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**NORTHWIND SQL ANALYTICS PROJECT**

**Problem Statement**

In any retail or distribution business, data holds the key to strategic decisions — from identifying top customers and understanding product performance to tracking employee efficiency and operational bottlenecks.

The **Northwind database** provides a realistic business dataset that simulates customer orders, product sales, shipping timelines, and employee activities.

However, raw data alone doesn’t provide value without analysis.

This project addresses key analytical challenges faced by such a business, including:

* Who are the most valuable customers?
* Which products contribute most to revenue, and which are underperforming?
* How efficient are our suppliers and shipping partners?
* Which employees contribute most to order fulfillment?
* How can we group customers and products to inform strategy?
* How does revenue accumulate over time within each year?

**Project Objectives**

* Analyze sales performance and revenue distribution
* Identify high- and low-performing products and customers
* Evaluate employee productivity and supplier contribution
* Detect inefficiencies in operations (e.g., shipping times, unsold products)
* **Analyze cumulative sales trends year-over-year using time-based window functions**
* Use SQL analytics (e.g., CTEs, window functions, views) to build dynamic reports
* Support strategic decision-making through data segmentation and trend analysis

**❓ Business Questions Answered**

1. **Top 5 Customers by Revenue**  
   → Who are the highest revenue-generating customers?
2. **Monthly Sales Trend for 1997**  
   → How did sales evolve month-by-month in 1997?
3. **Top 5 Suppliers by Product Quantity Supplied**  
   → Which suppliers provided the most product volume?
4. **Average Order Value by Country**  
   → Which countries yield the highest value per order?
5. **Employees with the Highest Number of Orders Handled**  
   → Which employees managed the most customer orders?
6. **Products Never Ordered**  
   → Are there products that were never sold?
7. **Customers with No Orders in 1997**  
   → Who remained inactive during 1997?
8. **Average Shipping Time per Shipper**  
   → How long does each shipper take to deliver orders?
9. **Revenue by Product Category**  
   → Which product categories generate the most revenue?
10. **Top-Selling Employees by Year**  
    → Which employees generated the most sales annually?
11. **Returning Customers – Time Between Orders**  
    → How often do customers place repeat orders?
12. **Product Sales Trends (Month-over-Month)**  
    → How does monthly sales volume vary by product?
13. **Products Sold Only Once Per Order**  
    → Which products are always purchased in a quantity of one?
14. **Product Revenue Percentile Rankings**  
    → How do products rank in terms of revenue performance?
15. **Employees' First Order Handled**  
    → When did each employee handle their first customer order?
16. **Customer Revenue Quartiles**  
    → How can customers be grouped based on revenue?
17. **Product Quantity Percentile Ranking**  
    → Which products sell the most or least by volume?
18. **Yearly Cumulative Sales Growth**  
    → How does revenue accumulate across the months within each year?

**Recommendations**

* **Focus marketing efforts on top revenue-generating customers** through loyalty and retention campaigns.
* **Investigate underperforming products** — those never ordered or sold in low quantities for potential removal or rebranding.
* **Recognize top-performing employees and suppliers**, and study their methods for company-wide improvement.
* **Improve operational efficiency** by evaluating and optimizing shipping timelines.
* **Leverage product and customer segmentation** (e.g., quartiles, percentiles) to target pricing strategies, promotions, and inventory planning.
* **Capitalize on repeat purchase patterns** by targeting customers with timely promotions or recommendations.
* **Monitor cumulative sales progression per year to identify seasonality patterns.**

**Conclusion / Insights**

This project demonstrated how SQL can unlock powerful insights from structured business data. From identifying top-performing products and customers to tracking employee impact and operational delays, every query contributed to a clearer picture of the business.

Key takeaways include:

* A small group of customers and products drive a majority of revenue — highlighting the importance of **focused retention and inventory planning**.
* **Window functions like the lag offset function** allowed deeper, more flexible analysis of behavior over time (e.g., product trends, customer return frequency).
* The business can **make smarter, data-driven decisions** by segmenting customers and products and acting on inefficiencies.

**Tools & Technologies Used**

* **PostgreSQL** – for querying and analyzing data using SQL
* **SQL Window Functions** – for calculating cumulative metrics, rankings, and trends
* **Common Table Expressions (CTEs)** – for readable, modular queries
* **Views** – for reusable data summaries
* **Northwind Traders Dataset** – as the simulated business database