Northeastern University
College of Professional Studies

GROUP PROJECT — Tableau Application

" E-Commerce Consumer Behavior Analysis: Insights and Recommendations from Data Visualization"

DIVYA CHENTHAMARAKSHAN

YASH SANJAY SINGH

COLLEGE OF PROFESSIONAL STUDIES, NORTHEASTERN UNIVERSITY

PROFESSOR: Paromita Guha

MARCH 23RD 2025

TABLE OF CONTENTS

INTRODUCTION

In today's competitive e-commerce landscape, understanding consumer behavior is critical for business growth and customer retention. This project utilizes a comprehensive dataset from Kaggle, showcasing detailed consumer interactions, purchase histories, product categories, payment preferences, and demographic information. Using Tableau, we transformed this raw data into meaningful visual insights to identify purchasing trends, customer spending patterns, and the influence of external factors like social media on buying decisions.

The primary objective of this analysis is to help businesses optimize their marketing strategies and product offerings by understanding what drives consumer actions. By examining variables such as purchase frequency, average transaction value, payment methods, and category popularity, we can uncover actionable insights for better targeting, customer segmentation, and long-term customer relationship management. This data-driven approach empowers businesses to make informed decisions and stay ahead in the rapidly evolving e-commerce market.

DATASET OVERVIEW

The *Ecommerce Consumer Behavior Analysis* dataset contains detailed records of customer interactions and purchases on an e-commerce platform. It includes fields such as customer ID, product categories, transaction dates, purchase amounts, payment methods, customer demographics, and browsing behavior.

	Customer_ID	Age	Gender	Income_Level	Marital_Status	Education_Level	Occupation	Location	Purchase_Category	Purchase_Amount	Frequency_of_Purch	Purchase_Channel	Brand_Loyalty
2	37-611-6911	22	Female	Middle	Married	Bachelor's	Middle	Évry	Gardening & Outdoo	$333.80	4	Mixed	5
3	29-392-9296	49	Male	High	Married	High School	High	Huocheng	Food & Beverages	$222.22	11	In-Store	3
4	84-649-5117	24	Female	Middle	Single	Master's	High	Huzhen	Office Supplies	$426.22	2	Mixed	5
5	48-980-6078	29	Female	Middle	Single	Master's	Middle	Wiwilí	Home Appliances	$101.31	6	Mixed	3
6	91-170-9072	33	Female	Middle	Widowed	High School	Middle	Nara	Furniture	$211.70	6	Mixed	3
7	82-561-4233	45	Male	Middle	Married	Master's	High	Boro Utara	Office Supplies	$487.95	8	Mixed	3
8	90-144-9193	21	Female	Middle	Divorced	High School	Middle	Liren	Furniture	$486.40	12	Online	2
9	88-661-4689	39	Male	Middle	Single	High School	Middle	Taocheng	Books	$218.06	6	Online	5
10	37-065-3182	24	Female	High	Divorced	Master's	Middle	Gråbo	Office Supplies	$201.96	8	In-Store	3
11	84-894-9222	25	Bigender	High	Married	Bachelor's	High	Pryamitsyno	Sports & Outdoors	$418.83	7	Online	2
12	44-674-4037	33	Male	Middle	Divorced	Bachelor's	Middle	Punta Gorda	Mobile Accessories	$389.70	12	In-Store	1
13	78-116-8349	38	Male	High	Widowed	Bachelor's	Middle	Győr	Sports & Outdoors	$238.93	5	Online	4
14	19-933-8095	34	Male	Middle	Single	Bachelor's	High	Gaosheng	Luxury Goods	$61.22	7	In-Store	5
15	80-684-5072	32	Male	High	Married	High School	Middle	Rokytne	Animal Feed	$79.81	4	Mixed	5
16	23-302-7502	30	Female	High	Widowed	High School	High	Alameda	Health Care	$58.51	2	Online	4
17	90-069-8934	40	Male	High	Divorced	Master's	High	Dhankutā	Hotels	$109.29	3	Online	3
18	45-073-7243	37	Male	High	Single	Bachelor's	High	Jindong	Furniture	$356.45	6	Mixed	5
19	89-883-2101	38	Female	Middle	Divorced	Bachelor's	High	Ngeru	Mobile Accessories	$236.99	10	Mixed	2

The dataset helps identify shopping patterns, product preferences, seasonal trends, and customer lifetime value. By analyzing variables like frequency of purchases, average order value, and cart abandonment, businesses can refine marketing strategies and personalize customer engagement.

This dataset is ideal for market segmentation, customer retention analysis, sales forecasting, and product performance evaluation across various demographics and time periods.

Data Source :

https://www.kaggle.com/datasets/salahuddinahmedshuvo/ecommerce-consumer-behavior-analysis-data

BUSINESS QUESTIONS:

1. **How does social media influence affect consumer decision-making speed across different influence levels?"**
2. **Which product categories show the strongest relationship between social media influence and average purchase amount?"**
3. **How does the frequency of purchases vary by consumer intent category when exposed to different levels of social media influence?**
4. **What is the relationship between social media influence, discount sensitivity, and overall customer satisfaction?**
5. **Which product categories attract the highest number of unique customers, and how should marketing efforts be allocated to maximize engagement?**
6. **What is the distribution of payment methods used by customers?**
7. **How can businesses optimize their payment options based on customer income levels to improve conversion and satisfaction?**

TARGET AUDIENCES :

E-commerce businesses aiming to enhance marketing strategies and customer engagement.

- **E-commerce business owners** looking to understand customer purchase behavior.
- **Marketing teams** aiming to optimize campaigns and customer retention.
- **Product managers** analyzing product demand and category performance.
- **Data analysts** studying consumer trends and payment preferences.
- **Sales strategists** focusing on income-based customer segmentation.

