Optimizing Inventory Management

An Exploratory Data Analysis (EDA) Approach

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Introduction

- This project aims to analyze historical inventory data to uncover key trends in order volume, shipping efficiency, and customer segmentation.

- Objectives
  - To identify patterns that can help improve supply chain operations, optimize shipping costs, and enhance customer targeting strategies.
  - To provide actionable insights into quarterly sales performance, regional demand variations, and logistics challenges, ultimately supporting data-driven decision-making for business growth.

Key Metrics Overview (Quarterly Trends)

Inventory Analysis

(All) ▼

2010 Q3   2010 Q4

ORDER #	ORDER VALUE	AVG ORDER PER DAY
366	$1.0M	4 ORDERS

AVG SHIPPING TIME	AVG SHIPPING COST	UNIT SOLD
3 Days	$14.0	14K

Key Metrics Overview (Quarterly Trends)

1. **Number of Orders & Order Value**

   - The number of orders fluctuates across quarters, with **peaks in Q3 2009 and Q3 2010**, where orders exceeded 360+ per quarter.
   - The order value follows a similar trend, with **highs in Q1 2009 ($1.26M) and Q4 2009 ($1.02M)**. Some quarters, such as Q2 2010 and Q3 2012, show relatively high order values despite a lower order count—indicating bulk purchases of higher-value products.

Key Metrics Overview (Quarterly Trends)

2. Average Orders Per Day

- The number of orders per day is consistent at **around 0.65 orders/day**, but peaks in Q3 2012 and Q4 2012 indicate a rise in demand.
- This trend suggests potential seasonal variations, possibly linked to holiday seasons or promotional campaigns.

Key Metrics Overview (Quarterly Trends)

3. Average Shipping Time

- The shipping time alternates **between 1 and 2 days**, suggesting regional logistical challenges or differences in shipping methods.
- For certain quarters (e.g., Q2 2011 and Q3 2012), shipping times tend to rise, which might indicate supply chain issues during those periods.

Key Metrics Overview (Quarterly Trends)

4. **Average Shipping Cost**

   - The average shipping cost **varies significantly, from $53.76 (Q2 2011) to $91.34 (Q1 2009)**.
   - Higher costs in some quarters might be due to long-distance shipments, premium delivery methods, or regional pricing differences.
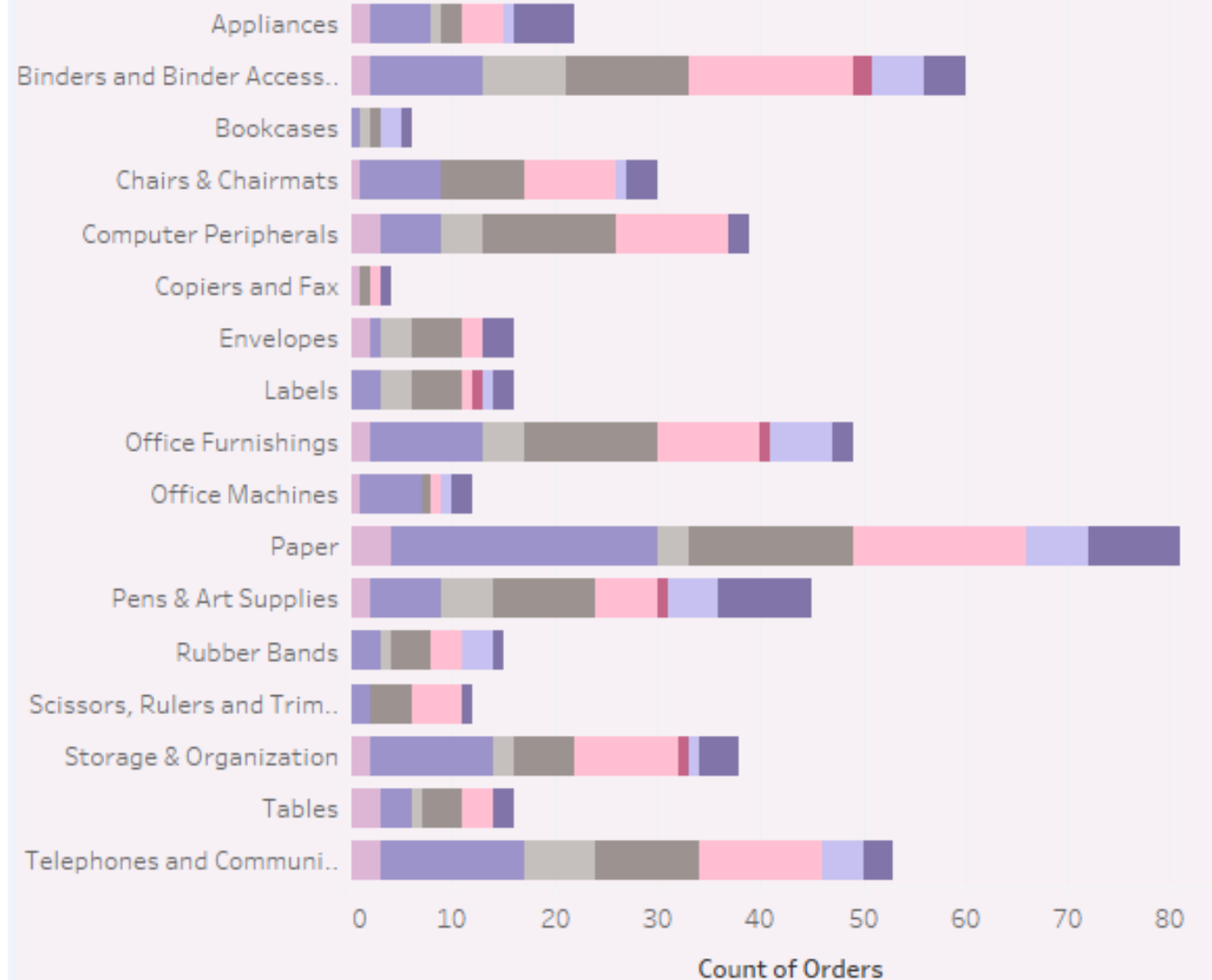
Key Metrics Overview (Quarterly Trends)

