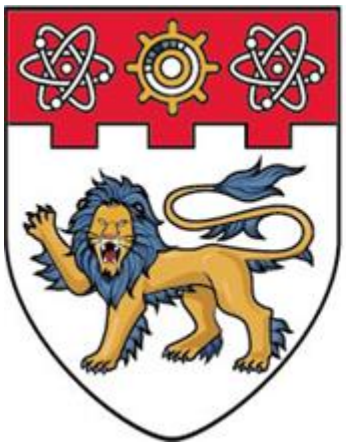
AB1401 Technological Innovations and Developments

Academic Year 2019-2020



NANYANG TECHNOLOGICAL UNIVERSITY

SINGAPORE

Semester Project – Office Suppliers

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Executive Summary

This report is prepared for Office Suppliers (OS), a supplier of office-related products. While OS is a public listed company headquartered in the United States of America (USA), and has established regional headquarters around the world, we will only be analysing the dataset for the South Asia region in this report. An analysis and evaluation of OS's current position will be provided through Descriptive, Trend, Profit and What-If Analysis of the data provided.

The visual analytics function of Tableau enabled us to analyse the large data set of information about the 3 segments[1], 3 categories[2] and 17 sub-categories[3], allowing us to identify key areas which require further investigation and remedial action by management. Based on our findings, 3 recommendations will be proposed to help OS remain competitive.

The following assumptions were made for the purpose of this analysis: sales transactions are recorded as at order date, costs of goods sold (COGS) are computed by subtracting profit and sales discount from sales, shipping costs are assumed to be included in the computed cost equation above, and the Financial Year ended is 31 December. We also assume that OS manufactures its own goods for sale.

Since current economic conditions were not made clear to us, we do acknowledge that there could be possible limitations in our analysis. Nevertheless, the recommendations proposed in this report were made to the best of our knowledge, and with reasonable judgement.

Findings from Descriptive Analysis:

Among OS's segments, the Consumer Segment contributed the most to overall profit *(Fig 1.4).* All sub-categories were profitable. However, it would be ideal to eliminate sub-categories with lower profitability (*Fig 2.1)* to free up OS's resources. OS did not do well in Kazakhstan, Pakistan, Tajikistan and Turkmenistan *(Fig 3.1).* Lahore (city in Punjab, Pakistan) performed exceptionally poor as almost all sub-categories incurred losses (*Fig 3.5)*.

Findings from Trend Analysis:

Overall, OS is profitable from 2012 to 2015 (*Fig 4.1*). "Phones" sold the most in terms of sales (dollar value) and was also the most profitable (*Fig 5.1, 6.1*). COGS, profits and sales were found to be directly correlated. However, "Appliances" and "Tables" have a high COGS relative to their profits, suggesting that their profits are not maximized (*Fig 6.2*). Kazakhstan and Pakistan generated large negative profits in 4 sub-categories ("Phones", "Appliances", "Copiers" and "Tables") (*Fig 6.3*).

It was determined that "Phones", "Appliances", "Copiers" in Kazakhstan and "Tables" in Pakistan needed further review as their negative profits relative to COGS exceeded the benchmark of 50% (*Table 1*). There is a spike in sales in the 4th quarter of every year (*Fig 8.1*), with "Technology" category being consistently the best in sales. This matches the overall profit analysis, which is an increasing trend of growth in sales yearly.

[1] Segments: Consumer, Corporate, Home Office

[2] Categories: "Office Furniture", "Office Supplies", "Technology"

[3] "Accessories", "Appliances", "Art", "Binders", "Bookcases", "Chairs", "Copiers", "Envelopes", "Fasteners", "Furnishings", "Labels", "Machines", "Paper", "Phones", "Storage", "Supplies" and "Tables".

Findings from What-If Analysis:

Sub-Categories "Appliances" and “Labels” generated negative cumulative profits *(Fig 9.1).* After analysis, we found a difference in the trend lines’ gradient *(Fig 10.6).* This is due to the difference in amount of shipping cost per order and per quantity versus profits earned per order and profits earned per quantity. There are months where "Appliances" incurred negative cumulative profit even though it contributed most to total sales and quantity *(Fig 10.4).* We inferred from the difference in gradient that shipping cost outweighs overall profits for months with negative cumulative profit. This happens if OS ships more orders but lesser quantity per order, hence incurring more shipping cost than earning profits.

Findings from Profit Analysis:

Company’s profit margin is not increasing as per industry standard despite the increasing sales. This is due to the rising cost year on year (*Fig 12.1*). We found that the 5 highest sales sub-categories do not translate to highest profits. We identified 5 other sub-categories with lower sales contributing much higher cumulative profits (*Fig 13.3*).

Certain sub-categories such as "Appliances" and “Tables” have underperforming profit margins of <10% thus implying COGS are high *(Fig 13.4).* Sub-categories such as "Furnishings", “Paper” and "Binders" have excellent profit margins of almost 20% *(Fig 13.4).* However, the contributions to total profit are low and average at $3,644 (*Fig 13.3*) as compared to the average contribution of $20,095, from the 3 most profitable sub-categories (*Fig 13.3*).

Recommendation to Control Costs of Goods Sold (COGS):

Evidently, OS has a high COGS for most sub-categories *(Fig 6.2).* Furthermore, the company has not maximized its full potential, as sub-categories with high profit margins have low sales (Fig 13.4). OS will be well served to ensure that costs are kept to a minimum and try to increase sales of products with high profit margin, while scaling back focus on products which are underperforming and generate low returns.

The general direction we recommend is to keep in line with the industry standard, aiming for at least 10% profit margin across the board where feasible. To achieve this, we have identified sub-categories like “Appliances” and “Tables”, which have profit margins below our target of 10% as well as the sub-categories with good profit margins (“Furnishings”, “Paper” and “Binders”) that can be maximized to their full potential.

A way to reduce COGS is to purchase raw materials in bulk to take advantage of quantity and shipping discounts. This will reduce the cost per unit produced. As OS has established regional headquarters worldwide. It would be beneficial for OS to station its manufacturing plant in regional hubs where material and labour cost are cheaper. Although distribution costs may increase, the benefits of consolidating bulk shipping should offset the increase.

OS may also reduce COGS of sub-categories such as “Appliances” and “Tables” by reducing their shipping cost incurred to deliver the product to customers. This can be done by seeking out couriers with more reasonable rates and consolidate shipments. Over the long term, the company can seek to implement vertical integration into the supply chain through acquisitions of members. *Fig 14.2* shows a scenario if shipping cost is reduced by 50%. With the reduction of the COGS, overall cumulative profit will increase by 31.57%. *(Fig 14.3).*

Recommendation of Ways to Increase Sales:

While OS is doing considerably well in general, OS can do better in sales by setting higher targets for the sales teams across all countries, especially for products with high profit margins but low sales amounts ("Furnishings", "Paper" and "Binders") *(Fig 13.4)*. Challenging but achievable sales goals motivates sales teams (A Zoltners, 2020) as well as increase OS's sales. OS can also implement sales incentive rewards to reward teams who achieve their goals. This encourages a sense of accomplishment and identity among OS's employees and hence, aligning employee's goals with OS goals (Hoppen, 2020).

Currently, sales are only peaking at the fourth quarter of every year *(Fig 8.1)*. To ensure that sales are more evenly spread out and boost sales, OS could increase marketing efforts such as sales promotions and campaigns in the first, second and third quarters of the year.

For example, OS could make use of the seasonal period in each quarter to offer special discounts and deals to drive demand for their products and increase sales. *Figure 14.1* depicts the best periods to undertake sales promotion for each of the categories: "Office Furniture" (April – May), "Office Supplies" (July – August) and "Technology" (November – December). The most popular sales periods are highlighted in yellow. Allocation of marketing budget can be done by looking at the profitability of each category whereby least profitable category should have a larger portion.

Marketing efforts should also be directed towards the Home Office and Corporate Segments as we found that they do not contribute to as much profits as the Consumer *(Fig 1.4)*.

Additionally, OS can implement Research and Development aimed towards "Technology"-based products as they are OS's most popular category *(Fig 7.1).* As such, OS can improve the quality of its products while increasing the profit margin through a reduction in COGS. A higher profit margin allows OS to have a greater leeway in pricing its products competitively, either through permanent or promotional reductions in price. This will increase purchases by current customers and attract new customers thus boosting OS's sales in the long run.

Recommendation to Discontinue Sub-Categories in Kazakhstan & Pakistan:

Kazakhstan and Pakistan had the largest cumulative profit loss (*Fig 3.1*). The "Phones", "Appliances" and "Copiers" in Kazakhstan and "Tables" in Pakistan generated large negative profits of more than 50% of their relative COGS (*Table 1*). Initially, we suggested focusing on investigating and improving the current sales of these product sub-categories. Since, most resources will be used for the above recommendations, OS should discontinue the aforementioned sub-categories. OS can strategize and improve other product lines by accounting for the economic factors and government regulations that affect the sales and loss of certain products. Discontinuing these sub-categories would allow OS to see a larger improvement in their overall cumulative profits.

Lahore in Pakistan incurred a cumulative loss of 60.70% of Pakistan's total loss (*Fig 3.4*). Due to this significant loss incurred from Lahore through the years, we recommend that OS should discontinue operations in Lahore completely. Furthermore, all sub-categories incurred a loss except for 3 sub-categories which were quite insignificant in increasing the overall profits. Hence, discontinuing operations in Lahore would allow OS to minimize the losses, free up resources and improve their overall profits.

Appendices

Descriptive Analysis

This section consists of a descriptive analysis based on current and historical data to summarize how well different segments and sub-categories performed.

Profit Analysis

Q1. In which year did the home office segment register the lowest profit? What was the cumulative profit in that year for the entire business unit?

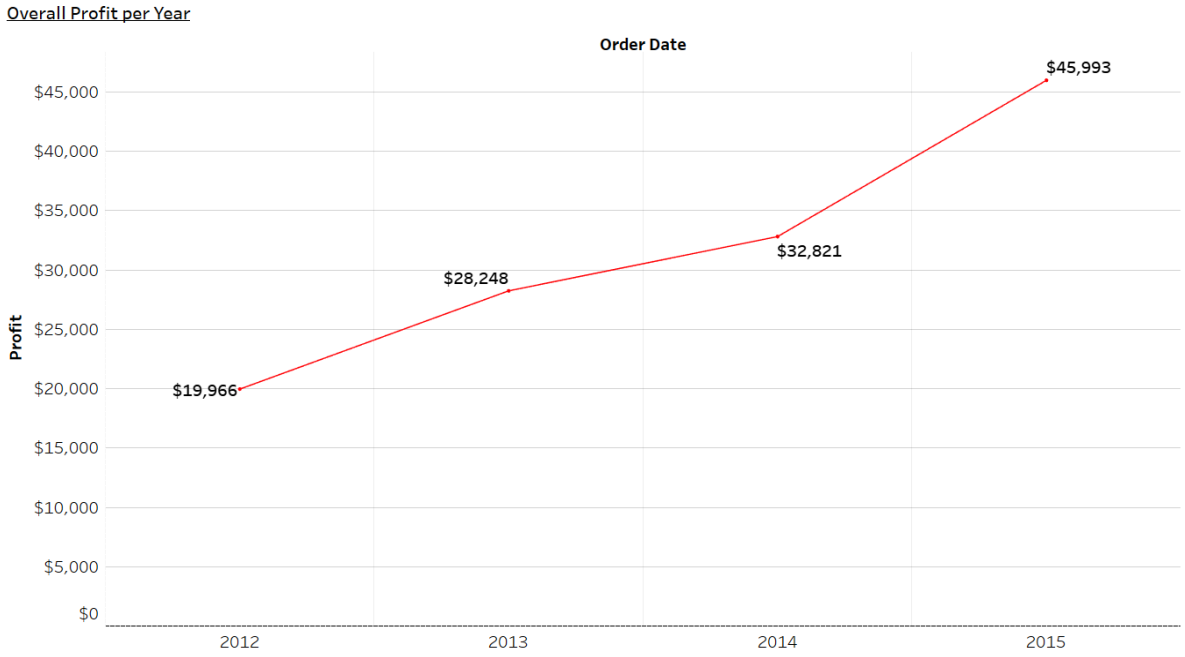


Figure 1.1: Overall Profit Per Year for the Entire Business Unit

We found that the overall profit of OS each year shows a general increasing trend *(Figure 1.1)*. This suggests that it has been reaping profits over the last 4 years (2012 to 2015). However, we noted that the increase in profit from 2013 to 2014 was not as significant as that from 2012 to 2013 or that from 2014 to 2015, as seen from its gentler gradient.

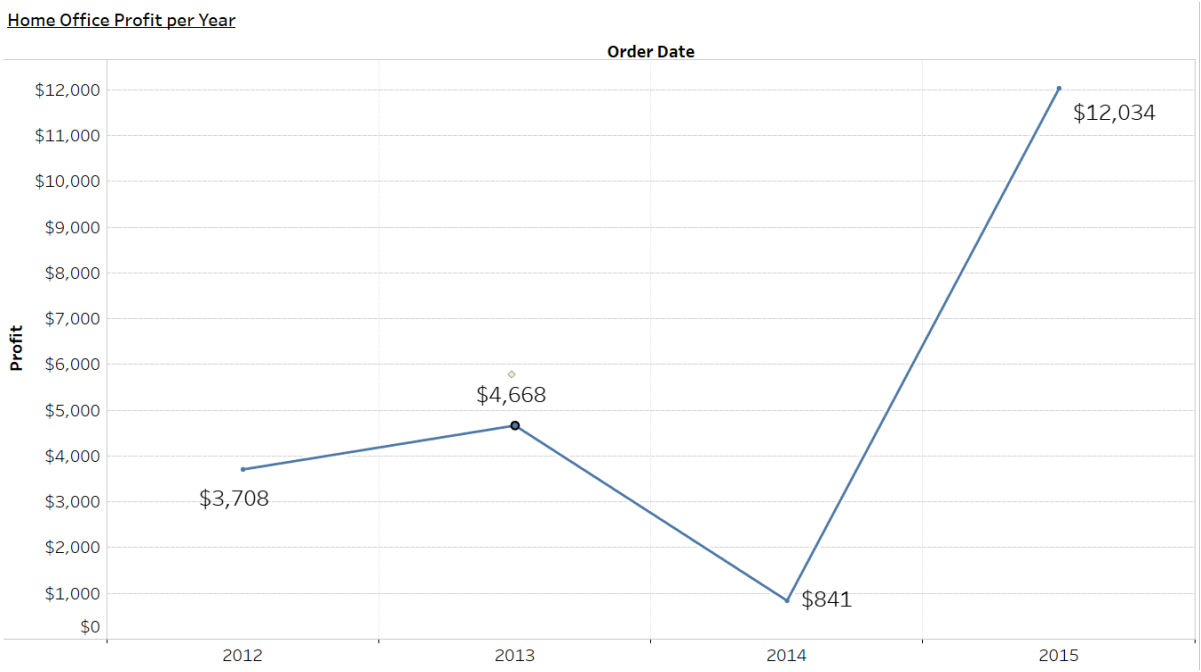


Figure 1.2: Profit Per Year for the Home Office Segment

A likely reason would be due to the profitability of segments varying over time. To investigate this, we decided to first analyse profit against the three segments. It was noted that out of the three segments, the home office segment saw a different trend from the rest. The Home Office Segment registered its **lowest profit in 2014**, a drop of 81.98% from the previous year *(Figure 1.2)*.

Despite this, we saw an increase in overall profit from $28,248 in 2013 to **$32,821 in 2014** instead *(Figure 1.1)*. From this, we can infer that the drop in profit from this particular segment did not affect the overall profit significantly, either because it was the smallest contributor, or because its drop in profit was cushioned by a significant increase in profit from another segment.

