Business Optimization and Profitability Analysis – Northwind Company

Using Data to Increase Profits and Improve Operational Effectiveness

Company Background and Project's Main Question

About the Company

A global wholesale distributor of food and beverages.

The Main Question

"How can Northwind increase its profits through data-driven decisions?"

Cost and Purchase Data

Gross profit was calculated by defining UnitPrice in the Products table as the purchase cost, and UnitPrice in the Order Details table as the selling price.

Company Metrics

Revenue surge from $200K in 1996 to $650K in 1997, with the leading market being the USA ($1.2M) and the highest-earning product being Cote de Blaye.

Product Profitability Analysis and Inventory Management

The main question: How can Northwind increase its profits by optimizing its various products and improving inventory operational efficiency?

Sub-questions guiding the analysis:

Sub-question 1:

Which products and categories yield the highest profit margins (Margin) and not just the highest revenues?

*Profit margin (Margin) is a key financial metric that shows what portion of revenue remains for the business as profit after deducting certain costs. It is a relative measure (in percentages), not a monetary sum, and therefore allows for comparison of profitability between products.

Sub-question 2:

Which products have been discontinued but still occupy inventory space?

Findings and Analysis

From the analysis of SQL queries we performed on the company's database, the following findings emerged:

Revenue vs. Profitability

The product "Cote de Blaye" leads the revenue chart with a sum of approximately $149,984.2.

It is important to note that for this calculation, we used the critical definition from the project guidelines: the Unit Price column in the products table represents the purchase cost to the supplier, while the UnitPrice in the order details table represents the selling price to the customer.

The Beverages category is the strongest category with total sales of approximately $500,000.

Identification of Unrealized Capital and Inventory

We identified several discontinued products that still hold physical inventory. Such as Mishi Kobe Niku from the meat category, with 29 units in stock whose monetary value stands at $1,406. Another example is Rössle Sauerkraut with inventory worth $592.80.

In total, there are discontinued products that are not generating active cash flow, valued at $2,225, and occupying warehouse space with 101 units of products. It should be noted that such food products have a certain expiration date and ultimately lead to a direct loss, despite the company having already paid suppliers for them.

Conclusions and Business Recommendations - Action Plan

Inventory Realization

A clearance sale should be conducted for products in the Discontinued category. The goal is to quickly convert inventory into liquid capital to prevent total loss of investment in these products.

Reinvestment

We recommend reinvesting the capital freed up from inventory clearance into purchasing additional inventory and marketing promotion for products with proven profitability such as Côte de Blaye and products from the Beverages category.

Process Implementation

It is recommended to ensure that discontinued products do not remain in stock for extended periods, thereby maintaining higher liquidity of company capital and maximizing profits.

Segmentation of Leading Customers and Purchase Behavior Analysis

The Main Question

How can profitability be maximized by identifying leading customers and analyzing the relationship between order frequency and gross profit?

Sub-Questions

- Who are the top 5 customers by total revenue and gross profit?
- Is there a statistical correlation between the number of orders placed by a customer and the profit generated for the company?
- What is the geographical distribution of leading customers and where is Northwind's global economic power center concentrated?

Work Plan

Tables in use: Customers, Orders, Order Details, and Products.

Tools: Python (Pandas) for data processing and correlation calculation, (Seaborn, Matplotlib) for visualization, and Plotly for generating a world map by gross profit per country.

Calculation Logic: Merging tables to cross-reference selling price against purchase cost (found in the Products table), calculating Gross Profit at the row level, and aggregation by customer.

Findings and Conclusions - Leading Customers

0.89
Strong Correlation

between order frequency and gross profit

$115K
USA

Leading Market

$110K
Germany

Second Market

Key Findings

Three customers: QUICK-Stop (Germany), Save-a-lot Markets (USA), and Ernst Handel (Austria), are the main drivers of the company, with each generating a gross profit of over $53,000, an amount more than double that of the other customers on the list.

This means that every additional order from an existing customer contributes to the bottom line, indicating operational efficiency in repeat sales. Geographically, according to the map: the world map clearly shows that the main economic power is in the United States and the Germany region. The South American market (Brazil) shows significant potential but lower profitability.

Courses of Action and Recommendations

Establish a VIP customer club: Given the large share of leading customers, dedicated account managers (from the Employees table) should be assigned to them to ensure they receive personal attention and prevent churn.

Frequency incentive program: Since we have proven a high correlation with order quantity, we recommend offering benefits such as "free shipping" or tiered discounts from the 10th order per year, to encourage customers to become regulars.

Penetrate potential markets: The map highlights Brazil ($ 50,000) and France ($ 36,000) as growing markets. It is recommended to allocate targeted marketing budgets to these areas to increase order volume in these areas.

Analyzing Human Growth Engines and Characterizing Employee Sales Excellence

The Main Question

How can sales excellence be characterized, and opportunities for strengthening employees in weak areas be identified to maximize company profitability?

Guiding Sub-Questions

- Who are the top 5 employees in terms of Gross Profit (Total Profit) generated for the company?
- Is there a correlation between excellent sales employees and the use of more discounts to close a deal? (Identifying employees who maintain high profit margins).
- What is the level of employee expertise or marketability in different product categories, and where do knowledge gaps exist?

Work Plan and Analysis

Tables Used: Employees, Orders, Order Details, and Categories.

Visualization Tools: Tableau.

Method of Execution:

- Creating a Bar Chart to rank employees by Gross Profit.
- Building a Scatter Plot to examine the relationship between Avg. Discount and Sum of Profit.
- Generating a Heatmap that cross-references EmployeeID and CategoryName by sales/profit volume.
- Building an interactive dashboard.

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Findings and Conclusions – Employee Performance

Outstanding Employee

Employee 4 (Margaret Peacock) is the top performer, with a total gross profit of approximately $232,000, significantly above the rest of the team.

Smart Discount Strategy

The Scatter Plot shows that the leading employees (4, 3, 1) manage to generate high profits while maintaining a low average discount. In contrast, employee #7 gives very high discounts but generates significantly lower profit, which directly harms the company's profitability.

Professional Gaps

Employee 4 is particularly strong in Beverages and Dairy Products. There are areas for improvement, for example, employee 9 is almost not mentioned in the Produce category.

Courses of Action and Recommendations

Profit-based Bonuses: Margaret Peacock and Janet Leverling are the main growth engines - they should be given profit-based bonuses (and not just volume) to retain them and their performance that contributes to the company's profit.

Onboarding and Training: It is recommended that employee 4 (high profit, low discount) provide training to employees like employee 7, to teach them how to close deals without reducing profit margins with high discounts.

Employee Training in Weak Categories: Employee 4 can train employee 9 in selling beverages and dairy products. The Heatmap serves as a quick tool to identify category gaps - green colors show strength and red indicate an opportunity for improvement.

Conclusion &

Bottom Line: Northwind's success depends on three pillars: clearing "dead" inventory, retaining leading customers based on frequency, analyzing advanced potential markets to not miss profit opportunities, and transitioning the sales team to a profit maximization model over volume.

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