customer
Segment	The segment where the Customer belongs
Country	Country of residence of the Customer
City	City of residence of of the Customer
State	State of residence of the Customer

Column	Description
Postal Code	Postal Code of every Customer
Region	Region where the Customer belong
Product ID	Unique ID of the Product
Category	Category of the product ordered
Sub-Category	Sub-Category of the product ordered
Product Name	Name of the Product
Sales	Sales of the Product
Quantity	Quantity of the Product
Discount	Discount provided
Profit	Profit/Loss incurred

Data Exploration and Hypothesis Building

- Import into Excel

  - Use one worksheet named `Raw_Data`

  - Create a copy named `Cleaned Data`

  - Make sure column headers are clean (remove trailing spaces)

- Scan Columns Focus on:

  - `Order Date`, `Region`, `Category`, `Sub-Category`
  - `Sales`, `Discount`, `Profit`, `Quantity`, `Ship Mode`
- Add Calculated Fields (Optional)

  - Profit Margin = `Profit / Sales`
  - Unit Price = `Sales / Quantity`
- Question: Where could profit be leaking?

  - Too many discounts?
  - Product returns?
  - Certain regions?
  - Costly shipping modes?
  - Low-margin product categories?
- Use Pivot Tables to explore:

  - Profit by Region, Category, and Sub-Category → Any consistent losses?
  - Profit vs. Discount → Are high discounts hurting?
  - Product Categories/Sub-Categories → Which are least profitable?
  - Sales vs. Profit trend over time

Discount vs Profit

> *Are heavy discounts leading to more sales and profit, or actually causing margin erosion? What's the optimal discount range for different product categories?*

Row Labels	Sum of Profit
0%	$ 3,20,987.60
10%	$ 9,029.18
15%	$ 1,418.99
20%	$ 90,337.31
30%	$ -10,369.28
32%	$ -2,391.14
40%	$ -23,057.05
45%	$ -2,493.11
50%	$ -20,506.43
60%	$ -5,944.66
70%	$ -40,075.36
80%	$ -30,539.04
Grand Total	286397.0217

Average of Discount

Discount By Category

Any discount above 20% leads to negative profit.

- Sub-categories with average discount > 0.20:
  ➤ Furniture (Bookcases, Tables), Office Supplies (Binders), Technology (Machines)
- These same sub-categories have negative or near-zero profit or negative profit margin.

Category vs Profit

Row Labels	Sum of Profit	Sum of Sales
Furniture	$ 18,451.27	$ 7,41,999.80
Office Supplies	$ 1,22,490.80	$ 7,19,047.03
Technology	$ 1,45,454.95	$ 8,36,154.03
Grand Total	2,86,397.02	22,97,200.86

Row Labels	Average of Profit Margin	Average of Discount
Furniture	**4%**	**17%**
Bookcases	-13%	21%
Chairs	4%	17%
Furnishings	14%	14%
Tables	-15%	26%
Office Supplies	**14%**	**16%**
Appliances	-16%	17%
Art	25%	7%
Binders	-20%	37%
Envelopes	42%	8%
Fasteners	30%	8%
Labels		
Paper	43%	7%
Storage	9%	7%
Supplies	11%	8%
Technology	**16%**	**13%**
Accessories	22%	8%
Copiers	32%	16%
Machines	-7%	31%
Phones	12%	15%
Grand Total	**12%**	**16%**

Sum of Profit   Sum of Sales

- Furniture(Bookcase, Tables), Office Supplies(Supplies) have neg profit

- Furniture(Bookcase, Tables), Office Supplies(Appliances, Binders), technology(machines) have neg profit margin

- Furniture(Bookcase, Tables), Office Supplies(Binders), technology(machines) have avg dicount > 0.20

- Furniture(Bookcase, Tables), Office Supplies(Supplies), technology(machines) have neg cumulative profit by product

- Furniture(Bookcase, Tables), technology(machines) have neg profit on first day shipment

- Furniture(Tables) have neg profit on second day shipment

- Furniture(Bookcase, Tables),Office Supplies(Supplies) have neg profit on standard class shipment