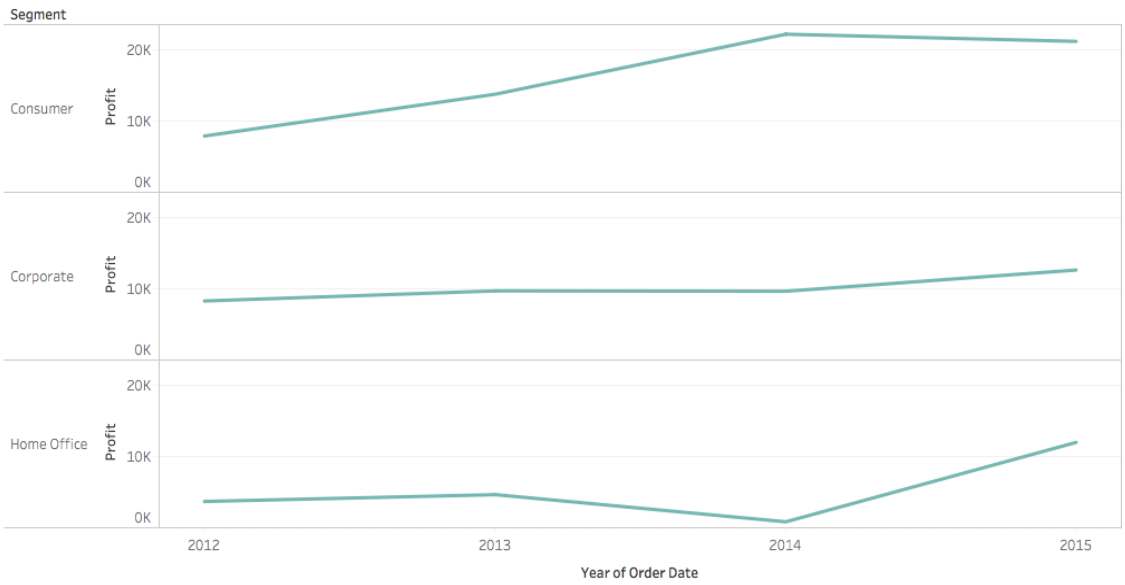


Figure 1.3: Comparison of Profit of Different Segments

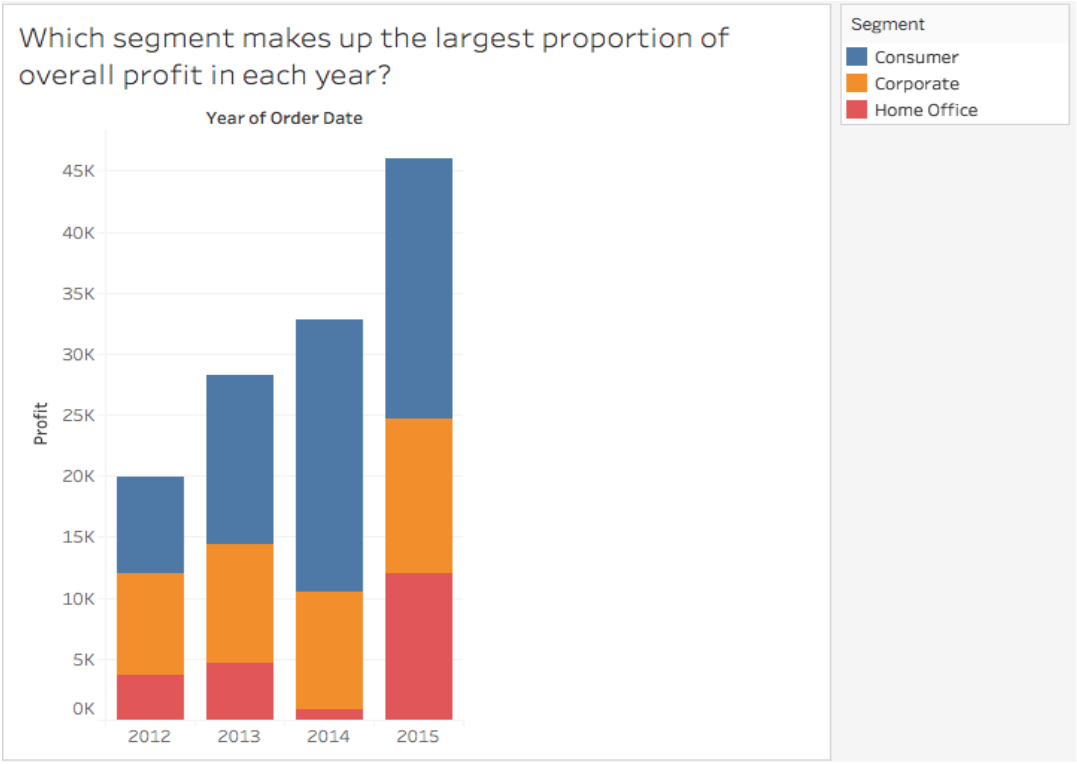


Figure 1.4: Profit from Segment as a Proportion of Overall Profit

Upon further analysis, we found that there was an increase in profit of a similar magnitude in the Consumer Segment from 2013 to 2014 *(Figure 1.3)* and that the segment which consistently has the largest impact on overall profit each year is the Consumer Segment *(Figure 1.4)*.

Q2. The CEO announced that the business unit will discontinue all sub-categories that had a cumulative (all years combined) loss. Which sub-categories had cumulative negative profit and how much?

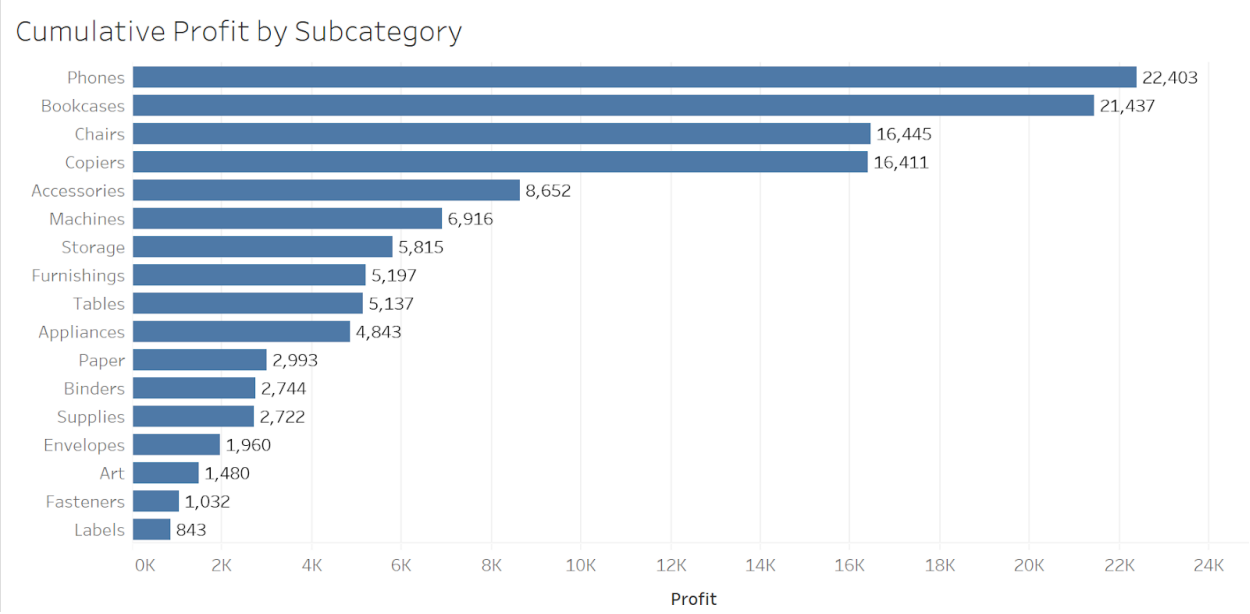


Figure 2.1: Cumulative Profit by Sub-category

Apart from looking at segments of the business unit, we decided to take a closer look at the profits of sub-categories as well. For the years 2012 to 2015, all sub-categories registered positive cumulative profits *(Figure 2.1)*. Since none reported a cumulative loss, none of the sub-categories would be discontinued in view of the CEO's announcement. If the CEO still intends to discontinue some of the sub-categories, he might want to consider discontinuing those with lower cumulative profit as it would be more profitable to give up on the cash flow of products which are not as profitable and strategically employ the company's resources elsewhere.

The three sub-categories with the lowest cumulative profit include "Labels", "Fasteners" and "Art" of 848k, 1,032k and 1,480k respectively *(Figure 2.1)*. However, if the CEO intends to discontinue more than three sub-categories, he can consider discontinuing "Paper", "Binders", "Supplies", "Envelopes", "Art", "Fasteners" and "Labels" since the largest difference in profit is between the "Paper" and "Appliances" category. Apart from that, the difference in profit is not as significant.

Q3. CEO has called for a detailed business review of the country/state/city that yielded cumulative negative profit across all years in the dataset. Which country/state/city will be part of this detailed review?

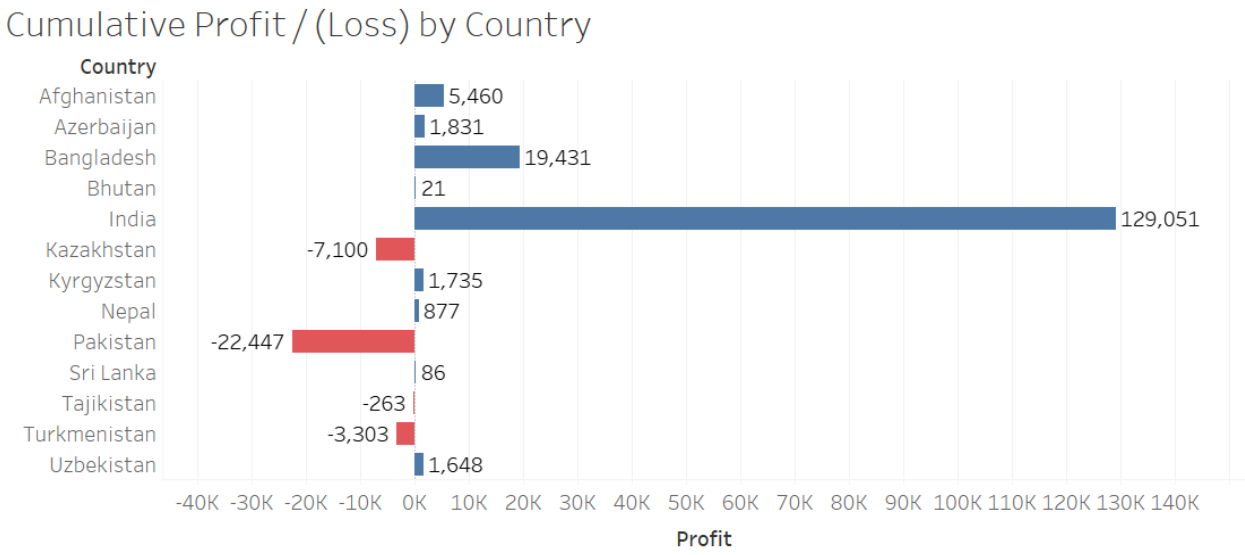
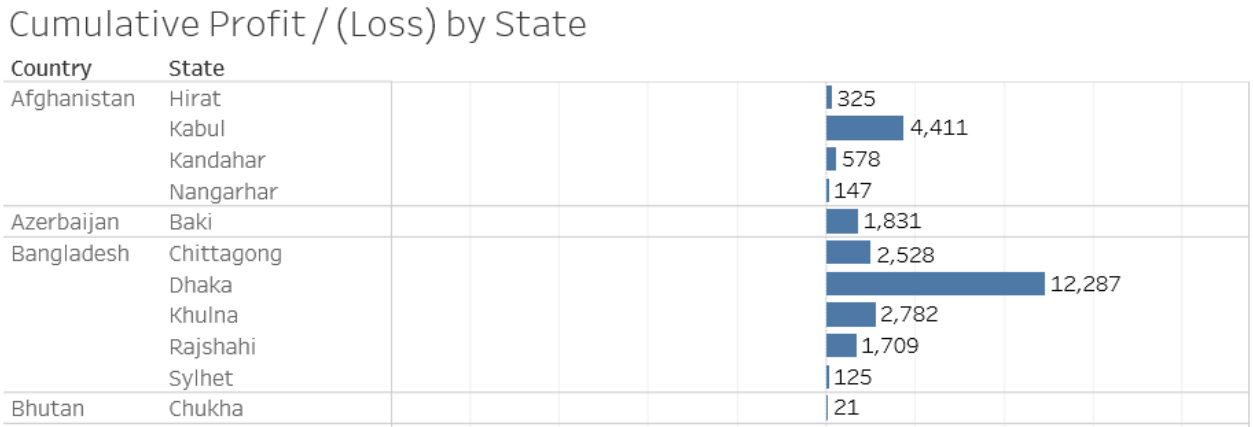


Figure 3.1: Cumulative Profit / Loss by Country

As per the CEO's request for a detailed business review of countries/states/cities that yielded a cumulative negative profit across all years, we will be narrowing our analysis down to the 4 countries that registered a cumulative negative profit – Kazakhstan, Pakistan, Tajikistan and Turkmenistan *(Figure 3.1)*.



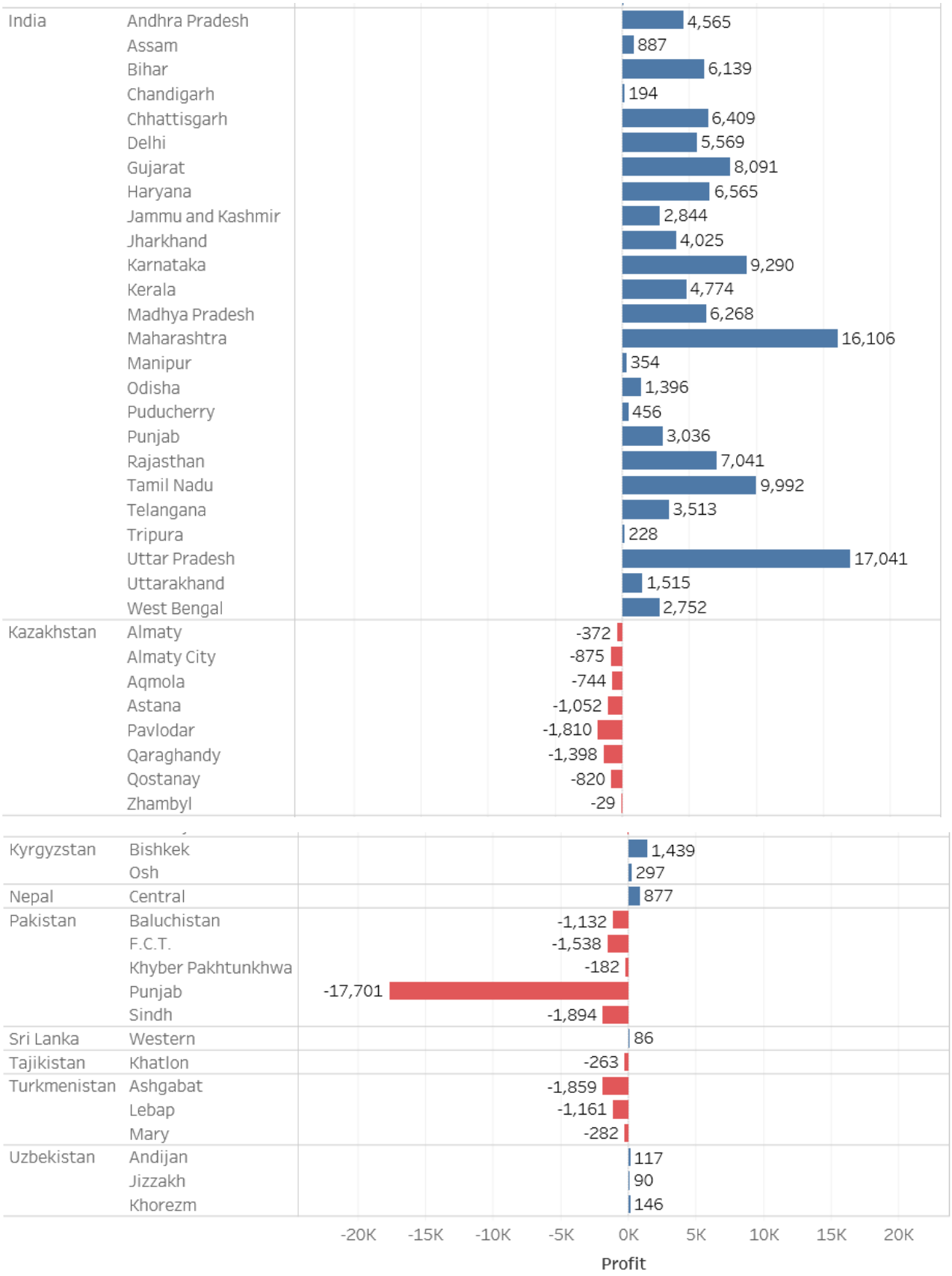


Figure 3.2: Cumulative Profit / Loss by State

Every state in each of these countries yielded a cumulative negative profit as well *(Figure 3.2*).