5. Total Units Sold

- The units sold follow a similar pattern to order volume but with **notable peaks in Q3 2012** (14.5K units) and Q1 2010 (14K units).
- This suggests that while some quarters had fewer orders, the average order size (quantity per order) was larger.

Orders by Product Sub-Category & Region

Orders by Product Sub-Category & Region

1. **Most ordered sub-categories:**

   - **Office Machines & Furniture (Chairs, Bookcases, Tables)** – Popular across most regions.
   - **Paper & Binders –** Frequently purchased in the Atlantic and Quebec regions.
   - **Storage & Organization –** Consistently ordered, particularly in Ontario and West.

Orders by Product Sub-Category & Region

2. **Regional Demand Insights:**

- **Ontario and Quebec:** Highest order volumes, contributing to the majority of sales.
- **West & Atlantic Regions:** Steady but slightly lower order counts compared to central provinces.
- **Yukon & Northwest Territories:** Lower order counts, likely due to smaller population and higher shipping costs.

Shipping Time by Product Sub-Category & Region

SHIPPING TIME BY PRODUCT SUB CATEGORY & REGION
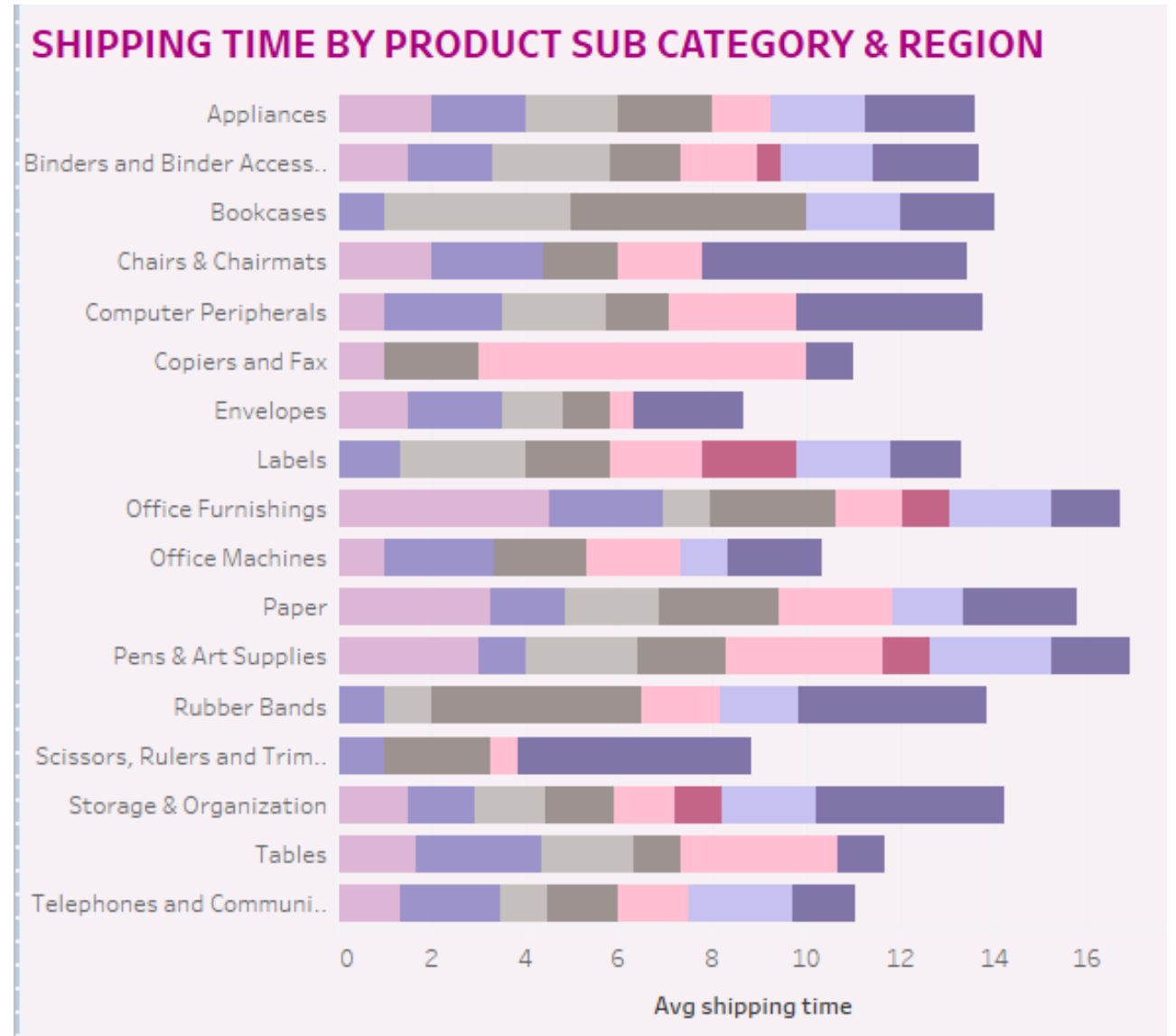
Shipping Time by Product Sub-Category & Region

1. **Longest shipping times:**

   - **Office Machines & Large Furniture Items** – These take longer to ship (up to 14 days in some regions), particularly in remote areas like Northwest Territories and Yukon.
   - **Storage & Organization Items** – Often shipped within 4-6 days, except for bulk orders.

