Power BI Report

On

Consumer Behaviour Dataset

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Power BI Project Report

Executive summary:

This Power BI project provides a detailed analysis of customer shopping behavior to uncover trends and patterns that drive business decisions. The dataset used contains comprehensive details about customer demographics, product purchases, transaction methods, and behavioral insights, offering a robust foundation for analysis.

Objective:
The primary goal of this analysis is to address key business questions:

- What products and categories generate the most revenue?
- How do customer demographics influence purchasing patterns?
- What role do discounts, promo codes, and seasonal trends play in boosting sales?

Methodology:
Using Power BI, the dataset was cleaned, transformed, and modeled to create meaningful visualizations. The process included:

1. Ensuring data consistency and preparing measures using DAX calculations.
2. Designing an intuitive dashboard layout for interactive exploration.
3. Developing visuals such as bar charts, pie charts, and line graphs to answer business questions effectively.

Key Findings:

1. **Product Performance**: Clothing is the top-performing category, with jeans and sweaters contributing significantly to revenue.
2. **Customer Insights**: Middle-aged individuals (30-50 years) are the largest contributors to sales.
3. **Seasonal Trends**: Sales peak in winter and spring, driven by promotions and discounts.
4. **Behavioral Insights**: Customers frequently use promo codes, indicating the importance of targeted discount campaigns.

Outcome:
The findings provide actionable insights, such as the need for focused marketing towards specific demographics, seasonal inventory planning, and enhancing loyalty programs. These strategies can improve customer satisfaction, increase revenue, and optimize resource allocation.

Future Scope:
To enhance the analysis, future iterations could integrate external data sources like competitor trends and market forecasts. Real-time data processing and predictive analytics could also provide dynamic and forward-looking insights.

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Introduction

Context

In today's competitive market, understanding customer shopping behavior is essential for businesses to thrive. Analysing data related to customer demographics, purchasing patterns, and product preferences helps companies make informed decisions. This project focuses on leveraging Power BI to transform raw data into actionable insights, enabling businesses to improve their operations and align strategies with customer needs.

The dataset used in this analysis includes detailed information about customer transactions, such as product details, payment methods, and demographic profiles. By analysing this data, businesses can identify high-performing products, optimize inventory, and tailor marketing efforts to better engage their target audience.

Importance of the Project

This project holds significant value in a business context because it:

1. **Enhances Decision-Making**: By visualizing sales trends and demographic data, businesses can better understand their customers and make strategic decisions.
2. **Optimizes Marketing Efforts**: Insights from the analysis enable targeted campaigns to specific customer segments.
3. **Improves Operational Efficiency**: Understanding seasonal trends and top-performing categories helps in inventory planning and resource allocation.

Objectives

The primary goal of this project is to analyze the shopping behavior of customers using Power BI to address key business questions, such as:

1. **Which products and categories are most popular?**
   o This helps identify top-performing items and categories, guiding inventory planning and promotional efforts.
2. **What role do customer demographics play in purchasing decisions?**
   o Understanding the age, gender, and location of customers enables businesses to target their audience more effectively.
3. **How do discounts, promo codes, and seasonal trends impact sales?**
   o This allows businesses to optimize their promotional strategies and prepare for seasonal demand.

By addressing these questions, this project aims to provide insights that businesses can use to drive revenue, improve customer satisfaction, and achieve long-term growth.

Data Overview

Sources of Data

The dataset used in this analysis was sourced from Kaggle, a popular online platform for datasets and machine learning projects. It was downloaded in CSV format and contains 3,900 rows and 18 columns, capturing key details about customer shopping behavior.

The dataset includes various types of information:

- **Customer Demographics**: Age, Gender, and Location.
- **Product Information**: Product Name, Category, Size, and Color.
- **Transaction Details**: Purchase Amount, Payment Method, Discounts, and Promo Code Usage.
- **Behavioral Insights**: Purchase Frequency, Subscription Status, and Review Ratings.

This dataset is comprehensive and serves as a strong foundation for conducting an in-depth analysis of shopping behavior.

Data Description

The Shopping Behavior dataset provides a comprehensive view of consumer purchasing patterns and preferences . Here's a detailed description:

1. Dataset Overview:

    - Total records: 3,900 entries

    - Total columns: 18 features

2. Key Features:

    - Customer Demographics:

        Age: Ranges widely, with a detailed distribution available.

        Gender: Predominantly male (2,652) compared to female (1,248).