ANALYSIS

GRAPH 1:

Purchase Amount Distribution by Product Category and Social Media Influence :

- This graph displays average purchase amounts across product categories, segmented by social media influence levels (None, Low, Medium, High).
- Categories like Software & Apps, Jewelry & Accessories, and Food & Beverages show the highest purchase amounts among highly-influenced consumers, often exceeding $1,200. Almost all categories demonstrate that higher social media influence correlates with higher average purchase amounts.
- The "None" influence segment consistently shows the lowest spending across categories. This visualization answers the second business question by revealing which product categories (Software & Apps, Jewelry & Accessories, Food & Beverages) demonstrate the strongest relationship between social media influence and purchase amounts.


Purchase Amount Distribution by Product Category and Social Media Influence
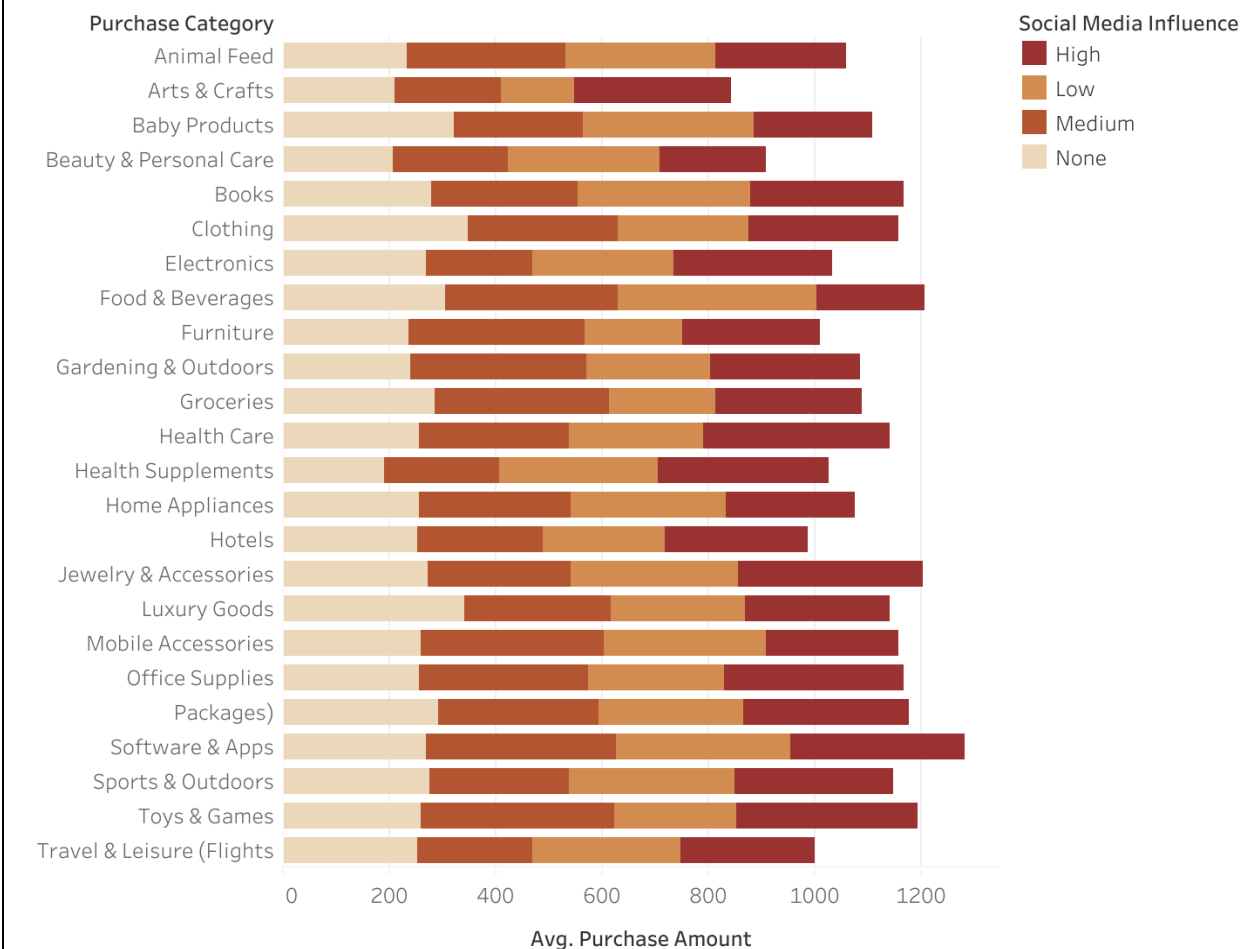
Graph 2

Discount Sensitivity and Customer Satisfaction by Social Media Influence :

- This stacked bar chart illustrates the relationship between discount sensitivity, customer satisfaction, and social media influence.
- The data shows that social media influence is distributed relatively evenly across satisfaction levels, with a slight concentration (26.69%) of highly-influenced customers.
- Among discount sensitivity levels, "Very Sensitive" shows the highest proportion of high social media influence (7.74%), suggesting that discount-driven customers are more susceptible to social media.
- The largest segment overall is customers with no social media influence (25.23%), followed closely by those with high influence (26.69%). This answers the fourth business question by revealing correlation patterns between these three variables.

