Orange Bee Restaurant

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Course: Business Intelligence and Data Warehousing

There are four phases of implementation in the Project.
They are:
Phase 1: Business Analysis
Phase 2: Data Modeling
Phase 3: ETL Implementation
Phase 4: Tableau Implementation

Restaurant/Cafeteria Management system

Phase 1: Business Analysis

In this phase, we identified the business needs and provided solutions to business problems. The solutions consist of process improvement, strategic planning to incur profits and growth of the organization.

The Business Scenario includes the details of restaurant management, the process and operation flow of the restaurant, swim lane diagram, lead measures, lag measures and Analytical use cases (Descriptive and Predictive Analytics).

Domain: Food Service Industry
A restaurant management system is a POS (Point of Sale) transaction designed for the foodservice industry. Like a standard POS system, the restaurant management system helps capture transactions and manage inventory with accuracy and generally run daily processes more efficiently. A setup may include both software and hardware, such as the cash register, barcode scanner, and receipt printer.

Business Questions/Problems:

As a restaurant owner, how to ensure profitability as well as highest rating on social media for the restaurant

- How do I track daily revenue and what is driving more business to restaurant?

- How do I ensure customers love food

- How do I know which are most popular items?

The following are the multiple business processes/scenarios involved in restaurant management.

Customer Order creation:

A customer enters the restaurant and gets greeted by the receptionist of the restaurant. The receptionist checks for the customer reservation and assigns a table to the customer. The waiter of that table presents the Menu which contains details of food available in that restaurant A customer browses through the menu and looks at the various food options available in the restaurant along with the price for each item. He selects items from the menu and places the order to the waiter of the table. The customer has successfully placed the order.

(makes a payment for the order. The receipt contains the itemized bill for the order along with the prices for each item and the tax applied)

Customers can also choose to order through self-order Kiosk. Categorized Menu with prices are visible and enabled with selection choices, as soon as the customer chooses items, the order is created in the database and is visible to the customer. The same order receipt is printed simultaneously in the kitchen as well for kitchen staff to prepare the order

Order queue and delivery: Kitchen Staff or Chefs get the current queue of orders, accept the orders and updates the order status to be ready once the order is prepared. Waiters pick up the orders that are ready and serves the customer. The customers can provide feedback for the service and the food.

Menu Management: Supervisors modifies the menu items, add new items, delete items, and update descriptions on the menu board that appear to the customer.

Inventory Management:
The manager or supervisor tracks the current inventory stock. He checks the inventory items, makes a list of items and prepares a forecast of the required items in the future.

Reporting/Tracking the Revenue:
Restaurant manager prepares the sales revenue on a weekly, monthly, quarterly and annual basis. He also reports on the most popular items ordered by the customers, the average bill and the least popular items for further actions in menu management.

Scenario details/ Parsing Scenario to Identify key Information:

Stakeholders: Consumers/customers, Owner, Shareholder, Managers, Staff/Employees, Suppliers,

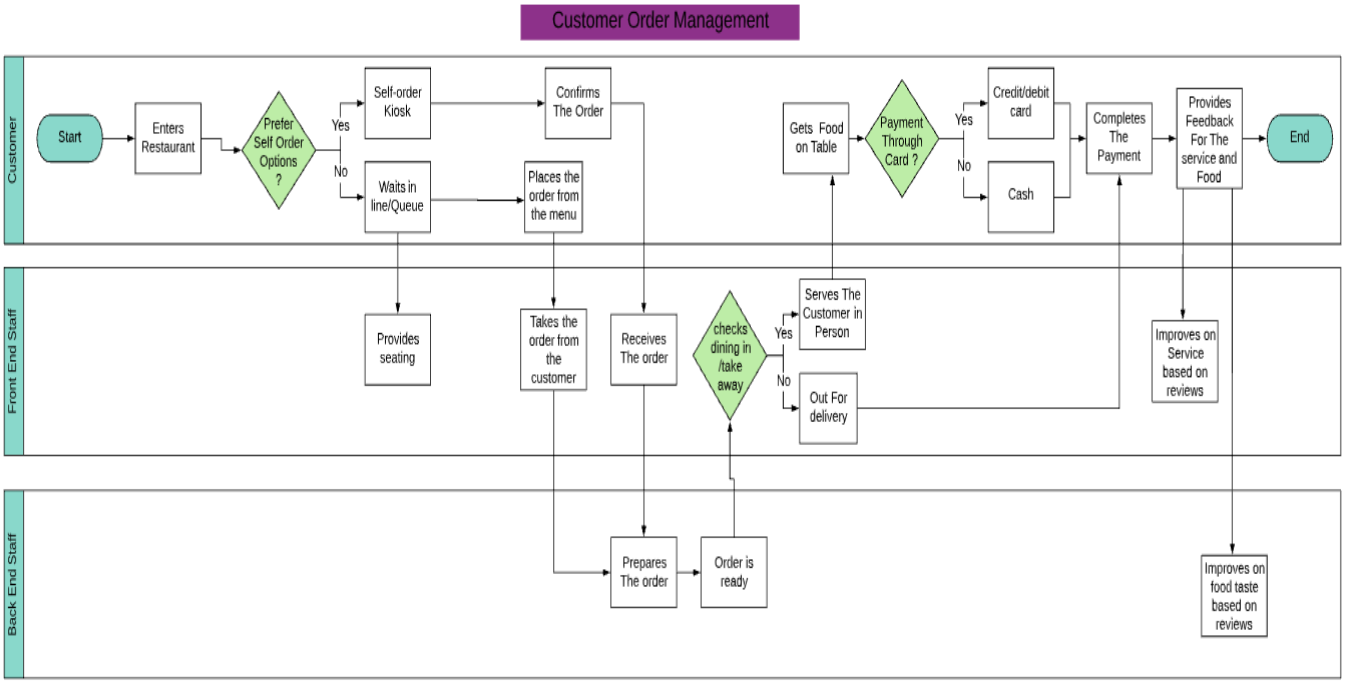
Products: Supply Stock, Inventory,

Infrastructure: Self-Order Kiosk, Computer, Receipt Printer, Furniture, Kitchen equipment.

Interpreting the Tasks and the Goals:

	Customer	**Front-end staff (Manager/Supervisor/Waiter)**	**Back-end staff (Chef/sous-chef/cleaning team)**
Tasks	Enter the restaurant. Order food. Wait for the food to be prepared. Eat the food/asks for take away. Pays the restaurant and leaves.	Welcome the customer. Help them find a table. Hand them the menu card. Take orders from customers. Acts as the Restaurant expeditor to maintain the efficient food delivery to customers by communicating to the back-end staff. Gets feedback from the customer while collecting the payment.	Takes customer orders from the front-end staff. Cooks the food. Hand the ready to go food to the front-end staff. Waits for customer feedback to improve on the food.
Goals	Eat/Buy food	Help customers from their entry to exit.	Cook and clean the restaurant.

Swim Lane Diagrams:



Description of the swim lane Diagram

The customer enters the restaurant and decides if he wants to self-order or be seated in the restaurant. The front-end staff here are referred to as waiters, receptionists, floor managers, etc. If the customer decides to do a takeaway, he can place his order through the Self-Order Kiosk which asks for confirmation of the order. Once the customer confirms the order, it goes to the kitchen where the chef prepares the order. When the order is ready the chef informs the waiters and they give to the customer. The customer then pays for the food through cash or card and provides feedback for the restaurant.

On the other hand, if the customer decides to eat at the restaurant the waiter will take them to the table and get them seated comfortably. Waiter then gives the menu the customer and gives them some time to order. The customer places the order and confirms it. The waiter then passes on the order to the chef who prepares it. When the order is ready the chef informs the waiters and they get it to the customer. After the customer is done eating, they pay for the food through cash or card and provides feedback for the restaurant.

Lead measures:

1. Increase average number of customers per day:

- New customers
- Regular customers

2. Offers and Discounts:

- Create new combos
- Discounts.

3. Marketing and advertising

4. Adding new food items to their menus.

5. Improve customer service and food taste.

6. Improve the ambience of the restaurant.

Lag Measures:

1)Average orders per day.

2) The mean table occupancy.

3) The money spent per head on average in the last 3 months.

4) Sales per employee per hour.

5) Present table turn rate.

6) Revenue generated per category per day.

7) Number of units sold per category of the menu.

8) ROI, Revenue growth.

GENERAL ANALYTICAL USE CASES:

Most ordered/raved about food item: The most ordered items with best reviews in the restaurant of the week, month and year.

Revenue generated and the performance of the restaurant: The revenue generated for the year, the best season of business, number of customers walk-ins comparing weekdays to weekends.

Most ordered food category: The most popular/profitable food categories in the restaurant like drinks, entrees or special combo options which will help the restaurant build better menus in the future.

Descriptive Analytical Use cases:

1. Food and service ratings per year.
2. Customer's Age distribution
3. Revenue generated based on Gender per quarter.
4. Customer's locations.
5. Revenue generated by Top 10 customers.

Predictive Analytical Use cases:

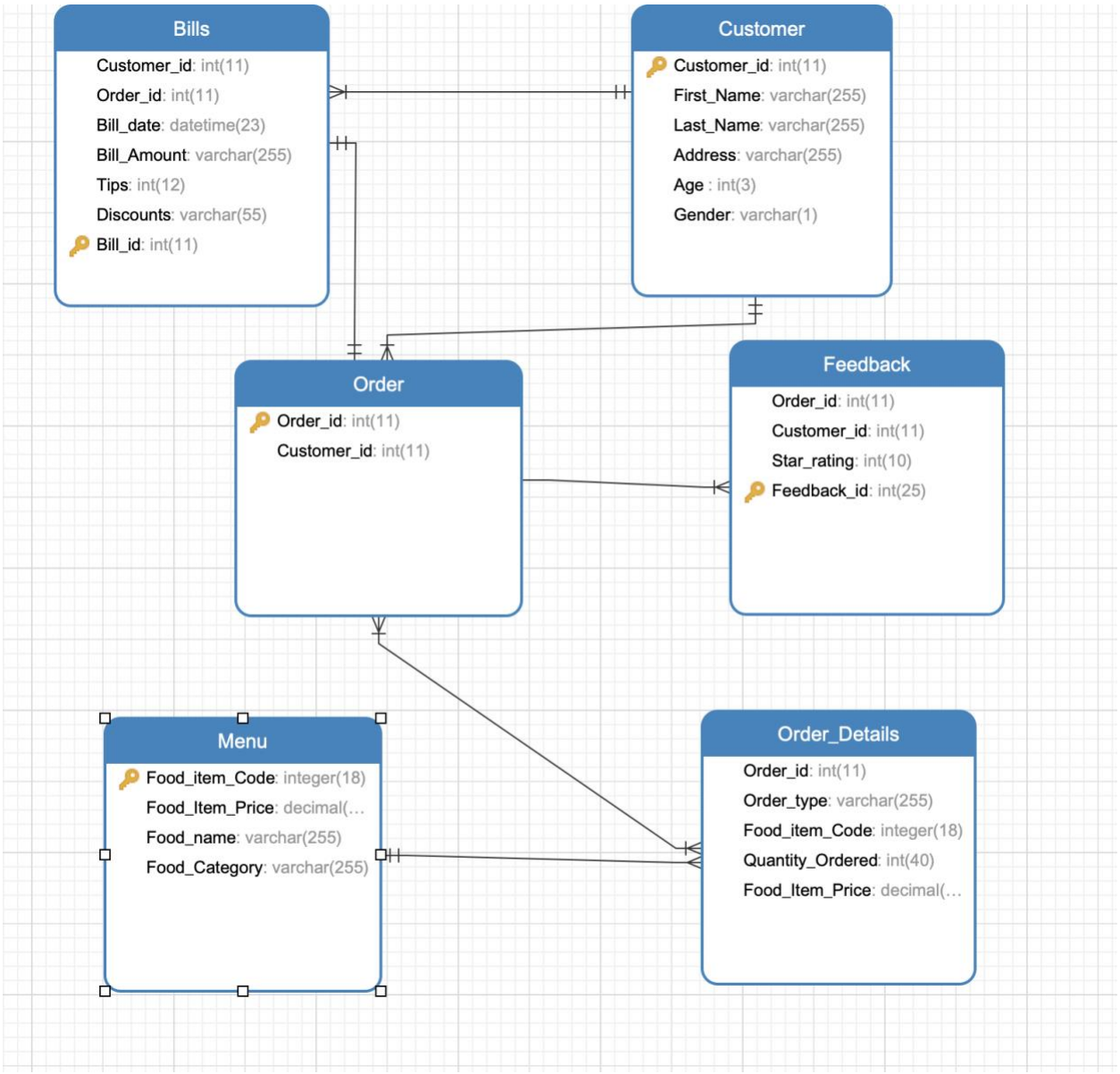
1. How will discount, offers work on the restaurant business?
2. Improving Loyalty membership programs.
3. By Adding new food items to their menus, how will the sales impact?
4. Attracting customers by introducing Marketing and Advertising strategies.
5. The number of times an extra ingredient or food item was requested.
6. Table turnover rate

