



BUSINESS INTELLIGENT SUPERMARKET

MEMBER

01

DO PHU THINH

02

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03

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CONTENT

01 BUSINESS INTELLIGENCE

04 CREATE DASHBOARD

02 DATA PROCESSING

05 IMPACT OF BI TOOLS

03 EXPLORE DATA

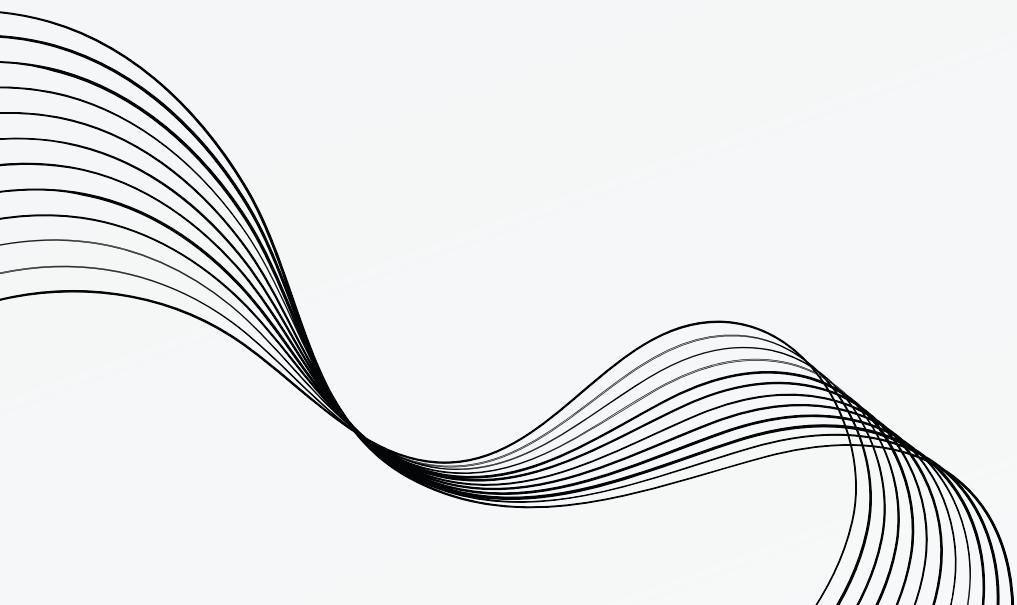
06 LEGAL SAFETY ISSUES

1. BUSINESS INTELLIGENCE

Business intelligence is a set of tools and systems used to collect and analyze business data, providing insights for informed decision-making and predicting future outcomes.

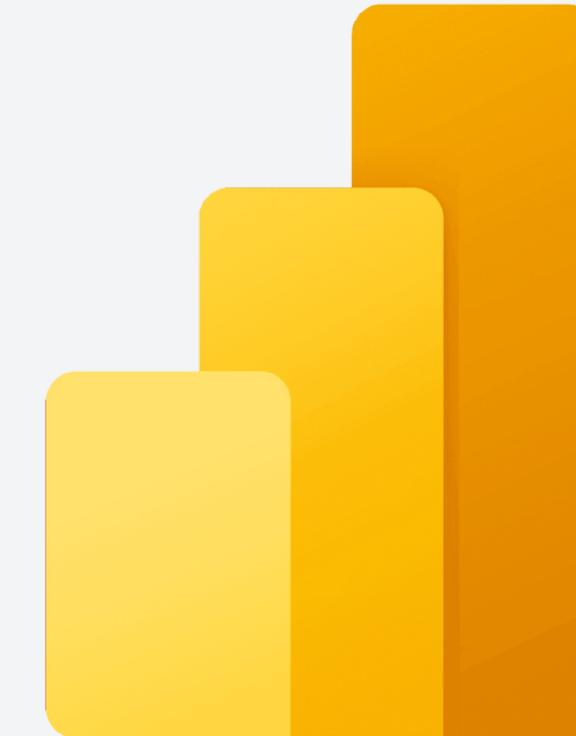
1.1. EXAMPLE

we can create bar charts to compare sales revenue across different stores, pie charts to show the revenue distribution by product category, or line charts to visualize revenue growth trends over time.

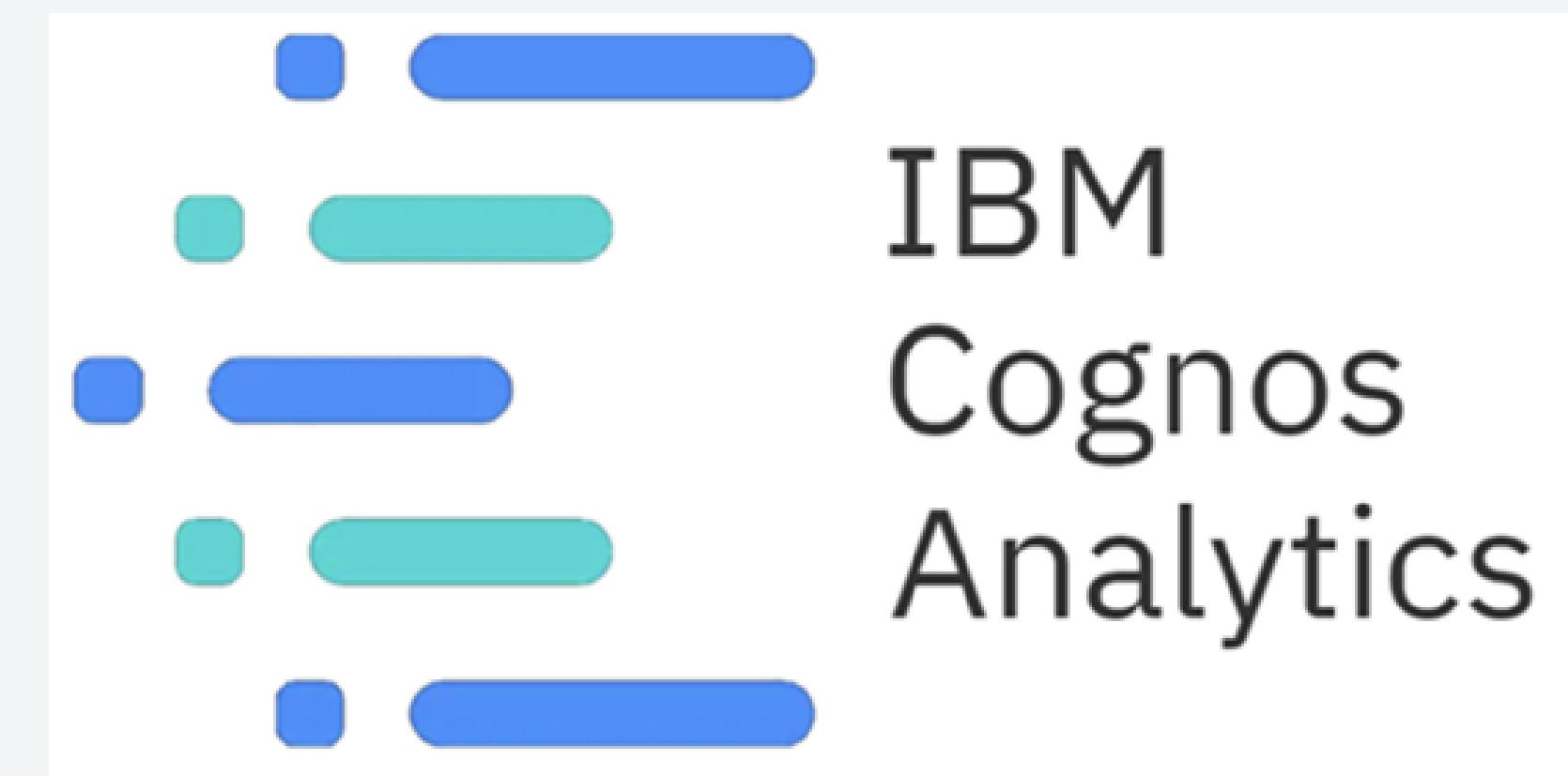
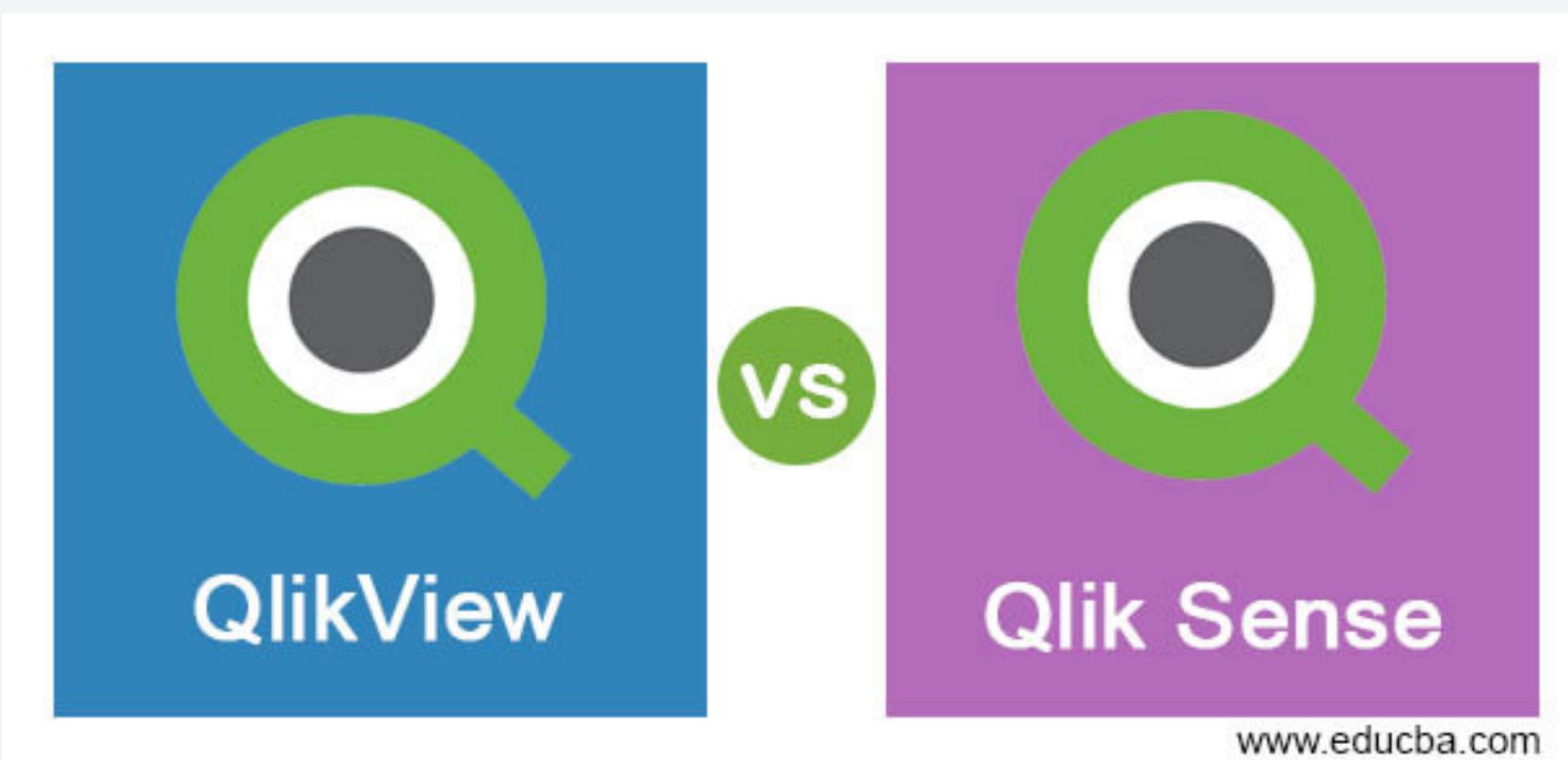


1.2. BI TOOL

+ a b l e a u



Power BI



2. DATA PROCESSING

2.1. explain data

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax %	Total	Date	Time	Payment	cogs	gross margin percentage	gross income	Rating
0	750-67-8428	A	Yangon	Member	Female	Health and beauty	74.69	7	26.1415	548.9715	1/5/2019	13:08	Ewallet	522.83	4.761905	26.1415	9.1
1	226-31-3081	C	Naypyitaw	Normal	Female	Electronic accessories	15.28	5	3.8200	80.2200	3/8/2019	10:29	Cash	76.40	4.761905	3.8200	9.6
2	631-41-3108	A	Yangon	Normal	Male	Home and lifestyle	46.33	7	16.2155	340.5255	3/3/2019	13:23	Credit card	324.31	4.761905	16.2155	7.4
3	123-19-1176	A	Yangon	Member	Male	Health and beauty	58.22	8	23.2880	489.0480	1/27/2019	20:33	Ewallet	465.76	4.761905	23.2880	8.4
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7	30.2085	634.3785	2/8/2019	10:37	Ewallet	604.17	4.761905	30.2085	5.3

This image is viewed the top rows of the data table, this operation is often done to get a quick overview of the data.

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax %	Total	Date	Time	Payment	cogs	gross margin percentage	gross income	Rating
995	233-67-5758	C	Naypyitaw	Normal	Male	Health and beauty	40.35	1	2.0175	42.3675	1/29/2019	13:46	Ewallet	40.35	4.761905	2.0175	6.2
996	303-96-2227	B	Mandalay	Normal	Female	Home and lifestyle	97.38	10	48.6900	1022.4900	3/2/2019	17:16	Ewallet	973.80	4.761905	48.6900	4.4
997	727-02-1313	A	Yangon	Member	Male	Food and beverages	31.84	1	1.5920	33.4320	2/9/2019	13:22	Cash	31.84	4.761905	1.5920	7.7
998	347-56-2442	A	Yangon	Normal	Male	Home and lifestyle	65.82	1	3.2910	69.1110	2/22/2019	15:33	Cash	65.82	4.761905	3.2910	4.1
999	849-09-3807	A	Yangon	Member	Female	Fashion accessories	88.34	7	30.9190	649.2990	2/18/2019	13:28	Cash	618.38	4.761905	30.9190	6.6

This figure is viewing the last rows of the data table, this operation is also done to understand the data.

2.1. explain data

	Unit price	Quantity	Tax 5%	Total	cogs	gross margin percentage	gross income	Rating
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000
mean	55.672130	5.510000	15.379369	322.966749	307.58738	4.761905	15.379369	6.97270
std	26.494628	2.923431	11.708825	245.885335	234.17651	0.000000	11.708825	1.71858
min	10.080000	1.000000	0.508500	10.678500	10.17000	4.761905	0.508500	4.00000
25%	32.875000	3.000000	5.924875	124.422375	118.49750	4.761905	5.924875	5.50000
50%	55.230000	5.000000	12.088000	253.848000	241.76000	4.761905	12.088000	7.00000
75%	77.935000	8.000000	22.445250	471.350250	448.90500	4.761905	22.445250	8.50000
max	99.960000	10.000000	49.650000	1042.650000	993.00000	4.761905	49.650000	10.00000

This figure is considered to produce descriptive statistics of the data table. Shows the mean, min, max, counts, 25%, 50%, 75%, and standard deviation.

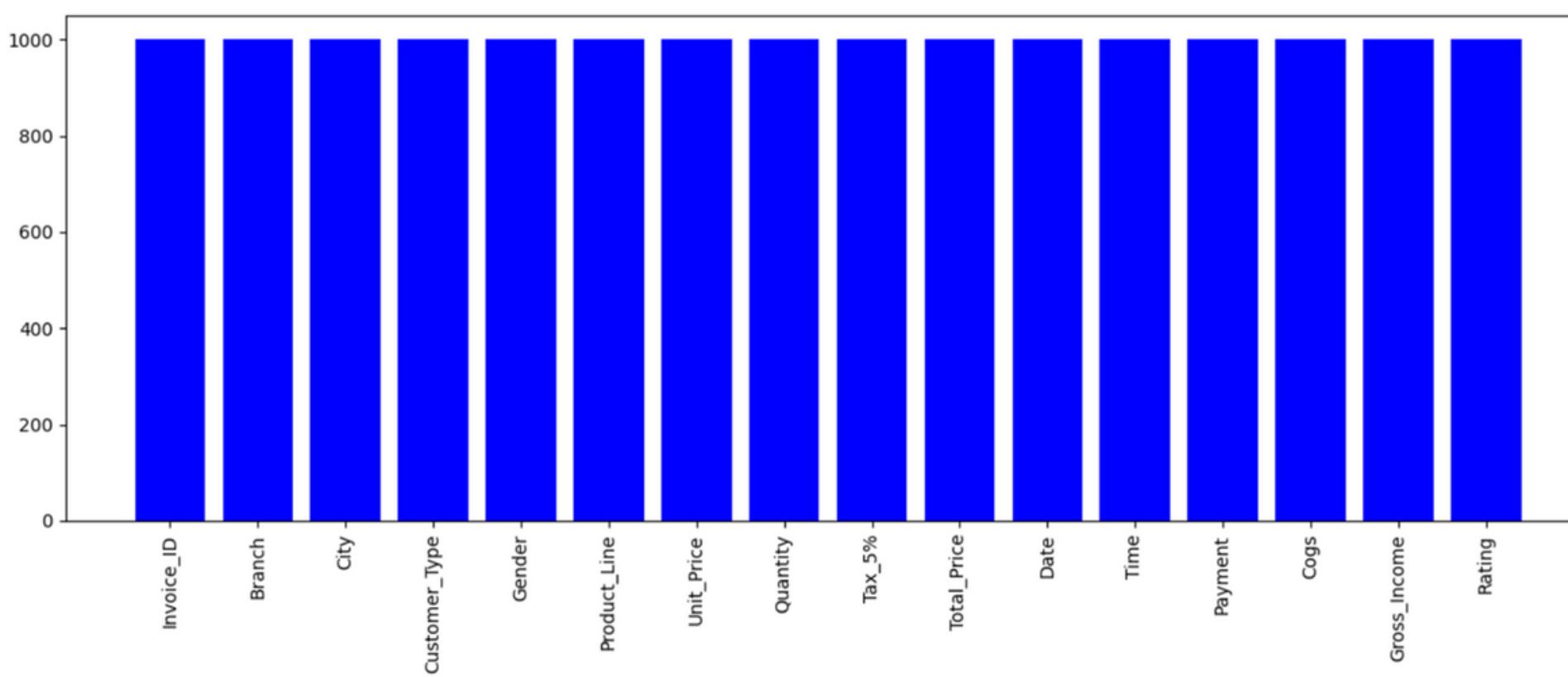
Descriptive statistics provide simple summaries of the sample and measure.

Invoice ID	object
Branch	object
City	object
Customer type	object
Gender	object
Product line	object
Unit price	float64
Quantity	int64
Tax 5%	float64
Total	float64
Date	object
Time	object
Payment	object
cogs	float64
gross margin percentage	float64
gross income	float64
Rating	float64
dtype: object	

See the data types of the data table. It should be noted that there is an incorrect data type – the "Date" column is of object type, which may need to be corrected for further analysis.

