SQL Queries Analysis and Data Insights

The provided SQL queries cover a range of business-critical metrics, including sales performance, customer behavior, product profitability, inventory management, and promotional analysis. Below is a detailed breakdown of the types of analyses conducted by each query, along with insights into the expected output data.

1. Total Sales by State

- **Purpose**: This query calculates the total sales in each state by summing the sales price across transactions.
- **Analysis**:
    - **Output**: The states are ranked based on total sales.
    - **Expected Insight**: The top states by sales can indicate geographic areas where the company is performing well. It may highlight opportunities for expansion, advertising, or market saturation in certain regions.
    - **Actionable Insights**:
        - Target high-performing states with promotions.
        - Investigate reasons for low sales in other states.

```sql
SELECT state, SUM(sales_price) AS total_sales
FROM sales_data
GROUP BY state
ORDER BY total_sales DESC;
```

2. Total Profit by Product Category

- **Purpose**: This query evaluates profitability across different product categories by calculating the sum of net profit for each category.
- **Analysis**:
    - **Output**: The product categories are ranked by total profit.
    - **Expected Insight**: This query identifies which product categories are driving the most profit. Higher profitability categories could be prioritized for inventory, marketing, and promotional efforts.
    - **Actionable Insights**:
        - Invest in marketing or expanding high-profit categories.

        - Review lower-performing categories for potential improvement or discontinuation.

```
 SELECT product_category, SUM(profit) AS total_profit
FROM sales_data
GROUP BY product_category
ORDER BY total_profit DESC;
```

3. Total Sales Across All Channels

- **Purpose**: It compares total sales and the number of transactions across different sales channels: Store, Catalog, and Web.
- **Analysis**:
    - **Output**: A breakdown of total sales and transaction volume by channel.
    - **Expected Insight**: This multi-channel sales view helps understand which channels are driving the most revenue. It can inform decisions regarding resource allocation, channel optimization, and customer engagement strategies.
    - **Actionable Insights**:
        - If one channel is underperforming, investigate its cause.
        - Optimize the customer experience in the highest-performing channel.

```
SELECT sales_channel, SUM(sales_price) AS total_sales, COUNT(*) AS
total_transactions
FROM sales_data
GROUP BY sales_channel
ORDER BY total_sales DESC;
```

4. Top Customers by Total Spend

- **Purpose**: The query identifies the top 10 customers based on their total spend in-store.
- **Analysis**:
    - **Output**: A list of top customers ranked by total sales spent.
    - **Expected Insight**: These customers are likely the most loyal and valuable. Understanding their purchase behavior can help in developing loyalty programs, personalized marketing campaigns, or exclusive offers.

    - **Actionable Insights**:
        - Build tailored rewards or VIP programs to retain top customers.
        - Study their buying patterns to replicate similar behaviors in other customer segments.

```sql
SELECT customer_id, SUM(sales_price) AS total_spent
FROM sales_data
GROUP BY customer_id
ORDER BY total_spent DESC
LIMIT 10;
```

5. Sales Performance by Product Category

- **Purpose**: This query calculates the total sales and number of transactions for each product category.
- **Analysis**:
    - **Output**: The product categories ranked by total sales.
    - **Expected Insight**: This reveals which categories contribute the most to overall revenue, which may differ from profitability (see Query 2). High sales volume in a particular category suggests strong demand.
    - **Actionable Insights**:
        - Focus marketing efforts on high-sales categories.
        - Analyze low-performing categories to improve sales.

```sql
SELECT product_category, SUM(sales_price) AS total_sales, COUNT(*) AS
total_transactions
FROM sales_data
GROUP BY product_category
ORDER BY total_sales DESC;
```

6. Sales by Promotion

- **Purpose**: This query analyzes the total sales generated during promotions, broken down by each specific promotion.
- **Analysis**:
    - **Output**: A ranking of promotions by total sales and number of transactions.

    - **Expected Insight**: Understanding which promotions drive the most sales helps in designing future promotions. It can also inform decisions about discounting, bundling, or coupon distribution.
    - **Actionable Insights**:
        - Replicate or extend successful promotions.
        - Reevaluate promotions that underperformed.

```
SELECT promotion_id, SUM(sales_price) AS total_sales, COUNT(*) AS
total_transactions
FROM sales_data
WHERE promotion_id IS NOT NULL
GROUP BY promotion_id
ORDER BY total_sales DESC;
```

7. Top Selling Products by Revenue

- **Purpose**: This query identifies the top 10 products generating the most revenue.
- **Analysis**:
    - **Output**: A list of the top 10 products by revenue, with the total units sold.
    - **Expected Insight**: This identifies which products are most valuable in terms of revenue generation, helping to guide product positioning, inventory stocking, and sales strategies.
    - **Actionable Insights**:
        - Increase stock or promote top products to boost sales.
        - Examine underperforming products for potential improvements or discontinuation.

```
SELECT product_id, SUM(sales_price) AS total_revenue,
SUM(quantity_sold) AS total_units_sold
FROM sales_data
GROUP BY product_id
ORDER BY total_revenue DESC
LIMIT 10;
```

8. Sales Performance by Store

- **Purpose**: This query calculates total sales and the number of transactions at each store location.
- **Analysis**:
    - **Output**: Sales and transactions are ranked by store location.
    - **Expected Insight**: This analysis highlights the best-performing stores and those that may require improvement.
    - **Actionable Insights**:
        - Consider shifting resources or marketing efforts to lower-performing stores.
        - Reward or incentivize top-performing store managers or teams.

```
SELECT store_id, SUM(sales_price) AS total_sales, COUNT(*) AS
total_transactions
FROM sales_data
GROUP BY store_id
ORDER BY total_sales DESC;
```

