UNIVERSITY OF GREENWICH

Alliance with FPT Education

GROUP 5

BUSINESS INTELLIGENCE

DANG VIET MINH MAN

NGUYEN XUAN TRUONG

PHAM MAI NHAT TRUONG

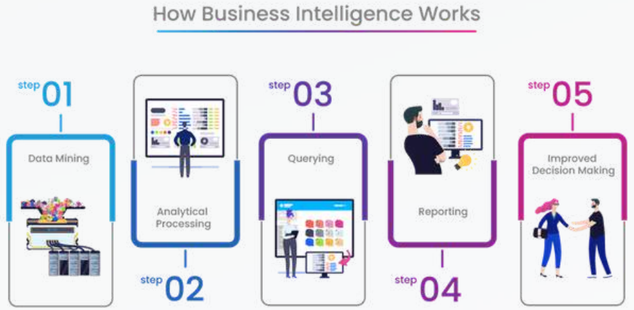
CLASS: GCS1005A

TABLE CONTENT

01 GENERAL ABOUT BI

- BI uses technology to analyze data for better decision-making. It gathers data from various sources, creates visualizations, and reports to enhance business outcomes through analytics and data management.

- BI architecture includes more than just software. Data is stored in data warehouses, smaller data marts, and may connect to enterprise data warehouses. Big data systems like Hadoop and data lakes are used for certain data types. BI data encompasses historical and real-time information for strategic and tactical decisions. Data integration and quality management are vital to ensure accurate and consistent data for BI applications.



2. ORIGINAL DATASET

phone_na	brand	os	inches	resolution	battery	battery_ty	ram(GB)	announcer	weight(g)	storage(GE	video_720	video_108	video_4K	video_8K	video_30f	video_60f	video_120	video_240	video_480	video_960	price(USD)
Y6II Comp	Huawei	Android 5.	5	720x1280	2200	Li-Po	2	9/1/2016	140	16	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	120
K20 plus	LG	Android 7.	5.3	720x1280	2700	Li-Ion	2	########	140	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	100
P8 Lite (20	Huawei	Android 7.	5.2	1080x192(	3000	Li-Ion	4	1/1/2017	147	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	420
Redmi Not	Xiaomi	Android 6.	5.5	1080x192(	4100	Li-Po	4	1/1/2017	165	32	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	150
P10	Huawei	Android 7.	5.1	1080x192(	3200	Li-Ion	4	2/1/2017	145	32	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	420
Xperia XA1	Sony	Android 7.	5	720x1280	2300	Li-Ion	3	2/1/2017	143	32	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	140
P10 Lite	Huawei	Android 7.	5.2	1080x192(	3000	Li-Po	4	2/1/2017	146	32	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	420
P10 Plus	Huawei	Android 7.	5.5	1440x256(	3750	Li-Ion	6	2/1/2017	165	64	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	170
Xperia XA1	Sony	Android 7.	6	1080x192(	2700	Li-Ion	4	2/1/2017	188	32	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	250
X power2	LG	Android 7.	5.5	720x1280	4500	Li-Ion	2	2/1/2017	164	16	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	170
Redmi Not	Xiaomi	Android 6.	5.5	1080x192(	4100	Li-Po	4	2/1/2017	165	16	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	130
Xperia XZs	Sony	Android 7.	5.2	1080x192(	2900	Li-Ion	4	########	161	32	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	TRUE	220
Xperia XZ F	Sony	Android 7.	5.46	3840x216(	3230	Li-Ion	4	########	195	64	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	TRUE	320
Xperia L1	Sony	Android 7.	5.5	720x1280	2620	Li-Ion	2	3/1/2017	180	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	110
A39	Oppo	Android 5.	5.2	720x1280	2900	Li-Ion	3	3/1/2017	147	32	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	250
F3 Plus	Oppo	Android 6	6	1080x192(	4000	Li-Ion	6	3/1/2017	185	64	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	250
Galaxy Xcc	Samsung	Android 7.	5	720x1280	2800	Li-Ion	2	3/1/2017	172	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	350
Galaxy J7 \	Samsung	Android 7.	5.5	720x1280	3300	Li-Ion	2	3/1/2017	167	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	170
Galaxy S8+	Samsung	Android 7.	6.2	1440x296(	3500	Li-Ion	6	########	173	64	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	350
K7 (2017)	LG	Android 6.	5	480x854	2500	Li-Ion	2	4/1/2017	143	8	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	170
Y5 (2017)	Huawei	Android 6.	5	720x1280	3000	Li-Ion	2	4/1/2017	150	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	280
Harmony	LG	Android 7.	5.3	720x1280	2800	Li-Ion	5	4/1/2017	141	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	160
Mi 6	Xiaomi	Android 7.	5.15	1080x192(	3350	Li-Po	6	4/1/2017	168	64	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	330
Y6 (2017)	Huawei	Android 6.	5	720x1280	3000	Li-Ion	2	5/1/2017	150	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	240
Y7	Huawei	Android 7.	5.5	720x1280	4000	Li-Ion	2	5/1/2017	165	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	90
nova 2 plu	Huawei	Android 7.	5.5	1080x192(	3340	Li-Po	4	5/1/2017	169	64	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	160
nova 2	Huawei	Android 7.	5	1080x192(	2950	Li-Po	4	5/1/2017	143	64	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	140
Y3 (2017)	Huawei	Android 6.	5	480x854	2200	Li-Ion	1	5/1/2017	175	8	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	230
Z4	Samsung	Tizen 3.0	4.5	480x800	2050	Li-Ion	1	5/1/2017	143	8	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	240

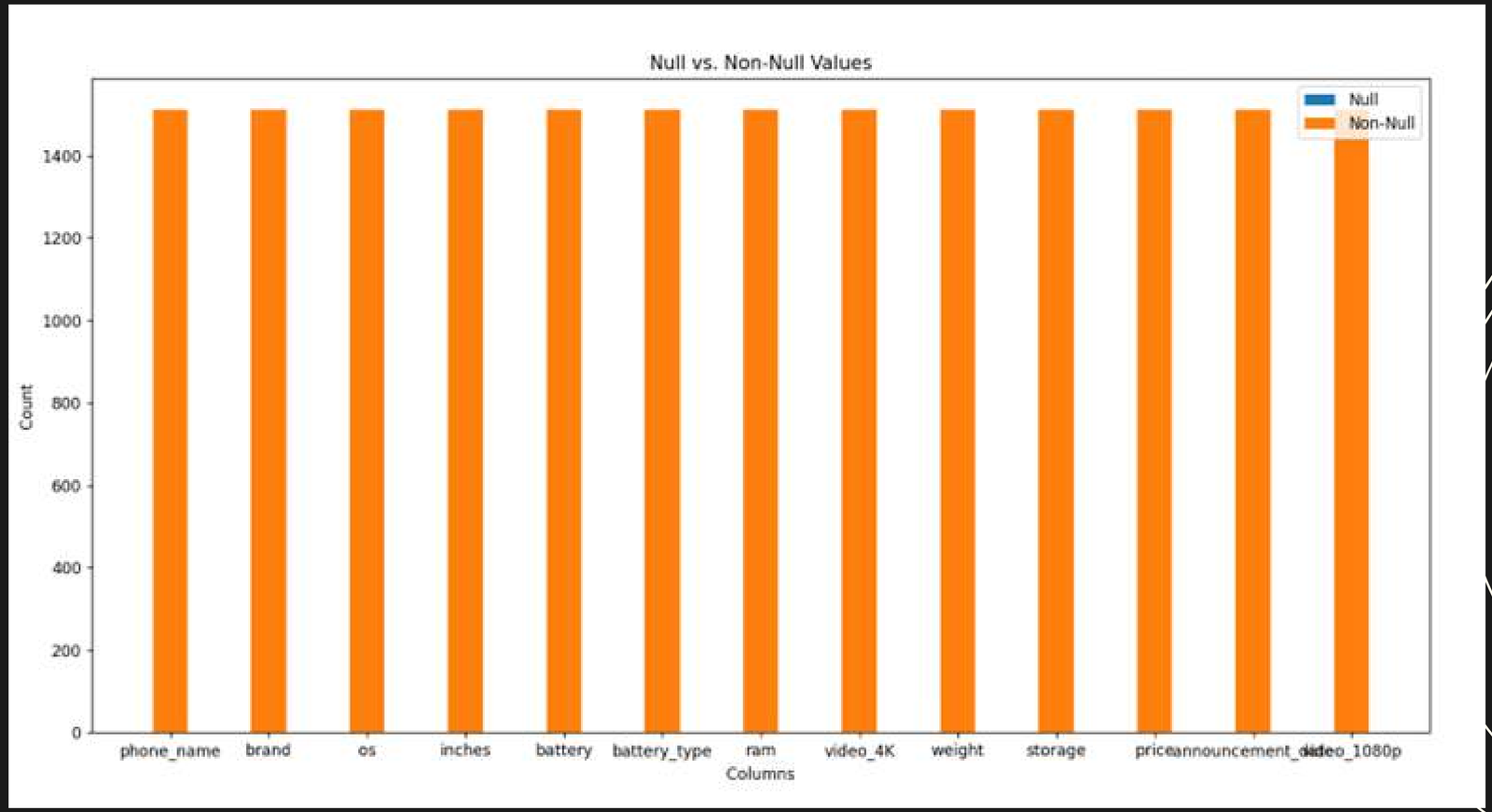
THIS IS ORIGINAL DATA THAT HAS NOT GONE THROUGH THE PRE-PROCESSING PROCESS.

3. PRE-PROCESSING DATA

phone_name	brand	os	inches	battery	battery_ty	ram	video_4K	weight	storage	price	announce	video_108
Y6II Compact	Huawei	Android 5.1	5	2200	Li-Po	2	FALSE	140	16	120	2022	FALSE
K20 plus	LG	Android 7.0	5.3	2700	Li-Ion	2	FALSE	140	16	100	2016	TRUE
P8 Lite	Huawei	Android 7.0	5.2	3000	Li-Ion	4	FALSE	147	16	420	2023	TRUE
Redmi Note 4	Xiaomi	Android 6.0	5.5	4100	Li-Po	4	FALSE	165	32	150	2020	TRUE
P10	Huawei	Android 7.0	5.1	3200	Li-Ion	4	TRUE	145	32	420	2018	TRUE
Xperia XA1	Sony	Android 7.0	5	2300	Li-Ion	3	FALSE	143	32	140	2018	TRUE
P10 Lite	Huawei	Android 7.0	5.2	3000	Li-Po	4	FALSE	146	32	420	2020	TRUE
P10 Plus	Huawei	Android 7.0	5.5	3750	Li-Ion	6	TRUE	165	64	170	2018	TRUE
Xperia XA1 Ultra	Sony	Android 7.0	6	2700	Li-Ion	4	FALSE	188	32	250	2023	TRUE
X power2	LG	Android 7.0	5.5	4500	Li-Ion	2	FALSE	164	16	170	2017	TRUE
Redmi Note 4X	Xiaomi	Android 6.0	5.5	4100	Li-Po	4	FALSE	165	16	130	2019	TRUE
Xperia XZs	Sony	Android 7.1	5.2	2900	Li-Ion	4	TRUE	161	32	220	2017	TRUE
Xperia XZ Premium	Sony	Android 7.1	5.5	3230	Li-Ion	4	TRUE	195	64	320	2016	TRUE
Xperia L1	Sony	Android 7.0	5.5	2620	Li-Ion	2	FALSE	180	16	110	2017	TRUE
A39	Oppo	Android 5.1	5.2	2900	Li-Ion	3	FALSE	147	32	250	2021	TRUE
F3 Plus	Oppo	Android 6	6	4000	Li-Ion	6	TRUE	185	64	250	2022	TRUE
Galaxy Xcover 4	Samsung	Android 7.0	5	2800	Li-Ion	2	FALSE	172	16	350	2016	TRUE
Galaxy J7 V	Samsung	Android 7.0	5.5	3300	Li-Ion	2	FALSE	167	16	170	2023	TRUE
Galaxy S8+	Samsung	Android 7.0	6.2	3500	Li-Ion	6	TRUE	173	64	350	2023	TRUE
K7	LG	Android 6.0	5	2500	Li-Ion	2	FALSE	143	8	170	2023	FALSE
Y5	Huawei	Android 6.0	5	3000	Li-Ion	2	FALSE	150	16	280	2018	TRUE
Harmony	LG	Android 7.0	5.3	2800	Li-Ion	5	FALSE	141	16	160	2022	TRUE
Mi 6	Xiaomi	Android 7.1.	5.2	3350	Li-Po	6	TRUE	168	64	330	2019	TRUE
Y6	Huawei	Android 6.0	5	3000	Li-Ion	2	FALSE	150	16	240	2016	TRUE
Y7	Huawei	Android 7.0	5.5	4000	Li-Ion	2	FALSE	165	16	90	2019	TRUE
nova 2 plus	Huawei	Android 7.0	5.5	3340	Li-Po	4	FALSE	169	64	160	2020	TRUE
nova 2	Huawei	Android 7.0	5	2950	Li-Po	4	FALSE	143	64	140	2018	TRUE
Y3	Huawei	Android 6.0	5	2200	Li-Ion	1	FALSE	175	8	230	2016	FALSE

