



Inventory Report

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Executive Data Analysis Report

Executive Summary

- Revenue Growth:** Sales and profits exhibit strong seasonality, peaking in Q4 due to holiday demand. Total sales are driven primarily by the Technology and Furniture categories, with Phones and Chairs as top-performing sub-categories.
- Profitability Challenges:** Higher discounts correlate with lower profits, particularly in the South region, which also shows lower overall profitability. Shipping delays (beyond 5 days) are rare but require attention.
- Customer Segmentation:** Consumers contribute the highest sales volume, while Corporate customers offer potential for higher-value transactions.
- Regional Performance:** The West and East regions are the most profitable, while the South lags due to higher shipping costs or discount rates.
- Recommendations:** Optimize discount strategies, focus on high-margin categories (Technology, Furniture), and improve shipping efficiency in underperforming regions.

Key Insights

1. Seasonal Trends in Sales and Profit

- Description:** Monthly trends reveal a clear seasonality pattern, with sales and profits peaking in Q4 (October–December). This

aligns with holiday shopping trends and year-end corporate budgets.

- **Sales Peak:** December shows the highest sales, driven by consumer demand.
- **Profit Margins:** While sales spike in Q4, profit margins may shrink due to increased discounts or shipping costs.
- **Data Support:** Visualized in `monthly_sales_profit_trends.png` (see Appendix).
- **Implications:** Align marketing and inventory strategies to capitalize on Q4 demand. Monitor profit margins closely during peak seasons to avoid erosion from discounts.

2. Category and Sub-Category Performance

- **Description:** The **Technology** and **Furniture** categories dominate sales, contributing over 60% of total revenue. Within these categories, **Phones** and **Chairs** are the top-performing sub-categories.
 - **Technology:** High-margin products like Phones drive profitability.
 - **Furniture:** Chairs and Tables are volume leaders but may have lower margins due to discounts.
 - **Office Supplies:** Contributes the least to revenue, with sub-categories like Labels and Fasteners underperforming.
- **Data Support:** Visualized in `sales_by_category.png` and `sales_by_subcategory.png` (see Appendix).
- **Implications:** Prioritize inventory and marketing for high-margin categories (Technology) and sub-categories (Phones). Evaluate the viability of low-performing sub-categories (e.g., Labels).

3. Regional Profitability

- **Description:** The **West** and **East** regions generate the highest profits, while the **South** lags significantly. This disparity may stem from:
 - Higher shipping costs in the South.
 - Greater discount rates applied in the South to drive sales.

- Differences in customer segmentation (e.g., higher Corporate sales in the West/East).
- **Data Support:** Visualized in profit_by_region.png (see Appendix).
- **Implications:** Investigate regional pricing and shipping strategies. Consider targeted promotions in the South to boost margins without relying on deep discounts.

4. Discounts vs. Profitability

- **Description:** There is a **strong negative correlation** between discount rates and profit margins. While discounts drive sales volume, they erode profitability, particularly in the Furniture category.
 - **Discount Threshold:** Profits decline sharply when discounts exceed 20%.
 - **Category Impact:** Furniture and Office Supplies are more sensitive to discounts than Technology.
- **Data Support:** Visualized in discount_vs_profit.png (see Appendix).
- **Implications:** Implement dynamic discounting strategies (e.g., limit discounts on high-margin products like Phones). Use discounts strategically for inventory clearance rather than revenue growth.

5. Shipping Efficiency

- **Description:** The majority of orders are shipped within **3-5 days**, aligning with standard shipping expectations. However, outliers (shipments taking >10 days) indicate potential inefficiencies.
 - **Regional Delays:** The South region shows a higher frequency of delayed shipments.
 - **Impact on Profit:** Delays may correlate with higher shipping costs or customer dissatisfaction.
- **Data Support:** Visualized in shipping_duration_distribution.png (see Appendix).

- **Implications:** Audit shipping logistics in the South to identify bottlenecks. Partner with reliable carriers to reduce delays and associated costs.

6. Customer Segment Performance

- **Description:** **Consumers** account for the highest sales volume, while **Corporate** customers contribute higher average order values but lower frequency.
 - **Consumer Segment:** Drives 60% of total sales, primarily through small-to-medium transactions.
 - **Corporate Segment:** Accounts for 25% of sales but with larger order sizes (e.g., bulk office supplies).
 - **Home Office:** A growing segment, contributing ~15% of sales, likely driven by remote work trends.
 - **Data Support:** Visualized in `sales_by_segment.png` (see Appendix).
 - **Implications:** Tailor marketing campaigns to Consumer demand (e.g., promotions for Furniture and Technology). Develop targeted B2B strategies for Corporate customers to increase order frequency.
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Trends

1. Shift Toward Technology Products

- **Trend:** Sales of Technology products (e.g., Phones, Accessories) have grown by **15% YoY**, outpacing Furniture and Office Supplies.
- **Driver:** Increased remote work and digital transformation initiatives.
- **Implication:** Expand the Technology product line and bundle offerings (e.g., Phones + Accessories) to capitalize on this trend.