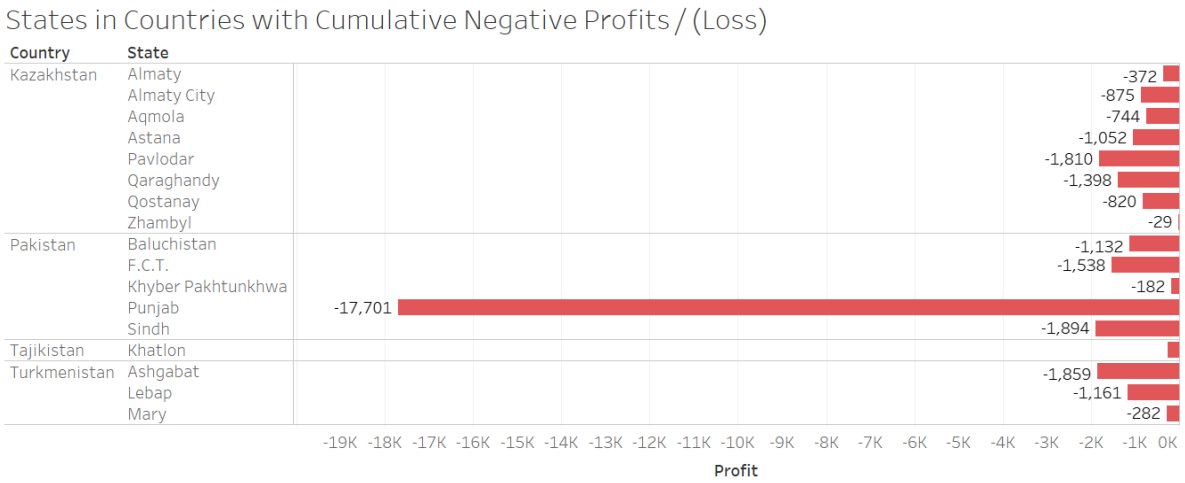


Figure 3.3: States in Countries with Cumulative Negative Profits (Loss)

Figure 3.3 summarizes all the countries and the states in these countries that have accumulated a cumulative loss over the years. Punjab (state in Pakistan) incurred the highest cumulative loss of $17,701. This loss is significantly greater compared to the loss in other states.

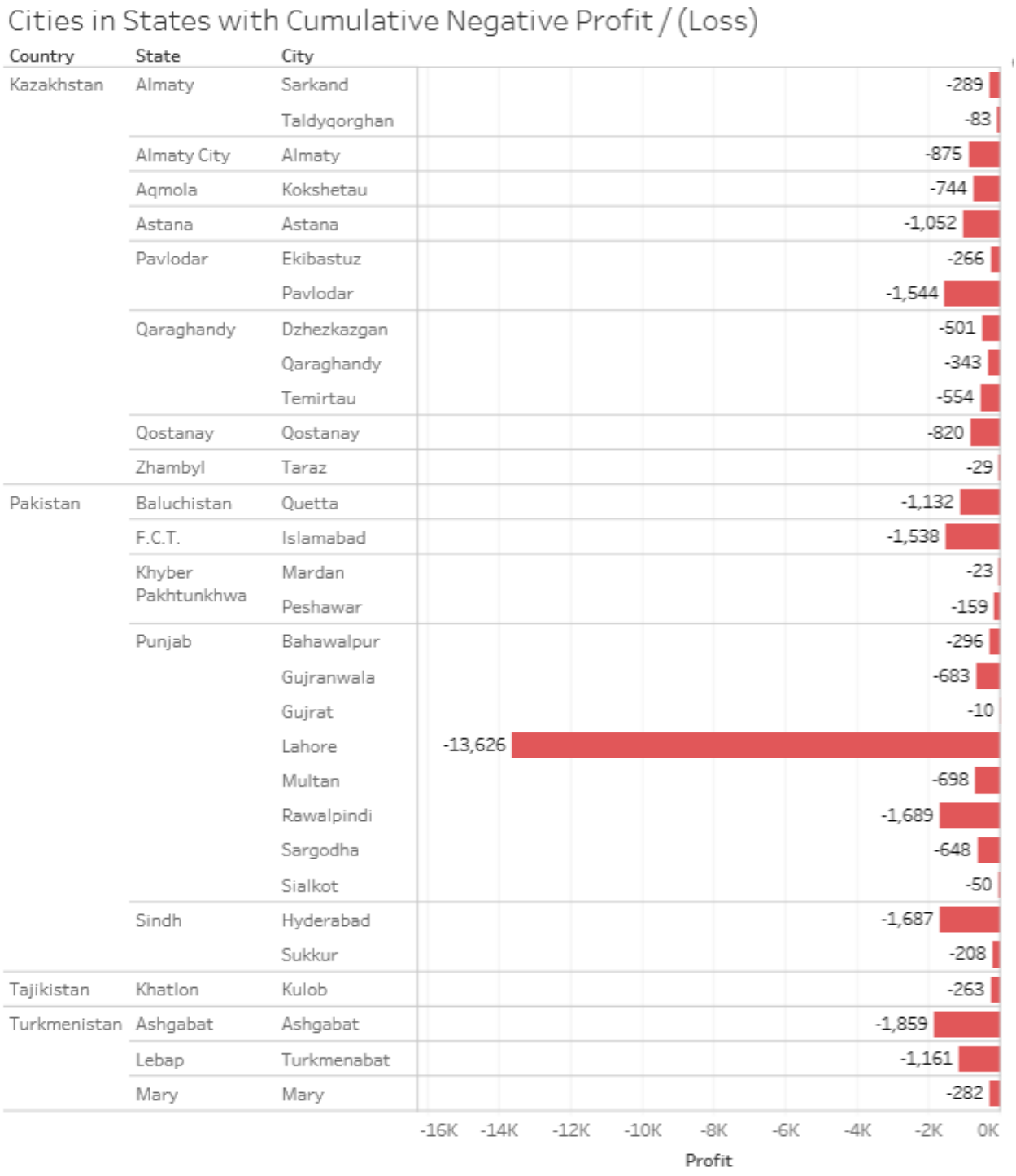


Figure 3.4: Cities in States with Cumulative Negative Profit (Loss)

We found that the high cumulative loss incurred by Punjab in Pakistan is primarily due to one of its cities, Lahore, suffering a significantly greater loss of $13,626 *(Figure 3.4*).

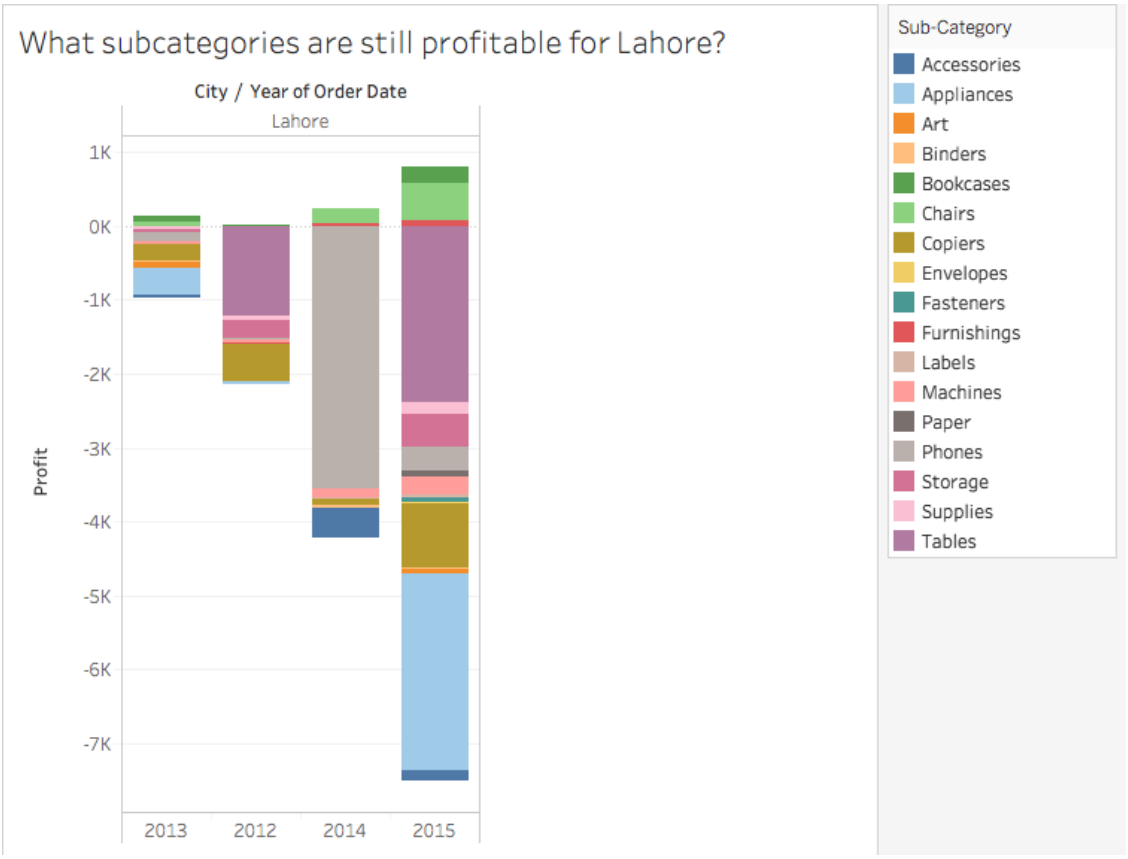


Figure 3.5: Profitability of sub-categories for Lahore

Upon taking a closer look at Lahore, it seems like all the sub-categories are making a loss, except for "Chairs", "Bookcases" and "Furnishings" (*Figure 3.5)*. In that case, all other sub-categories in Lahore should be discontinued to minimize the losses incurred by the company.

Trend Analysis

This analysis predicts a trend based on historical data from multiple time periods thus identifying actionable patterns to project future outcomes.

Profit Trend Analysis

Q4. Looking at the profit figures across all years, is the business profitable? How much was the cumulative profit (all years combined)?

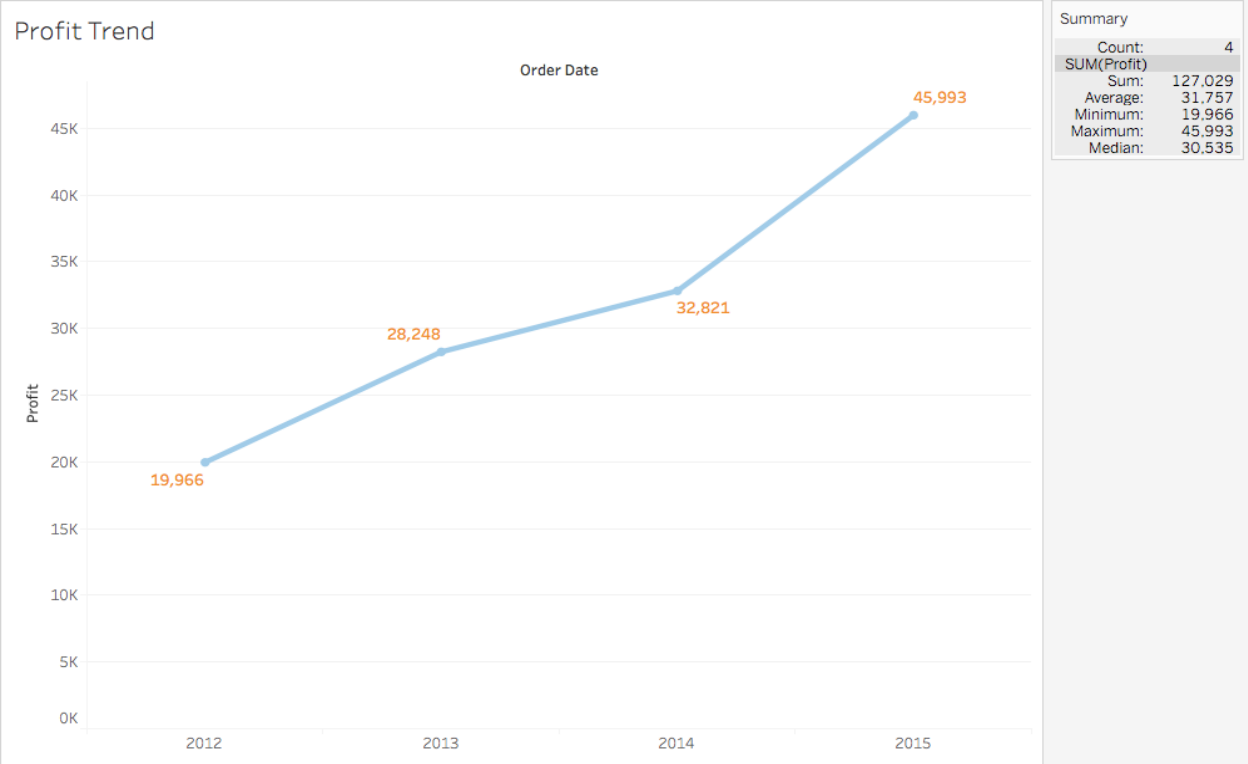


Figure 4.1: Profitability Over the Years from 2012 to 2015

OS's cumulative profit from 2012 to 2015 amounts to $127,028. An upward trend is observed for profit, but the growth is not constant. The profitability of the business grew by 41.5% in 2013, 16.2% in 2014 and 40.1% in 2015. This averages to a growth rate of 32.6%, which will be the forecasted growth rate for 2016 *(Figure 4.1)*.

Hence, OS's business was overall profitable in all the years from 2012 to 2015. Furthermore, it was an upward trend in profitability over the years. However, one of our limitations is that we are unable to compare the yearly profit growth with companies in the same industry to gauge how well OS is doing. Regardless, we must seek continuous improvement. This can be done via a deeper analysis to see how we can improve individual product sales and profits and eventually improve our overall profitability. In doing so, we will be able to improve COGS, decrease negative profits and plan when and which products to conduct research and development, plan inventory management and promotion for.

Sales Trend Analysis (Sub-Categories)

Q5. Which product sub-category sold the most in the period of the data provided? What was the total sales in dollar value?

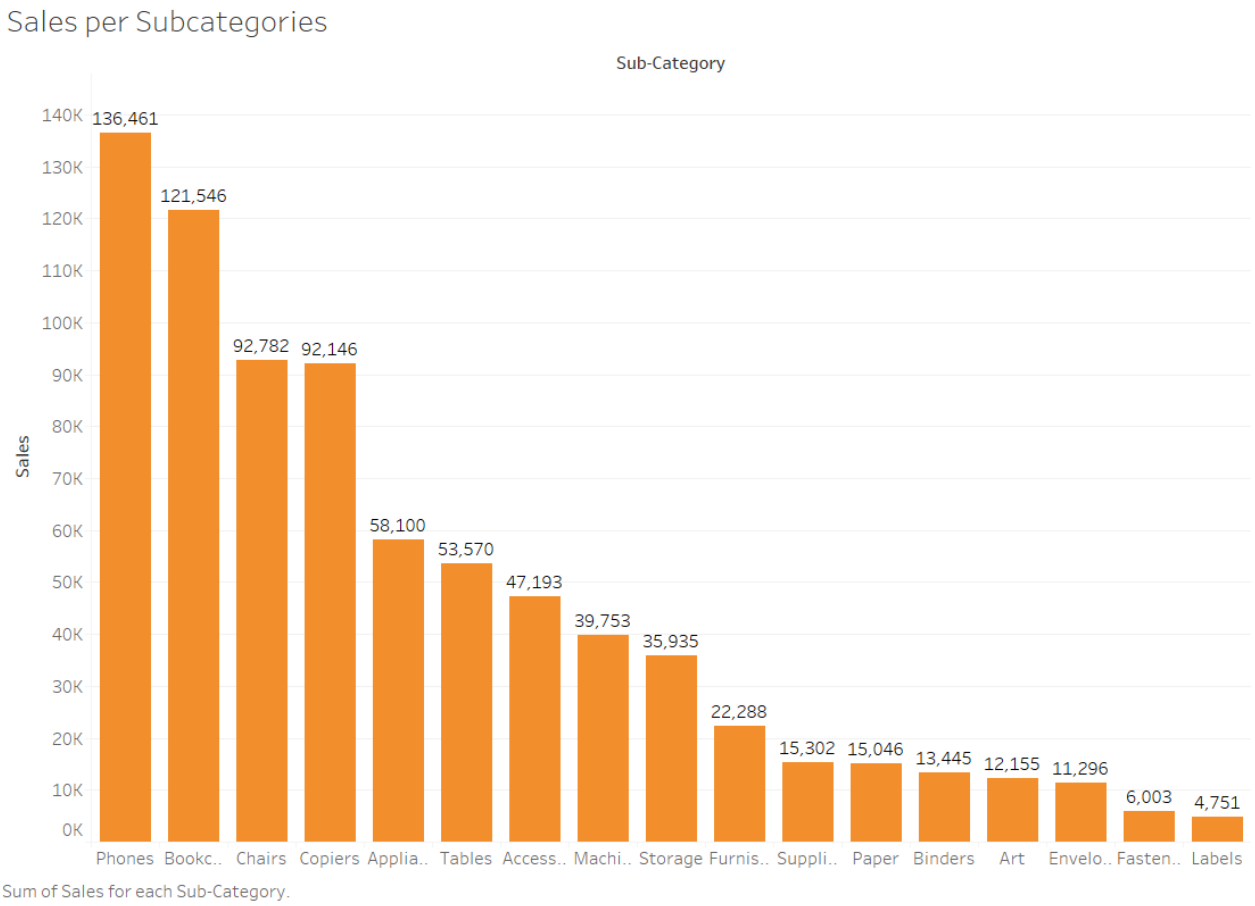


Figure 5.1: Sales in Dollar Value for the Different Sub-Categories

The graph is arranged in descending order of the total sales in terms of dollar value per sub-category. The product category that sold the most in terms of sales in dollar value would be "Phones", whereby there was a sales figure of $136,461 accumulated over the years. The total sales in dollar value across all sub-categories and across all years of operation would then be $777,769.54 (derived from Excel) *(Figure 5.1)*.