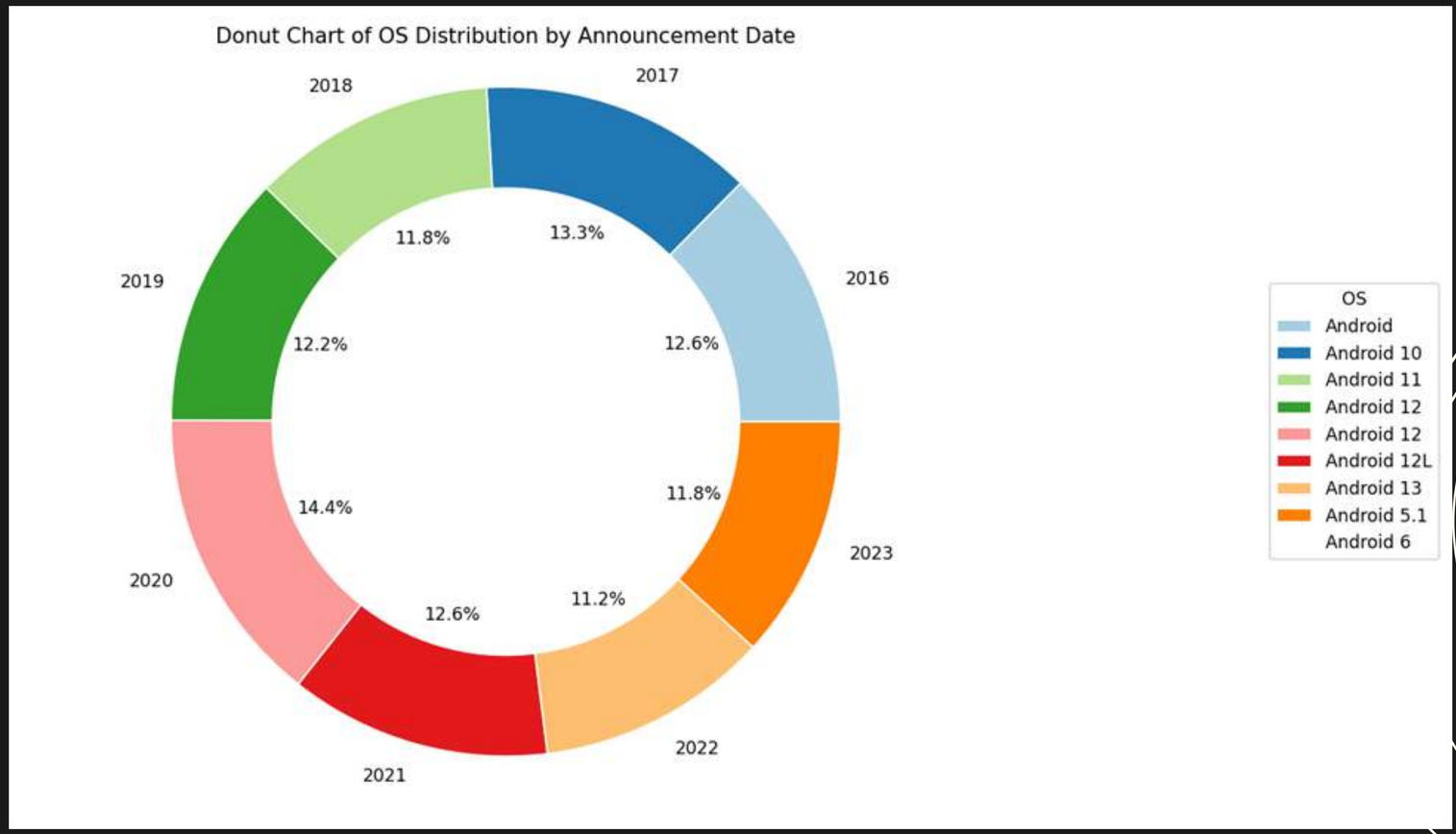
OUT OF THE ORIGINAL DATASET WITH 22 COLUMNS, I ELIMINATED 9 COLUMNS THAT CONTAINED REDUNDANT INFORMATION, CONSISTENTLY DISPLAYING EITHER "TRUE" OR "FALSE." THIS REMOVAL WAS DONE TO ENHANCE DATA CLARITY AND CLEANLINESS BY AVOIDING REPETITIVE DATA ENTRIES.

BAR CHAR NON-NULL AND NULL



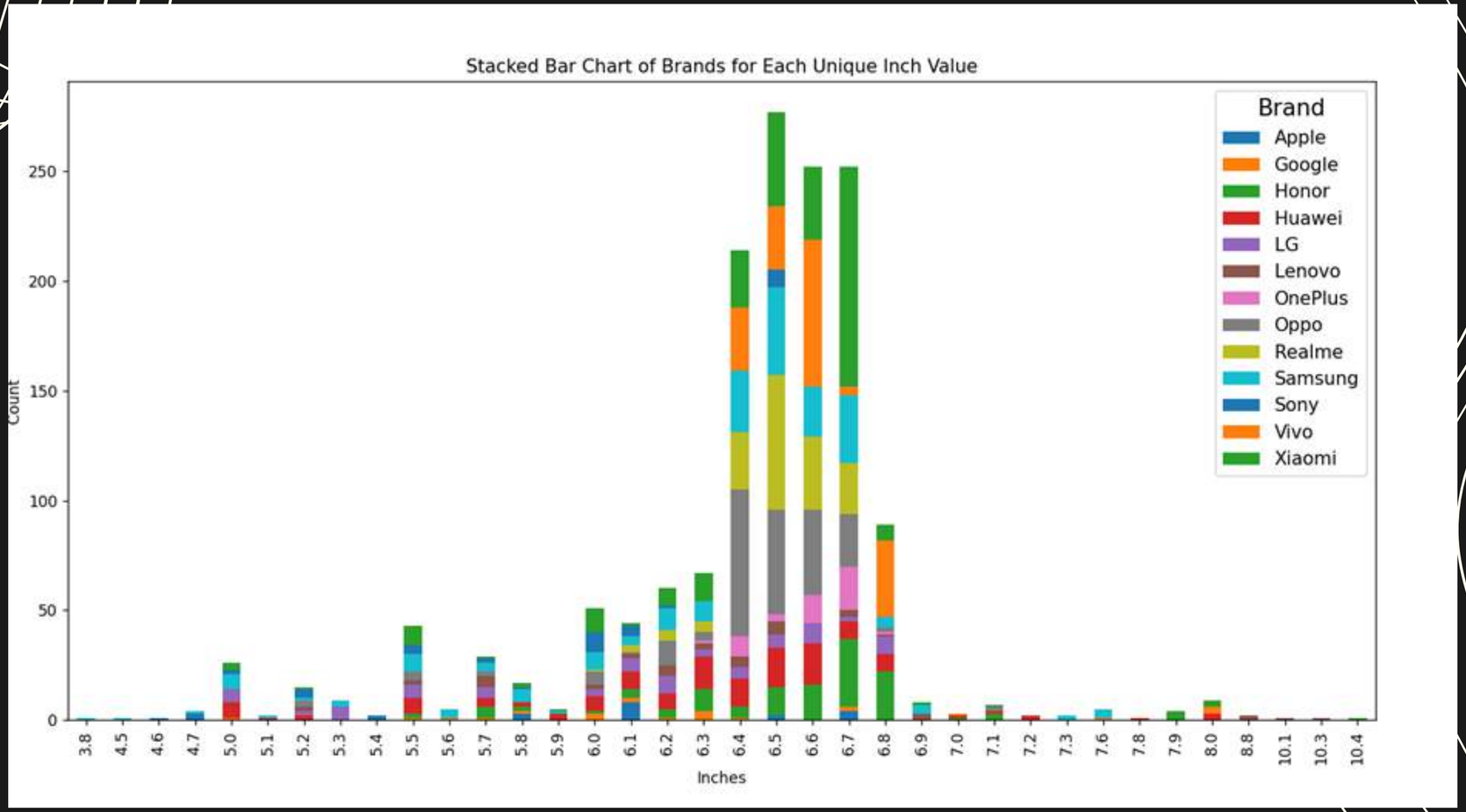
IN GENERAL, THE BAR CHART CHECKS ALL VALUES OF NULL AND NON-NULL IN 13 CSV COLUMNS.
IN MY 13 COLUMNS THE VALUES ARE VERY CLEAN SO THE DATA IS 100% NON-NULL

DONUT CHART



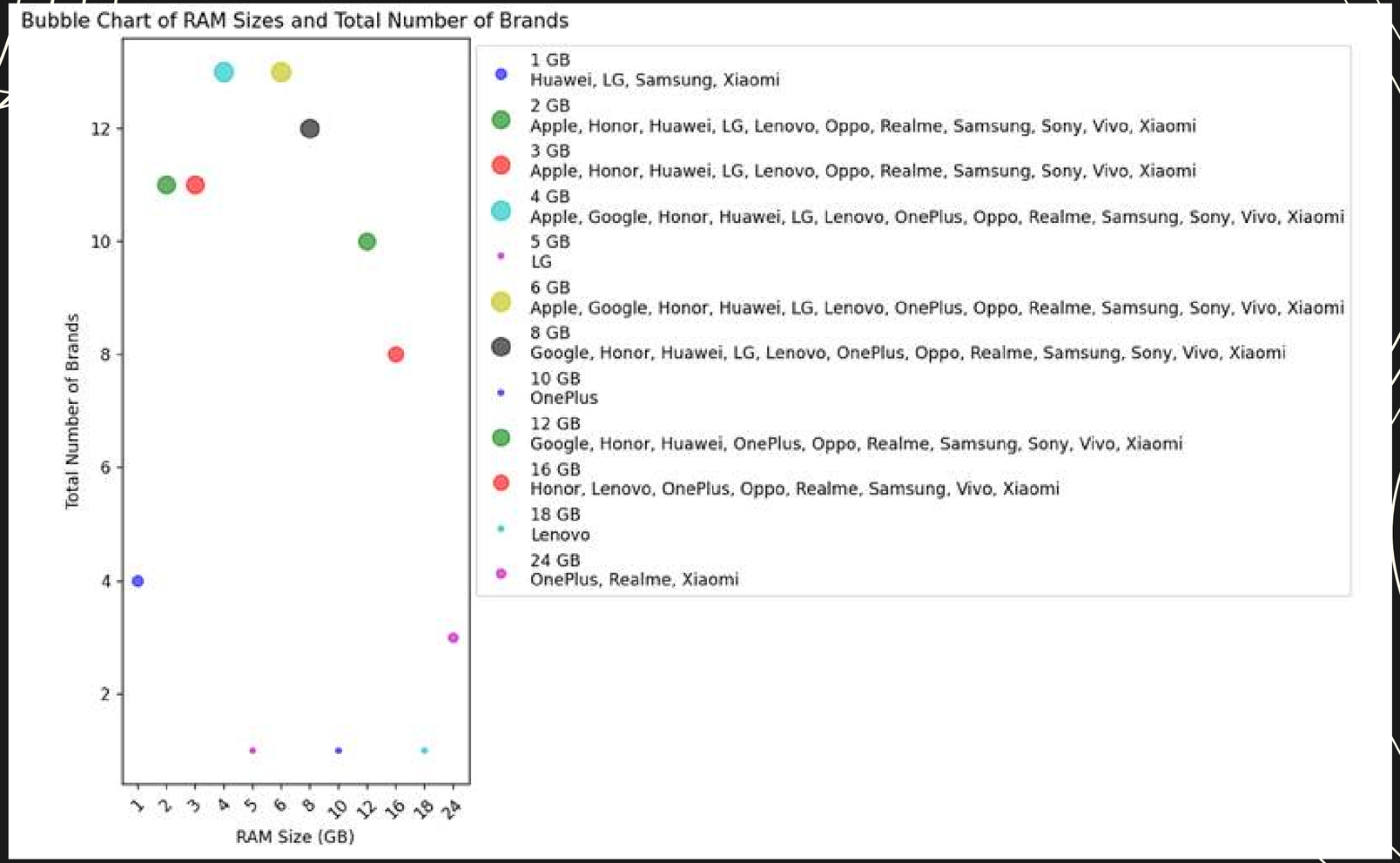
THE DONUT CHART SHOWS THE OS PRODUCED BY YEAR AND THE YEAR WITH THE MOST PRODUCTION IS 2020, WHICH IS ANDROID13.

STACKED BAR CHART



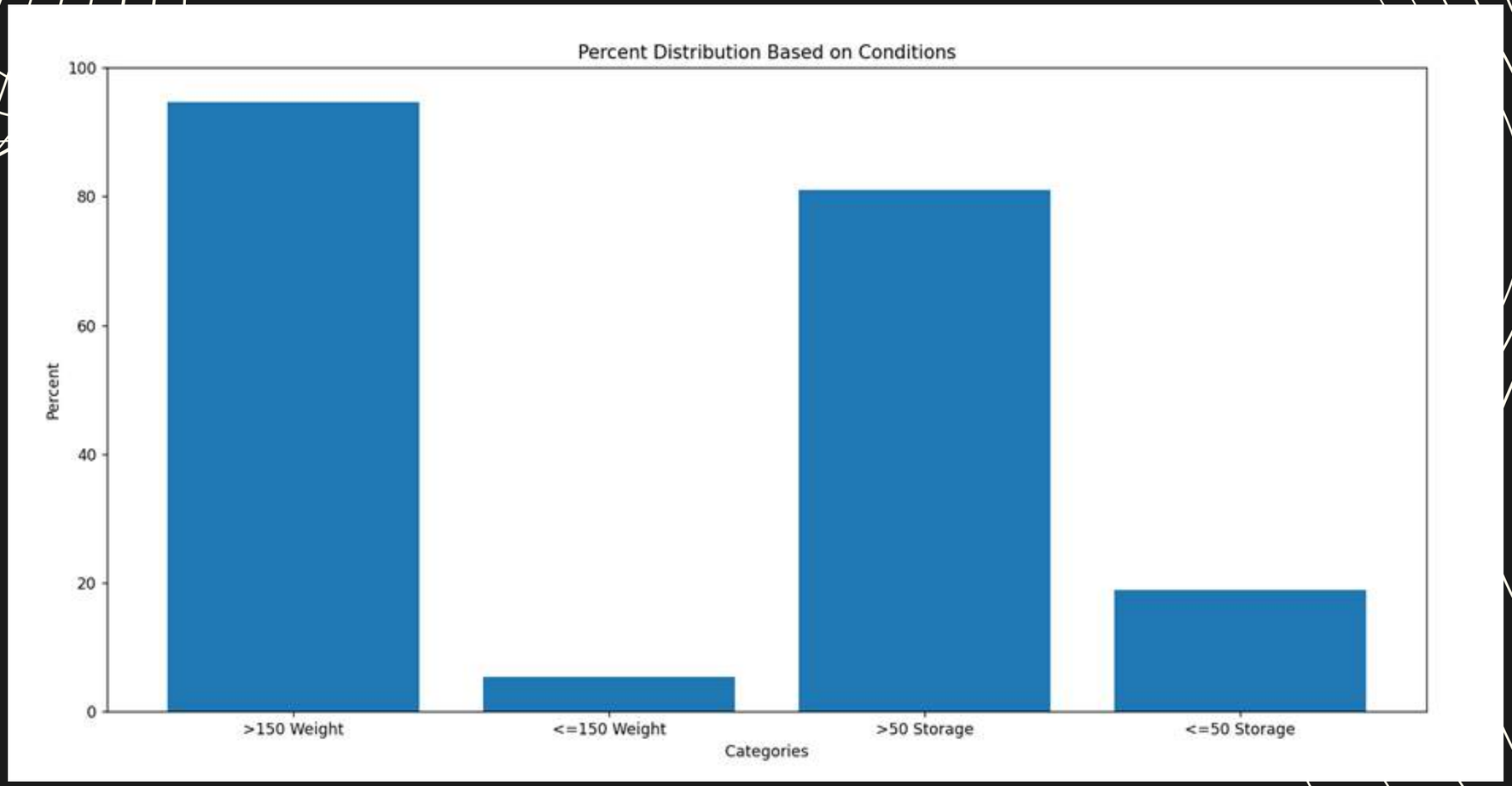
STACKED BAR CHART OF ALL BRANDS THROUGH EACH VALUE. IN GENERAL, PHONES WITH 6.5 INCHES ARE COMMON ON ALL PHONES AND THEN 6.6 AND 6.7, BUT THE SMALLEST SCREENS LIKE 3.8 AND THE HIGHEST 10.4 ARE VERY RARELY PRODUCED BECAUSE THEY ARE DIFFICULT TO REACH CUSTOMERS.