Discount Sensitivity and Customer Satisfaction by Social Media Influence
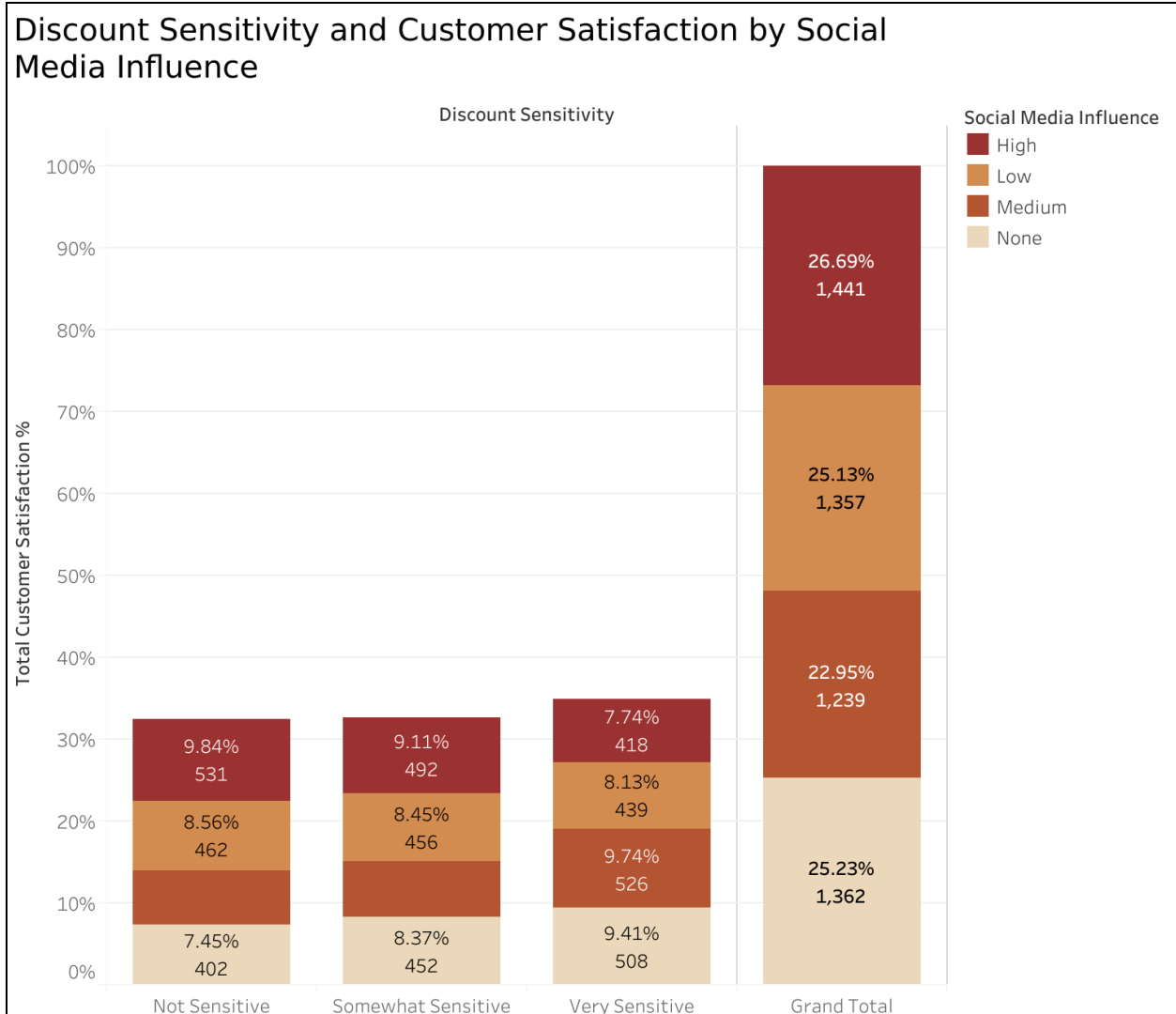
Graph 3
Social Media's Impact on Purchase Frequency Across Intent Segments
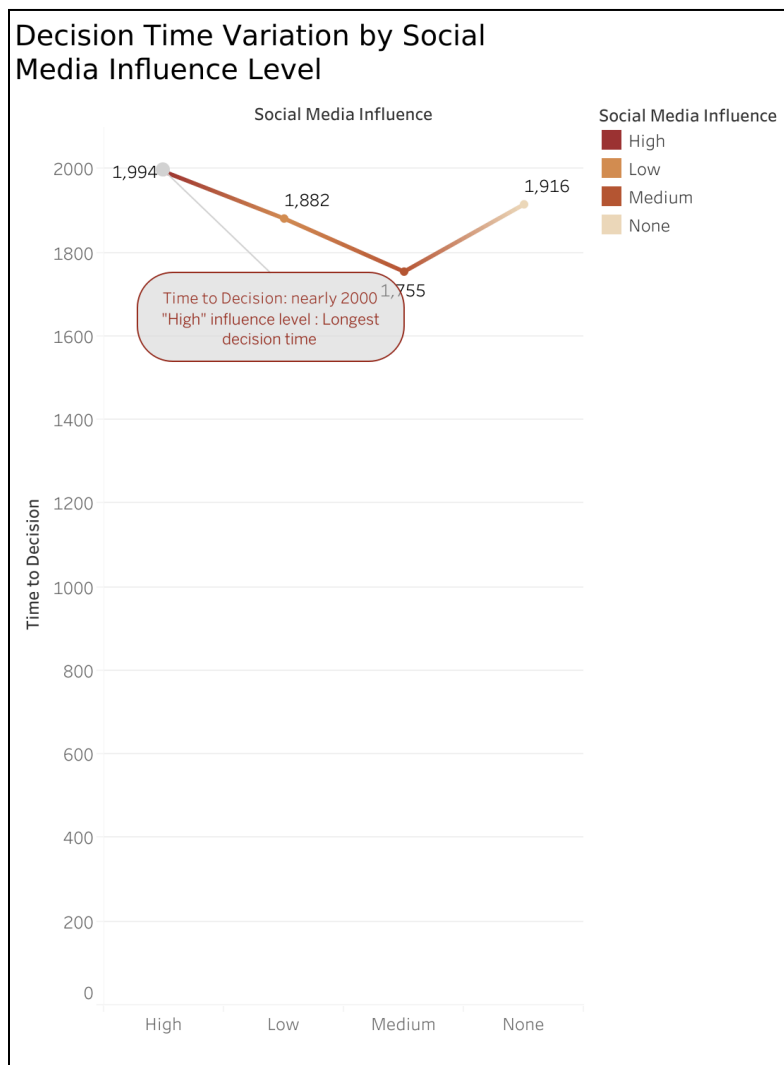- This multi-panel chart shows how purchase frequency varies across four consumer intent segments based on social media influence levels.
- For impulsive and wants-based purchases, high social media influence drives the highest purchase frequency (506 and 498 respectively).
- Need-based purchases show the highest frequency among those with no social media influence (456).
- Planned purchases peak with low social media influence (524).
- This indicates that social media most effectively drives impulse and wants-based purchasing, while planned purchasing benefits from modest influence, and need-based purchasing happens regardless of social influence. This answers the third business question about purchase frequency variation across intent categories and influence levels.
