

Low Level Design

Data Analysis

Written By	Leo Rajan
Document Version	1.3
First Revised Date	21/08/2023
Last Revised Date	30/08/2023
Last Revised Date	20/09/2023

Contents:

1 Introduction	03
1.1 What is Low-Level Design Document?	03
1.2 Scope.....	03
2 Architecture	04
3 Power BI Architecture Description	05
3.1 Architecture Description	06
3.2 Alteryx	07
3.3 Data Preparation & Cleaning.....	07
3.4 Export Data	11
4 Deployment	12
5 Case Study	13

1. Introduction

1.1 What is Low-Level design document?

The goal of the LDD or Low-level design document (LLDD) is to give the internal logic design of the actual program code for the Expenditure Data Analysis dashboard. LDD describes the class diagrams with the methods and relations between classes and programs specs. It describes the modules so that the programmer can directly code the program from the document.

1.2 Scope

Low-level design (LLD) is a component-level design process that follows a step-by step refinement process. The process can be used for designing data structures, required software architecture, source code and ultimately, performance algorithms. Overall, the data organization may be defined during requirement analysis and then refined during data design work.

2. Architecture

Power BI Desktop Architecture

1. Get Power BI Desktop

With Power BI Desktop, you can build advanced queries, models, and reports that visualize data. You can also build data models, create reports, and share your work by publishing to the Power BI service. Power BI Desktop is a free download.

2. BI solution architecture in the Centre of Excellence

BI solution architecture can consist of:

- Data sources
- Data ingestion
- Big data / data preparation
- Data warehouse
- BI semantic models
- Reports

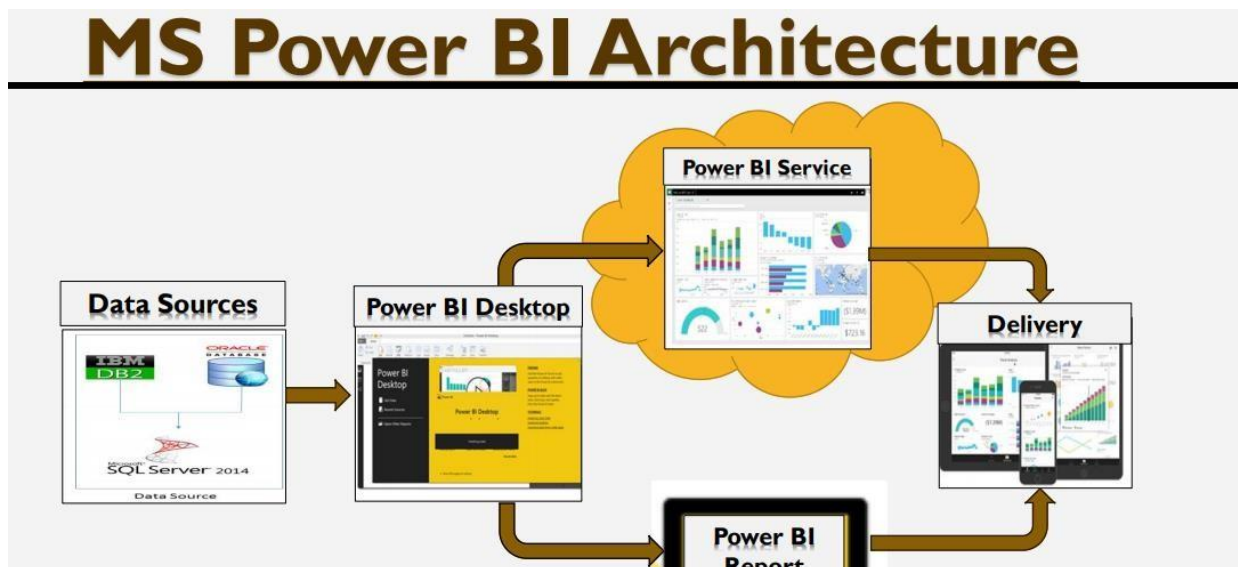


Fig: Power BI Architecture diagram

Microsoft Power BI Desktop is a companion desktop application to Power BI.

