Northwind Analytics: Transforming Raw Data into Actionable Business Intelligence

Mr. Hemant

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1 Project Overview

Northwind Analytics provides a comprehensive analysis of the Northwind company's sales and operations data to uncover meaningful business insights. Using data from 11 interconnected areas — including customers, products, orders, suppliers, and employees — this project translates complex information into clear, actionable findings that support smarter decision-making.

The analysis focuses on identifying top-performing products, high-value customers, and key revenue regions, while also revealing opportunities to improve inventory efficiency, employee performance, and overall profitability.

By turning raw data into an easy-to-understand story about business performance, this project enables managers and stakeholders to make informed, evidence-based decisions that strengthen customer relationships, optimize operations, and drive sustainable growth.

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2 Dataset Description

The Northwind dataset is a widely used sample database representing a global trading company specializing in specialty food products. It provides a comprehensive view of business operations through 11 interconnected tables that capture key aspects of the company's activities.

The dataset includes:

- **Customers :** Client information, including company names, contact details, and locations.

- **Orders :** Sales transactions with order dates, shipped dates, shipping methods, and order details.

- **Products & Categories:** Details about products, their classifications, and pricing.

- **Suppliers :** Information about suppliers and their locations.

- **Employees :** Sales representatives, their territories, and reporting structure.

- **Shippers :** Companies responsible for delivering orders and their shipping details.

By encompassing customers, sales, products, suppliers, employees, and shippers, the Northwind dataset enables in-depth analysis of sales performance, customer behavior, inventory management, employee productivity, shipping efficiency, and overall business operations.

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3 Project Objectives

The primary objective of the Northwind SQL Analytics project is to transform business data into meaningful insights that help Northwind's management make informed, data-driven decisions. The project aims to:

- Identify key revenue drivers by analyzing top-performing products, customers, and regions.

- Improve operational efficiency through insights on order patterns, supplier performance, and inventory management.

- Evaluate employee sales performance to recognize high achievers and identify areas for growth.

- Understand customer purchasing behavior to support targeted marketing and retention strategies.

- Provide a data-backed foundation for optimizing profitability, resource allocation, and strategic planning.

By achieving these objectives, the project empowers stakeholders with a clear understanding of how business performance can be enhanced through the intelligent use of data.

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4 Key Business Questions

- **Sales & Revenue Insights :**

  1. Which products and categories drive the most revenue, and how can this information guide sales and inventory strategies?

  2. Who are the top customers, and what portion of total sales do they represent?

  3. Which regions or markets contribute most to revenue, and where are the opportunities for growth?

- **Product & Inventory Performence :**

  4. Which products are frequently ordered together, and how can this support cross-selling or bundling strategies?

  5. Which products are underperforming, and how can inventory and supply chain decisions be optimized?

6. What is the average order size across product categories, and which categories dominate bulk orders?

- **Customer & Order Behaviour :**

  7. What is the average time gap between successive orders from the same customer?

  8. Which customers have the longest relationships with the company, and what is their lifetime value?

  9. Which shipping method is most cost-effective based on average order value and delivery frequency?

- **Employee & Sales Performence :**

  10. Which sales representatives generate the highest revenue, and how does their performance vary across different regions?

  11. Which employees are responsible for managing the most valuable customers according to order value?

- **Operational Efficiency :**

  12. What is the average order fulfillment time, and which shipping providers perform best?

  13. Do customer orders exhibit seasonal fluctuations, such as increased activity in certain quarters?

  14. Which product categories show the highest return on investment when comparing cost vs. sales revenue?

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5 Exploratory Data Analysis (EDA)

5.1 Sales & Revenue Insights

Q1: Which products and categories drive the most revenue, and how can this information guide sales and inventory strategies?

Revenue by Products:

Product Name	Category	Total Revenue ($)	% of Total Revenue
Côte de Blaye	Beverages	141,396.74	11.17
Thüringer Rostbratwurst	Meat/Poultry	80,368.67	6.35
Raclette Courdavault	Dairy Products	71,155.70	5.62
Tarte au sucre	Confections	47,234.97	3.73
Camembert Pierrot	Dairy Products	46,825.48	3.70
Gnocchi di nonna Alice	Grains/Cereals	42,593.06	3.36
Manjimup Dried Apples	Produce	41,819.65	3.30
Alice Mutton	Meat/Poultry	32,698.38	2.58
Carnarvon Tigers	Seafood	29,171.88	2.30
Rössle Sauerkraut	Produce	25,696.64	2.03

Insights :

- Côte de Blaye (Beverages) leads with $141K revenue, contributing over 11% of total sales.

- Meat/Poultry and Dairy Products appear multiple times suggesting there is strong demand for these in the market.

- Top 10 products seems to be the significant portion of revenue highlighting product concentration risk.

- The diversity across categories (Beverages, Dairy, Produce, Confections, Seafood) suggests opportunities for cross-category promotion and product bundling strategies.

Q2: Who are the top customers, and what portion of total sales do they represent?