2.2. Check missing value

The chart shows missing value



2.4. check Handle Outliers

Compare values before and after applying log and sqrt

Skew of column Gross_Income is: 0.8912303920037635
Skew of column Tax_5% is: 0.8912303920037635
Skew of column Total_Price is: 0.8912303920037631
Skew of column Cogs is: 0.8912303920037631
Skew of column Gross_Income_log is: -0.5900867323522739
Skew of column Gross_Income_sqrt is: 0.26845772715204963
Skew of column Tax_5%_log is: -0.5900867323522739
Skew of column Tax_5%_sqrt is: 0.26845772715204963
Skew of column Total_Price_log is: -0.5900867323522712
Skew of column Total_Price_sqrt is: 0.26845772715204924
Skew of column Cogs_log is: -0.5900867323522706
Skew of column Cogs_sqrt is: 0.2684577271520502

2.3. check Handle inconsistent values

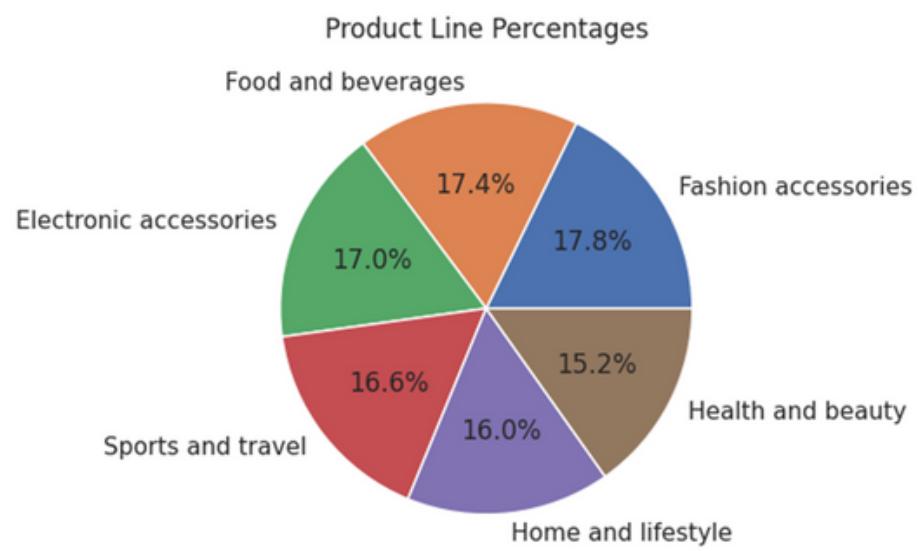
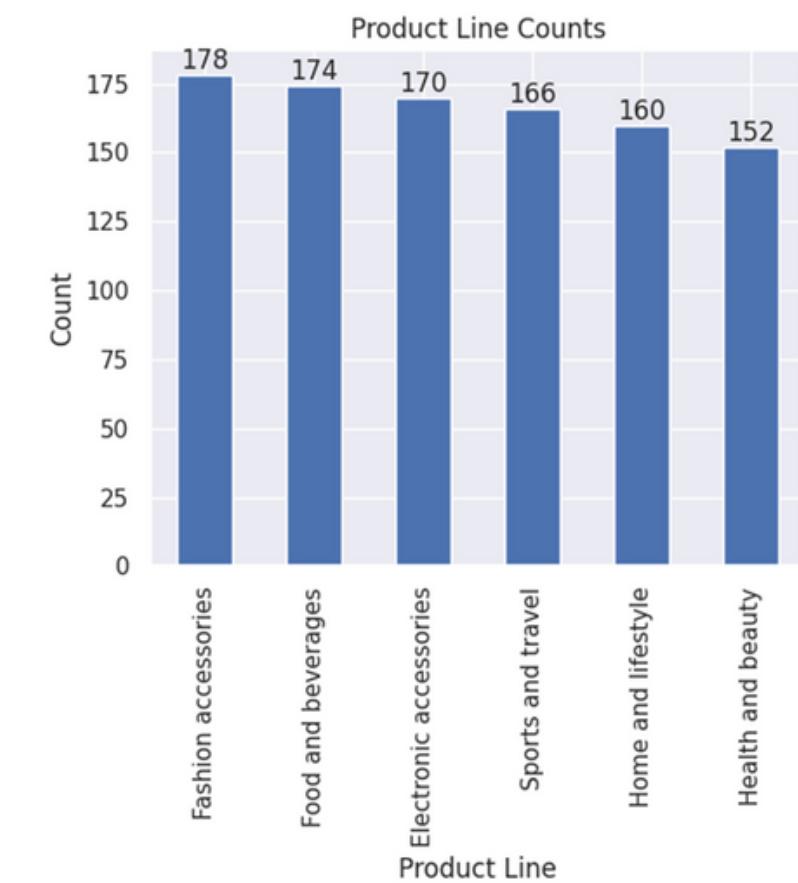
Unique value of each column

Invoice_ID	1000
Branch	3
City	3
Customer_Type	2
Gender	2
Product_Line	6
Unit_Price	943
Quantity	10
Tax_5%	990
Total_Price	990
Date	89
Time	506
Payment	3
Cogs	990
Gross_Income	990
Rating	61
dtype: int64	

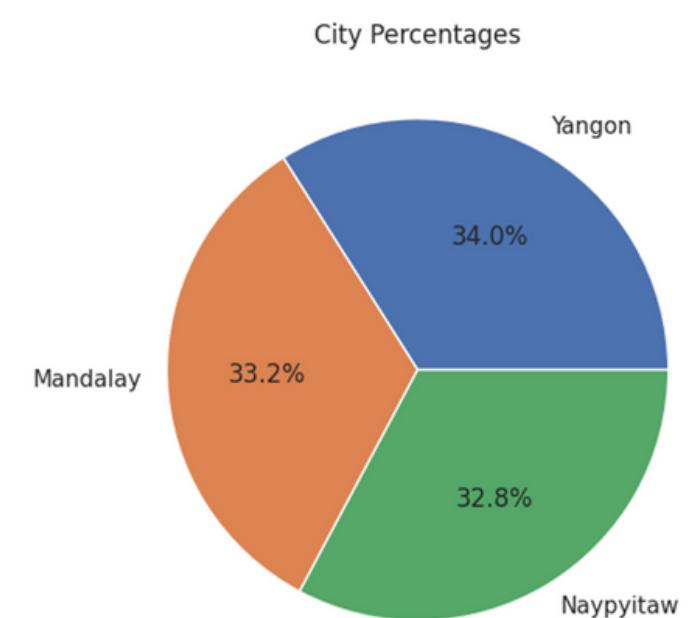
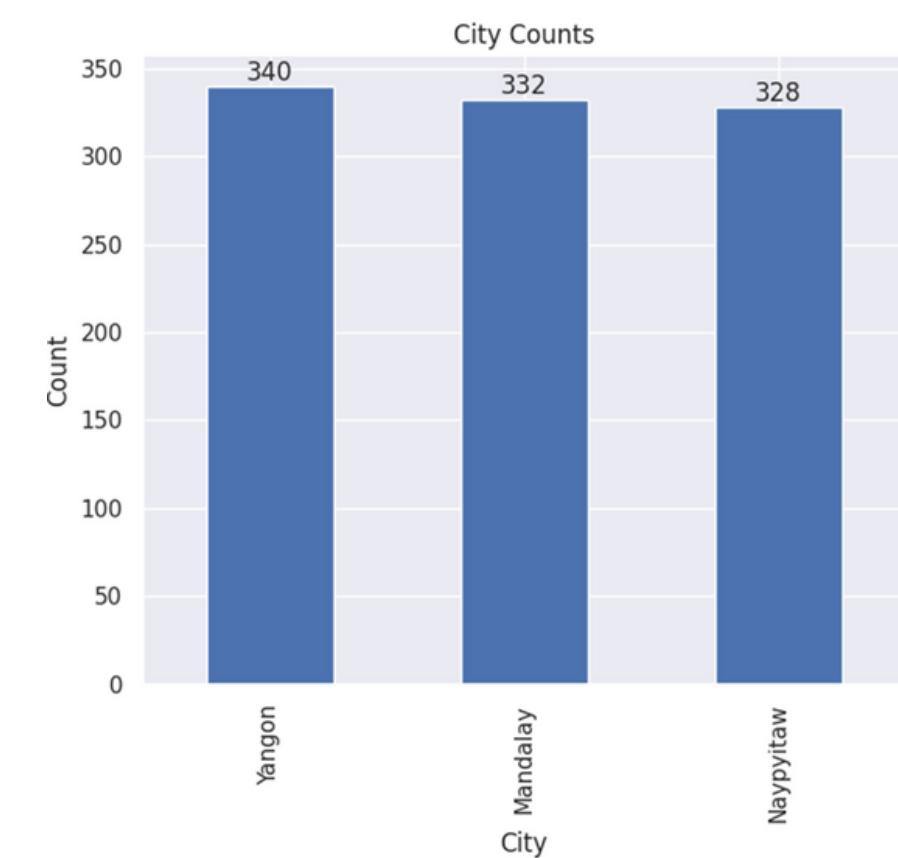
3.Explore data

3.1.Categorical data

From the above data categories, we can see that the ratio of product lines in the store is not much different, and from the column chart and pie chart we can see which product lines have the most and fewest products in the store.

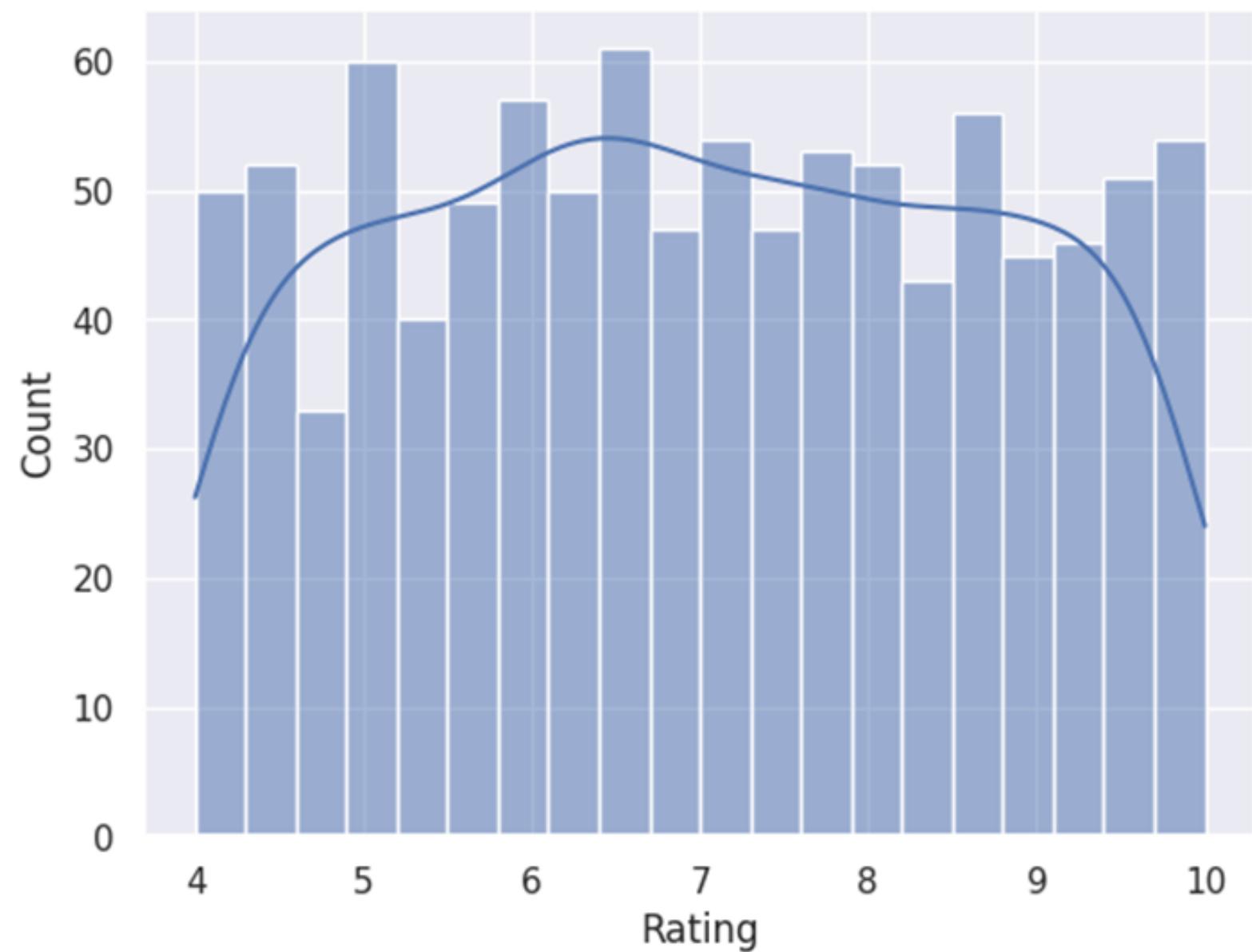


3.2 From the data in the table, it can be seen that the ratio of product lines appearing in the 3 cities is not too different

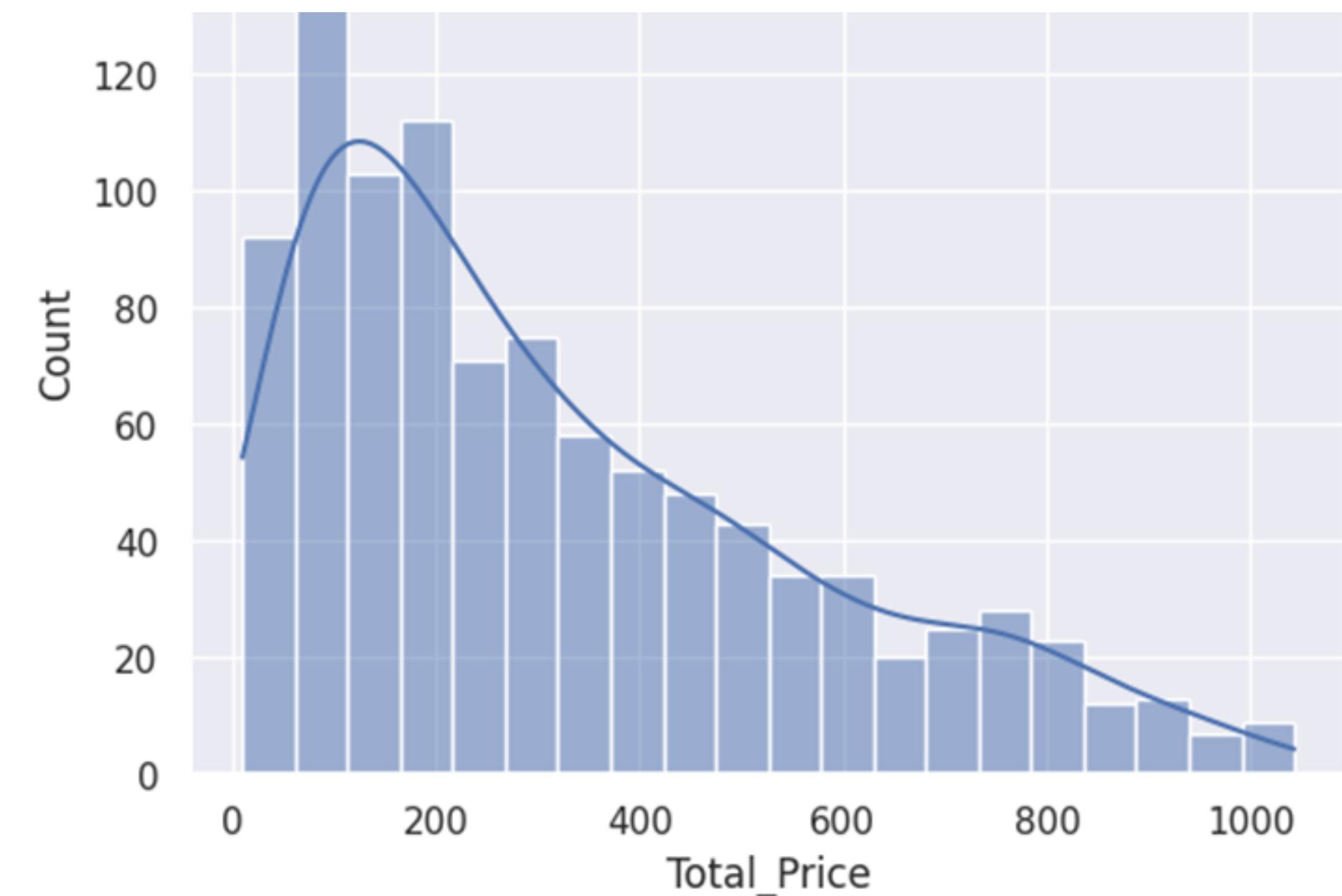


3.3. Numeric data

Histogram about Rating. The value is between 4 and 10. The most common value is between 6 and 7.