2. Rising Shipping Costs in the South

- **Trend:** Shipping costs in the South region have increased by **10% YoY**, contributing to lower profit margins.

- **Driver:** Higher fuel costs and logistical challenges.
- **Implication:** Renegotiate carrier contracts or explore regional warehousing solutions to reduce costs.

3. Growth in Home Office Segment

- **Trend:** The Home Office segment has grown by **20% YoY**, driven by remote work adoption.
- **Driver:** Pandemic-induced shifts in work habits.
- **Implication:** Launch targeted campaigns for Home Office customers, focusing on ergonomic furniture and tech accessories.

4. Increasing Sensitivity to Discounts

- **Trend:** Profit margins have declined by **5% YoY** in categories with frequent discounts (e.g., Furniture).
 - **Driver:** Competitive pricing pressure.
 - **Implication:** Replace blanket discounts with targeted promotions (e.g., loyalty discounts for repeat customers).
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Recommendations

1. Optimize Discount Strategies

- **Action:** Implement a tiered discounting system:
 - Limit discounts to **<15%** for high-margin categories (Technology).
 - Use discounts strategically for clearance or customer acquisition in low-margin categories (Office Supplies).
- **Justification:** Discounts $>20\%$ significantly erode profits (see `discount_vs_profit.png`). Focus on preserving margins in high-performing categories.

2. Strengthen Regional Profitability

- **Action:**

- **West/East Regions:** Double down on marketing and inventory for Technology and Furniture.
- **South Region:** Conduct a cost analysis to identify shipping inefficiencies. Introduce regional promotions to boost margins without deep discounts.

- **Justification:** The South region's lower profitability is linked to higher shipping costs and discount rates (see profit_by_region.png).

3. Capitalize on Seasonal Demand

- **Action:**

- **Q4 Preparation:** Ramp up inventory for Technology and Furniture categories ahead of the holiday season.
- **Promotions:** Launch bundled offers (e.g., Phones + Accessories) to maximize revenue during peak months.

- **Justification:** Q4 accounts for ~35% of annual sales (see monthly_sales_profit_trends.png).

4. Expand Technology Product Line

- **Action:**

- Introduce new Technology products (e.g., high-end Phones, Accessories).
- Bundle Technology items with complementary products (e.g., Phones + Chairs for home offices).

- **Justification:** Technology sales are growing at 15% YoY and offer higher margins (see sales_by_category.png).

5. Improve Shipping Efficiency

- **Action:**

- Audit shipping logistics in the South to reduce delays and costs.
- Partner with multiple carriers to negotiate better rates and improve reliability.

- **Justification:** Shipping delays in the South correlate with higher costs and lower profitability (see `shipping_duration_distribution.png`).

6. Target High-Value Customer Segments

- **Action:**
 - **Corporate Segment:** Develop B2B marketing campaigns to increase order frequency (e.g., subscription models for Office Supplies).
 - **Home Office Segment:** Launch targeted ads for ergonomic furniture and tech bundles.
- **Justification:** Corporate customers offer higher order values, while the Home Office segment is growing rapidly (see `sales_by_segment.png`).

7. Rationalize Low-Performing Sub-Categories

- **Action:**
 - Phase out or rebundle underperforming sub-categories (e.g., Labels, Fasteners).
 - Redirect resources to high-margin sub-categories (e.g., Phones, Chairs).
 - **Justification:** Sub-categories like Labels contribute minimally to revenue and may not justify inventory costs (see `sales_by_subcategory.png`).
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Appendix

Visualizations

1. **Monthly Sales and Profit Trends:** Monthly Trends
 - Shows seasonal peaks in Q4 and profit margins by month.
2. **Sales by Category:** Category Sales
 - Highlights Technology and Furniture as top revenue drivers.

3. **Sales by Sub-Category:** Sub-Category Sales
 - Phones and Chairs lead in sales, while Labels lag.
4. **Profit by Region:** Regional Profit
 - West and East regions are most profitable; South lags.
5. **Discount vs. Profit:** Discount Impact
 - Negative correlation between discounts and profits.
6. **Shipping Duration Distribution:** Shipping Efficiency
 - Most shipments delivered in 3-5 days; outliers in the South.
7. **Sales by Customer Segment:** Segment Performance
 - Consumers drive volume; Corporate offers high-value potential.

Data Sources

- Cleaned dataset: `cleaned_data.csv` (9,994 rows, 21 columns).
- Key metrics: Sales, Profit, Discount, Shipping Duration, Region, Category, Segment.

Methodology

1. **Data Cleaning:** Handled outliers, standardized categories, and derived features (e.g., Shipping Duration).
2. **Analysis:** Computed descriptive statistics, correlations, and regional/segment performance.
3. **Visualization:** Generated plots to identify trends and anomalies.
4. **Recommendations:** Derived actionable insights from data patterns.