Customer	Total Spending ($)	Spending Share (%)
QUICK-Stop	110,277.31	12.93
Ernst Handel	104,874.98	12.30
Save-a-lot Markets	104,361.95	12.24
Rattlesnake Canyon Grocery	51,097.80	5.99
Hungry Owl All-Night Grocers	49,979.91	5.86
Hanari Carnes	32,841.37	3.85
Königlich Essen	30,908.38	3.62
Folk och fä HB	29,567.56	3.47
Mère Paillarde	28,872.19	3.39
White Clover Markets	27,363.61	3.21

Insights :

- QUICK-Stop, Ernst Handel, and Save-a-lot Markets — together account for over 37% of total company revenue.

- Mid-tier customers like Rattlesnake Canyon Grocery and Hungry Owl All-Night Grocers also contribute significantly, suggesting a stable secondary customer base.

- Spending distribution indicates loyal, high-value customers that drive consistent business performance.

Q3: Which regions or markets contribute most to revenue, and where are the opportunities for growth?

Country	Revenue ($)	Revenue Share (%)
USA	245,584.61	19.40
Germany	230,284.63	18.19
Austria	128,003.84	10.11
Brazil	106,925.78	8.45
France	81,358.32	6.43
UK	58,971.31	4.66
Venezuela	56,810.63	4.49
Sweden	54,495.14	4.31
Canada	50,196.29	3.97
Ireland	49,979.91	3.95
Belgium	33,824.86	2.67
Denmark	32,661.02	2.58
Switzerland	31,692.66	2.50
Mexico	23,582.08	1.86
Finland	18,810.05	1.49
Spain	17,983.20	1.42
Italy	15,770.16	1.25
Portugal	11,472.36	0.91
Argentina	8,119.10	0.64
Norway	5,735.15	0.45
Poland	3,531.95	0.28

Insights :

- USA (19.4%), Germany (18.2%), and Austria (10.1%) together contribute nearly 48% of total revenue.

- Countries like Brazil (8.5%), France (6.4%), and UK (4.7%) provide moderate but consistent revenue, suggesting these markets are stable contributors.

- Current revenue distribution indicates over-reliance on top 3 markets, highlighting a need to diversify revenue streams across smaller or emerging markets to mitigate risk.

5.2 Product & Inventory Performence

Q4: Which products are frequently ordered together, and how can this support cross-selling or bundling strategies?

Product 1	Product 2	Times Ordered Together
Sir Rodney's Scones	Sirop d'érable	8
Gorgonzola Telino	Pavlova	7
Pavlova	Tarte au sucre	6
Nord-Ost Matjeshering	Tourtière	6
Gorgonzola Telino	Mozzarella di Giovanni	6
Camembert Pierrot	Flotemysost	6
Camembert Pierrot	Pavlova	6
Pâté chinois	Tarte au sucre	5
Gorgonzola Telino	Manjimup Dried Apples	5
Chang	Gorgonzola Telino	5

Insights :

- Sir Rodney's Scones & Sirop d'érable (8 times), Gorgonzola Telino & Pavlova (7 times), and Pavlova & Tarte au sucre (6 times) are the top product pairs frequently ordered together.

- Indicates strong complementary demand, where purchasing one product increases the likelihood of buying the other.

- Products like Gorgonzola Telino appear in multiple top pairs, highlighting them as key drivers of combined sales.

- Customers tend to order desserts and complementary ingredients together, showing a preference for themed or complete meal solutions.

Q5: Which products are underperforming, and how can inventory and supply chain decisions be optimized?

Product Name	Units in Stock	Total Revenue ($)
Rhönbräu Klosterbier	125	8,177.49
Boston Crab Meat	123	17,910.63
Grandma's Boysenberry Spread	120	7,137.00
Pâté chinois	115	17,426.40
Sirop d'érable	113	14,352.60
Geitost	112	1,648.13
Inlagd Sill	112	13,458.46
Sasquatch Ale	111	6,350.40
Gustaf's Knäckebröd	104	7,122.36
Röd Kaviar	101	3,997.20

Insights :

- Boston Crab Meat ($17,910.63), Pâté chinois ($17,426.40), Sirop d'érable ($14,352.60), and Inlagd Sill ($13,458.46) generate the most revenue, indicating strong sales performance.

- Geitost ($1,648.13) and Röd Kaviar ($3,997.20) have relatively low revenue despite decent stock, suggesting slow-moving inventory.

- Products like Boston Crab Meat and Pâté chinois are high-revenue items; ensure sufficient inventory to meet demand.

- Conversely, low-revenue items could be promoted or discounted to free up storage space.

- Items with high revenue per unit in stock (like Pâté chinois, Sirop d'érable) could be prioritized for marketing campaigns and bundle promotions.

Q6: What is the average order size across product categories, and which categories dominate bulk orders?

