



ANALYZING DATA FROM A FICTIONAL SUPERSTORE:

Written Report with Recommendations

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Summary

The following report consists of a thorough and comprehensive analysis of a fictional Superstore in the US that is looking to gain actionable insights into the store's performance across different years, regions, customer segments, product categories, product returns, and more. The following report was built looking at approximately 10,000 rows of data points, from 2014 to 2017, including information around customers, their order ID, name, segment, categories, sales & profit, plus other key metrics.

In summary, between 2014 and 2017, the Superstore accumulated total sales of **\$2.30M** and **\$286.40K** in profits, resulting in a **~12.5%** profit margin, whilst providing an average discount of **16%**. Additionally, whilst sales did go down from 2014 to 2015, profits increased year after year – resulting in an **86%** increase to profits when comparing 2014 to 2017.

Key Findings and Insights

1. West Region outperforms the East, South, and Central Regions.

The West Region was the best-performing region with \$725K in sales and a 14.5% profit margin. Within the West region, almost 65% of total sales came solely from California – as it represents the most urbanized state within the region, thus contributing the largest percentage of sales.

2. Technology Category outshines the rest

The Technology Category brought in the most sales and profits compared to the other two categories with \$836K in sales, and \$145K in profits (17.4% profit margin). Even though Furniture was the second best-performing category with \$742K in sales, it only accomplished a 2.5% profit margin, compared to the 17% profit margin of Office Supplies.

3. Consumer Segment drives the majority of sales

The Consumer Segment contributed 51% of total sales, bringing in \$1.16M. Even though the consumer segment brought in the most sales and the most profits (\$135K), it had the lowest profit margin with 11.55%, with the highest profit margin coming from the Home Office Segment at 14.03%.

4. Sales and returns peak in Q4

Q4 saw the highest sales and profits with \$878K and \$111K respectively, compared to the other lower-performing quarters. On the other hand, Q4 also saw a spike in product returns – contributing ~40% to the total returns during 2014 to 2017. The category that saw the most returns was Office Supplies, which could indicate an opportunity for more educational and informational marketing around the products to lessen the overall returns for the Superstore.

5. Profitability suffered due to high discount rates

Specific items such as tables and machines were discounted heavily – with an average discount rate of 26% and 31% respectively, resulting in a loss for tables, and 1.8% profit margin for machines. Opportunities exist to improve these numbers by implementing marketing tactics such as bundling – tables could be paired up with a high-performing sub-category such as chairs, whilst the low-performing sub-categories can be tackled operationally to reduce inventory costs, boosting profitability by forecasting per-category customer demand.

Platforms and Tools Used to Analyze

a. Microsoft Excel:

- a. Pivot tables
- b. VLOOKUP's
- c. Seasonal Forecasting

b. Power Bi:

- a. Dashboard creation
- b. Summary visuals with comprehensive filtering to dive deeper

c. Knime:

- a. Predictive Analytics
- b. Market Basket Analysis

Hypotheses Categorized

a. Sales and Profit Analysis

H1: The consumer segment will contribute more to sales volume compared to the other segments.

H2: Some product categories and sub-categories generated high sales but low profits.

b. Regional Performance Analysis

H3: Both Eastern and Western regions showed stronger sales in the technology category, compared to the other regions.

c. Time Series Analysis

H4: Sales peaked during Q4 across all regions

H5: Office Supplies category did best in Q3 (back to school months)

d. Product Performance

H6: A small percentage of sub-categories drove the majority of profit (using Pareto Principle)

H7: In 2017, approximately 20% of sub-categories contributed to approximately 80% of profits

e. Returned Items

H8: The Consumer segment returned the most items

H9: Q4 saw the most returns during the 2014-2017 period

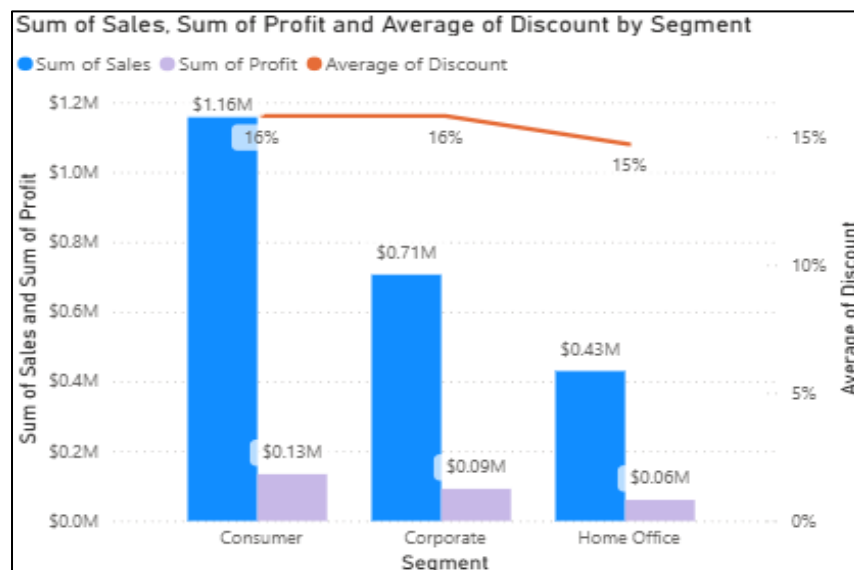
Sales and Profit Analysis

(Customer Segments)

It is important to capture the sales and profit amounts, as well as the average discount rates across a variety of criteria as it relates to the Superstore. When analyzing the different customer segments (consumer, corporate, and home office), based off the rationale that consumers tend to be more frequent shoppers at the Superstore compared to other segments, resulting in higher sales, we can hypothesize that:

H1: The consumer segment will contribute more to sales volume compared to the other segments.

Customer Segments	Sum of Sales	Sum of Profit	Average of Discount
Consumer	\$ 1,161,401.34	\$ 134,119.21	16%
Corporate	\$ 706,146.37	\$ 91,979.13	16%
Home Office	\$ 429,653.15	\$ 60,298.68	15%



By viewing the table and graph above, we can conclude that **H1** can be accepted as the consumer segment amounted to \$1.16M in sales, more than the next highest, which was Corporate at \$0.71M. Results show that the consumer segment is arguably the most important to the Superstore since it contributes the most to total sales, as well as most profits, even through a 16%

average discount across products. Because of this, it is crucial to maintain evolving customer experience so that the customer segment continues to grow.

Recommendations

- Expand in product offerings for consumers

By understanding the importance of this segment and providing varied options for the consumers to purchase from Superstore, the consumers will recognize the care that is being given by the brand, and further invest in more products; thus, strengthening their relationship with the company.

- Capitalize on the brand's digital presence

One way to continue listening to the consumer segment is to meet them where they spend most of their time, and that happens to be on social media platforms. By being able to interact with and understand the consumers' wants and trends, the Superstore will be better informed on product variation, which will result in a boost to brand value, as well as sales growth through repeat customers

- Build a loyalty program; motivate consumers to come back for more

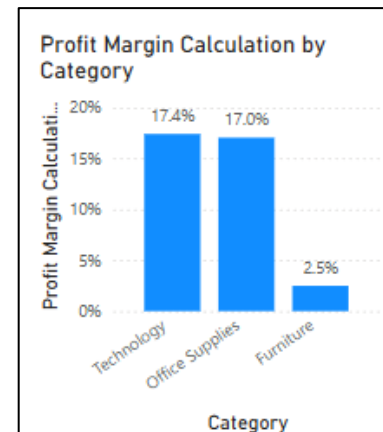
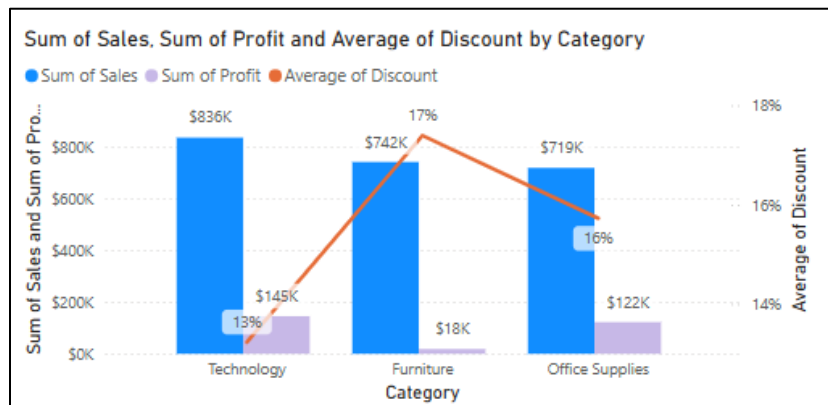
To increase the consumers' lifetime value, the Superstore can reward them by offering exclusive products, early access to drops/sales, and reward their loyalty to the brand. Not only would the brand provide another interaction avenue to the consumers, but would also benefit from more frequent purchases, since consumers would want to "unlock" the perks that come by spending more at Superstore.