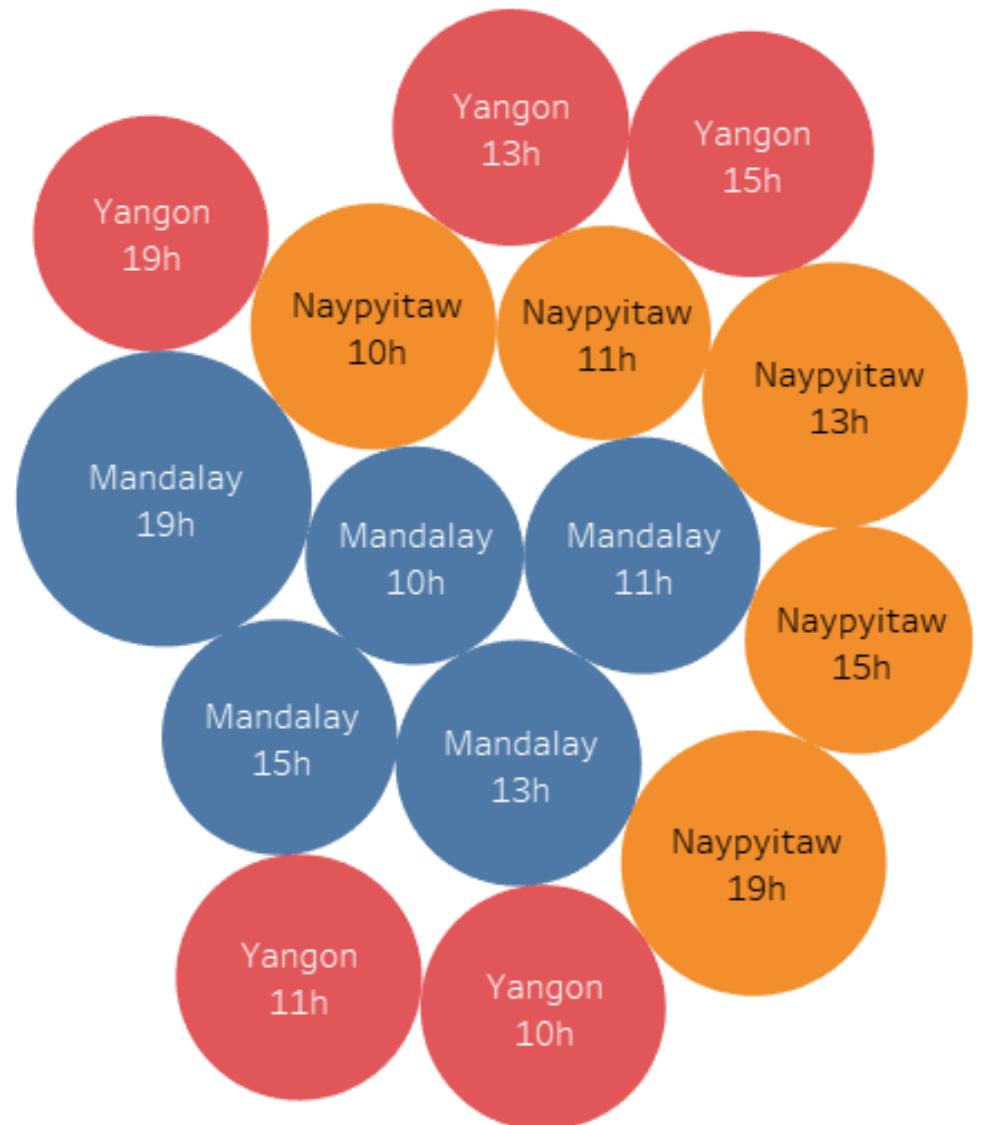


3.4 Histogram about Total_Price. The value is between 0 and 1000. The most common value is between 0 and 200



4.Create Dashboard

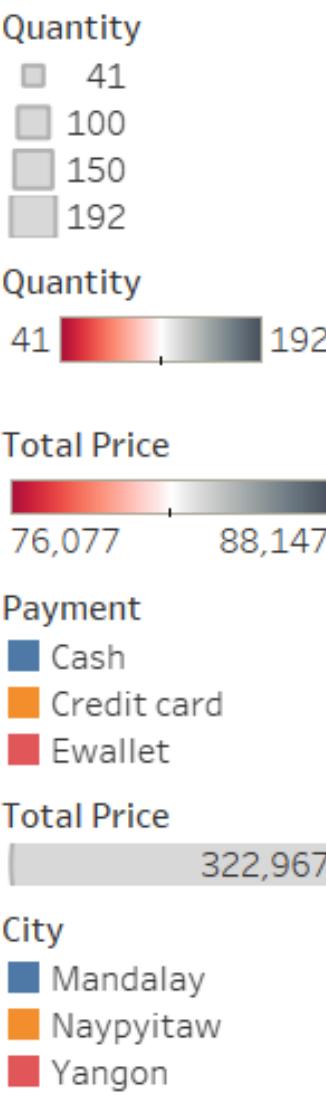
Top 5 time sale the most in city



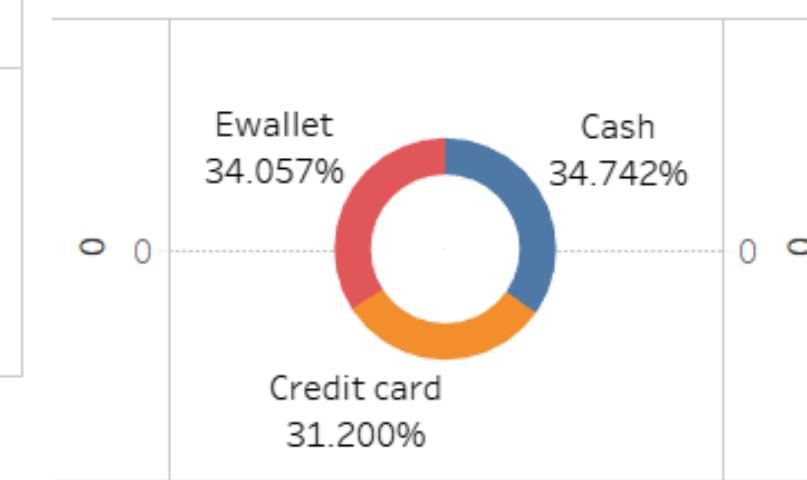
Product quality lines in each city



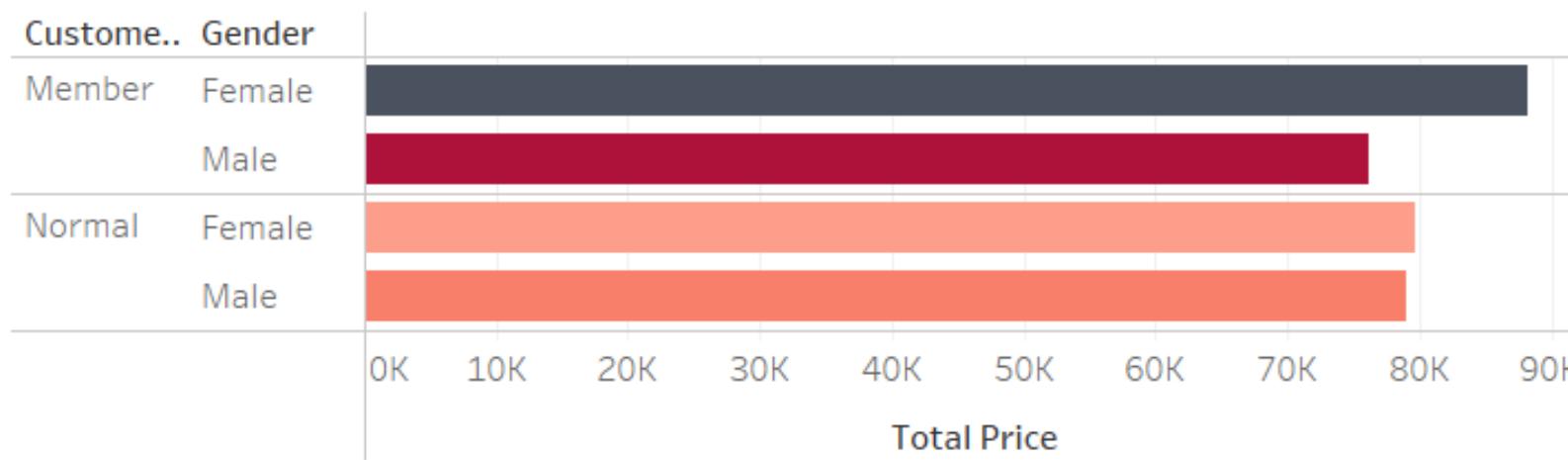
Total price and gross income



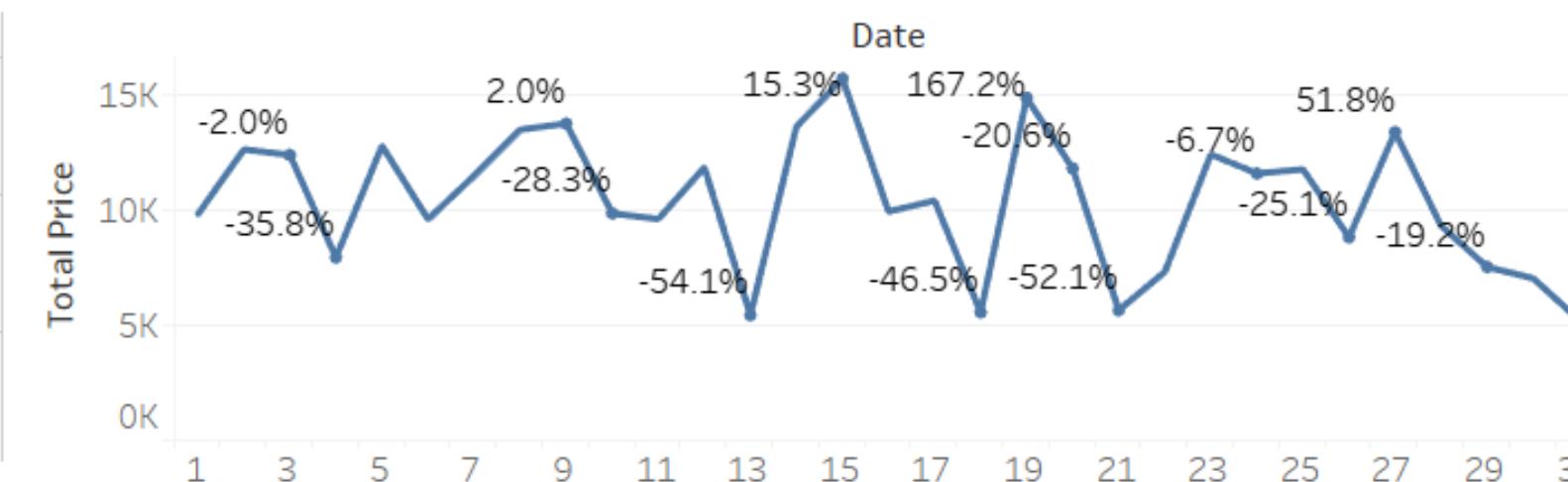
Payment percentage



Customer information



Total price increased and decreased in January

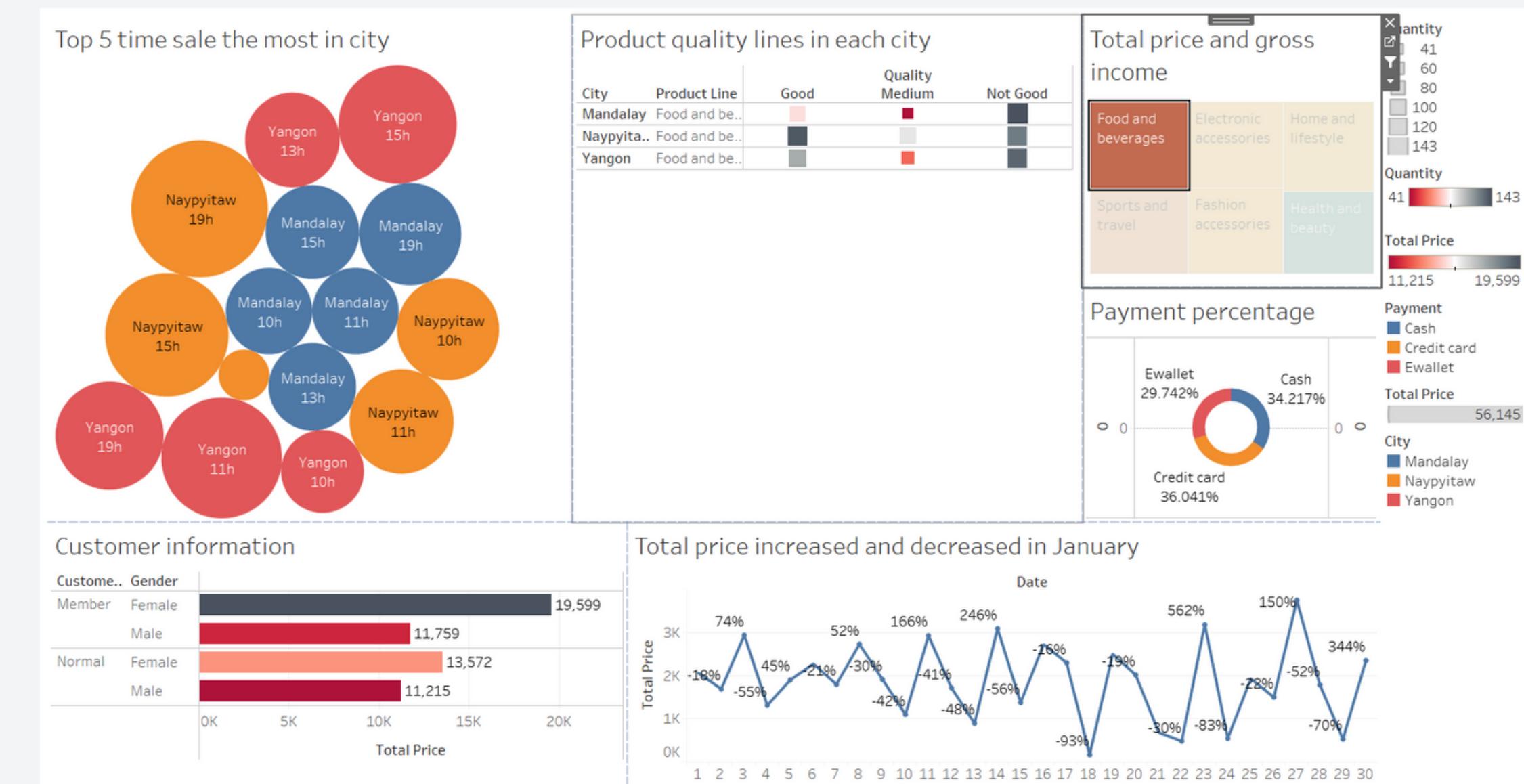


5. Impact of BI tools

Business intelligence (BI) is a vital tool for informed decision-making in a company's operations. Analysts utilize BI to offer performance benchmarks and competition analysis, enhancing operational effectiveness. Efficient data usage through BI aids in managing compliance and hiring. BI benefits businesses by enabling:

- 1. Improved decision-making
- 2. Increased efficiency
- 3. Greater insights
- 4. Competitive advantage
- 5. Improved financial performance

In summary, business intelligence (BI) tools offer companies valuable insights for informed decision-making, competitive analysis, and customer targeting. By leveraging BI tools, companies can improve marketing strategies, enhance customer support, monitor competitors, generate real-time reports, and identify growth opportunities. BI is a crucial asset for thriving in today's business environment.



This image shows the product and we will see the 5 time frames most customers buy in each city, customer information, payment percentage and income percentage of that product in January.

1. Poor Access Control for Sensitive Data

- Keep your data safe Ask for more than technical protections. You also need policies and procedures that limit risk and provide strong data governance.

2. Data Retention and Destruction

- Data retention and destruction practices play a significant role in ensuring the secure exploitation of business.

3. Security Liability

- Data retention and destruction practices play a significant role in ensuring the secure exploitation of business.

4. Privacy:

- Many individuals have their personal data distributed all over the digital globe.

5. Incident Response and Legal Obligations

- In the event of a security incident or data breach, businesses have legal obligations to respond appropriately. From there we can find the important work of legal issues when we want to do business and develop our business in a safe way and limit risks as much as possible.

P6. Explore the legal issues involved in the secure exploitation of business .

There are 5 important legal issues when running a business:

- 1. Poor access control for sensitive data**
- 2. Data retention and destruction**
- 3. Responsibility for confidentiality**
- 4. Privacy**
- 5. Incident response and legal obligations**

Higher Nationals in Computing

Unit 14: Business Intelligence ASSIGNMENT 2

Assessor name: **LE TRAN NGOC TRAN**

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Class: **GCS1007**

Subject code: **1641**

Assignment submitted: **11/03/2024**

ASSIGNMENT 2 FRONT SHEET

Qualification	BTEC Level 5 HND Diploma in Computing		
Unit number and title	Unit 14: Business Intelligence		
Submission date	03/03/2024	Date Received 1st submission	03/03/2024
Re-submission Date	11/03/2024	Date Received 2nd submission	11/03/2024
Student Name	Đỗ Phú Thịnh Hà Thé Hải Trương Trần Anh Khoa	Student ID	GCS210895 GCS210662 GCS210818
Class	GCS1007	Assessor name	LE TRAN NGOC TRAN
Student declaration I certify that the assignment submission is entirely my own work and I fully understand the consequences of plagiarism. I understand that making a false declaration is a form of malpractice.			
		Student's signature	

Grading grid

P3	P4	P5	P6	M3	M4	D3	D4

Summative Feedback:

Resubmission Feedback:

Grade:	Assessor Signature:	Date:
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IV Signature:

Assessment Brief

Student Name/ID Number	
Unit Number and Title	14: Business Intelligence
Academic Year	2018
Unit Tutor	
Assignment Title	Assignment 2: Apply BI tools & techniques and their impact
Issue Date	
Submission Date	
IV Name & Date	

Submission Format

Part I: Project submission. This should be a zip / rar folder of your project, including all necessary files to run your project. There should be a link to your Tableau work on Tableau Public cloud.

Part II: The submission is in the form of a group written report. This should be written in a concise, formal business style using single spacing and font size 12. You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced using the Harvard referencing system. Please also provide a bibliography using the Harvard referencing system.

Part III: Team needs to present their point of view about how business intelligence tools can contribute to effective decision-making as well as the legal issues involved in exploiting user data for business intelligence. You may need to research for specific examples of organizations that use BI tools to enhance or improve their business and evaluate how they can use BI tools to extend their target audience and make them more competitive within the market.

Unit Learning Outcomes

LO3 Demonstrate the use of business intelligence tools and technologies

Assignment Brief

(Continued from previous scenario)

Your next task is to demonstrate to the board of directors about the ability of applying business intelligence in the company's current business processes. To demonstrate BI, you need to prepare a presentation about BI and related tools & techniques and a demonstration on real company dataset.

For the presentation, you need:

- Explain general concept of what is BI
- Introduction to some tools / techniques for BI and their application in general

For the demonstration, you need:

- A (some) data set(s) extracted from the company's business processes. Explain the dataset.
- Show how you pre-process data for later analysis, explain each step and its purpose
- Design dashboards to show your analysis on pre-processed data. Explain clearly purpose of dashboards and charts. **Suggestions should be made after analysis**

During the demonstration, you need collect feed-back and comments from users to review how well your dashboards design meet user or business requirement and what customization needed for future use.

Team needs to present their point of view about how business intelligence tools can contribute to effective decision-making as well as the legal issues involved in exploiting user data for business intelligence. You may need to research for specific examples of organizations that use BI tools to enhance or improve their business and evaluate how they can use BI tools to extend their target audience and make them more competitive within the market.

To summary, you need to submit a report in PDF includes 4 parts: your presentation, result of demonstration and review of user feedback, point of view on BI contribution and legal issues.

Learning Outcomes and Assessment Criteria		
Pass	Merit	Distinction
LO3 Demonstrate the use of business intelligence tools and technologies	P3 Determine, with examples, what business intelligence is and the tools and techniques associated with it. P4 Design a business intelligence tool, application or interface that can perform a specific task to support problem-solving or decision-making at an advanced level.	M3 Customise the design to ensure that it is user friendly and has a functional interface.
LO4 Discuss the impact of business intelligence tools and technologies for effective decision-making purposes and the legal/regulatory context in which they are used		D3 Provide a critical review of the design in terms of how it meets a specific user or business requirement and identify what customisation has been integrated into the design.
P5 Discuss how business intelligence tools can contribute to effective decision-making. P6 Explore the legal issues involved in the secure exploitation of business intelligence tools	M4 Conduct research to identify specific examples of organisations that have used business intelligence tools to enhance or improve operations.	D4 Evaluate how organisations could use business intelligence to extend their target audience and make them more competitive within the market, taking security legislation into consideration

Table of Contents

Assessment Brief	3
P3. Determine, with examples, what business intelligence is and the tools and techniques associated with it.	7
1.Business intelligence.....	7
2.BI techniques	7
3.BI tools.....	8
P4. Design a business intelligence tool, application or interface that can perform a specific task to support problem-solving or decision-making at an advanced level.....	9
1.Introducing data	9
2. Data processing.....	10
3.Create dashboard.....	42
P5. Discuss how business intelligence tools can contribute to effective decision-making.....	47
P6. Explore the legal issues involved in the secure exploitation of business intelligence tools	50
Task table for each member	51
References.....	52

P3. Determine, with examples, what business intelligence is and the tools and techniques associated with it.

1. Business intelligence

Business intelligence is the set of tools and systems used to collect and analyze business data to gain insights that allow businesses to make informed decisions. Business intelligence tools give customers insights into how a company performs now and in the past. By using business intelligence and analytic tools, you can help companies predict what can happen in the future.

Example

Here's an example of applying Business Intelligence to data manipulation and dashboard creation to manage many supermarkets. We are managers of a supermarket chain, and we want to apply Business Intelligence to optimize our store operations and make data-driven decisions. We have collected data from our supermarket management system, and now we want to manipulate that data to create a dashboard in Tableau.

For example, we can create bar charts to compare sales revenue across different stores, pie charts to show the revenue distribution by product category, or line charts to visualize revenue growth trends over time. By applying Business Intelligence, we gain a comprehensive view of our supermarket operations, identify trends, discover consumer preferences, and make data-driven decisions. The Tableau dashboard helps us visualize information and quickly share it with stakeholders, improving performance and achieving better business outcomes for our supermarket chain.

2. BI techniques

Collection Techniques:

- Data Cleansing: This technique involves removing or correcting errors, inconsistencies, and inaccuracies in the collected data. It ensures that the data is accurate, complete, and reliable for analysis and reporting.
- Data Labeling: Labeling data involves assigning descriptive tags or categories to the collected data points. It helps in organizing and classifying the data, making it easier to analyze and interpret.

Analysis Techniques:

- Reporting: Reporting techniques involve generating summary information and presenting it in a structured format, such as tables, charts, or graphs. Reports provide a concise overview of key performance indicators, trends, and insights derived from the data.

- **Queries:** Querying techniques involve extracting specific subsets of data based on predefined criteria. It allows users to retrieve relevant information from large datasets and perform ad-hoc analysis to answer specific business questions.
- **Dashboards:** Dashboards are visual representations of data that provide real-time, interactive insights into key metrics and performance indicators. They enable users to monitor trends, track progress, and make informed decisions based on the presented information.

Analytic Techniques:

- **Regression Analysis:** Regression analysis is a statistical technique used to explore the relationship between variables. It helps in understanding how changes in one variable affect another and predicting future outcomes based on historical patterns.
- **Machine Learning:** Machine learning techniques involve training algorithms to automatically learn patterns and make predictions or classifications from data. It can be used for tasks such as customer segmentation, demand forecasting, fraud detection, and personalized recommendations.

3.BI tools

- **Tableau:** Tableau is a powerful and widely adopted BI tool that allows users to create interactive dashboards, reports, and visualizations. It supports data blending, data exploration, and provides a user-friendly interface for data analysis.
- **Power BI:** Power BI is a business analytics tool by Microsoft that enables users to visualize data and share insights. It offers a range of features including data modeling, interactive visualizations, and collaboration capabilities.
- **QlikView/Qlik Sense:** QlikView and Qlik Sense are data discovery and visualization tools that help users create interactive dashboards and perform data exploration. They offer associative data indexing, allowing users to easily navigate through data and uncover insights.
- **MicroStrategy:** MicroStrategy is a comprehensive BI platform that provides enterprise reporting, data discovery, and mobile analytics capabilities. It offers a wide range of features including self-service analytics, data connectors, and advanced analytics functions.
- **IBM Cognos:** IBM Cognos is an enterprise-level BI platform that offers a suite of tools for reporting, analysis, and performance management. It supports features such as ad-hoc querying, report authoring, and multidimensional analysis.
- **SAP BusinessObjects:** SAP BusinessObjects is a suite of BI tools that provides reporting, ad-hoc analysis, and data visualization capabilities. It integrates with SAP and other data sources, enabling users to access and analyze data from various systems.

P4. Design a business intelligence tool, application or interface that can perform a specific task to support problem-solving or decision-making at an advanced level.