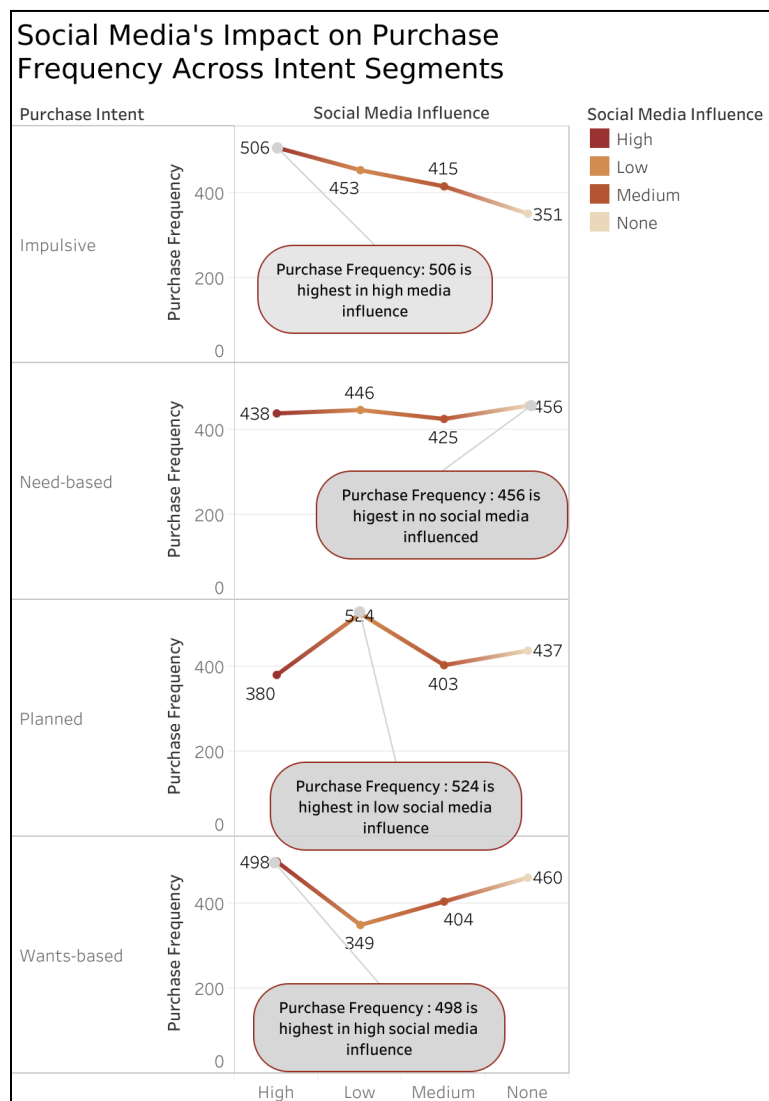
Graph 4
Decision Time Variation by Social Media Influence Level
- This line graph reveals how social media influence affects consumer decision-making speed.
- Consumers with high social media influence take the longest time to make purchase decisions (approximately 2,000 time units), while those with medium influence make the quickest decisions (about 1,755 time units).
- Interestingly, consumers with no social media influence take the second-longest time (1,916 time units).
- This suggests that heavy social media users may experience decision paralysis from information overload, while moderately influenced consumers benefit from just enough information to decide efficiently.
- This directly answers the first business question about decision-making speed across influence levels.

