E-Commerce Customer Retention & Behaviour Analysis

Project Overview

This project analyzes customer ordering and reordering behavior for an e-commerce grocery platform using SQL, Excel, and Power BI. The objective is to understand retention-driven growth, identify high-performing categories and products, and analyze customer behavior patterns to support data-driven business decisions.

Business Objectives

• Analyze first-time vs repeat customer behavior

• Identify departments and products with high reorder rates

• Understand ordering patterns by time of day

• Evaluate average basket size to measure purchase depth

• Generate actionable insights for retention and engagement

Tools & Technologies

• Excel – Data cleaning, VLOOKUP, pivot tables

• PostgreSQL – Joins, CTEs, aggregations

• Power BI – DAX, data modeling, dashboards

• GitHub – Project documentation

Dataset

Instacart Market Basket Analysis dataset with multiple related tables:

• Orders

• Order-Product details

• Products

• Departments

Key Analysis & Insights

Executive Overview:

• Repeat orders (~3.21M) are over 15× higher than first-time orders (~0.21M), showing retention as the primary growth driver.

• Average basket size is ~10 items per order, indicating strong multi-item purchasing behavior.

Retention Analysis:

• Dairy Eggs has the highest reorder rate, indicating habitual purchasing behavior.

• Raw Veggie Product is the #1 reordered product, making it a key retention-driving SKU.

• Reorders are concentrated around a small set of essential products.
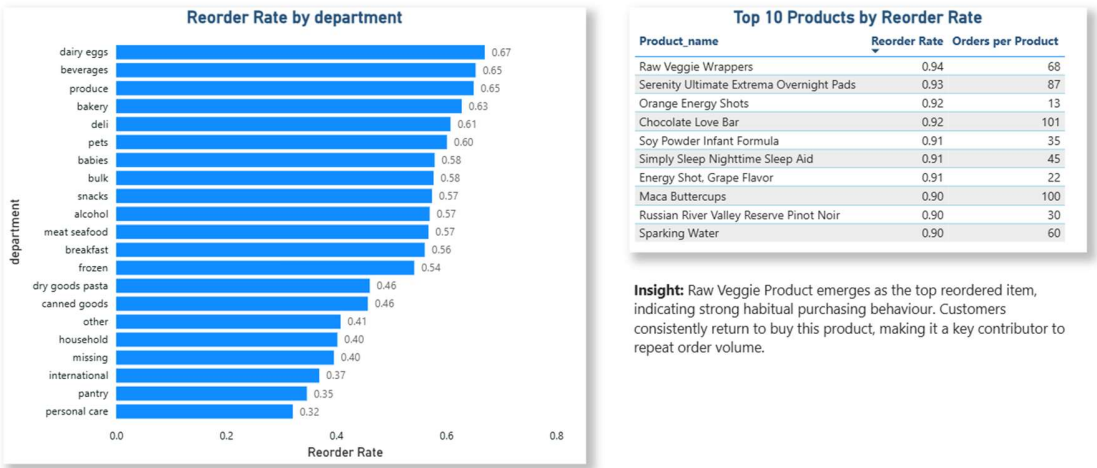
Customer Behavior Analysis:

• Order volume peaks around the 10th hour of the day, highlighting late morning as the most active ordering window.

• Repeat customers contribute consistently across peak hours.

Dashboard Structure

1. Executive Overview : KPIs and retention split

Total Orders	Repeat Orders	Average Basket Size	Repeat Order %
3M	3M	10.09	0.94

Orders: First vs Repeat

● First-time orders ● Returning orders

0.21M

3.21M

0.0M | 0.5M | 1.0M | 1.5M | 2.0M | 2.5M | 3.0M

First-time orders and Returning orders

Insight: Repeat customers placed approximately **3.21 million orders**, compared to only **0.21 million first-time orders**, meaning repeat orders are over **15 times higher**. This indicates that the platform is overwhelmingly driven by returning customers, making retention the primary growth lever.

2. Retention Analysis - Department and product-level reorders

Reorder Rate by department

department	Reorder Rate
dairy eggs	0.67
beverages	0.65
produce	0.65
bakery	0.63
deli	0.61
pets	0.60
babies	0.58
bulk	0.58
snacks	0.57
alcohol	0.57
meat seafood	0.57
breakfast	0.56
frozen	0.54
dry goods pasta	0.46
canned goods	0.46
other	0.41
household	0.40
missing	0.40
international	0.37
pantry	0.35
personal care	0.32

Top 10 Products by Reorder Rate

Product_name	Reorder Rate	Orders per Product
Raw Veggie Wrappers	0.94	68
Serenity Ultimate Extrema Overnight Pads	0.93	87
Orange Energy Shots	0.92	13
Chocolate Love Bar	0.92	101
Soy Powder Infant Formula	0.91	35
Simply Sleep Nighttime Sleep Aid	0.91	45
Energy Shot, Grape Flavor	0.91	22
Maca Buttercups	0.90	100
Russian River Valley Reserve Pinot Noir	0.90	30
Sparking Water	0.90	60

Insight: Raw Veggie Product emerges as the top reordered item, indicating strong habitual purchasing behaviour. Customers consistently return to buy this product, making it a key contributor to repeat order volume.

Insight: Dairy Eggs has the highest reorder rate, indicating strong habitual purchasing behavior and making it a key category for retention-focused initiatives.

3. Customer Behavior - Time-based ordering patterns

Insight: Orders peak around the 10th hour of the day, with repeat customers contributing significantly during this window, highlighting a predictable late-morning ordering pattern.

Key Business Takeaways

• Retention drives the majority of platform growth

• Essential categories contribute disproportionately to repeat purchases

• A small number of products drive most reorders

• Late-morning hours are optimal for engagement strategies