3. Purchase Information:

    - Categories: Includes clothing, Footwear, Outerwear, and Accessories.

    - Average purchase amount: Approximately $59.76

    - Payment Methods: Diverse options such as Venmo, Cash, Credit Card, PayPal, Bank Transfer, and Debit Card.

4. Additional Insights:

    - No Missing values: The dataset is complete with no missing entries.

- Visual Insights:

    Purchase amounts by category show variability and potential outliers.

    Age distribution provides insights into the target demographic.

5. Columns Description:

    - Customer ID: Unique identifier for each customer.

    - Item Purchased: Specific product bought.

    - Category: Product category

    - Purchase amount (USD): Cost of the purchase.

    - Location: Customer's location.

    - Size, color, season: Product attributes.

    - Review Rating: Customer feedback score.

    - Subscription Status: Indicates if a customer is a subscriber.

    - Shipping type: Method of delivery.

    - Discount Applied, Promo Code Used: Indicated promotional Usage.

    - Previous Purchases: Number of past purchases.

    - Payment Method: Mode of payment.

    - Frequency of Purchases: How often purchases are made.

    This dataset is well-suited for analyzing consumer behavior, identifying trends, and making data-driven decisions in retail and marketing strategies.

Data Preparation

To ensure the dataset was ready for analysis, the following steps were undertaken:

1. **Data Cleaning**:
    o   Verified there were no missing values in the dataset.
    o   Checked for consistency in categorical data (e.g., uniform values for Gender such as "Male" and "Female").
2. **Data Transformation**:
    o   Converted columns to appropriate data types for analysis in Power BI (e.g., numeric types for Purchase Amount, text types for Category).
    o   Standardized attributes like currency to ensure accurate calculations.

3. **Data Enrichment**:
    - o Derived new metrics, such as Total Revenue and Purchase Frequency, using calculations in Power BI.
    - o Added time-related context for potential seasonal trend analysis.

Power BI Process

Dashboard Design

The dashboard was designed to ensure clarity, interactivity, and ease of navigation. It was divided into three key sections to address the project objectives effectively:

1. **Sales Overview**:
    - o **Objective**: Provide a snapshot of overall sales performance and revenue trends.
    - o **Visuals Used**:
        - **Bar Chart**: Highlights top-performing products and categories.
        - **KPI Cards**: Show critical metrics such as Total Revenue, Total Customers, and Average Purchase Amount.
        - **Line Chart**: Displays monthly sales trends, identifying seasonal peaks and slumps.
2. **Customer Demographics**:
    - o **Objective**: Analyse customer profiles to understand their contribution to sales.
    - o **Visuals Used**:
        - **Pie Chart**: Illustrates the proportion of purchases by gender.
        - **Stacked Bar Chart**: Breaks down revenue by age groups.
        - **Map Visualization**: Displays sales distribution across geographical regions.
3. **Purchase Patterns**:
    - o **Objective**: Explore trends in discounts, promo code usage, and purchase frequency.
    - o **Visuals Used**:
        - **Clustered Column Chart**: Compares sales with and without discounts.
        - **Donut Chart**: Shows the share of transactions using promo codes.
        - **Table**: Lists products with the highest sales during specific seasons.

Data Modeling

Power BI's data modeling features were used to organize and connect the data efficiently. While this dataset was a single flat file, the following steps were performed to ensure a robust model:

1. **Data Relationships**:
   - In more complex scenarios with multiple tables, relationships would be defined between primary and foreign keys. For this analysis, a single-table model was sufficient.
2. **Calculated Measures** (DAX):
   - **Total Revenue**: SUM(Purchase Amount)
   - **Average Rating**: AVERAGE(Review Rating)
   - **Purchase Frequency**: COUNTROWS() to calculate the number of transactions for each customer.
   - **Discount Impact**: Created a calculated column to differentiate between purchases with and without discounts.
3. **Calculated Columns**:
   - Created new columns for key business metrics, such as identifying high-value customers or categorizing purchases by season.