With Power BI Desktop, you can:

1. Get data:

The Power BI Desktop makes discovering data easy. You can import data from a wide variety of data sources. After you connect to a data source, you can shape the data to match your analysis and reporting needs.

2. Create relationships and enrich your data model with new measures and data formats:

When you import two or more tables, oftentimes you'll need to create relationships between those tables. The Power BI Desktop includes the Manage Relationships dialog and the Relationships view, where you can use Autodetect to let the Power BI Desktop find and create any relationships, or you can create them yourself. You can also very easily create your own measures and calculations or customize data formats and categories to enrich your data for additional insights.

3. Create reports:

The Power BI Desktop includes the Report View. Select the fields you want, add filters, choose from dozens of visualizations, format your reports with custom colours, gradients and several other options. The Report View gives you the same great report and visualizations tools just like when creating a report on PowerBI.com.

4. Save your reports:

With the Power BI Desktop, you can save your work as a Power BI Desktop file. Power BI Desktop files have a .pbix extension.

5. Upload or Publish your reports:

You can upload the reports you created and saved in the Desktop to your Power BI site. You can also publish them to Power BI right from Power BI Desktop.

3. Architecture Description

3.1. Data Description: The Dataset contains year wise Product sales details with the following parameters:

1) Aggregate Sales:

The Total Sales Amount KPI is a pivotal metric that encapsulates the overall revenue generated by a business. It serves as a comprehensive indicator of the company's financial performance, representing the sum of all sales transactions over a specific period.

2) Product Margin:

The Total Product Margin KPI is a crucial metric that measures the profitability of a company's entire product line. It calculates the difference between the total revenue generated from product sales and the total cost of producing or procuring those products.

3) Profit Margin %:

The Total Profit Margin Percentage KPI is a vital financial metric that assesses a company's overall profitability. It represents the percentage of revenue that translates into profit after accounting for all costs, including production, operating, and overhead expenses. A high profit margin percentage indicates efficient cost management and strong pricing strategies, reflecting a healthy financial position.

4) Total Discount Amount:

The Total Discount Amount KPI is a critical metric used by businesses to evaluate the effectiveness of their discount strategies. It represents the cumulative value of all discounts applied to products or services within a specific period.

5) Revenue Deficits:

A revenue deficit occurs when realized net income is less than the projected net income. This happens when the actual amount of revenue and/or the actual number of expenditures do not correspond with budgeted revenue and expenditures.

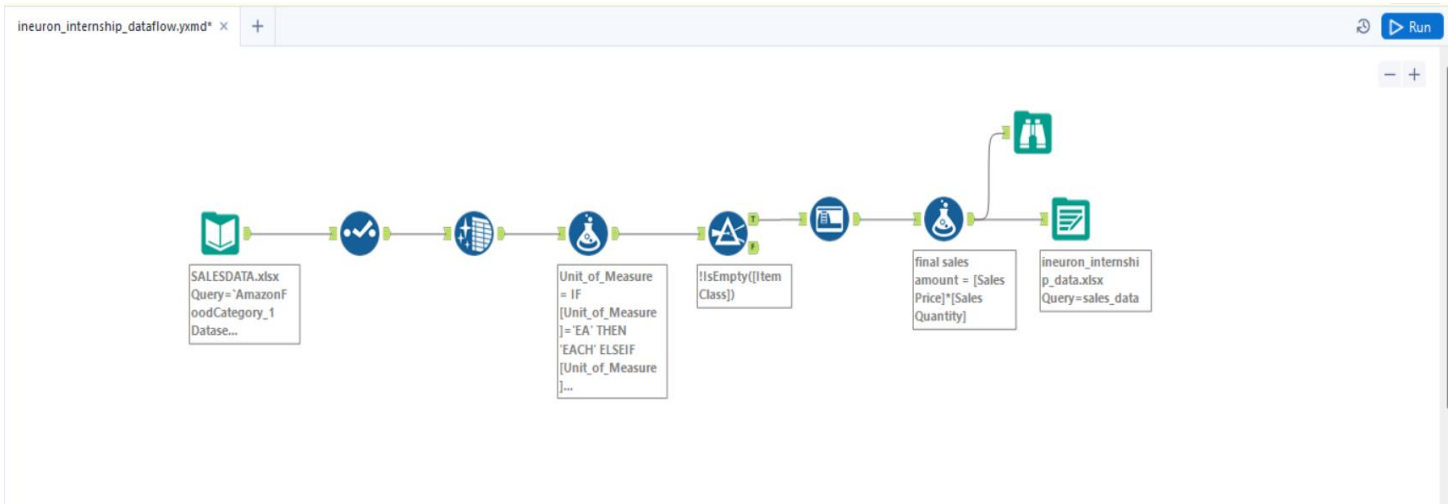
3.2. Alteryx:

Alteryx is a powerful data analytics platform designed to simplify the process of preparing, blending, and analyzing complex datasets. It offers a user-friendly interface that allows data professionals to perform advanced analytics without the need for extensive coding. Alteryx integrates seamlessly with various data sources, enabling users to extract, transform, and load (ETL) data effortlessly. One of its key features is its ability to automate repetitive tasks, saving valuable time and resources. Furthermore, Alteryx provides advanced predictive and spatial analytics capabilities, making it a popular choice for organizations seeking comprehensive solutions for their data analysis needs.

7 Low Level Design (LLD)

3.3. Data Preparation:

- In the Preparation Process, we will convert our original datasets with other necessary attributes format. And will merge it.
- All the datasets are of same format as shown below: Original dataset.



A1	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	Order Number	Promised Delivery Date	Sales Amount	Sales Amount Based on List Price	Sales Cost Amount	Sales Margin Amount	Sales Price	Sales Quantity	Sales Rep	U/M					
2	124295	05-01-17	229.76	502.8	164.36	65.4	11.488	20	166 EA			U/M = unit of measure			
3	218219	08-02-17	362.02	754.2	246.54	115.48	12.06733333	30	185 EA			EA = each			
4	118219	19-02-19	347.54	754.2	246.54	101	11.58466667	30	185 EA			SE = some SI unit like kgs or gallons			
5	207623	08-08-17	362.02	754.2	246.54	115.48	12.06733333	30	185 EA			PR = pair			
6	107623	20-08-19	347.54	754.2	246.54	101	11.58466667	30	185 EA						
7	213205	22-10-17	239.33	502.8	164.36	74.97	11.9665	20	166 EA						
8	113205	03-11-19	229.76	502.8	164.36	65.4	11.488	20	166 EA						
9	224295	24-12-17	239.33	502.8	164.36	74.97	11.9665	20	166 EA						
10	318219	31-01-18	372.88	754.2	246.54	126.34	12.42933333	30	185 EA						
11	123081	03-01-17	209.08	398	68.78	140.3	104.54	2	143 EA						
12	122025	05-01-17	393.06	796	137.55	255.51	98.265	4	125 EA						
13	123363	06-01-17	211.28	398	68.78	142.5	105.64	2	127 EA						
14	218893	19-02-17	330.12	597	103.16	226.96	110.04	3	157 EA						
15	218640	19-02-17	326.68	597	103.16	223.52	108.8933333	3	175 EA						
16	218625	20-02-17	336.99	597	103.16	233.83	112.33	3	120 EA						
17	118640	02-03-19	313.61	597	103.16	210.45	104.5366667	3	175 EA						
18	118893	02-03-19	316.92	597	103.16	213.76	105.64	3	157 EA						
19	118625	03-03-19	323.51	597	103.16	220.35	107.8366667	3	120 EA						
20	219467	04-03-17	204.72	398	68.78	135.94	102.36	2	167 EA						
21	116162	12-03-19	509.6	995	171.94	337.66	101.92	5	168 EA						
22	119386	12-03-19	407.68	796	137.55	270.13	101.92	4	168 EA						
23	208391	19-08-17	330.12	597	103.16	226.96	110.04	3	157 EA						
24	208100	19-08-17	326.68	597	103.16	223.52	108.8933333	3	175 EA						
25	208084	20-08-17	336.99	597	103.16	233.83	112.33	3	120 EA						
26	208968	29-08-17	424.67	796	137.55	287.12	106.1675	4	168 EA						
27	203762	29-08-17	530.83	995	171.94	358.89	106.166	5	168 EA						
28	108100	31-08-19	313.61	597	103.16	210.45	104.5366667	3	175 EA						
29	108391	31-08-19	316.92	597	103.16	213.76	105.64	3	157 EA						
30	108084	01-09-19	323.51	597	103.16	220.35	107.8366667	3	120 EA						
31	209072	02-09-17	204.72	398	68.78	135.94	102.36	2	167 EA						
32	103762	10-09-19	509.6	995	171.94	337.66	101.92	5	168 EA						
33	108968	10-09-19	407.68	796	137.55	270.13	101.92	4	168 EA						
34	209112	20-10-17	204.72	398	68.78	135.94	102.36	2	139 EA						
35	211734	20-10-17	217.79	398	68.78	149.01	108.895	2	143 EA						
36	210000	22-10-17	410.44	796	137.55	271.89	102.36	4	175 EA						