Product Categories and Sub-categories

The Superstore divides its products into 3 categories: Technology, Furniture, and Office Supplies. And it further slices the categories into 17 sub-categories. It is important to distinguish between all of these categories and sub-categories, as it can dictate product development, marketing, and operations. Furthermore, if a product may be generating a large quantity of sales, it may not necessarily mean that it translates into profitability, therefore we can hypothesize:

H2: Some product categories and sub-categories generated high sales but low profits.

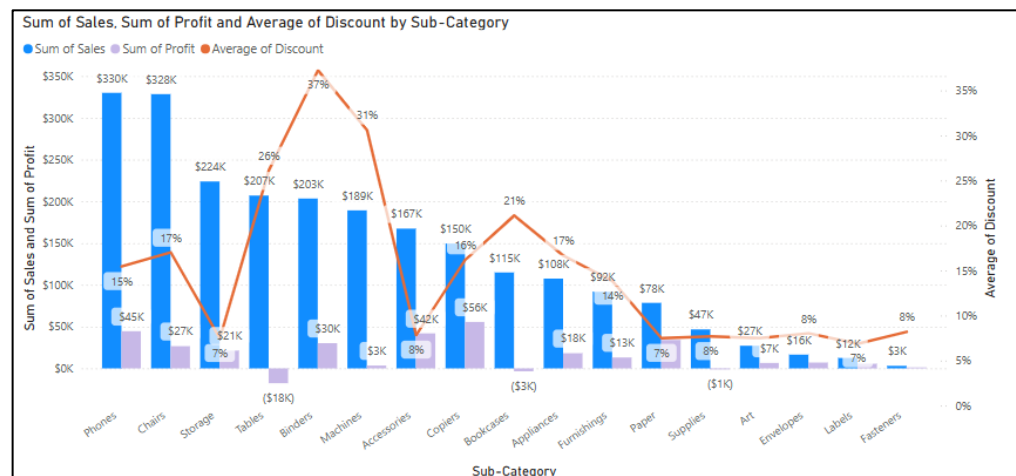
Categories	Sum of Sales	Sum of Profit	Average of Discount
Technology	\$ 836,154.03	\$ 145,454.95	13%
Furniture	\$ 741,999.80	\$ 18,451.27	17%
Office Supplies	\$ 719,047.03	\$ 122,490.80	16%



As we can see from the visuals above, the most profitable category for the Superstore is Technology with \$836K in sales, and \$145K in profit, which equates to a 17.4% profit margin. On the other hand, even though the Furniture category is second highest in sales with \$742K in sales, only \$18K is profits, which equates to a 2.5% profit margin – almost 15% less than the next category's profit margin (Office Supplies).

Looking at the sub-categories:

Sub-categories	Sum of Sales	Sum of Profit	Average of Discount
Accessories	\$ 167,380.32	\$ 41,936.64	8%
Appliances	\$ 107,532.16	\$ 18,138.01	17%
Art	\$ 27,118.79	\$ 6,527.79	7%
Binders	\$ 203,412.73	\$ 30,221.76	37%
Bookcases	\$ 114,880.00	\$ (3,472.56)	21%
Chairs	\$ 328,449.10	\$ 26,590.17	17%
Copiers	\$ 149,528.03	\$ 55,617.82	16%
Envelopes	\$ 16,476.40	\$ 6,964.18	8%
Fasteners	\$ 3,024.28	\$ 949.52	8%
Furnishings	\$ 91,705.16	\$ 13,059.14	14%
Labels	\$ 12,486.31	\$ 5,546.25	7%
Machines	\$ 189,238.63	\$ 3,384.76	31%
Paper	\$ 78,479.21	\$ 34,053.57	7%
Phones	\$ 330,007.05	\$ 44,515.73	15%
Storage	\$ 223,843.61	\$ 21,278.83	7%
Supplies	\$ 46,673.54	\$ (1,189.10)	8%
Tables	\$ 206,965.53	\$ (17,725.48)	26%



Looking at the visuals above, we can notice that the most profitable sub-category is copiers with \$150K in sales and \$56K in profits, compared to the least profitable sub-category: tables – with \$207K in sales, and a loss of (\$18K). Evidenced by the charts for categories and sub-categories, we can accept H2 in that high sales may not necessarily mean high profitability.

Within sub-categories – both tables and machines rank in the top 6 sub-categories for sales, however their profits are not near any top ranking, thus indicating that the Superstore has categories and sub-categories of low value in terms of profitability for the company. It is also important to note that both tables and machines have two of the top three positions for the highest average discount rate amongst the sub-categories (26% for tables and 31% for machines). Higher discounts will result in lower profit margins as noted by tables and machines.

As it was illustrated above, discount rates can have a big impact on the overall sales and profit for the Superstore. The visual below shows the number of times each sub-category had a discount, as well as how much the Superstore could've earned had they not been on discount:

Row Labels	Count of Discou	Sum of Difference in profit from Discounted price vs Non-Discounted Price
+ 0%	4798	\$ 0.00
- 10%	94	\$ 5,436.94
Appliances	16	\$ 432.41
Chairs	76	\$ 4,663.42
Machines	2	\$ 341.10
- 15%	52	\$ 4,133.78
Bookcases	52	\$ 4,133.78
- 20%	3657	\$ 152,918.87
Accessories	304	\$ 9,802.00
Appliances	112	\$ 4,351.86
Art	298	\$ 1,820.83
Binders	573	\$ 17,088.53
Bookcases	46	\$ 5,368.30
Chairs	250	\$ 24,149.72
Copiers	37	\$ 11,231.81
Envelopes	102	\$ 1,173.99
Fasteners	89	\$ 240.29
Furnishings	248	\$ 4,722.13
Labels	125	\$ 649.35
Machines	31	\$ 7,590.91
Paper	513	\$ 5,064.27
Phones	469	\$ 34,358.00
Storage	316	\$ 13,197.97
Supplies	73	\$ 3,022.87
Tables	71	\$ 9,086.05
- 30%	227	\$ 30,968.00
Bookcases	10	\$ 1,284.81
Chairs	158	\$ 21,001.65
Machines	5	\$ 1,126.89
Tables	54	\$ 7,554.65
- 32%	27	\$ 4,637.91
Bookcases	27	\$ 4,637.91
- 40%	206	\$ 46,567.11
Copiers	9	\$ 6,767.92
Machines	13	\$ 7,818.49
Phones	109	\$ 13,734.94
Tables	75	\$ 18,245.76
- 45%	11	\$ 2,468.24
Tables	11	\$ 2,468.24
- 50%	66	\$ 29,459.27
Bookcases	18	\$ 3,654.23
Machines	12	\$ 18,967.54
Tables	36	\$ 6,837.51
- 60%	138	\$ 3,986.82
Furnishings	138	\$ 3,986.82
- 70%	418	\$ 28,434.20
Binders	380	\$ 15,791.57
Bookcases	15	\$ 1,721.57
Machines	23	\$ 10,921.06
- 80%	300	\$ 13,571.00
Appliances	67	\$ 2,706.03
Binders	233	\$ 10,864.98
Grand Total	9994	\$ 322,582.13

The sub-category of Tables, for example, was discounted up to 50%, which would provide evidence as to the low profitability of the product – having such high discounts on the tables resulted in a loss on the items. As the table shows, if the products that were put on 20% discount were charged at and sold for full price, the Superstore could’ve gained close to \$153K in profits. Realistically, many products have a lifecycle, and towards the end will need to be promoted in a way to make inventory space as well as make a marginal amount on each item. Instead of having all the products up at a cheaper price, there are other methods the Superstore could try out.

