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:

SELECT COUNT(DISTINCT customer_id) AS total_customers

FROM order_t;
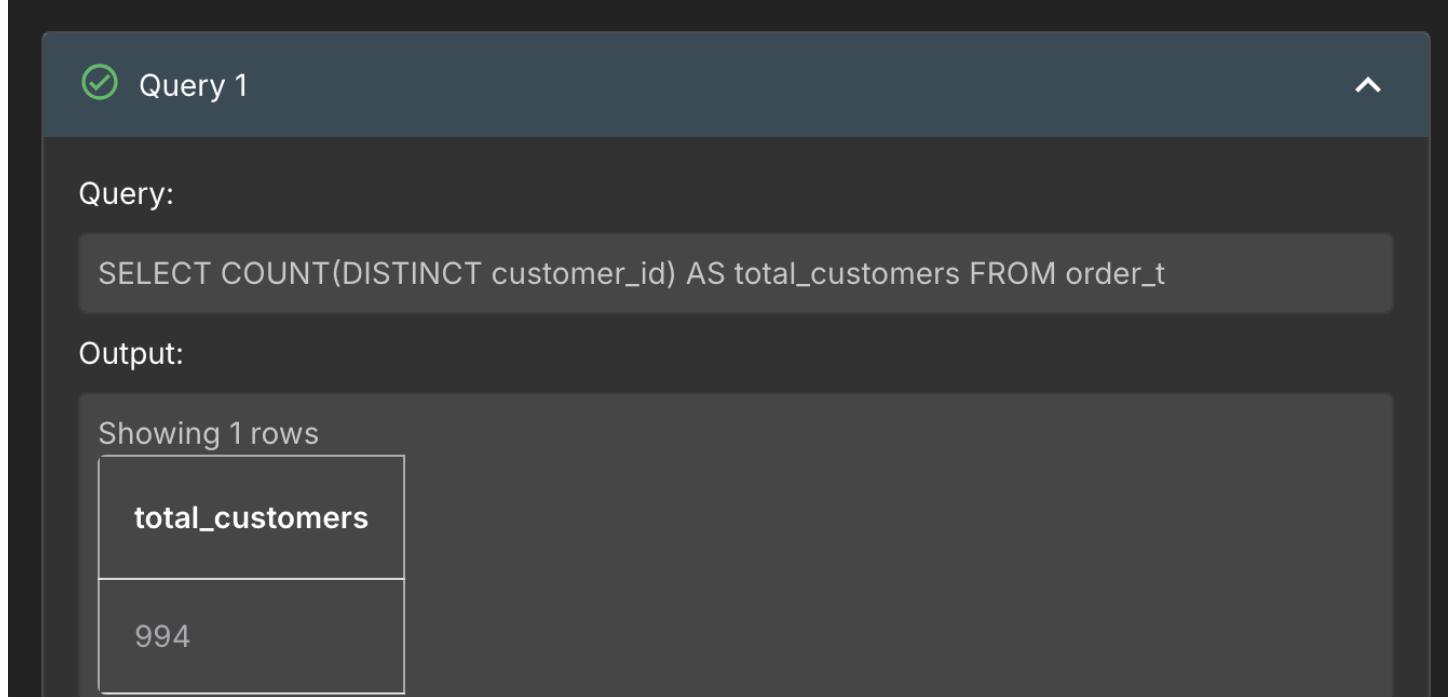
What is the distribution of the customers a cross states?

SELECT state, COUNT(*) AS number_of_customers

FROM customer_t

GROUP BY state

ORDER BY number_of_customers DESC;

Output:

- Total number of customers who have placed orders displayed first
- Distribution of customers across states displayed 2nd

Result: **Passed**

✓ Query 1 ⌃

Query:

```
SELECT COUNT(DISTINCT customer_id) AS total_customers FROM order_t
```

Output:

Showing 1 rows

total_customers
994

Result: Passed

✓ Query 1 ⌃

Query:

```
SELECT state, COUNT(*) AS number_of_customers FROM customer_t GROUP BY state
ORDER BY number_of_customers DESC
```

Output:

Showing first 10 rows out of 49 rows

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

Observations and Insights:

- **The total number of unique customers who have placed orders is 994.**
- Insights and metrics on the provides understanding of the customer base size which can help us understand the reach of New Wheels service. New Wheels has a high unique customer number which usually indicates that they have a wide market impact.
- **Looking at distribution across states**, we can identify regions with a higher customer market. Understanding this, New Wheels marketing and sales strategies can ensure focus on these areas for high growth potential. We also so areas where there are low customer numbers, these can help New Wheels understand areas of improvement or expansion.