BUBBLE CHART



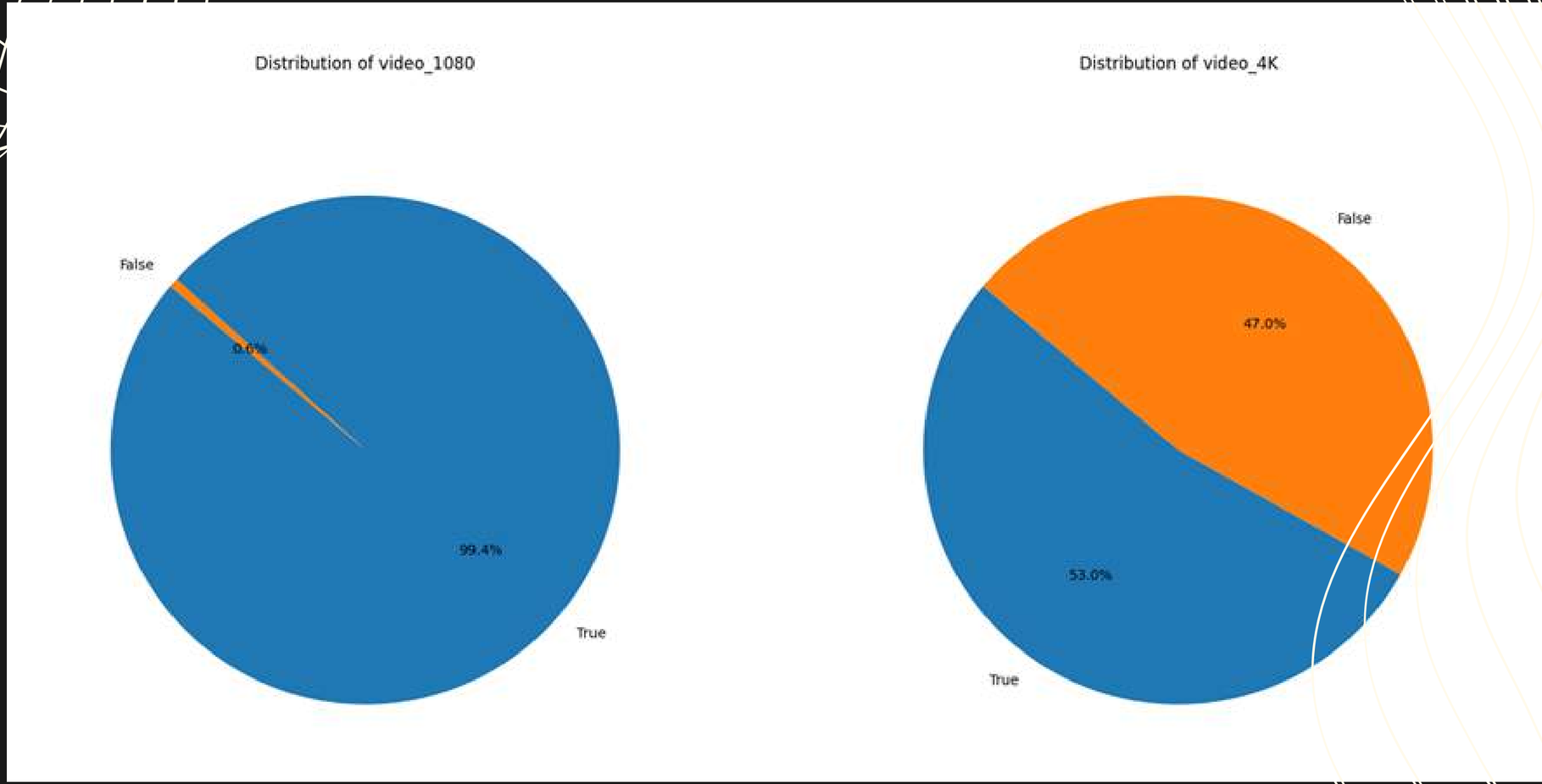
BUBBLE CHART OF RAM AND TOTAL NUMBER OF BRANDS. VERY FEW PHONES USE 1GB AND 18GB BECAUSE IT IS AT THE AVERAGE LEVEL. IF YOU USE 1GB, IT IS TOO LITTLE. IF YOU USE 18GB, IT IS ALMOST EQUAL TO 24GB, SO PEOPLE WILL CHOOSE TO BUY MEDIUM-LEVEL RAM LIKE IS 6GB OR 8GB AND IF CUSTOMERS WANT LARGER GB, THEY WILL CHOOSE 24GB.

BAR CHART



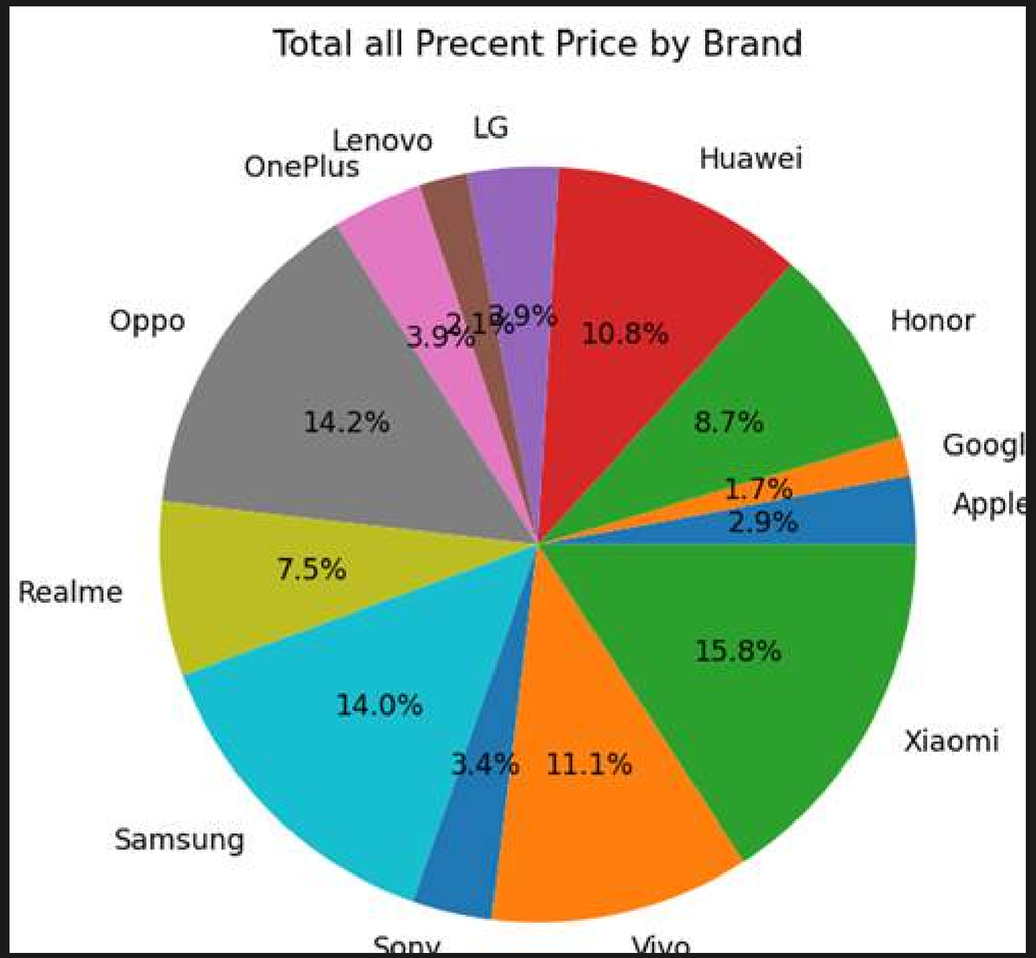
THE BAR CHART LOOKS AT ALL PRODUCTS THAT WEIGH MORE THAN 150WEIGHT, 150WEIGHT IS GIVEN A LOT OF WEIGHT BECAUSE IF THE PHONE IS TOO LIGHT THEN THE PROCESSOR IN THE PHONE IS VERY WEAK. BESIDES, STORAGE IS THE SAME, >50 ACCOUNTS FOR A LOT BUT <=50 IS PRODUCED VERY LITTLE. BECAUSE EVERYONE WANTS A PHONE WITH HIGH PERFORMANCE, EVEN IF THE WEIGHT AND STORAGE ARE LIGHT, VERY FEW PEOPLE CAN ACCESS IT.

PIE CHART



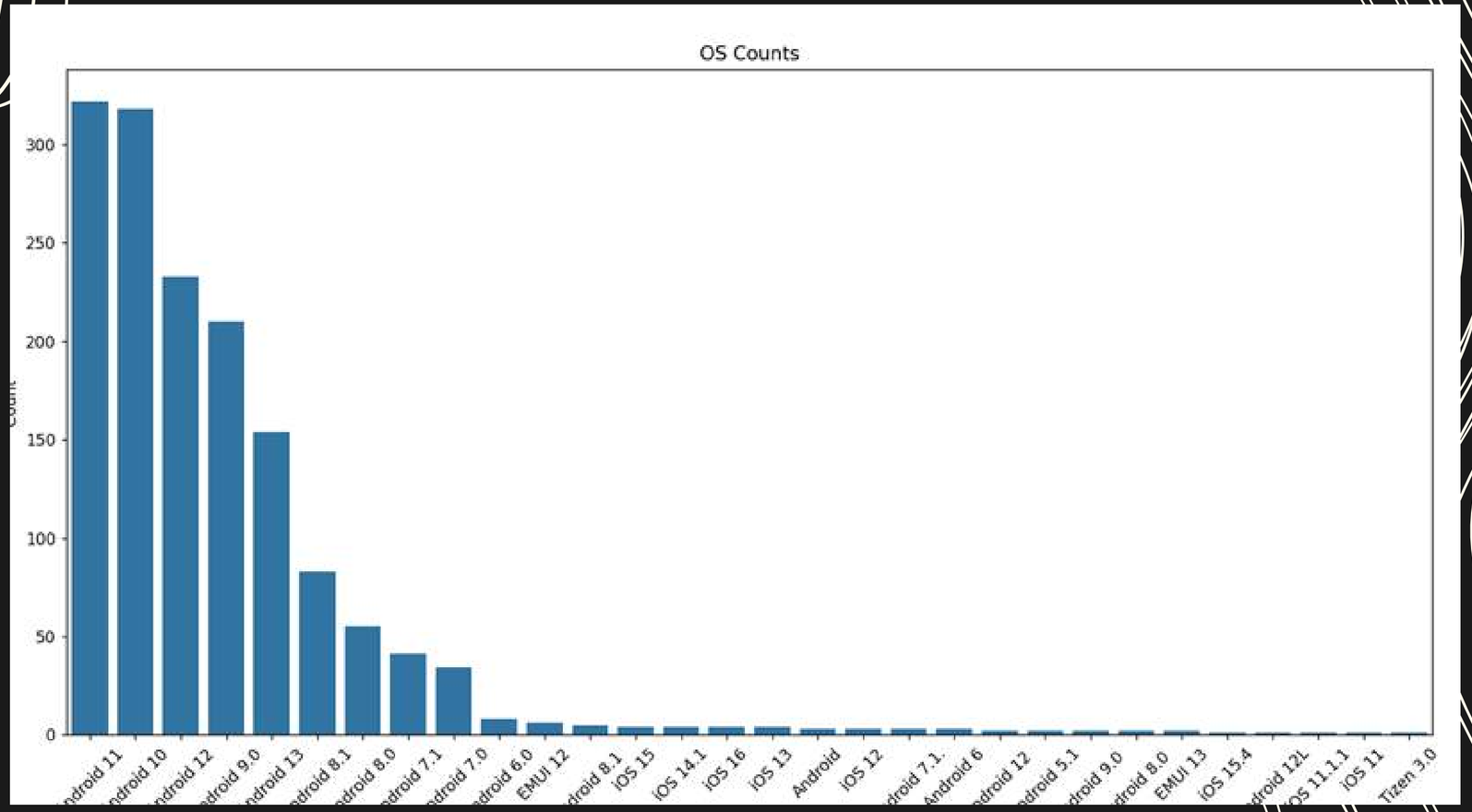
THE PIE CHART COMPARES PHONES WITH 1080 VIDEO AND 4K VIDEO. IN GENERAL, 1080 VIDEOS ARE INSTALLED ON A LOT OF PHONES BECAUSE MOST PHONES TODAY SUPPORT 1080 WHICH IS CONSIDERED FULLHD. AS FOR 4K VIDEO, IT IS STILL INSTALLED ON ALL PHONES BUT HAS A QUITE HIGH PRICE AND VERY FEW PEOPLE CARE ABOUT IT.