1. Introducing data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Invoice ID	Branch	City	Customer	Gender	Product lin	Unit price	Quantity	Tax %	Total	Date	Time	Payment	cogs	gross marg	gross incov	Rating
2	750-67-84	A	Yangon	Member	Female	Health anc	74.69	7	26.1415	548.9715	1/5/2019	13:08	Ewallet	522.83	4.761905	26.1415	9.1
3	226-31-30	C	Naypyitaw	Normal	Female	Electronic	15.28	5	3.82	80.22	3/8/2019	10:29	Cash	76.4	4.761905	3.82	9.6
4	631-41-31	A	Yangon	Normal	Male	Home and	46.33	7	16.2155	340.5255	3/3/2019	13:23	Credit card	324.31	4.761905	16.2155	7.4
5	123-19-11	A	Yangon	Member	Male	Health anc	58.22	8	23.288	489.048	#####	20:33	Ewallet	465.76	4.761905	23.288	8.4
6	373-73-79	A	Yangon	Normal	Male	Sports and	86.31	7	30.2085	634.3785	2/8/2019	10:37	Ewallet	604.17	4.761905	30.2085	5.3
7	699-14-30	C	Naypyitaw	Normal	Male	Electronic	85.39	7	29.8865	627.6165	#####	18:30	Ewallet	597.73	4.761905	29.8865	4.1
8	355-53-59	A	Yangon	Member	Female	Electronic	68.84	6	20.652	433.692	#####	14:36	Ewallet	413.04	4.761905	20.652	5.8
9	315-22-56	C	Naypyitaw	Normal	Female	Home and	73.56	10	36.78	772.38	#####	11:38	Ewallet	735.6	4.761905	36.78	8
10	665-32-91	A	Yangon	Member	Female	Health anc	36.26	2	3.626	76.146	#####	17:15	Credit card	72.52	4.761905	3.626	7.2
11	692-92-55	B	Mandalay	Member	Female	Food and	54.84	3	8.226	172.746	#####	13:27	Credit card	164.52	4.761905	8.226	5.9
12	351-62-08	B	Mandalay	Member	Female	Fashion ac	14.48	4	2.896	60.816	2/6/2019	18:07	Ewallet	57.92	4.761905	2.896	4.5
13	529-56-39	B	Mandalay	Member	Male	Electronic	25.51	4	5.102	107.142	3/9/2019	17:03	Cash	102.04	4.761905	5.102	6.8
14	365-64-05	A	Yangon	Normal	Female	Electronic	46.95	5	11.7375	246.4875	#####	10:25	Ewallet	234.75	4.761905	11.7375	7.1
15	252-56-26	A	Yangon	Normal	Male	Food and	43.19	10	21.595	453.495	2/7/2019	16:48	Ewallet	431.9	4.761905	21.595	8.2
16	829-34-39	A	Yangon	Normal	Female	Health anc	71.38	10	35.69	749.49	#####	19:21	Cash	713.8	4.761905	35.69	5.7
17	299-46-18	B	Mandalay	Member	Female	Sports and	93.72	6	28.116	590.436	#####	16:19	Cash	562.32	4.761905	28.116	4.5
18	656-95-93	A	Yangon	Member	Female	Health anc	68.93	7	24.1255	506.6355	#####	11:03	Credit card	482.51	4.761905	24.1255	4.6
19	765-26-69	A	Yangon	Normal	Male	Sports and	72.61	6	21.783	457.443	1/1/2019	10:39	Credit card	435.66	4.761905	21.783	6.9
20	329-62-15	A	Yangon	Normal	Male	Food and	54.67	3	8.2005	172.2105	#####	18:00	Credit card	164.01	4.761905	8.2005	8.6
21	319-50-33	B	Mandalay	Normal	Female	Home and	40.3	2	4.03	84.63	#####	15:30	Ewallet	80.6	4.761905	4.03	4.4
22	300-71-46	C	Naypyitaw	Member	Male	Electronic	86.04	5	21.51	451.71	#####	11:24	Ewallet	430.2	4.761905	21.51	4.8
23	371-85-57	B	Mandalay	Normal	Male	Health anc	87.98	3	13.197	277.137	3/5/2019	10:40	Ewallet	263.94	4.761905	13.197	5.1
24	273-16-66	B	Mandalay	Normal	Male	Home and	33.2	2	3.32	69.72	#####	12:20	Credit card	66.4	4.761905	3.32	4.4
25	636-48-82	A	Yangon	Normal	Male	Electronic	34.56	5	8.64	181.44	#####	11:15	Ewallet	172.8	4.761905	8.64	9.9
26	549-59-13	A	Yangon	Member	Male	Sports and	88.63	3	13.2945	279.1845	3/2/2019	17:36	Ewallet	265.89	4.761905	13.2945	6
27	227-03-50	A	Yangon	Member	Female	Home and	52.59	8	21.036	441.756	#####	19:20	Credit card	420.72	4.761905	21.036	8.5
28	649-29-67	B	Mandalay	Normal	Male	Fashion ac	33.52	1	1.676	35.196	2/8/2019	15:31	Cash	33.52	4.761905	1.676	6.7
29	189-17-42	A	Yangon	Normal	Female	Fashion.ac	87.67	2	8.767	184.107	#####	12:17	Credit card	175.34	4.761905	8.767	7.7

The dataset is one of the historical sales of supermarket company which has recorded in 3 different branches for 3 months data. Predictive data analytics methods are easy to apply with this dataset.

Attribute information

- Invoice id: Computer generated sales slip invoice identification number
- Branch: Branch of supercenter (3 branches are available identified by A, B and C).
- City: Location of supercenters
- Customer type: Type of customers, recorded by Members for customers using member card and Normal for without member card.
- Gender: Gender type of customer
- Product line: General item categorization groups - Electronic accessories, Fashion accessories, Food and beverages, Health and beauty, Home and lifestyle, Sports and travel
- Unit price: Price of each product in \$
- Quantity: Number of products purchased by customer
- Tax: 5% tax fee for customer buying
- Total: Total price including tax
- Date: Date of purchase (Record available from January 2019 to March 2019)
- Time: Purchase time (10am to 9pm)
- Payment: Payment used by customer for purchase (3 methods are available – Cash, Credit card and Ewallet)
- COGS: Cost of goods sold
- Gross margin percentage: Gross margin percentage
- Gross income: Gross income
- Rating: Customer stratification rating on their overall shopping experience (On a scale of 1 to 10)

2. Data processing

Step 1: Data Understanding

1.1. View the top rows of the data table

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax %	Total	Date	Time	Payment	cogs	gross margin percentage	gross income	Rating
0	750-67-8428	A	Yangon	Member	Female	Health and beauty	74.69	7	26.1415	548.9715	1/5/2019	13:08	Ewallet	522.83	4.761905	26.1415	9.1
1	226-31-3081	C	Naypyitaw	Normal	Female	Electronic accessories	15.28	5	3.8200	80.2200	3/8/2019	10:29	Cash	76.40	4.761905	3.8200	9.6
2	631-41-3108	A	Yangon	Normal	Male	Home and lifestyle	46.33	7	16.2155	340.5255	3/3/2019	13:23	Credit card	324.31	4.761905	16.2155	7.4
3	123-19-1176	A	Yangon	Member	Male	Health and beauty	58.22	8	23.2880	489.0480	1/27/2019	20:33	Ewallet	465.76	4.761905	23.2880	8.4
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7	30.2085	634.3785	2/8/2019	10:37	Ewallet	604.17	4.761905	30.2085	5.3

Figure 1

1.2. View the last rows of the data table

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax %	Total	Date	Time	Payment	cogs	gross margin percentage	gross income	Rating
995	233-67-5758	C	Naypyitaw	Normal	Male	Health and beauty	40.35	1	2.0175	42.3675	1/29/2019	13:46	Ewallet	40.35	4.761905	2.0175	6.2
996	303-96-2227	B	Mandalay	Normal	Female	Home and lifestyle	97.38	10	48.6900	1022.4900	3/2/2019	17:16	Ewallet	973.80	4.761905	48.6900	4.4
997	727-02-1313	A	Yangon	Member	Male	Food and beverages	31.84	1	1.5920	33.4320	2/9/2019	13:22	Cash	31.84	4.761905	1.5920	7.7
998	347-56-2442	A	Yangon	Normal	Male	Home and lifestyle	65.82	1	3.2910	69.1110	2/22/2019	15:33	Cash	65.82	4.761905	3.2910	4.1
999	849-09-3807	A	Yangon	Member	Female	Fashion accessories	88.34	7	30.9190	649.2990	2/18/2019	13:28	Cash	618.38	4.761905	30.9190	6.6

Figure 2

1.3. View rows and columns of a data table

The dataset has 1000 rows and 17 columns

1.4. Generate descriptive statistics of the Data table

	Unit price	Quantity	Tax 5%	Total	cogs	gross margin percentage	gross income	Rating
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000		1000.000000	1000.000000
mean	55.672130	5.510000	15.379369	322.966749	307.58738		4.761905	15.379369
std	26.494628	2.923431	11.708825	245.885335	234.17651		0.000000	11.708825
min	10.080000	1.000000	0.508500	10.678500	10.17000		4.761905	0.508500
25%	32.875000	3.000000	5.924875	124.422375	118.49750		4.761905	5.924875
50%	55.230000	5.000000	12.088000	253.848000	241.76000		4.761905	12.088000
75%	77.935000	8.000000	22.445250	471.350250	448.90500		4.761905	22.445250
max	99.960000	10.000000	49.650000	1042.650000	993.00000		4.761905	49.650000

Figure 3

1.5. View the data types of the data table . It has an incorrect data type (The "Date" column has type object)

Invoice ID	object
Branch	object
City	object
Customer type	object
Gender	object
Product line	object
Unit price	float64
Quantity	int64
Tax 5%	float64
Total	float64
Date	object
Time	object
Payment	object
cogs	float64
gross margin percentage	float64
gross income	float64
Rating	float64
dtype: object	

Figure 4

Step 2: Data Preparation

2.1. Check unnecessary columns to remove

```
Index(['Invoice ID', 'Branch', 'City', 'Customer type', 'Gender',
       'Product line', 'Unit price', 'Quantity', 'Tax 5%', 'Total', 'Date',
       'Time', 'Payment', 'cogs', 'gross margin percentage', 'gross income',
       'Rating'],
      dtype='object')
```

Figure 5

2.2. The "gross margin percentage" has only 1 value. It is an unnecessary column

```
array([4.76190476])
```

Figure 6

2.3. Deleting "gross margin percentage"

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax 5%	Total	Date	Time	Payment	cogs	gross income	Rating
0	750-67-8428	A	Yangon	Member	Female	Health and beauty	74.69	7	26.1415	548.9715	1/5/2019	13:08	Ewallet	522.83	26.1415	9.1
1	226-31-3081	C	Naypyitaw	Normal	Female	Electronic accessories	15.28	5	3.8200	80.2200	3/8/2019	10:29	Cash	76.40	3.8200	9.6
2	631-41-3108	A	Yangon	Normal	Male	Home and lifestyle	46.33	7	16.2155	340.5255	3/3/2019	13:23	Credit card	324.31	16.2155	7.4
3	123-19-1176	A	Yangon	Member	Male	Health and beauty	58.22	8	23.2880	489.0480	1/27/2019	20:33	Ewallet	465.76	23.2880	8.4
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7	30.2085	634.3785	2/8/2019	10:37	Ewallet	604.17	30.2085	5.3

Figure 7

2.4. Check for wrong data type. The "Date" column has data type object. That column has the wrong data type

```

Invoice ID          object
Branch             object
City               object
Customer type     object
Gender             object
Product line       object
Unit price         float64
Quantity           int64
Tax 5%             float64
Total              float64
Date               object
Time               object
Payment            object
cogs               float64
gross income       float64
Rating             float64
dtype: object

```

Figure 8

2.5. Change the data type of the "Date" column. From type "object" to "Datetime"

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax 5%	Total	Date	Time	Payment	cogs	gross income	Rating
0	750-67-8428	A	Yangon	Member	Female	Health and beauty	74.69	7	26.1415	548.9715	2019-01-05	13:08	Ewallet	522.83	26.1415	9.1
1	226-31-3081	C	Naypyitaw	Normal	Female	Electronic accessories	15.28	5	3.8200	80.2200	2019-03-08	10:29	Cash	76.40	3.8200	9.6
2	631-41-3108	A	Yangon	Normal	Male	Home and lifestyle	46.33	7	16.2155	340.5255	2019-03-03	13:23	Credit card	324.31	16.2155	7.4
3	123-19-1176	A	Yangon	Member	Male	Health and beauty	58.22	8	23.2880	489.0480	2019-01-27	20:33	Ewallet	465.76	23.2880	8.4
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7	30.2085	634.3785	2019-02-08	10:37	Ewallet	604.17	30.2085	5.3

Figure 9

2.6. Check if the "Date" column has been changed to Datetime type

```

Invoice ID          object
Branch             object
City               object
Customer type     object
Gender             object
Product line      object
Unit price        float64
Quantity           int64
Tax 5%            float64
Total              float64
Date                datetime64[ns]
Time               object
Payment             object
cogs              float64
gross income      float64
Rating             float64
dtype: object

```

Figure 10

2.7. RENAME COLUMNS

	Invoice_ID	Branch	City	Customer_Type	Gender	Product_Line	Unit_Price	Quantity	Tax_5%	Total_Price	Date	Time	Payment	Cogs	Gross_Income	Rating
0	750-67-8428	A	Yangon	Member	Female	Health and beauty	74.69	7	26.1415	548.9715	2019-01-05	13:08	Ewallet	522.83	26.1415	9.1
1	226-31-3081	C	Naypyitaw	Normal	Female	Electronic accessories	15.28	5	3.8200	80.2200	2019-03-08	10:29	Cash	76.40	3.8200	9.6
2	631-41-3108	A	Yangon	Normal	Male	Home and lifestyle	46.33	7	16.2155	340.5255	2019-03-03	13:23	Credit card	324.31	16.2155	7.4
3	123-19-1176	A	Yangon	Member	Male	Health and beauty	58.22	8	23.2880	489.0480	2019-01-27	20:33	Ewallet	465.76	23.2880	8.4
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7	30.2085	634.3785	2019-02-08	10:37	Ewallet	604.17	30.2085	5.3

Figure 11

2.8. Invoice_ID column has 1000 unique values

```
Invoice_ID      1000
Branch          3
City            3
Customer_Type   2
Gender          2
Product_Line    6
Unit_Price     943
Quantity        10
Tax_5%          990
Total_Price    990
Date            89
Time            506
Payment         3
Cogs            990
Gross_Income   990
Rating          61
dtype: int64
```

Figure 12

Step 3. Pre_Processing

3.1. Check missing value

3.1.1. Check for missing values. No missing data

```
Invoice_ID      0
Branch         0
City           0
Customer_Type  0
Gender          0
Product_Line   0
Unit_Price     0
Quantity        0
Tax_5%          0
Total_Price    0
Date            0
Time            0
Payment         0
Cogs            0
Gross_Income   0
Rating          0
dtype: int64
```

Figure 13

3.1.2. Draw a graph showing missing values of the data table. Blue is the number of cells with data, red is the number of cells lacking data.

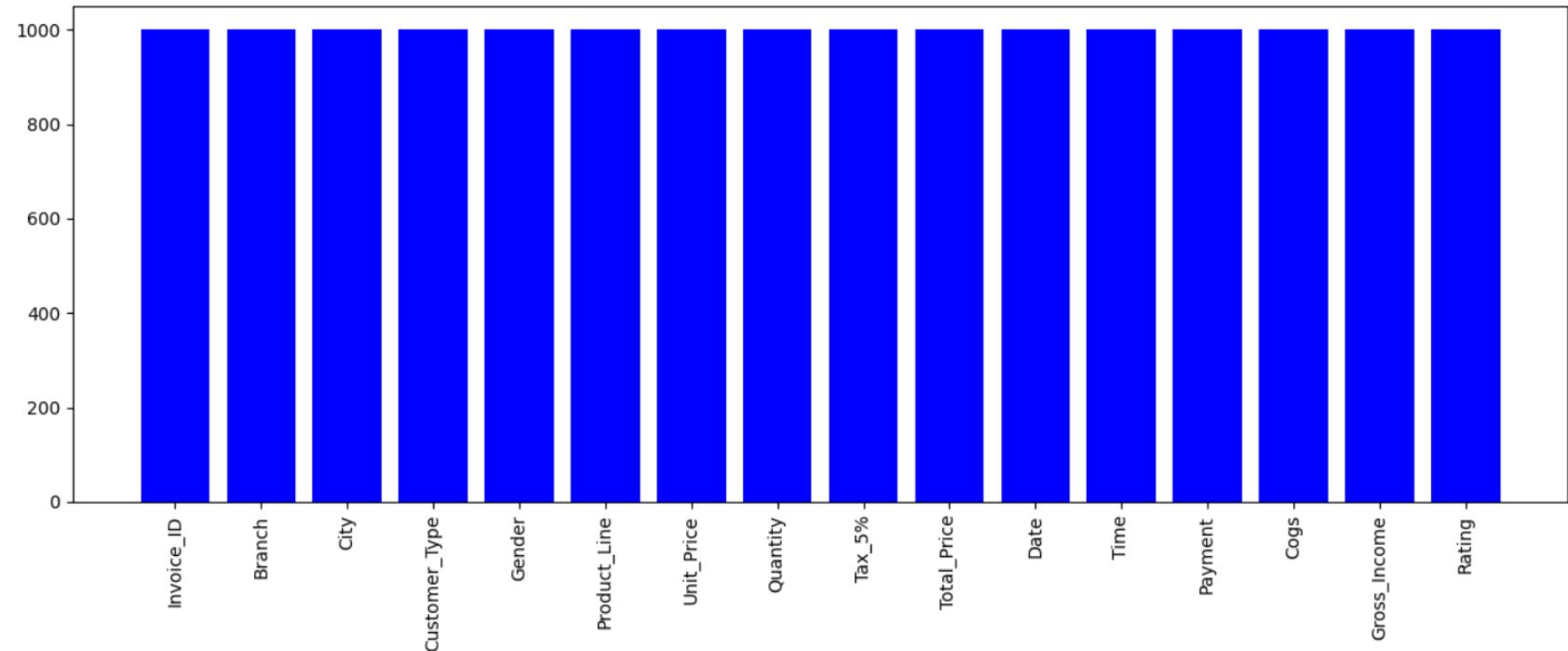


Figure 14

3.2. Check handle inconsistent values

3.2.1. Check the number of unique values in each column

```
Invoice_ID      1000
Branch          3
City            3
Customer_Type   2
Gender          2
Product_Line    6
Unit_Price     943
Quantity        10
Tax_5%          990
Total_Price    990
Date            89
Time            506
Payment         3
Cogs            990
Gross_Income   990
Rating          61
dtype: int64
```

Figure 15

3.2.2. The column has 3 values

```
A    340
B    332
C    328
Name: Branch, dtype: int64
```

Figure 16

3.3.3. The column has 3 values

```
Yangon      340
Mandalay    332
Naypyitaw   328
Name: City, dtype: int64
```

Figure 17

3.3.4. The column has 2 values

```
Member      501
Normal     499
Name: Customer_Type, dtype: int64
```

Figure 18

3.3.5. The column has 2 values

```
Female     501
Male       499
Name: Gender, dtype: int64
```

Figure 19

3.3.6. The column has 6 values

```
Fashion accessories      178
Food and beverages        174
Electronic accessories    170
Sports and travel         166
Home and lifestyle        160
Health and beauty         152
Name: Product_Line, dtype: int64
```

Figure 20

3.3.7. The column has 3 values

```
Ewallet      345
Cash        344
Credit card 311
Name: Payment, dtype: int64
```

Figure 21

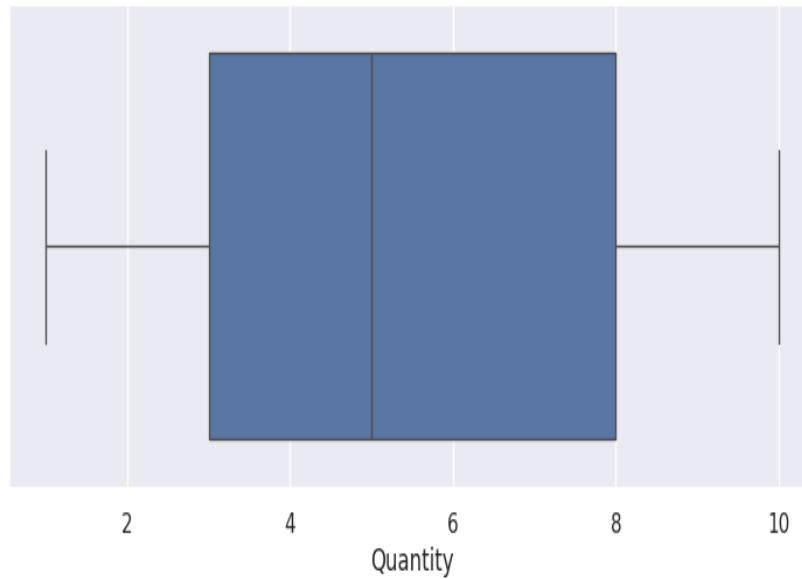
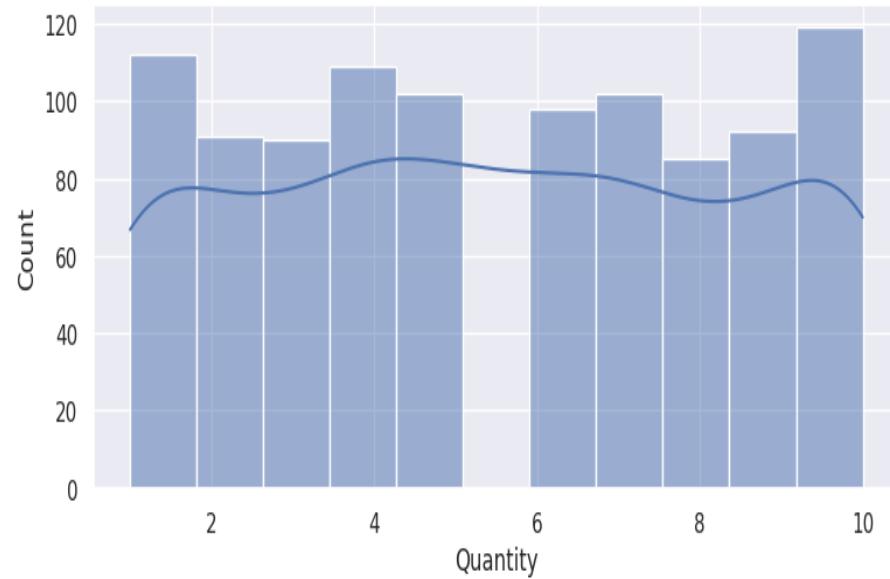
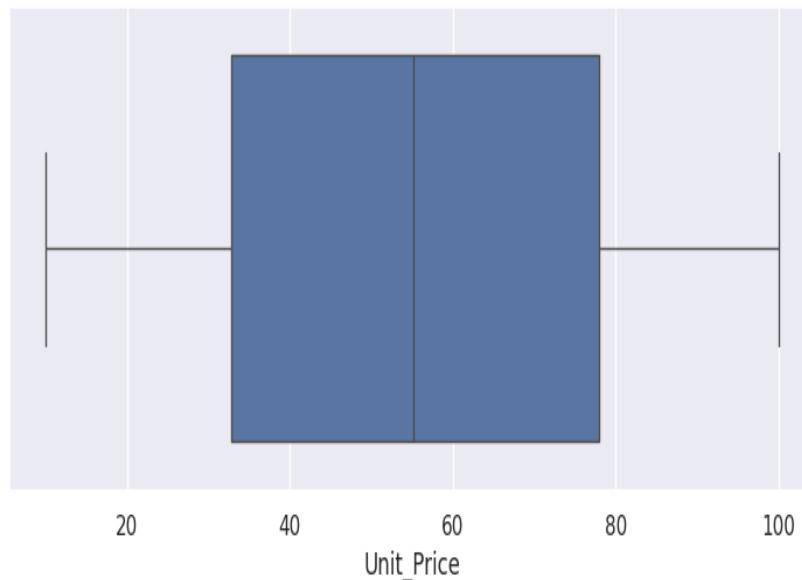
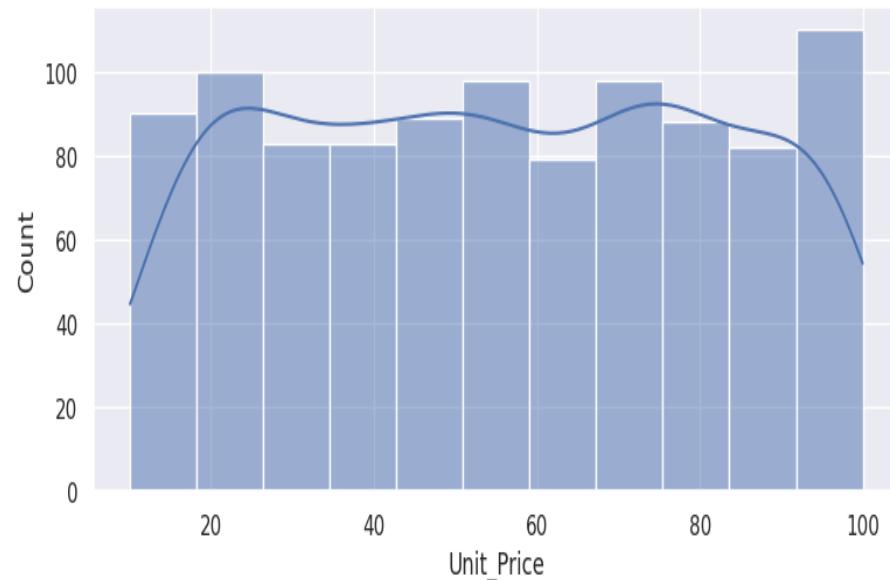
3.3. Check handle Outliers