Phase 2: Data Modeling

OLTP Schema Design:

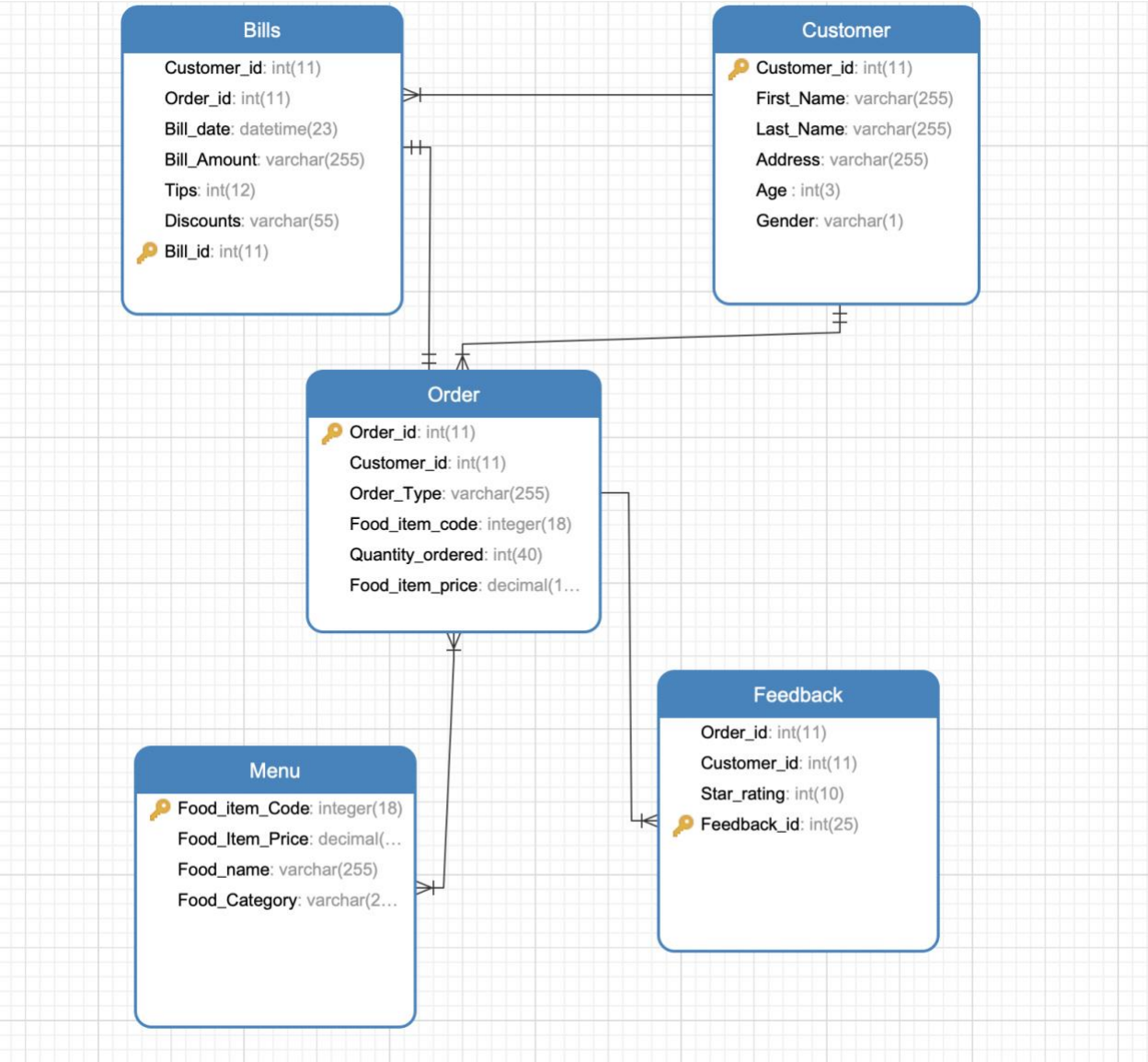
The OLTP schema is designed to have 6 tables Bills, Order, Menu, Customer, Feedback and Order Details. In this design, order details are an associative entity.

Screenshot of OLTP Data Model (Navicat):



ODS Schema: In ODS Schema, there are 5 tables Customer, Orders, Menu, Bills and Feedback. Order and Order Details from OLTP schema is merged into one table as a preparation to convert the OLTP schema into OLAP schema.

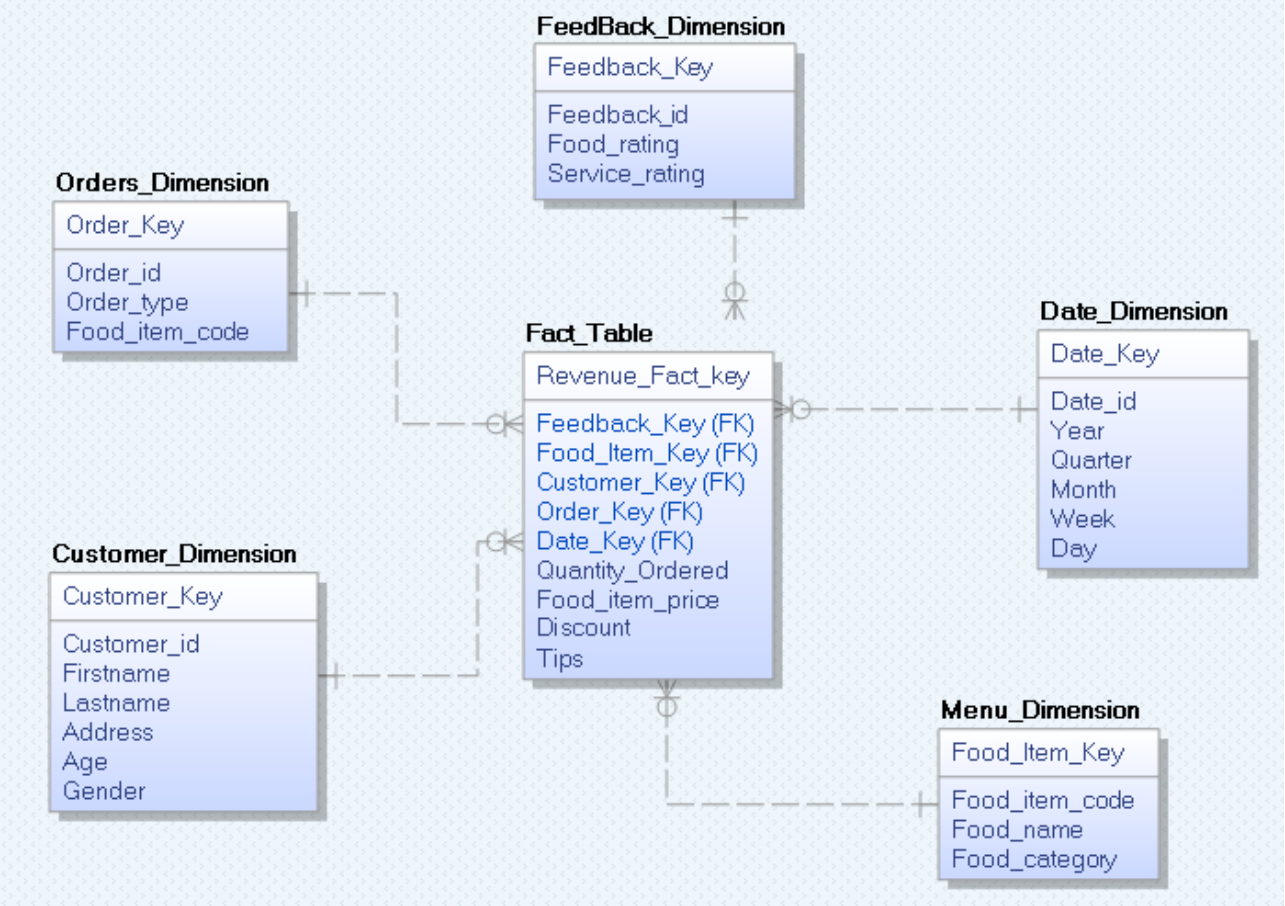
Screenshot of ODS Data Model:



<u>Data Warehouse Schema (Facts & Dimensions)</u>: Designed the OLAP schema for the restaurant management in ERWIN. There are five Dimension tables and one fact table. The Dimension tables are:

1. Customer
2. Orders
3. Menu
4. Date
5. Feedback

Screenshot of OLAP Data Model:



Phase 3: ETL Implementation

Data Sources used for implementation:

1. MySQL Database
2. Json
3. CSV
4. Excel

Data Sets: Few of the tables data are manually generated from generatedata.com

Website: Generatedata.com

Order of generating Data in Tables:

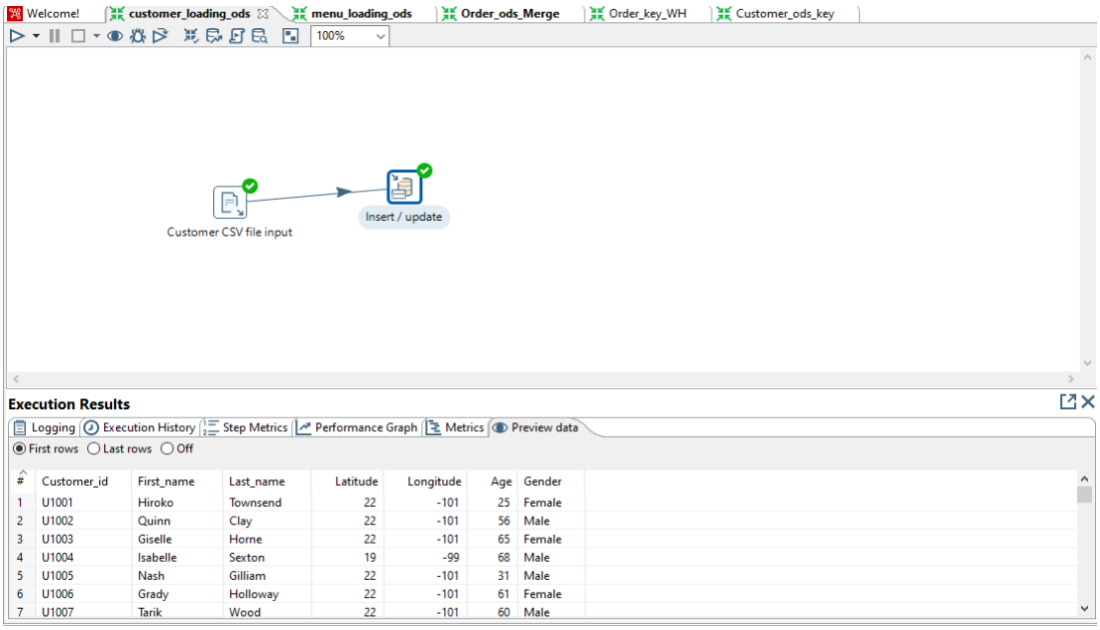
1. Menu table
2. Customer Table
3. Orders Table
4. Order details table
5. Feedback Table
6. Payments or Bills

SQL Dump: Project_OLTP Schema is exported using Forward Engineering.

Part 1: Extracting data from different data sources:

File 1: Load data into customer_ods from customer csv file.