PIE CHART TOTAL



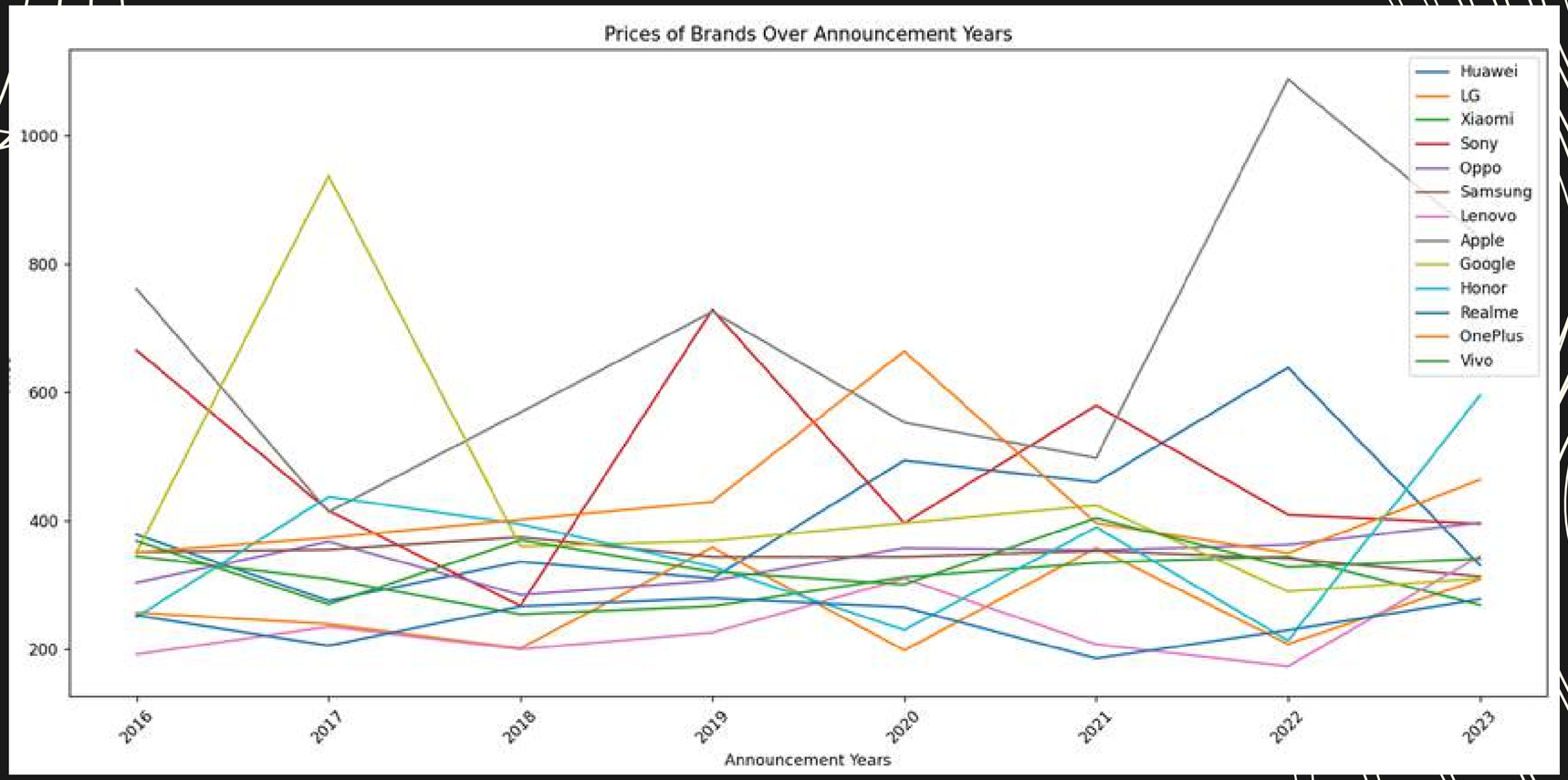
IN GENERAL, THE PIE CHART SHOWS THE PERCENTAGE OF TOTAL MONEY OF THE COMPANIES WITH THE HIGHEST PERCENTAGE BEING XIAOMI AND THE LOWEST PERCENTAGE BEING GOOGLE, LENOVO, AND APPLE. XIAOMI IS A BRAND WITH AN AVERAGE PRICE SO IT IS PRODUCED A LOT SO IT ACCOUNTS FOR THE HIGHEST PERCENTAGE. AS FOR GOOGLE, LENOVO, AND APPLE PHONES, EVERY YEAR, EVEN EVERY FEW YEARS, THEY PRODUCE A NEW PRODUCT BECAUSE WHAT THEY NEED IS QUALITY.

BAR CHART OS



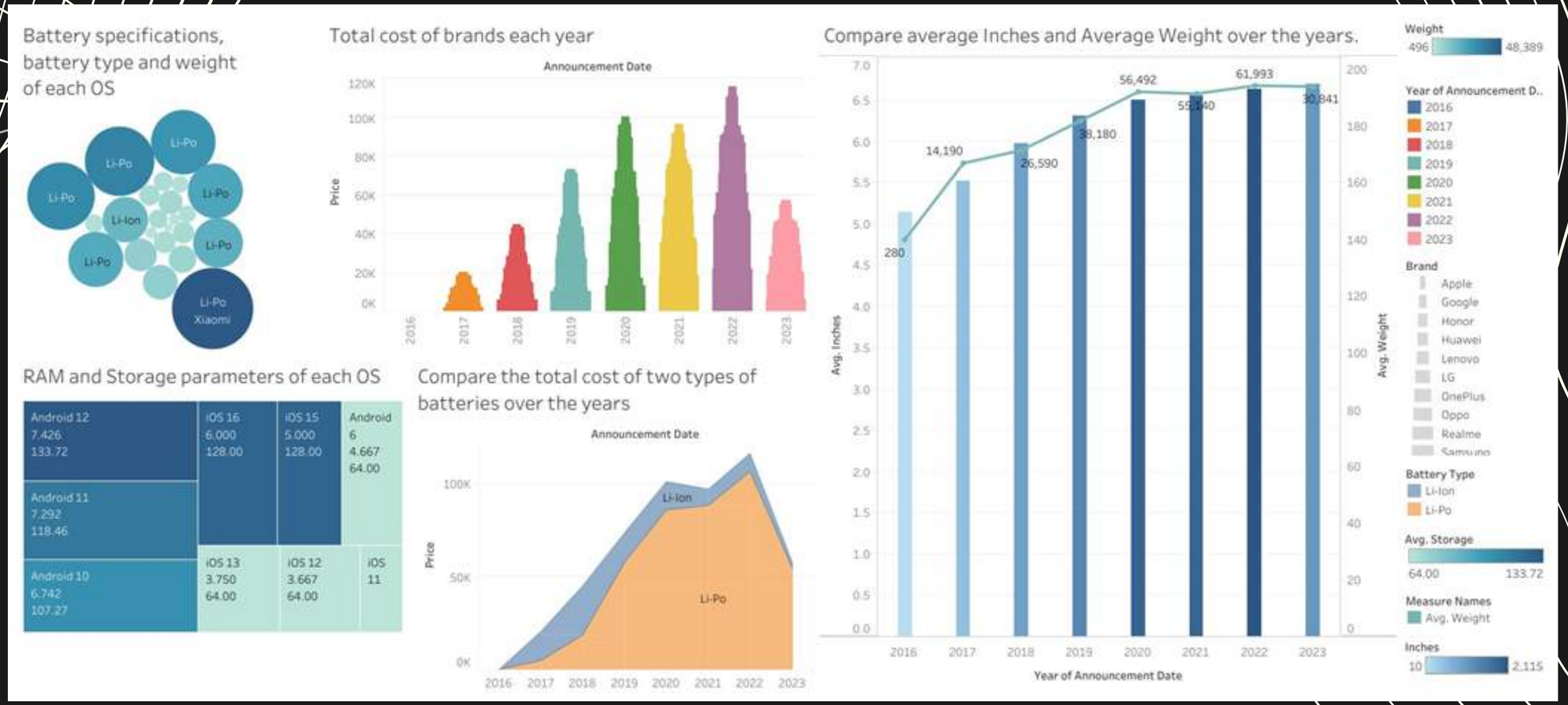
IN GENERAL, THE BAR CHART OS COUNT CHART OF ANDROID 11 IS VERY HIGH BECAUSE THE ANDROID OS IS USED BY MANY COMPANIES IN THE SAME OPERATING SYSTEM SO IT ACCOUNTS FOR A VERY HIGH NUMBER AND BESIDES, ANDROID PHONES HAVE VERY REASONABLE PRICES SO MANY PEOPLE BUY THEM BECAUSE SO THEY ALSO HAVE TO FACE A LOT OF ERRORS SO THEY HAVE TO CONSTANTLY UPDATE THE OS. AS FOR IOS AND TIZEN, EACH COMPANY ONLY SUPPORTS 1 PRODUCT LINE, SO THEY UPDATE VERY FEW TIMES A YEAR, ONLY UPDATING TO A NEW OS 1 OR 2 TIMES.

LINE CHART



THE LINE CHART AT THE END OF THE LINE CHART GIVES US A MORE GENERAL OVERVIEW OF THE PRICES OF COMPANIES UPDATED OVER THE YEARS.

4. DASHBOARD



- BATTERY SPECIFICATIONS, BATTERY TYPE AND WEIGHT OF EACH OS
- RAM AND STORAGE PARAMETERS OF EACH OS
- COMPARE AVERAGE INCHES AND AVERAGE WEIGHT OVER THE YEARS
- TOTAL COST OF BRANDS EACH YEAR
- COMPARE THE TOTAL COST OF TWO TYPES OF BATTERIES OVER THE YEARS

5. POINT OF VIEW

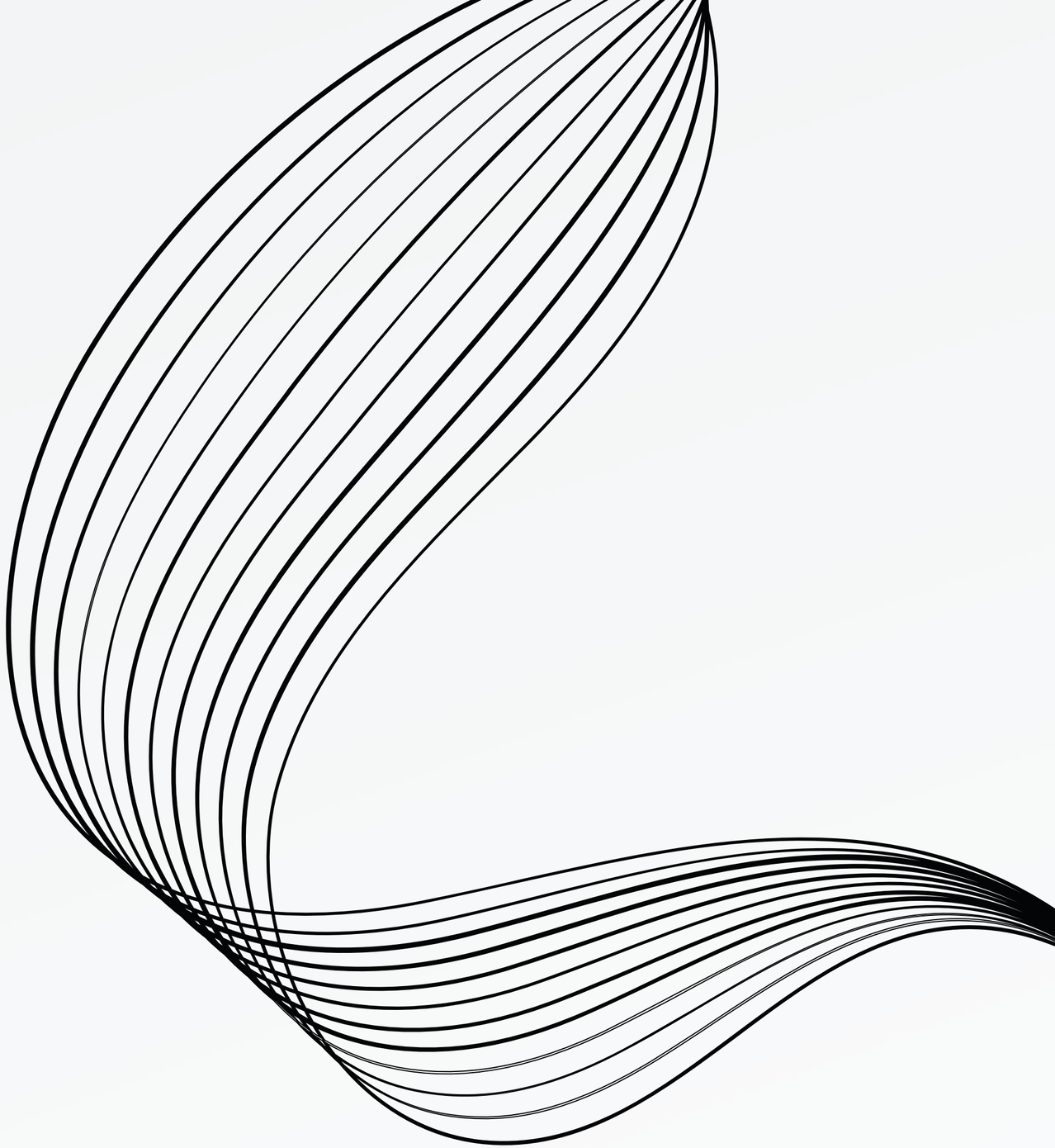
5.1. DISCUSS HOW BI TOOLS CAN CONTRIBUTE TO EFFECTIVE DECISION-MAKING

- DATA AGGREGATION AND CONSOLIDATION:
- DATA VISUALIZATION
- REAL-TIME REPORTING

5.2. LEGAL ISSUES INVOLVED IN EXPLOITING USER DATA FOR BUSINESS INTELLIGENCE

- DATA PRIVACY REGULATIONS
- DATA CONSENT AND TRANSPARENCY
- DATA MINIMIZATION
- DATA SECURITY

THANK'S FOR WATCHING



UNIVERSITY of GREENWICH
Alliance with FPT Education

BTEC

Higher Nationals in Computing

Business Intelligence

ASSIGNMENT 2

Learner's name: Dang Viet Minh Man
Nguyen Xuan Truong
Pham Mai Nhat Truong
ID:
Class: GCS1005A
Subject code: 1641
Assessor name: **Le Tran Ngoc Tran**

Assignment due: Assignment submitted:

ASSIGNMENT 2 FRONT SHEET

Qualification	**BTEC Level 5 HND Diploma in Computing**		
Unit number and title	Unit 14: Business Intelligence		
Submission date		**Date Received 1st submission**	
Re-submission Date		**Date Received 2nd submission**	
Student Name		**Student ID**	
Class		**Assessor name**	
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:**
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 for 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 it 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 for 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		**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.
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		**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
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.	