Product vs Profit

> *Which products and sub-categories generate the most revenue and profit, and which consistently underperform? How should the store adjust its product mix?*

Row Labels	Sum of Cumulative Profit by Product
⊟Bevis Oval Conference Table, Walnut	
⊟Furniture	
Tables	$ -6,848.12
⊟Bush Advantage Collection Racetrack Conference Table	
⊟Furniture	
Tables	$ -13,540.78
⊟Chromcraft Bull-Nose Wood Oval Conference Tables & Bases	
⊟Furniture	
Tables	$ -14,380.58
⊟Cubify CubeX 3D Printer Double Head Print	
⊟Technology	
Machines	$ -26,639.91
⊟GBC DocuBind P400 Electric Binding System	
⊟Office Supplies	
Binders	$ -11,269.00
⊟Global High-Back Leather Tilter, Burgundy	
⊟Furniture	
Chairs	$ -6,646.38
⊟Global Wood Trimmed Manager's Task Chair, Khaki	
⊟Furniture	
Chairs	$ -7,043.67
⊟Lexmark MX611dhe Monochrome Laser Printer	
⊟Technology	
Machines	$ -18,359.89
⊟Martin Yale Chadless Opener Electric Letter Opener	
⊟Office Supplies	
Supplies	$ -7,795.10
⊟O'Sullivan 4-Shelf Bookcase in Odessa Pine	
⊟Furniture	
Bookcases	$ -6,825.69
Grand Total	**$ -1,19,349.12**

Row Labels	Average of Profit Margin
⊟3.6 Cubic Foot Counter Height Office Refrigerator	
⊟Office Supplies	
Appliances	-1.48
⊟Acco 6 Outlet Guardian Basic Surge Suppressor	
⊟Office Supplies	
Appliances	-1.16
⊟Acco 6 Outlet Guardian Premium Plus Surge Suppressor	
⊟Office Supplies	
Appliances	-1.13
⊟Bush Westfield Collection Bookcases, Dark Cherry Finish, Fully Assembled	
⊟Furniture	-2.1
⊟Eureka Disposable Bags for Sanitaire Vibra Groomer I Upright Vac	
⊟Office Supplies	
Appliances	-2.75
⊟Euro Pro Shark Stick Mini Vacuum	
⊟Office Supplies	
Appliances	-1.775
⊟Hoover Commercial Lightweight Upright Vacuum	
⊟Office Supplies	
Appliances	-1.3125
⊟Kensington 6 Outlet SmartSocket Surge Protector	
⊟Office Supplies	
Appliances	-1.25
⊟Okidata B401 Printer	
⊞Technology	-1.4
⊟Zebra GK420t Direct Thermal/Thermal Transfer Printer	
⊞Technology	-1.333333333
Grand Total	**-1.44**

Chart Area ue) Axis Major Gridlines

- Top 10 loss-making products = mostly Furniture and Machines.
- Office Supplies (Appliances, Binders) dominate the lowest profit margin list.
- Low unit price products (mostly Office Supplies) may not justify handling and shipping cost.

Shipment vs Profit

> *How does shipping mode impact delivery time, customer satisfaction, and profitability? Are faster shipping modes causing losses due to higher costs or smaller margins?*