Profit Trend Analysis (Sub-Categories)

Q6. Which product sub-category was the most profitable in the period of your dataset? How much was the total profit in dollar value?

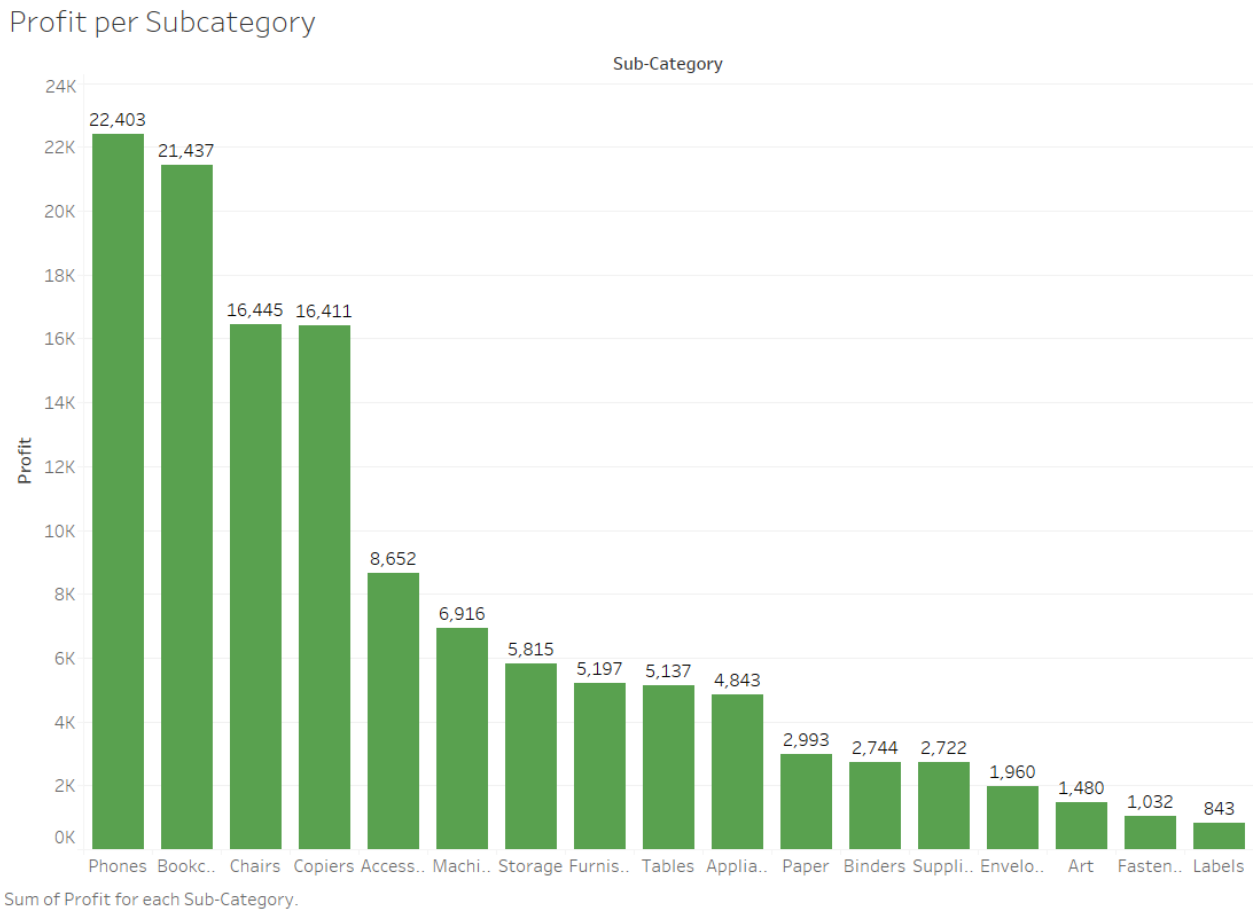


Figure 6.1: Profits per Sub-Category

The graph is arranged in descending order of the total profits per sub-category accumulated across the years of operation. The sub-category that was the most profitable was "Phones", with that sub-category earning a total of $22,403 in terms of total profits. *(Figure 6.1)* The total profits across all sub-categories is $127,029.23 (derived from Excel).

Studying the formula, “Sales = Profits + Sales Discount + COGS”, we assume that the COGS must be proportionate to the profits as it would mean that the cost to produce the goods are proportionate to the profits earned. Additionally, we know that sales discount is not high in dollar value (observing Sales Discount values in Excel), hence we can assume that the norm is that profits, COGS and sales should be directly correlated.

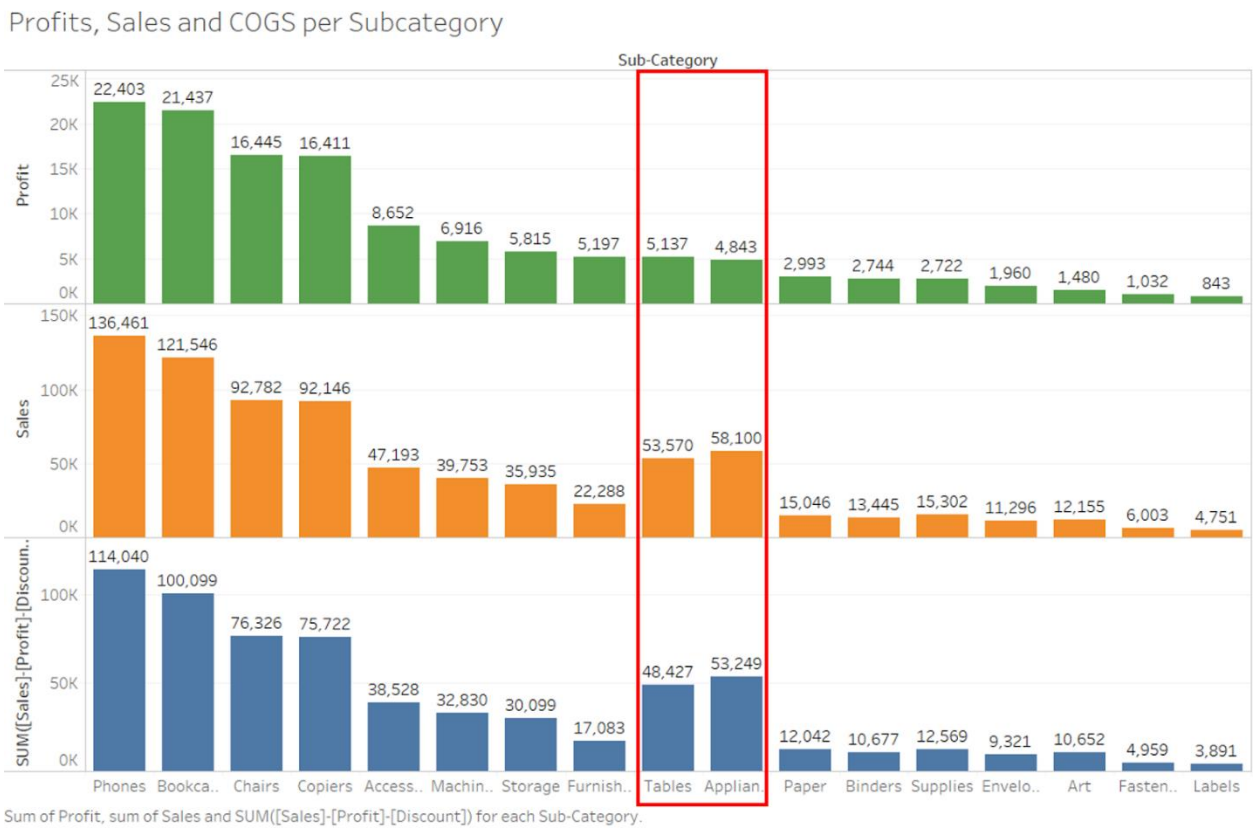


Figure 6.2: COGS vs Profit for the various Sub-Categories

However, in our analysis *(Figure 6.2)*, we observed that there was an abnormality that went against the previously stated assumption. The sub-categories “Tables” and "Appliances" have seen a larger sales and COGS in proportion to their profits. Since the profits follow the generally decreasing trend in the profits portion of the graph, we assume that the spike in sales and COGS is then the abnormality to focus on.

Looking at the same but rearranged formula, “Sales = Profits + Sales Discount + COGS”, we see that ignoring the effects of Sales Discount (previously established that the effects are insignificant) and seeing that profits are following the normal trend, we see that an abnormally high COGS is the only factor that could result in abnormally high sales.

Hence, we can assume that the COGS is relatively high compared to their Profit made for these 2 sub-categories. With the high COGS, these 2 product sub-categories should be earning much higher profits. This implies that OS would have to either to reduce the COGS or reduce production of these 2 sub-categories as they are not profitable enough.

Improving the COGS of profitable sub-categories is one method of improving overall profits, however, by decreasing negative profits, we can also increase overall profits.

Sales Trend Analysis (Country)

As mentioned, OS would have to look at improving sales in countries that have cumulative negative profit. We have decided to analyse by country as no product sub-category resulted in negative profits, hence improvement by focusing on the different countries would be a better strategy.

Furthermore, this is crucial as the large amount of negative profit is affecting OS's overall profitability. Instead of removing services in those countries entirely, we should determine which sub-categories should be removed and which sub-categories could be improved on. As observed before in *Figure 3.1*, the 4 countries that were doing the poorest were Kazakhstan, Pakistan, Tajikistan and Turkmenistan.

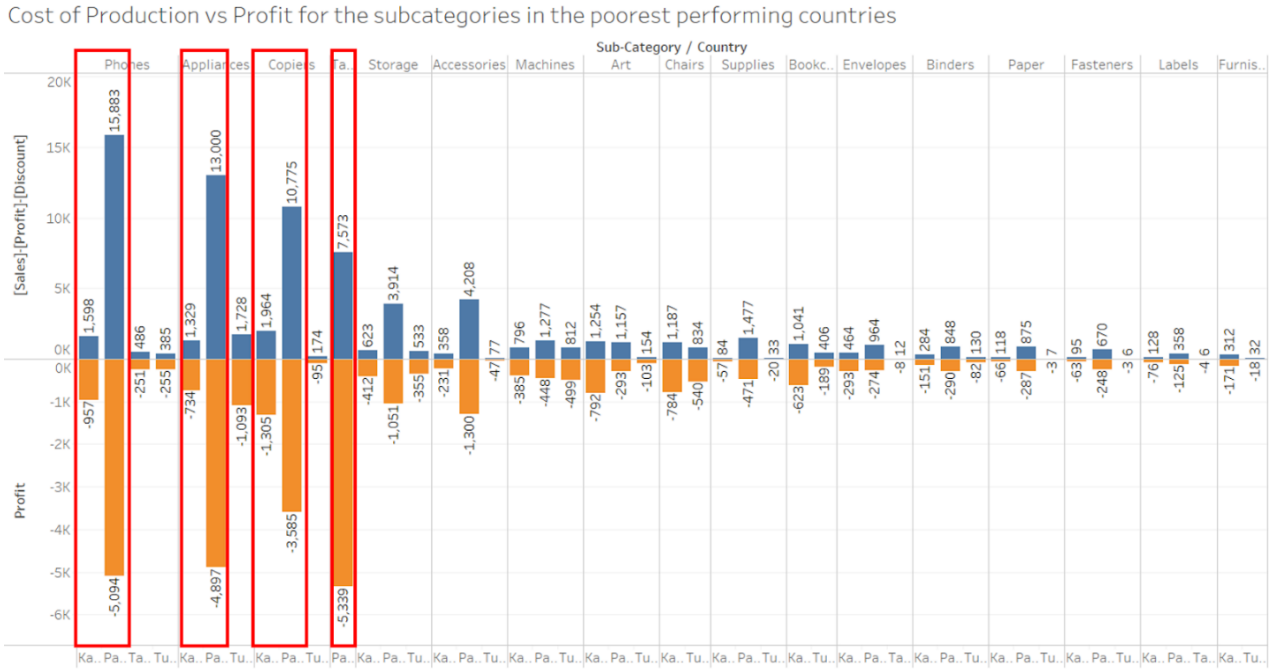


***Figure 6.3: COGS vs Profit for the* Sub-Categories in the 4 Poorest Performing Countries**

Country and Sub-category	Percentage (Negative Profit/ COGS*100%)
Kazakhstan, "Phones"	60%
Pakistan, "Phones"	32%
Kazakhstan, "Appliances"	55%
Pakistan, "Appliances"	38%
Kazakhstan, "Copiers"	66%
Pakistan, "Copiers"	33%
Pakistan, "Tables"	71%

Table 1: Negative Profits Relative to the COGS

From the team's analysis, it was found that Kazakhstan and Pakistan were generating large negative profits in 4 different sub-categories, namely "Phones", "Appliances", "Copiers" and "Tables" *(From Left to Right in Figure 6.3)* Thus, OS should focus its resources on improving sales in these 2 countries as there will be a larger improvement in the resulting cumulative profits. In determining which products needed a deeper review, a benchmark of above 50% ratio of negative profits relative to the COGS was used. *(Table 1)*

Hence, OS should be focusing on finding solutions and focusing efforts on "Phones", "Appliances" and "Copiers" in Kazakhstan and "Tables" in Pakistan as the resultant percentages were 60%, 55%, 66%, and 71% respectively. If the situation does not improve, OS could consider removing these products in these 2 countries and concentrate their efforts on the other product lines instead. Economic factors and government regulations do play a role in affecting the sales of certain products. Thus, OS should consider these factors to find out the reason behind their products' negative profits in those countries.

Apart from focusing on improving our COGS and decreasing our negative profits, we should choose a time period to focus sales efforts on particular products, so as to focus our resources on generating an exponential increase in profits during that time period.

Sales Trend Analysis (Categories)

As mentioned, we must analyse the trends in the categories that are profitable and the time periods that see an increase in profits. Foresight derived from following the trends of profitable categories would allow us to conduct Research and Development (R&D) that can be applied to all the products in the same category as they are similar in nature, hence leading to a general increase in quality and sales prices of the products in the profitable category. This foresight would also allow us to predict and increase our purchase amount for raw materials that can be shared across all products in the same category, hence allowing us to have enough inventory to supply our customers.

By focusing on the time period that is the most profitable, we would be able to speed up R&D to meet this deadline in time and buy raw materials accordingly to maximize our profits during that period. We can also increase promotion before the profitable time period to increase the number of customers but also spread out sales.

Q7. Which product category registered the highest ever monthly sales (in dollar value) in the period of the dataset? How much was the total sales (in dollar value) for that product category in that month?