Table of Contents

TABLE OF FIGURE

I. General about BI

1. What is Business Intelligence (BI)

Figure 1: Business Intelligence

Business Intelligence (BI) is a technology-driven process that involves the analysis of data to provide actionable insights for CEOs, managers, and employees, enabling them to make informed business decisions.

Organizations gather data for analysis from both their internal IT systems and external sources as a fundamental part of the BI process. This involves performing data-driven queries and constructing data visualizations, BI dashboards, and reports to present analytical findings to business users. These insights aid in guiding operational, planning, and strategic decisions.

The primary objective of BI efforts is to facilitate better business decision-making, enabling companies to increase revenue, improve operational efficiency, and gain a competitive edge over their rivals. BI achieves this goal by leveraging analytics, data management, and reporting technologies, as well as various effective approaches for data management and analysis.

2. How does the Business Intelligence work?

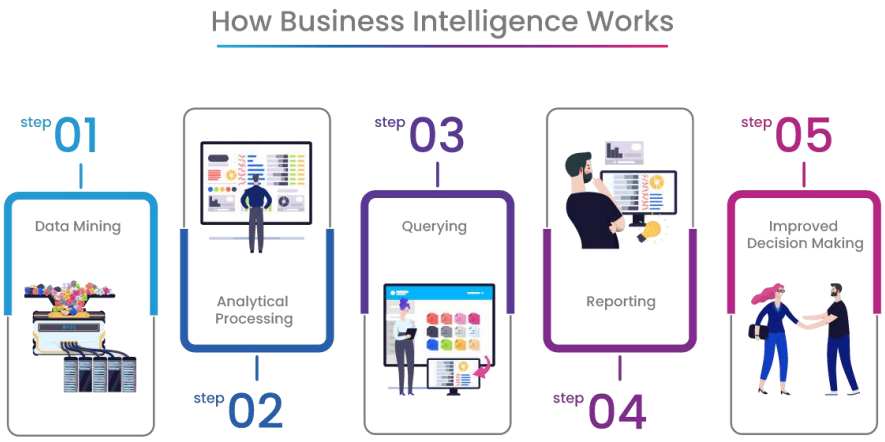


Figure 2: Business Intelligence Works

A business intelligence architecture encompasses more than just BI software. Typically, data for business intelligence is stored in a comprehensive organizational data warehouse or smaller data marts, which hold subsets of business data for different departments and business units. These data repositories often have connections to an enterprise data warehouse. Additionally, Hadoop clusters and other big

data systems, such as data lakes, are increasingly being used as storage locations or initial destinations for BI and analytics data. This is particularly true for data types like log files, sensor data, text, and other forms of unstructured or semi-structured data.

BI data includes both historical information and real-time data generated by source systems. This enables BI tools to support both strategic and tactical decision-making processes. However, before this data can be effectively used in BI applications, raw data from various source systems often needs to be merged, aggregated, and cleansed. Data integration and data quality management solutions are employed for this purpose to ensure that BI teams and business users work with accurate and consistent data.

The BI process consists of the following phases:

- Data organization and modeling: This step involves preparing data sets for analysis, ensuring they are structured and organized for effective use.
- Data analysis: Analyzing the prepared data to derive meaningful insights and patterns.
- Distribution of results to corporate users: This includes the dissemination of findings, often in the form of key performance indicators (KPIs), to relevant stakeholders within the organization.
- Applying data for advising and guiding business decisions: Using the insights gained from data analysis to provide guidance and recommendations for making informed business decisions.

3. Why business intelligence is important?

Business Intelligence (BI) holds significant importance for various reasons, offering numerous benefits to organizations. Firstly, it empowers informed decision-making by granting access to relevant data and insights. This, in turn, enables decision-makers to select the most effective strategies and actions based on data-driven analysis.

Secondly, BI plays a crucial role in enhancing business performance. It facilitates the monitoring of key performance indicators (KPIs) and the evaluation of overall performance, pinpointing areas where improvements can be implemented. This leads to increased operational efficiency and a heightened competitive edge.

Thirdly, BI confers a competitive advantage upon organizations by facilitating a deeper understanding of market trends, customer preferences, and competitors' actions. Armed with this knowledge, companies can swiftly adapt to industry and market changes, positioning themselves for success.

Fourthly, BI provides valuable customer insights that assist organizations in gaining a better understanding of their customer base. It aids in identifying customer behavior, preferences, and purchasing patterns, which can be leveraged to tailor marketing efforts and enhance customer service.

Lastly, BI contributes to cost reduction by pinpointing inefficiencies and areas where resources can be optimized. This may involve refining supply chain management, minimizing waste, or streamlining processes for greater cost-effectiveness.

4. Real examples of how to apply BI on business.

Example 1:

Airbnb: Enhancing Customer Experience with BI

Airbnb, a global online marketplace for lodging and travel experiences, showcases how Business Intelligence (BI) can be instrumental in enhancing the customer experience. Airbnb harnessed the power of data analytics to improve their service quality and customer satisfaction.

- **Challenge:** With a rapidly growing user base and a wide range of accommodations, Airbnb aimed to deliver a personalized and exceptional experience to its diverse customer segments.

- **Solution:** Airbnb established a dedicated data analytics team, comprising data scientists and experts in BI. They integrated data from various sources, including user reviews, booking history, and property details.
- **Results:** By leveraging BI tools and data-driven insights, Airbnb was able to provide personalized accommodation recommendations to its users. They optimized their search and recommendation algorithms, leading to increased user engagement and more bookings. Additionally, they improved customer support by proactively addressing potential issues based on data analysis, resulting in higher customer satisfaction and loyalty.

Example 2:

Walmart: BI for Retail Optimization

Walmart, one of the world's largest retail giants, exemplifies the transformative power of Business Intelligence (BI) in optimizing retail operations and decision-making.

- **Challenge**: Operating thousands of stores worldwide, Walmart faced the challenge of efficiently managing inventory, improving customer experiences, and making data-driven decisions across their vast retail network.
- **Solution:** Walmart invested in a sophisticated BI system, integrating data from point-of-sale systems, supply chain logistics, customer transactions, and online sales. They developed a centralized data warehouse that could handle the enormous volume of data generated daily.
- **Results:** By implementing BI tools and dashboards, Walmart gained real-time visibility into inventory levels, allowing them to optimize stock management and reduce stockouts. They also harnessed data for customer segmentation, personalization, and targeted marketing efforts. Furthermore, they enhanced the efficiency of their supply chain by analyzing historical data and predicting demand.

5. BI Tools/ Technique.

5.1. Tools

Tableau

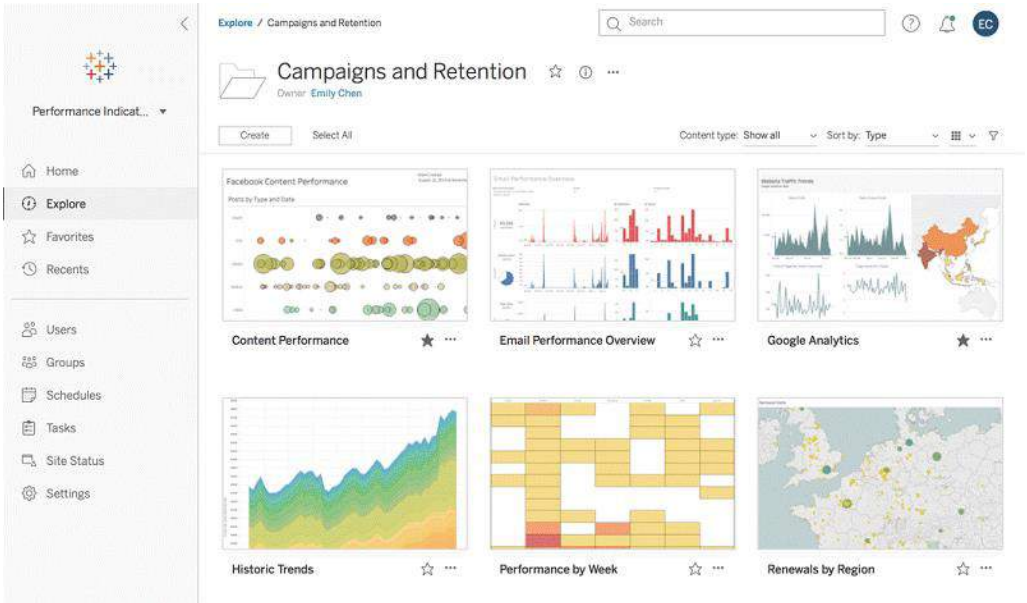


Figure 3: Tableau

Tableau, a robust data visualization and Business Intelligence (BI) tool, empowers users to convert unstructured data into engaging, interactive insights. It is a widely adopted solution among businesses, analysts, and data experts for the purpose of data analysis, the creation of interactive dashboards, and making well-informed decisions.

Thanks to its intuitive interface and powerful data analysis and visualization features, Tableau proves to be an excellent choice for anyone looking to explore data and effectively convey insights.

Tableau offers a range of platforms that cater to diverse user needs:

- **Tableau Desktop:** This serves as the primary environment for authoring and developing data visualizations, enabling users to create and design data-driven visuals.
- **Tableau Server:** As a web-based platform, Tableau Server is designed for sharing and collaborative work on Tableau content.
- **Tableau Online:** Similar to Tableau Server, this cloud-based platform allows users to securely publish and share Tableau workbooks and dashboards via the internet.
- **Tableau Mobile:** Tableau extends its reach to mobile devices with dedicated apps for iOS and Android, granting users the ability to access and interact with Tableau reports and dashboards on smartphones and tablets.
- **Tableau Reader:** Tableau Reader, a free desktop application, enables users to open and engage with Tableau workbooks and visualizations created by others.
- **Tableau Public:** Tableau Public is a free version of Tableau, but it comes with certain limitations related to data privacy and publishing.
- **Tableau Prep:** As a distinct tool, Tableau Prep assists users in the process of cleaning, shaping, and transforming their data before utilizing it in Tableau Desktop for visualization and analysis.

Power BI

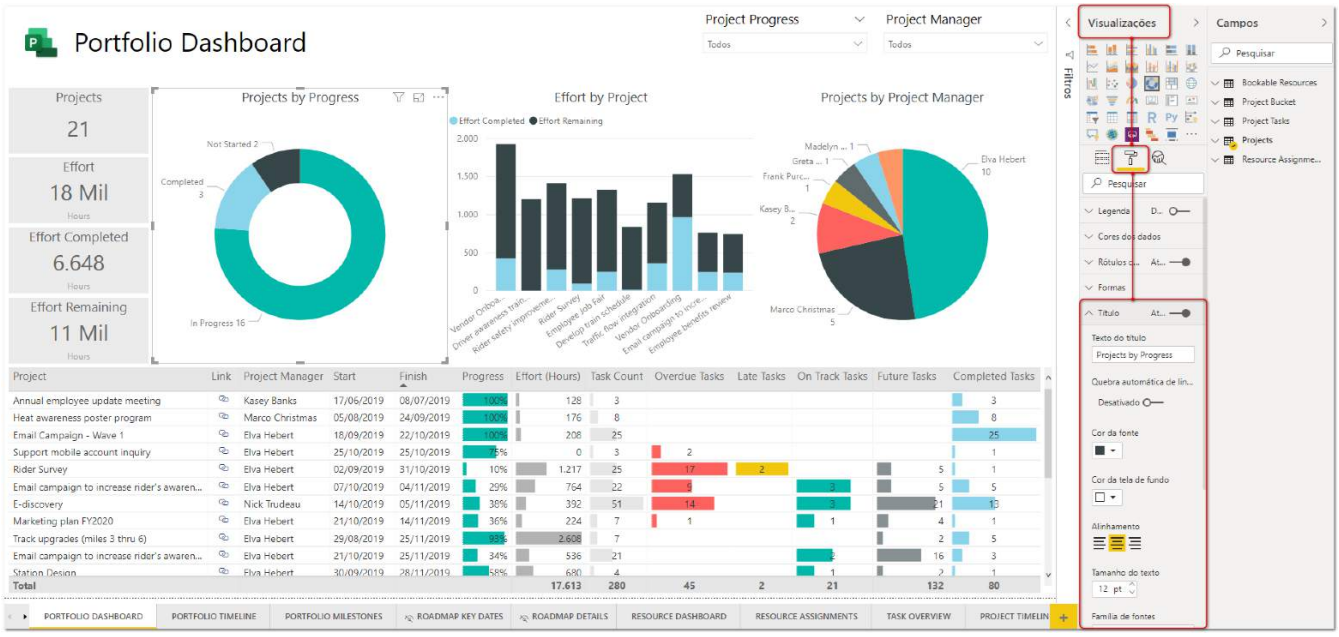


Figure 4: Power BI

Microsoft Power BI is a robust application for business intelligence (BI) and data visualization. It empowers both organizations and individuals to conduct data analysis, craft interactive reports and dashboards, and facilitate the sharing of insights for informed decision-making. Microsoft Power BI

enjoys widespread adoption across various industries and organizations of diverse sizes, contributing to improved decision-making processes and aiding businesses in achieving success through data-driven strategies.

Notably, its user-friendly interface and seamless integration within the Microsoft ecosystem make it a favored solution for businesses aiming to unlock the full potential of their data.

The Power BI suite provides a range of platforms to cater to diverse user needs:

- Power BI Desktop: This serves as the primary tool for authoring and developing reports and visualizations.

- Power BI Service (Power BI in the Cloud): Power BI Service is a cloud-based platform designed for publishing, sharing, and collaborating on Power BI reports and dashboards.

- Power BI Mobile Apps: Power BI offers dedicated mobile apps for both iOS and Android devices, enabling users to access and interact with Power BI reports and dashboards on smartphones and tablets.

