

# **COURSEWORK**

## **ST2187- BUSINESS ANALYTICS, APPLIED MODELLING AND PREDICTION**

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## **Executive Summary**

We have analyzed customer historical sales dataset to understand and project online sales of our business around the world. The company spans 13 different regions with overall revenue of \$12.64M in 4 years with its operation mainly into three different categories i.e. Furniture, Technology, Office Supplies with the profitability of \$1.47M and 1590 customers in more than 3500 cities. The dataset includes attributes such as user-id, sales price, discount, shipping cost, order priority to help us map the sales ecosystem of our company. Our customers mainly include consumers, enterprises and other small businesses. In this study, we will try to shed more light on factors like discount-profit relations, Average Order Value of subcategories and areas that have opportunities for improvement in sales and generating profits. We've also estimated next year's sales projection across segments, which can help the management to target the right customers with tailored offers for a better financial year. Additionally, this data has been used to analyze customers buying patterns and preferences to generate better recommendation algorithms to implement strategies like combo deal offers to drive sales and profit.

### **Assumptions**

1. Currency is in \$
2. Column "Sales" is the total price for the total units sold in each row.
3. Sales is considered as: [Sales - Discount amount]
4. Discount is given in %
5. Customer is paying the shipping cost
6. Profit Margin=  $\text{Sum}(\text{Profit})/\text{Sum}(\text{Sales})$

## **REGIONAL ANALYSIS**

Based on the data, I have segregated the regions according to their margin and % of Total Sales. On one hand, the company is generating its highest revenue in the Central region by giving an average discount of 14%, on the other hand, Canada is outperforming every other region in terms of margin. But also the business is generating its lowest of total sales in this region and one of the factors behind it could be a 0% discount. I will further lengthen my analysis to identify the root causes of it and recommend ways to senior management how we can further improve sales expansion in Canada. Seasonality can be observed in the data and revenues are at its peak in the final quarter of every year where 34% of the total sales have been generated. Customers have a proclivity towards the "Medium Priority" mode to order more than 50% of the units whereas the company has sold 178K units in total. EMEA, South and Southeast Asia are the lowest profitable regions for the company, there could be numerous factors behind it, one of them could be the discount as 2 among 3 of them are offering huge concessions among all the regions. I will further elongate the analysis of these 3 regions to unearth which subcategory is incurring a loss and what are the alarming zones for the management.

### **LOWEST PROFIT EARNING REGIONS**

After identification of EMEA, South and Southeast Asia as the lowest profitable regions, this section aims to unbury its root causes and suggest steps to improve the profitability further. Commonly, higher the average order value(AOV), higher would be the profit but this expression doesn't complement tables subcategory AOV with its margin. On average, a customer has spent more than \$815 on each purchase of tables across regions, which is a significant order value, still, this product is incurring heavy losses in 2 of these 3 regions because of providing more than 35% concession on this product and there is a high negative correlation between discounts and profit margins. Running discounts on the website is a proven way to acquire new and retain existing customers but we should also prioritize the acceptable margins. 8 out of 17 subcategories in Southeast Asia are running in loss because we are giving more than a 35% discount in each of the subcategories even after their low AOV. Generally, the companies approach higher discounts to increase AOV but this strategy is hurting the business here. To increase AOV, we can either focus on upselling by showing relevant recommendations to the customers or by providing bundle deals, like 'buy four get one free'. Order with discounts up to 20% are not hurting the business in the South and EMEA region but margin can still be improved by analyzing customer profile and buying patterns. For instance, if a customer purchases 2-3 times a year, instead of offering a 10 or 20% discount, the team can recommend low-priced but high-margin products to that person. On the contrary, if a customer makes purchases multiple times a month, that customer can be presented with exclusive offers with a higher discount.