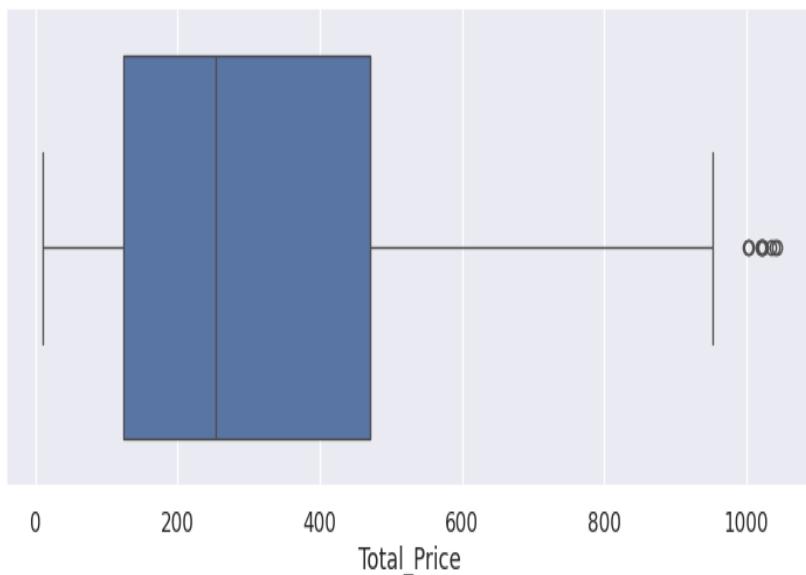
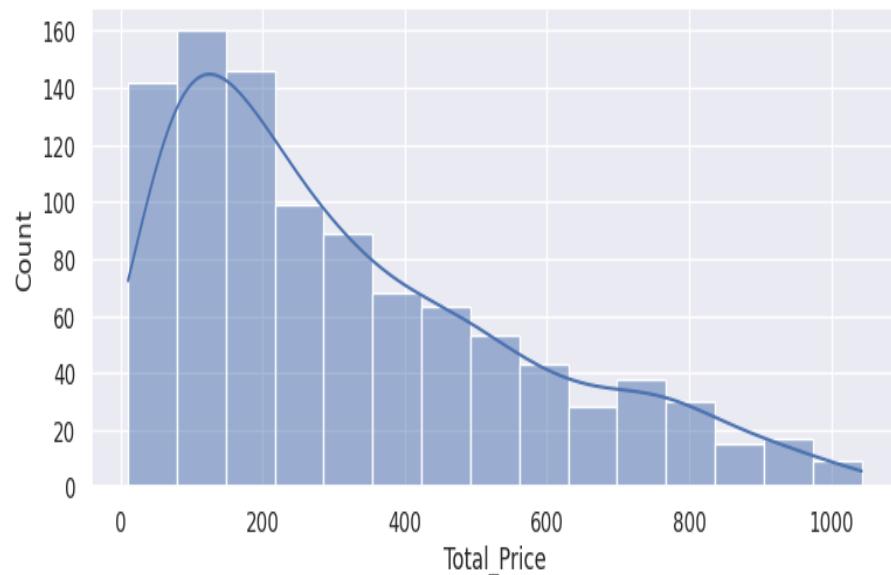
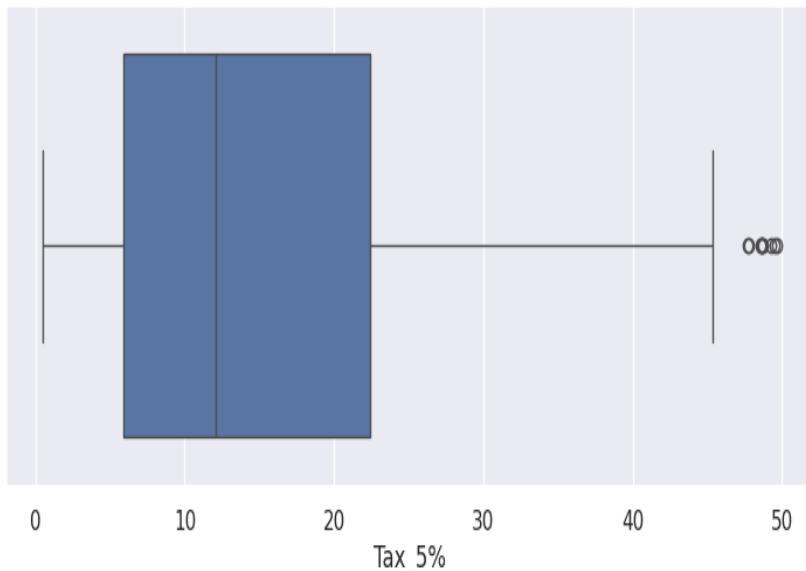
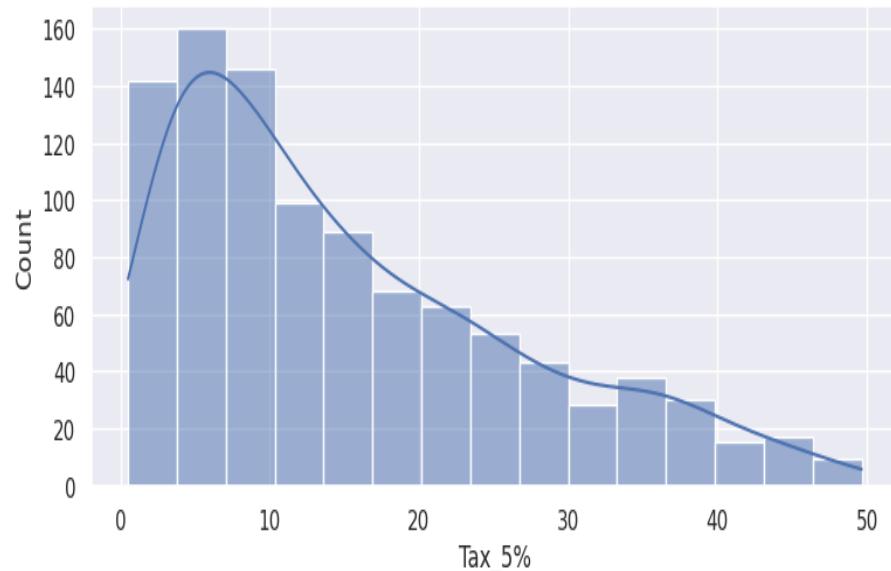
3.3.1. View numeric columns

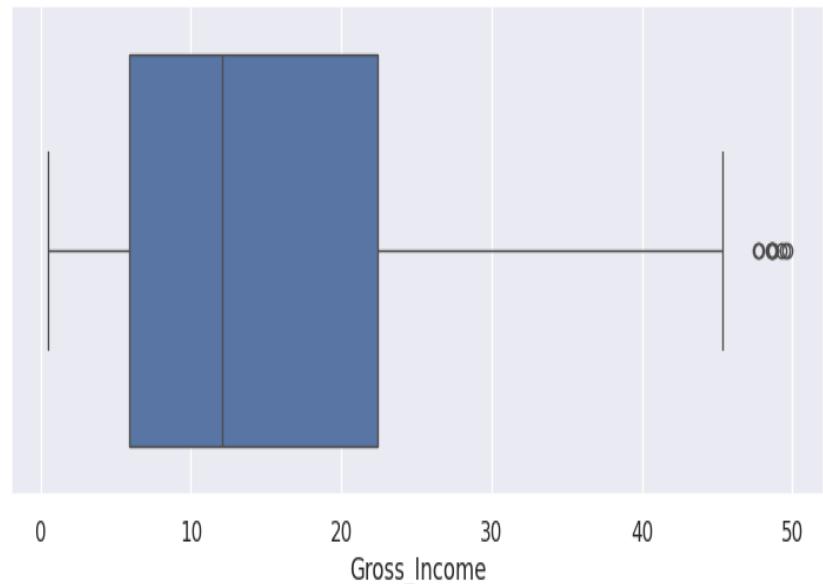
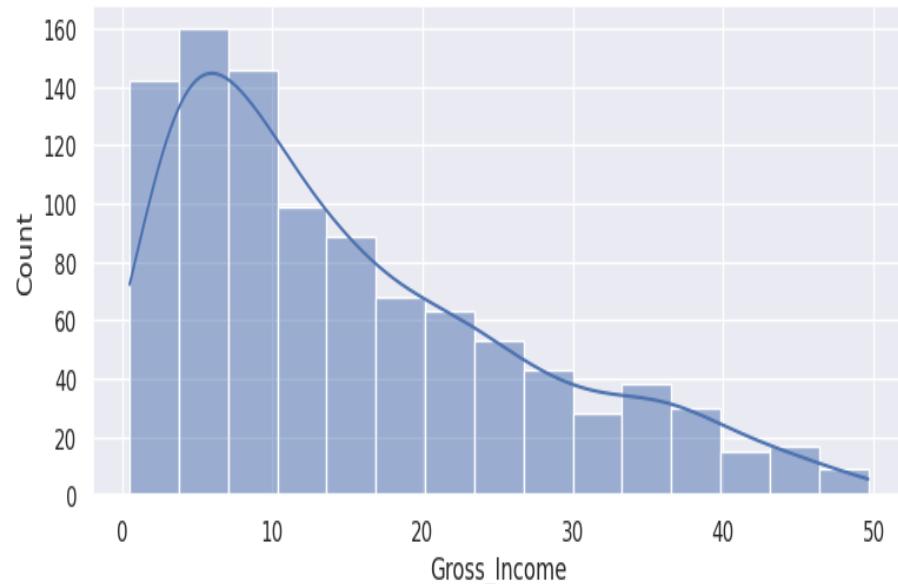
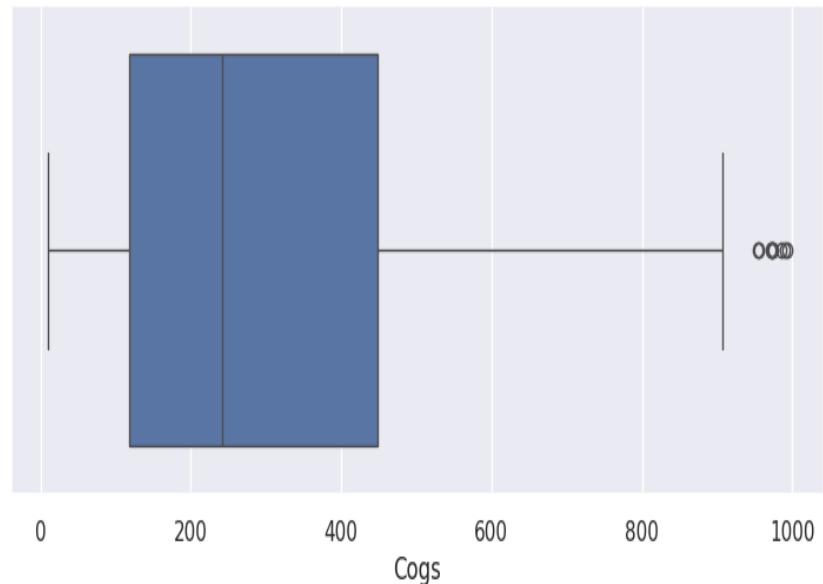
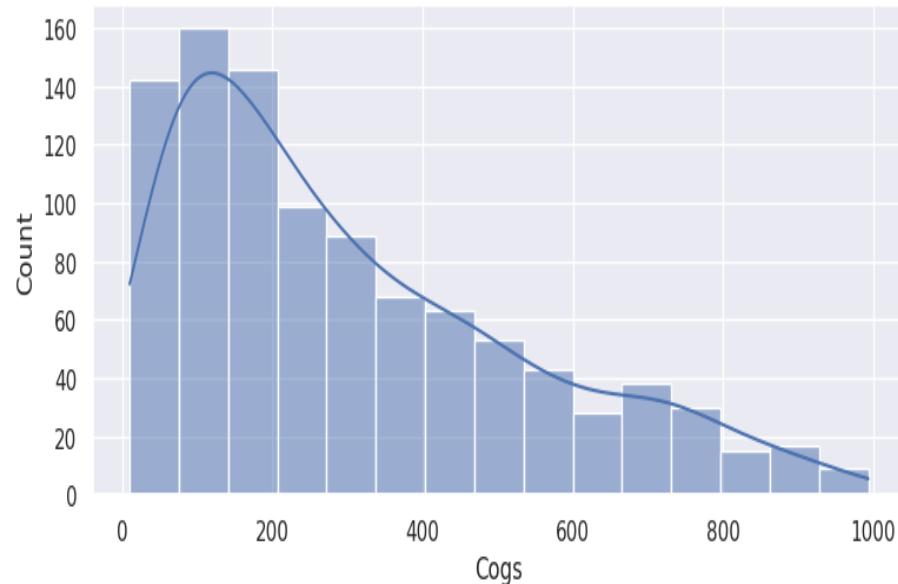
	Unit_Price	Quantity	Tax_5%	Total_Price	Cogs	Gross_Income	Rating
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000
mean	55.672130	5.510000	15.379369	322.966749	307.58738	15.379369	6.97270
std	26.494628	2.923431	11.708825	245.885335	234.17651	11.708825	1.71858
min	10.080000	1.000000	0.508500	10.678500	10.17000	0.508500	4.00000
25%	32.875000	3.000000	5.924875	124.422375	118.49750	5.924875	5.50000
50%	55.230000	5.000000	12.088000	253.848000	241.76000	12.088000	7.00000
75%	77.935000	8.000000	22.445250	471.350250	448.90500	22.445250	8.50000
max	99.960000	10.000000	49.650000	1042.650000	993.00000	49.650000	10.00000

Figure 22

3.3.2. Creating subplots of histograms and box plots for multiple columns in the DataFrame df. The columns "Rating", "Quantity", "Unit_Price" are even. The remaining columns are off to the left







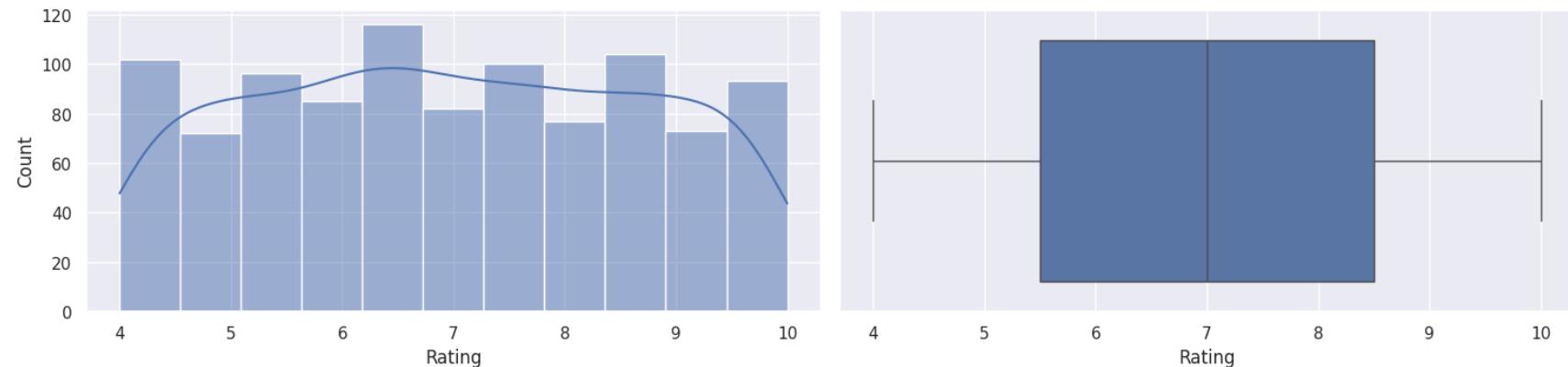


Figure 23

3.3.3. Check the uniformity of the number columns. The columns "Rating", "Quantity", "Unit_Price" are even.

```
Unit_Price 0.0070668272550450705
Quantity 0.012921628351325404
Tax_5% 0.8912303920037635
Total_Price 0.8912303920037631
Cogs 0.8912303920037631
Gross_Income 0.8912303920037635
Rating 0.008996128657606762
```

Figure 24

3.3.4. Choose uneven columns

	Gross_Income	Tax_5%	Total_Price	Cogs
0	26.1415	26.1415	548.9715	522.83
1	3.8200	3.8200	80.2200	76.40
2	16.2155	16.2155	340.5255	324.31
3	23.2880	23.2880	489.0480	465.76
4	30.2085	30.2085	634.3785	604.17

Figure 25

3.3.5. Compare the values of the columns before and after applying log and sqrt. The values of the columns after changing do not differ too much, so there is no need to replace them with new values

```
Skew of column Gross_Income is: 0.8912303920037635
Skew of column Tax_5% is: 0.8912303920037635
Skew of column Total_Price is: 0.8912303920037631
Skew of column Cogs is: 0.8912303920037631
Skew of column Gross_Income_log is: -0.5900867323522739
Skew of column Gross_Income_sqrt is: 0.26845772715204963
Skew of column Tax_5%_log is: -0.5900867323522739
Skew of column Tax_5%_sqrt is: 0.26845772715204963
Skew of column Total_Price_log is: -0.5900867323522712
Skew of column Total_Price_sqrt is: 0.26845772715204924
Skew of column Cogs_log is: -0.5900867323522706
Skew of column Cogs_sqrt is: 0.2684577271520502
```

Figure 26

Step 4: Feature Understanding (Univariate Analysis)

