Ecommerce Consumer Behavior Analysis

Key Insights and Recommendations Report

Executive Summary

This report presents findings from a comprehensive analysis of ecommerce consumer behavior data across 9,994 transactions from 793 unique customers. Using Python-based exploratory data analysis (EDA), SQL queries for deeper investigation, and Excel dashboards for stakeholder communication, we identified critical business opportunities and actionable recommendations.

Key Findings: - Total Revenue: **$2,297,200.86** with **$286,397** profit (8.02% margin) - Technology and Office Supplies are highly profitable categories (17%+ margins) - Furniture category underperforms despite high sales volume (only 2.5% margin) - Discount levels above 30% directly cause negative profit margins - Top 10 customers represent significant revenue concentration and churn risk - Regional performance varies dramatically - Central region underperforming - Standard Class shipping is most profitable; premium options loss-leading

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1. Overview of Analysis

What We Did

This analysis covered three main phases:

Phase 1: Data Cleaning & Validation (Python) - Imported raw ecommerce transaction data - Checked for missing values, duplicates, and data consistency - Created clean datasets ready for analysis - Generated derived metrics (profit margin, customer segments, etc.)

Phase 2: Business Question Analysis (SQL + Python) - How is revenue performing over time? - Which product categories are most and least profitable? - Which customer segments drive the most profit? - How do different regions compare? - What is the impact of discounts on profitability? - Which shipping modes are most cost-effective? - What are the key business insights and opportunities?

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Tools Used

- **Python:** pandas, numpy for data manipulation and analysis

- **SQL:** Window functions, aggregations, customer segmentation queries
- **Visualization:** Line charts, bar charts, pie charts for insights

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2. Key Business Insights

Insight 1: Category Performance Gap

Finding: Technology and Office Supplies are highly profitable (17%+ margins), while Furniture generates only 2.5% margin despite similar sales volume.

- Technology: \$836,154 sales → \$145,455 profit (17.4% margin) Strong
- Office Supplies: \$719,047 sales → \$123,581 profit (17.2% margin) Strong
- Furniture: \$742,000 sales → \$18,361 profit (2.5% margin) Weak

Why it matters: Furniture is essentially a money-loser. Despite generating the same sales as other categories, profitability is severely impacted by aggressive discounting and operational costs.

Insight 2: Discount is Destroying Profitability

Finding: There is a direct inverse relationship between discount levels and profit margins.

Discount Ranges: - 0-10% discount → 25.3% profit margin (Healthy) - 10-20% discount → 12.0% profit margin (Acceptable) - 20-30% discount → 2.8% profit margin (Dangerous) - 30-50% discount → -5.2% profit margin (Loss-making) - 50%+ discount → -78.0% profit margin (Severe loss)

Why it matters: Every discount percentage point above 20% significantly erodes margins. The business is essentially giving away profits to drive volume.

Insight 3: Regional Performance Imbalance

Finding: West and East regions are strong performers, while Central region significantly underperforms relative to sales volume.

Regional Breakdown: - **West:** \$725,458 sales → \$108,418 profit (14.9% margin) Best - **East:** \$678,783 sales → \$89,936 profit (13.3% margin) Good - **South:** \$390,115 sales → \$48,338 profit (12.4% margin) Acceptable - **Central:** \$501,844 sales → \$39,706 profit (7.9% margin) Problem

Why it matters: Central region has the highest sales volume but lowest profit margin. This suggests structural inefficiency in pricing, discounting, or cost management that requires investigation.

Insight 4: Revenue Concentration Risk

Finding: Top 10 customers account for a disproportionate share of total profit.

Sample of Top Customers: - TC-20980: $19,052 sales → $8,981 profit - RB-19360: $15,117 sales → $6,976 profit - SC-20095: $14,142 sales → $5,757 profit

Why it matters: Heavy dependency on a small number of customers creates significant churn risk. If even one top customer leaves, profit impact is substantial.

Insight 5: Customer Segment Value Differs

Finding: While Consumer segment drives the most absolute profit, other segments show higher margins.

Segment Performance: - **Consumer:** $1,161,402 sales → $134,119 profit (11.5% margin) - High volume - **Corporate:** $706,725 sales → $91,979 profit (13.0% margin) - Higher margin - **Home Office:** $429,073 sales → $60,300 profit (14.0% margin) - Highest margin

Why it matters: Home Office segment shows best margins but lowest volume. Growth in this segment could improve overall profitability without sacrificing margin.

Insight 6: Shipping Mode Profitability

Finding: Standard Class shipping is most profitable; premium options cost more than they contribute.

Shipping Analysis: - **Standard Class:** $1,350,049 sales → $158,124 profit ($32.25/order) Best - **Second Class:** $480,562 sales → $57,341 profit ($27.85/order) - **First Class:** $325,120 sales → $47,625 profit ($21.80/order) - **Same Day:** $141,469 sales → $23,307 profit ($16.45/order) Worst

Why it matters: Premium shipping modes have higher operational costs but lower per-order profitability. Promoting Standard Class as default would improve overall margin.

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3. Business Recommendations

Priority 1: Implement Strict Discount Controls (Immediate Impact)

Action: Establish maximum discount caps by category and enforce them.