Row Labels	Sum of Profit
First Class	$ 48,969.84
Same Day	$ 15,891.76
Second Class	$ 57,446.64
Standard Class	$ 1,64,088.79
Grand Total	$ 2,86,397.02
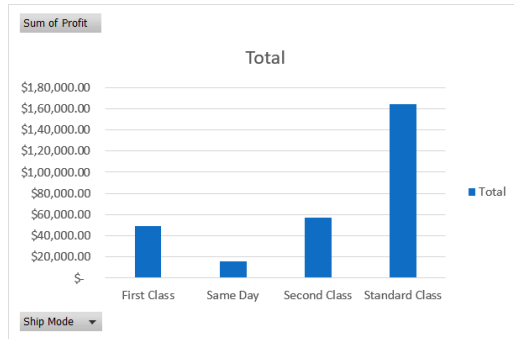
Row Labels	Sum of Profit	Average of Profit Margin
⊟ First Class	$ 48,969.84	0.12
Central	$ 3,707.27	-0.12
East	$ 15,732.01	0.15
South	$ 6,892.39	0.16
West	$ 22,638.17	0.20
⊟ Same Day	$ 15,891.76	0.14
Central	$ 1,531.88	-0.05
East	$ 7,980.27	0.14
South	$ -1,762.34	0.19
West	$ 8,141.95	0.24
⊟ Second Class	$ 57,446.64	0.15
Central	$ 9,114.83	-0.05
East	$ 10,787.29	0.18
South	$ 14,667.15	0.21
West	$ 22,877.36	0.24
⊟ Standard Class	$ 1,64,088.79	0.11
Central	$ 25,352.38	-0.12
East	$ 57,023.21	0.17
South	$ 26,952.23	0.14
West	$ 54,760.97	0.22
Grand Total	$ 2,86,397.02	0.12

Sum of Profit	Column Labels				
Row Labels	Central	East	South	West	Grand Total
First Class	$ 3,707.27	$ 15,732.01	$ 6,892.39	$ 22,638.17	$ 48,969.84
Same Day	$ 1,531.88	$ 7,980.27	$ -1,762.34	$ 8,141.95	$ 15,891.76
Second Class	$ 9,114.83	$ 10,787.29	$ 14,667.15	$ 22,877.36	$ 57,446.64
Standard Class	$ 25,352.38	$ 57,023.21	$ 26,952.23	$ 54,760.97	$ 1,64,088.79
Grand Total	$ 39,706.36	$ 91,522.78	$ 46,749.43	$ 1,08,418.45	$ 2,86,397.02
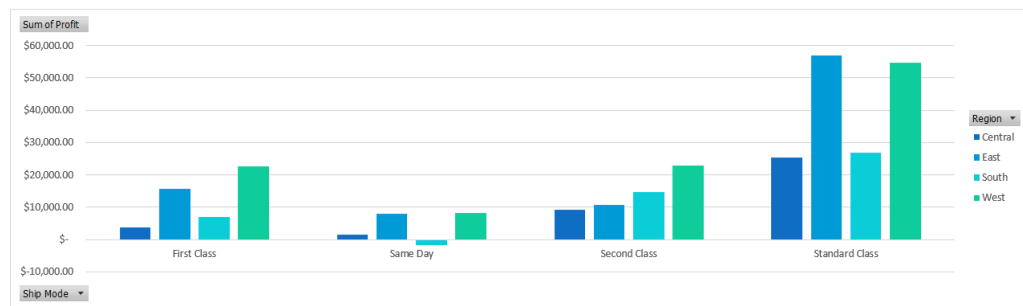
- Same-Day Shipping in the South and Central Regions (especially for Furniture and Technology) has negative profit.
- First and Second-Class shipping in the Central Region causes losses in Furniture.
- Standard Class shipping also unprofitable for certain categories in multiple regions.