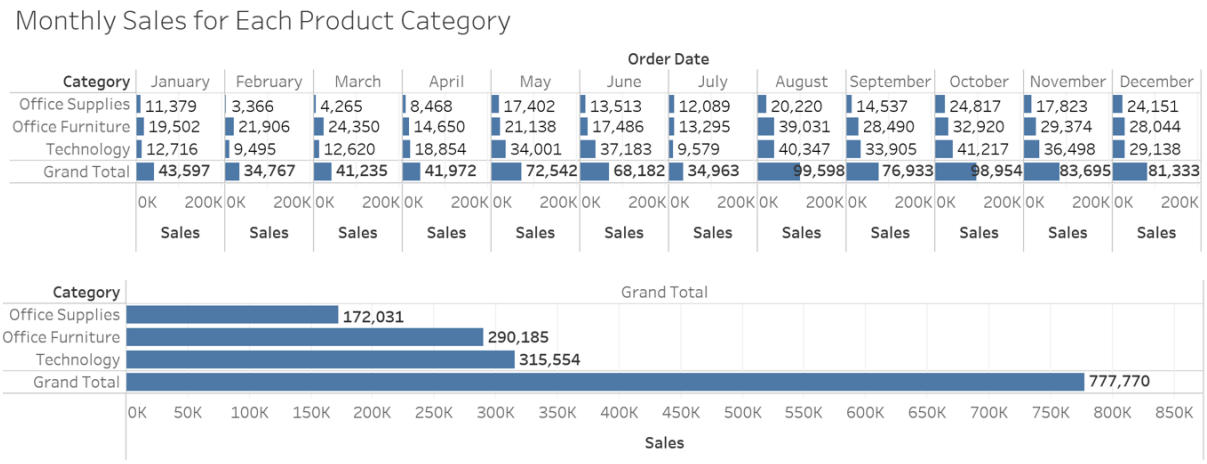


Figure 7.1: Cumulative Monthly Sales for Each Product Category

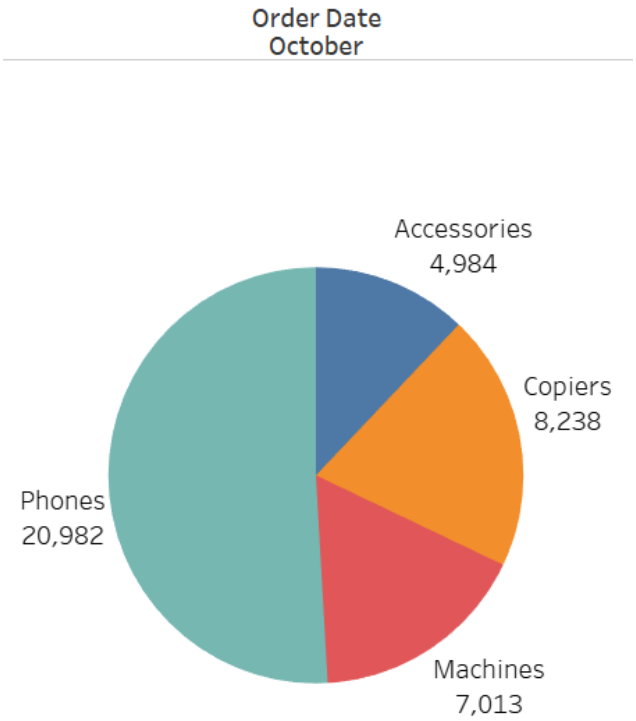


Figure 7.2: Breakdown of Sales in "Technology" Sub-category for the month of October

"Technology" registered the highest ever monthly sales of $41,217 in October. Products in this category include "Phones", "Accessories", "Copiers" and "Machines". Among the 3 product categories, "Technology" seems to be having consistently better sales than the rest. *(Figure 7.1*)

Looking at the breakdown of the sales in dollar value for the products in the "Technology" category, "Phones" took up 50.9% of the total sales in dollar value in October. *(Figure 7.2*) Hence, OS should focus their R&D in the area of "Technology" in order to achieve goals such

as reduction in COGS or increase the quality of their products in the "Technology" category. These would help to achieve an increase in profits for OS's "Phones", "Accessories", "Copiers" and "Machines". It would then subsequently lead to a significant growth in overall profits for the company.

Since we understand that the "Technology" category is doing the best, we can also increase the raw materials that are shared between the products in this category. This would ensure that we have enough inventory and hence not miss out on loss profits that result from not having enough products to sell to customers. However, to know how much and when to stock up on inventory and raw materials, we must look at the trends of profitability in relation to the time period.

Q8. A year is divided into 4 quarters with 3 months in each quarter. Q1 has Jan, Feb, Mar, Q2 has Apr, May, Jun and so on. In which quarter does the store sell the most (in $) and how much? In that quarter, which sub-category had the most sales ($) and how much?

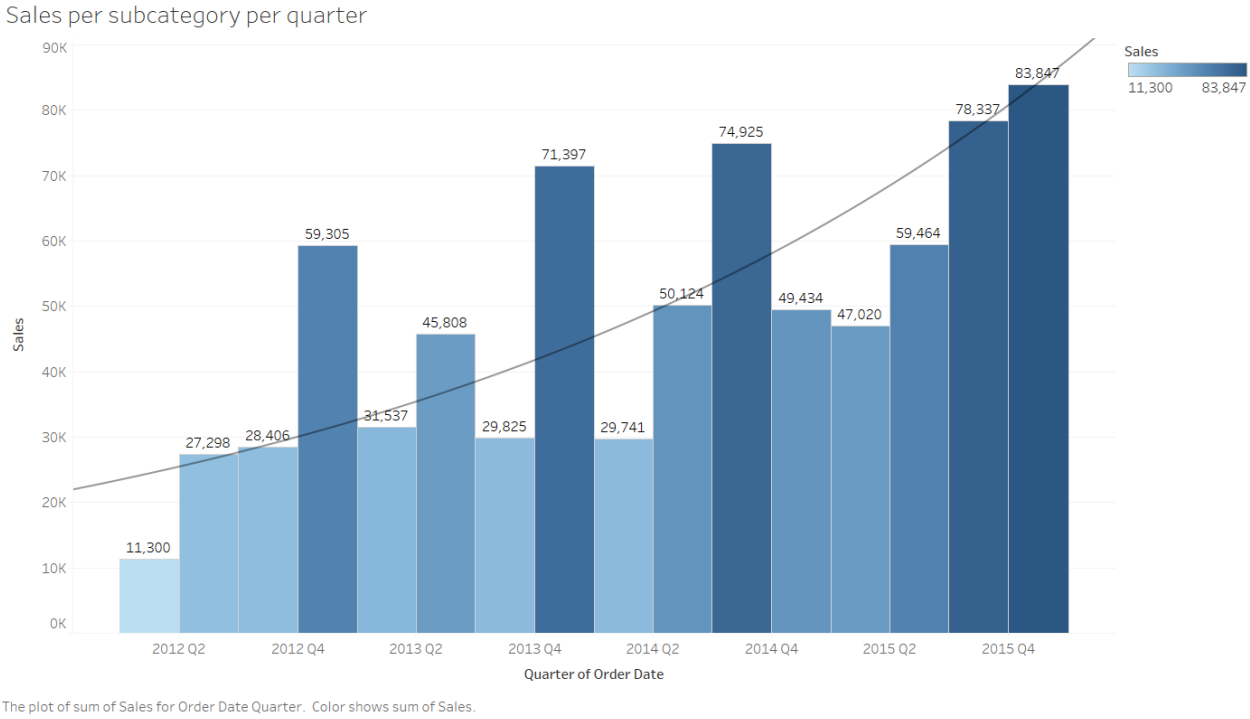


Figure 8.1: Sales per Sub-category per Quarter from year 2012 to 2015

The quarter that sold the most is the fourth quarter in 2015, whereby OS was able to gain a total sales figure of $83,847 for the quarter.

There is a general upward trend of growth in sales. Upon further analysis, we realize that there is a peak at the end of each year (fourth quarter) and a drop at the beginning of the following year (first quarter). This could be due to the customers stocking up on office supplies at the end of the year in preparation for the following year *(Figure 8.1).*

Hence, to ensure that sales are more evenly spread out through the years, OS could offer sales promotion in the first or second quarter. This would drive demand for the products during the first few quarters rather than the spike in demand only at the last quarter of every year. OS can then better manage its inventory as an even demand throughout the year means OS can order supplies at a more stable rate without needing to anticipate sudden peaks and drops. This allow OS to eliminate unnecessary storage costs whenever possible.

However, to determine our direction of focus, we must look at what category and sub-category was doing well and hence focus on them for our R&D and inventory management.

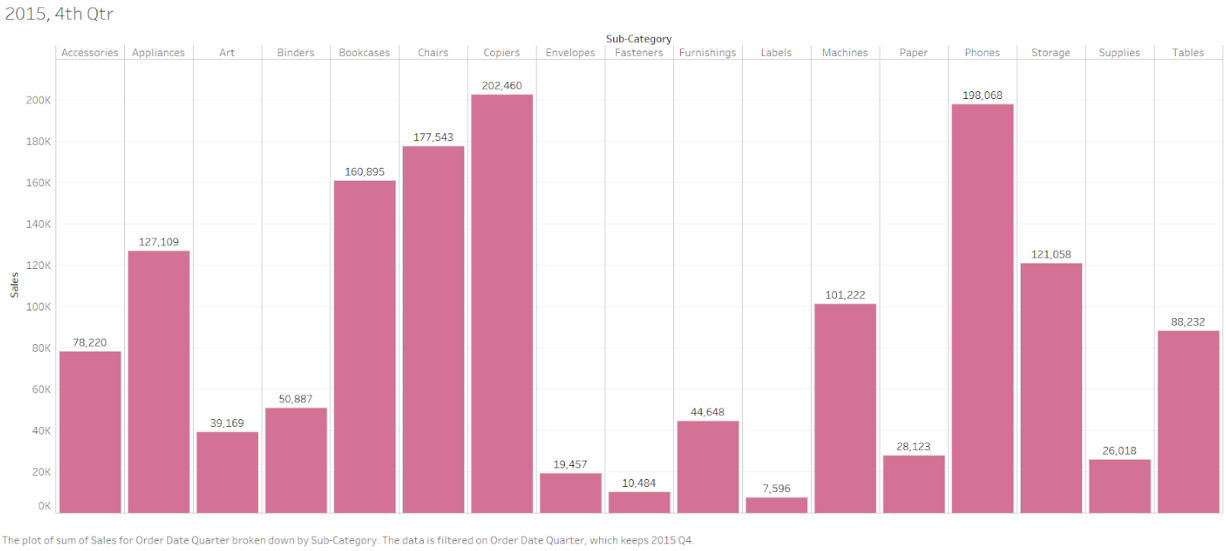


Figure 8.2: Sales for Sub-Categories in the 4th Quarter of 2015

In the fourth quarter of 2015, the sub-category that had the most sales would be “Copiers” with total sales of $202,460. Hence, it correlates with the general trend of "Technology" being the most attractive category (*Figure 8.2*).

We assume that OS will still peak in the fourth quarter despite our efforts to even out the sales. This is because such efforts take time to take effect and will not completely disrupt the consumer behaviour of stocking up during the fourth quarter. Given the higher sales in the fourth quarter, OS can conduct and speed up R&D before then to increase the quality of the "Technology"-based products, especially the “Copiers”. This would allow OS an option to charge a higher premium above and beyond their current prices, allowing them to capitalise on the rise in sales while subsequently increasing overall profits.

What-If Analysis

Q9. Calculate the cumulative profit (in $) for each sub-category across all years. Remove or exclude all the sub-categories that had a cumulative negative profit across all years. After removal, what is the total profit of the OS business unit across all years?

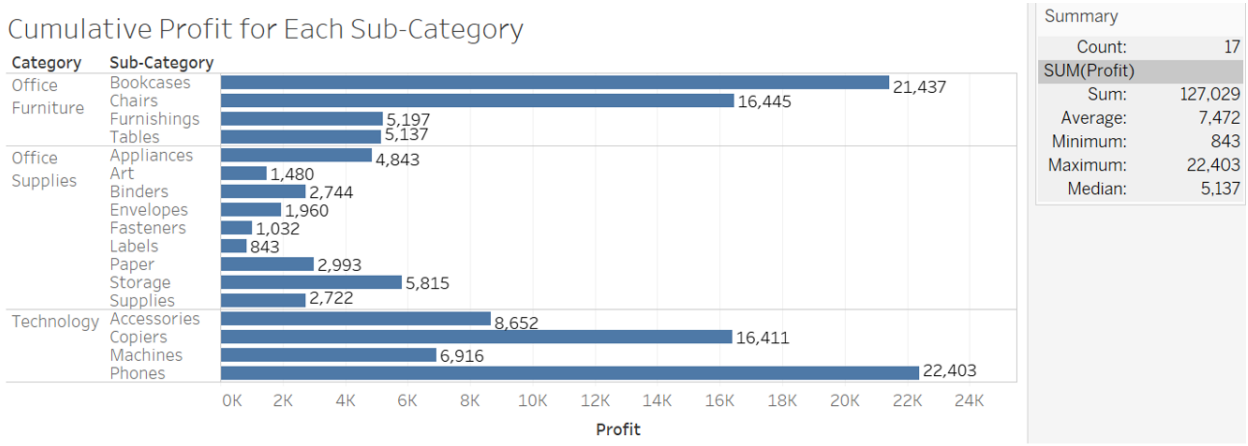


Figure 9.1: Cumulative Profit for Each Sub-category (2012 - 2015)

Based on *Figure 9.1*, all sub-categories had cumulative profit across all the years from 2012 to 2015. The total profit of the OS business unit across all years is $127,029. "Phones" had the highest cumulative profit of $22,403 while "Labels" had the lowest cumulative profit of $843. In general, "Office Supplies" do not yield a high cumulative profit. It is not necessary to remove any sub-categories as there are no cumulative negative profits across all years. Overall, "Phones" have the highest cumulative profit while "Labels" have the lowest cumulative profit.

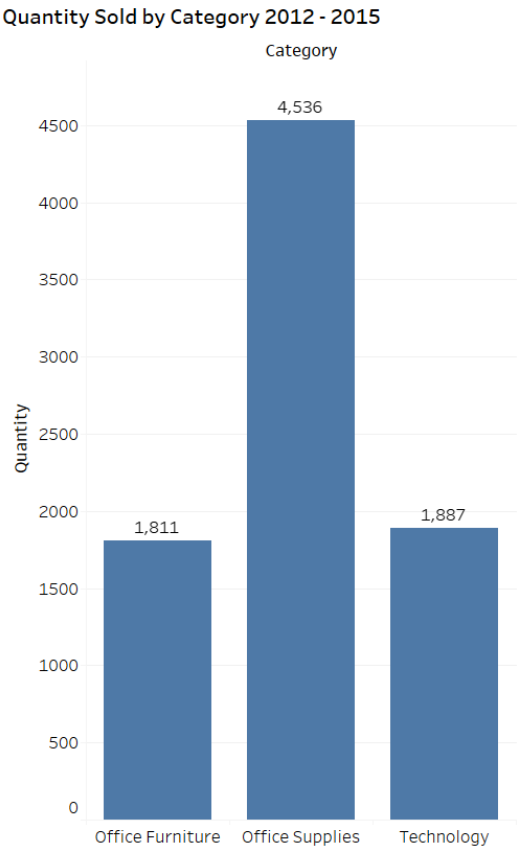


Figure 9.2: Cumulative Quantity Sold by Category (2012 - 2015)

Looking at Categories, “Office Supplies” is not earning a high cumulative profit as compared to "Office Furniture" and "Technology". This may be due to a low unit price. It is seen that "Office Supplies" has the highest sales quantity among the 3 categories (*Figure 9.2*) thus supporting our previous point.

Q10. If only sales in the month of December were considered for analysis, which product sub-category within the "Office Supplies" category sold the most quantity cumulatively across all years? How much was it?

The team analysed the "Office Supplies" Category December Sales across the years. "Office Supplies" category was selected for this analysis as its category cumulative profit is the lowest among the 3 categories. Past trends show an exponential increase in sales quantity (*Figure 10.1*) across all categories overall years, hence, it can be deduced that on average, more sales occurred towards the end of the financial year.