Recommendations

- Promote and introduce product bundling

Tables were bought on a 20% discount 71 times, chairs were bought on a 20% discount 250 times. Tables and chairs (those with matching designs/colors) could be bundled up and sold at a price that justifies both items and is a better deal than selling the products at 20% discount. With more products, more value for the customer. The value added should be communicated to the consumer so that they feel more incentivized to purchase. Similarly, after a market basket analysis on **Knime (predictive analytics platform)**, we can examine the table below and draw conclusions and next steps:

Rows: 105 Columns: 6									
	#	RowID	Support Number (dou...	Confidence Number (double)	Lift Number (dou...	Consequent String	Implies String	Items Set	
<input type="checkbox"/>	1	rule13	0.011	0.309	1.174	Binders+Count*(Quantity)	<---	[Paper+Count*(Quantity),Phones+Count*(Quantity)]	
<input type="checkbox"/>	2	rule5	0.011	0.298	1.133	Binders+Count*(Quantity)	<---	[Paper+Count*(Quantity),Storage+Count*(Quantity)]	
<input type="checkbox"/>	3	rule33	0.012	0.288	1.098	Binders+Count*(Quantity)	<---	[Fasteners+Count*(Quantity)]	
<input type="checkbox"/>	4	rule75	0.026	0.288	1.097	Binders+Count*(Quantity)	<---	[Appliances+Count*(Quantity)]	
<input type="checkbox"/>	5	rule0	0.01	0.288	1.097	Binders+Count*(Quantity)	<---	[Paper+Count*(Quantity),Furnishings+Count*(Quantity)]	
<input type="checkbox"/>	6	rule25	0.012	0.274	1.154	Paper+Count*(Quantity)	<---	[Fasteners+Count*(Quantity)]	
<input type="checkbox"/>	7	rule14	0.011	0.271	1.141	Paper+Count*(Quantity)	<---	[Binders+Count*(Quantity),Phones+Count*(Quantity)]	
<input type="checkbox"/>	8	rule6	0.011	0.266	1.12	Paper+Count*(Quantity)	<---	[Storage+Count*(Quantity),Binders+Count*(Quantity)]	
<input type="checkbox"/>	9	rule1	0.01	0.258	1.083	Paper+Count*(Quantity)	<---	[Furnishings+Count*(Quantity),Binders+Count*(Quantity)]	
<input type="checkbox"/>	10	rule101	0.04	0.256	0.975	Binders+Count*(Quantity)	<---	[Storage+Count*(Quantity)]	
<input type="checkbox"/>	11	rule15	0.011	0.25	0.952	Binders+Count*(Quantity)	<---	[Bookcases+Count*(Quantity)]	
<input type="checkbox"/>	12	rule100	0.04	0.244	0.931	Binders+Count*(Quantity)	<---	[Phones+Count*(Quantity)]	
<input type="checkbox"/>	13	rule63	0.022	0.242	1.016	Paper+Count*(Quantity)	<---	[Appliances+Count*(Quantity)]	
<input type="checkbox"/>	14	rule45	0.016	0.237	0.902	Binders+Count*(Quantity)	<---	[Labels+Count*(Quantity)]	
<input type="checkbox"/>	15	rule37	0.014	0.231	0.88	Binders+Count*(Quantity)	<---	[Tables+Count*(Quantity)]	
<input type="checkbox"/>	16	rule41	0.016	0.231	0.972	Paper+Count*(Quantity)	<---	[Labels+Count*(Quantity)]	
<input type="checkbox"/>	17	rule77	0.027	0.231	0.971	Paper+Count*(Quantity)	<---	[Chairs+Count*(Quantity)]	
<input type="checkbox"/>	18	rule103	0.055	0.231	0.879	Binders+Count*(Quantity)	<---	[Paper+Count*(Quantity)]	
<input type="checkbox"/>	19	rule95	0.036	0.229	0.963	Paper+Count*(Quantity)	<---	[Storage+Count*(Quantity)]	
<input type="checkbox"/>	20	rule19	0.011	0.229	0.963	Paper+Count*(Quantity)	<---	[Envelopes+Count*(Quantity)]	
<input type="checkbox"/>	21	rule97	0.04	0.226	0.859	Binders+Count*(Quantity)	<---	[Furnishings+Count*(Quantity)]	
<input type="checkbox"/>	22	rule89	0.032	0.224	0.853	Binders+Count*(Quantity)	<---	[Accessories+Count*(Quantity)]	
<input type="checkbox"/>	23	rule8	0.011	0.217	0.825	Binders+Count*(Quantity)	<---	[Envelopes+Count*(Quantity)]	
<input type="checkbox"/>	24	rule92	0.035	0.215	0.904	Paper+Count*(Quantity)	<---	[Phones+Count*(Quantity)]	
<input type="checkbox"/>	25	rule87	0.031	0.213	0.896	Paper+Count*(Quantity)	<---	[Accessories+Count*(Quantity)]	
<input type="checkbox"/>	26	rule104	0.055	0.209	0.879	Paper+Count*(Quantity)	<---	[Binders+Count*(Quantity)]	

#2 shows that in almost 30% of transactions where paper and storage sub-categories are bought, binders are also bought. With 1.133 times more likely to buy these together than just happening by chance. Similar with the relationship between fasteners and binders, as well as between

fasteners and paper, there's a little over 27% confidence that both will be bought together. By using the analysis above, and identifying the products that may be bought together, products/sub-category products could be bundled up – looking at the highest margins, to increase sales volume and thus increasing profits in the long run. Plus, the Superstore will be identifying and anticipating customer wants before they pair them up together, which will show that the Superstore understands its target market.

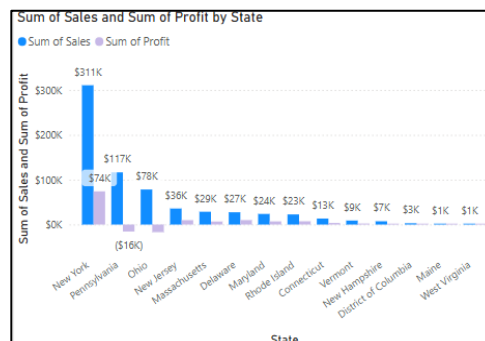
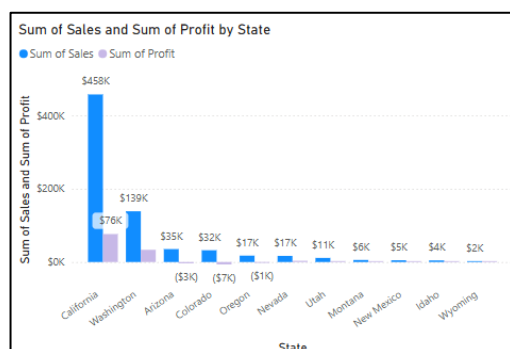
- Innovate with product trials

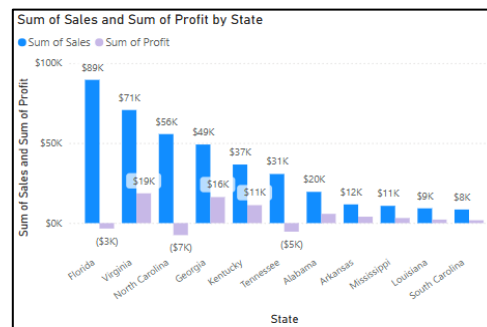
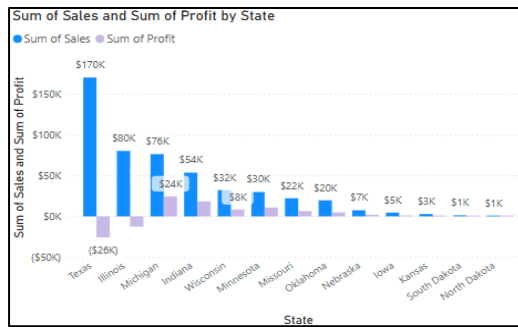
The Superstore could introduce trials for some products where the customer segment could “try out” the product for a week or a month and if at the end of that trial they choose not to keep it, then they could return it. Now, this would bring in operational uncertainties and costs, and the way to combat this would be with restocking fees. Designed to discourage returns, if the consumer chooses to return, there would be a fine, and consumers value their convenience, therefore charging them to return could be a way to motivate them to keep the product and pay full price.