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

Solution Query:

SELECT vehicle_maker, COUNT(*) AS num_orders

FROM order_t

JOIN product_t ON order_t.product_id = product_t.product_id

GROUP BY vehicle_maker

ORDER BY num_orders DESC LIMIT 5

Output:

Result: Passed

⊘ Query 1 ⌃

Query:

```
SELECT vehicle_maker, COUNT(*) AS num_orders FROM order_t JOIN product_t ON
order_t.product_id = product_t.product_id GROUP BY vehicle_maker ORDER BY
num_orders DESC LIMIT 5
```

Output:

Showing 5 rows

vehicle_maker	num_orders
Chevrolet	83
Ford	63
Toyota	52
Pontiac	50
Dodge	50

Observations and Insights:

- In the above table we have displayed the top 5 auto makers preferred by customers
  - **Chevolet: 83 orders**
  - **Ford: 63 orders**
  - **Toyota: 52 orders**
  - **Pontiac: 50 orders**
  - **Dodge: 50 orders**
- Chevrolet is he clear market leader here with 83 orders indicting a strong preference amongst unique customers. Ford and Toyota lead behind also indicating they are popular choices within the market. Pontiac and Dodge suggest a competitive market between the 2 brands since they have an equal amount of customer orders at 50.
- This information can help New Wheels focus marketing and inventory efforts to the more popular brands. This can allow them to have sufficient stock for higher demand vehicles while also strategizing campaigns for lower performing brands.

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

Solution Query:

SELECT

state,

vehicle_maker,

total_customers,

cus_rank

FROM (

SELECT

c.state,

p.vehicle_maker,

COUNT(DISTINCT o.customer_id) AS total_customers,

RANK() OVER (PARTITION BY c.state ORDER BY COUNT(DISTINCT o.customer_id) DESC) AS cus_rank

FROM order_t o

JOIN product_t p ON o.product_id = p.product_id

JOIN customer_t c ON o.customer_id = c.customer_id

GROUP BY c.state, p.vehicle_maker) ranked_vehicles

WHERE cus_rank = 1

ORDER BY state;

Query 1 ✓

Query:

```
SELECT state, vehicle_maker, total_customers, cus_rank FROM (SELECT c.state,
p.vehicle_maker, COUNT(DISTINCT o.customer_id) AS total_customers, RANK() OVER
(PARTITION BY c.state ORDER BY COUNT(DISTINCT o.customer_id) DESC) AS cus_rank
FROM order_t o JOIN product_t p ON o.product_id = p.product_id JOIN customer_t c ON
o.customer_id = c.customer_id GROUP BY c.state, p.vehicle_maker) ranked_vehicles
WHERE cus_rank = 1 ORDER BY state
```

Output:

Showing first 10 rows out of 143 rows

state	vehicle_maker	total_customers	cus_rank
Alabama	Dodge	5	1
Alaska	Chevrolet	2	1
Arizona	Pontiac	3	1
Arizona	Cadillac	3	1
Arkansas	Volkswagen	1	1
Arkansas	Suzuki	1	1
Arkansas	Pontiac	1	1
Arkansas	Mitsubishi	1	1
Arkansas	GMC	1	1
Arkansas	Chevrolet	1	1

Observations and Insights:

- The table shows us 4 states: Alabama, Alaska, Arizona and Arkansas
  The top automaker for Alabama is Dodge, with a customer rank of 1, Arizona is Pontaic and Cadillac with a customer rank of 1, while Arkansas top automakers are Volkswagen, Suzuki, Pontaic, Mitsubishi, GMC, and Chevrolet with a customer rank of 1.
- The customer rank is 1 across the board indicting that each maker has an equal number of customers.
- Arkansas has the most diverse top automakers, Arizona with a split preference and Alabama has one automaker reigning king amongst customers
- Alabama can allow New Wheels to campaigning and promoting other automakers to diversify and reach more customers. This data can allow marketing teams and sales strategist to strengthen under represented automaker makers and expand on the market for their most popular automakers.