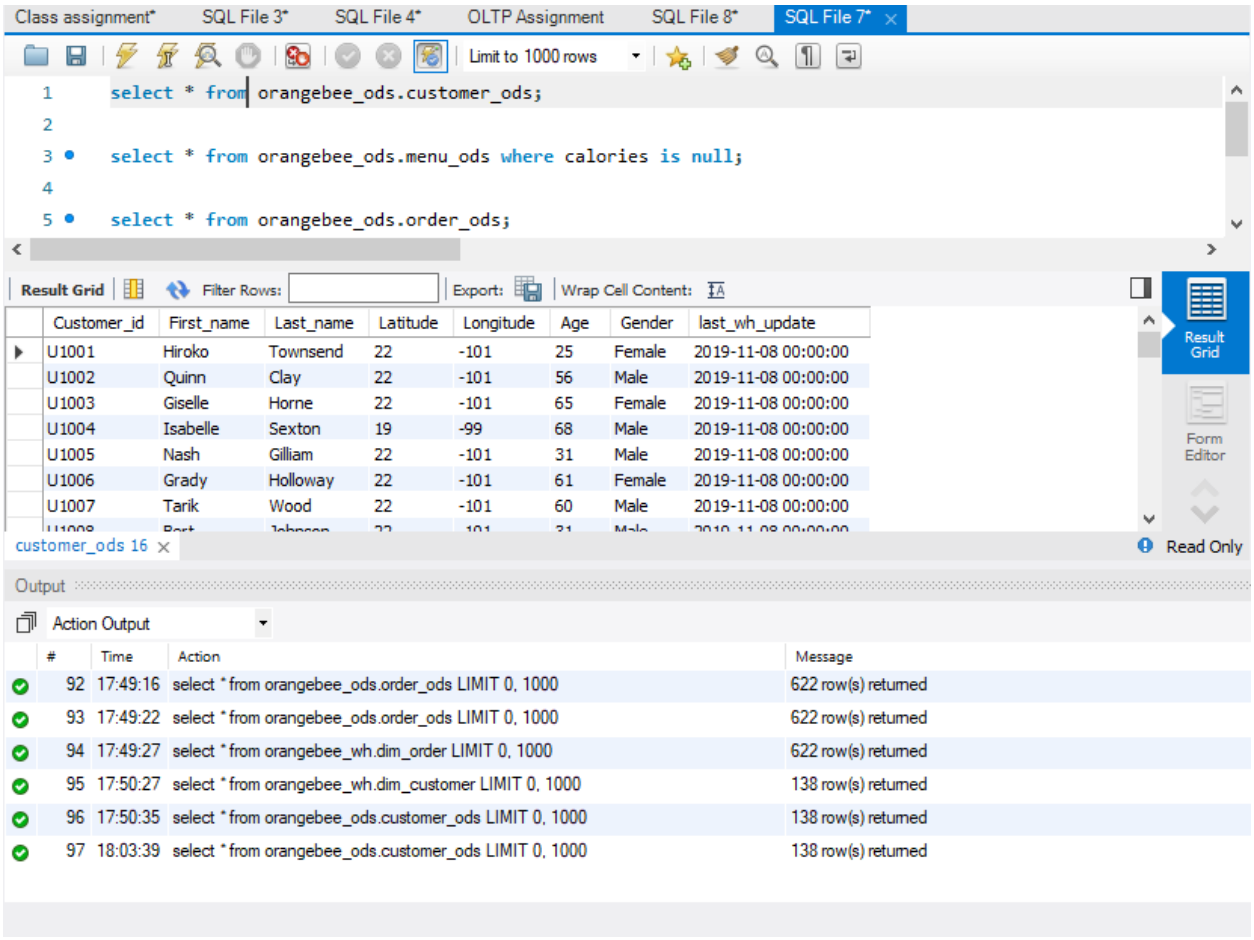
ETL Transformation:



#	Customer_id	First_name	Last_name	Latitude	Longitude	Age	Gender
1	U1001	Hiroko	Townsend	22	-101	25	Female
2	U1002	Quinn	Clay	22	-101	56	Male
3	U1003	Giselle	Horne	22	-101	65	Female
4	U1004	Isabelle	Sexton	19	-99	68	Male
5	U1005	Nash	Gilliam	22	-101	31	Male
6	U1006	Grady	Holloway	22	-101	61	Female
7	U1007	Tarik	Wood	22	-101	60	Male

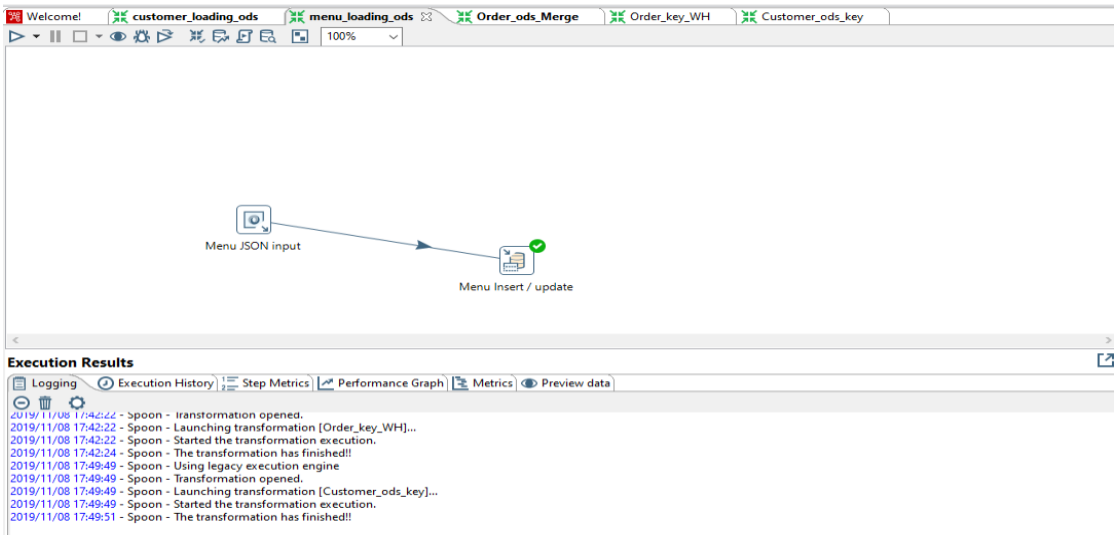
MySQL Results:

The customer_ods table is as shown below:

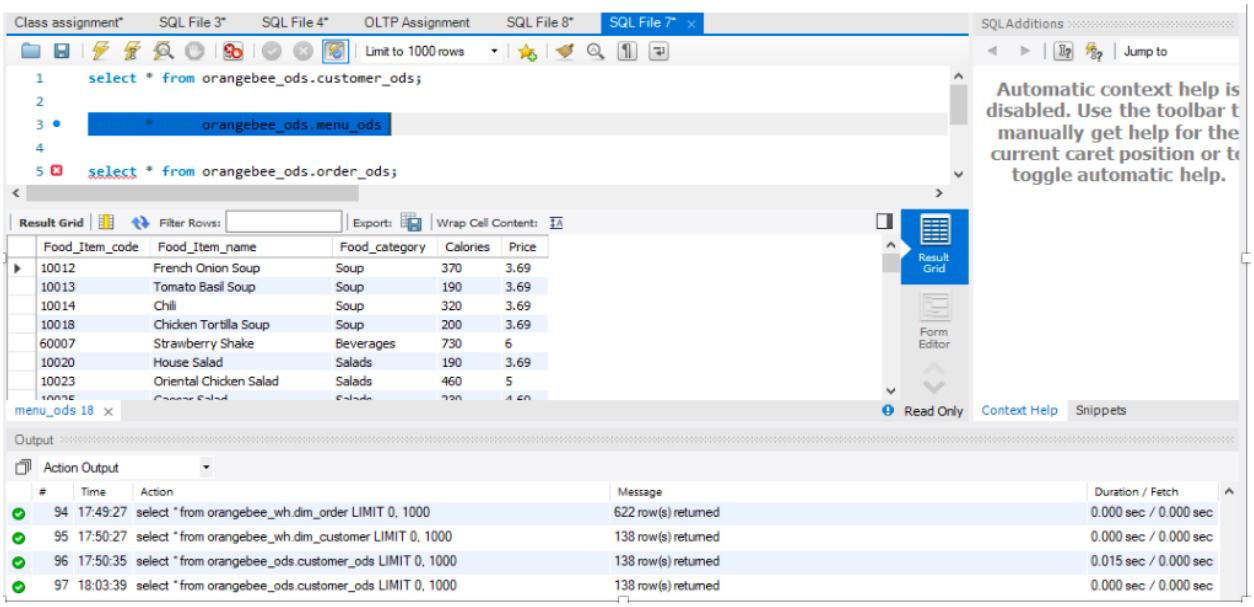


File 2: Load data into menu_ods from a json Menu File

ETL Transformation:

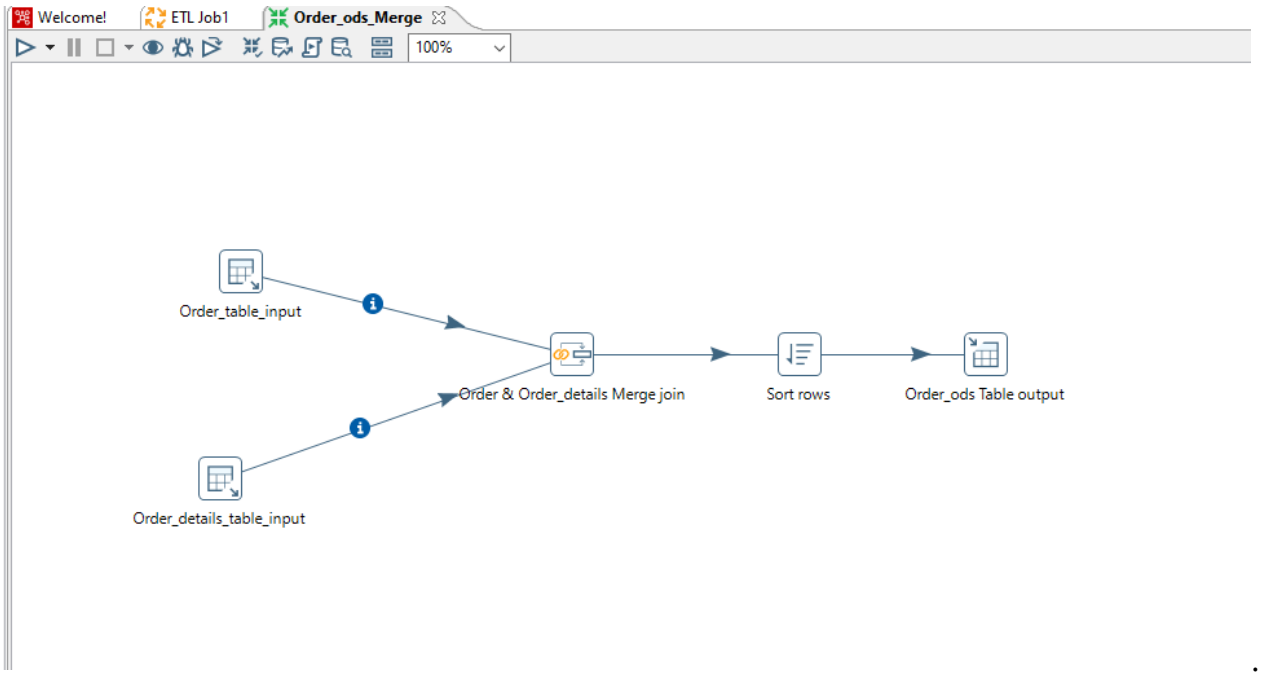


MySQL Results:



File 3: Load data into orders_ods by joining/merging from Orders and order_details from database

ETL Transformation:



MySQL Results:

Order_id	Customer_id	Food_item_code	Quantity_ordered	Order_type	Price	orderLineNumber	last_wh_update
10100	U1001	10012	2	To-Go	3.69	3	2019-11-08 00:00:00
10100	U1001	10013	3	Dine_in	3.69	2	2019-11-08 00:00:00
10100	U1001	10014	3	To-Go	3.69	4	2019-11-08 00:00:00
10100	U1001	10018	3	To-Go	3.69	1	2019-11-08 00:00:00
10101	U1002	60007	3	To-Go	6	4	2019-11-08 00:00:00
10101	U1002	10020	2	Dine_in	3.69	1	2019-11-08 00:00:00
10101	U1002	10023	4	Dine_in	5	3	2019-11-08 00:00:00
10101	U1002	10025	2	To-Go	4.69	2	2019-11-08 00:00:00
10102	U1003	10040	2	To-Go	6.26	2	2019-11-08 00:00:00
10102	U1003	10056	4	To-Go	5.29	1	2019-11-08 00:00:00
10103	U1004	10068	4	To-Go	6.29	11	2019-11-08 00:00:00
10103	U1004	10078	2	To-Go	12.99	4	2019-11-08 00:00:00
10103	U1004	10082	2	Dine_in	9.99	8	2019-11-08 00:00:00