Product Category	Average Order Size	Number of Orders
Beverages	26.93	354
Dairy Products	30.19	303
Confections	26.80	295
Seafood	26.40	291
Condiments	27.45	193
Grains/Cereals	25.07	182
Meat/Poultry	26.08	161
Produce	23.18	129

Insights :

- Dairy Products (30.19) and Condiments (27.45) have the largest average order sizes, suggesting bulk orders are more common in these categories.

- Beverages (354 orders), Dairy Products (303), and Confections (295) dominate in order frequency, indicating high customer demand across these categories.

- Produce (23.18) and Grains/Cereals (25.07) have the smallest average order sizes, reflecting either smaller packaging or individual item purchases.

- Focus inventory planning on high-volume categories to avoid stockouts.

- Consider promotional bundles for bulk-order categories like Dairy Products and Condiments to maximize revenue per order.

5.3 Customer & Order Behaviour

Q7: What is the average time gap between successive orders from the same customer?

Customer Name	Average Order Days Frequency
GROSELLA-Restaurante	253.00
Bólido Comidas preparadas	176.67
The Big Cheese	139.50
Ana Trujillo Emparedados y helados	133.00
Du monde entier	128.50
North/South	123.33
Romero y tomillo	120.60
Comércio Mineiro	120.60
Consolidated Holdings	117.67
Morgenstern Gesundkost	116.00

Insights :

- GROSELLA-Restaurante (253 days) and Bólido Comidas preparadas (176.67 days) have the longest intervals between orders, indicating infrequent purchasing patterns.

- Customers like The Big Cheese (139.5 days) and Ana Trujillo Emparedados y helados (133 days) place orders occasionally, suggesting stable but less frequent demand.

- Morgenstern Gesundkost (116 days) and Consolidated Holdings (117.67 days) are among the most frequent buyers, highlighting loyalty and regular demand.

- Target infrequent customers with promotions or reminders to increase order frequency.

- Reward frequent customers to maintain loyalty and encourage consistent purchase behavior.

Q8: Which customers have the longest relationships with the company, and what is their lifetime value?

Customer	Relationship Period (Days)	Lifetime Value ($)
Richter Supermarkt	663	19,343.78
Hanari Carnes	658	32,841.37
Ernst Handel	657	104,874.98
Rattlesnake Canyon Grocery	653	51,097.80
Suprêmes délices	651	24,088.78
HILARION-Abastos	651	22,768.76
Chop-suey Chinese	650	12,348.88
Folk och fä HB	642	29,567.56
White Clover Markets	639	27,363.61
Ottilies Käseladen	634	12,496.20

Insights :

- Richter Supermarkt (663 days), Hanari Carnes (658 days), and Ernst Handel (657 days) have the longest-standing relationships with the company, indicating high customer loyalty.

- Ernst Handel ($104,874.98) is the top contributor to revenue, despite having a similar relationship period as other customers.

- Rattlesnake Canyon Grocery ($51,097.80) and Hanari Carnes ($32,841.37) are also high-value long-term customers.

- Customers like Suprêmes délices, HILARION-Abastos, Folk och fä HB, and White Clover Markets have moderate lifetime value but long relationships, highlighting opportunities to upsell or increase engagement.

Q9: Which shipping method is most cost-effective based on average order value and delivery frequency?

Shipping Method	Average Order Value ($)	Delivery Frequency	Cost per Order ($)
United Package	8.92	86.64	5.02
Speedy Express	8.43	65.00	5.63
Federal Shipping	7.30	80.44	5.90

Insights :

- United Package has the highest delivery frequency (86.64) with a moderate average order value ($8.92) and the lowest cost per order ($5.02), making it the most cost-effective option.

- Speedy Express has a slightly lower average order value ($8.43) and lower delivery frequency (65) with higher cost per order ($5.63), making it less efficient than United Package.

- Federal Shipping delivers more frequently than Speedy Express (80.44) but has the highest cost per order ($5.90) and lowest average order value ($7.30), making it the least cost-effective.

5.4 Employee & Sales Performance

Q10: Which sales representatives generate the highest revenue, and how does their performance vary across different regions?

Employee Name	Region	Net Revenue ($)	Revenue Share (%)
Robert King	Western	1,245,682.35	30.75
Janet Leverling	Southern	811,251.37	20.03
Margaret Peacock	Eastern	698,672.54	17.25
Anne Dodsworth	Northern	541,156.47	13.36
Nancy Davolio	Eastern	384,215.21	9.49
Michael Suyama	Western	369,565.65	9.12

Insights :

- Robert King (Western, 30.75%) is the highest revenue generator, followed by Janet Leverling (Southern, 20.03%) and Margaret Peacock (Eastern, 17.25%).

- These three employees together contribute nearly 68% of total sales, highlighting their critical impact on revenue.

- The Western region leads in revenue, largely due to Robert King's performance, while Northern and Eastern regions have lower individual contributions despite multiple employees.

- High dependency on top performers, especially Robert King, suggests a potential risk if performance drops or turnover occurs.

Q11: Which employees are responsible for managing the most valuable customers according to order value?

5.5 Hypothesis Testing

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6 Key Insights

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7 Recommendations

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8 Conclusion