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:

SELECT AVG(rating) AS overall_avg_rating

FROM (

SELECT

       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

FROM order_t
) AS ratings

What is the average rating on each quarter?

SELECT quarter_number, AVG(rating) AS avg_rating_per_quarter
FROM (
      SELECT
            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
      FROM order_t
) AS ratings

Output:

Result: Passed

✓ Query 1 ^

Query:

```
SELECT AVG(rating) AS overall_avg_rating FROM (SELECT 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 FROM order_t ) AS ratings
```

Output:

Showing 1 rows

overall_avg_rating
3.135

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 FROM order_t) AS ratings GROUP BY quarter_number ORDER BY quarter_number

Output:

Showing 4 rows

quarter_number	avg_rating_per_quarter
1	3.554838709677419
2	3.354961832061069
3	2.9563318777292578
4	2.3969849246231156

Observations and Insights:

- The overall average rating shows the column overall_avg_rating having a value of ***3.135***
- The average rating by quarter:
    - **Quarter 1 - 3.55**
    - **Quarter 2 - 3.35**
    - **Quarter 3 - 2.96**
    - **Quarter 4 - 2.40**
- The insights on the above chart indicate a decline in customer ratings from Quarter to Quarter 4. Customer satisfaction decreases overtime. Even though Quarter one shows an average rating of 3.135 this suggest room for improvement.
- The decline in rating could point to a dissatisfaction with service after the vehicle is sold and overall customer experience over the course of the year.

- New Wheels can use this information to investigate why this decline happens over the course of the year, identify those issues and improves customer satisfaction to potentially reverse any decline in sales and ratings.

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

Solution Query:

SELECT

      quarter_number,

      SUM(CASE WHEN customer_feedback = 'Very Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS very_bad_percentage,

      SUM(CASE WHEN customer_feedback = 'Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS bad_percentage,

      SUM(CASE WHEN customer_feedback = 'Okay' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS okay_percentage,

      SUM(CASE WHEN customer_feedback = 'Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS good_percentage,

      SUM(CASE WHEN customer_feedback = 'Very Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS very_good_percentage

FROM

      order_t

GROUP BY

      quarter_number

ORDER BY

      quarter_number;

Output:

Result: Passed

✓ Query 1 ⌃

Query:

SELECT quarter_number, SUM(CASE WHEN customer_feedback = 'Very Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS very_bad_percentage, SUM(CASE WHEN customer_feedback = 'Bad' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS bad_percentage, SUM(CASE WHEN customer_feedback = 'Okay' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS okay_percentage, SUM(CASE WHEN customer_feedback = 'Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS good_percentage, SUM(CASE WHEN customer_feedback = 'Very Good' THEN 1 ELSE 0 END) * 100.0 / COUNT(*) AS very_good_percentage FROM order_t GROUP BY quarter_number ORDER BY quarter_number

Output:

Showing 4 rows

quarter_number	very_bad_percentage	bad_percentage	okay_perce
1	10.96774193548387	11.290322580645162	19.0322580
2	14.885496183206106	14.122137404580153	20.2290076
3	17.903930131004365	22.707423580786028	21.8340611:
4	30.65326633165829	29.14572864321608	20.1005025

Showing 4 rows

|	okay_percentage	good_percentage	very_good_percentage
5162	19.032258064516128	28.70967741935484	30
153	20.229007633587788	22.137404580152673	28.625954198473284
6028	21.83406113537118	20.96069868995633	16.593886462882097
608	20.100502512562816	10.050251256281408	10.050251256281408

Observations and Insights:

- The table displays the percentages of different performance categories across quarters
- The columns are as follows: quarter_number, very_bad_percentage, bad_percentage, okay percentage, good_percentage, and very_good_percentage.
- **Insights:**
    - Over the course of Q1 and Q4, there is an upward trend.
    - very_bad_percentage increased from 10.97% in Q1 to 30.65% in Q4
    - Bad_percentage rose from 11.29% in Q1 to 2915% in Q4
    - good_percentage dropped from 28.71% in Quarter 1 to 10.05% in Quarter 4. o very_good_percentage decreased from 30.00% in Quarter 1 to 10.05% in Quarter 4
    - The okay_percentage remains relatively stable across the quarters

    - There is an overall trend of a decline in customer satisfaction with an increase in negative feedback and decrease in positive feedback over the 4 quarters

Solution Query:

SELECT

quarter_number,

COUNT(order_id) AS number_of_orders

FROM order_t

GROUP BY quarter_number

ORDER BY quarter_number;

Output:

> ✓ Query 1 ⌃
>
> Query:
>
> SELECT quarter_number, COUNT(order_id) AS number_of_orders FROM order_t GROUP BY quarter_number ORDER BY quarter_number
>
> Output:
>
> Showing 4 rows

quarter_number	number_of_orders
1	310
2	262
3	229
4	199

Observations and Insights:

- **N**umber of Orders Per Quarter:
  - **Quarter 1: 310 orders**
  - **Quarter 2: 262 orders**
  - **Quarter 3: 229 orders**
  - **Quarter 4: 199 orders**

- As we observe the chart above, the number of orders decrease significantly over the course of Q1 to Q4
  - Q1 has the highest at 310 and Q4 has the lowest at 199
- **Insights**

  - The consistent increase in the decline of over suggest that New Wheels is currently experiencing a decrease in sales over time. Factors can include customer interest, competition, and marketing efforts.

  - These drops in orders can indicate seasonal trends over quarters. Understanding these patterns can help New Wheels plan targeted campaigns and promotions to help the decline.

  - Investigating these causes of trend declines and help New Wheels implement measure to boost sales and this could involve boosting marketing efforts, offering incentives, and improving customer satisfaction.

Solution Query:

select sum(final_price) as amount from

(select quarter_number,(1-discount)*vehicle_price*quantity as final_price from order_t) as a

What is the quarter-over-quarter % change in net revenue?

select *,(quarter_revenue-previous_quarter_revenue)*100/previous_quarter_revenue as percentage_change from(

select quarter_number,amount as quarter_revenue,lag(amount) over (order by quarter_number) asprevious_quarter_revenue from (

select quarter_number,sum(final_price) as amount from

(select quarter_number,(1-dicount)*vehicle_price*price*quantity as final_price from order_t) as a group by quarter_number) order by quarter_number);

Output:

Result: Passed

✓ Query 1

Query:

```
select sum(final_price) as amount from(select quarter_number,(1-
discount)*vehicle_price*quantity as final_price from order_t) as a
```

Output:

Showing 1 rows

amount
48610993.78130001

✓ Query 1

Query:

```
select *,(quarter_revenue-previous_quarter_revenue)*100/previous_quarter_revenue as
percentage_change from( select quarter_number,amount as
quarter_revenue,lag(amount) over (order by quarter_number) as
previous_quarter_revenue from ( select quarter_number,sum(final_price) as amount from
(select quarter_number,(1-discount)*vehicle_price*quantity as final_price from order_t)
as a group by quarter_number) order by quarter_number)
```

Output:

Showing 4 rows

quarter_number	quarter_revenue	previous_quarter_reve...	percenta

Showing 4 rows

quarter_number	quarter_revenue	previous_quarter_reve...	percentage_change
1	18032549.899600018		
2	13122995.7562	18032549.899600018	-27.226067143776024
3	8882298.8449	13122995.7562	-32.31500634522776
4	8573149.280599998	8882298.8449	-3.480512980910439

Observations and Insights:

- **Quarterly Revenue Data:**
  - **Quarter 1:**
    - Revenue: 18,032,549.90
  - **Quarter 2:**
    - Revenue: 13,122,995.76
    - Previous Quarter Revenue: 18,032,549.90
    - Percentage Change: -27.23%
  - **Quarter 3:**
    - Revenue: 8,882,298.84

Previous Quarter Revenue: 13,122,995.76
Percentage change: -32,32%

Quarter 4:
Revenue: 8,573,149.28
Previous Quarter Revenue: 8,882,298.84
Percentage Change: - 3.48%

- Total Net Revenue
  - The total net revenue is 48,610,993.78

- Insights

  - There is a significant decline in revenue from Q1 to Q4

  - The most significant drops are observed into Q2 (27.23%) and Q3(-32.32%). This can indicate issues that start in Q2 and get worse by Q3

  - Q4 shows negative change of (-3.48%) indicating a stabilization or improvements in revenue

  - The total net revenue is still strong at 48,610,993.78 indicating strong business potential even in the face of revenue quarter by quarter challenges and decrease in customer satisfaction over quarters.

  - New Wheels can focus on drops between Q2 and Q3 investigating market conditions, internal sales, and customer service.