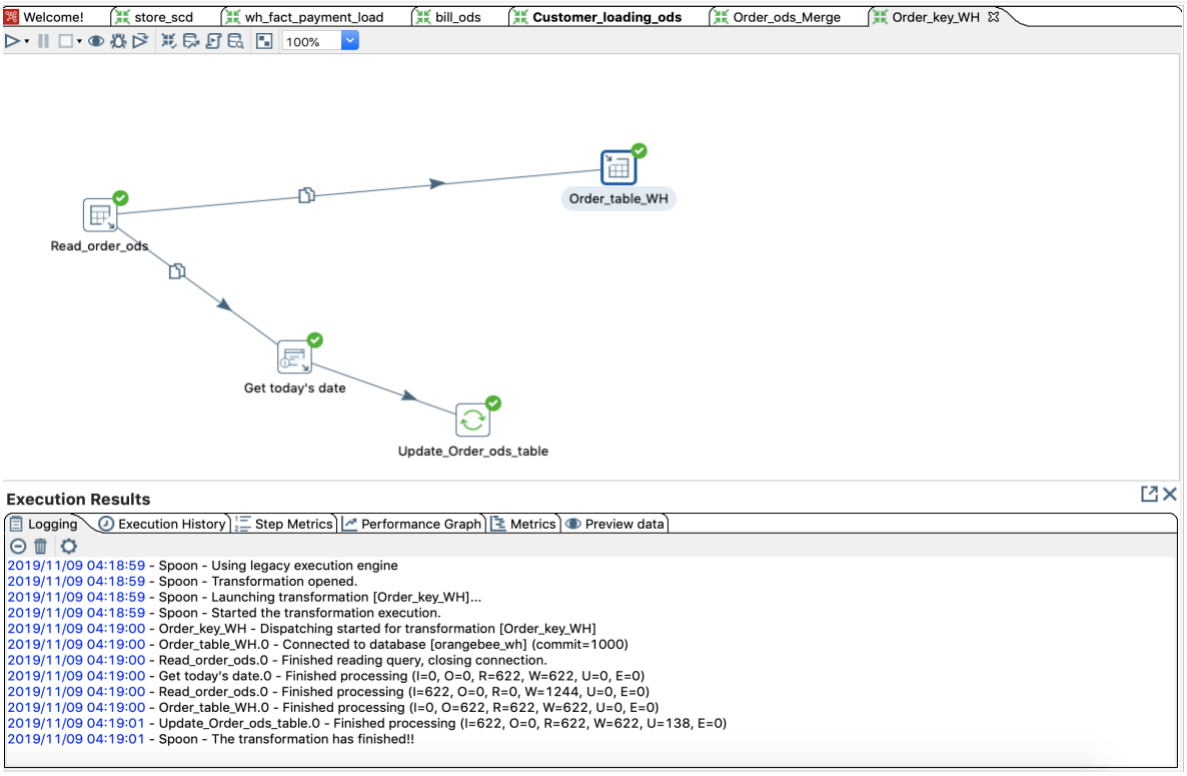
order_ods 25

Part 2: Load data from ODS Tables to Dimension Tables

Warehouse:

1) Generate Order key in dim_orders in Warehouse schema from order_ods table in ODS schema

ETL Transformation:



MySQL Results:

```
USE orangebee_wh;
select * from dim_order;
```

100% 25:37 1 error found

Result Grid Filter Rows: Search Edit: Export/Import:

order_key	Order_id	Customer_id	Food_item_code	Quantity_ordered	Order_type	Price	orderLineNumber
1	10100	U1001	10012	2	To-Go	3.69	3
2	10100	U1001	10013	3	Dine_in	3.69	2
3	10100	U1001	10014	3	To-Go	3.69	4
4	10100	U1001	10018	3	To-Go	3.69	1
5	10101	U1002	60007	3	To-Go	6	4
6	10101	U1002	10020	2	Dine_in	3.69	1
7	10101	U1002	10023	4	Dine_in	5	3
8	10101	U1002	10025	2	To-Go	4.69	2
9	10102	U1003	10040	2	To-Go	6.26	2
10	10102	U1003	10056	4	To-Go	5.29	1
11	10103	U1004	10068	4	To-Go	6.29	11
12	10103	U1004	10078	2	To-Go	12.99	4
13	10103	U1004	10082	2	Dine_in	9.99	8
14	10103	U1004	10087	3	To-Go	9.99	10
15	10103	U1004	10090	2	To-Go	4.99	2
16	10103	U1004	10091	4	Dine_in	5.99	12
17	10103	U1004	10092	1	Dine_in	4.99	14
18	10103	U1004	10093	4	Dine_in	5.99	13
19	10103	U1004	10094	3	Dine_in	4.99	16
20	10103	U1004	10106	1	Dine_in	10.49	5

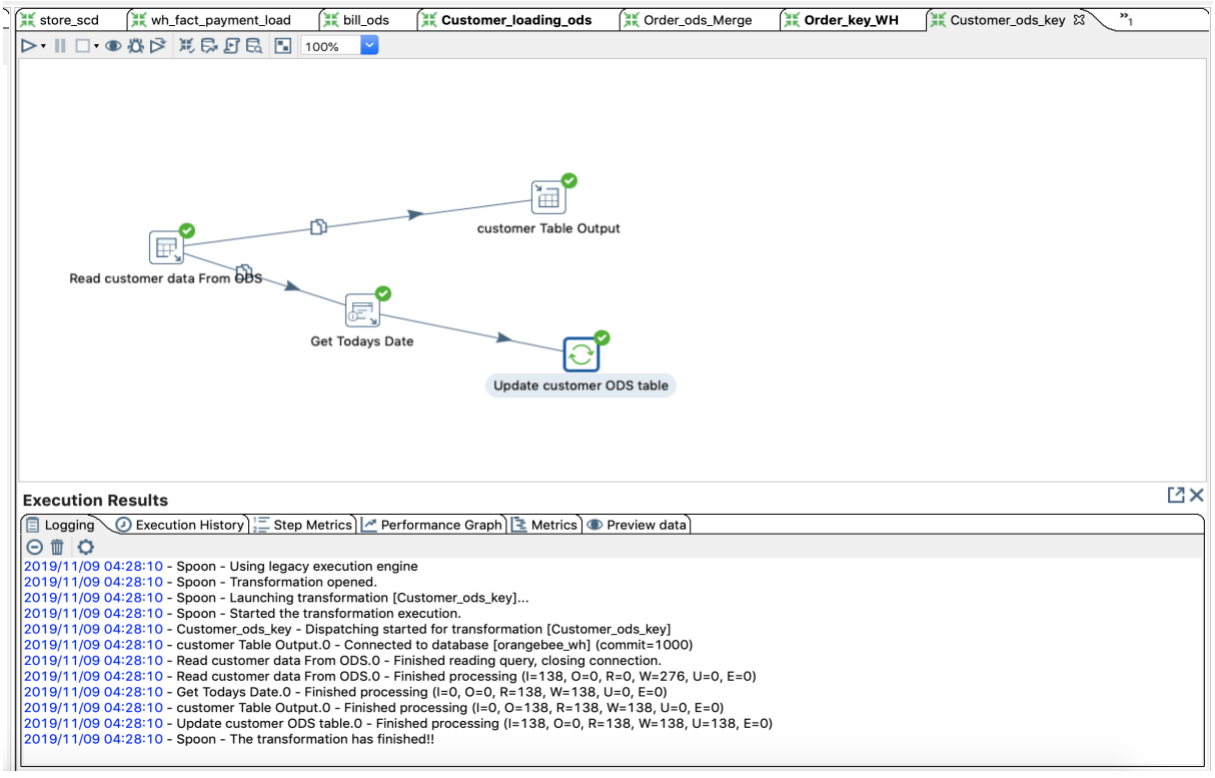
dim_order 18 Apply

Action Output

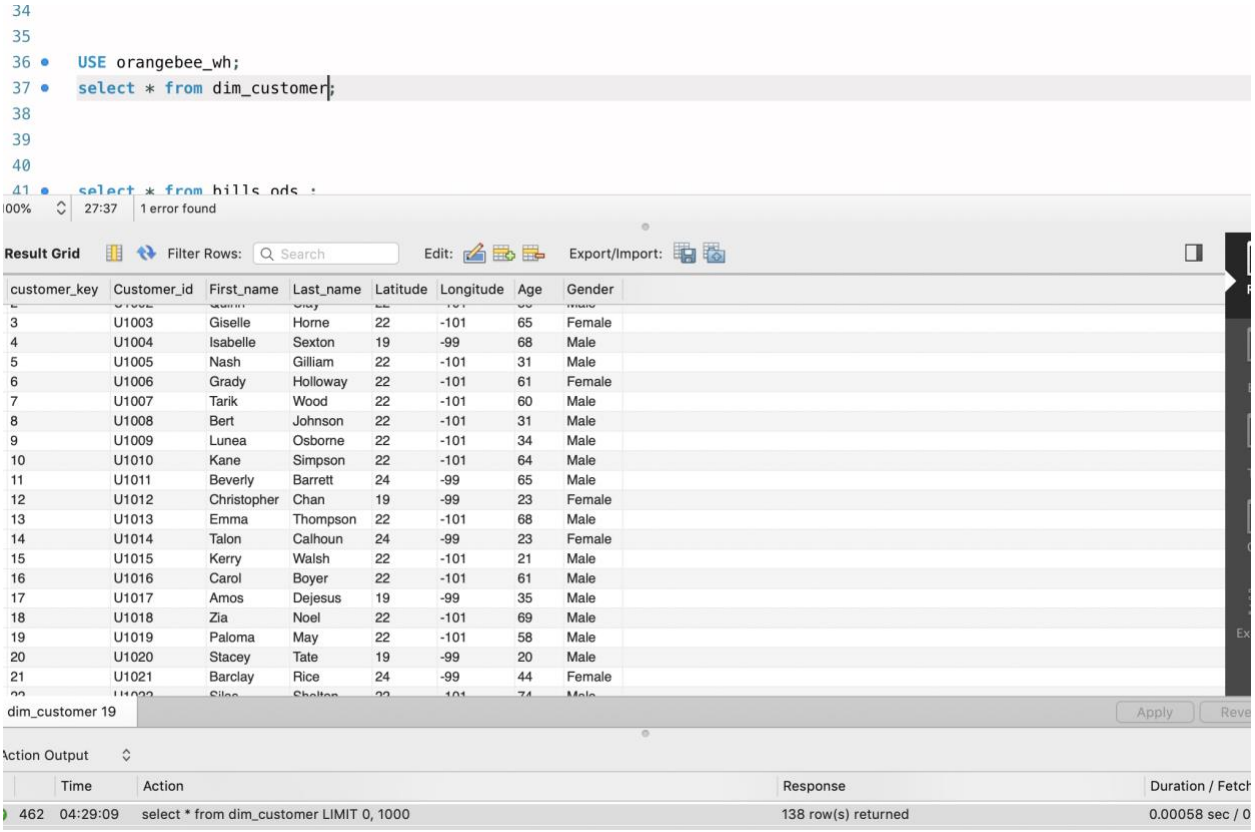
	Time	Action	Response	Duration / F
461	04:24:03	select * from dim_order LIMIT 0, 1000	622 row(s) returned	0.0013 sec /

2) Generate customer key in dim_customer in Warehouse schema from customer_ods in ODS schema.

ETL Transformation:



MySQL Results:



```
34
35
36 •  USE orangebee_wh;
37 •  select * from dim_customer;
38
39
40
41 •  select * from bills_ods ;
```

100% 27:37 1 error found

Result Grid Filter Rows: Search Edit: Export/Import:

customer_key	Customer_id	First_name	Last_name	Latitude	Longitude	Age	Gender
3	U1003	Giselle	Horne	22	-101	65	Female
4	U1004	Isabelle	Sexton	19	-99	68	Male
5	U1005	Nash	Gilliam	22	-101	31	Male
6	U1006	Grady	Holloway	22	-101	61	Female
7	U1007	Tarik	Wood	22	-101	60	Male
8	U1008	Bert	Johnson	22	-101	31	Male
9	U1009	Lunea	Osborne	22	-101	34	Male
10	U1010	Kane	Simpson	22	-101	64	Male
11	U1011	Beverly	Barrett	24	-99	65	Male
12	U1012	Christopher	Chan	19	-99	23	Female
13	U1013	Emma	Thompson	22	-101	68	Male
14	U1014	Talon	Calhoun	24	-99	23	Female
15	U1015	Kerry	Walsh	22	-101	21	Male
16	U1016	Carol	Boyer	22	-101	61	Male
17	U1017	Amos	Dejesus	19	-99	35	Male
18	U1018	Zia	Noel	22	-101	69	Male
19	U1019	Paloma	May	22	-101	58	Male
20	U1020	Stacey	Tate	19	-99	20	Male
21	U1021	Barclay	Rice	24	-99	44	Female

dim_customer 19 Apply

Action Output

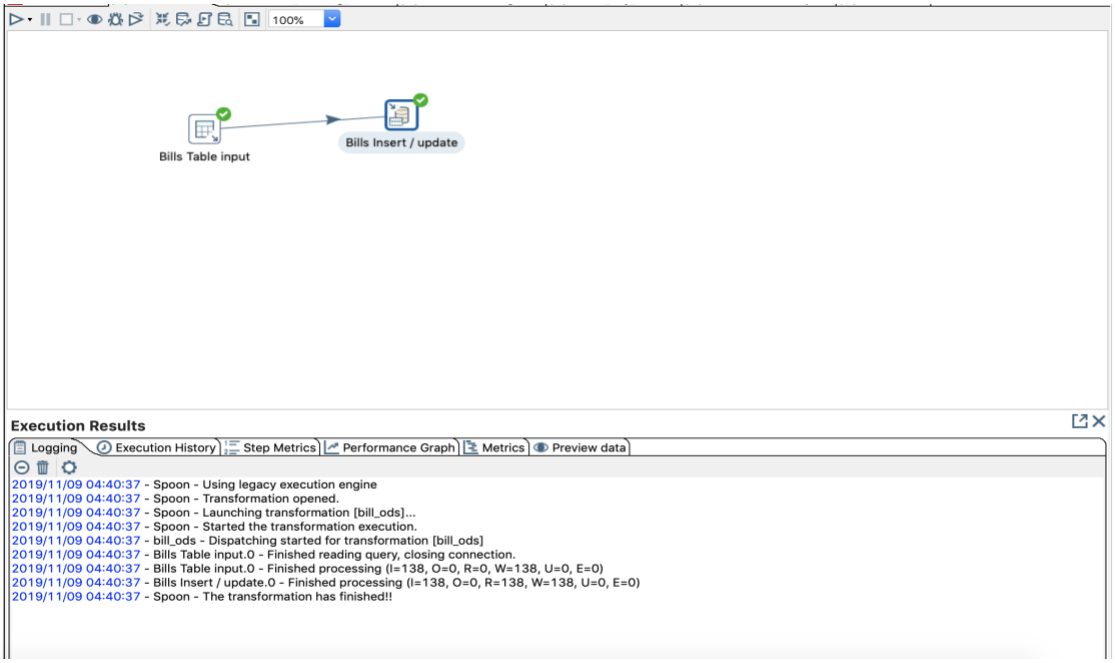
	Time	Action	Response	Duration / Fetch
462	04:29:09	select * from dim_customer LIMIT 0, 1000	138 row(s) returned	0.00058 sec / 0