- Power BI Report Server: Power BI Report Server is an on-premises solution ideal for organizations seeking to keep their data and reports within their network.

- Power BI Embedded: Power BI Embedded is a platform tailored for developers, allowing them to integrate Power BI capabilities into custom applications and websites.

- Power BI Premium: Power BI Premium is a cloud-based service offering dedicated capacity, well-suited for the needs of organizations.

- Power BI for SharePoint: Power BI seamlessly integrates with Microsoft SharePoint, enabling users to embed Power BI reports and dashboards directly into SharePoint sites and pages, facilitating collaboration and data sharing.

5.2. Techniques

Data Collection Techniques

The term "collection technique" is a broad concept encompassing various methods and approaches for gathering data or information. The choice of a specific data collection strategy depends on factors such as the type of data, research objectives, and the context in which data is being gathered. Two fundamental strategies for ensuring data quality include data cleansing and data labeling.

- **Data Cleansing**, also referred to as data cleaning or data scrubbing, involves the identification and rectification of errors or inconsistencies within a dataset to enhance data quality. This process encompasses activities like data validation, elimination of duplicates, rectification of spelling and formatting errors, and inclusion of missing values. Data cleaning is critical as erroneous or inconsistent data can lead to inaccurate analysis, modeling, and decision-making. Clean data is a prerequisite for obtaining meaningful insights and constructing effective predictive models.
- **Data Labeling,** also known as data annotation, involves the assignment of meaningful labels or tags to data, particularly in the context of supervised machine learning. This step is essential when working with datasets for tasks such as classification, object recognition, sentiment analysis, or any other application where the model relies on labeled examples for learning.

Both data cleaning and data labeling are vital processes in ensuring that data is of high quality, accuracy, and suitability for analysis or modeling. These procedures are integral to data preparation and significantly contribute to the success of data-driven projects.

Data Analysis Techniques:

Analysis techniques encompass a variety of methods and procedures used to examine data, uncover patterns, derive insights, and draw conclusions from information. These methodologies are essential for data analysis, business intelligence, scientific research, and decision-making processes. Within the realm of Business Intelligence (BI) and data analysis, tools like reports, queries, and dashboards play pivotal roles in extracting valuable insights from data.

- **Reports in BI** offer a structured and organized presentation of data, often in printed or digital formats. Reports typically incorporate tables, charts, graphs, and textual data descriptions. BI reports can be generated at regular intervals, such as daily, weekly, or monthly, or on an as-needed basis to address specific informational requirements. They serve the purpose of evaluating and assessing corporate progress, identifying trends, and facilitating data-driven decision-making.
- **Queries** are integral to business intelligence as they enable the extraction of specific data subsets from databases or datasets. They are dynamic in nature, allowing users to filter, sort, and manipulate data according to their preferences. Queries can return raw or refined data and offer customization options. They are often used for real-time data exploration. Businesses make use of structured query language (SQL) or query tools to uncover data that aligns with specific criteria or standards. Queries empower organizations to find answers to specific questions, identify patterns, and explore data relationships.
- **Dashboards** in business intelligence (BI) provide an immediate snapshot of key performance indicators (KPIs), data trends, and real-time insights. These dashboards are composed of interactive and dynamic visuals, charts, and widgets. Popular BI tools like Tableau, Power BI, and QlikView are commonly employed to create these interactive and dynamic dashboards, offering a comprehensive view of critical business metrics and facilitating data-driven decision-making.

Analytic technique.

Analytic techniques encompass a range of methodologies and approaches for scrutinizing data to extract meaningful insights and patterns. These methods are deployed across diverse domains, including data analysis, business intelligence, statistics, and data science. Analytic techniques, such as regression and machine learning, serve as fundamental tools for data analysis, predictive modeling, and informed decision-making in various fields.

- **Regression** stands as a statistical data analysis technique primarily used to unveil relationships between variables. It aims to predict the value of a dependent variable based on the values of independent variables. Regression analysis is employed to analyze data related to sales, pricing, product sales, and various other business parameters.
- **Machine Learning,** on the other hand, is an advanced data analysis technique that harnesses the power of computers to learn from data and anticipate outcomes. Machine Learning can categorize data, forecast results, and unearth intricate patterns within datasets. It is frequently used to examine data pertaining to customer behavior, product performance, and other facets of business operations.

Both regression analysis and machine learning serve as invaluable tools for making data-driven decisions. The choice between the two hinges on specific circumstances, the nature of the data, and the level of complexity required by the modeling. While regression is commonly employed for simpler correlations and linear modeling, machine learning accommodates more intricate patterns and can be applied to a broader spectrum of activities.

II. BI applications.

1. Datasets

phone_nam	brand	os	inches	resolution	battery	battery_ty	ram(GB)	announcem	weight(g)	storage(GI	video_720	video_108	video_4K	video_8K	video_30fp	video_60fp	video_120	video_240	video_480	video_960	price(USD)
YGII Comp	Huawei	Android 5.	5	720x1280	2200	Li-Po	2	9/1/2016	140	16	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	120
K20 plus	LG	Android 7.	5.3	720x1280	2700	Li-Ion	2	########	140	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	100
P8 Lite (20	Huawei	Android 7.	5.2	1080x192(	3000	Li-Ion	4	1/1/2017	147	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	420
Redmi Not	Xiaomi	Android 6.	5.5	1080x192(	4100	Li-Po	4	1/1/2017	165	32	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	150
P10	Huawei	Android 7.	5.1	1080x192(	3200	Li-Ion	4	2/1/2017	145	32	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	420
Xperia XA1	Sony	Android 7.	5	720x1280	2300	Li-Ion	3	2/1/2017	143	32	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	140
P10 Lite	Huawei	Android 7.	5.2	1080x192(	3000	Li-Po	4	2/1/2017	146	32	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	420
P10 Plus	Huawei	Android 7.	5.5	1440x256(	3750	Li-Ion	6	2/1/2017	165	64	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	170
Xperia XA1	Sony	Android 7.	6	1080x192(	2700	Li-Ion	4	2/1/2017	188	32	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	250
X power2	LG	Android 7.	5.5	720x1280	4500	Li-Ion	2	2/1/2017	164	16	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	170
Redmi Not	Xiaomi	Android 6.	5.5	1080x192(	4100	Li-Po	4	2/1/2017	165	16	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	130
Xperia XZs	Sony	Android 7.	5.2	1080x192(	2900	Li-Ion	4	########	161	32	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	TRUE	220
Xperia XZ I	Sony	Android 7.	5.46	3840x216(	3230	Li-Ion	4	########	195	64	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	TRUE	320
Xperia L1	Sony	Android 7.	5.5	720x1280	2620	Li-Ion	2	3/1/2017	180	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	110
A39	Oppo	Android 5.	5.2	720x1280	2900	Li-Ion	3	3/1/2017	147	32	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	250
F3 Plus	Oppo	Android 6	6	1080x192(	4000	Li-Ion	6	3/1/2017	185	64	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	250
Galaxy Xcc	Samsung	Android 7.	5	720x1280	2800	Li-Ion	2	3/1/2017	172	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	350
Galaxy J7 I	Samsung	Android 7.	5.5	720x1280	3300	Li-Ion	2	3/1/2017	167	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	170
Galaxy S8+	Samsung	Android 7.	6.2	1440x296(	3500	Li-Ion	6	########	173	64	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	350
K7 (2017)	LG	Android 6.	5	480x854	2500	Li-Ion	2	4/1/2017	143	8	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	170
Y5 (2017)	Huawei	Android 6.	5	720x1280	3000	Li-Ion	2	4/1/2017	150	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	280
Harmony	LG	Android 7.	5.3	720x1280	2800	Li-Ion	5	4/1/2017	141	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	160
Mi 6	Xiaomi	Android 7.	5.15	1080x192(	3350	Li-Po	6	4/1/2017	168	64	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	330
Y6 (2017)	Huawei	Android 6.	5	720x1280	3000	Li-Ion	2	5/1/2017	150	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	240
Y7	Huawei	Android 7.	5.5	720x1280	4000	Li-Ion	2	5/1/2017	165	16	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	90
nova 2 plu	Huawei	Android 7.	5.5	1080x192(	3340	Li-Po	4	5/1/2017	169	64	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	160
nova 2	Huawei	Android 7.	5	1080x192(	3950	Li-Po	4	5/1/2017	143	64	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	140
Y3 (2017)	Huawei	Android 6.	5	480x854	2200	Li-Ion	1	5/1/2017	175	8	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	230
Z4	Samsung	Tizen 3.0	4.5	480x800	2050	Li-Ion	1	5/1/2017	143	8	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	240

Figure 5: Dataset

This is original data that has not gone through the pre-processing process. It has 22 columns: phone_name, brand, os, inches, resolution, battery, battery_type, ram (GB), announcement_date, weight(g), storage(GB), video_720p, video_1080p, video_4K, video_8K, video_30fps, video_60fps, video_120fps, video_240fps, video_480fps, video_960fps, price(USD).

2. Pre-processed Data.

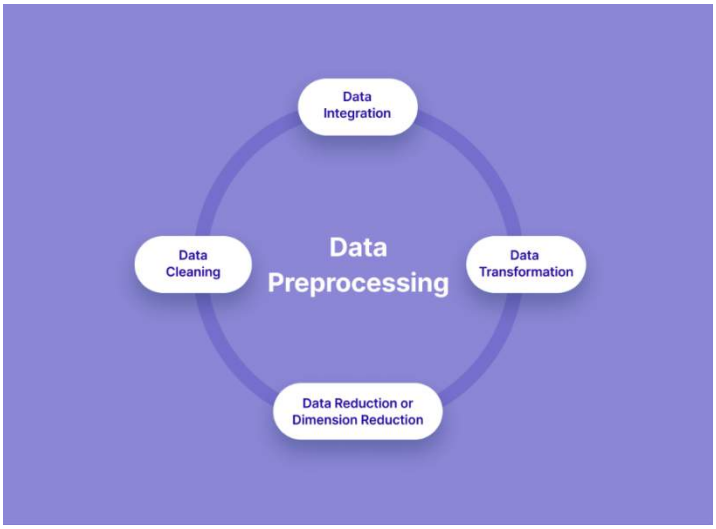


Figure 6: Pre-Processing Data

Pre-processed data refers to data that has undergone cleaning, transformation, and preparation to ensure its suitability for analysis or modeling. Data pre-processing is a pivotal stage in various data-driven processes, including data analysis and machine learning. It serves to enhance data quality and ensures that the data is in a format that can be effectively utilized for subsequent research.

- **Data Cleaning** involves addressing missing values by either imputing them or eliminating rows or columns containing such gaps. Additionally, outliers that could skew analysis or modeling results need to be identified and corrected. Removing duplicate records is another vital aspect to

ensure data consistency.

- **Data Integration** encompasses the amalgamation of data from multiple sources to create a unified dataset for analysis. This process allows for a comprehensive view of information from various origins.
- **Data Transformation** is the procedure of scaling numerical data to attain a mean of 0 and a standard deviation of 1, making different characteristics comparable on the same scale. Scaling data to a specified range (e.g., 0 to 1) is often undertaken to render it more suitable for certain algorithms. Furthermore, transforming categorical variables into numerical representations is performed through methods like one-hot encoding or label encoding. It also involves the addition of new features or the alteration of existing ones to capture essential data.
- **Data Reduction** is the technique used to decrease the number of features while preserving crucial information. This can be achieved through methods like Principal Component Analysis (PCA) or by reducing the dataset's size through random sampling, particularly in cases involving large datasets.

phone_name	brand	os	inches	battery	battery_ty	ram	video_4K	weight	storage	price	announcer	video_108
Y6II Compact	Huawei	Android 5.1	5	2200	Li-Po	2	FALSE	140	16	120	2022	FALSE
K20 plus	LG	Android 7.0	5.3	2700	Li-Ion	2	FALSE	140	16	100	2016	TRUE
P8 Lite	Huawei	Android 7.0	5.2	3000	Li-Ion	4	FALSE	147	16	420	2023	TRUE
Redmi Note 4	Xiaomi	Android 6.0	5.5	4100	Li-Po	4	FALSE	165	32	150	2020	TRUE
P10	Huawei	Android 7.0	5.1	3200	Li-Ion	4	TRUE	145	32	420	2018	TRUE
Xperia XA1	Sony	Android 7.0	5	2300	Li-Ion	3	FALSE	143	32	140	2018	TRUE
P10 Lite	Huawei	Android 7.0	5.2	3000	Li-Po	4	FALSE	146	32	420	2020	TRUE
P10 Plus	Huawei	Android 7.0	5.5	3750	Li-Ion	6	TRUE	165	64	170	2018	TRUE
Xperia XA1 Ultra	Sony	Android 7.0	6	2700	Li-Ion	4	FALSE	188	32	250	2023	TRUE
X power2	LG	Android 7.0	5.5	4500	Li-Ion	2	FALSE	164	16	170	2017	TRUE
Redmi Note 4X	Xiaomi	Android 6.0	5.5	4100	Li-Po	4	FALSE	165	16	130	2019	TRUE
Xperia XZs	Sony	Android 7.1	5.2	2900	Li-Ion	4	TRUE	161	32	220	2017	TRUE
Xperia XZ Premium	Sony	Android 7.1	5.5	3230	Li-Ion	4	TRUE	195	64	320	2016	TRUE
Xperia L1	Sony	Android 7.0	5.5	2620	Li-Ion	2	FALSE	180	16	110	2017	TRUE
A39	Oppo	Android 5.1	5.2	2900	Li-Ion	3	FALSE	147	32	250	2021	TRUE
F3 Plus	Oppo	Android 6	6	4000	Li-Ion	6	TRUE	185	64	250	2022	TRUE
Galaxy Xcover 4	Samsung	Android 7.0	5	2800	Li-Ion	2	FALSE	172	16	350	2016	TRUE
Galaxy J7 V	Samsung	Android 7.0	5.5	3300	Li-Ion	2	FALSE	167	16	170	2023	TRUE
Galaxy S8+	Samsung	Android 7.0	6.2	3500	Li-Ion	6	TRUE	173	64	350	2023	TRUE
K7	LG	Android 6.0	5	2500	Li-Ion	2	FALSE	143	8	170	2023	FALSE
Y5	Huawei	Android 6.0	5	3000	Li-Ion	2	FALSE	150	16	280	2018	TRUE
Harmony	LG	Android 7.0	5.3	2800	Li-Ion	5	FALSE	141	16	160	2022	TRUE
Mi 6	Xiaomi	Android 7.1.	5.2	3350	Li-Po	6	TRUE	168	64	330	2019	TRUE
Y6	Huawei	Android 6.0	5	3000	Li-Ion	2	FALSE	150	16	240	2016	TRUE
Y7	Huawei	Android 7.0	5.5	4000	Li-Ion	2	FALSE	165	16	90	2019	TRUE
nova 2 plus	Huawei	Android 7.0	5.5	3340	Li-Po	4	FALSE	169	64	160	2020	TRUE
nova 2	Huawei	Android 7.0	5	2950	Li-Po	4	FALSE	143	64	140	2018	TRUE
Y3	Huawei	Android 6.0	5	2200	Li-Ion	1	FALSE	175	8	230	2016	FALSE

Figure 7: Pre-processing Dataset

Out of the original dataset with 22 columns, I eliminated 9 columns that contained redundant information, consistently displaying either "True" or "False." This removal was done to enhance data clarity and cleanliness by avoiding repetitive data entries.