Regional Performance Analysis

The US represents a tremendously large country, in which different regions could have completely different behaviors and habits towards shopping. For that reason, strategies should be catered carefully with the regional consumers' profiles in mind. For a national company like the Superstore, it is important to make note of the regions and states with the highest sales and profits.

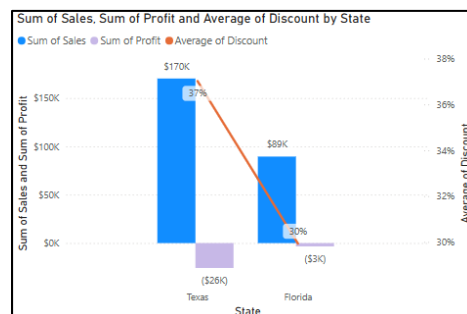
By State





It is noteworthy that in the West Coast, almost 65% of total sales for the region came from California – reason being that it is most urban state in that region, where a lot of banks and global offices have their US headquarters, which is directly proportional to the median household income in that state, in turn creating higher spend per person.

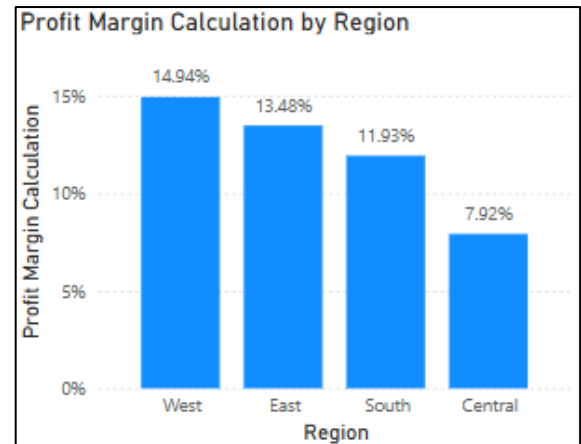
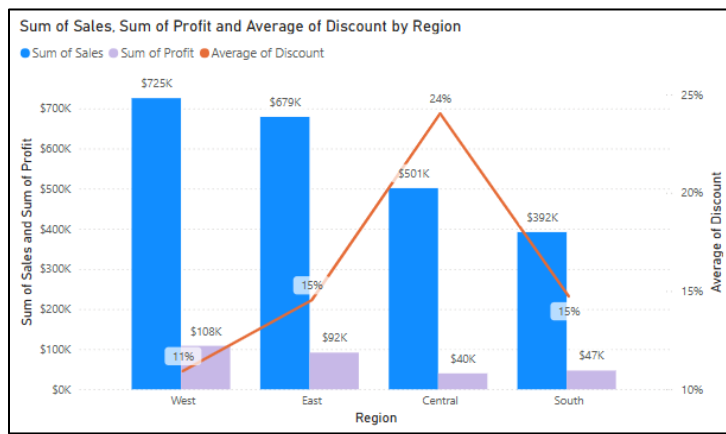
Furthermore, looking closely at Texas and Florida:



Both states have the highest sales volume within their respective regions, however, compared to the top states of the West and East Coasts, their profits are at a loss. One reason for this result could be attributed to the average discount rate within the state. The graph above shows that Texas has an average discount rate of 37%, whereas Florida has 30%. As noted above, the higher discount rates can play a large role in the profit margins, which end up hurting overall sales.

By Region

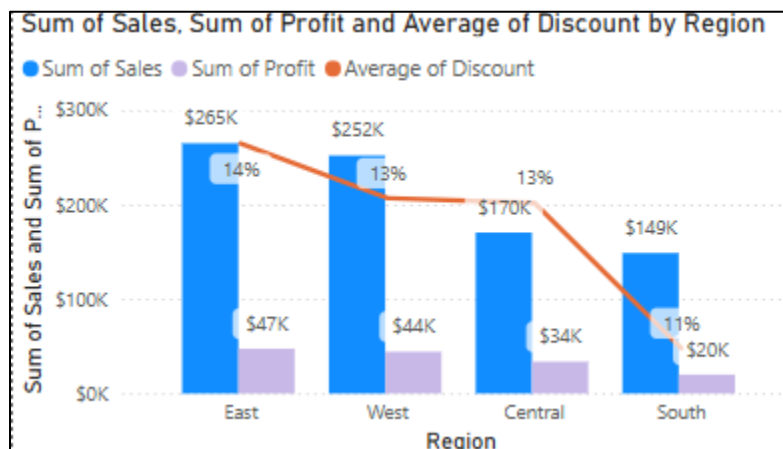
Region	Sum of Sales	Sum of Profit	Average of Discount
West	\$ 725,457.82	\$ 108,418.45	11%
East	\$ 678,781.24	\$ 91,522.78	15%
Central	\$ 501,239.89	\$ 39,706.36	24%
South	\$ 391,721.91	\$ 46,749.43	15%



We can see from the charts above that the West (managed by Anna Andreadi) brought in the most dollars in sales, the highest profitability, as well as the highest profit margin: \$725K and 108K, and 14.5% respectively. With the South (managed by Cassandra Brandow) bringing in the lowest sales of \$392K and \$47K in profit, yet the lowest profit margin belongs to Central (managed by Kelly Williams) with 7.92%. As discussed above, regions within the US have differences in price sensitivity as well as average spending. Both the West coast and East coast (managed by Chuck Magee) represent households with higher average incomes when contrasted to Central and South – which could spark true when analyzing categories that cost more.

With that in mind, we can hypothesize the following:

H3: Both Eastern and Western regions showed stronger sales in the technology category, compared to the other regions.



The rationale for this hypothesis lies in the urban cities investing more in tech-related products (where many urban cities are found in the Western and Eastern regions) as there are many offices for global corporations. H3 can be accepted as evidenced by the graph above, in that East and West had \$265K and \$252K in sales respectively, more than the less urban regions in the US (Central and South) with \$170K and \$149K in sales respectively.

Recommendations

- Prolong the full price without a discount; add value in other ways

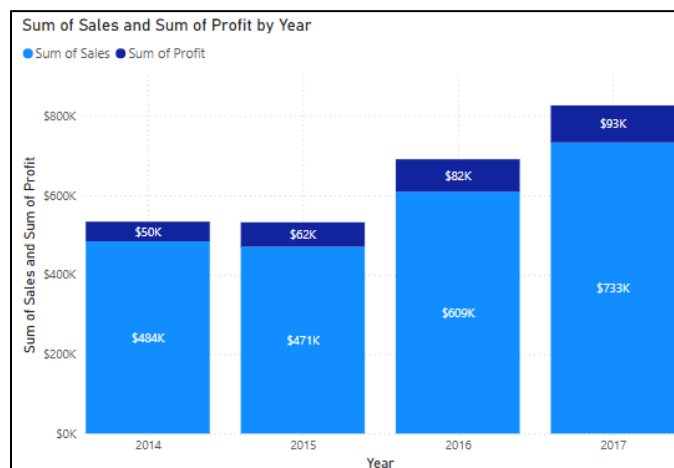
Focusing on the corporate segment can be profitable if the connections and pricing models are done right. Central states such as Texas, are seeing high growth with a lot of companies constructing big offices due to the cheaper cost of land and favoring tax policies. With that in mind, the Superstore can partner with companies who announce plans to move to their region and offer them deals before competitors can get to them. Not only would it be an investment in technology from the customer's side, but this is even more beneficial because the technology products are the ones with highest margins – which will strengthen overall profit margins.

- Prioritize products and cut costs to boost overall margins

In the central region, the discount rate is 24%, which means several products are put up for sale for prolonged periods to get rid of them to make less of a loss. For that reason, the Superstore should invest in an analysis of the products to discontinue – especially those that represent the highest costs and end up selling for minimal or negative profit margins. By lowering costs, overall profit margins will be able to grow and boost the region's financial goals.