Region vs Profit

Row Labels	Sum of Sales	Sum of Profit
⊟ Central	$ 5,01,239.89	$ 39,706.36
Furniture	$ 1,63,797.16	$ -2,871.05
Office Supplies	$ 1,67,026.42	$ 8,879.98
Technology	$ 1,70,416.31	$ 33,697.43
⊟ East	$ 6,78,781.24	$ 91,522.78
Furniture	$ 2,08,291.20	$ 3,046.17
Office Supplies	$ 2,05,516.06	$ 41,014.58
Technology	$ 2,64,973.98	$ 47,462.04
⊟ South	$ 3,91,721.91	$ 46,749.43
Furniture	$ 1,17,298.68	$ 6,771.21
Office Supplies	$ 1,25,651.31	$ 19,986.39
Technology	$ 1,48,771.91	$ 19,991.83
⊟ West	$ 7,25,457.82	$1,08,418.45
Furniture	$ 2,52,612.74	$ 11,504.95
Office Supplies	$ 2,20,853.25	$ 52,609.85
Technology	$ 2,51,991.83	$ 44,303.65
Grand Total	$22,97,200.86	$2,86,397.02
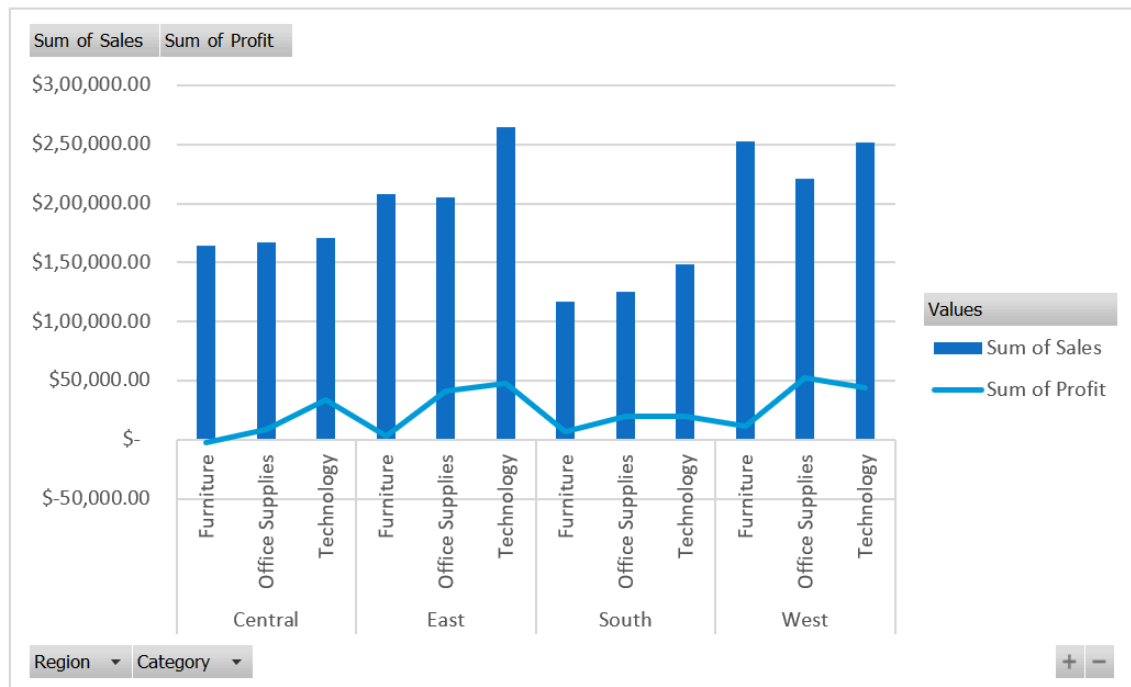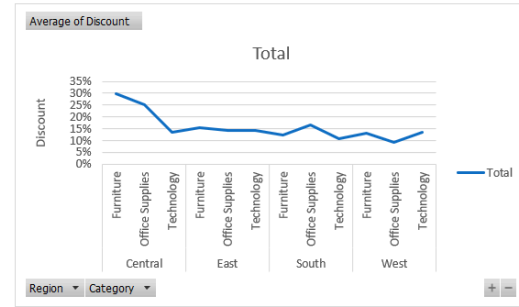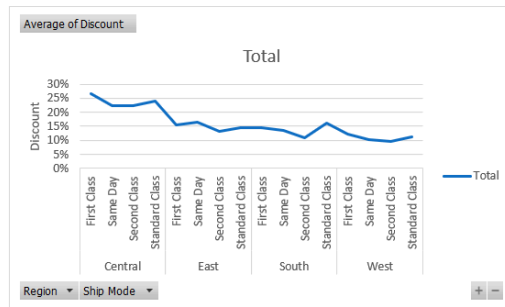
- Central Region: High-risk across all categories and shipping modes. States: Illinois, Texas.
- Other red-flag states: Ohio, Pennsylvania, Florida, North Carolina, Tennessee, Arizona, Colorado, Oregon.
- Even in regions like Central, some states (e.g., Illinois) exhibit significant net losses, suggesting that regional averages may hide deeper state-level issues.