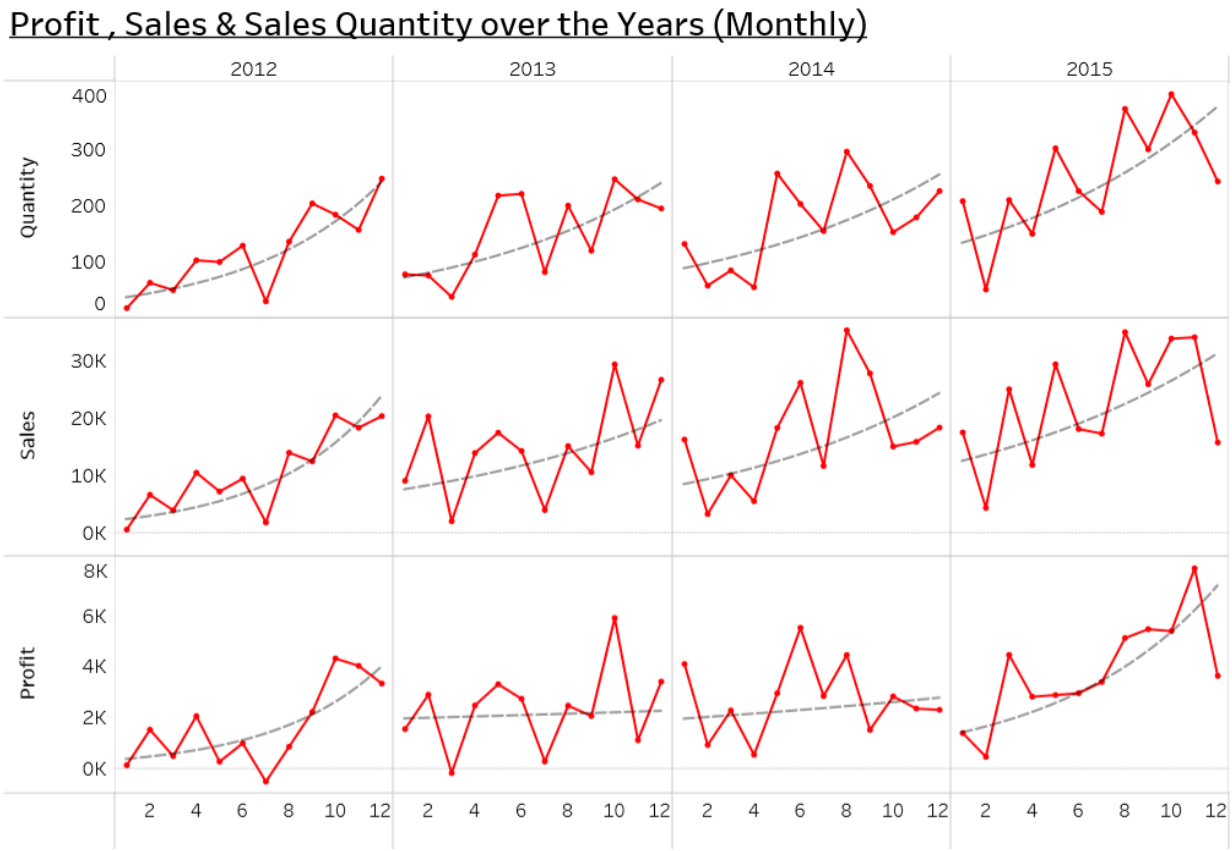


Figure 10.1: Profit, Sale & Quantity over Years (Monthly)

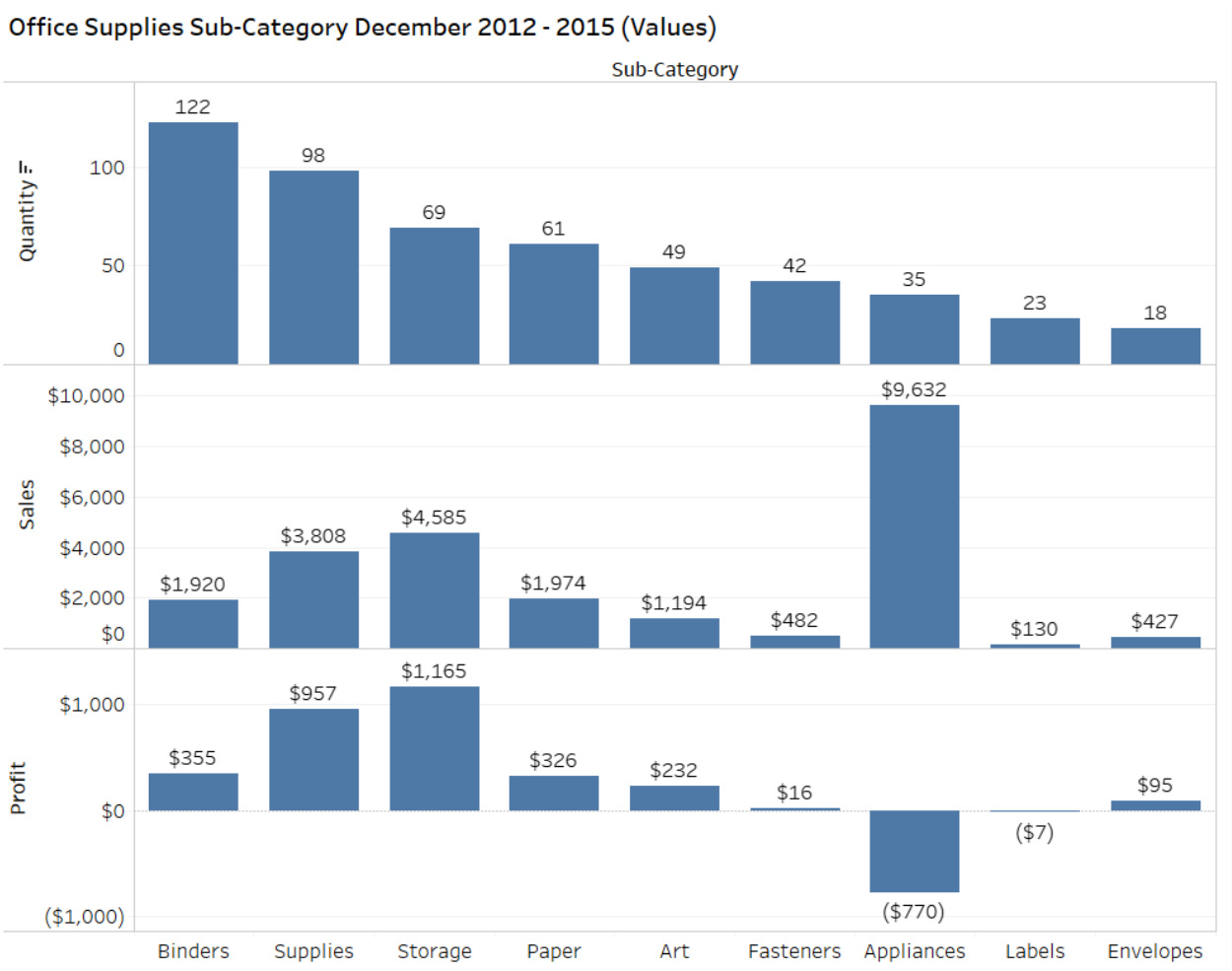


Figure 10.2: Cumulative Profit, Sale & Quantity for December over the Years

("Office Supplies" - Sub-category)

With this, the team investigated the "Office Supplies" category for December cumulatively for all years. Cumulative sales of "Binders" topped the charts for the month of December 2012 – 2015. A total of 122 sales were sold *(Figure 10.2)*.

Why is this so? In the United States, December is seen to be a festive month where consumers tend to spend more. Holidays such as Christmas and New Year Countdown influences consumer behaviour (Jespersen, 2019). Also, it can be inferred that due to its financial year end 31 December, "Binders" are in great demand to prepare for filing and audit ahead.

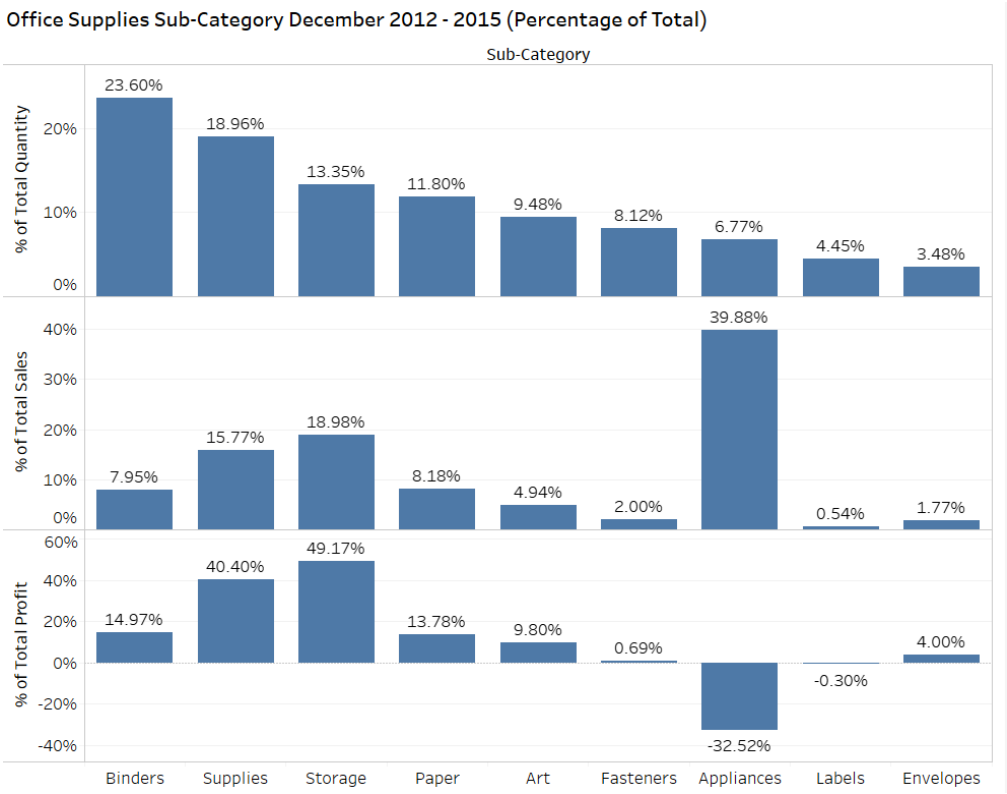


Figure 10.3: Cumulative Profit, Sale & Quantity for December over Years

("Office Supplies" - Sub-category)

(Percentage of Total)

On the contrary, "Envelopes", "Labels" and "Appliances" are the last 3 sub-categories of "Office Supplies" with quantities of 18, 23 and 35 respectively for December cumulative for all years *(Figure 10.2)*. "Appliances", which sold 35 units for December cumulatively for all years, makes up 6.77% of the Total Quantity sold for December 2012 - 2015 *(Figure 10.3)*. But "Appliances" contributed to 39.88% (*Figure 10.3)* of Total Sales for "Office Supplies" for December 2012 - 2015 which is the highest among "Office Supplies"' sub-categories. From this, one can infer that "Appliances" has a high unit sales price.

Surprisingly, "Appliances" has a negative cumulative profit of -$770 *(Figure 10.2)* despite the high sales. Another sub-category of "Office Supplies" which have a negative cumulative profit is "Labels" with -$7 despite a positive sales figure *(Figure 10.2)*.

Therefore, for the month of December, there are 2 sub-categories yielding negative cumulative profit. The team shall look at the overall cumulative quantity, sales and profit of the "Office Supplies" category to investigate further.

Figure 10.4: Cumulative Profit, Sale & Quantity over Years ("Office Supplies" – Sub-category)

The team will look at quantity, sales and profit for "Office Supplies" and its sub-categories cumulatively for all years. With reference to *Figure 9.6*, "Binders" has the most quantity sold. This means that "Binders" is "Office Supplies"' best-selling sub-category cumulatively for 2012 to 2015. However, "Storage" yields the most profit as of $5,815 while "Appliances" yield the most Sales as of $58,100 *(Figure 10.4)*. Looking back at "Appliances" and "Labels", they had a positive cumulative profit of $4,843 and $843 *(Figure 10.4)* respectively, each contributing 19.82% and 3.45% to cumulative total profit 2012 - 2015 *(Figure 10.5)*. Therefore, it is not viable to remove these sub-categories.

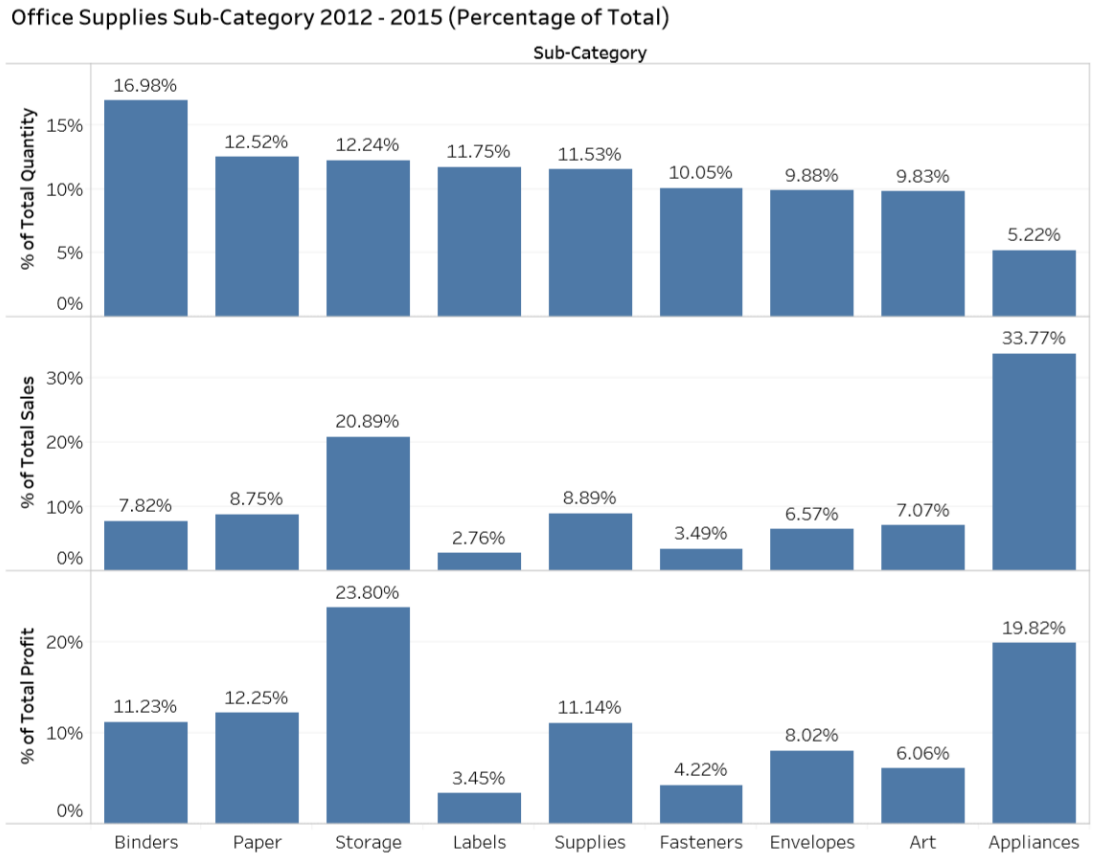


Figure 10.5: Cumulative Profit, Sale & Quantity over Years ("Office Supplies" – Sub-category) (Percentage of Total)

The team decided to investigate further into "Appliances" cumulative monthly quantity, sales, profit and shipping cost for 2012 - 2015 as due to its significant figure to determine the reason for negative cumulative profit.