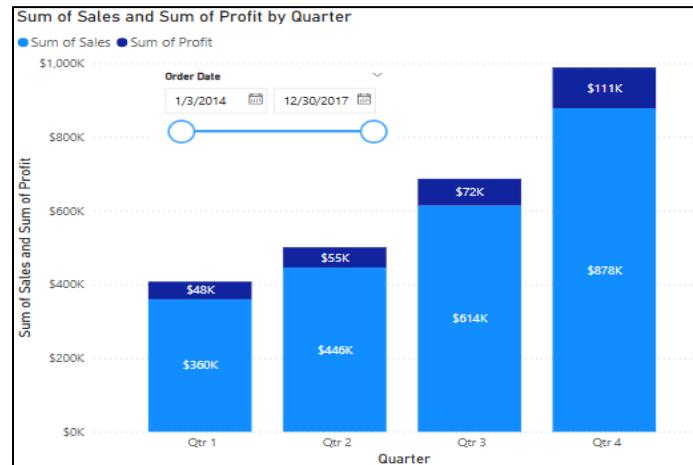
Time Series Analysis

As this report looks at data from January 2014 to December of 2017, we can uncover a few trends and patterns, which can help the Superstore better strategize in the future according to customer behavior. When taking a step back, we can look at the total sales and profitability of the Superstore across all regions during the whole period (2014 to 2017):

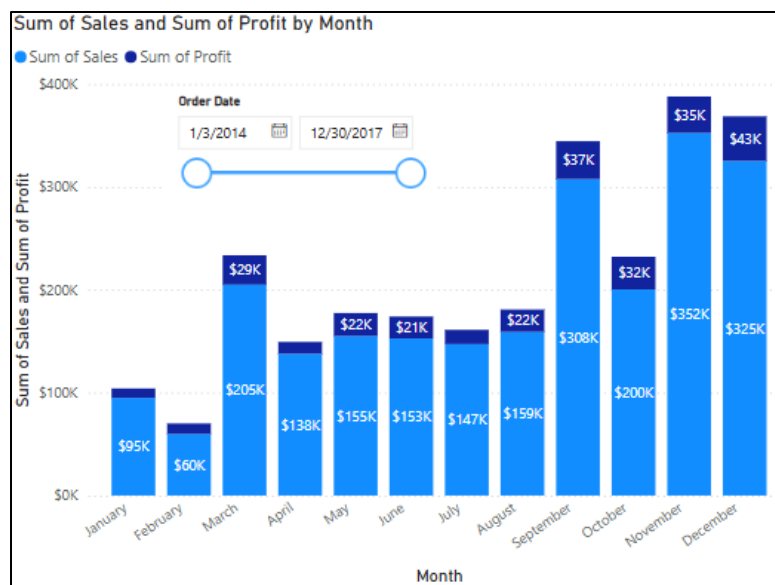


We can notice from the graph above that whilst sales did go down from 2014 to 2015, profits have been going up year after year, reaching up to 51% increase in sales, and 86% increase in profits when comparing 2014 to 2017. It is important to note that sales and profits can slump or peak during seasons or quarters. With that in mind, we can hypothesize:

H4: Sales peaked during Q4 across all regions



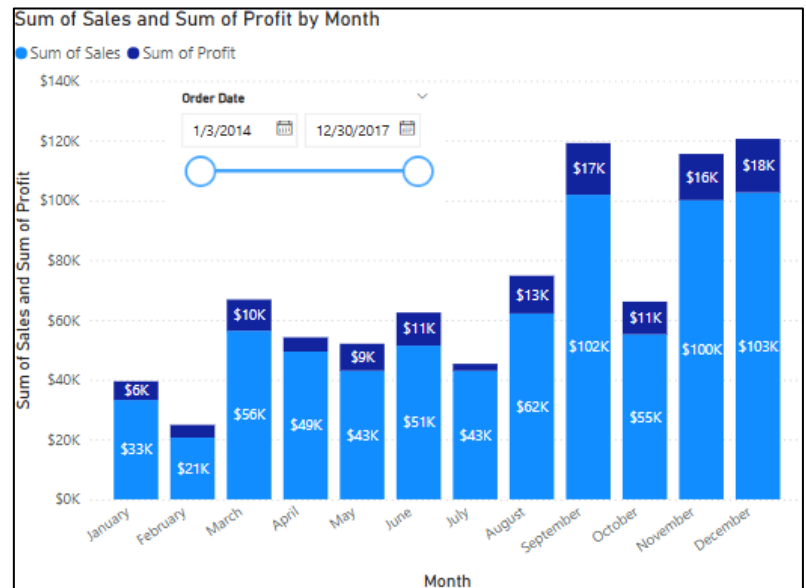
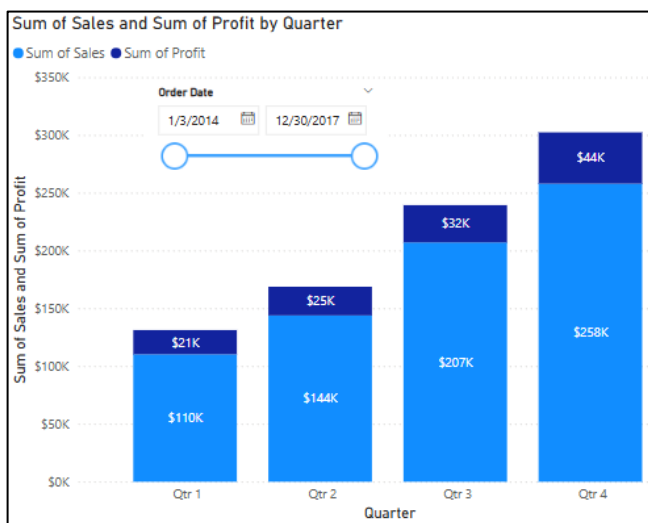
In the US, Q4 usually marks an important quarter for a company, because of the holiday season. In November there's Thanksgiving & Black Friday and in December Christmas and New Year's – for that reason both months usually see a surge in demand, resulting in more sales for the company. The Superstore, being that it sells a variety of products through many sub-categories, benefits from the holiday season surge, as seen in the chart below:



Therefore, we can accept the hypothesis as we recognize that during the Q4 months there has been a spike in sales and profits, thus showing seasonality from four years' worth of data for the latter months of the year.

Similarly, it is important for the Superstore to be aware of any categories that do particularly well when analyzed throughout the year.

H5: Office Supplies category did best in Q3 (back to school months)



As seen from the graphs above, Q3, whilst having performed better than Q1 and Q2, still falls behind Q4. Which emphasizes the importance of Q4 when it comes to all product categories. Even though Q3 represents a period where the consumer segment especially would need most office supplies products (such as binders, papers, supplies, etc.), Q4 portrays higher shopping habits behavior amongst consumers.

Recommendations

- Invest in marketing for Q3 promoting the Office Supplies category

Even though it is beneficial that Q4 statistics are positive and better than the rest of the year, because of the timeliness of Q3 and the start of schools, universities, and other educational institutions, the Superstore could benefit from marketing their office supplies products to incentivize customers of an upgrade. Examples include (as mentioned earlier), bundling products that go well together.

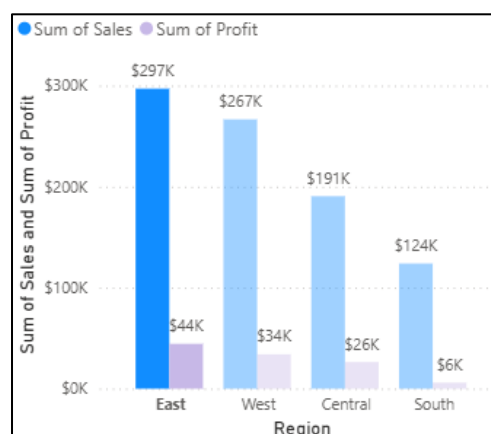
- Learn more about the demographics around the customers

This dataset doesn't provide demographic information about consumers. And the reason this may be of use going forward is to know whether they are university students or grown-ups that do shopping for their children, or if they're working adults. It'd be beneficial to know because that way marketing can be more guided, which will help connect the Superstore to their target market and hence boost sales by getting more people into the store.