Miscellaneous

Row Labels	Sum of Profit
3	$ 57,015.53
5	$ 49,516.59
4	$ 44,223.39
2	$ 38,448.41
7	$ 34,286.97
9	$ 17,687.89
8	$ 10,856.80
6	$ 10,325.47
1	$ 7,440.48
13	$ 6,348.90
11	$ 4,293.37
14	$ 2,724.00
10	$ 2,044.16
12	$ 1,185.07
Grand Total	$ 2,86,397.02

| Row Labels	Sum of Sales	Sum of Profit	Average of Profit Margin	Average of Discount
⊟Consumer	$ 11,61,401.34	$ 1,34,119.21	0.11	16%
Furniture	$ 3,91,049.31	$ 6,991.08	0.03	18%
Office Supplies	$ 3,63,952.14	$ 56,330.32	0.13	16%
Technology	$ 4,06,399.90	$ 70,797.81	0.15	13%
⊟Corporate	$ 7,06,146.37	$ 91,979.13	0.12	16%
Furniture	$ 2,29,019.79	$ 7,584.82	0.05	17%
Office Supplies	$ 2,30,676.46	$ 40,227.32	0.14	16%
Technology	$ 2,46,450.12	$ 44,167.00	0.16	13%
⊟Home Office	$ 4,29,653.15	$ 60,298.68	0.14	15%
Furniture	$ 1,21,930.70	$ 3,875.38	0.05	17%
Office Supplies	$ 1,24,418.43	$ 25,933.16	0.17	15%
Technology	$ 1,83,304.02	$ 30,490.14	0.17	13%
Grand Total	$ 22,97,200.86	$ 2,86,397.02	0.12	16%

Row Label	Sum of Sales	Sum of Profit
2014	$ 4,84,247.50	$ 49,543.97
2015	$ 4,70,532.51	$ 61,618.60
2016	$ 6,09,205.60	$ 81,795.17
2017	$ 7,33,215.26	$ 93,439.27
Grand Total	$ 22,97,200.86	$ 2,86,397.02

Row Labels	Average of Discount
2014	16%
2015	16%
2016	15%
2017	16%
Grand Total	16%
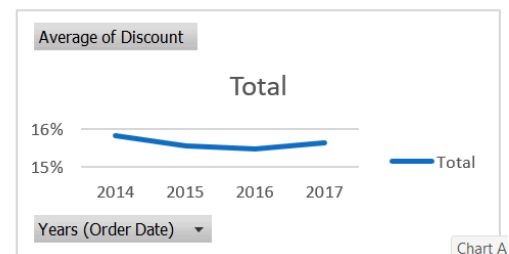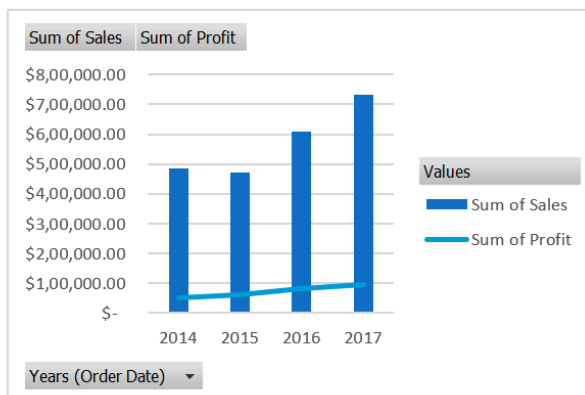
- Profit in descending order by quant is: 3,5, 4, 2, 7, 9, 8, 6, 1, 13, 11, 14, 10, 12