Our research team's dataset is called "sales pipeline" and is available on the Kaggle platform. The data collection contains detailed information about the product, including the product name, hardware software and operating system of the product, our data also includes the time the product was sold. The provided dataset contains a wealth of information that can be systematically studied to better understand product information.

This database uses 13 variables associated with analytical data (product name, brand, operating system,

and product details) to reflect the analytical performance of the system. Variables provide specific information about the following: An organization's data system contains thousands of detailed product information. Along with 13 columns of product information, etc.

Explain details

- **Phone Name**: The specific name of the phone.
- **Brand:** Recognizable brands include Apple, Samsung, Oppo, LG, Huawei, Sony, and more.
- **OS:** Reflects the operating system running on each phone, such as Android 5.1, Android 7.0, Tizen 3.0, iOS 11, or Android 8.0.
- **Announcement Date:** Signifies the timeframe when the phone became available to consumers.
- Inches: Indicates the screen size of the phone, measuring the diagonal length of the screen in inches.
- **Battery:** Represents the battery capacity of each phone, enabling comparisons based on mAh (milliampere-hours).
- **Battery Type**: Specifies the battery technology with two primary parameters: Li-Po and Li-Ion.
- **RAM**: Denotes the type of volatile memory, typically measured in gigabytes (GB), that allows random read-write access for a phone.
- **Weight**: Refers to the phone's weight, usually expressed in grams (g) for simplicity.
- **Storage**: Refers to the phone's internal memory or storage drive, which is vital for data storage and computational functions.
- **Price**: Indicates the cost of each product, typically expressed in US dollars (USD).
- **Video 1080p**: States whether the product supports 1080p video recording, with values true or false.
- **Video 4k**: States whether the product supports 4k video recording, with values true or false.

This dataset offers in-depth and thorough information about phone products, facilitating an analysis of product trends and providing valuable insights into product details and popular phone models.

Processing data

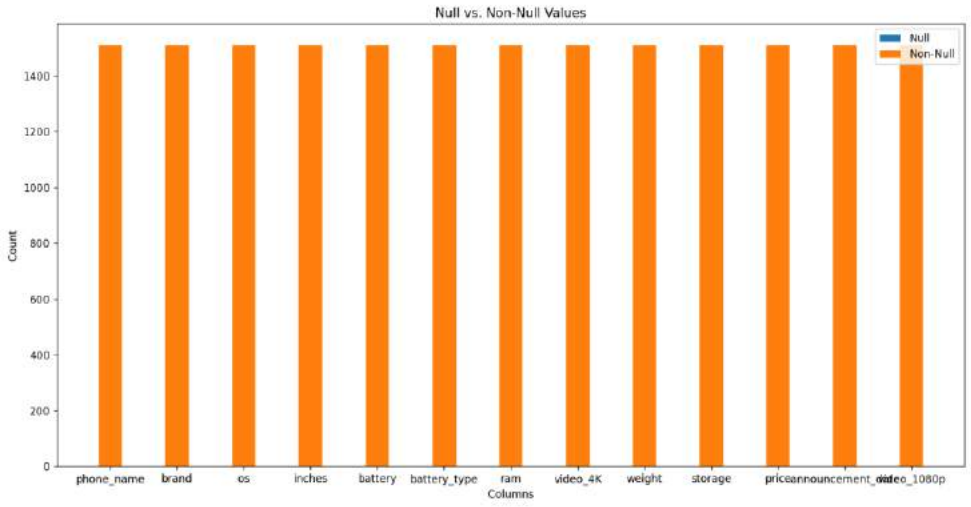


Figure 8: Bar char non-null and null

In general, the bar chart checks all values of null and non-null in 13 csv columns. In my 13 columns the values are very clean so the data is 100% non-null

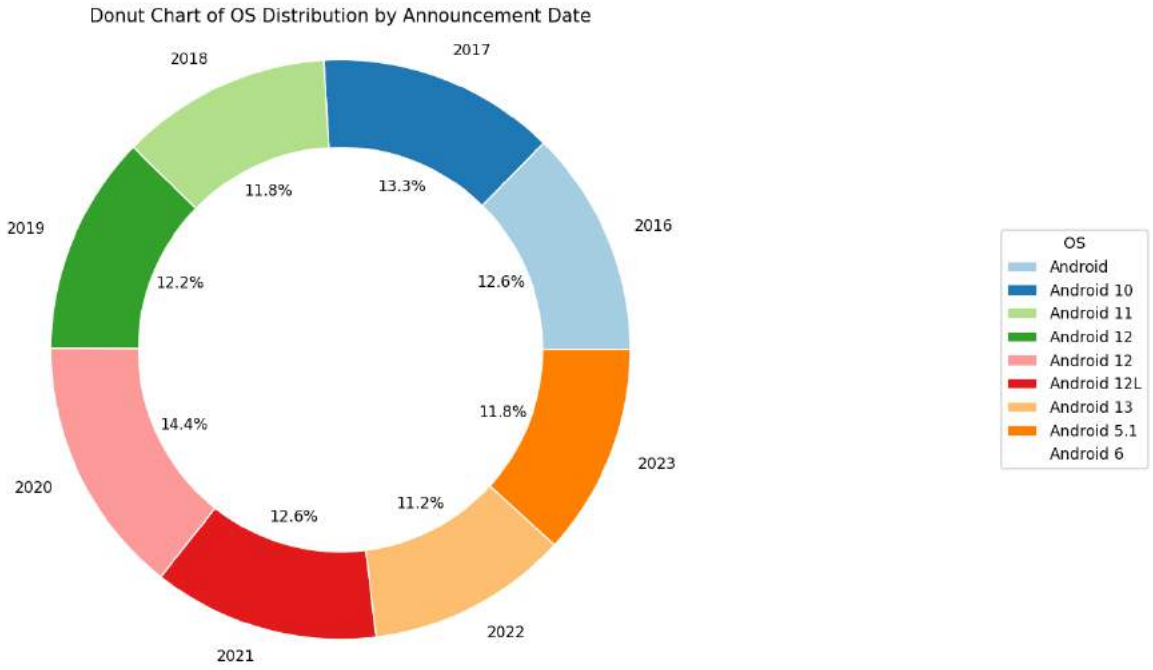


Figure 9: Donut chart

The Donut chart shows the OS produced by year and the year with the most production is 2020, which is Android13.

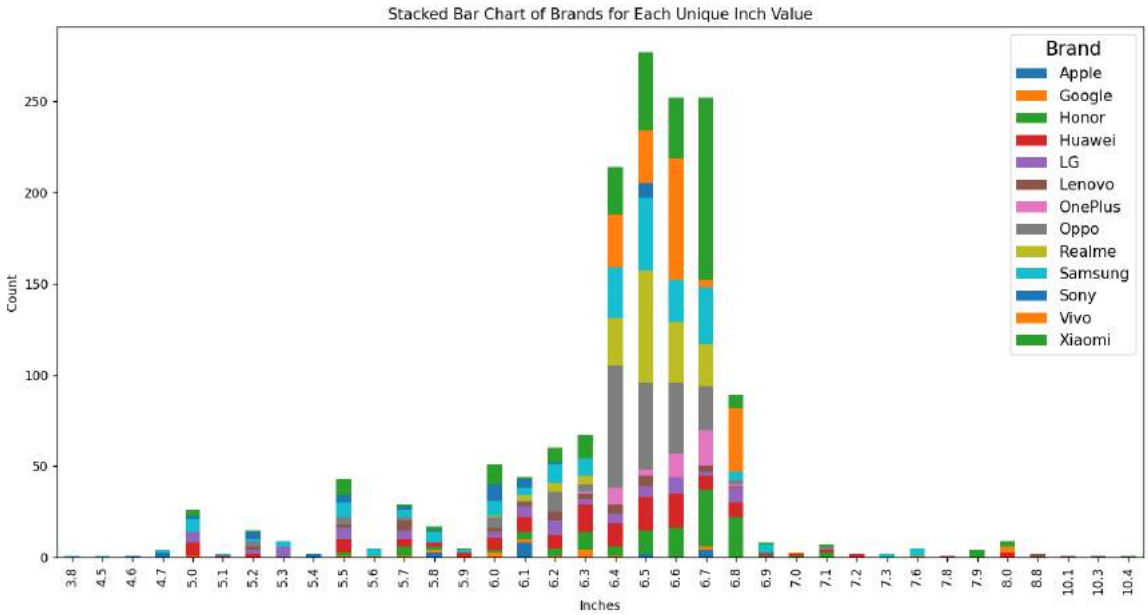


Figure 10: Stacked Bar Chart

Stacked Bar Chart of all brands through each value. In general, phones with 6.5 inches are common on all phones and then 6.6 and 6.7, but the smallest screens like 3.8 and the highest 10.4 are very rarely produced because they are difficult to reach customers.

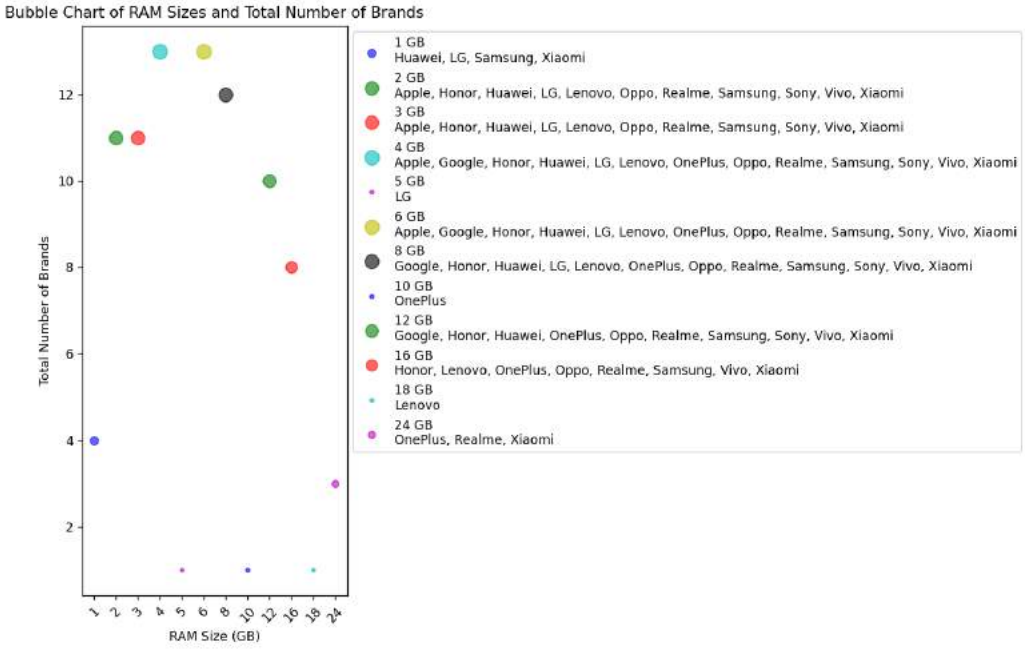


Figure 11: Bubble Chart

Bubble chart of Ram and total number of brands. Very few phones use 1GB and 18GB because it is at the average level. If you use 1GB, it is too little. If you use 18GB, it is almost equal to 24GB, so people will choose to buy medium-level ram like is 6Gb or 8Gb and if customers want larger GB, they will choose 24GB.

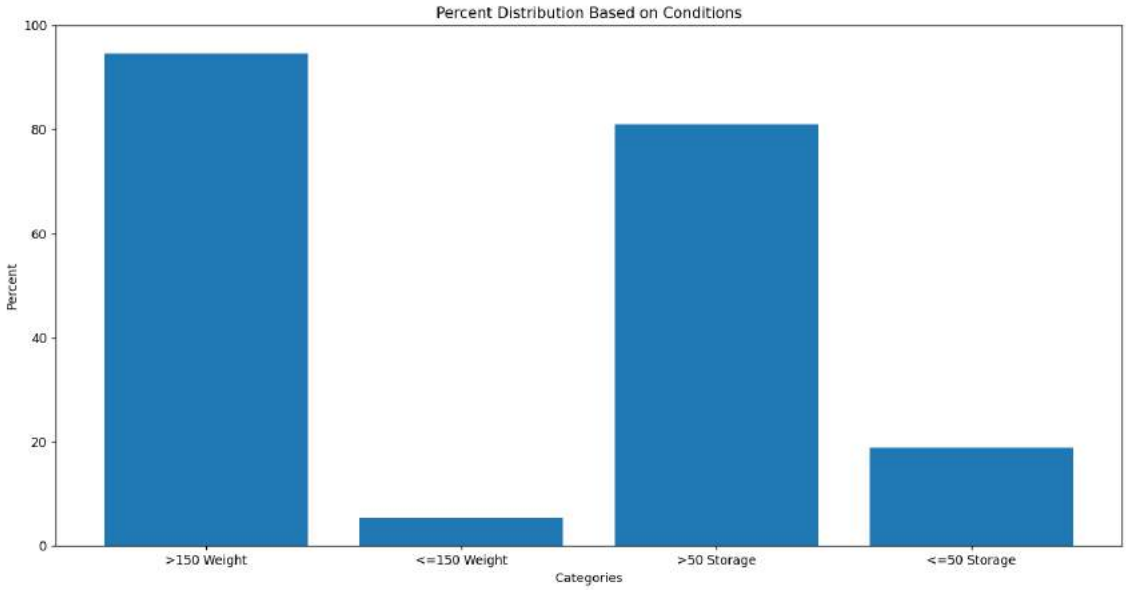


Figure 12: Bar Chart

The Bar chart looks at all products that weigh more than 150Weight, 150Weight is given a lot of weight because if the phone is too light then the processor in the phone is very weak. Besides, Storage is the same, >50 accounts for a lot but <=50 is produced very little. Because everyone wants a phone with high performance, even if the weight and storage are light, very few people can access it.