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 16 columns):
 #   Column      Non-Null Count  Dtype  
--- 
 0   Invoice_ID    1000 non-null   object  
 1   Branch        1000 non-null   object  
 2   City          1000 non-null   object  
 3   Customer_Type 1000 non-null   object  
 4   Gender         1000 non-null   object  
 5   Product_Line   1000 non-null   object  
 6   Unit_Price    1000 non-null   float64 
 7   Quantity       1000 non-null   int64   
 8   Tax_5%        1000 non-null   float64 
 9   Total_Price   1000 non-null   float64 
 10  Date          1000 non-null   datetime64[ns]
 11  Time          1000 non-null   object  
 12  Payment        1000 non-null   object  
 13  Cogs          1000 non-null   float64 
 14  Gross_Income  1000 non-null   float64 
 15  Rating         1000 non-null   float64 
dtypes: datetime64[ns](1), float64(6), int64(1), object(8)
memory usage: 125.1+ KB
```

Figure 27

4.1. Categorical data

4.1.1. Number of Product_Line rows. The quantity of the product line is quite balanced. The "Fashion accessories" accounts for the most. "Healthy and beauty" accounts for the least

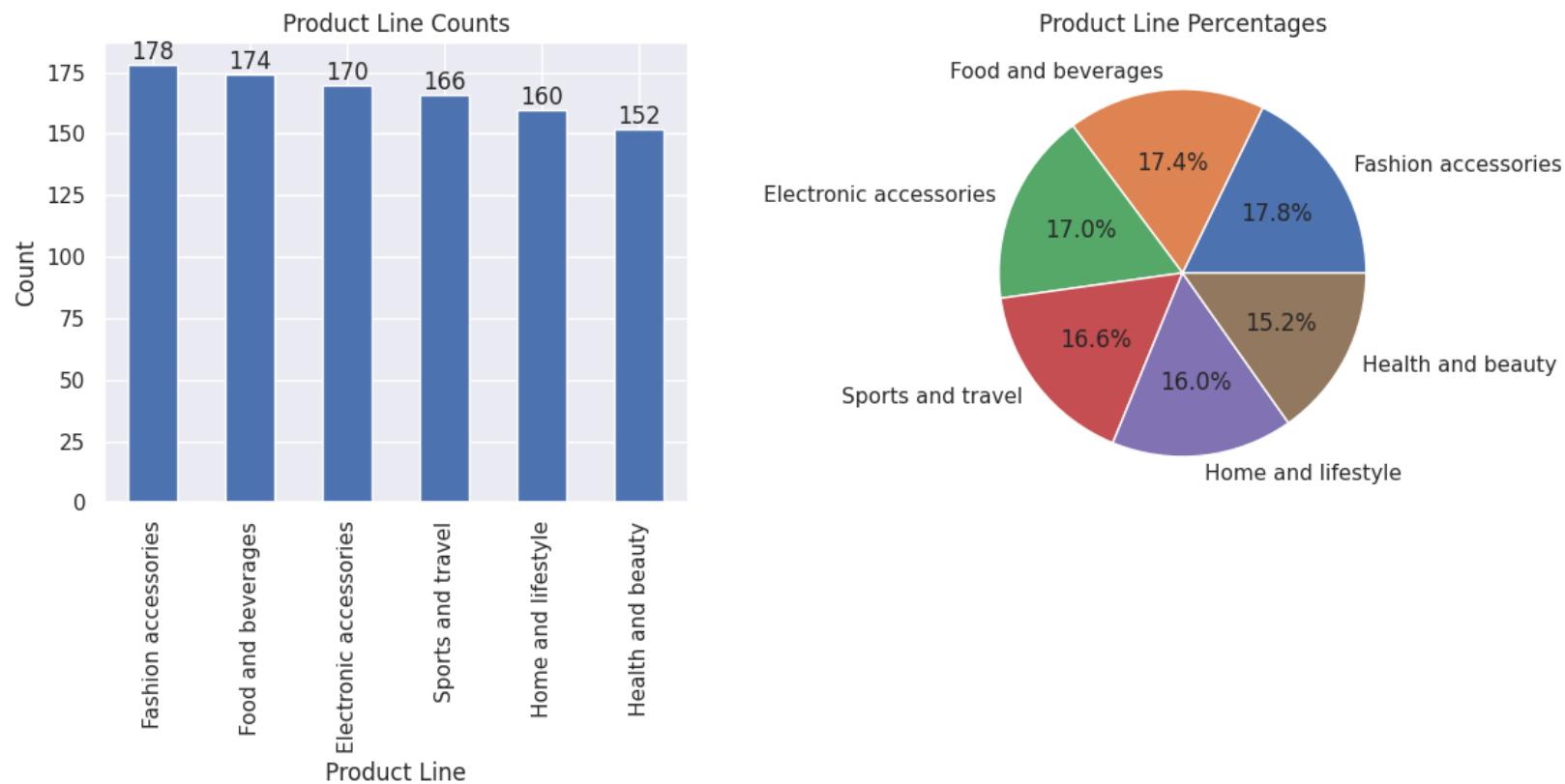


Figure 28

4.1.2. Number of "Branch" rows. The quantity of the Branch is quite balanced. "A" accounts for the most. "C" accounts for the least

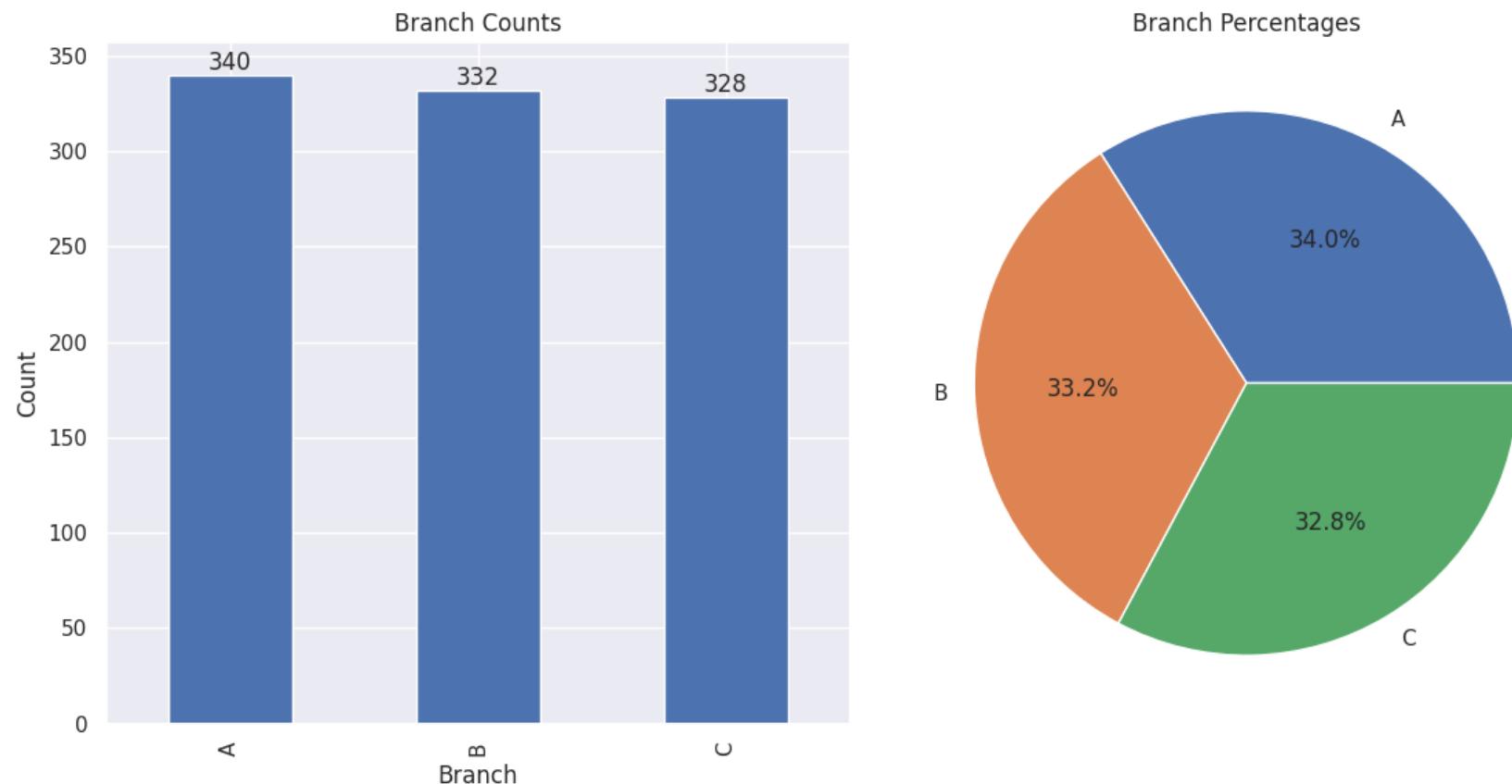


Figure 29

4.1.3. Number of "City" rows. The quantity of the City is quite balanced. "Yangon" accounts for the most. "Naypiayto" accounts for the least

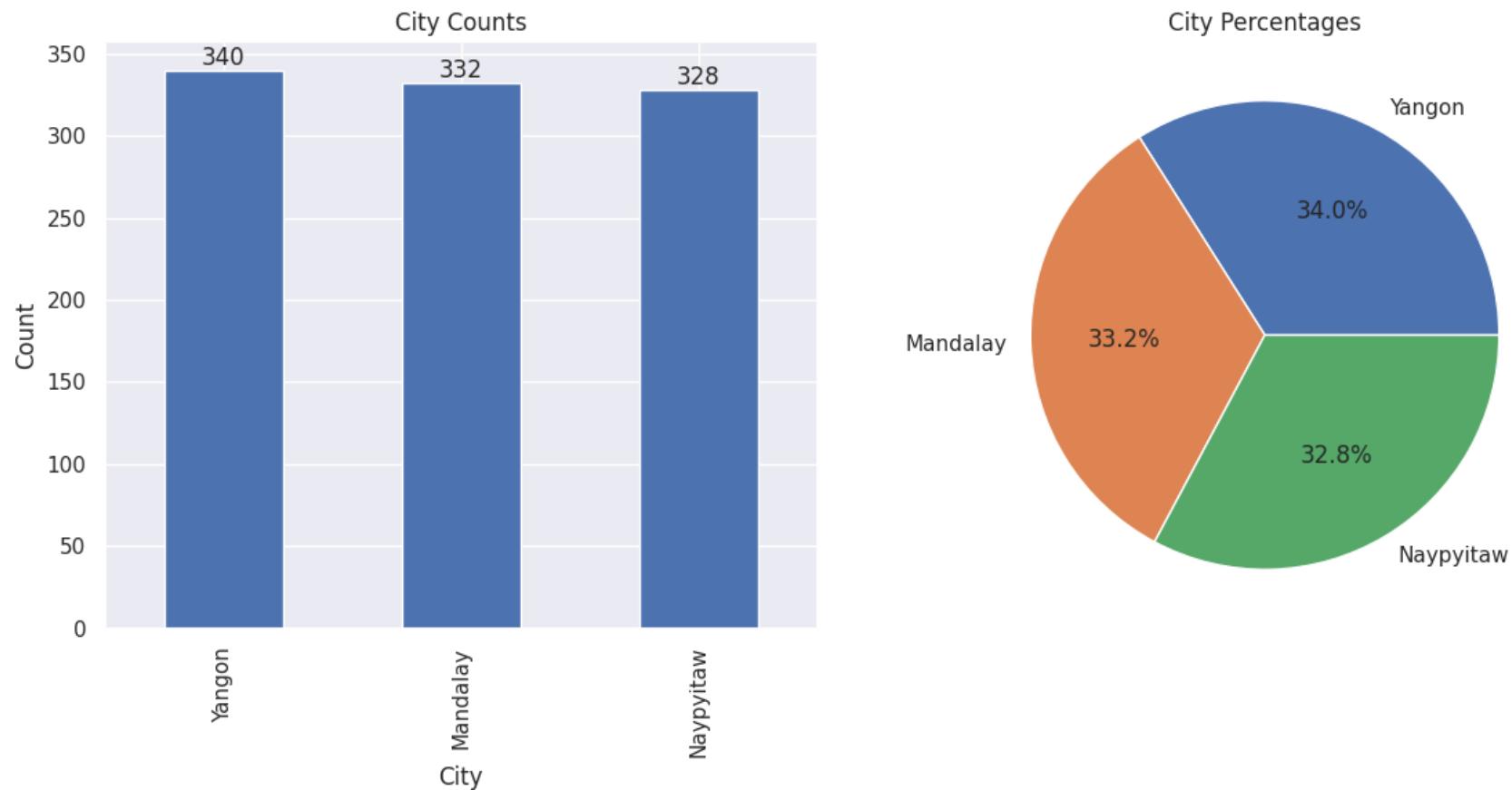


Figure 30

4.1.4. Number of "Customer_Type" rows. The quantity of the Customer_Type is quite balanced. Members account for more than the normal category

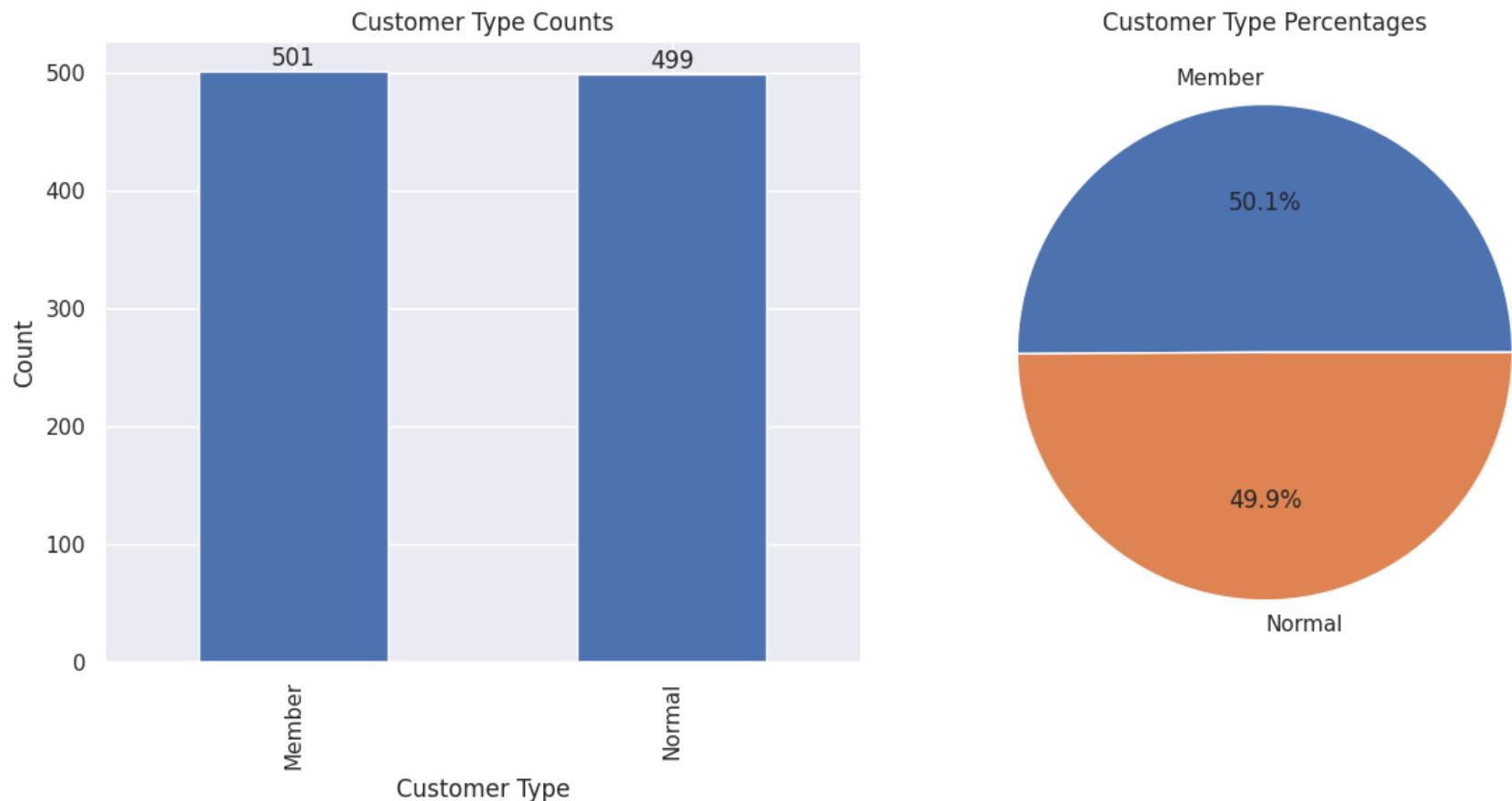


Figure 31

4.1.5. Number of "Gender" rows. The quantity of the Gender is quite balanced. Female account for more than the Male category

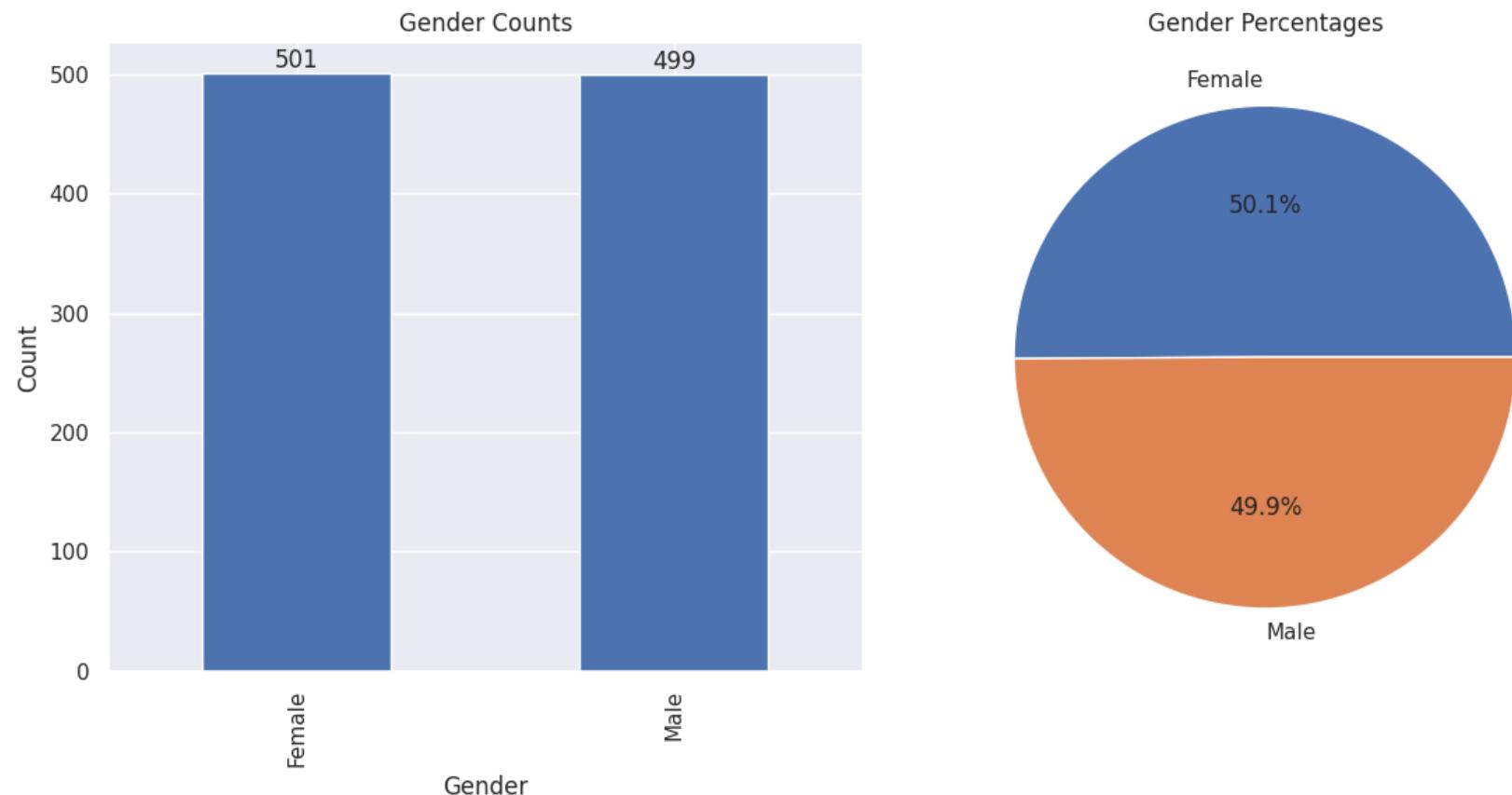


Figure 32

4.1.6. Number of "Quantity" rows. The quantity of the Quantity is quite balanced. "10" accounts for the most. "8" accounts for the least

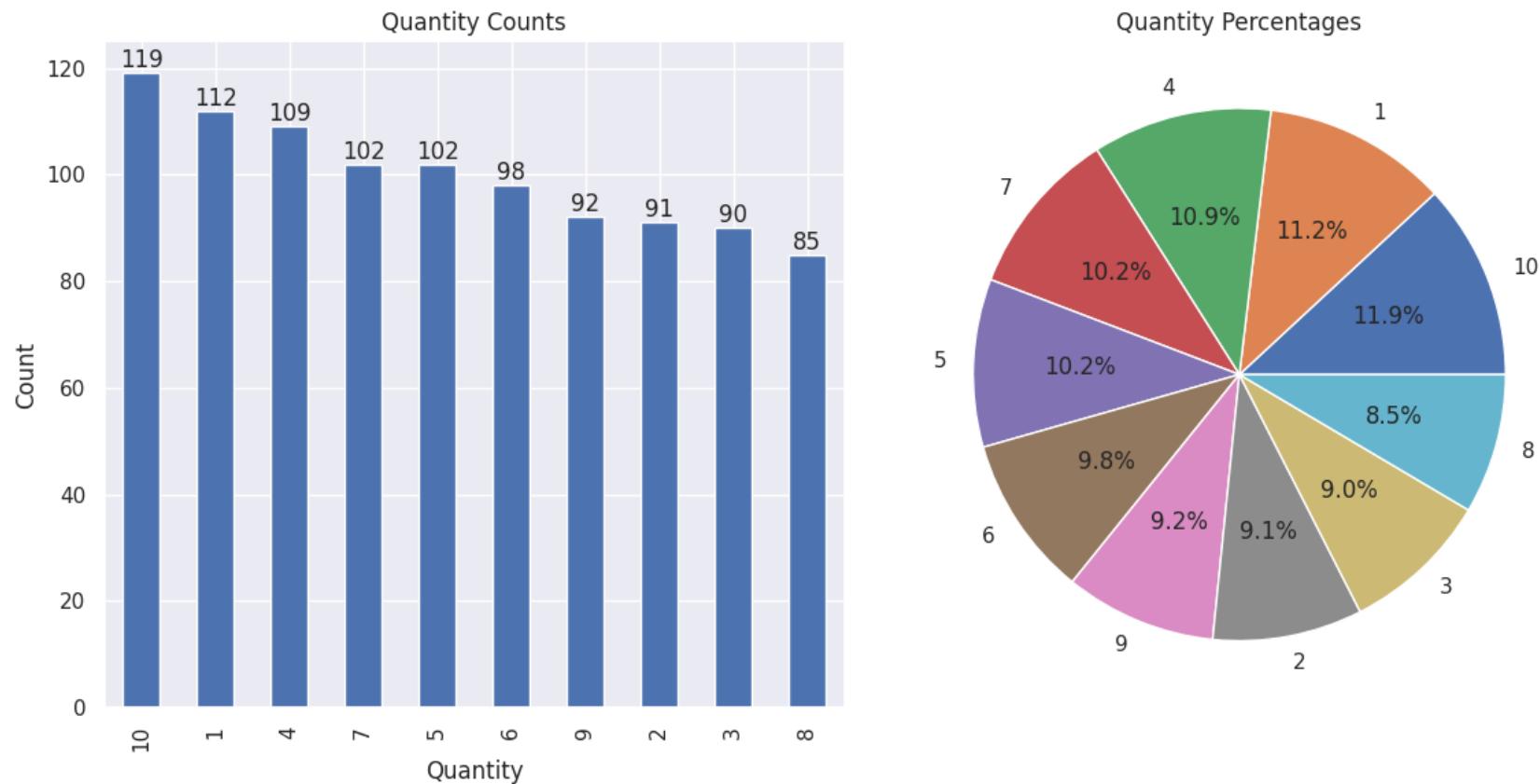


Figure 33

4.1.7. Number of "Payment" rows. The quantity of the Payment is quite balanced. "Ewallet" accounts for the most. "Credit card" accounts for the least

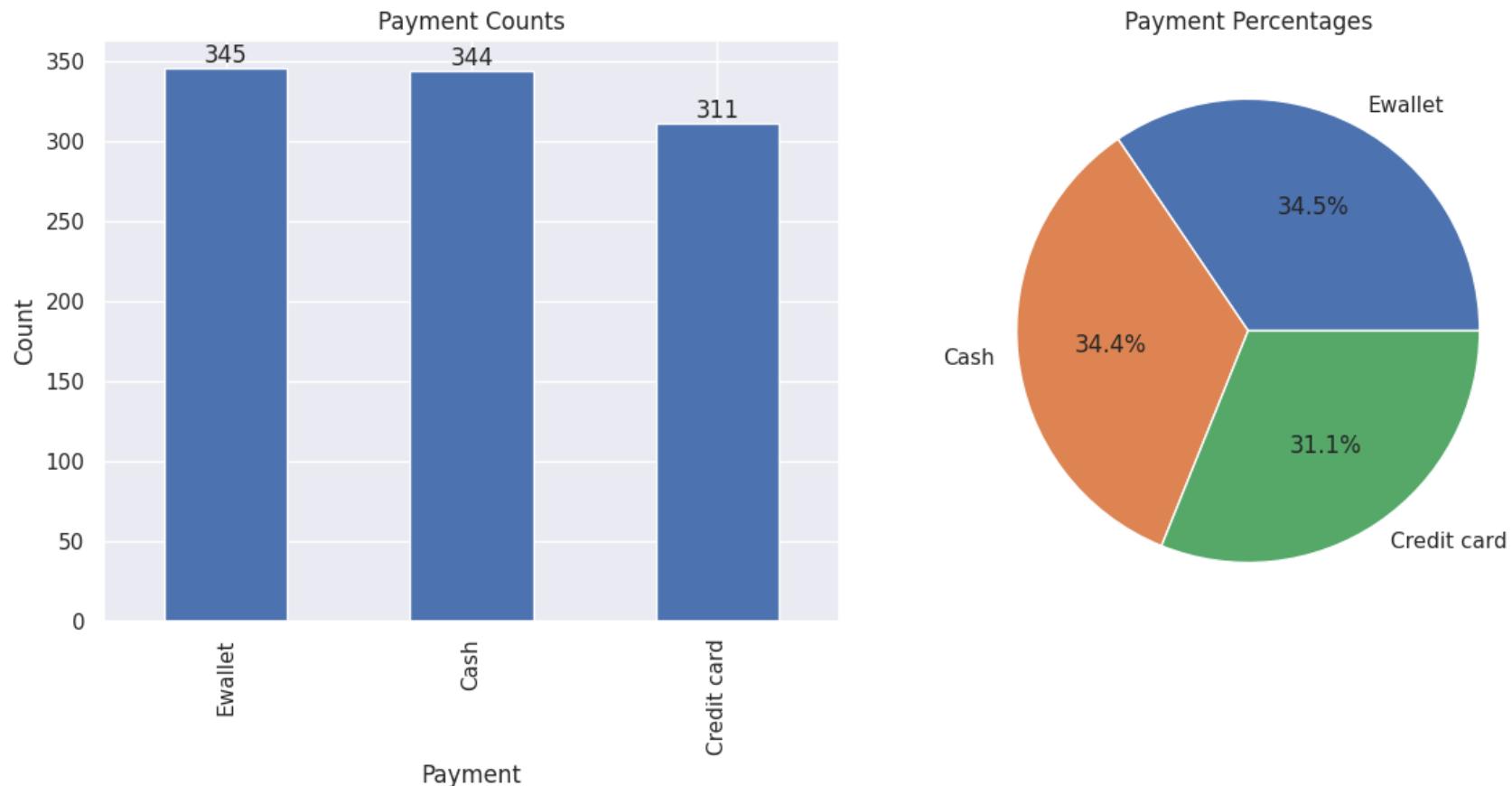


Figure 34

4.2. Numeric data

4.2.1. Histogram about Rating. The value is between 4 and 10. The most common value is between 6 and 7.

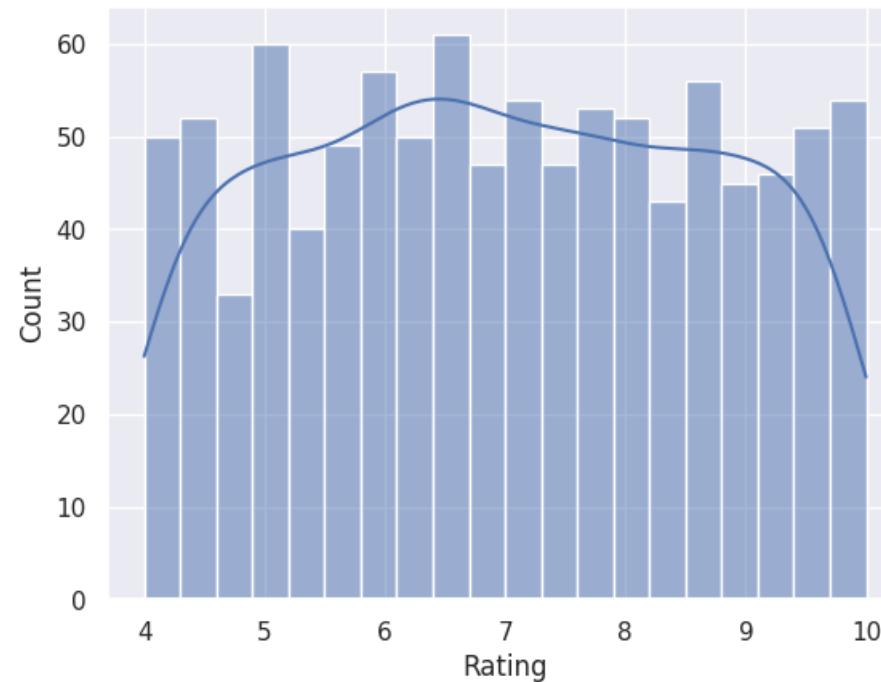


Figure 35

4.2.2. Histogram about Total_Price. The value is between 0 and 1000. The most common value is between 0 and 200.

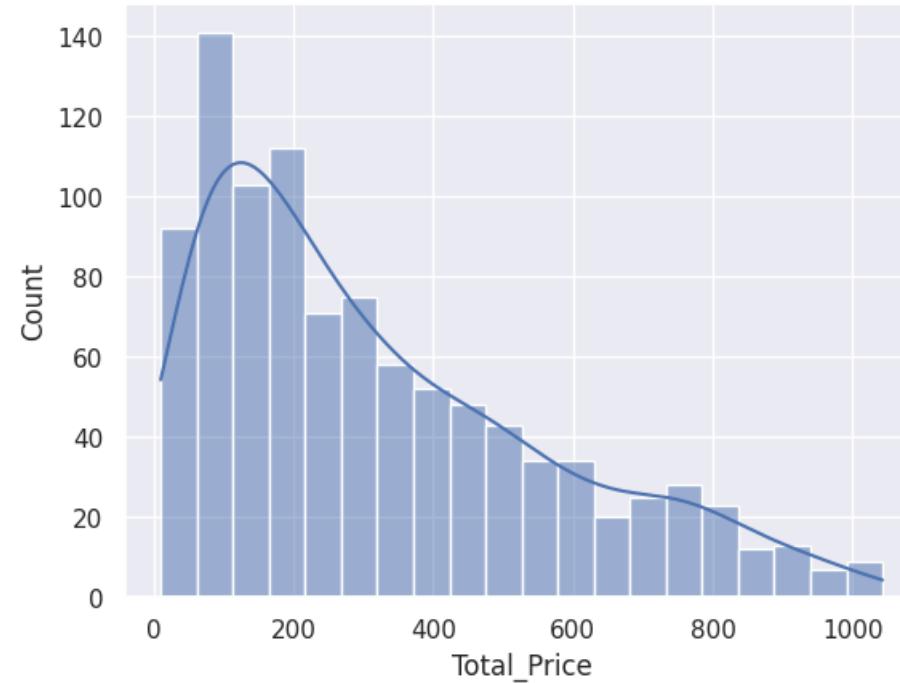


Figure 36

4.2.3. Histogram about Unit_Price. The value is between 20 and 100. The most common value is between 60 and 80.

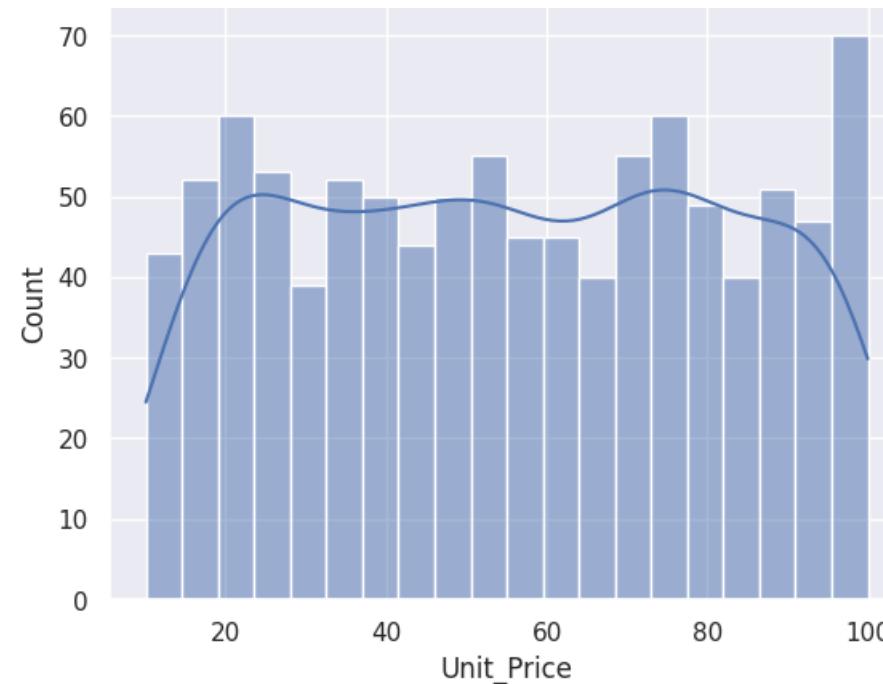


Figure 37

4.2.4. Histogram about Tax_5%. The value is between 0 and 50. The most common value is between 0 and 10.

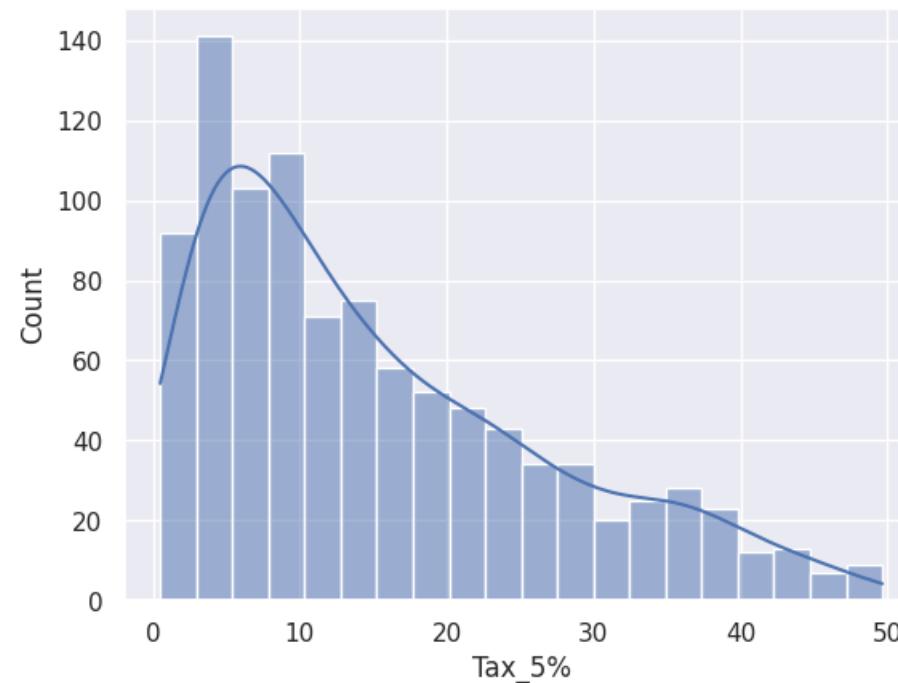


Figure 38

4.2.5. Histogram about Cogs. The value is between 0 and 1000. The most common value is between 0 and 200.

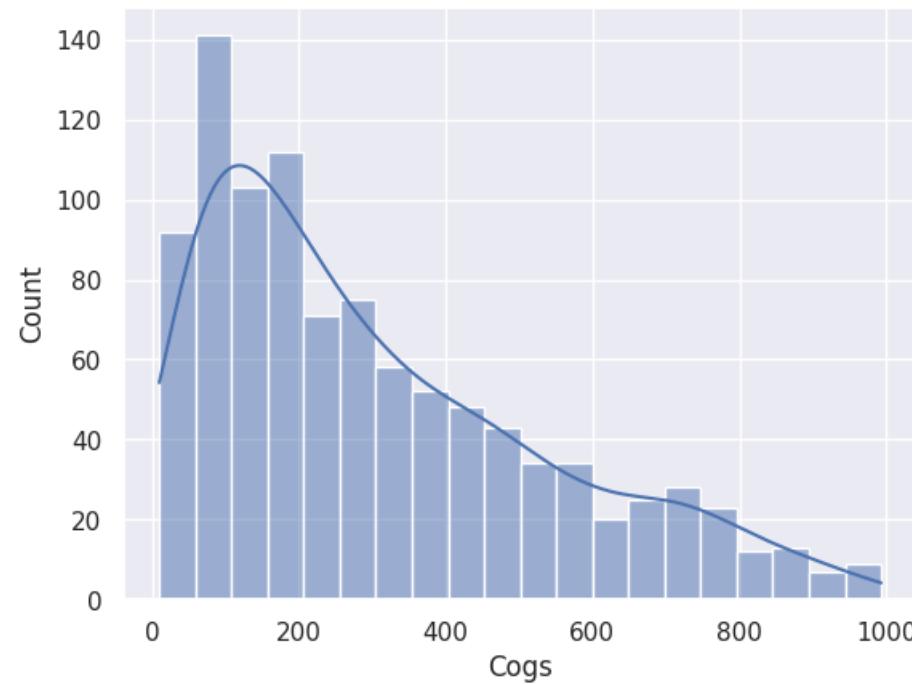


Figure 39

4.2.6. Histogram about Gross_Income. The value is between 0 and 50. The most common value is between 0 and 10.

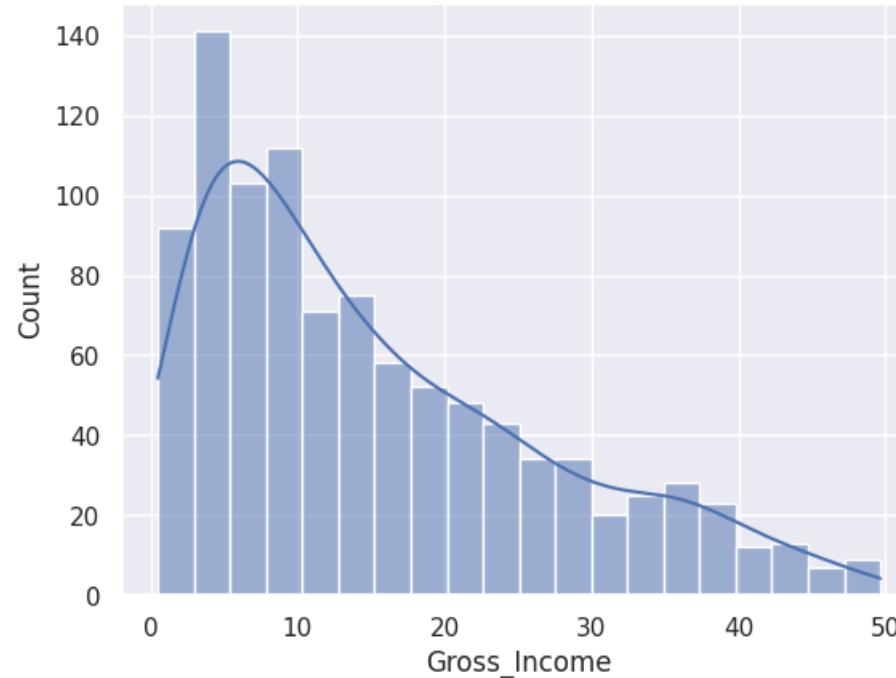


Figure 40

Step 5: Feature Engineering

5.1. Add columns(Column: "Quality" has Not Good, Medium, Good)

	Invoice_ID	Branch	City	Customer_Type	Gender	Product_Line	Unit_Price	Quantity	Tax_5%	Total_Price	Date	Time	Payment	Cogs	Gross_Income	Rating	Quality
0	750-67-8428	A	Yangon	Member	Female	Health and beauty	74.69	7	26.1415	548.9715	2019-01-05	13:08	Ewallet	522.83	26.1415	9.1	Good
1	226-31-3081	C	Naypyitaw	Normal	Female	Electronic accessories	15.28	5	3.8200	80.2200	2019-03-08	10:29	Cash	76.40	3.8200	9.6	Good
2	631-41-3108	A	Yangon	Normal	Male	Home and lifestyle	46.33	7	16.2155	340.5255	2019-03-03	13:23	Credit card	324.31	16.2155	7.4	Medium
3	123-19-1176	A	Yangon	Member	Male	Health and beauty	58.22	8	23.2880	489.0480	2019-01-27	20:33	Ewallet	465.76	23.2880	8.4	Good
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7	30.2085	634.3785	2019-02-08	10:37	Ewallet	604.17	30.2085	5.3	Not Good

Figure 41