Decision Time Variation by Social Media Influence Level

Social Media Influence

Social Media Influence
- High
- Low
- Medium
- None

1,994

1,882

1,916

Time to Decision: nearly 2000 "High" influence level : Longest decision time

1,755

High   Low   Medium   None

Graph 5

Top 10 Most Purchased Product Categories

The Electronics category stands out with the highest customer count, indicating a strong preference for tech products. The use of the Gestalt Law of Similarity is evident here, as the darker-colored bar (representing high customer engagement) stands out from the rest, making it easy to compare which category is the most popular.

Categories like Sports & Outdoors, Jewelry & Accessories, and Home Appliances also perform well, with bars that are only slightly lighter than Electronics. The Gestalt Law of Proximity helps viewers quickly compare these similar-performing categories due to their placement next to each other. This close proximity visually links these categories, suggesting a strong but not top-tier demand.
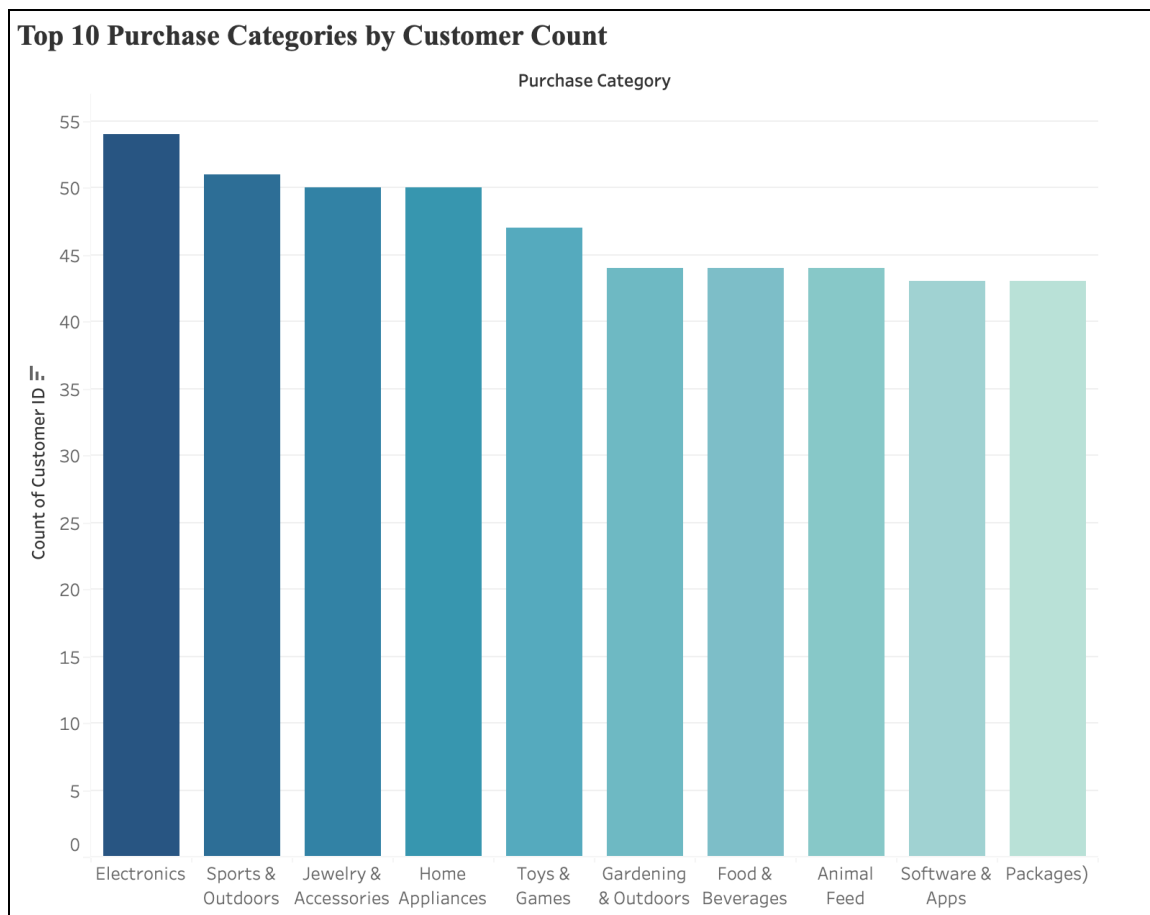
Mid-Range Categories: Toys & Games and Gardening & Outdoors show moderate engagement, performing better than lower-ranked categories but trailing behind the high performers. The consistent color gradient (from darker to lighter bars) follows the Gestalt Law of Continuity, where the smooth transition from high-performing categories to mid-range categories allows the viewer to track the overall trend.

Categories like Software & Apps, Animal Feed, and Packages show the lowest customer counts. The lighter-colored bars for these categories indicate lower engagement, which could be due to niche markets or limited customer interest. The use of the Gestalt Law of Closure allows us to notice gaps in customer engagement when we visually close the space between these lower bars, making it clear that these categories lag behind others.

Graph 6
Customer Payment Method Distribution
This pie chart represents the distribution of payment methods used by customers, based on their count. Each slice of the chart corresponds to a different payment method, with its proportion reflecting the percentage of customers who used that method. Here's a breakdown of the insights:

1. **PayPal (21.9%)** – The most used payment method, indicating that a significant portion of customers prefer digital wallets.
2. **Other (20.4%)** – A notable portion of transactions fall under unspecified or alternative payment methods.

Distribution of Payment Methods by Customer

PayPal 21.900%
Cash 18.700%
Credit Card 19.400%
Debit Card 19.600%
Other 20.400%
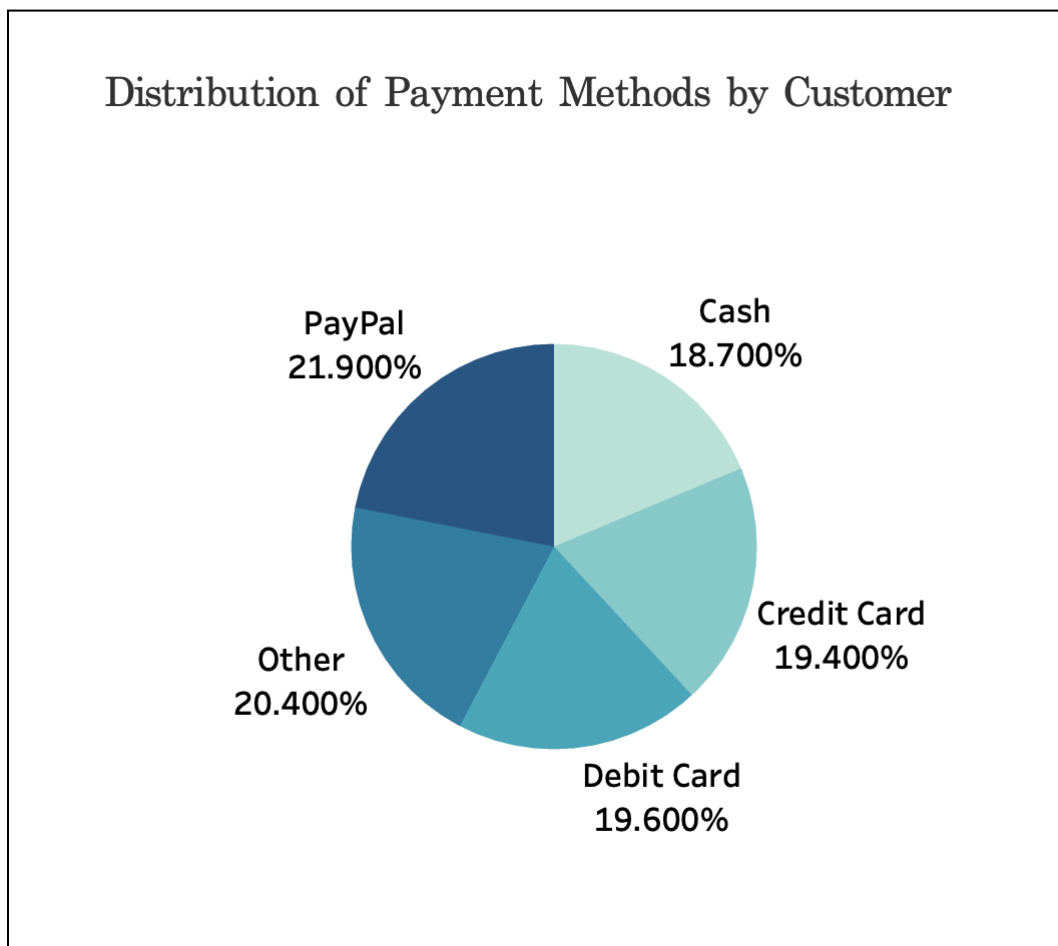
3. **Debit Card (19.6%)** – Shows a strong preference for direct bank-linked transactions.
4. **Credit Card (19.4%)** – Almost equal to debit card usage, suggesting a balanced preference between the two.
5. **Cash (18.7%)** – The least used method, indicating a shift toward digital and card-based payments.
   This analysis suggests that customers prefer electronic and card-based transactions over cash, with PayPal leading as the most popular payment method.