Visualizations

Each visualization was selected to meet specific analytical needs and improve data storytelling:

1. **Bar Charts**:
   - **Purpose**: Compare quantitative data, such as revenue by category or sales across regions.
   - **Example**: A bar chart showing top-selling product categories helps identify trends.
2. **Pie Charts and Donut Charts**:
   - **Purpose**: Show proportions, such as the share of purchases by gender or the usage rate of promo codes.
   - **Example**: A donut chart illustrates how promo codes impact total revenue.
3. **KPI Cards**:
   - **Purpose**: Highlight key metrics at a glance, such as total revenue, customer count, and average sales per transaction.
   - **Example**: A KPI card showing the total number of customers helps gauge customer engagement.
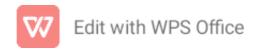4. **Line Charts**:
   - **Purpose**: Display trends over time, such as monthly revenue fluctuations.
   - **Example**: A line chart reveals seasonal spikes in sales during winter and spring.
5. **Tables**:
   - **Purpose**: Provide detailed information, such as product-level sales data or customer purchase frequencies.
   - **Example**: A table listing the top 10 products with the highest sales.
6. **Map Visualizations**:
   - **Purpose**: Offer geographical insights by visualizing sales data across regions.
   - **Example**: A map showing revenue distribution helps businesses focus on high-performing locations.

User Interactivity

The dashboard includes interactive features to enhance usability:

1. **Filters and Slicers**: Allow users to explore data by categories, time periods, and demographics.
2. **Drill-Through Pages**: Enable users to click on a category or region to access more detailed insights.
3. **Hover Effects**: Tooltips provide additional information, such as total revenue or average discount, when hovering over a visual element.

Insights and Recommendations

Key Insights

Through detailed analysis using Power BI, several critical findings emerged. Each insight was supported by relevant visualizations to enhance understanding and guide actionable strategies.

1. **Product Performance**:
   - **Insight**: Clothing is the leading category, with jeans, sweaters, and jackets being top contributors to revenue. Accessories, while underperforming, have untapped potential for increased sales.
   - **Graph Used**:
     - **Bar Chart**: Displayed revenue generated by each product category.
     - **Clustered Bar Chart**: Showed individual product contributions within categories.
     - These visuals provided a clear comparison between products and their performance, making trends easy to identify.
2. **Customer Demographics**:
   - **Insight**: Middle-aged customers (30–50 years old) contribute over 60% of total sales, indicating this group is a priority for marketing efforts. Female customers have higher purchase frequency and transaction value compared to male customers.
   - **Graph Used**:
     - **Pie Chart**: Illustrated the proportion of total revenue by gender.
     - **Stacked Bar Chart**: Broke down revenue by age group, with color coding for gender within each age group.
   - These graphs effectively highlighted the demographic segments contributing the most to revenue, aiding in customer segmentation strategies.
3. **Seasonal Trends**:
   - **Insight**: Sales peak during winter and spring, driven by seasonal demand for clothing and discounts. Summer months show the lowest

revenue, indicating the need for targeted seasonal strategies.
- o **Graph Used**:
  - ▪ **Line Chart**: Displayed monthly revenue trends over the year, showing clear peaks and troughs.
  - ▪ **Heat Map**: Highlighted sales performance by month and category, revealing seasonal patterns.
- o The line chart and heat map made it easy to visualize how seasonality impacts sales and where to focus efforts.

4. **Impact of Discounts and Promo Codes**:
- o **Insight**: Discounts and promo codes significantly influence sales. Over 40% of transactions involve promotional incentives, with repeat customers showing a strong preference for these offers.
- o **Graph Used**:
  - ▪ **Donut Chart**: Represented the proportion of sales with and without promo codes.
  - ▪ **Clustered Column Chart**: Compared revenue generated with and without discounts.
- o These graphs helped quantify the importance of discounts and informed strategies to optimize promotional campaigns.

5. **Geographical Insights**:
- o **Insight**: Urban regions contribute the most revenue, but suburban areas show potential for growth. Rural regions underperform, suggesting marketing efforts could be reallocated.
- o **Graph Used**:
  - ▪ **Map Visualization**: Showed geographical distribution of sales, with color intensity indicating revenue levels.
  - ▪ **Bubble Map**: Displayed key urban and suburban areas contributing to sales.
- o These maps offered a spatial view of sales performance, making it easier to identify high- and low-performing regions.

Business Recommendations

1. **Optimize Marketing Strategies**:
- o Focus advertising on middle-aged customers and female shoppers, who are the most profitable segments.
- o Develop personalized campaigns for top-selling products like jeans and sweaters.

2. **Seasonal Inventory Planning**:
- o Stock up on winter and spring collections well in advance to meet seasonal demand.
- o Launch exclusive summer promotions to increase sales during slower months.

3. **Enhanced Promotions**:
- o Create targeted promo campaigns for repeat customers to drive loyalty.
- o Experiment with bundled discounts to increase accessory sales and cross-sell opportunities.