Shipping Time by Product Sub-Category & Region

2. **Fastest shipping times:**

   - **Paper, Envelopes, and Small Office Supplies –** Usually delivered in 1-2 days, especially in Ontario and Quebec due to closer proximity to warehouses.
   - **Computer Peripherals & Accessories –** Typically shipped in 2-3 days across most regions.
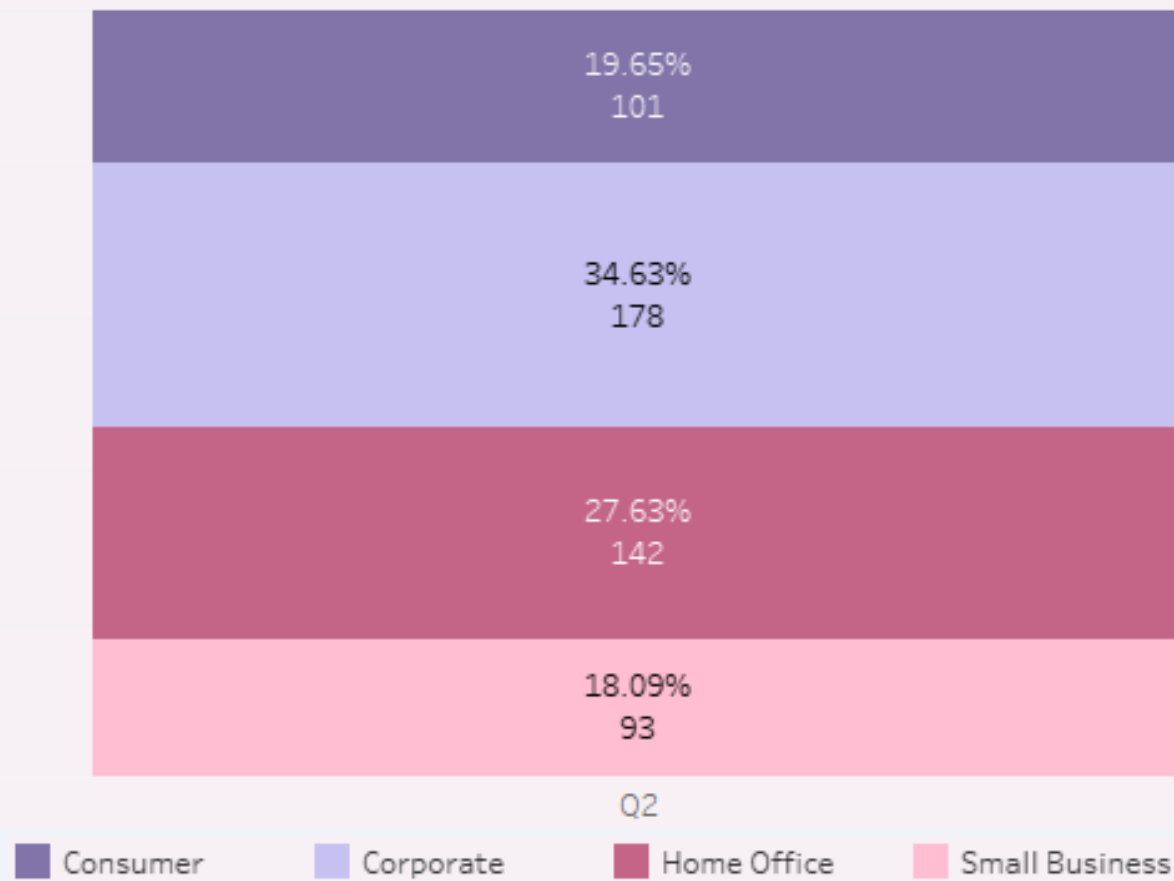
Shipping Time by Product Sub-Category & Region