Graph 7

Payment Method Preferences by Income Level

The graph "Payment Method Preferences by Income Level" gives us a clear look at how people with different income levels prefer to pay. It shows that high-income individuals tend to use payment methods like Cash, Credit Cards, and PayPal the most, while middle-income individuals spread their preferences across several payment options, including Debit Cards and Other payment methods. This makes the graph easy to follow, especially since the payment methods within each income group are grouped together by color, following the Gestalt Law of Similarity, which helps us quickly see the differences.
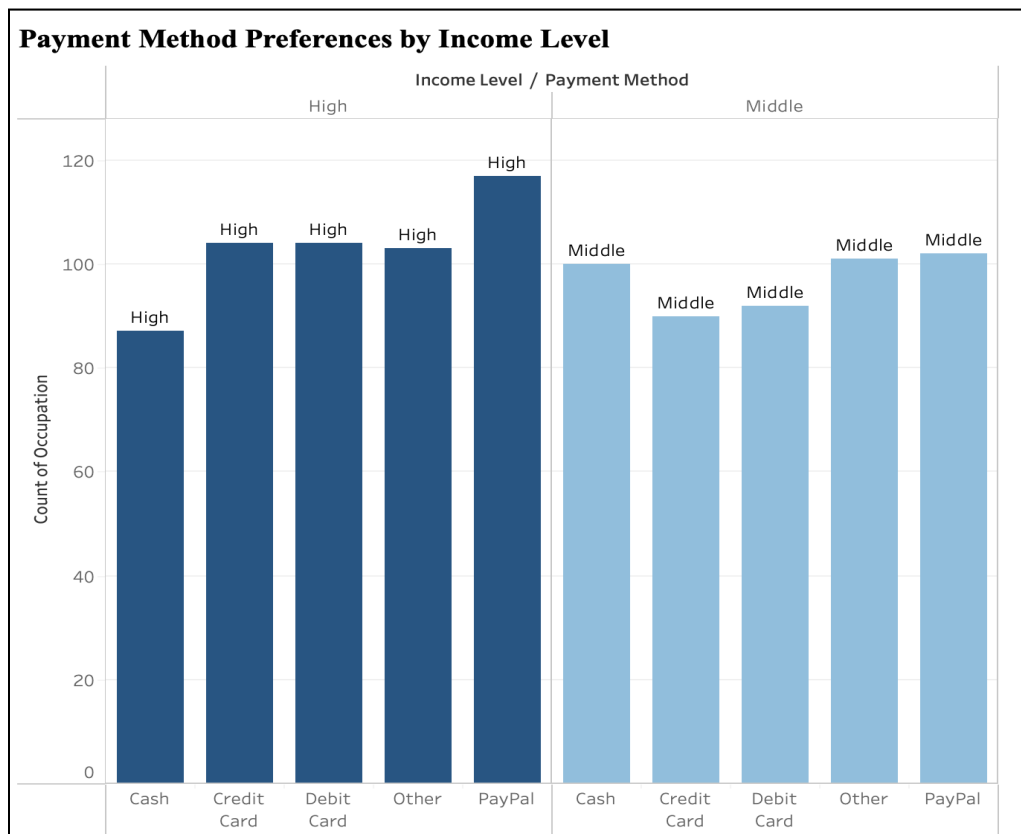
For businesses, this graph offers valuable insights on how to design their payment options. If you're trying to reach high-income customers, focusing on Credit Card and PayPal options could be key, since those are the most popular with this group. The grouping of payment methods in close proximity also makes it clear which ones are preferred, which is in line with the Gestalt Law of Proximity, making it easy for viewers to understand the most popular choices.

On the flip side, middle-income customers seem to be less picky and use a wider range of payment methods. This suggests that businesses aiming at this group might want to offer a variety of payment options to meet these diverse preferences. By providing flexibility in how people can pay, businesses are more likely to engage this group and improve sales.

