New Wheels Project

Introduction to SQL

Problem Statement

Business Context

A lot of people in the world share a common desire: to own a vehicle. A car or an automobile is seen as an object that gives the freedom of mobility. Many now prefer pre-owned vehicles because they come at an affordable cost, but at the same time, they are also concerned about whether the after-sales service provided by the resale vendors is as good as the care you may get from the actual manufacturers.

New-Wheels, a vehicle resale company, has launched an app with an end-to-end service from listing the vehicle on the platform to shipping it to the customer's location. This app also captures the overall after-sales feedback given by the customer.

Objective

New-Wheels sales have been dipping steadily in the past year, and due to the critical customer feedback and ratings online, there has been a drop in new customers every quarter, which is concerning to the business. The CEO of the company now wants a quarterly report with all the key metrics sent to him so he can assess the health of the business and make the necessary decisions.

As a data analyst, you see that there is an array of questions that are being asked at the leadership level that need to be answered using data. Import the dump file that contains various tables that are present in the database. Use the data to answer the questions posed and create a quarterly business report for the CEO.

Business Questions

Question 1: Find the total number of customers who have placed orders. What is the distribution of the customers across states?

Solution Query:

To find the total number of customers who have placed orders

```
SELECT  COUNT(DISTINCT customer_id) AS total_customers_with_orders
FROM order_t;
```

To find the distribution of the customers across states

```
SELECT  c.state, COUNT(DISTINCT o.customer_id) AS customer_count
FROM order_t o
JOIN customer_t c ON o.customer_id = c.customer_id
GROUP BY c.state ORDER BY customer_count DESC;
```

Output:

Result Grid | Filter Rows: | Expo

total_customers
994

state	customer_count
California	97
Texas	97
Florida	86
New York	69
District of Columbia	35
Colorado	33
Ohio	33
Alabama	29
Washington	28
Arizona	26
Illinois	25

Observations and Insights:

- California and Texas have a significantly higher number of customers.
- Maine, Vermont, and Wyoming have only single customers, and there are many states with single-digit customers
- If certain states prefer specific vehicle makers or models, this could indicate regional brand loyalty or economic factors affecting purchase decisions.

Question 2: Which are the top 5 vehicle makers preferred by the customers?

Solution Query:

```
SELECT

vehicle_maker,count(vehicle_maker)as total_orders

 from product_t

group by vehicle_maker

order by total_orders DESC;
```

Output:

	vehicle_maker	total_orders
▶	Chevrolet	83
	Ford	63
	Toyota	52
	Dodge	50
	Pontiac	50
	Mercedes-Benz	45
	Mazda	43
	Mitsubishi	41
	Buick	40
	GMC	37
	Volkswagen	35

Observations and Insights:

- The most ordered vehicle makers are Chevrolet, and Ford takes the next place. No close competition between these two.
- Toyota, Dodge, and Pontiac have close competition, which stood at 3rd,4th, and 5th place, respectively.
- Daewoo, MG, Citron, Austin and RAM vehle_maker have only single customer.

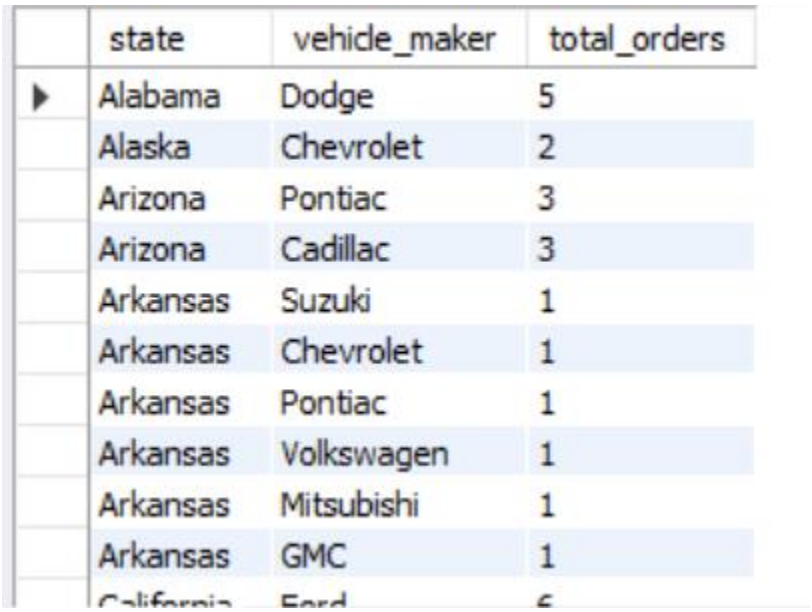
Question 3: Which is the most preferred vehicle maker in each state?