- Quantities 3 to 5 tend to generate highest cumulative profit. Lower/higher quantities don't perform as well.
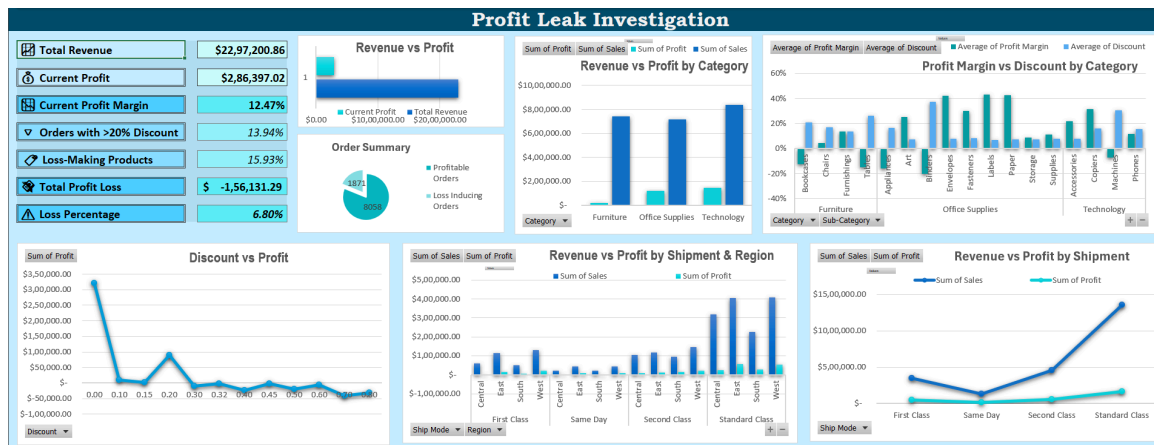
- The products having lowest unit price are from

    - OfficeSup x8
    - Tech x2

Dashboard

Insight and Recovery Plan

The data shows profits are actually growing, not shrinking - from $49K$ in 2014 to $93K$ in 2017. However, profit margins peaked in 2016 at 13.43% and dropped to 12.74% in 2017, indicating efficiency issues despite revenue growth.

Key Findings:

- `18.7%` of orders are unprofitable, causing `$156K` in losses
- High discounts (`50%+`) are the biggest profit killer, losing `$97K`
- Technology products like 3D printers are major loss leaders
- Furniture category has the lowest profitability at only `$18K`
- No discount orders have `29.5%` profit margin vs negative margins at high discounts
- Revenue is growing but profits are being eroded by excessive discounting and unprofitable product mix.

The insights show revenue growth masking a profit crisis `-$156K` lost from excessive discounting and poor product mix.

The key profit issues:

- Orders with losses: 1871 out of 9994 (`18.7%`)
- Total losses: `$-156131.29`

- High discount orders (50%+): 922 orders
- High discount total loss: `-$97065.48`

Key Solutions:

- Cap all discounts at `15%` maximum
- Discontinue/reprice the top 10 loss-making products
- Implement state-specific pricing for unprofitable regions
- Restrict premium shipping on low-margin furniture/tech items
- This could recover `$147K` annually and boost profit margins from 12.5% to `18.9%` .

Key Insights	Findings	Root Causes	Solutions	Expected Impact
Revenue Growth vs Profit Decline	Revenue up but profit margins declining from 16% to 12.5%	Aggressive discounting without margin protection	Cap discounts at 15%-20% maximum	Immediate margin recovery to 18.9%
Discount Impact	Discounts >20% cause negative profits; 922 orders lose $97K	No discount caps or approval thresholds	Discontinue/reprice top 10 loss products	$97K annual recovery from discount control
Product Portfolio Issues	Top 10 loss products: Furniture Tables, Tech Machines, Binders	Loss-leader products not identified/managed	Implement state-specific pricing	$30K savings from product optimization
Regional Performance Gaps	IL, TX, OH, PA, FL, NC consistently unprofitable states	No regional pricing strategy	Restrict premium shipping on low-margin items	$15K gain from regional pricing strategy
Shipping Cost Problems	Same-day/first-class shipping unprofitable for furniture	Shipping costs not factored into pricing	Focus sales on high-margin office supplies	$5K savings + 20% category margin boost

Profit Recovery Potential

- Current Annual Profit: `$286397.0`

- Potential Recovery: `$147065.0`

- Projected Profit: `$433462.0`

- Margin Improvement: `+6.4%` (12.5% → 18.9%)

The analysis shows a clear path to recover `$147K` annually through five targeted solutions. The discount cap alone delivers `$97K` in immediate impact with minimal risk, while product discontinuation adds another `$30K` .
Regional pricing carries higher implementation complexity but significant upside.