3. **Regional Shipping Observations:**

   - **Ontario & Quebec:** Fastest shipping (1-3 days on average).
   - **West & Atlantic:** Mid-range shipping times (3-7 days).
   - **Northern Regions (Yukon & Northwest Territories):** Longest shipping times (up to 14 days in some cases).
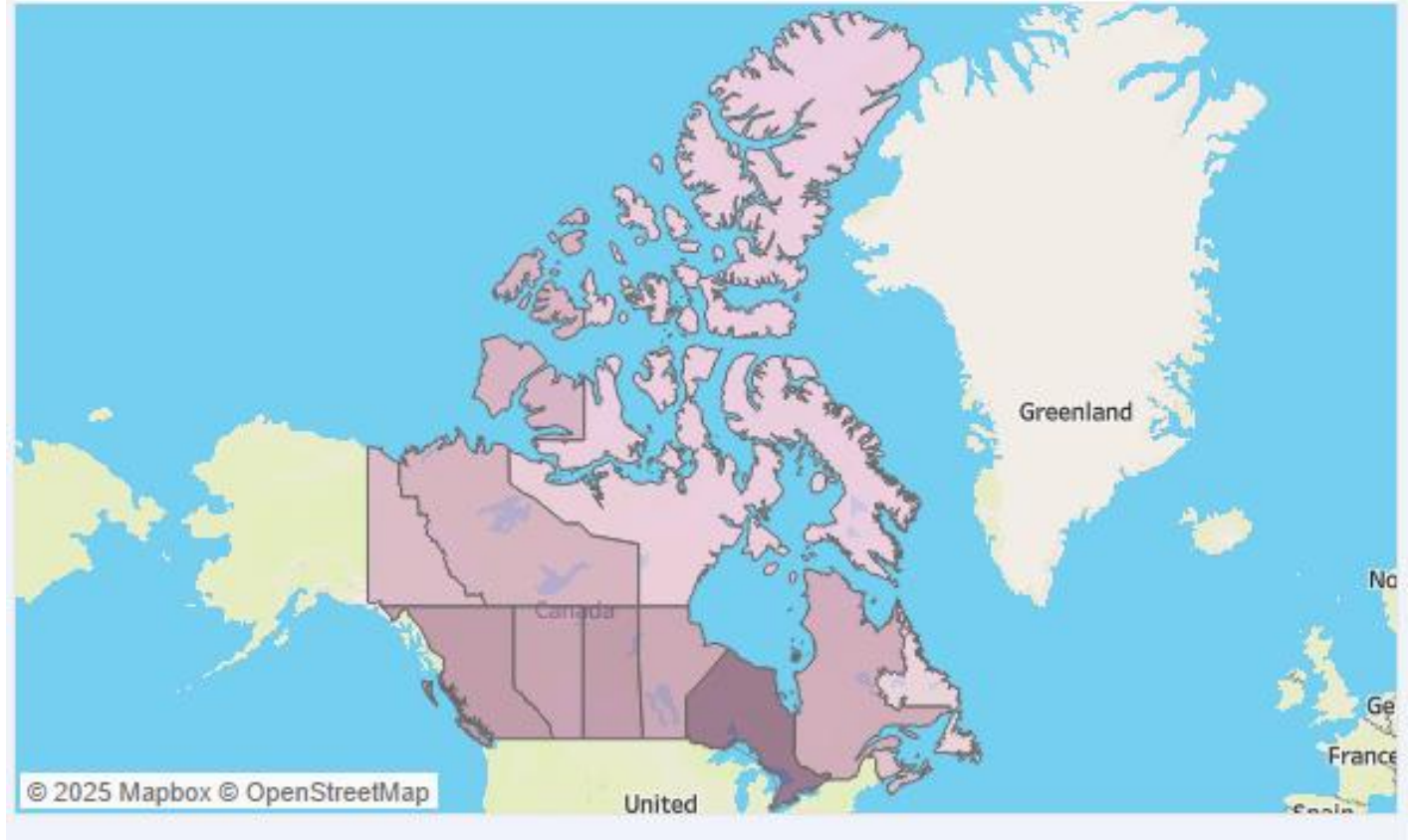
Quarterly Orders by Customer Segment

Orders by Region

Orders by Region

- **Ontario & Quebec dominate sales**, accounting for most orders and revenue.

- **Western regions (Prairie & Yukon) have lower order counts**, likely due to lower population density and shipping constraints.

- **Atlantic & Northwest Territories show the least activity**, potentially due to higher shipping costs and logistical challenges.

Strategic Recommendations

1. **Enhance Regional Logistics:** Address longer shipping times in remote regions by partnering with local distributors or establishing regional fulfillment centers.

2. **Reduce Shipping Costs:** Implement strategies like consolidated shipments or negotiating better carrier rates to lower shipping expenses in high-cost areas.

3. **Boost Small Business & Home Office Engagement:** Offer subscription plans or loyalty discounts to encourage frequent purchases from these customer segments.

Strategic Recommendations

4. **Target Seasonal Promotions**: Leverage historical demand peaks in Q3 and Q4 by running timely marketing campaigns and bulk purchase discounts.

5. **Expand Product Reach in Low-Performing Regions**: Implement localized advertising and promotional efforts in underperforming areas like Yukon and Northwest Territories to stimulate demand.

6. **Optimize Inventory Management**: Analyze demand forecasts to stock high-demand items in key regions, reducing delivery delays and optimizing warehouse operations.

Conclusion

- **Overall Performance:** The business has a strong order flow, with demand varying across quarters. Corporate and small business segments drive the majority of sales.

- **Logistics & Shipping:** Some regions experience longer delivery times, particularly for large items. Adjusting warehouse locations or optimizing shipping routes may improve efficiency.