- Test the consumers' price sensitivity for items

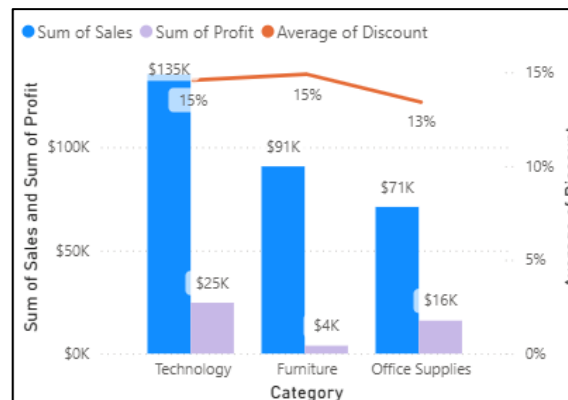
As noted above, Q4 is when consumers do most of their shopping through all categories. It could be worth investigating how sensitive customers are to pricing specifically in this season. A lot of last-minute shopping occurs, which means there's less attention given to pricing. The Superstore could incorporate dynamic pricing and test a few products by raising the price marginally, while remaining within competitors' scope – this could automatically generate more sales and more improved profit margins. But the Superstore will have to be cautious with such tests, since they may backfire.

Continuing to analyze Q4, an important factor to also consider is the discount rate, ensuring that the products are selling – bringing in high sales volume, and that too with a lower discount rate. Looking specifically at the regions in Q4, the East brings in the highest sum of sales and sum of profit compared to the other regions, as seen below:

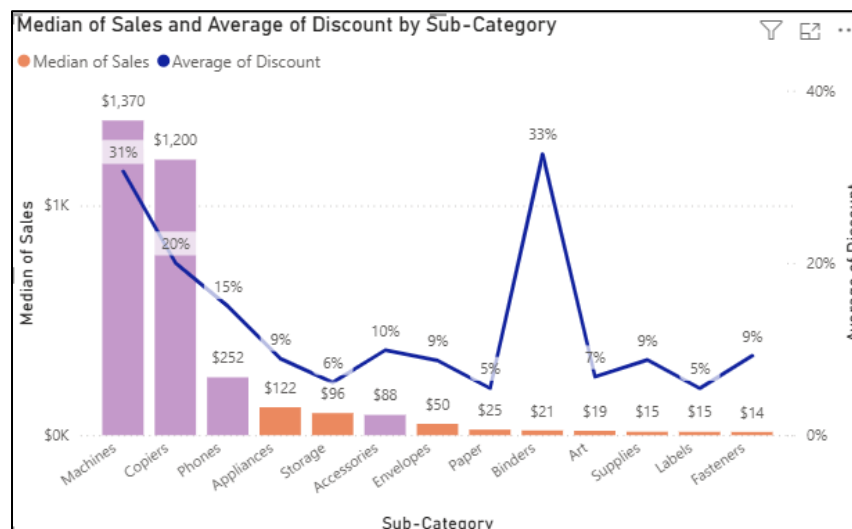


Diving deeper into Q4 within the East region – we can see that the Technology category brings in the highest sum of sales and sum of profit (18.21% profit margin) at an average of 15% discount

rate, and the Office Supplies category is the lowest in sum of sales, yet second-most in profit volume (~22.54% profit margin) at a lower discount rate of 13%.



An important aspect to consider is that the higher the cost the consumer must pay for a product, the more sensitive they could be to a price change. Therefore, we can analyze the sub-category median prices for both Technology and Office Supplies:



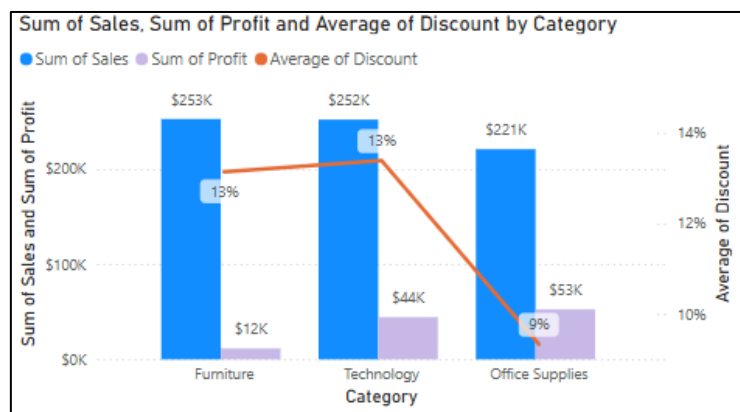
- In pink are the Technology products, and in orange are the Office Supplies products

As we can see above, the Technology sub-categories have the higher price points as well as a higher average discount when compared to the Office Supplies sub-categories. This suggests that, even though the Technology sub-categories bring in more sales and profits, an increase to the price points of these products could result in the consumers being sensitive, as it represents a higher cost – to which they would examine other competitors and choose the cheapest price point.

Overall, with lower prices, consumers tend to be less sensitive to price changes, therefore the Superstore can focus its attention on testing the Office Supplies sub-categories, since they're at a lower price point, and they also have a lower discount rate – which suggests that the discount rate isn't the main reason the consumers are buying, therefore an increase in price could be positive for the Superstore – ensuring no consumers or sales volume is lost.

The following recommendations are based off inventory levels, and how to avoid high costs – by doing so, costs will be lower for the Superstore, and more profits will be attained.

The West coast is the region that brings in the most sales and the most profits. One noteworthy observation is that in the West, the technology category isn't the category that brings in the most profits, it is the office supplies category.



The technology category usually represents the highest margin category, and therefore we can see an opportunity for the Superstore to capitalize on higher profit margins by forecasting the upcoming year's (2018) quarterly figures for the West region, specific to technology. Doing a **seasonal decomposition forecast**:

Year	Quarter	Ordinal	Actual Amount	Averages	Seasonal Factor	De-sazonalized Demand	Long-range Forecast	Long-range Forecast Re-seasonalized
2014	Q1	1	2700	Q1: 12950	0.822222222	3283.783784		
2014	Q2	2	10700	Q2: 14400	0.914285714	11703.125		
2014	Q3	3	13800	Q3: 17000	1.079365079	12785.29412		
2014	Q4	4	17800	Q4: 18650	1.184126984	15032.17158		
2015	Q1	5	9200		0.718562874	12803.33333		
2015	Q2	6	10200		0.761676647	13391.50943		
2015	Q3	7	7500		0.991616766	7563.405797		
2015	Q4	8	18200		1.528143713	11909.87461		
2016	Q1	9	10900		0.718562874	15169.16667		
2016	Q2	10	15700		0.761676647	20612.42138		
2016	Q3	11	21700		0.991616766	21883.45411		
2016	Q4	12	17600		1.528143713	11517.24138		
2017	Q1	13	29000		0.718562874	40358.33333		
2017	Q2	14	21000		0.761676647	27570.75472		
2017	Q3	15	25000		0.991616766	25211.35266		
2017	Q4	16	21000		1.528143713	13742.16301		
2018	Q1	17	?		0.718562874		26520.10642	\$ 19,056.36
2018	Q2	18	?		0.761676647		27694.99111	\$ 21,094.63
2018	Q3	19	?		0.991616766		28869.8758	\$ 28,627.85
2018	Q4	20	?		1.528143713		30044.76048	\$ 45,912.71
Overall Average			15750		SLOPE	1174.884689		
					INTERCEPT	6547.066697		
				Y=	1174.884689	*X	+	6547.066697

2018 QUARTERLY FORECAST (WEST REGION)

Q1	\$19,056.36
Q2	\$21,094.63
Q3	\$28,627.85
Q4	\$45,912.71

Continuing the recommendations that stem from being able to forecast the coming year's figures:

- Reduction of stockouts and overstocks

By having the projections for the coming year, Anna Andreadi will be able to avoid stockouts and overstocks by adjusting stock levels accordingly – this'll ensure that the Superstore can meet demand during peak quarters and avoid excess stock during the slower months.