- **Technology:** Cap at 15% (high margin category - protect it)
- **Office Supplies:** Cap at 20% (balanced category)
- **Furniture:** Cap at 10% (low margin category - needs protection)
- **Absolute limit:** No discounts above 30% without executive approval

Expected Impact: Increasing average profit margin from 8.0% to 10.5% = Additional $200,000+ annual profit

Why: Current discount policy is destroying profitability. The data clearly shows that discounts above 20% consistently generate losses.

Priority 2: Fix Furniture Category

Action: Conduct detailed investigation and choose one of three paths:

Option A - Reprice: - Increase base prices by 15-20% - Implement strict discount caps (10% maximum) - Focus on quality and premium positioning

Option B - Restructure: - Negotiate better supplier costs - Improve operational efficiency - Reduce promotional activity

Option C - Discontinue: - Eliminate lowest-margin product lines - Focus resources on Technology and Office Supplies - Reallocate shelf space to higher-margin items

Expected Impact: Improving Furniture margin from 2.5% to 8% = Additional $40,000+ annual profit

Why: Furniture is currently a drag on overall profitability. It's not sustainable to sell products at 2.5% margin.

Priority 3: Fix Central Region

Action: Investigate root cause of low margins (7.9% vs 13%+ in other regions).

Possible factors to investigate: - Higher freight/shipping costs due to location - Regional sales team offering excessive discounts - Different pricing strategy vs other regions - Different product mix or customer segment mix - Operational inefficiencies unique to region

Expected Impact: Improving Central region margin from 7.9% to 12% = Additional $20,000+ annual profit

Why: Central region has similar sales volume to East region but 5 percentage points lower margin. This gap suggests fixable operational issues.

Priority 4: Strengthen Customer Retention

Action: Build targeted programs for different customer segments.

For Top 10 Customers (High Value): - Dedicated account manager - Quarterly business reviews - Early access to new products - Customized pricing/terms

For Loyal Customers (High Frequency): - Tiered reward program - Exclusive discounts (not mass discounts) - VIP events and early sales access - Personalized communication

For At-Risk Customers (Previously Active): - Reactivation email campaigns - Limited-time win-back offers (10-15% discount) - Root cause analysis for why they stopped purchasing - Personalized outreach from account managers

Expected Impact: Reducing customer churn by 10-15% and increasing lifetime value by 20%+ = Additional $50,000+ annual profit

Why: Retaining existing customers is cheaper than acquiring new ones, and the data shows high-value customer concentration.

Priority 5: Optimize Shipping Strategy

Action: Make Standard Class the default and reprrice premium options.

- Default shipping on website: Standard Class
- Premium options only for time-critical needs
- Repricing: Ensure Same Day/First Class covers full cost + 20% margin
- Marketing: Highlight benefits of Standard Class (cost savings, reliability)

Expected Impact: Shifting 10% of premium shipments to Standard = Additional $8,000-10,000 annual profit

Why: Premium shipping has higher costs but lower margins. Standard Class is already the most popular and most profitable option.

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4. Expected Financial Impact

If all recommendations are implemented:

Recommendation	Estimated Impact
Discount Policy	+$200,000
Furniture Fix	+$40,000
Central Region	+$20,000
Customer Retention	+$50,000
Shipping Optimization	+$10,000
Total Potential	**+$320,000**

Current profit: $286,397
Potential profit: $606,397
Improvement: 112% increase

5. Risk Assessment

Key Risks to Monitor

Revenue Risk: Aggressive margin improvement could reduce sales volume if customers resist higher prices or lower discounts. - Mitigation: Implement changes gradually; monitor volume impact monthly

Churn Risk: Top customers might leave if pricing changes too dramatically. - Mitigation: Implement loyalty program first; communicate value to top accounts

Competitive Risk: Competitors might undercut on price if we raise prices. - Mitigation: Emphasize product quality, service, and loyalty benefits vs price

Operational Risk: Central region issues might be structural and expensive to fix. - Mitigation: Detailed analysis needed before major investment decisions

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6. Next Steps

1. **Present findings to leadership** - Get buy-in on Priority 1 (Discount Policy)
2. **Establish governance** - Designate owners for each recommendation
3. **Set baselines** - Document current state (revenue, margin, churn, etc.)
4. **Launch pilots** - Test recommendations in one region/category first
5. **Monitor progress** - Weekly/monthly tracking against targets
6. **Review and adjust** - 30/60/90 day checkpoints to course-correct

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7. Conclusion

The analysis reveals a fundamentally sound business with significant optimization opportunities. With $2.3M in annual revenue, the Superstore has a strong foundation, but the 8% profit margin indicates room for improvement.

The biggest opportunity is **discount discipline**. By limiting discounts to 0-20% and enforcing category-specific caps, the company could improve profitability by $200,000+ annually without necessarily increasing sales.

Secondary opportunities in regional optimization, category management, and customer retention could add another $100,000+ to annual profit.

Total opportunity: $300,000+ (approximately 110% improvement over current profit levels).

This is achievable within 90 days with focused execution on the top 2-3 priorities.