- As you all can notice that format of the data, we have is not good to analyse and visualize. So, we need to reconstruct the structure of the dataset.

8 Low Level Design (LLD)

We will be using only Alteryx for data restructuring and cleaning purpose.

Step 1) Input Data:

In Alteryx we can use Input Data tool to load data.

The screenshot shows the Alteryx Designer interface. On the left, the 'Input Data (1) - Configuration' pane is open. A red arrow points to the 'Connect a File or Database' section, specifically to the file path: `\\Users\HP\Downloads\ineuron expenditure project\SALESDATA.xlsx`. Another red arrow points to the 'File Format' dropdown, which is set to 'Microsoft Excel (*.xlsx)'. Below this, the 'Table or Query' is set to 'AmazonFoodCategory_1 Datasets'. The 'Preview (first 100 records)' section shows a table with columns: CustKey, DateKey, Discount Amount, Invoice Date, Invoice Number, and Item. The main workflow area shows a sequence of tools: 'Input Data (1)', 'Select', 'Formula' (with a formula for 'Unit_of_Measure'), 'Filter' (with a condition 'IsEmpty([Item Class])'), 'Summarize' (with a formula for 'final sales amount'), and 'Output Data'. The 'Results - Input Data (1) - Output' pane at the bottom shows '0 of 0 Fields' and 'No data available. Use Ctrl+R to run the workflow.'

Step 2) Rename and Unselect Column:

The screenshot shows the Alteryx Designer interface. On the left, the 'Select (3) - Configuration' pane is open. A red arrow points to the 'Field' list, where 'Sales Report' and 'Unit_of_Measure' are highlighted with red boxes. Another red arrow points to the 'F21' checkbox, which is unchecked. The main workflow area shows the same sequence of tools as in Step 1, but the 'Select' tool is now highlighted with a red box. The 'Results - Select (3) - Output' pane at the bottom shows '20 of 20 Fields' and '* 6,117 of 65,482 records displayed (partial results)'. The table shows columns: Record, Line Number, List Price, Order Number, Promised Delivery Date, Sales Amount, Sales Amount Based on List Price, and Sales Cost Amount.

9 Low Level Design (LLD)

Step 3) Remove NULLs:

The screenshot shows the Alteryx Designer interface with the Data Cleansing tool configured. The 'Remove Null Data' section is highlighted with a red box, showing the following options:

- ☒ Remove null rows
- ☐ Remove null columns

The 'Select Fields to Cleanse' section is also highlighted with a red box, showing the following fields selected:

- ☒ CustKey
- ☒ DateKey
- ☒ Discount Amount
- ☒ Invoice Date
- ☒ Invoice Number
- ☒ Item Class
- ☒ Item Number

The 'Replace Nulls' section is also highlighted with a red box, showing the following options:

- ☐ Replace with Blanks (String Fields)
- ☐ Replace with 0 (Numeric Fields)

The 'Remove Unwanted Characters' section is also highlighted with a red box, showing the following options:

- ☒ Leading and Trailing Whitespace
- ☐ Tabs, Line Breaks, and Duplicate Whitespace
- ☒ All Whitespace
- ☐ Letters
- ☐ Numbers
- ☐ Punctuation