Step 6: Export new file

3.Create dashboard

3.1.The chart below shows customer information based on total price

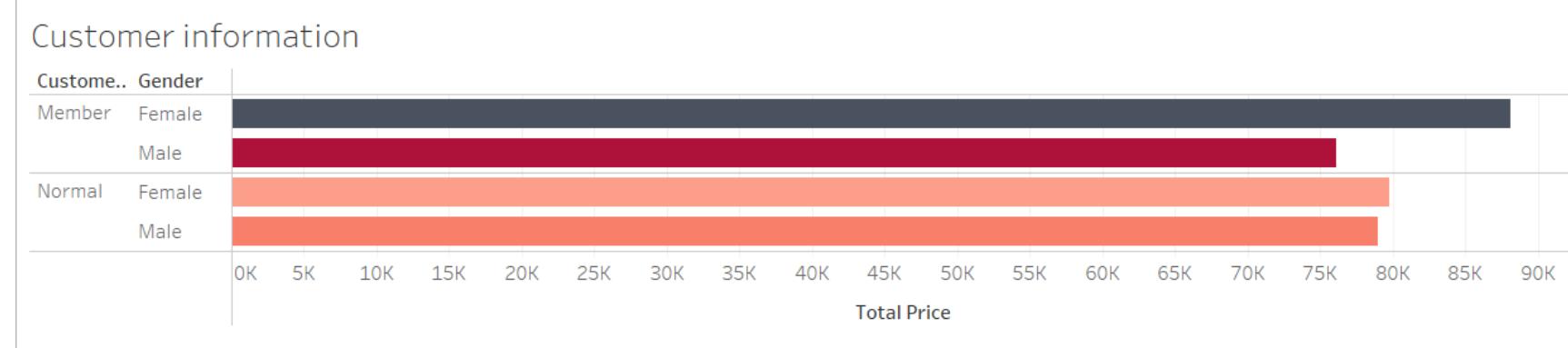


Figure 1Total_Price

3.2.The pie chart below shows the percentage of payment methods based on total cost

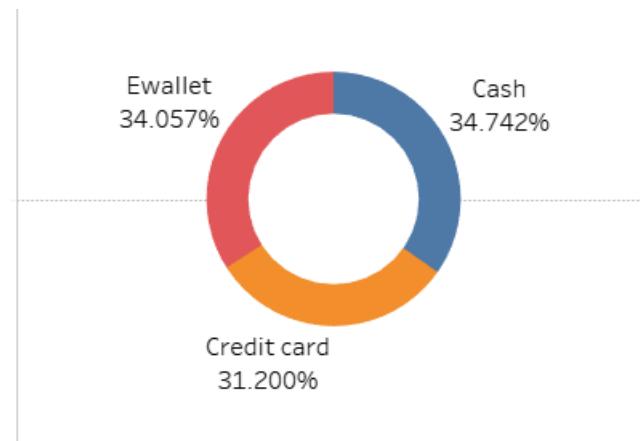


Figure 2.Percentage of payment

3.3.Percentage of total costs increasing or decreasing by day in January

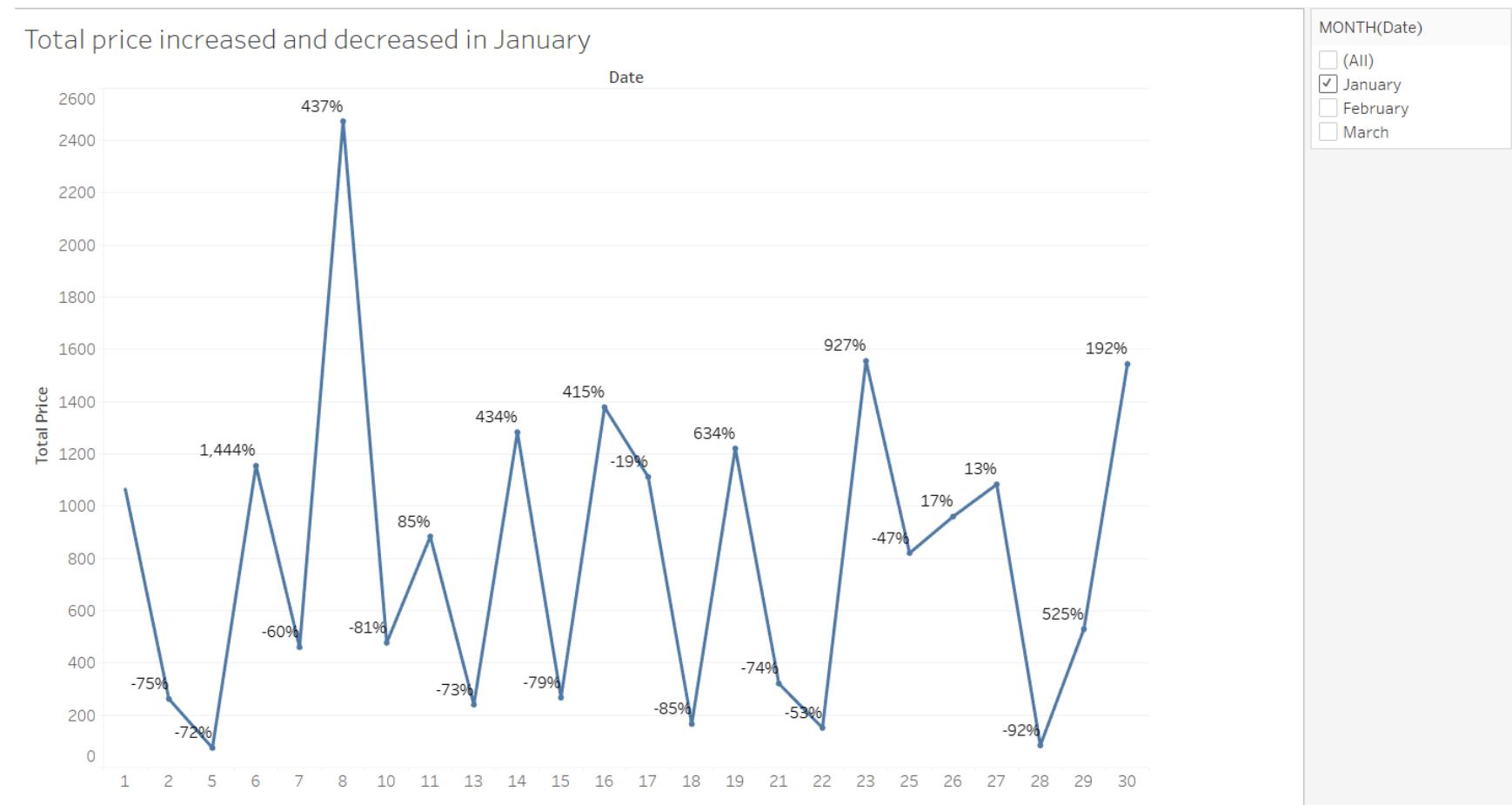


Figure 3.Total price increased and decreased in January

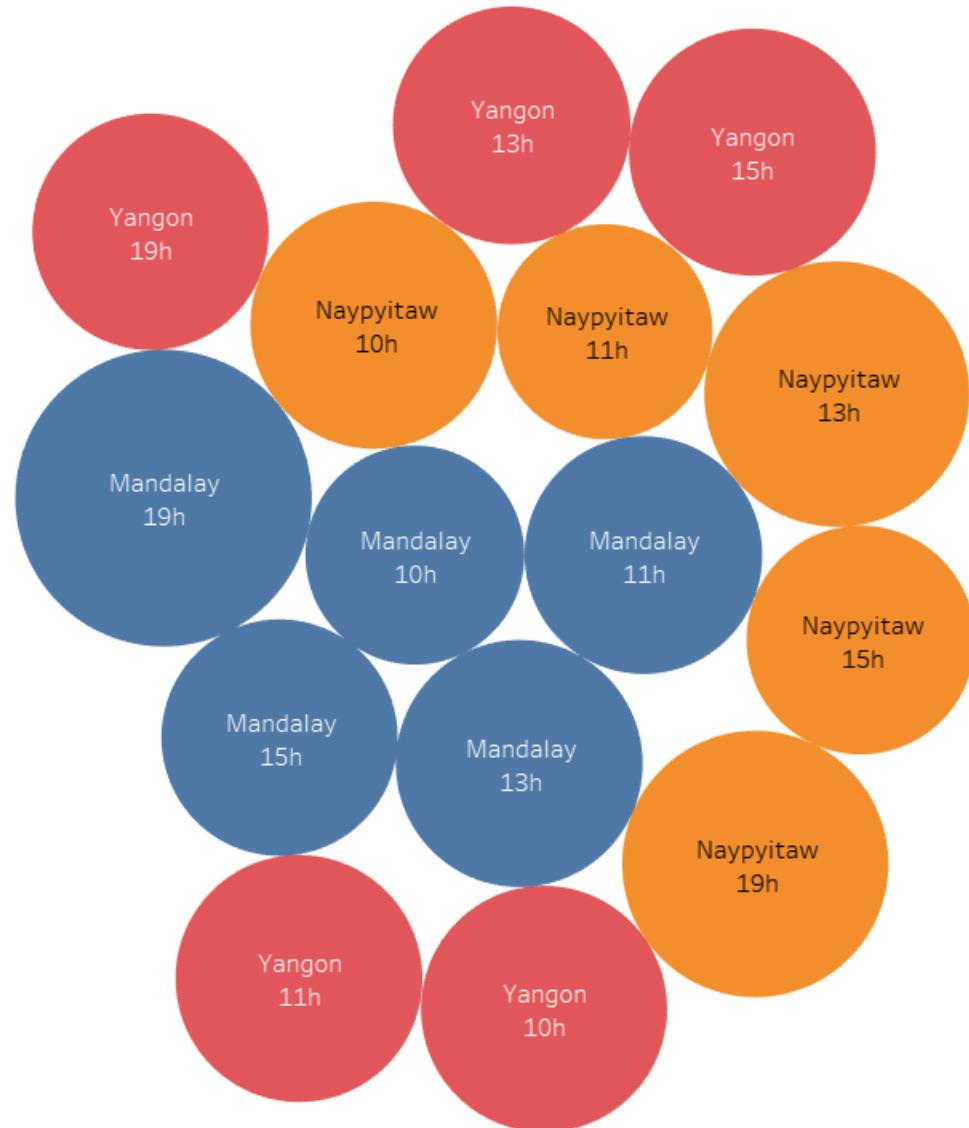
3.4.Total price and gross income each product line

Total price and gross income



3.5.Top 5 selling hours of each city based on total cost column

Top 5 time sale the most in city

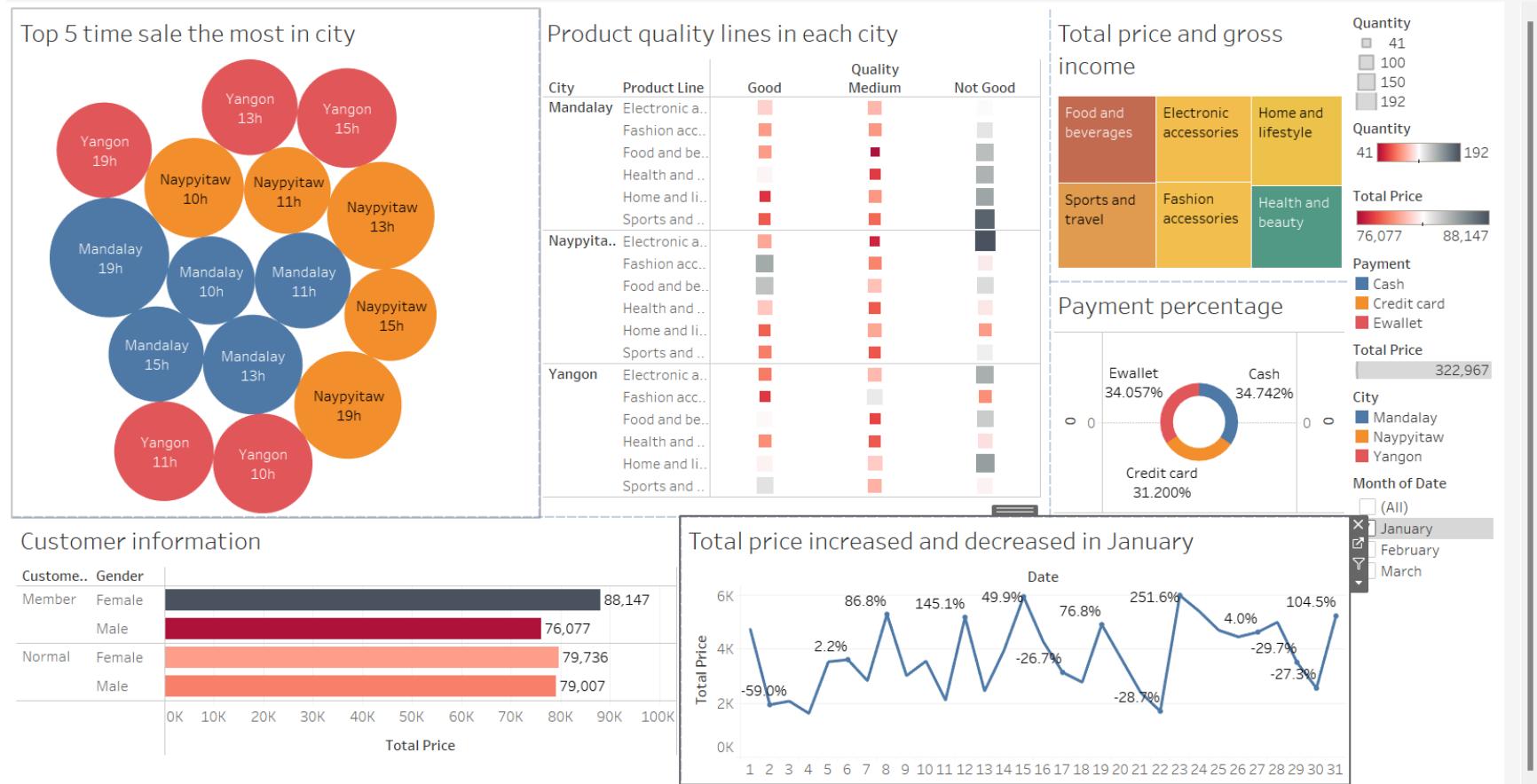


3.6. Product quality in each city

Product quality lines in each city

City	Product Line	Good	Quality Medium	Not Good
Mandalay	Electronic accessories			
	Fashion accessories			
	Food and beverages			
	Health and beauty			
	Home and lifestyle			
	Sports and travel			
Naypyitaw	Electronic accessories			
	Fashion accessories			
	Food and beverages			
	Health and beauty			
	Home and lifestyle			
	Sports and travel			
Yangon	Electronic accessories			
	Fashion accessories			
	Food and beverages			
	Health and beauty			
	Home and lifestyle			
	Sports and travel			

3.7. This is a banana, it can filter all related things when clicking on each product in the Total price and quantity sheet



P5. Discuss how business intelligence tools can contribute to effective decision-making.

1. Discuss

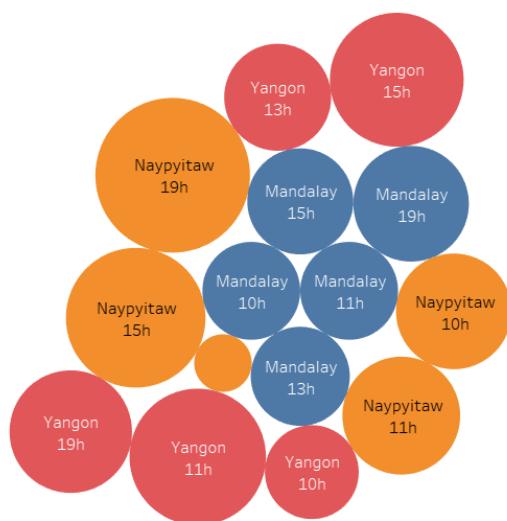
Presenting pertinent data in the context of a company's operations, business intelligence (BI) is an invaluable tool that helps managers make well-informed decisions. In order to facilitate easier and more effective operations, analysts might use BI to provide performance benchmarks and competition analysis. Companies may handle a number of issues, including compliance and hiring, by using data efficiently. In order to help businesses make more informed decisions based on data, BI may help in the following ways:

1. Improved decision-making
2. Increased efficiency
3. Greater insights
4. Competitive advantage
5. Improved financial performance

In summary, BI tools offer significant advantages to companies aiming to enhance decision-making, expand their target audience, and remain competitive. By leveraging the capabilities of BI tools, companies can gain valuable insights into customers, competitors, and market trends, enabling them to make informed business decisions. This includes developing targeted marketing campaigns, improving customer support strategies, monitoring competitors, generating real-time reports, and conducting predictive analytics to anticipate future trends and identify growth opportunities. Overall, BI tools are essential assets that empower companies to thrive in today's fast-paced business environment.

2.Example

Top 5 time sale the most in city



Product quality lines in each city

City	Product Line	Quality		
		Good	Medium	Not Good
Mandalay	Food and be..	■	■	■
Naypyita..	Food and be..	■	■	■
Yangon	Food and be..	■	■	■

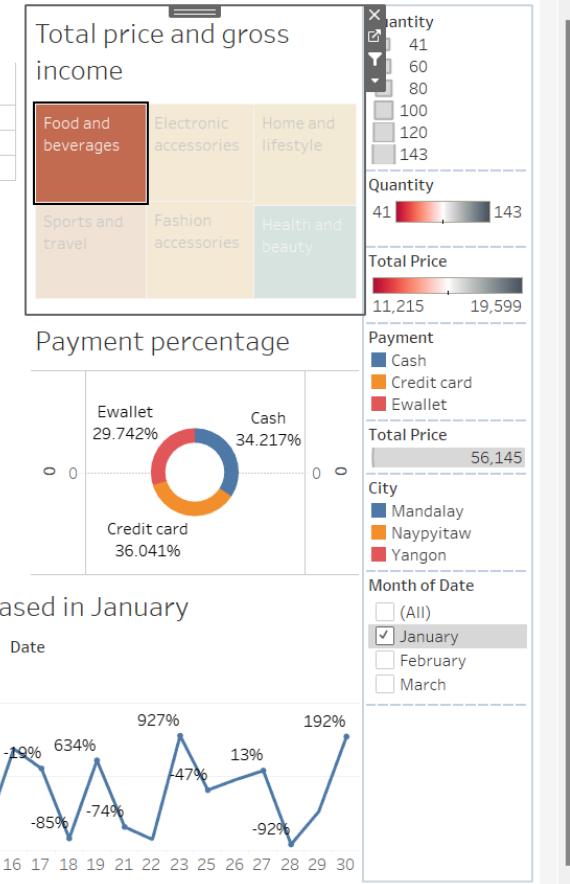


Figure 42:tableau

This image shows the product and we will see the 5 time frames most customers buy in each city, customer information, payment percentage and income percentage of that product in January.

Product quality lines in each city refer to the range of product quality available in different cities. Total price and quantity refer to the overall cost and quantity of products purchased. Payment percentage represents the proportion of the total amount paid by the customer at a given time. Customer information includes data about individuals who have purchased or shown interest in a product or service and Total price increased and decreased in January.

P6. Explore the legal issues involved in the secure exploitation of business intelligence tools

Poor Access Control for Sensitive Data

Keep your data safe Ask for more than technical protections. You also need policies and procedures that limit risk and provide strong data governance. For example, everyone with access to a BI tool may not need access to all data to create reports and visualizations. If the end user has limited accounts in related locations, limit access to sensitive databases.