Solution Query:

```
WITH StateWisePreferences AS (
   SELECT
    c.state, p.vehicle_maker, COUNT(o.product_id) AS total_orders,
    RANK() OVER (PARTITION BY c.state ORDER BY COUNT(o.product_id) DESC) AS rank_order
   FROM order_t o
   JOIN customer_t c ON o.customer_id = c.customer_id
   JOIN product_t p ON o.product_id = p.product_id
   GROUP BY c.state, p.vehicle_maker
      )
   SELECT state, vehicle_maker, total_orders
    FROM StateWisePreferences
    WHERE rank_order = 1;
```

Output:

<Attach the screenshot of your output table>



state	vehicle_maker	total_orders
Alabama	Dodge	5
Alaska	Chevrolet	2
Arizona	Pontiac	3
Arizona	Cadillac	3
Arkansas	Suzuki	1
Arkansas	Chevrolet	1
Arkansas	Pontiac	1
Arkansas	Volkswagen	1
Arkansas	Mitsubishi	1
Arkansas	GMC	1
California	Ford	6

Observations and Insights:

- More than two brands dominate in multiple states.
- Different states prefer different vehicle makers.
- Two or more brands have similar order counts in a state, and some states have low orders across all brands.

Question 4: Find the overall average rating given by the customers. What is the average rating in each quarter?

Consider the following mapping for ratings: “Very Bad”: 1, “Bad”: 2, “Okay”: 3, “Good”: 4, “Very Good”: 5

Solution Query:

```
WITH RatingMapping AS (
        SELECT
        order_id,
        quarter_number,
        CASE
        WHEN customer_feedback = 'Very Bad' THEN 1
        WHEN customer_feedback = 'Bad' THEN 2
        WHEN customer_feedback = 'Okay' THEN 3
        WHEN customer_feedback = 'Good' THEN 4
        WHEN customer_feedback = 'Very Good' THEN 5
        END AS rating_value
        FROM order_t
      )
```

- Overall Average Rating

```
SELECT
  (SELECT AVG(rating_value) FROM RatingMapping) AS overall_avg_rating,
  quarter_number,
  AVG(rating_value) AS avg_rating_per_quarter
FROM RatingMapping
GROUP BY quarter_number
ORDER BY quarter_number;
```

Output:

overall_avg_rating	quarter_number	avg_rating_per_quarter
3.1350	1	3.5548
3.1350	2	3.3550
3.1350	3	2.9563
3.1350	4	2.3970

Observations and Insights:

- The average rating for the 1st and 2nd quarter is in between 3 and 4 indicates that the customers have mixed experiences and need improvements.
- The 3rd and 4th quarters have average rating below 3 indicates serious dissatisfaction of the customers and a need for urgent attention, so identify the customer support gaps.
- The average rating in the 4th quarter might be due to higher order volumes and delays during the holiday season.

Question 5: Find the percentage distribution of feedback from the customers. Are customers getting more dissatisfied over time?