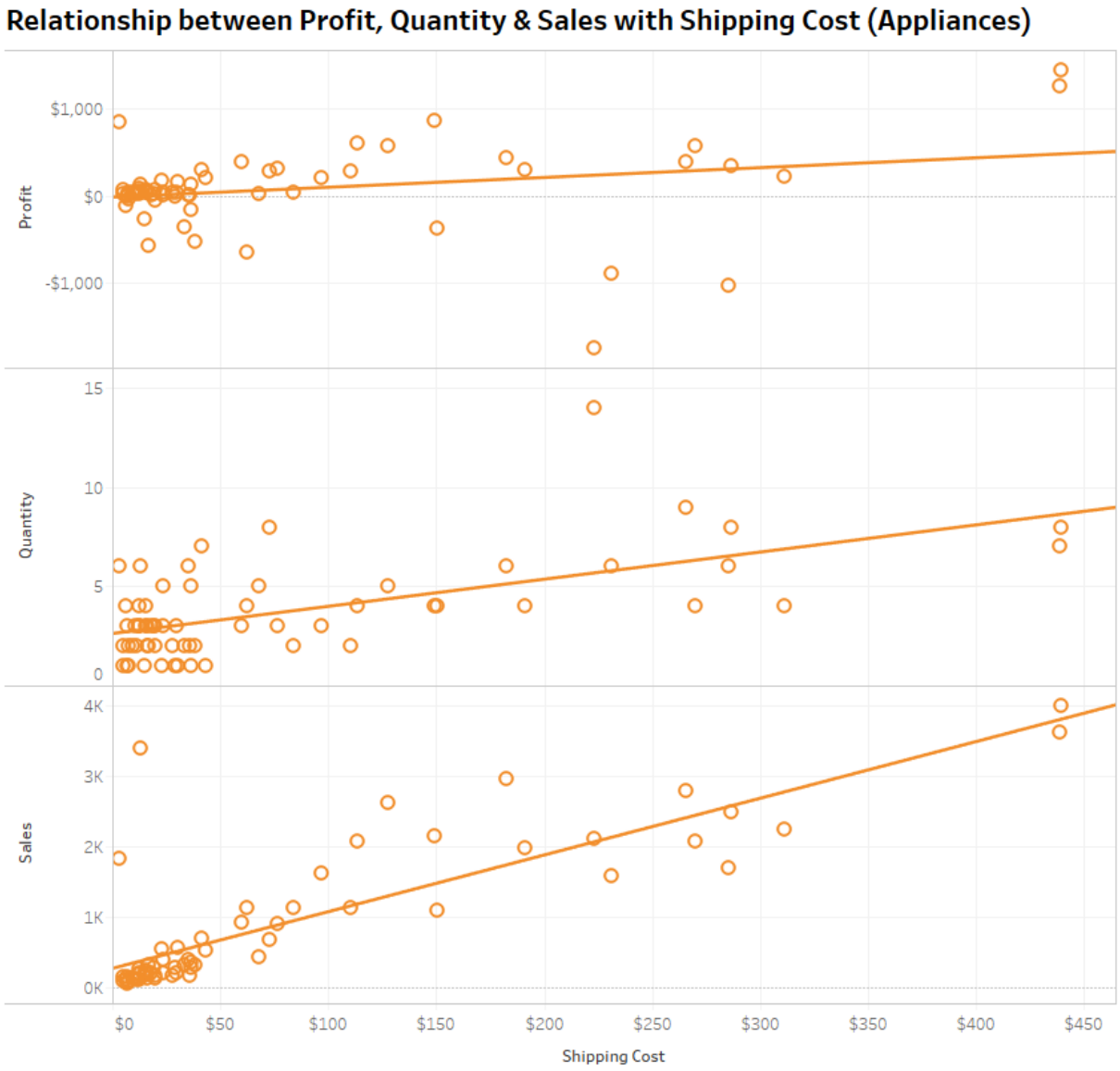


Figure 10.6: "Appliances" Relationship (Profit, Quantity & Sales) with Shipping Cost (2012-2015)

Figure 10.6 describes the relationship between shipping cost and sales, quantity & profit. The gradient of the trend line for the "quantity" graph is lower than "sales". This shows that as shipping costs increase, the increase in quantity sold decreases. Visibly, the gradient of the trendline for profit is much lower than sales as well. As shipping cost increases, the increase in profit earned decreases. Hence, it can be inferred that the higher the shipping cost, there will be a decrease in quantity sold and profit earned. This affects the profit as shipping costs are absorbed by OS. Frequent orders of "Appliances" will increase sales figures but will also increase shipping costs per unit sales. This is because shipping costs are incurred regardless of the quantity sold for each other. Therefore, OS should consider bulk delivery or transfer the shipping cost to the customer.

Profit Analysis

Sub-category Profit Analysis

Q11. What percentage of the total profit (across all years) was contributed by the top three most selling sub-categories?

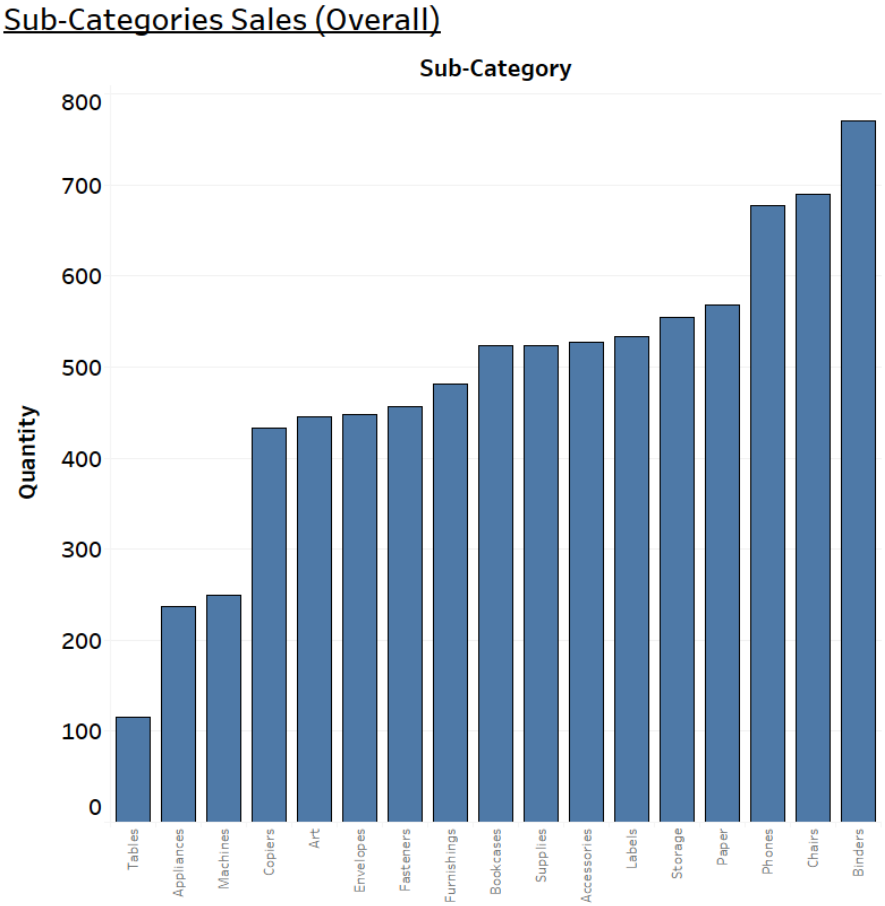


Figure 11.1: Sales by Sub-Categories

In *Figure 11.1*, we can see that the 3 sub-categories by sales are "Phones", "Chairs" and "Binders".

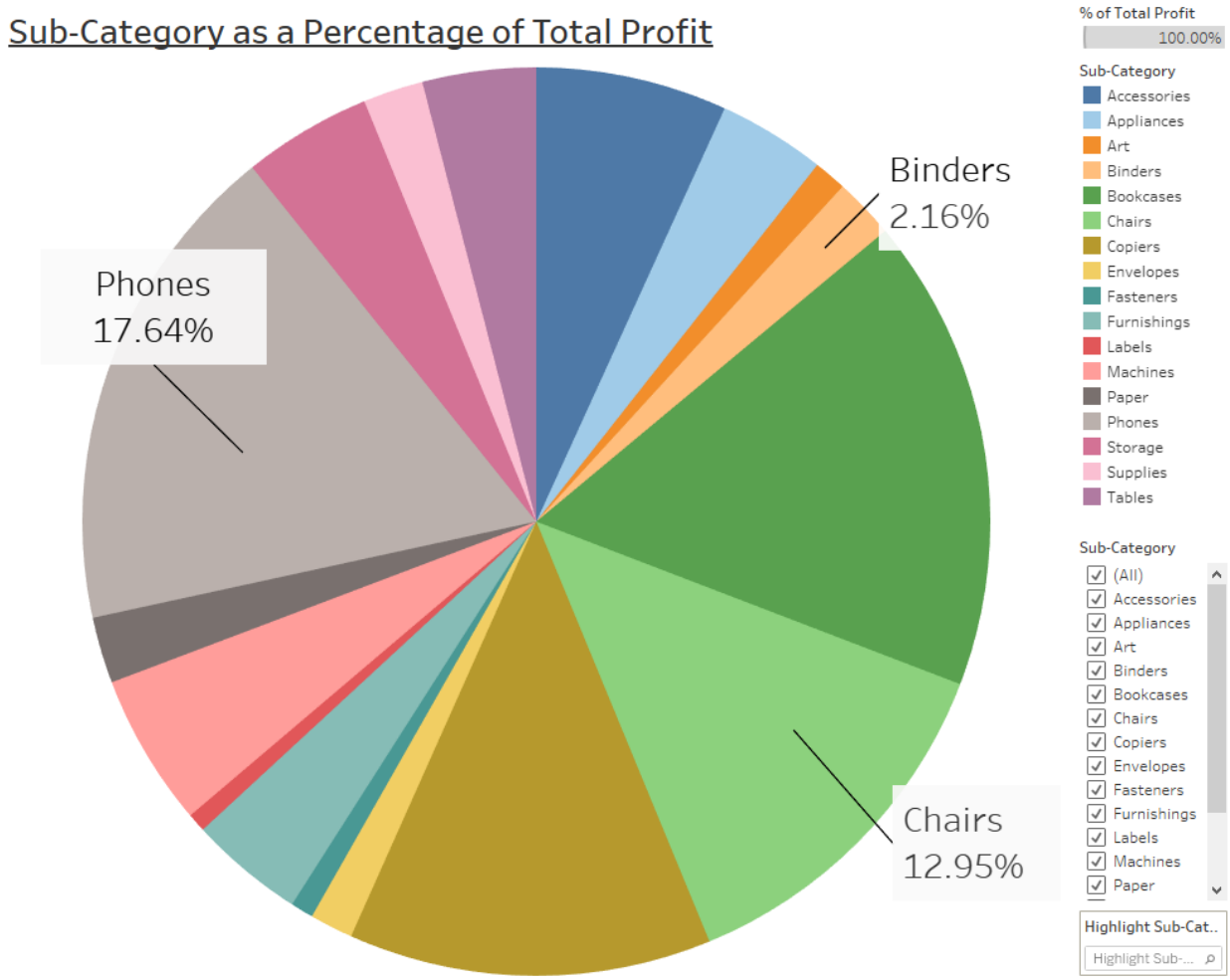


Figure 11.2: Sales for each Sub-category

According to *Figure 11.2*, we can see that the 3 best-selling sub-categories ("Binders", "Chairs" and "Phones") contributed about 32.75% of the total profit. "Binders" contributed to 2.16% of total profit. "Phones" and "Chairs" contributed 17.64% and 12.95% respectively.

Profit Margin Analysis

Q12. Examine the profit ratio (Profit Ratio = Profits/ Sales) of the OS business unit across all years in the dataset.

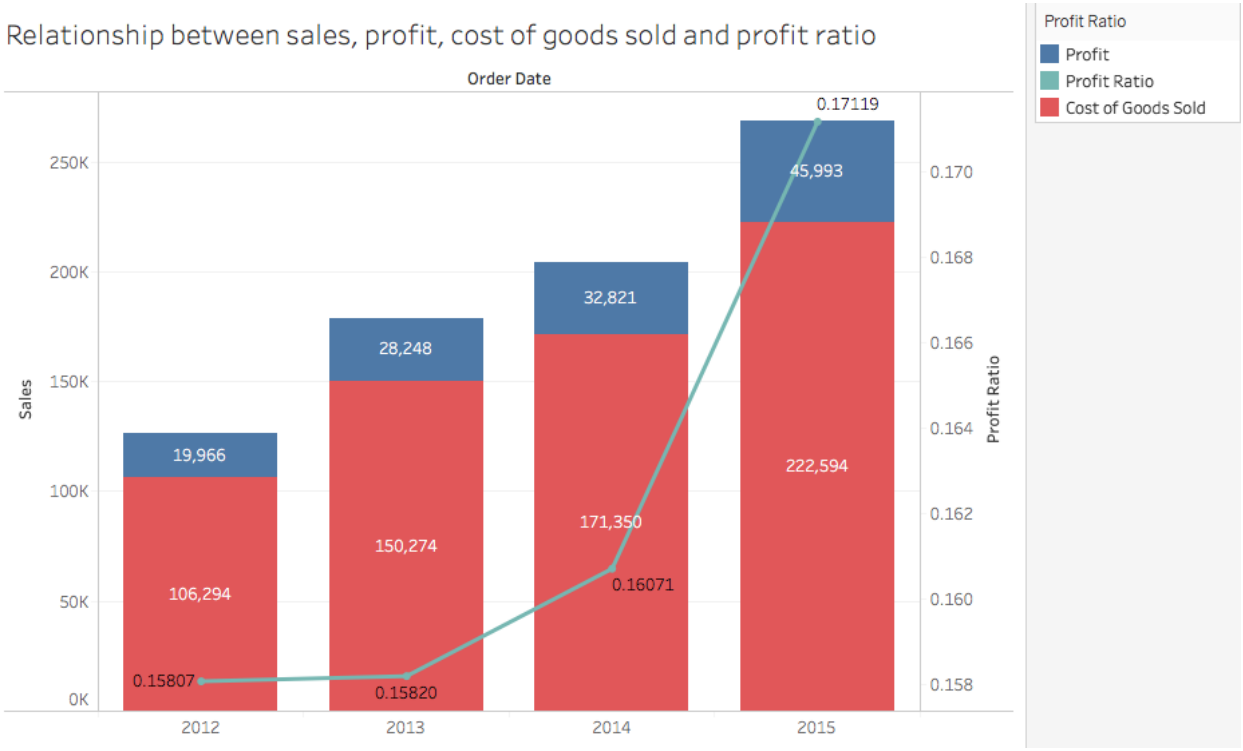


Figure 12.1: Relationship between Profit, Sales, Cost, and Profit Ratio across All Years

By plotting a graph (*Figure 12.1*), we can observe the relationship between the profit, sales amount, cost and profit ratio of the business. Even though we see an increase in cost over the years, the profit ratio increased over the years as well.

While the increase in profit ratio is not significant and lies between 0.158 to 0.171 in the span of 4 years, the extent of its increase in each year corresponds to the increase in sales amount and increase in profit. We can also see an increasing trend of the profit ratio, with a 0.08% increase from year 2012 to 2013, to 1.59% increase from year 2013 to 2014, and finally a 6.52% increase in profit ratio from year 2014 to 2015.

This increasing trend is extremely good, and the company should aim to increase its profit ratio even further (*Figure 12.2*). According to corporatefinanceinstitute.com (*Profit Margin - Guide, Examples, How to Calculate Profit Margins, 2020*), a good profit margin should be around 10%. Therefore, it is recommended that we increase the profit margin to a more sustainable level of 10%, with the goal of reaching 20%

What is a good profit margin?

You may be asking yourself, "what is a good profit margin?" A good margin will vary considerably by industry, but as a general rule of thumb, a 10% net profit margin is considered average, a 20% margin is considered high (or "good"), and a 5% margin is low. Again, these guidelines vary widely by industry and company size, and can be impacted by a variety of other factors.

Figure 12.2: Optimal Profit Margin (Obtained from corporatefinanceinstitute.com)

To ensure that the profit ratio continues to increase in the next few years, the business should try to decrease the cost of goods sold such that profit as a proportion of sales would be larger, given that Profit = Sales - Cost.

Q13. How much cumulative profit (all years) did the five sub-categories with maximum sales (in $) contribute? What are those sub-categories?