9. Inventory Management by Product Category

- **Purpose**: This query computes the average inventory levels for each product category.
- **Analysis**:
    - **Output**: A breakdown of average inventory levels by category.
    - **Expected Insight**: The inventory analysis helps ensure optimal stock levels. Categories with too much inventory may indicate overstocking, while low levels may point to a risk of stockouts.
    - **Actionable Insights**:
        - Adjust stock levels based on sales velocity.
        - Reduce excess inventory in overstocked categories to avoid holding costs.

```
SELECT product_category, AVG(inventory_level) AS avg_inventory
FROM inventory_data
GROUP BY product_category
ORDER BY avg_inventory DESC;
```

10. Sales by Customer Demographics (Income)

- **Purpose**: This query analyzes sales based on the income band of customers.

- **Analysis**:
    - **Output**: A breakdown of total sales by income band.
    - **Expected Insight**: This helps identify which income segments contribute the most to sales, offering a glimpse into the purchasing power of the customer base.
    - **Actionable Insights**:
        - Tailor promotions and product offerings to high-income bands.
        - Create targeted campaigns for underrepresented income groups to increase sales.

```
 SELECT income_band, SUM(sales_price) AS total_sales
FROM customer_data
JOIN sales_data ON customer_data.customer_id = sales_data.customer_id
GROUP BY income_band
ORDER BY total_sales DESC;
```

11. Customer Lifetime Value

- **Purpose**: It calculates the total lifetime spend of each customer.
- **Analysis**:
    - **Output**: Customers ranked by lifetime value (total spend).
    - **Expected Insight**: This is crucial for identifying high-value customers and creating long-term engagement strategies to retain them.
    - **Actionable Insights**:
        - Implement customer retention strategies for high-value customers.
        - Develop marketing plans to boost lifetime value in other customer segments.

```
SELECT customer_id, SUM(sales_price) AS lifetime_value
FROM sales_data
GROUP BY customer_id
ORDER BY lifetime_value DESC;
```

12. Sales by Age Group

- **Purpose**: This query groups sales by customer age range.
- **Analysis**:
    - **Output**: A breakdown of sales across different age groups.

    - **Expected Insight**: Understanding which age groups are spending the most can inform product offerings, pricing strategies, and marketing campaigns.
    - **Actionable Insights**:
        - Align marketing strategies with the preferences of the top-spending age group.
        - Diversify product lines or promotions to appeal to lower-performing age groups.

```
SELECT age_group, SUM(sales_price) AS total_sales
FROM customer_data
JOIN sales_data ON customer_data.customer_id = sales_data.customer_id
GROUP BY age_group
ORDER BY total_sales DESC;
```

13. Frequent Product Purchases Together

- **Purpose**: This query identifies products frequently purchased together.
- **Analysis**:
    - **Output**: Common product pairings based on transaction data.
    - **Expected Insight**: Frequently purchased product combinations suggest opportunities for bundling, cross-selling, and upselling.
    - **Actionable Insights**:
        - Develop product bundles or discounts for frequent pairings.
        - Suggest related products during the customer checkout process.

```
SELECT p1.product_id AS product_1, p2.product_id AS product_2,
COUNT(*) AS purchase_frequency
FROM sales_data p1
JOIN sales_data p2 ON p1.transaction_id = p2.transaction_id
WHERE p1.product_id != p2.product_id
GROUP BY product_1, product_2
ORDER BY purchase_frequency DESC
LIMIT 10;
```

14. Inventory Turnover by Product Category

- **Purpose**: This query evaluates the inventory turnover rate by product category.
- **Analysis**:
    - **Output**: The total number of units sold and average inventory on hand, per category.
    - **Expected Insight**: Categories with high turnover are moving quickly, while low-turnover categories may be overstocked or underperforming.
    - **Actionable Insights**:
        - Focus on restocking fast-moving products.
        - Reduce inventory levels or discontinue products with slow turnover.

```
SELECT product_category, SUM(quantity_sold) AS total_units_sold,
AVG(inventory_level) AS avg_inventory
FROM sales_data
JOIN inventory_data ON sales_data.product_id =
inventory_data.product_id
GROUP BY product_category
ORDER BY total_units_sold DESC;
```

15. Promotion vs. Non-Promotion Sales

- **Purpose**: It compares sales during promotional periods to non-promotion periods.
- **Analysis**:
    - **Output**: A breakdown of total sales and transactions for promotion vs. non-promotion.
    - **Expected Insight**: This helps assess the effectiveness of promotions in driving sales compared to regular sales periods.
    - **Actionable Insights**:
        - Increase promotional frequency if promotions significantly boost sales.
        - Explore different promotional strategies if promotions show little impact.

```
SELECT
  CASE
    WHEN promotion_id IS NULL THEN 'Non-Promotion'
    ELSE 'Promotion'
  END AS sales_type,
```

```
  SUM(sales_price) AS total_sales,
  COUNT(*) AS total_transactions
FROM sales_data
GROUP BY sales_type
ORDER BY total_sales DESC;
```

Conclusion

These queries provide a comprehensive view of various business metrics, offering valuable insights into sales performance, customer behavior, inventory management, and promotional effectiveness. By acting on these insights, the business can optimize resources, improve customer retention, enhance product offerings, and boost overall profitability.