- Optimizing cost savings

By being able to predict sales volume, West management can bulk order accordingly and avoid excess costs for months when the tech products didn't sell. With costs going down, profits would increase, boosting profit margins for the category.

- Plan for centralized vs decentralized inventory management

By understanding each region's projections for different categories and products, the Superstore can better plan for centralized vs decentralized inventory management. For items that aren't in too much demand, those can live in centralized locations and ship out when an order is placed. For quicker-moving products (such as office supplies during Q3 and Q4), those can remain decentralized and particular to each region for quicker shipping and higher customer satisfaction through faster delivery.

Product Performance

Using Pareto Principle, we can tackle the analysis to investigate whether approximately 80% of the outcomes come from approximately 20% of the inputs. Therefore, we can hypothesize:

H6: A small percentage of sub-categories drove the majority of profit (using Pareto Principle)

Category	Sub-category	Sum of Sales	Sum of Profit
Technology	Copiers	\$ 149,528.03	\$ 55,617.82
Technology	Phones	\$ 330,007.05	\$ 44,515.73
Technology	Accessories	\$ 167,380.32	\$ 41,936.64
Office Supplies	Paper	\$ 78,479.21	\$ 34,053.57
Office Supplies	Binders	\$ 203,412.73	\$ 30,221.76
Furniture	Chairs	\$ 328,449.10	\$ 26,590.17
Office Supplies	Storage	\$ 223,843.61	\$ 21,278.83
Office Supplies	Appliances	\$ 107,532.16	\$ 18,138.01
Furniture	Furnishings	\$ 91,705.16	\$ 13,059.14
Office Supplies	Envelopes	\$ 16,476.40	\$ 6,964.18
Office Supplies	Art	\$ 27,118.79	\$ 6,527.79
Office Supplies	Labels	\$ 12,486.31	\$ 5,546.25
Technology	Machines	\$ 189,238.63	\$ 3,384.76
Office Supplies	Fasteners	\$ 3,024.28	\$ 949.52
Office Supplies	Supplies	\$ 46,673.54	\$ (1,189.10)
Furniture	Bookcases	\$ 114,880.00	\$ (3,472.56)
Furniture	Tables	\$ 206,965.53	\$ (17,725.48)

When looking at all the sub-categories, in order to analyze approximately 20% of inputs, we can look at the top 4 sub-categories (~24%). By summing the total profits from 2014 to 2017 for Copiers, Phones, Accessories, and Paper and dividing by the total profits across all sub-categories, we identify that the top 4 sub-categories (24% of sub-categories) account for **61% of total profits**. Thus, indicating that the hypothesis can be rejected, since it doesn't reach a number close to 80% (as listed by Pareto Principle). Furthermore, a point to highlight is that three of the

top 4 sub-categories come from the Technology category, with only paper belonging to the Office Supplies category. Whilst Pareto Principle is not satisfied, this shows us that the Superstore distribution of profits is more evenly spread than the typical 80/20 ratio.

Since the dataset and table above contain all orders from 2014 to 2017, it could be worthwhile to explore whether Pareto Principle is satisfied for the most recent year.

H7: In 2017, approximately 20% of sub-categories contributed to approximately 80% of profits

2017			
Category	Sub-category	Sum of Sales	Sum of Profit
Technology	Copiers	\$ 62,899.39	\$ 25,031.79
Technology	Accessories	\$ 59,946.23	\$ 15,672.36
Technology	Phones	\$ 105,340.52	\$ 12,849.33
Office Supplies	Paper	\$ 27,694.72	\$ 12,040.84
Office Supplies	Appliances	\$ 42,926.93	\$ 7,865.27
Office Supplies	Binders	\$ 72,788.05	\$ 7,669.74
Furniture	Chairs	\$ 95,554.35	\$ 7,643.55
Office Supplies	Storage	\$ 69,677.62	\$ 7,402.80
Furniture	Furnishings	\$ 28,915.09	\$ 4,099.16
Office Supplies	Art	\$ 8,863.07	\$ 2,221.96
Office Supplies	Labels	\$ 3,861.22	\$ 1,744.61
Office Supplies	Envelopes	\$ 3,378.57	\$ 1,441.76
Office Supplies	Fasteners	\$ 857.59	\$ 304.95
Furniture	Bookcases	\$ 30,024.28	\$ (583.63)
Office Supplies	Supplies	\$ 16,049.41	\$ (955.31)
Technology	Machines	\$ 43,544.68	\$ (2,869.22)
Furniture	Tables	\$ 60,893.54	\$ (8,140.69)

We can see that in 2017, the same sub-categories are the top performing ones as they were when looking at the full dataset, however accessories were more profitable than phones in the most recent year. When calculating the top 4's contribution to the total sub-categories profits, **70% of total sub-category profits** resulted from the top 4 performing sub-categories (copiers, accessories, phones, and paper). Whilst the hypothesis is still rejected as the figure was not a few percentage points off of 80%, 70% is still a high figure, and therefore, the distribution of profits

in 2017 was not as evenly distributed as it has been when looking at 2014 to 2017, which suggests that the importance of these 4 sub-categories to the Superstore cannot be overlooked, and should be prioritized.

Recommendations

- From the remaining sub-categories that did not enter the top 4, identify opportunities for focus

Many sub-categories, (such as: Appliances, Binders, Chairs, Storage, Furnishings, Bookcases, Machines, and Tables) amounted to higher sales than paper, yet paper broke into the top 4 for most profitable sub-categories. These sub-categories can be analyzed further and find ways to improve their respective profit margins – whether it'd be by lowering costs and improving inventory levels or considering a price change to improve the profits the Superstore could make.

- Distribute marketing spend across all sub-categories

As Pareto Principle wasn't satisfied when looking at orders from 2014 to 2017, this shows that there isn't a heavy concentration of demand. Therefore, when promoting the Superstore's products, all sub-categories should be given attention and investment. By doing so – the company will ensure that sub-categories and products don't fall behind in communication plans, and consumers will be more aware of the variation in sub-categories, thus, resulting in potential boost in sales.

- Introduce and explore new categories

Since there is no heavy reliance on a small subset of sub-categories, this could be indicative of the introduction of new categories. There is less risk in adding new categories/sub-categories because the sales aren't overly concentrated in a few key categories. The customer base shows to be more diverse, and so customers could be more open about exploring a wider array of products. Whilst this will require resource and budget allocation, the lack of reliance coming from the Pareto Principle Analysis suggests that this could be an approach going forward.

Returned Items

Returned items are part of every Superstore company, and the keys lie in how to lessen the amount, and how to optimize operations and processes to ensure financial goals are met. The Superstore has three segments, consumer, corporate, and home office. With that in mind, and discussing returned items – the following hypothesis can be made:

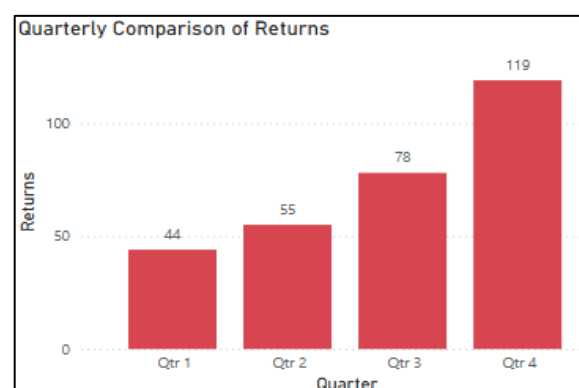
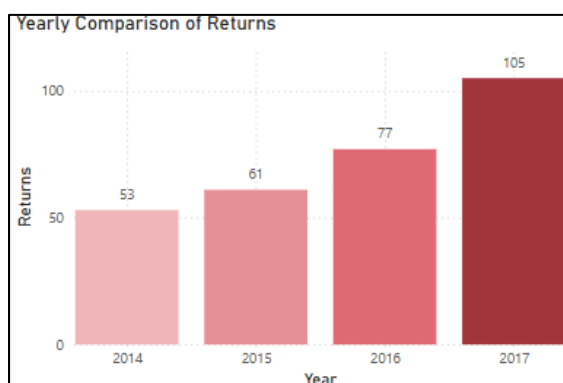
H8: The Consumer segment returned the most items