Part 3: Load Bill data to Bill_ODS schema

We used the below SQL query to generate the bill amount for each order in MySQL workbench:

```
select o.customer_id, od.Order_id, sum(od.Quantity_ordered * od.Price) as Bill_Amount
from Project.Order_Details od, Project.Order o, Project.Customer c
where o.Order_id = od.Order_id and c.Customer_id = o.Customer_id
group by od.Order_id;
```

ETL Transformation:



MySQL results:

```
35
36 •  USE orangebee_ods;
37 •  select * from Bills_ods;
38
39
40
```

100% 24:37 1 error found

Result Grid Filter Rows: Search Export:

Bill_id	Order_id	Customer_id	Bill_date	Bill_amount	Tips	Discount
B0001	10100	U1001	11-11-2017	40.59	6.0885	Nil
B0002	10101	U1002	13-01-2018	54.76	8.214	Coupon
B0003	10102	U1003	13-11-2017	33.68	5.052	3%
B0004	10103	U1004	02-01-2018	309.5	46.425	Nil
B0005	10104	U1005	12-02-2018	217.45	32.6175	2%
B0006	10105	U1006	14-11-2017	177.29	26.5935	Coupon
B0007	10106	U1007	21-12-2017	110.15	16.5225	3%
B0008	10107	U1008	08-12-2017	94.81	14.2215	3%
B0009	10108	U1009	18-01-2018	247.38	37.107	Coupon
B0010	10109	U1010	27-02-2018	65.73	9.8595	2%
B0011	10110	U1011	02-03-2018	373.72	56.058	GiftCard
B0012	10111	U1012	22-12-2017	51.92	7.788	GiftCard
B0013	10112	U1013	21-12-2017	52.5	7.875	GiftCard
B0014	10113	U1014	18-01-2018	132.3	19.845	2%
B0015	10114	U1015	21-11-2017	67.04	10.056	Nil
B0016	10115	U1016	27-11-2017	36.27	5.4405	Nil
B0017	10116	U1017	20-11-2017	8.37	1.2555	GiftCard
B0018	10117	U1018	11-11-2017	95.45	14.3175	Nil
B0019	10118	U1019	13-01-2018	13	1.95	3%
B0020	10119	U1020	05-01-2018	195.57	29.3355	Coupon

Result Grid | Form Editor | Field Types | Query Stats | Execution Plan

Bills_ods 21 Read Only

Action Output

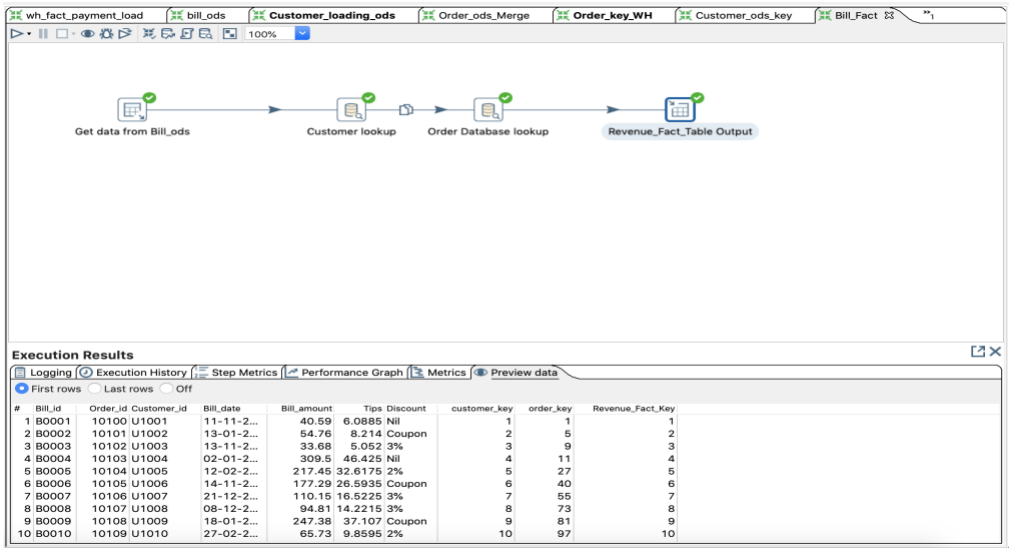
	Time	Action	Response	Duration / Fetch Time
465	04:41:16	select * from Bills_ods LIMIT 0, 1000	138 row(s) returned	0.0022 sec / 0.00005..

Part 4: Load fact Table by using the Dimension Tables in Warehouse Schema:

1. Generate customer key in customer_ods and load it into Revenue Fact Table.

2. Generate Order Key in Orders_ods and load it into Revenue Fact Table.
3. Load Fact Table with Bill Amount from Dimension Bills in Warehouse Schema.

ETL Transformation:



#	Bill_id	Order_id	Customer_id	Bill_date	Bill_amount	Tips	Discount	customer_key	order_key	Revenue_Fact_Key
1	B0001	10100	U1001	11-11-2...	40.59	6.0885	Nil	1	1	1
2	B0002	10101	U1002	13-01-2...	54.76	8.214	Coupon	2	5	2
3	B0003	10102	U1003	13-11-2...	33.68	5.052	3%	3	9	3
4	B0004	10103	U1004	02-01-2...	309.5	46.425	Nil	4	11	4
5	B0005	10104	U1005	12-02-2...	217.45	32.6175	2%	5	27	5
6	B0006	10105	U1006	14-11-2...	177.29	26.5935	Coupon	6	40	6
7	B0007	10106	U1007	21-12-2...	110.15	16.5225	3%	7	55	7
8	B0008	10107	U1008	08-12-2...	94.81	14.2215	3%	8	73	8
9	B0009	10108	U1009	18-01-2...	247.38	37.107	Coupon	9	81	9
10	B0010	10109	U1010	27-02-2...	65.73	9.8595	2%	10	97	10

MySQL results:

```
34
35
36 •  USE orangebee_wh;
37 •  select * from revenue_fact;
38
39
```

100% 27:37 1 error found

Result Grid | Filter Rows: Search | Edit: | Export/Import:

Revenue_Fact_Key	Revenue	customer_key	order_key
1	40.59	1	1
2	54.76	2	5
3	33.68	3	9
4	309.5	4	11
5	217.45	5	27
6	177.29	6	40
7	110.15	7	55
8	94.81	8	73
9	247.38	9	81
10	65.73	10	97
11	373.72	11	103
12	51.92	12	119
13	52.5	13	125
14	132.3	14	127
15	67.04	15	131
16	36.27	16	141
17	8.37	17	146
18	95.45	18	147
19	13	19	159
20	195.57	20	160

Result Grid | Form Editor | Field Types | Query Stats | Execution Plan

revenue_fact 20 | Apply | Revert

Action Output

	Time	Action	Response	Duration / Fetch Time
463	04:39:19	select * from revenue_fact LIMIT 0, 1000	138 row(s) returned	0.00074 sec / 0.0000...

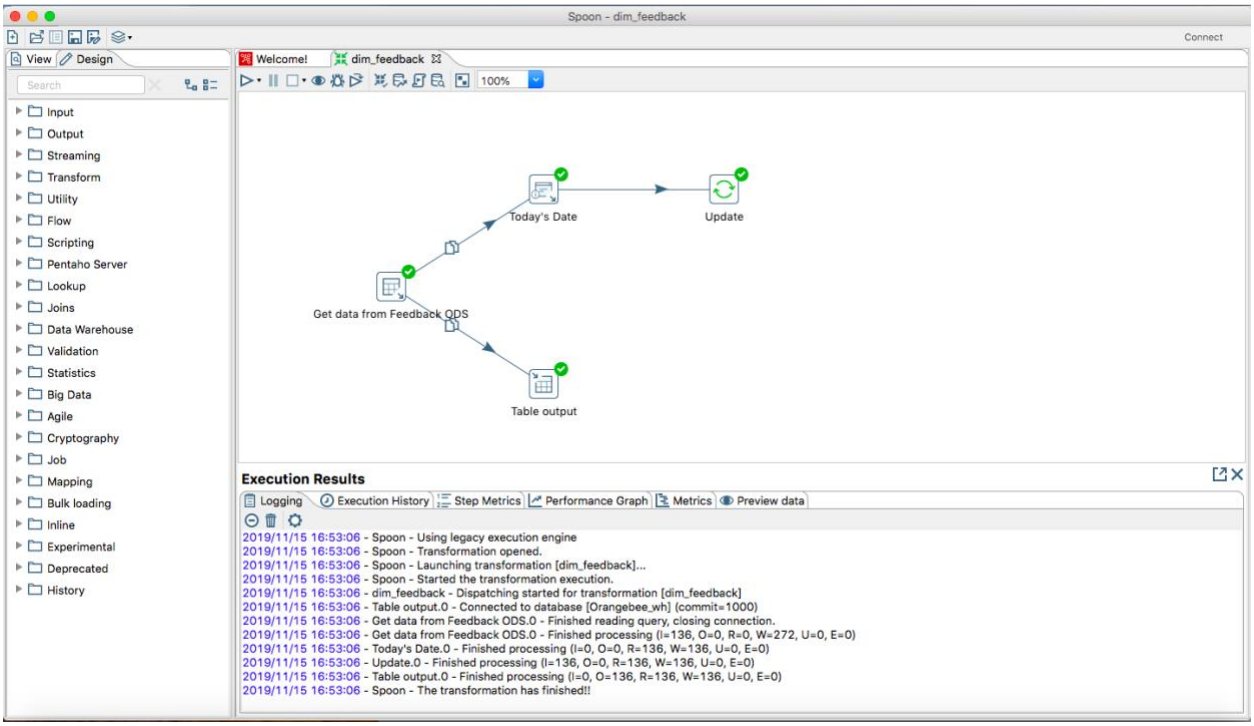
Warehouse Schema: Orangebee_wh
Dimension Tables:

1. Dim_customer
2. Dim_order
3. Dim_menu
4. Dim_feedback
5. Dim_date

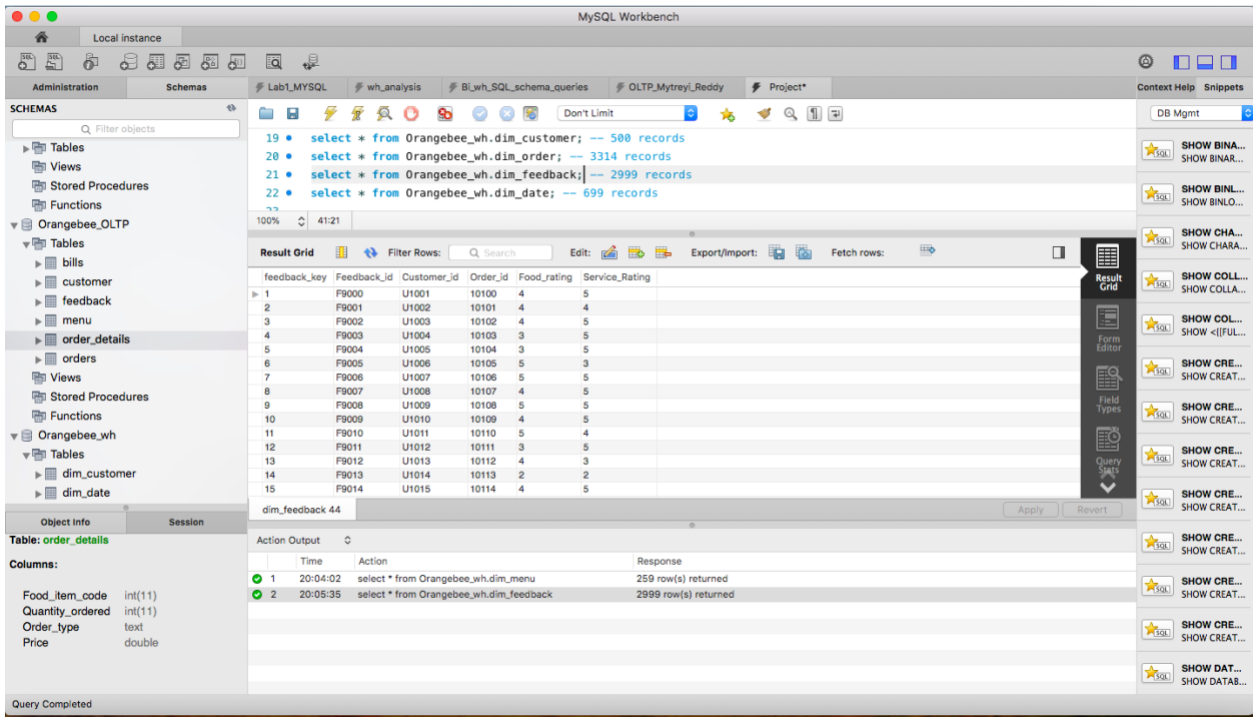
Fact Table: 1. Fact_Revenue

ETL Implementation: Loading Dimensions
File 1: Loading Feedback from ODS to Feedback Warehouse