Solution Query:

SELECT

    quarter_number,

    ROUND(SUM(quantity*vehicle_price), 0) AS revenue,

    COUNT(order_id) AS total_order

FROM order_t

GROUP BY 1

ORDER BY 1;

Output:

Query 1

Query:

SELECT quarter_number,ROUND (SUM(quantity*vehicle_price), 0) AS revenue, COUNT(order_id) AS total_order FROM order_t GROUP BY 1 ORDER BY 1

Output:

Showing 4 rows

quarter_number	revenue	total_order
1	39637631	310
2	32913738	262
3	29435427	229
4	23496008	199

Observations and Insights:

- The table above shows revenue and total number of orders for each quarter.
- The columns include: quarter_number, revenue, and total_number.
- **Insights**
    - There is a consistent decline in revenue from Q1 and Q4
    - This indicates a drop off in sales performance within the company
    - The chart displays are decrease in order numbers and aligns with the decrease in revenue

- New Wheels investigating the cause of decrease in order numbers and generate a fix can lead to a increase in revenue since the two appear to be correlated.
- Q1 is the best performing quarter with 39,637,631 and Q4 is the worst performing at 23,496,008

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

Solution Query:

SELECT

credit_card_type,

ROUND(AVG(discount), 2) AS average_discount

FROM order_t t1

INNER JOIN customer_t t2

ON t1.customer_id = t2.customer_id

GROUP BY 1

ORDER BY 2 DESC;

Output:

Result: Passed

✓ Query 1 ⌃

Query:

```
SELECT credit_card_type, ROUND(AVG(discount), 2) AS average_discount FROM order_t
t1 INNER JOIN customer_t t2 ON t1.customer_id = t2.customer_id GROUP BY 1 ORDER BY
2 DESC
```

Output:

Showing first 10 rows out of 16 rows

credit_card_type	average_discount
laser	0.64
mastercard	0.63
visa-electron	0.62

maestro	0.62
instapayment	0.62
china-unionpay	0.62
americanexpress	0.62
switch	0.61
jcb	0.61
diners-club-us-ca	0.61

Observations and Insights:

- The above table list the different credit card types along with average discount given
- Credit card type:
  - **Laser: 0.64**
  - **Mastercard: 0.63**
  - **Visa-electron: 0.62**
  - **Maestro: 0.62**
  - **instapayment: .62**
  - **china-unionpay: 0.62**
  - **americanexpress: 0.62**
  - **switch: 0.61**
  - **jcb: 0.61**
  - **diners-club-us-ca: 0.61**

- **Insights**
  - Laser offers the highest discount at 0.64. Customer receive the most savings with this method of payment
  - Mastercard is the second highest while Visa, Maestro Instapayment, China, and American Express offer 0.62
  - Switch, Jcb, and Diners club offer the lowest at 0.61
  - New Wheels can utilize this information in target campaigns and promotions the attract cost saving customers. They can also look into partnering with higher discounted card type that will enhance customer satisfaction and loyalty

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

Solution Query:

SELECT

      quarter_number,

      AVG(julianday(ship_date) - julianday(order_date)) AS avg_shipping_time

FROM

      order_t

GROUP BY

      quarter_number

ORDER BY

      quarter_number

Output:

Query 1

Query:

```
SELECT quarter_number, AVG(julianday(ship_date) - julianday(order_date)) AS
avg_shipping_time FROM order_t GROUP BY quarter_number ORDER BY quarter_number
```

Output:

Showing 4 rows
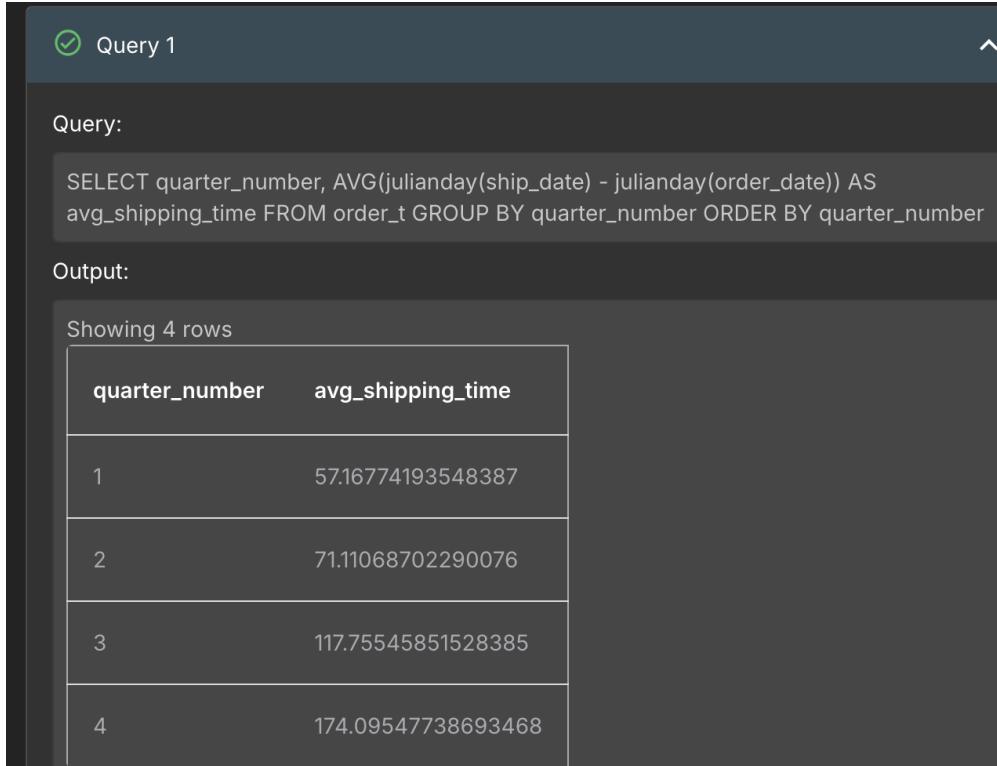
quarter_number	avg_shipping_time
1	57.16774193548387
2	71.11068702290076
3	117.75545851528385
4	174.09547738693468

Observation and insight

Average Shipping time Per Quarter
Quarter 1: 57.17 days
Quarter 2: 71.11 days
Quarter 3: 117.76 days
Quarter 4: 172.10 days

Trend Analysis:

The average shipping time dramatically increases from Q1 to Q4

Insights
The increase is shipping time over the 4 quarters indicate that New Wheels is experiencing increasing challenges in the shipping process
Longer shipping tomes can lead to a decrease in customer satisfaction that can then lead to a decline in sales.
This also indicates an issues with logistics and supply chain.

New Wheels should focus on underusing these issues ad reducing shipping. This could be improving coordination with shipping partners, inventory management and logistic planning.

Business Metrics Overview

Total Revenue	Total Orders	Total Customers	Average Rating
48,610,993.78	1,000	994	3.07
Last Quarter Revenue	**Last quarter Orders**	**Average Days to Ship**	**% Good Feedback**
8,573,149.28	199	97.964	21.5%

Business Recommendations

- Increase Positive Customer Feedback
  - 21.5% of feedback is positive

- - New Wheels should implement a plan to understand pain points. The can lead to effectively address negative feedback and enhance customer service quality increasing overall good feedback.

- Focus on enhancing the customer experience
  - The average rating is 3.07 which indicates a near low to moderate customer satisfaction.
  - New Wheels should focus on improving the after sales experience. This could be offering additional services, training for staff, or product quality.

- Reduce Shipping Times

  - The average days to ship a customer order is 98 days.

  - New Wheels should focus on improving supply chain and logistics management. This can lead to higher customer satisfaction and higher revenue due to higher order numbers.

- Boost Campaign and Marketing

  - The total number of customers stands at 994 indicating there is room for growth in this number

  - Invest in targeted marketing and sales strategies can attract more customers.

- Implement Loyalty or awards programs

  - Introducing loyalty programs can contain a customer base that sticks and recommends your brand. This will also lead to customers who keep coming back to buy vehicles from generation to generation

- Investigate Quarter 4 performance

  - Understanding why revenue and order numbers drop during this quarter can be crucial in gaining and maintaining customers and increasing revenue. Plan to look at market conditions, products offered, and customer service.

Management Inventory Effencially

By handling inventory better, New Wheels can keep popular vehicles available and optimizing shipping tomes can ensure customers received their orders timely.

Overall focusing on these areas can allow New Wheels to improve business growth, lead to higher customer satisfaction which can generate higher revenue for the company.