Ultimately, this graph shows how understanding the payment habits of different income groups can help businesses meet their customers' needs better. Whether it's offering targeted payment methods for high-income earners or a wider variety for middle-income individuals, the visual organization of the data, supported by Gestalt principles, makes it easy to spot key patterns and make informed decisions.
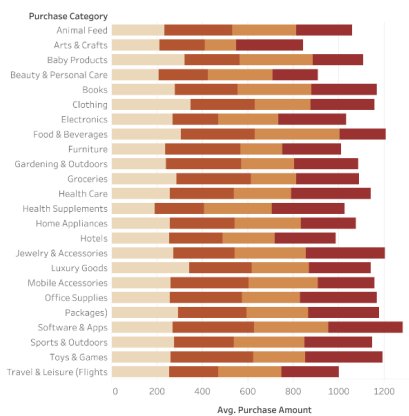
DASHBOARD OVERVIEW

This dashboard provides a comprehensive analysis of consumer purchase behavior using e-commerce data. It focuses on how social media influence, payment preferences, and product categories drive shopping decisions and patterns.
Social media influence plays a significant role in consumer behavior, as seen through higher average purchase amounts, more frequent purchases, and longer decision-making times for customers with strong social media exposure. Impulsive and need-based buying behaviors are notably higher among those highly influenced by social media, while customer satisfaction also varies based on discount sensitivity and influence levels.
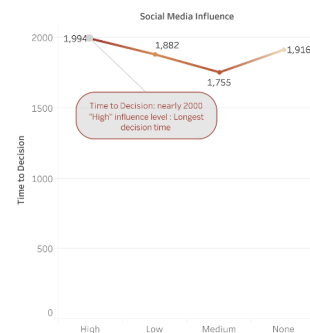
The blue-colored charts highlight key consumer patterns. The pie chart shows that PayPal and credit cards are the most preferred payment methods. The bar chart on top purchase categories reveals that electronics, sports & outdoors, and jewelry & accessories are the most popular categories by customer count. The payment method preference chart by income level indicates that higher-income customers favor cash and credit cards, while middle-income groups lean toward PayPal and debit cards.

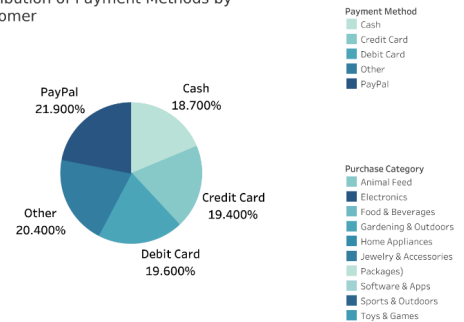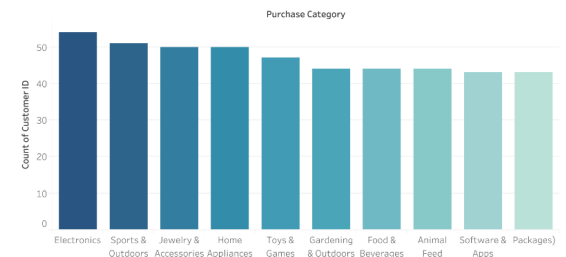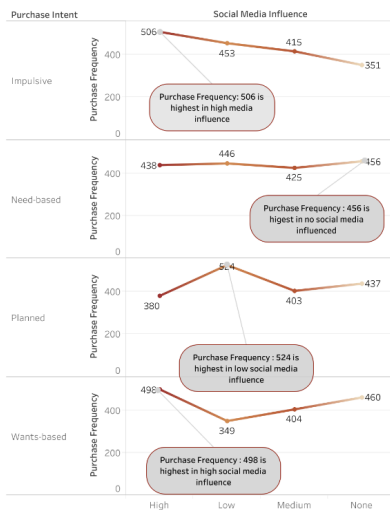**Analyzing Consumer Purchase Behavior: The Role of Social Media Influence, Payment Preferences, and Product Trends**
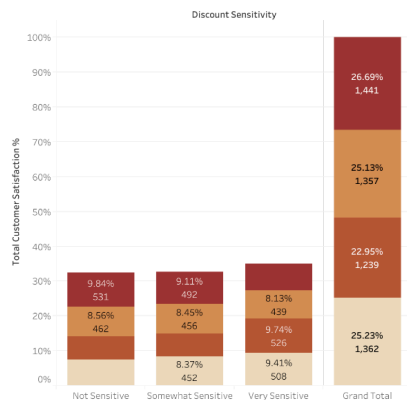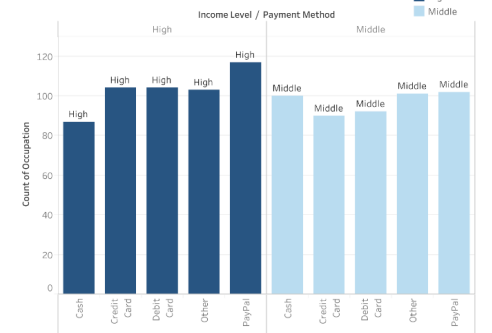
Overall, the dashboard emphasizes how social media, product trends, and payment methods collectively shape e-commerce consumer behavior. These insights can help businesses tailor marketing, product positioning, and payment options to meet the evolving needs of different customer segments.

Additional Insights

Social Media Affects Impulse vs. Planned Purchases Differently: Social media is great for encouraging impulsive buys, but it doesn't really speed up planned purchases. If you're selling something people have thought about for a while, give them all the info they need. But for impulse shoppers, quick and trendy promotions will grab their attention faster.

Segment Your Marketing for Different Income Groups: High-income people tend to prefer Credit Cards and PayPal, while middle-income shoppers like to have a mix of payment options. Knowing this, businesses can create more tailored campaigns that speak directly to each group's preferences, which could increase sales.

Cash is Losing Ground: Cash is becoming less popular, with more people choosing digital payments instead. This shift means businesses should be ready to offer credit cards, PayPal, or mobile payment options like Apple Pay to stay in sync with customer preferences, especially as younger shoppers lean more towards digital.

Customers Are Getting Pickier: Categories like Electronics and Sports & Outdoors are growing, but customers expect more quality. This means businesses need to focus on offering top-notch products and experiences in these areas to meet higher customer expectations.

Social Media May Slow Down Decision-Making: It's interesting, but the more a customer is influenced by social media, the longer it might take them to decide. They can get overwhelmed by too much information. Businesses should keep this in mind by making the decision-making process smoother, with clear and concise info to help them make quicker choices.