Segment	Count of Segment
Consumer	154
Corporate	93
Home Office	49

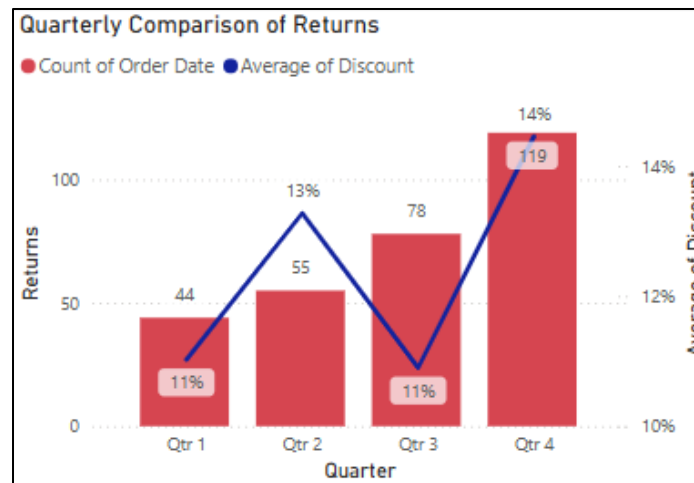
Of the 296 items that were returned between 2014 and 2017, 154 were from the consumer segment (52%). The consumer segment is comprised of individuals who need their demands and needs fully met. Hence, if any inconvenience arises when purchased, or if the product presents even the tiniest flaws, the consumer segment will return the item. The table above provides evidence to accept H8, and it is noteworthy that the ease of a return is something that can increase consumer satisfaction. The customers want to see that the brand understands how much of a hassle it could be to return an item; therefore, if the process is simple – even if it may mean losing out on such sale, consumers see the Superstore with a positive outlook.

Similarly, it is worth investigating whether returns have been increasing year after year, and what quarters see the most returns (as it can help guide and predict operations). We can hypothesize the following:

H9: Q4 saw the most returns during the 2014-2017 period



As proven by the charts above, returned items have been increasing year after year, reaching 108 in 2017, and supporting H9 – Q4 had the most returned items between 2014-2017. Reasons for this include the large sales volume that the Superstore sees in Q4, thus resulting in higher returns. Additionally, as noted above – Q4 includes months with holiday months + gift-giving occasions; customers return gifts that didn't meet expectations or were the wrong size.



On a similar note: Q4 marks a quarter where average discount rates are higher, which means customers may make impulse purchases, that they then return after having used the product or taken the time to consider the true need without the pressure of a discount.

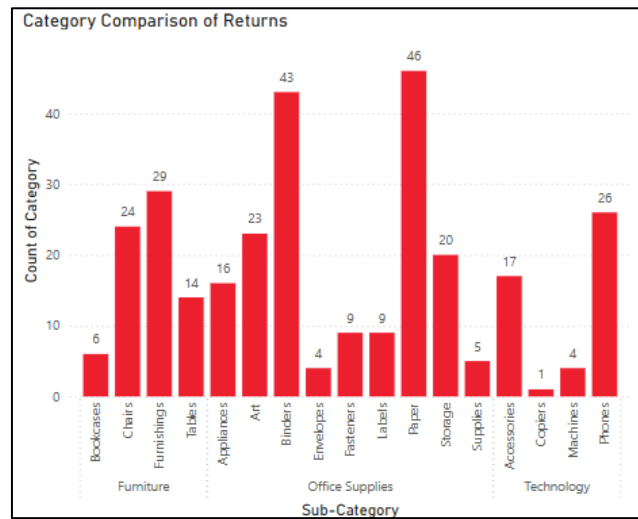
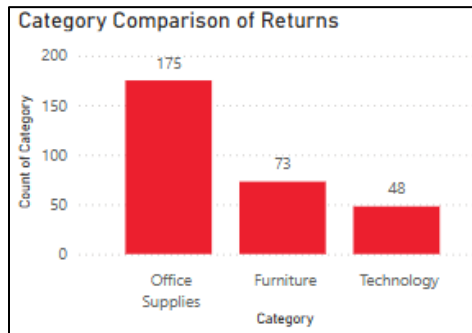
Recommendations

- Operationally plan for an increase in returns

As seen above, Q4 marks a time when many returns are processed by the Superstore, therefore, the company can increase warehouse staffing in order to fulfil return orders as soon as possible. Additionally, returns usually happen while speaking with a live agent or customer service representative – therefore the Superstore can plan for more representatives during Q4 in order to continue providing quality service to their customers, from pre-purchase to a potential return.

- Invest in educational/informational marketing for products

Many times, customers may buy products because of a lack of information provided upfront.



As noted from the above visuals, office supplies are the most returned items, with binders and paper leading to the amount of returns processed. These products – falling under the office supplies category, could be prevented from having to be returned. By being able to communicate more information about the dimensions, uses, and durability of the product, customers will be able to make a more informed decision.

- Speak to suppliers / cut ties with their products

As evidenced by the charts above, many office supplies are being returned and hurting the Superstore's sales. Management should be speaking with the suppliers for such products and inquire about any trends they are seeing and for what reasons. This may result in stopping the sales of such products and finding other products that don't see many returns or are seen as customer favorites. This will consequently impact sales positively by lowering the number of returns.

Similarly, understanding from the charts above that paper products have resulted in the most returns for the Superstore, and using Power BI to filter and count the number of paper products that could come from the same brand, we can determine that from 2014 to 2017, 30 paper products that have been returned are products by Xerox (~\$1.13K).

[illegible]

And further investigating – 9 of those Xerox returns occurred in the last year (2017), and all of them coming from either the West or East region.

Knowing this information, the Superstore management should engage in conversations with Xerox to better understand whether it may be a problem with their product, or if it needs to be better communicated and marketed, since it has caused a loss of profits for over a thousand dollars.

Final Recommendations

This Superstore dataset contains rich amounts of information that can guide the company in a new direction by incorporating innovative and data-driven strategies that will help the brand further connect with its customer base, all whilst improving sales volume and boosting profit margins.

Recommendations by Department

Key business departments that can take immediate steps to fortify the Superstore's position in the market include:

- Sales and marketing
 - Target the consumer segment
 - Refine promotional strategies per region
- Product management
 - Build and optimize product bundling
 - Enhance product descriptions and uses to lower returns
- Customer service
 - Improve return policies and increase customer services agents during peak times (Q4)
 - Review customer service feedback on returns to analyze products that could be discontinued from the Superstore
- Operations and Supply Chain
 - Adjust inventory management in the West
 - Avoid excess stock during the slower months to improve profitability in low-performing regions
- Finance and Accounting
 - Analyze profit margins and discount impact to avoid profit erosion
 - Analyze financial impact of returns
- Business Development and Strategy
 - Explore product expansion to test customer demand
 - Test new business models in lower-performing markets, such as partnering with local designers for unique and attractive products
- Data Analytics
 - Gather information on demographics from customers to better understand the customer and target with more personalized information
 - Look at regional demand by people's characteristics and be able to forecast more accurately.

Recommendations by Region

Demand, sales volume, profit margins, and returns all vary by region. Therefore, below are the key steps different regions can take in order to strengthen the Superstore's overall performance:

- East
 - Avoid raising prices on Technology products due to price sensitivity
 - Test price sensitivity of consumers on Office Supplies products, as lower price points may mean less sensitivity to price increases.
- West
 - Use forecasts to optimize inventory and avoid excess costs
 - Promote Office Supplies category during back-to-school months to capture the young adults & parents market and strengthen the profitability of such category.
- Central
 - Target corporate relocations and prioritize Technology, as they represent high-margin sub-categories and fulfill relocation needs
- South
 - As this region represented the lowest sales volume, focus on bringing in more sales by:
 - Product bundling – combine products that could pair up well together (phones & accessories, or paper and binders) to provide more value to consumers without offering a high discount rate that cuts into profitability
 - Pilot the rewards program to incentivize consumers to come back and purchase more. Repeating customers will prove to bring in consistent value to the Superstore.