4. **Geographic Targeting**:
- o Invest more in marketing and distribution for urban regions, which

already generate high revenue.
- o Explore suburban markets with region-specific offers to tap into their growth potential.
5. **Expand Product Offerings**:
   - o Introduce trendy accessories and bundle them with clothing to enhance their appeal.
   - o Conduct surveys to identify gaps in product offerings and adjust inventory accordingly.

Visuals Used to Support Insights and Recommendations

1. **Bar Charts**:
   - o Purpose: Compare revenue across products and categories.
   - o Example: Highlight top-performing products like jeans and sweaters.
2. **Pie and Donut Charts**:
   - o Purpose: Show proportions, such as gender-wise revenue distribution or sales with promo codes.
   - o Example: Illustrate that female customers contribute the most to sales.
3. **Line Charts**:
   - o Purpose: Track trends over time.
   - o Example: Show seasonal spikes in revenue, emphasizing the importance of winter and spring.
4. **Stacked Bar Charts**:
   - o Purpose: Provide a breakdown within groups, such as age-wise and gender-wise revenue.
   - o Example: Reveal that middle-aged women are the most active shoppers.
5. **Maps (Heat and Bubble)**:
   - o Purpose: Display geographical sales performance.
   - o Example: Highlight urban regions as high-revenue zones while identifying suburban growth potential.
6. **Clustered Column Charts**:
   - o Purpose: Compare multiple variables side by side.
   - o Example: Show the impact of discounts on revenue.

Limitations

While the analysis provides valuable insights, it is essential to acknowledge certain limitations:

1. **Data Coverage**: The dataset focuses primarily on past transactions, limiting its ability to predict future trends accurately.
2. **Customer Demographics**: Some regions or demographic groups may be underrepresented, potentially skewing insights.
3. **Promo Code Analysis**: The dataset does not include details about the origin of promo codes, making it difficult to assess the effectiveness of specific campaigns.

Summary of Outcomes

1. **Enhanced Understanding of Customer Behavior:**
   - The analysis revealed that middle-aged female customers are the most profitable demographic. By targeting this group with personalized marketing campaigns and loyalty programs, businesses can boost customer retention and revenue.
   - Seasonal trends in sales were identified, with winter and spring contributing the most revenue. These insights emphasize the importance of season-specific inventory planning and promotional strategies.
2. **Optimized Product Strategies:**
   - Clothing emerged as the top-performing category, with clear opportunities to increase accessory sales through bundling or targeted campaigns.
   - The data demonstrated the strong influence of discounts and promo codes on sales, providing a clear direction for future promotional strategies.
3. **Geographical Insights for Expansion:**
   - Urban regions remain a stronghold for revenue generation, but suburban areas show potential for growth with the right marketing focus. Understanding geographical variations enables more strategic allocation of resources and efforts.
4. **Data-Driven Decision-Making:**
   - Power BI's interactive dashboard offers stakeholders a clear, visual representation of performance metrics, allowing for real-time data exploration and more informed decisions.

Impact on Business Decision-Making

The findings equip the business with a data-driven roadmap to:

- Enhance customer engagement by focusing on profitable demographics and tailoring campaigns accordingly.
- Address seasonal demand fluctuations with better inventory planning and promotions.
- Allocate resources strategically across high-performing products and geographical regions.
- Improve overall profitability by leveraging insights into discount and promo code effectiveness.

Future Improvements and Extensions

While the analysis successfully addressed the project's objectives, there are opportunities to expand and refine this work in the future:

1. **Integrate Predictive Analytics**:
   - Using advanced machine learning models within Power BI, the business could predict future sales trends, customer behaviors, and market demands.
2. **Include Additional Data Sources**:
   - Incorporating external data, such as competitor performance, social media trends, or economic factors, could provide a more holistic view.
3. **Enhance Customer Segmentation**:
   - Diving deeper into customer behavior by analyzing purchase frequencies, lifetime value, and feedback ratings can lead to even more targeted strategies.
4. **Refine Dashboard Interactivity**:
   - Adding more dynamic filters, drill-through pages, and cross-highlighting capabilities will enhance user experience and make the dashboard more intuitive.

This project underscores the value of Power BI as a tool for unlocking insights and empowering businesses to make evidence-based decisions. By applying the recommendations derived from this analysis, the organization can better align its operations with customer preferences and market dynamics, paving the way for sustained growth and success.