Niche Markets Offer Special Opportunities: Categories like Software & Apps or Animal Feed don't attract a huge number of people, but that means there's a specific audience to tap into. If you're in these niches, creating more personalized campaigns or focused promotions could be a great way to connect with these smaller but engaged groups.

KEY FINDINGS

The main focus of the report is on understanding e-commerce consumer behavior, and it's all built around a comprehensive dashboard that shows key insights into how consumers shop, what they buy, and how they pay. Here's a breakdown of the key takeaways:

1. **Social Media Influences Spending**: The data clearly shows that social media has a huge impact on consumer purchases. Products like Software & Apps, Jewelry & Accessories, and Food & Beverages see the highest spending when customers are heavily influenced by social media. The more people are influenced, the more they tend to spend across most categories.
2. **Discount Sensitivity and Satisfaction**: If a customer is sensitive to discounts, they are more likely to be influenced by social media. This group tends to be more active on social media, which means businesses might want to focus on social promotions for these customers to boost engagement and satisfaction.
3. **Frequency of Purchases Depends on Intent**: Social media affects impulsive and wants-based purchases the most, with those customers making purchases more frequently. But for planned purchases, customers are less influenced by social media, suggesting that planned shoppers prefer a more straightforward buying experience without too much outside influence.
4. **Payment Preferences by Income Level**: The way people pay also varies by income. High-income customers tend to stick to Cash, Credit Cards, and PayPal, while middle-income customers are more flexible and use a wider range of payment options like Debit Cards and Other. This shows businesses should consider offering more options for middle-income groups to boost engagement.
5. **Electronics Are King**: **Electronics** is by far the most popular category, attracting the most customers. Other categories like Sports & Outdoors and Jewelry & Accessories also perform well, but some, like Software & Apps and Animal Feed, have fewer customers, pointing to niche markets.
6. **Cash is on the Decline**: When it comes to how people pay, PayPal and Credit Cards are leading the way, while Cash usage is much lower. This shift highlights that customers are increasingly moving toward digital and card-based payments.

The dashboard ties everything together, showing businesses how social media, product preferences, and payment methods shape consumer decisions. It provides the perfect roadmap for businesses to optimize their strategies, whether it's focusing on high-demand products, adjusting marketing efforts, or offering the right payment options based on customer income. This data-driven approach helps businesses connect better with their customers and grow more effectively.

CONCLUSION

The dashboard provided in this report offers a comprehensive and visually engaging way to understand e-commerce consumer behavior. By analyzing the impact of social media influence, purchase frequency, and payment preferences, businesses can refine their strategies and tailor their approach to meet customer needs more effectively. The dashboard clearly shows that social media exposure drives higher spending and impulsive purchasing, which businesses can capitalize on by targeting the right audiences with timely, trend-driven campaigns.

Payment preferences displayed in the dashboard reveal important insights, such as the preference of high-income customers for premium options like Credit Cards and PayPal, while middle-income customers display more variety in their payment methods, including Debit Cards and Other. This segmentation can help businesses customize their payment offerings and marketing tactics based on income levels, ensuring greater engagement and satisfaction.

Lastly, the dashboard highlights trends in product category popularity and payment method usage. The rise in digital payments over Cash and the strong demand for Electronics and Sports & Outdoors categories present opportunities for businesses to align their product assortment and payment systems with shifting consumer behavior. By leveraging the insights from the dashboard, businesses can drive more informed decisions that enhance customer experience and overall sales performance in a competitive e-commerce landscape.

RECOMMENDATIONS

1. **Target High-Spending Age Groups:** The analysis reveals that certain age groups exhibit higher average spending. Focus marketing campaigns and loyalty programs on these segments to maximize revenue.
2. **Optimize Popular Product Categories:** Product categories with consistently high sales volume should receive priority in inventory management, promotional efforts, and seasonal marketing.
3. **Enhance Customer Retention Strategies:** Identify customers with frequent purchasing patterns and offer personalized recommendations, discounts, and follow-up emails to encourage repeat purchases.
4. **Regional Focus:** Regions with lower engagement should be studied further to identify potential barriers, while top-performing regions can be leveraged for localized promotions and product launches.

5. **Mobile vs. Desktop Optimization:** If device usage trends were part of the dataset, consider investing in platform-specific UX improvements based on consumer preferences.

REFERENCES

1. Bloomenthal, A. (2024, September 24). *E-commerce defined: types, history, and examples*. Investopedia. https://www.investopedia.com/terms/e/ecommerce.asp
2. Readman, J. (2024, April 3). *Council Post: E-Commerce is Ever-Changing: How to meet Consumers' evolving needs*. Forbes. https://www.forbes.com/councils/forbesagencycouncil/2024/04/03/e-commerce-is-ever-changing-how-to-meet-consumers-evolving-needs/
3. *Product Analytics - PostHog*. (n.d.). https://posthog.com/product-analytics?utm_source=google&utm_medium=cpc&utm_campaign=Product-Analytics-USCA&utm_term=product%20analytics%20tool&gad_source=1&gbraid=0AAAAACflbF8O8mEF9rohAUqpVXfMwJmE2&gclid=Cj0KCQjw4v6-BhDuARIsALprm33db4EGw-rUXc8b1c8SdTuKvzuD57G8hRi3TxxUo_RnFN1I-LhCiTEaArhPEALw_wcB
4. *5 best practices for analyzing e-commerce data – and the 7 mistakes to avoid*. (n.d.). Tableau. https://www.tableau.com/learn/whitepapers/5-best-practices-analyzing-ecommerce-data
5. Quantiz. (2024, November 21). 8 Best Tableau eCommerce Dashboard Examples. *Quantize Analytics*. https://www.quantizeanalytics.co.uk/tableau-ecommerce-examples/#google_vignette
6. *Ecommerce Consumer Behavior Analysis data*. (2025, March 3). Kaggle. https://www.kaggle.com/datasets/salahuddinahmedshuvo/ecommerce-consumer-behavior-analysis-data