The workflow diagram shows the following steps:

- SALESDATA.xlsx Query - Amazon FoodCategory_1 Database...
- Formula tool: `Unit_of_Measure = IF [Unit_of_Measure] = 'EA' THEN 'EACH' ELSEIF [Unit_of_Measure] = 'SE' THEN 'Some SI Units' ELSE 'PAIR' ENDIF`
- Filter tool: `[IsEmpty]([Item Class])`
- Aggregate tool: `final sales amount = [Sales Price]*[Sales Quantity]`
- Output tool: `ineuron_internsh p_data.xlsx Query=expense`

The Results - Data Cleansing (4) - Output26 table shows 20 of 20 fields and 6,292 of 65,282 records displayed (partial results).

Record	Line Number	List Price	Order Number	Promised Delivery Date	Sales Amount	Sales Amount Based on List Price	Sales Cost Amount
1	5000	189.27	225123	2017-04-17	207.14	378.54	105.81
2	1000	26.4525	217828	2017-02-06	188553.42	188553.42	121084.76
3	1000	101	108025	2019-08-20	2462.95	5050	1467.83
4	39000	247.07	203533	2017-06-27	256.87	494.14	171.84
5	100000	625	110866	2019-10-01	328.32	625	252.06
6	45000	247.07	321106	2018-03-14	529.16	988.28	341.29
7	29000	181.44	118117	2019-02-11	953.13	181.44	298.64
8	1000	294.54	222725	2017-12-17	883.62	883.62	255.09
9	2000	1431.23	118931	2019-02-23	712.27	1431.23	449.69
10	1000	288.31	209889	2017-09-15	3944.08	8649.3	2795.32
11	1000	625	105021	2019-07-09	328.32	625	253.71

Step 4) Column Data Correction:

The screenshot shows the Alteryx Designer interface with the Formula tool configured. The 'Output Column' section is highlighted with a red box, showing the following configuration:

- Unit_of_Measure: EACH
- Formula: `IF [Unit_of_Measure] = 'EA' THEN 'EACH' ELSEIF [Unit_of_Measure] = 'SE' THEN 'Some SI Units' ELSE 'PAIR' ENDIF`
- Data type: V_String
- Size: 255

The workflow diagram shows the following steps:

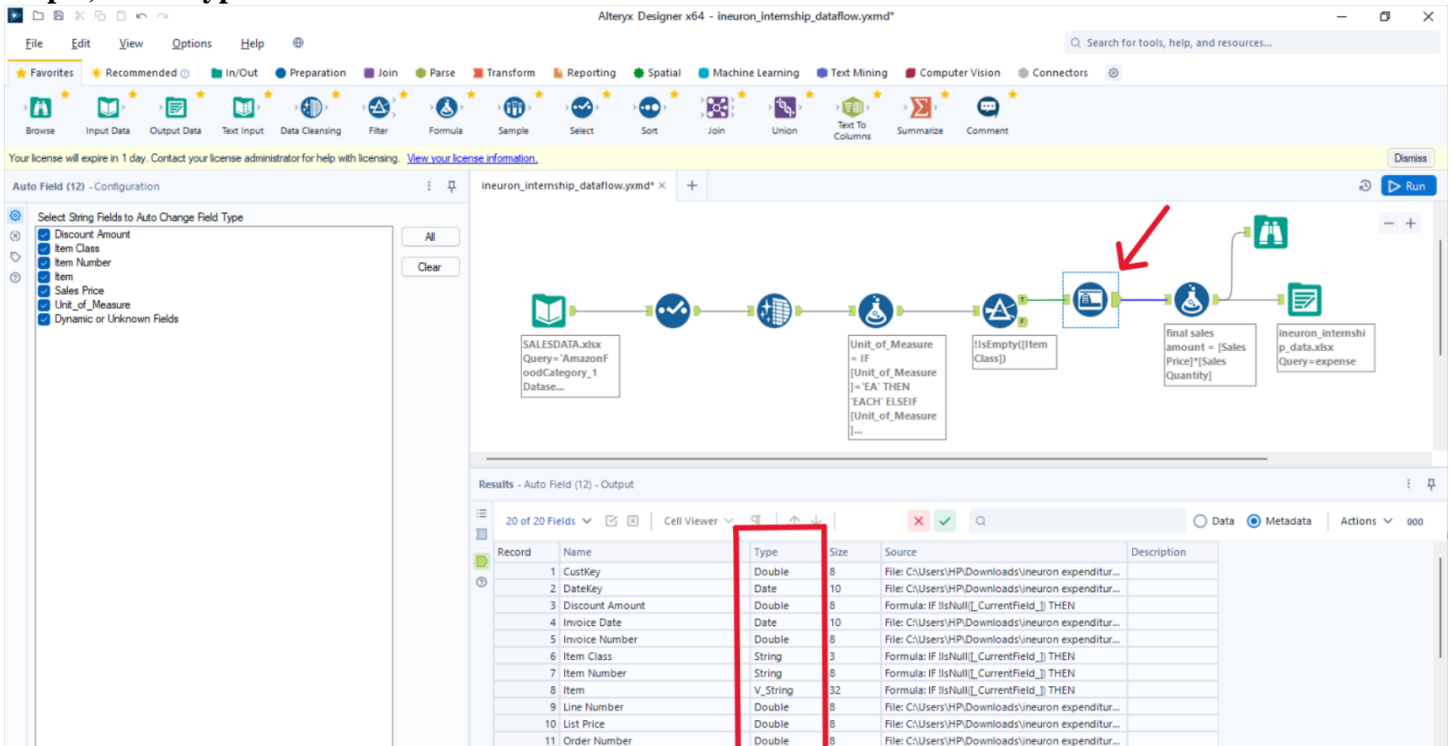
- SALESDATA.xlsx Query - Amazon FoodCategory_1 Database...
- Formula tool: `Unit_of_Measure = IF [Unit_of_Measure] = 'EA' THEN 'EACH' ELSEIF [Unit_of_Measure] = 'SE' THEN 'Some SI Units' ELSE 'PAIR' ENDIF`
- Filter tool: `[IsEmpty]([Item Class])`
- Aggregate tool: `final sales amount = [Sales Price]*[Sales Quantity]`
- Output tool: `ineuron_internsh p_data.xlsx Query=expense`

The Results - Formula (9) - Output table shows 20 of 20 fields and 6,193 of 65,282 records displayed (partial results).