KTR :

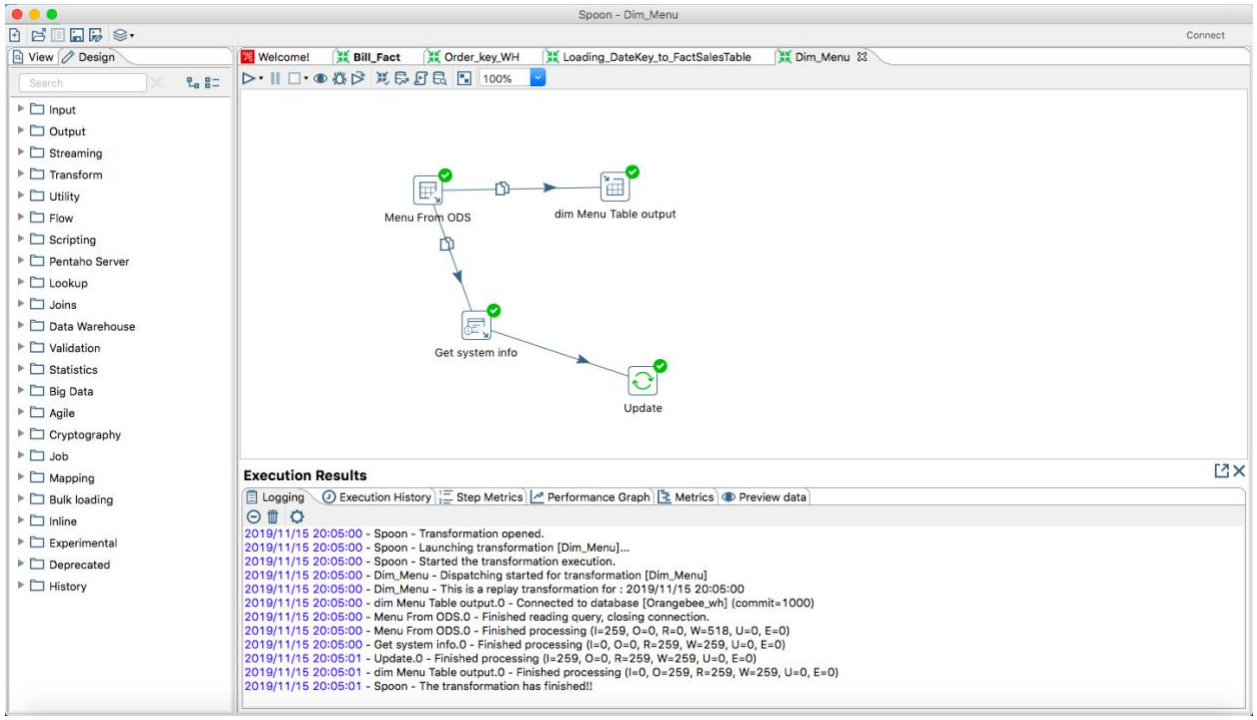


MySQL results:

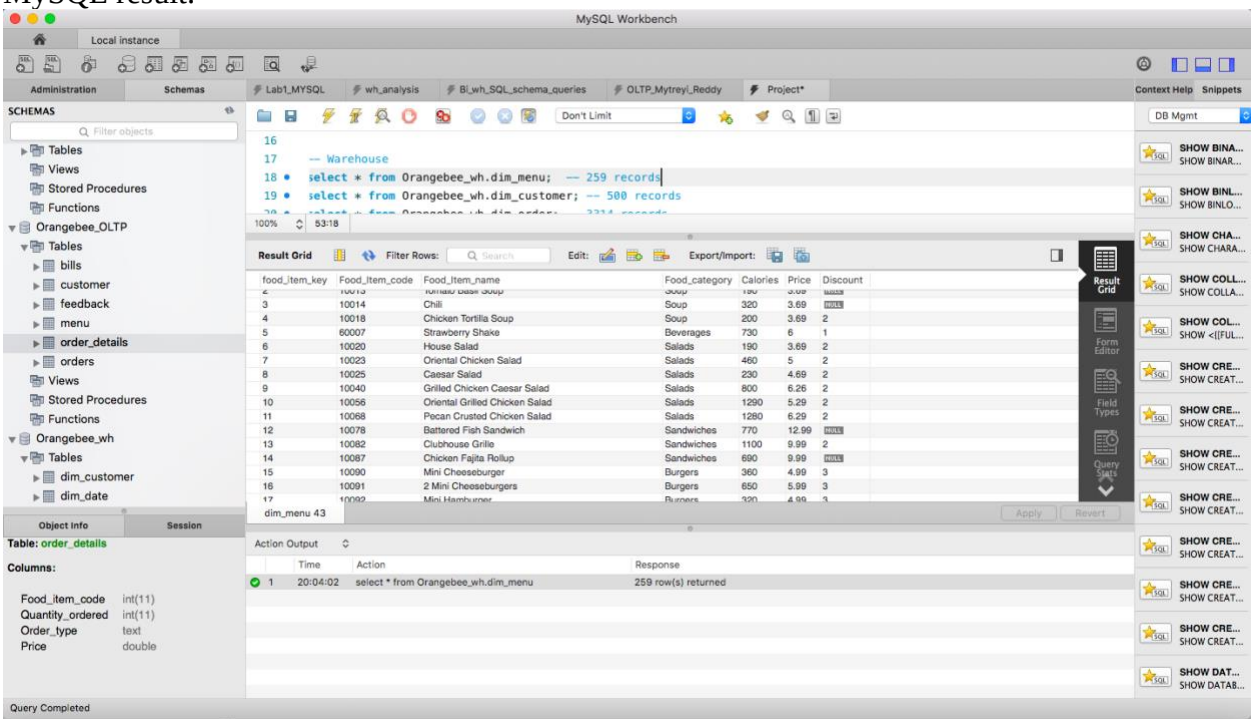


File 2: Loading Menu from ODS to Menu Warehouse

KTR File:

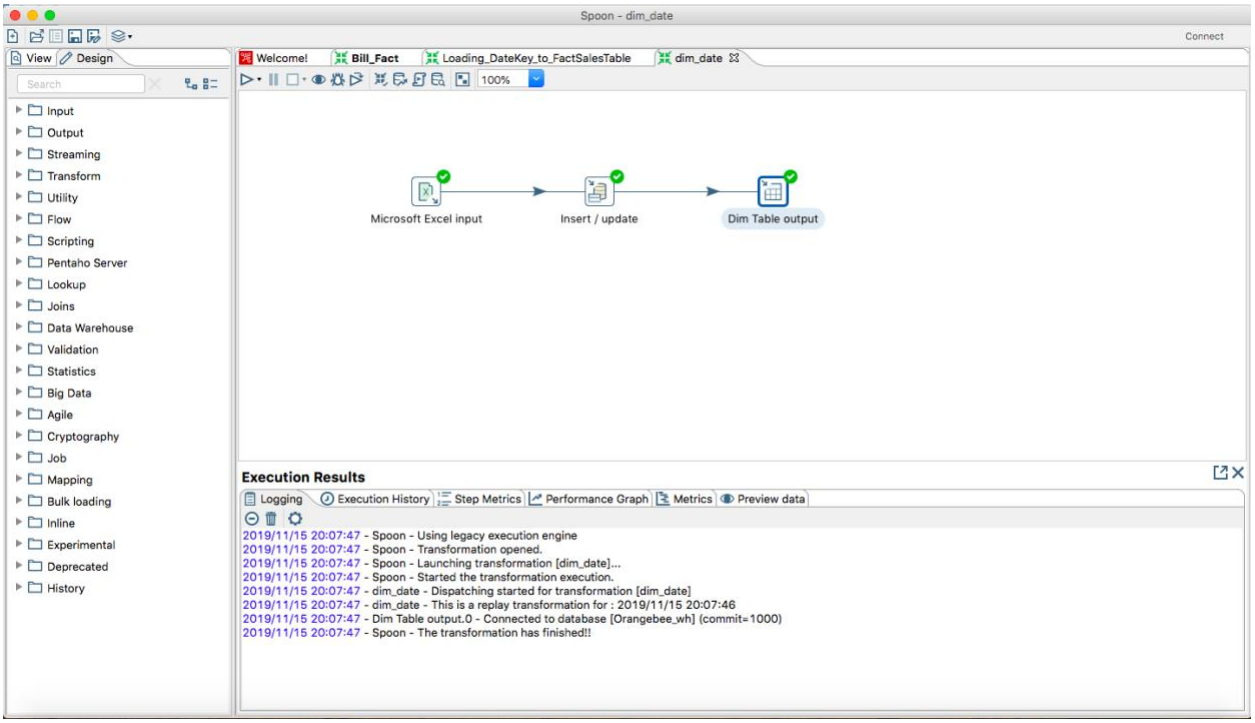


MySQL result:

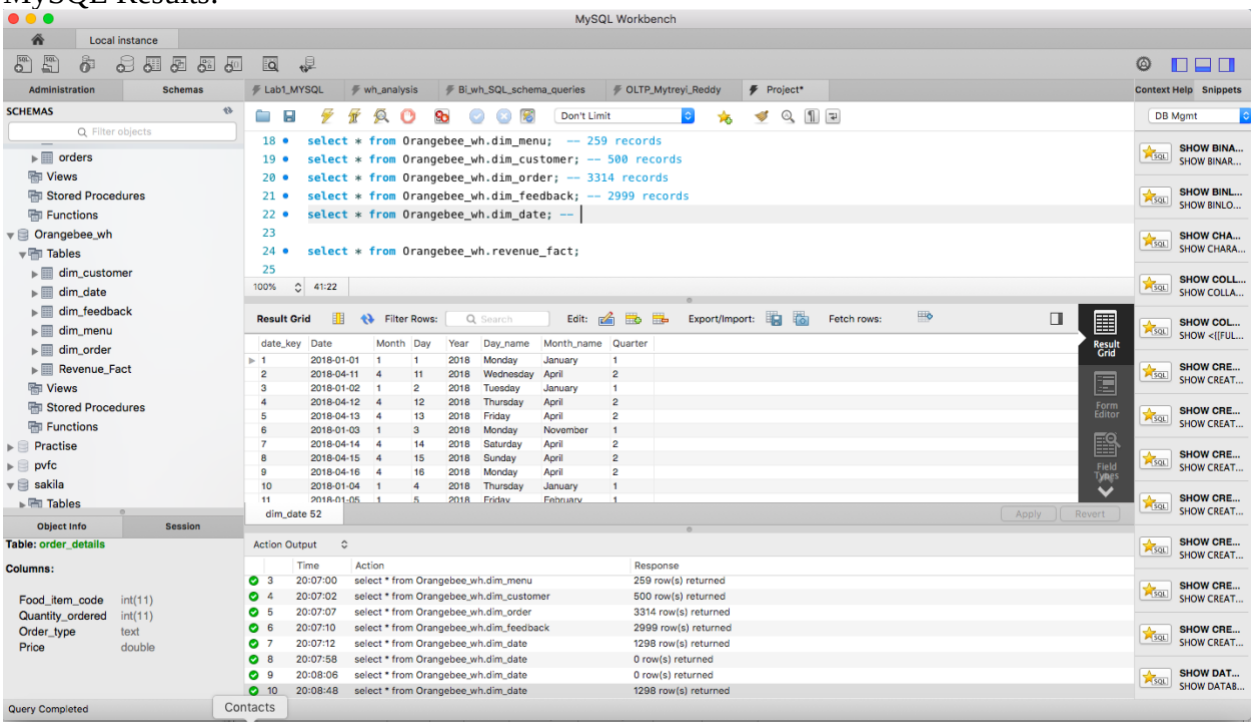


File 3: Loading date excel file to dimension date table

KTR:

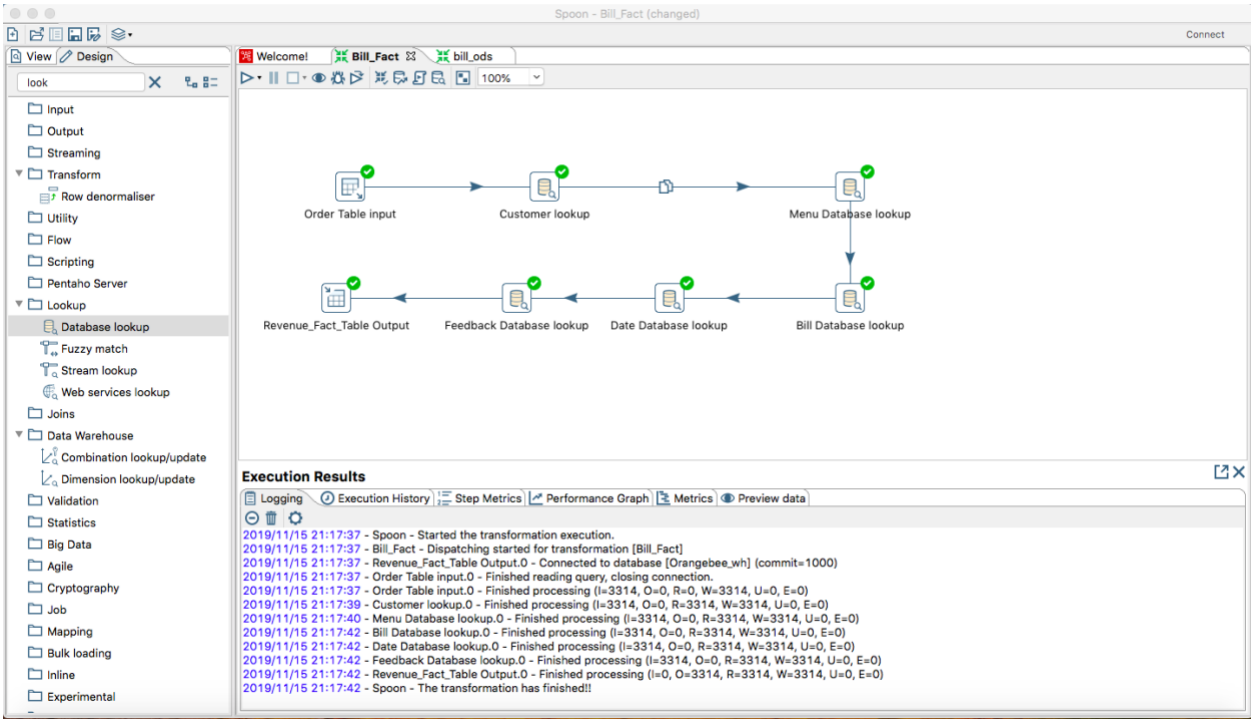


MySQL Results:

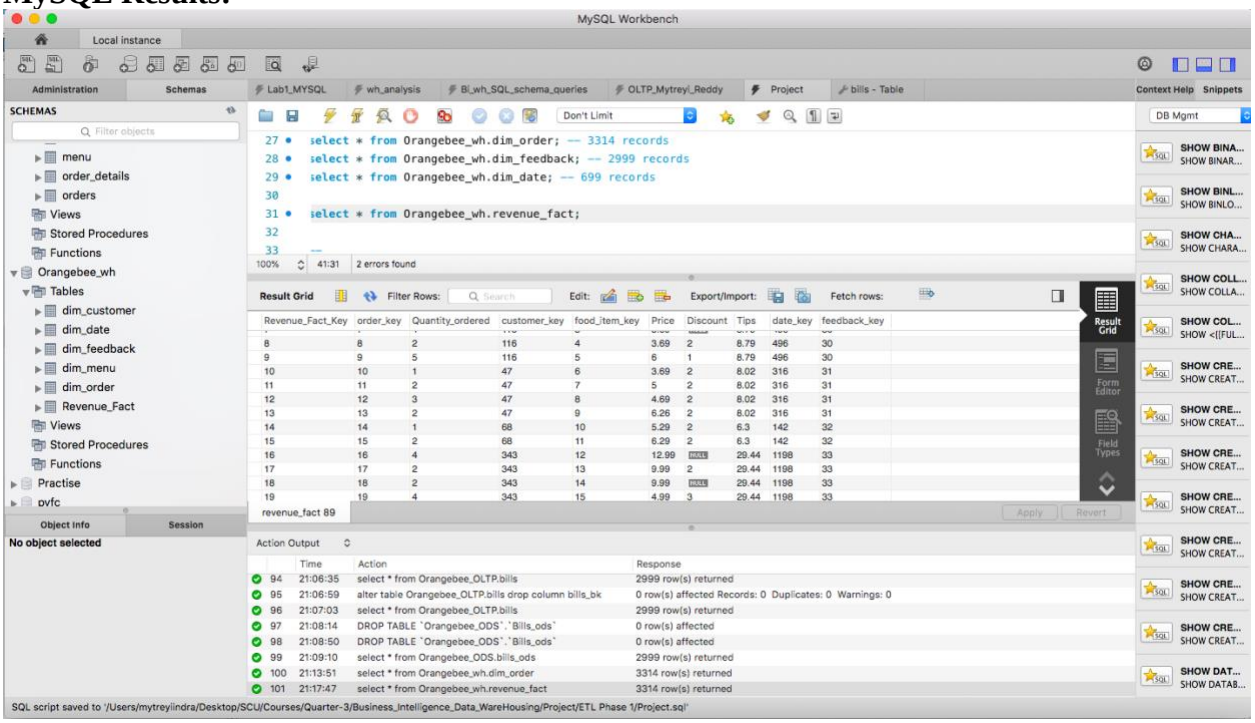


File 4: Loading Fact Table Revenue_Fact with all the dimension tables.

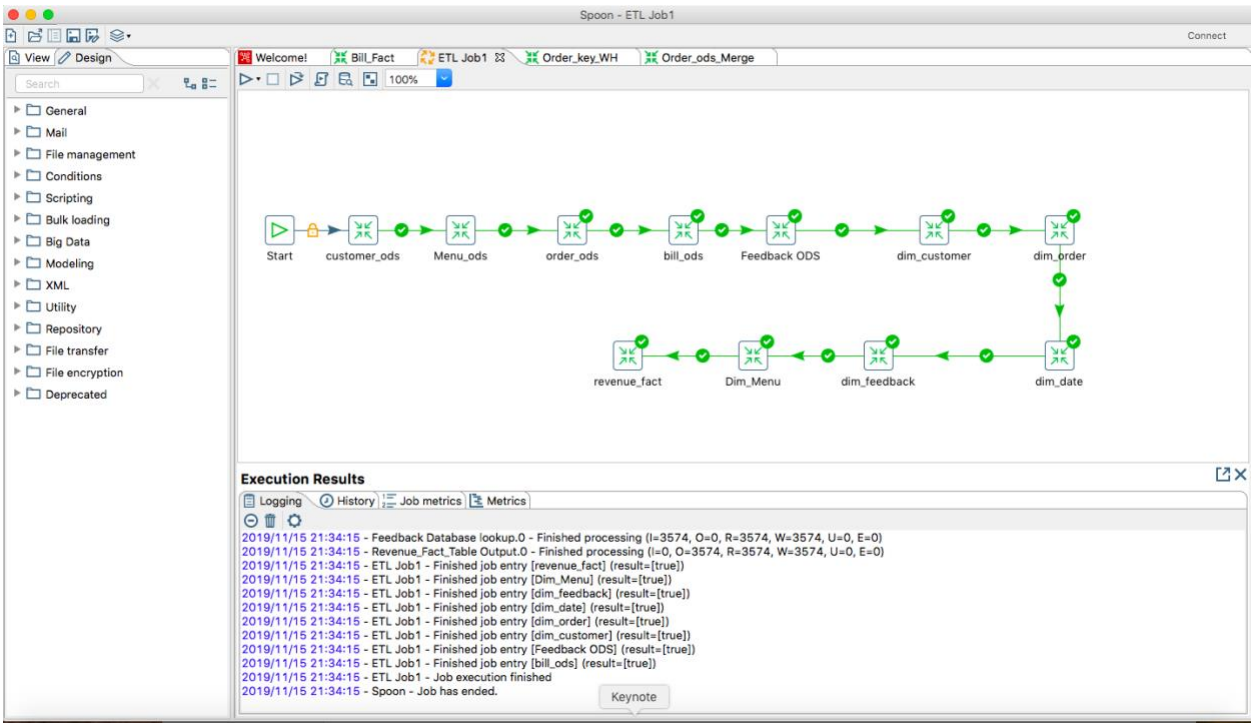
KTR:



MySQL Results:



File 5: Job Transformation: ETL Job with all KTRs in sequence of execution:

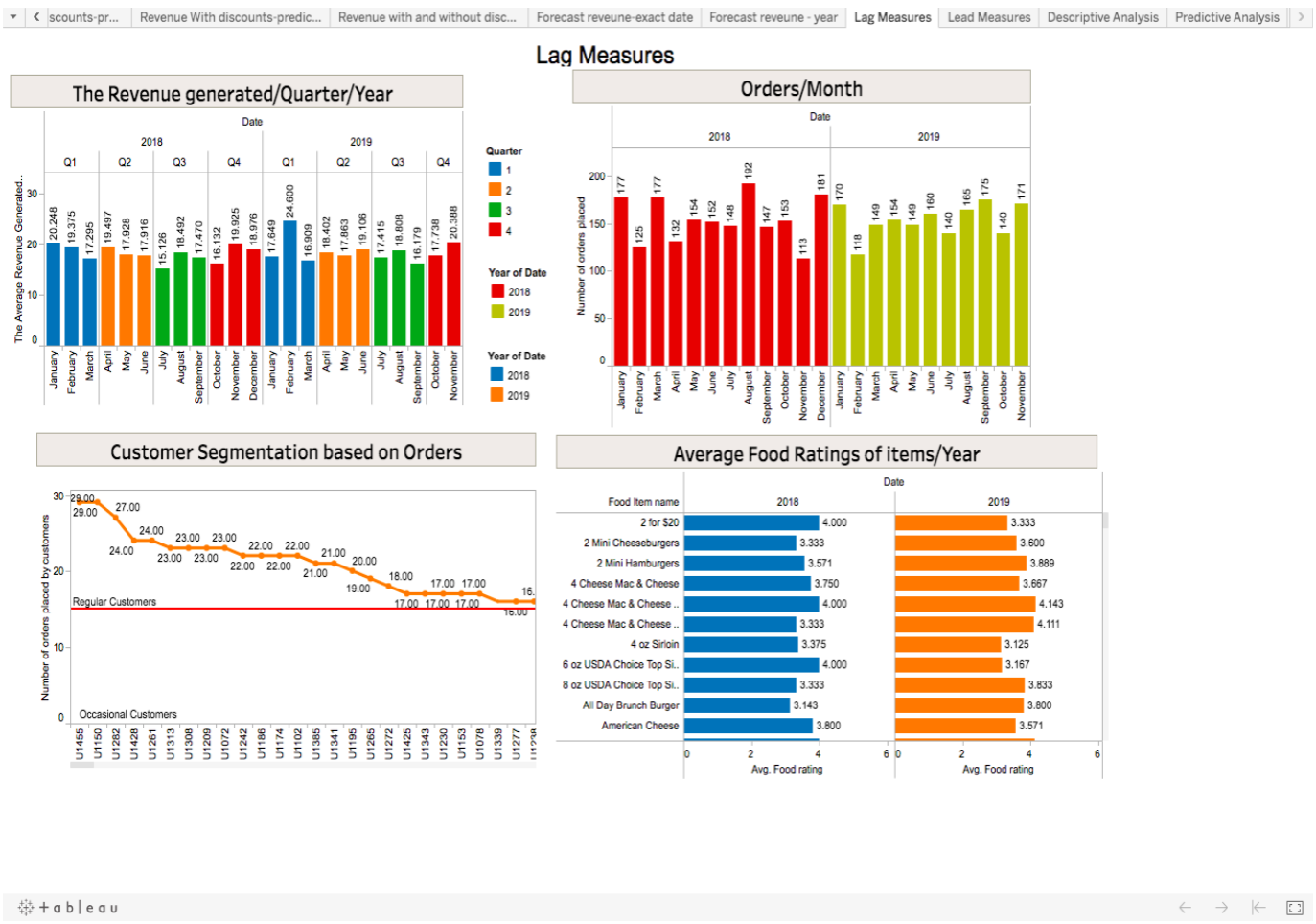


Phase 4: Tableau Implementation

The Tableau file, twbx has various lead and lag measures. The main metrics which are highly important and impact the business are taken and included in dashboards.