## **CANADA SALES ANALYSIS**

Out of all the 13 regions, Canada has the highest profit margin of 26.6% but also has the sale share of only 0.53%. The goal of this dashboard analysis is to increase overall sales in the Canada region. We have a total of 8 states in Canada and Ontario is the state with the highest total profit among all. The Office Supplies category has more than 50% of total sales volume, in 5 out of 8 states, but average sales in \$ per quarter are low compared to others. Since the Canada region is not offering any discount, there could be many ways management can increase sales. The more traffic a website receives, the better are the chances for the company to generate leads, sales, and revenue. Running targeted ad campaigns for deals on the platform can attract customers. The management can use this strategy to expand the Furniture business across states since it is the lowest selling category among all. Roughly, it takes 4 days for the company to ship the product in the Canada region. Reducing order processing time by streamlining the warehouse supply chain can improve overall order turnaround time. Subcategory Copiers and Tables have a very high shipping cost of \$63, and \$81 which could be hurting the sales in this region. To expand in this market, the company can offer discounted shipping to customers in subcategories like Tables and Copiers. Also, the marketing team can run seasonal sales through media ads to capture the attention of internet users. There is a sharp jump in the average sales of the "Furniture" & "Technology" category in the last quarter of the year 2014 whereas there is a dip in Office Supplies sales. To accelerate the Office Supplies' average sales, the company can negotiate a deal with regional large scale office supply retailers to sell products in bulk.

## **CUSTOMER SEGMENT ANALYSIS**

There are three customer segments in our dataset - Consumer, Corporate & Home Office and from the "Profitability in Segments" we can see that Consumer is the most profitable segment for the company in every category and this customer segment is leading the profit share by buying ~52% of the total units which portrays a high positive correlation between units sold and profitability. The last quarter of every year is favourable for the company to generate higher revenue and intuitively from the forecast it is clear that the sales, in all segments, will follow the seasonality with an inelastic demand of the customers in the first quarter but there is a more dip in forecasted sales of Consumer segment in Q1 2015 as compared to Q4 2013 to Q1 2014, to investigate this steep decline the management can analyze factors like 'Minimizing Marketing Budget'. Based on seasonality the company's strategy of allocating a low budget on marketing deals could be the reason for this dip. To uplift the sales, the management can use a promotional strategy like 'Clearance Sales' for attracting new customers and running customized deals would be cherry on the cake to re-engage old customers. The company is offering the same average discount in all segments which reveals that discounts can't be the only factor to enhance the revenue and traffic. Offering more targeted and personalized discounts in the Home office category can uplift sales. Also setting up exclusive deals for corporate customers can not only derive sales but also will be a regular stream of profit.



## **MARKET BASKET ANALYSIS**

The order history dataset shows that customers have bought multiple products in a single order. This insight would be very useful for the management to understand the association between products that customers prefer to buy so that they can help new customers by suggesting relevant types of products together through recommendation algorithms. Which product is selling more and what would be the other product that customers would likely to buy along with it, helps the management to maintain their inventory accordingly. "Market basket analysis is based on the idea that a customer who buys product A is likely to buy product B, too" (Anna Kayfitz, 2019) [1]. In this analysis, we are only focusing on a pair of products bought together by our customers, but we can further extend this analysis to multi-products. Insights like 'the highest profit margin on Tables-Papers but low order counts and high correlation between products like Binders-Storage' can be extremely helpful for the management to tune its recommendation algorithms for better decision making. Additional insights like 'Tables & Machines subcategories are the least sold combination with a margin of 18%' can help us to understand the purchasing behavior of our customers across regions, to increase the order count management can offer additional discounts to the customer if they have the combination of these two products in their cart. The useful insight of low-profit margin on Machines-Chairs and Tables-Storage can help the management in managing their inventory. Having a 100% visibility of inventory can minimize the markdowns to a great extent. A company can use this same strategy in each region to understand its customers better through their buying habits, likes-dislikes, and other factors. Management can make better decisions by targeting the right people with the right products through this analysis by running referral programs or festive season sales based on their cultures and buying patterns.

## **TECHNICAL APPENDIX**

[1] Kayfitz, A. (2019). *Use Market Basket Analysis to Boost Cross-sales, Average Order Values | Practical Ecommerce*. [online] Practical Ecommerce. Available at: <https://www.practicalecommerce.com/use-market-basket-analysis-to-boost-cross-sales-average-order-values> [Accessed 1 Mar. 2020].