Solution Query:

```
SELECT
  customer_feedback,
  COUNT(*) AS feedback_count,
  (COUNT(*) * 100.0 / (SELECT COUNT(*) FROM order_t)) AS percentage_distribution
```

```
FROM order_t

GROUP BY customer_feedback

ORDER BY percentage_distribution DESC;


WITH RatingTrend AS (

    SELECT  quarter_number, COUNT(*) AS total_feedback,

    SUM(CASE WHEN customer_feedback IN ('Very Bad', 'Bad') THEN 1 ELSE 0 END) AS
negative_feedback

   FROM order_t

   GROUP BY quarter_number

)

SELECT

 quarter_number,

 (negative_feedback * 100.0 / total_feedback) AS negative_feedback_percentage

FROM RatingTrend

ORDER BY quarter_number;
```

Output:

customer_feedback	feedback_count	percentage_distribution
Very Good	226	22.60000
Good	215	21.50000
Okay	202	20.20000
Bad	182	18.20000
Very Bad	175	17.50000

quarter_number	negative_feedback_percentage
1	22.25806
2	29.00763
3	40.61135
4	59.79899

Observations and Insights:

- Very good 22.6% and Good 21.5%, combined make up 44.1% of the feedback, indicates customer moderate satisfaction.
- Ok is 20.2% are neutral customers who could be influenced either positively or negatively. Measures should be taken to make them to turn towards positive.
- Bad is 18.2% and very bad is 17.5%, combinely 35.7%. so there is no much gap between satisfied and dissatisfied customers.

Question 6: What is the trend of the number of orders by quarter?

Solution Query:

```
SELECT

quarter_number,

COUNT(order_id) AS total_orders

FROM order_t

GROUP BY quarter_number

ORDER BY quarter_number;
```

Output:

quarter_number	total_orders
1	310
2	262
3	229
4	199

Observations and Insights:

- The number of orders are continuously decresing in each quarter.
- Total orders decreased from 310 to 199 from the 1st quarter to the 4th quarter.
- The reason for this decrement might be due to customer dissatisfaction.

Question 7: Calculate the net revenue generated by the company. What is the quarter-over-quarter % change in net revenue?

Solution Query:

```
SELECT
   SUM(quantity * order_t.vehicle_price * (1 - discount / 100)) AS net_revenue
   FROM order_t  JOIN product_t ON order_t.product_id = product_t.product_id;
```

- To find net revenue by quarter

```
SELECT
   quarter_number,
   SUM(quantity * product_t.vehicle_price * (1 - discount / 100)) AS net_revenue
FROM order_t
JOIN product_t ON order_t.product_id = product_t.product_id
GROUP BY quarter_number
ORDER BY quarter_number;
```

- To find quarter over quarter % change

```
WITH RevenueByQuarter AS (
   SELECT
      quarter_number,
      SUM(quantity * vehicle_price * (1 - discount / 100)) AS net_revenue
   FROM order_t
   JOIN product_t ON order_t.product_id = product_t.product_id
   GROUP BY quarter_number
)
SELECT
```

```
    r1.quarter_number,
    r1.net_revenue,
    ((r1.net_revenue - r2.net_revenue) / r2.net_revenue) * 100 AS qoq_percentage_change
FROM RevenueByQuarter r1
LEFT JOIN RevenueByQuarter r2
ON r1.quarter_number = r2.quarter_number + 1
ORDER BY r1.quarter_number;
```

Output:

net_revenue
124714086.25967353800000

quarter_number	net_revenue
1	39421580.15929600000000
2	32715830.39237633800000
3	29229896.19364900000000
4	23346779.51435220000000

Observations and Insights:

- Net revenue dropped every quarter.
- The biggest drop in revenue is from Q3 to Q4.
- The drop aligns with the falling order trend.

Question 8: What is the trend of net revenue and orders by quarters?