Data Retention and Destruction:

Data retention and destruction practices play a significant role in ensuring the secure exploitation of business. It is essential for businesses to have clear policies and procedures regarding the retention of data and the secure disposal of information when it is no longer needed. Failure to properly retain or destroy data can lead to legal issues, such as violating privacy laws or facing penalties for non-compliance. Businesses must understand the legal requirements for data retention in their industry and jurisdiction and implement appropriate measures to securely retain and dispose of data.

Security Liability:

“Security liability coverage protects against risks associated with the failure to protect electronic data containing others’ private information, the inadvertent transmission of a computer virus, the inability of authorized users to access your website or computer network, and failure to notify individuals as required by any security breach notification law that applies. Security problems have been solved in the past by locking a door. In order to secure sensitive information and valuable properties, data security is a much more complex protection mechanism for data networks to be computerized. This increased protection comes with increased supervision, however. Both security devices bear inherent threats, which means that what rights can be forfeited is a question of. In the end, IT professionals need to balance risk with independence to build a security that is both effective and ethical.

Privacy:

Many individuals have their personal data distributed all over the digital globe. Even items considered to be safemay be unintended outlets,such as email or private accounts. Software behaviors of the majority of workers. Privacy has evolving legal consequences but ethical concerns are still present. Do folks know how their accounts are being monitored? As the tech world points out, privacy issues can quickly turn into a slippery slope, slowly eroding a person's right to privacy altogether.

- How to improve the BI Security Risk:
- Regularly update the version of the software program
- Secure password policy

- Data backup
- Encrypt peripherals and content on peripherals
- Firewall setting

Incident Response and Legal Obligations:

In the event of a security incident or data breach, businesses have legal obligations to respond appropriately. This includes promptly investigating the incident, mitigating harm, notifying affected individuals, and potentially reporting the incident to regulatory authorities. Failure to comply with these legal obligations can result in significant legal and reputational consequences. Businesses should have an incident response plan in place that outlines the steps to be taken in case of a breach and ensures compliance with applicable laws and regulations.

Task table for each member

Name	Task	Teacher's request
Đỗ Phú Thịnh	Data processing, draw a tableau diagram.	
Truong Trần Anh Khoa	Word writing.	Draw a tableau diagram at the teacher's request, Explain data processing code
Hà Thé Hải	Making powerpoint.	Draw a tableau diagram at the teacher's request. Explain data processing code

References

What is business intelligence? benefits, examples, and more (no date) Coursera. Available at:
https://www.coursera.org/articles/business-intelligence?utm_medium=sem&utm_source=gg&utm_campaign=B2C_APAC_IBM_Data_Science_FTCOF_Professional_Certificate_ArtE_PMax&campaignid=20896738298&adgroupid=&device=c&keyword=&matchtype=&network=x&devicemodel=&adposition=&creativeid=&hide_mobile_promo&gad_source=1&gclid=Cj0KCQiAxOauBhCaARIsAEbUSQQ-0Vs6InQyqd46wIOmDe0R4yiIQAg_3Kpo0l-uoCGhGAIQ3EtzmNcaAn8uEALw_wcB (Accessed: 25 February 2024).

Domo Resource - how business intelligence is revolutionizing the way we make decisions (no date) Domo. Available at:
<https://www.domo.com/learn/article/how-business-intelligence-is-revolutionizing-the-way-we-make-decisions> (Accessed: 27 February 2024).

Zip Folder: https://drive.google.com/drive/folders/1pL88S8stV15TLD7VWB0O0ypZjmnj27Fh?usp=drive_link