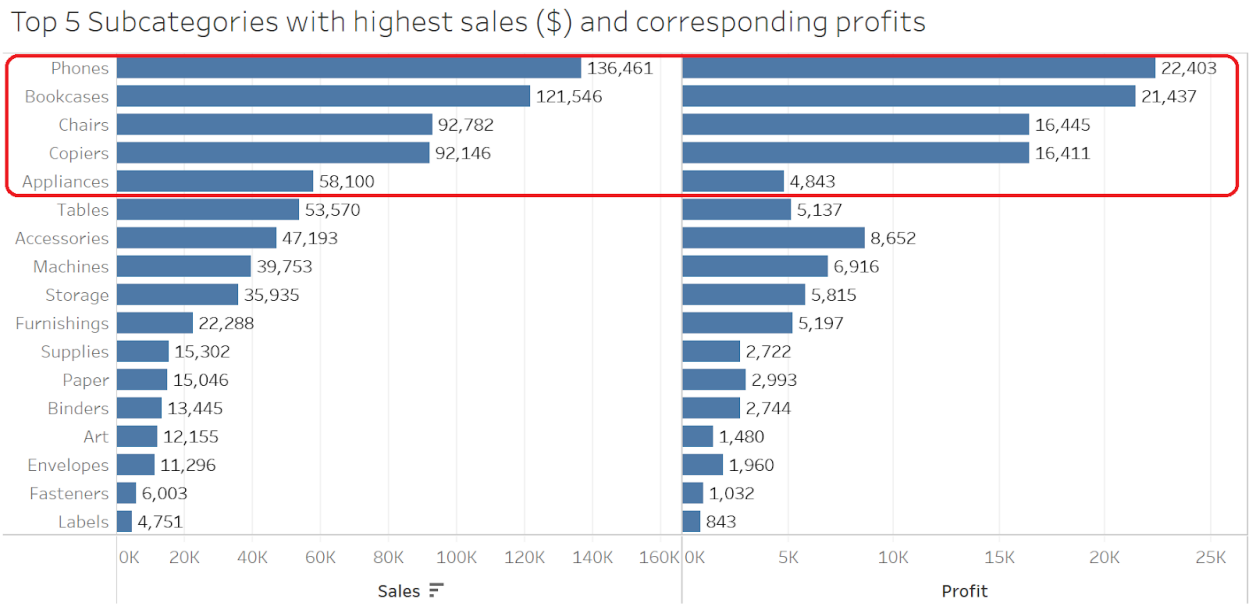


Figure 13.1: Sales and Profit for each Sub-category (Sub-categories are in Order of Profits Contributed)

For these 5 categories, total cumulative profit across 2012 to 2015 of the top 5 best-selling sub-categories amounts to $81,539 (*Figure 13.1)*.

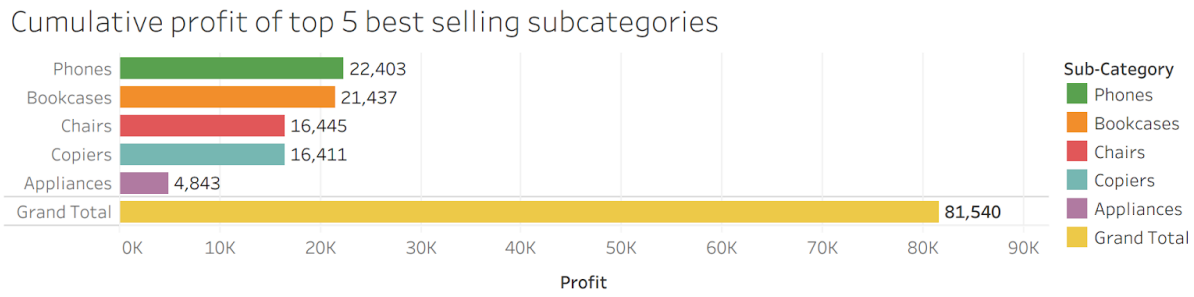


Figure 13.2: Cumulative profit of best-selling categories (Sub-categories are in Order of Profits Contributed)

For these 5 categories, total cumulative profit across 2012 to 2015 of the top 5 best-selling sub-categories amounts to $81,539 (*Figure 13.2)*

1. “Phones” with a contribution of $22,403
2. "Bookcases" with a contribution of $21,437
3. "Chairs" with a contribution of $16,445
4. "Copiers" with a contribution of $16,411
5. “Appliances” with a contribution of $4,843

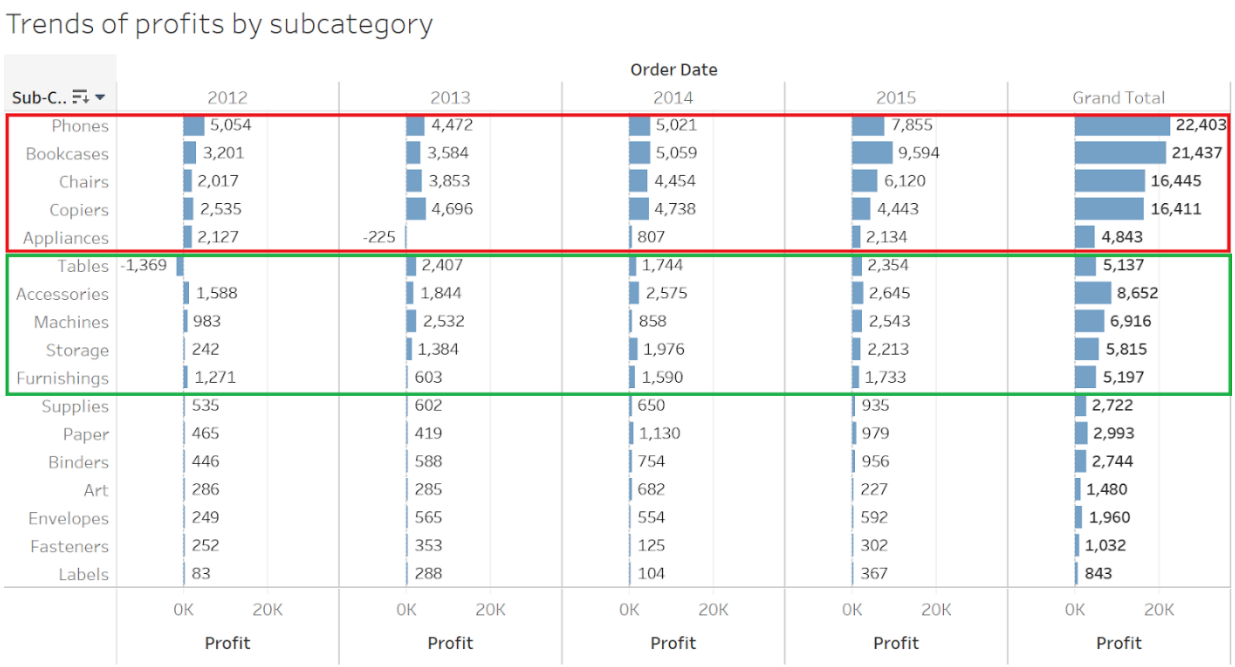


Figure 13.3: Profit Contribution by Sub-category

The graph above (*Figure 13.3)* is the profit contribution of each sub-category, sorted according to sales, in descending order of sales contributions. Highlighted in red are the top 5 sub-categories with the highest sales contribution. Focusing on "Appliances", we can see that it is within the top 5 sub-categories by sales. However, highlighted in green are sub-categories that had a lower sales contribution, but higher profits than "Appliances". A reason for this might be because the cost of goods sold (COGS) for "Appliances" are significantly higher than the sub-categories highlighted in green. We recommend that the company investigate controlling the costs for "Appliances", as it already has high sales figures. More profits can be earned by reducing the cost.

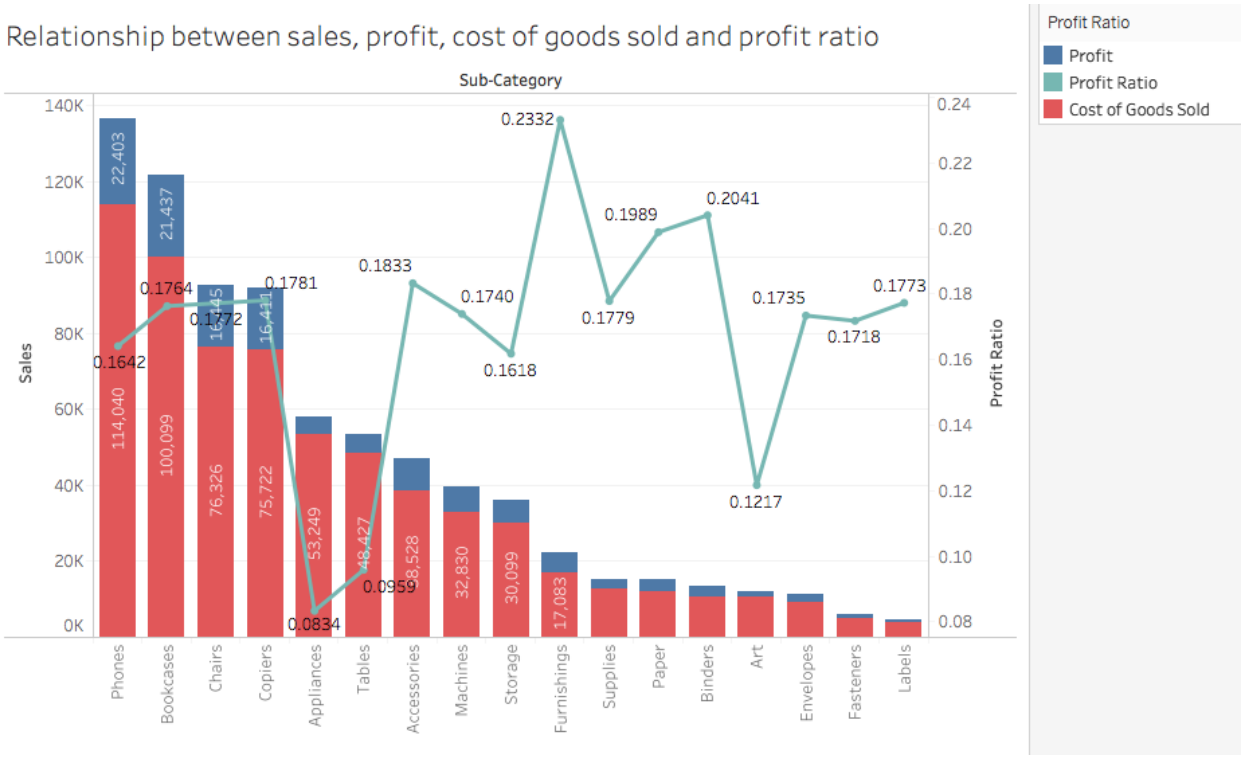


Figure 13.4: Analysis of Profit Margin of each Sub-category

The graph above (*Figure 13.4*) shows the profit margins of each sub-category. As mentioned in (*Figure 12.2*), each sub-category should aim to hit a profit margin of at least 10%. It can be seen from the graph that "Appliances" and “Tables” are only able to garner profit margins of 8.34% and 9.59% respectively. This is due to the high cost relative to the overall sales. The company can investigate controlling costs for these two sub-categories, while looking to boost its sales for these two areas. On the other hand, there are sub-categories which have excellent profit margins, such as "Furnishings", “Paper” and "Binders" with profit margins that are close to or exceed 20%. These are excellent figures. However, these sub-categories have room for improvement, as they only contribute $5,197, $2,993 and $2,744 to overall cumulative profit respectively, a far cry from the highest contributing sub-category at $22,403.

Additional Diagrams

Major Sales	Month	Product in Demand
New Year.	Jan	Technology
Martin Luther King Jr. Day.	Jan	
Presidents Day.	Feb	Furniture & Technology
St. Patrick's Day.	Mar	
Easter.	Apr	Furniture
Mother's Day.	May	Furniture
Memorial Day.	May	Furniture
Father's Day.	Jun	
Fourth of July.	Jul	Supplies
Amazon Prime Day.	Jul	Supplies
Tax-free weekends.	Aug	Supplies
Labor Day.	Sep	Furniture
Columbus Day.	Oct	
Black Friday.	Nov	Technology
Cyber Monday.	Nov	Technology
Super Saturday.	Dec	Technology
New Year's Eve.	Dec	Technology

Figure 14.1: Breakdown of Seasonal Sales Periods

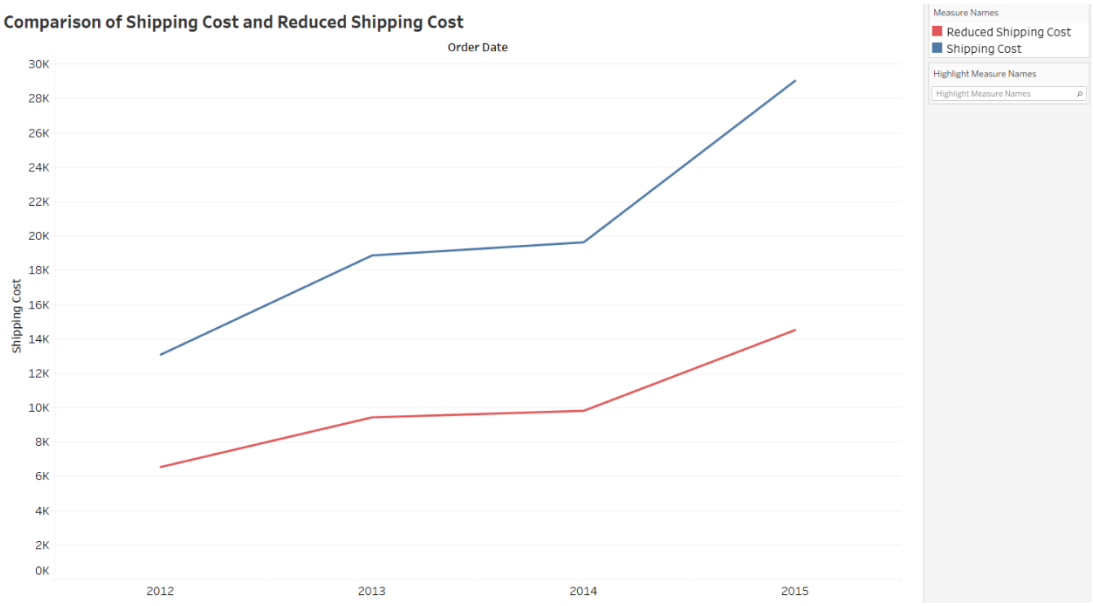


Figure 14.2: Reduced Shipping Cost Scenario

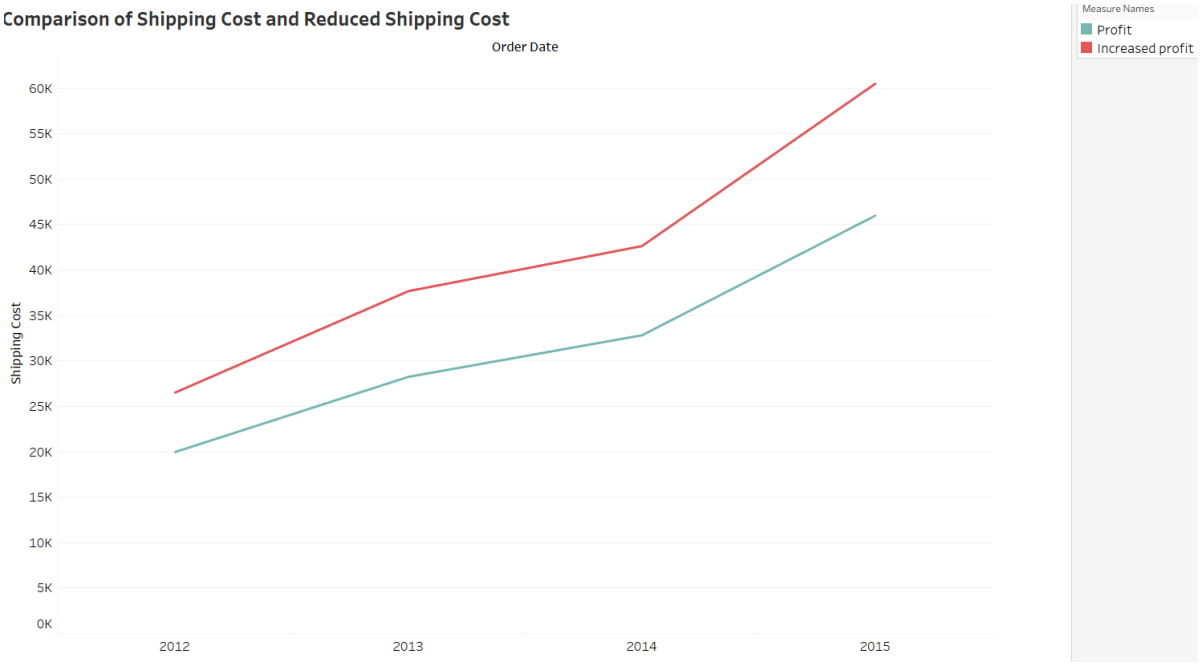


Figure 14.3: Increased Profit Scenario

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