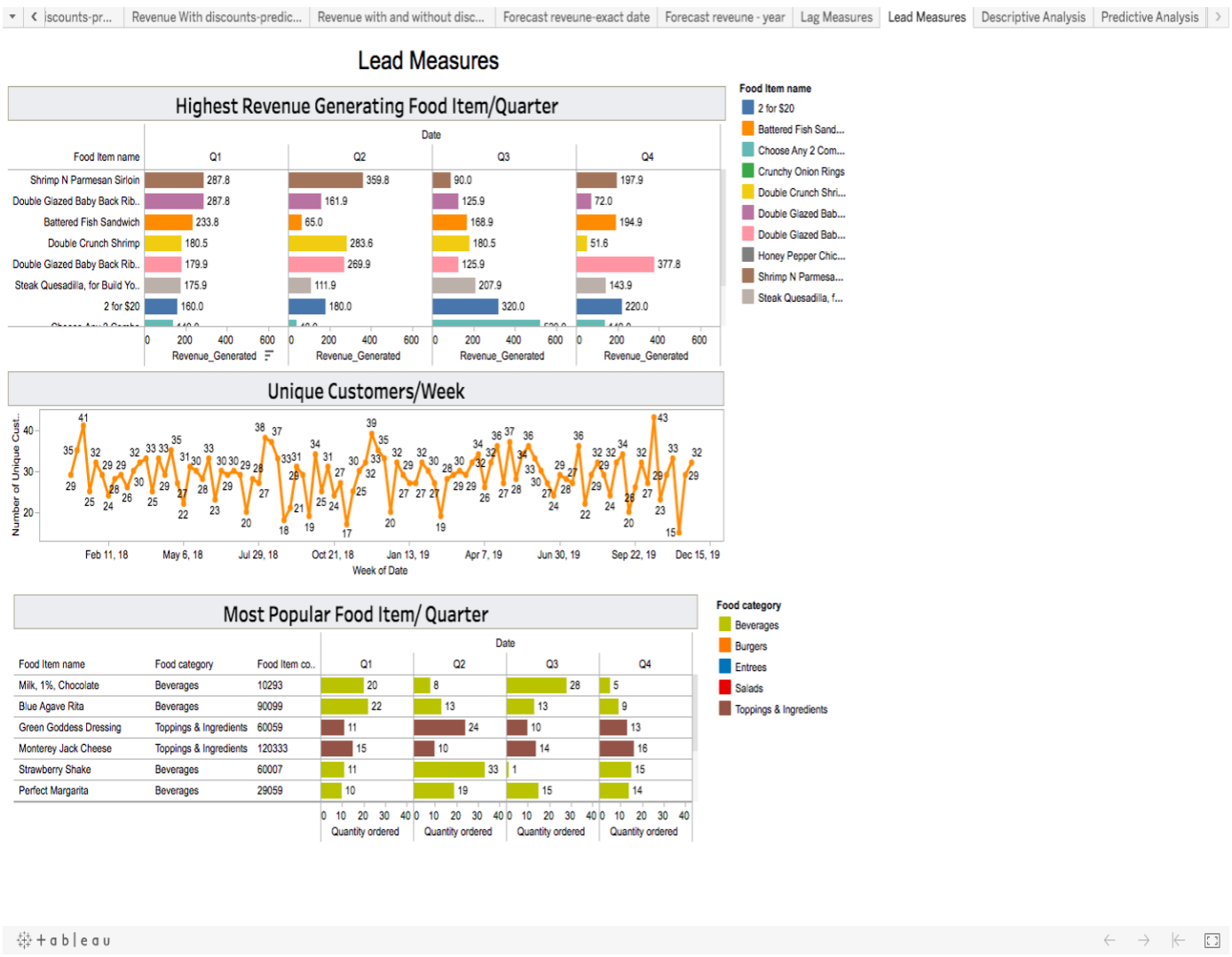
Dashboard 1 - Lag Measures:

1. Finding revenue generated for a quarter/ year.
2. Average orders per month.
3. Customers differentiation based on their number of orders - regular customers and occasional customers.
4. Average of food ratings per year.



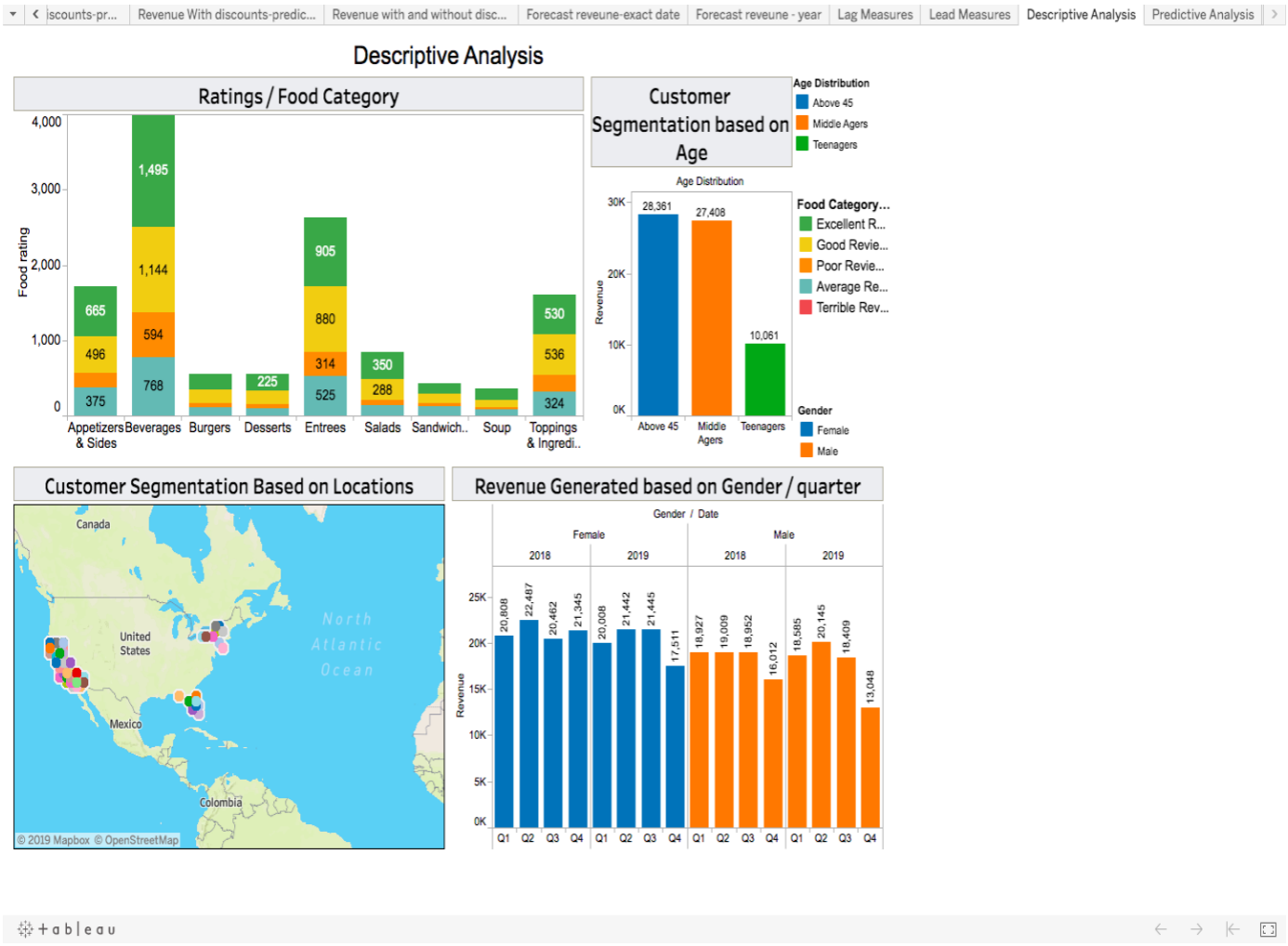
Dashboard 2 - Lead Measures:

1. A number of unique customers per week/month.
2. The most popular food item and food category - per quarter
3. Highest revenue generated for food item per quarter - the food item that brought the most revenue



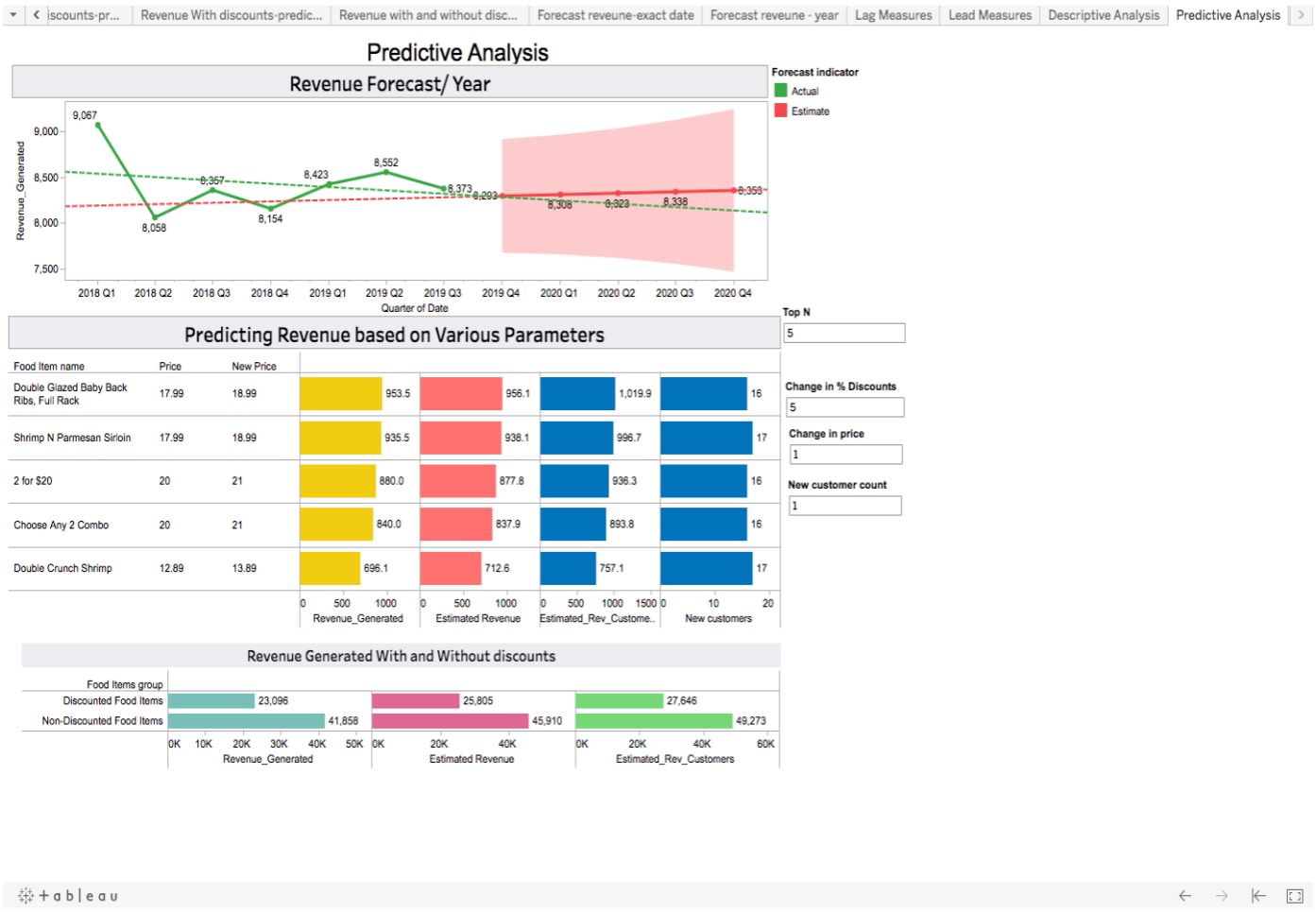
Dashboard 3 – Descriptive Analytics:

1. Food and service ratings through 2018-2019
2. Customer's Age distribution
3. Revenue generated based on Gender per quarter.
4. Customer's locations.



Dashboard 4 - Predictive:

1. Revenue Forecast For next 4 quarters.
2. Predicting revenue based on variations in discounts, price and customer base.
3. Total Revenue that is generated With and Without discounts.



Link to The Tableau Public Server:

https://public.tableau.com/profile/mytreyi.reddy#!/vizhome/Project_Final_OrangeBee/LagMeasures

Future Enhancements: For precise prediction, Including Parameters such as Quantity Ordered, most preferred food items, specific highest revenue generated orders give accurate growth and profits.

Conclusion:

By analyzing all these metrics and reports business can know the frequency of special requests to engineer the menu and could know why a certain day of the week attracts fewer customers? Therefore, analyzing every datapoint related to the restaurant business and converting them into meaningful insights can help improve everything from menus and staff straining to restaurant policies and marketing campaigns.