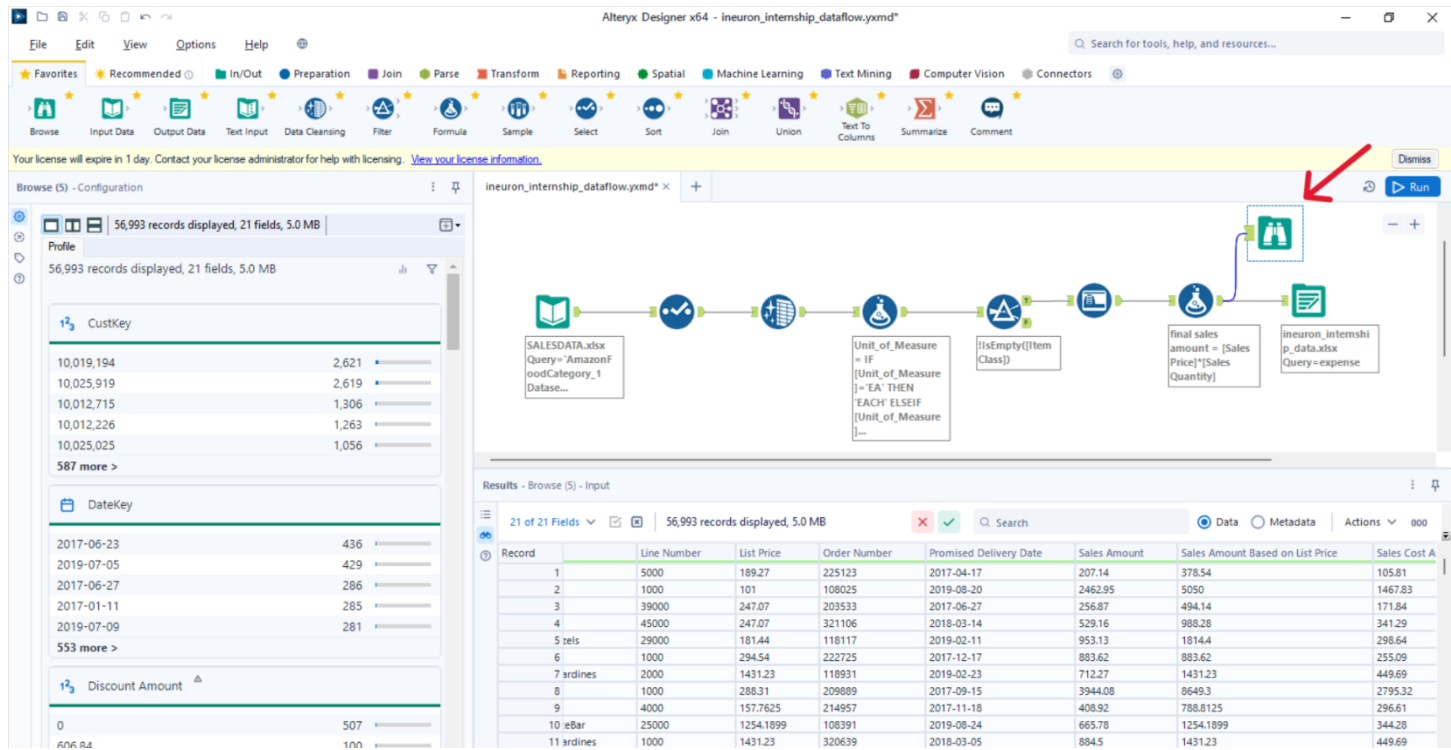
Record	Amount Based on List Price	Sales Cost Amount	Sales Margin Amount	Sales Price	Sales Quantity	Sales Report	Unit_of_Measure
1	34	105.81	103.33	103.57	2	103	EACH
2	53.42	121084.76	67468.66	26.4525	7128	181	EACH
3	1	1467.83	995.12	49.259	50	157	Some SI Units
4	14	171.84	85.03	128.435	2	108	EACH
5	252.06	76.26	328.32	1	113	103	EACH
6	18	341.29	187.87	132.29	4	108	EACH
7	4	298.64	654.49	95.313	10	103	Some SI Units
8	32	255.09	628.53	294.54	3	147	EACH
9	23	449.69	262.58	712.27	1	180	EACH
10	13	2795.32	1148.76	131.469333333333	30	185	EACH
11	1	253.71	74.61	328.32	1	103	EACH

10

Step 5) Data Type Correction:



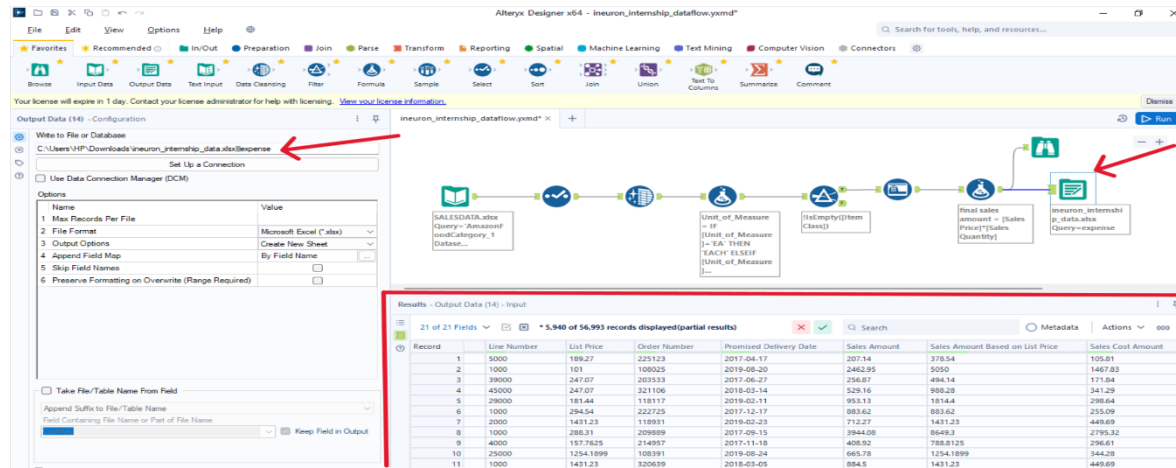
Step 6) Final dataset:



3.4 Export Data:

1. Load Dataset
2. Data Preparation
3. Data Visualization

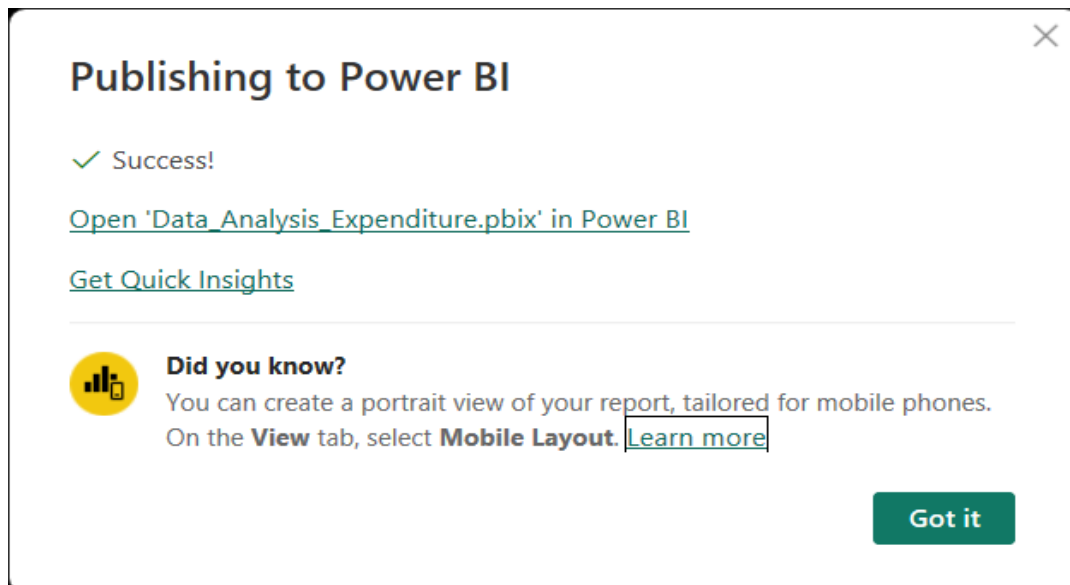
- After performing Pre-processing and cleaning dataset.
- After cleaned data, its exported into csv as sales_data.csv.
- Now this cleaned dataset uses for creating dashboard in Power BI.



4. Deployment:

Once you've completed your dashboard, follow these steps:

1. Load dataset on Power BI in csv formats and creates visuals for dashboard.
2. After creating all visual, create insightful dashboard.
3. Then Login into Power BI Service by using Microsoft developer account.
4. Then create new project workspace for uploading dashboard and reports into this workspace.



5. Cases Study:

CASE DESCRIPTION	CONCLUSIONS
Examining past expenditure records enables the identification of trends and patterns, facilitating the prediction of future costs and enhancing resource distribution efficiency.	The data analysis revealed significant interconnections between cost factors and key business variables like revenue, customer satisfaction, and employee productivity. This indicates that implementing cost management strategies that account for these connections can lead to comprehensive optimizations, positively impacting various aspects of the business.
Exploring potential interconnections between cost factors and various business variables like revenue, customer satisfaction, or employee productivity can reveal opportunities to enhance cost management strategies.	The data analysis unveiled substantial links between cost factors and crucial business variables such as revenue, customer satisfaction, and employee productivity. This underscores the importance of implementing cost management strategies that consider these connections, leading to holistic optimizations that positively influence different aspects of the business.
Efforts to reduce costs will enhance overall profitability.	Upon analyzing the data, it was observed that businesses implementing cost reduction strategies saw a concurrent rise in profitability. This reinforces the theory that adept cost management significantly enhances the bottom line.