Solution Query:

```
WITH QuarterlyData AS (
    SELECT
     quarter_number,  COUNT(order_id) AS total_orders,
    SUM(quantity * order_t.vehicle_price * (1 - discount / 100)) AS net_revenue
```

```
    FROM order_t
    JOIN product_t ON order_t.product_id = product_t.product_id
    GROUP BY quarter_number
),
QoQChange AS (
    SELECT
      q1.quarter_number, q1.total_orders, q1.net_revenue,
       ((q1.total_orders - q2.total_orders) / NULLIF(q2.total_orders, 0)) * 100 AS qoq_orders_change,
       ((q1.net_revenue - q2.net_revenue) / NULLIF(q2.net_revenue, 0)) * 100 AS qoq_revenue_change
    FROM QuarterlyData q1
    LEFT JOIN QuarterlyData q2
    ON q1.quarter_number = q2.quarter_number + 1
)
SELECT * FROM QoQChange
ORDER BY quarter_number;
```

Output:

quarter_number	total_orders	net_revenue	qoq_orders_change	qoq_revenue_change
1	310	39421580.15929600	NULL	NULL
2	262	32715830.33996200	-15.4839	-17.010352685603
3	229	29229896.19364900	-12.5954	-10.655190805458
4	199	23346779.63060600	-13.1004	-20.127052535757

Observations and Insights:

- Both orders and net revenue are showing a declining trend.
- 4th quarter shows biggest revenue drop
- This might be due to seasonal effects.

Question 9: What is the average discount offered for different types of credit cards?

Solution Query:

```
SELECT c.credit_card_type, ROUND(AVG(o.discount), 2) AS avg_discount
FROM customer_t c
JOIN order_t o ON c.customer_id = o.customer_id
GROUP BY c.credit_card_type
ORDER BY avg_discount DESC;
```

Output:

credit_card_type	avg_discount
laser	0.64
mastercard	0.63
visa-electron	0.62
china-unionpay	0.62
americanexpress	0.62
maestro	0.62
instapayment	0.62
jcb	0.61
switch	0.61
diners-club-carte-blanche	0.61
bankcard	0.61
diners-club-us-ca	0.61
diners-club-enroute	0.60
visa	0.60
solo	0.59

Observations and Insights:

- Discounts are fairly uniform, so discounts are not a key differentiator.
- Laser credit card type holders are getting the highest average discount.
- Diners-club-international, solo and visa credit card type holders are getting least avg discount.

Question 10: What is the average time taken to ship the placed orders for each quarter?

Solution Query:

```
SELECT
   quarter_number,
   ROUND(AVG(DATEDIFF(ship_date, order_date)), 2) AS avg_shipping_days
FROM order_t
WHERE ship_date IS NOT NULL
GROUP BY quarter_number
ORDER BY quarter_number;
```

Output:

quarter_number	avg_shipping_days
1	57.17
2	71.11
3	117.76
4	174.10

- Shipping time is increasing drastically over quarters.
- In Q4, the average shipping time is 174.1 days, which is not acceptable for customers.
- Customers may cancel orders or switch to competitors if the delay continues.
- Long shipping times may be linked to poor feedback scores.

Business Metrics Overview

Total Revenue	Total Orders	Total Customers	Average Rating
124714086.259673538	1000	994	3.1350
Last Quarter Revenue	**Last quarter Orders**	**Average Days to Ship**	**% Good Feedback**
23346779.5143522	199	105.035	21.5

Business Recommendations

- Total revenue, total orders are steadily declining in each quartile. Make the products available according to the customer requirement, improve marketing efforts and promotions to attract more customers.
- Shipping time has increased drastically from 57.17 days(Q1) to 174.1 days(Q4) leading to customer dissatisfaction. Optimize logistics to reduce delivery delays, improve inventory forecasting to avoid stock shortages leading to delays.
- The overall customer rating is 3.135, which is close to okay. So, improve product quality and service and provide after-sales support to enhance the customer experience.
- Chevrolet, Ford, Toyota, Dodge, and Potiac are the top 5 preferred vehicle makers. Prioritize stocking and promoting these brands, negotiate better supplier deals to improve profit margins.