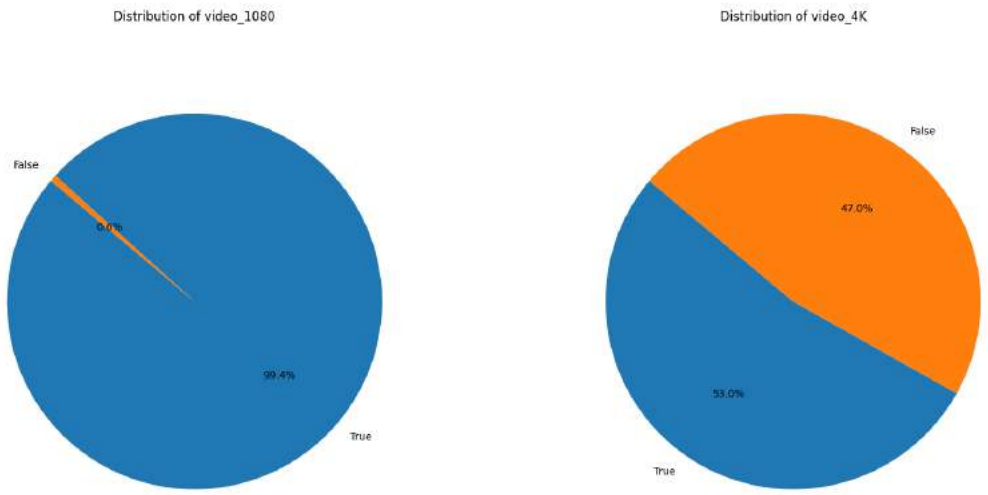


Figure 13: Pie Chart

The Pie Chart compares phones with 1080 video and 4k video. In general, 1080 videos are installed on a lot of phones because most phones today support 1080 which is considered fullHD. As for 4k video, it is still installed on all phones but has a quite high price and very few people care about it.

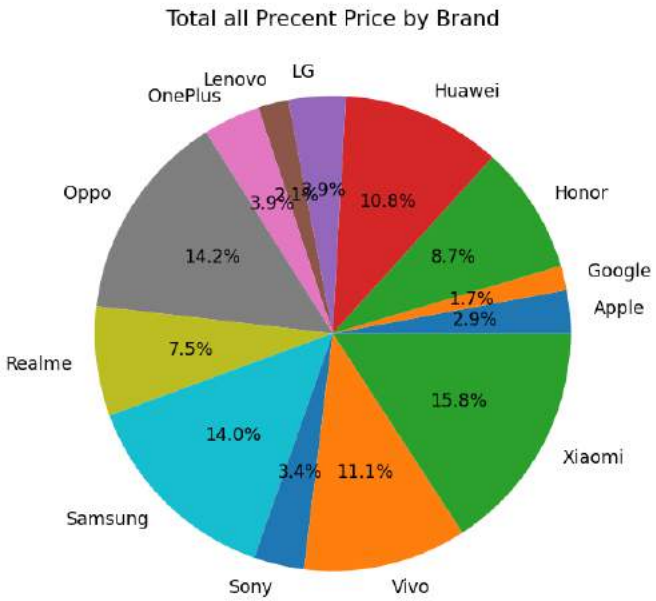


Figure 14: Pie Chart Total

In general, the pie chart shows the percentage of total money of the companies with the highest percentage being Xiaomi and the lowest percentage being Google, Lenovo, and Apple. Xiaomi is a brand with an average price so it is produced a lot so it accounts for the highest percentage. As for Google, Lenovo, and Apple phones, every year, even every few years, they produce a new product because what they need is quality.

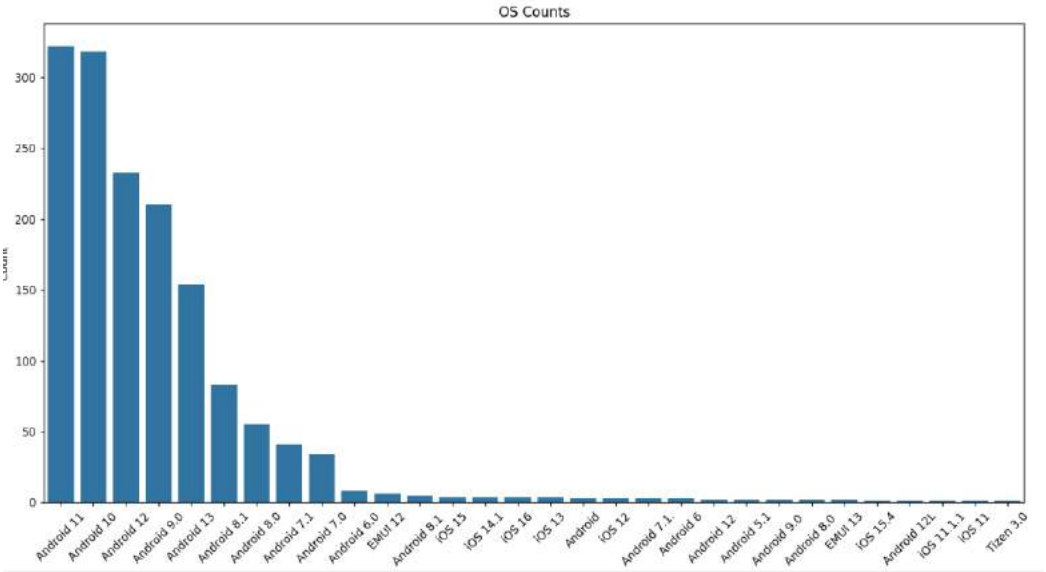


Figure 15: Bar Chart OS

In general, the Bar Chart OS count chart of Android 11 is very high because the Android os is used by many companies in the same operating system so it accounts for a very high number and besides, Android phones have very reasonable prices so many people buy them because So they also have to face a lot of errors so they have to constantly update the OS. As for IOS and Tizen, each company only supports 1 product line, so they update very few times a year, only updating to a new OS 1 or 2 times.

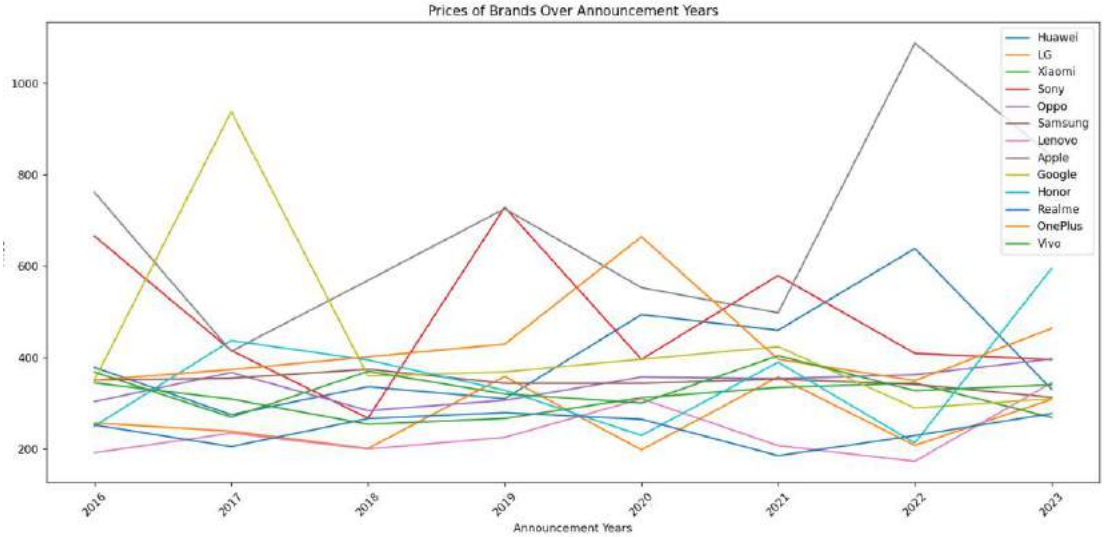


Figure 16: Line Chart

The line chart at the end of the Line Chart gives us a more general overview of the prices of companies updated over the years.

3. Dashboard

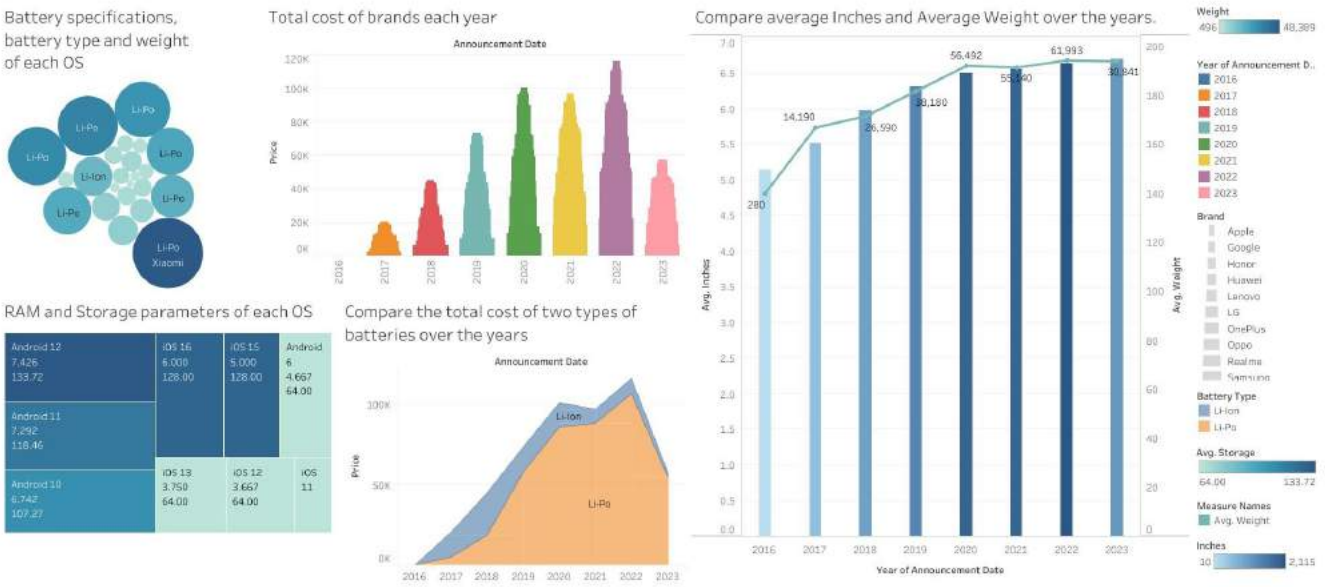


Figure 17: Dashboard

Explain:

Battery specifications, battery type and weight of each OS: When we talk about battery parameters in phones running different operating systems, we're referring to details like the battery's specifications and type. Battery specifications include information like capacity, voltage, chemistry, and cycle life, which determine the battery's performance. The battery type indicates the technology used, commonly lithium-ion or lithium-polymer. On the other hand, the weight of the phone simply tells us how heavy or light the device is, often measured in grams or kilograms. The exact values for these parameters can vary significantly depending on the specific phone model and the operating system it runs, whether it's Android, iOS, or any other OS.

Total cost of brands each year: This chart will show us how the prices of phone brands increase or decrease over the years and through the above data will tell us which products are being sold. popular in the market and from there will come up with a business strategy.

Ram and Storage parameters of each OS: In a chart depicting operating systems, you find the names of different systems such as Windows 10, macOS, Android, iOS, and Ubuntu. Each OS has its specified RAM requirements, which may vary depending on the specific version and usage. Additionally, these operating systems have storage needs, whether in the form of SSDs or HDDs, to house the OS itself and accommodate user data, applications, and files. Keep in mind that exact requirements can differ based on factors like version and device, so it's essential to refer to official documentation for precise information.

Compare the total cost of two types of batteries over the years: In a chart comparing the total cost of two types of batteries over the years, the horizontal axis depicts the timeline, showing annual changes in cost. On the vertical axis, you'll find the total cost in a specific currency. The chart includes two distinct lines or bars, each one representing a different battery type. This visual representation enables you to compare how the total cost for each battery type evolves annually, offering insights into their relative

costs and cost trends over time.

Compare average Inches and Average Weight over the years: A chart comparing average inches and average weight over the years displays how these two measurements change annually. The horizontal axis represents the years, revealing the yearly variations in both average inches and average weight. The vertical axis for average inches might represent population height or the size of objects, while the vertical axis for average weight reflects changes in the weight of individuals, products, or another relevant category. This chart offers a visual comparison of how these measurements evolve over time and their potential correlations.

Purpose:

The purpose of this dashboard is to offer an in-depth analysis of product data, particularly focusing on mobile phones. It serves as a robust tool for gaining deeper insights into the different facets of mobile phone information. Through the utilization of available data, this dashboard empowers users to grasp price trends across categories, monitor key details, and perform in-depth product analysis, facilitating well-informed recommendations and decisions.

III. Feedbacks/Comments.

1. Collect feedbacks.

The dashboard shows promise, but there are opportunities for enhancement. Increasing interactivity, incorporating additional historical data, and delivering more contextual information could elevate its value to users.

2. Good points

2.1. Price Analysis Dashboard

- The dashboard boasts a well-structured layout, ensuring ease of navigation. It effectively labels its numerous sections and presents data in a concise and lucid manner.
- Colors are judiciously used to emphasize critical information. Employing distinct colors for various metrics provides an instant understanding of the performance of different sections.
- The graphs and charts are notably legible and straightforward. The inclusion of diverse graphical representations enhances the data's clarity and interpretability.

3. Points need to improve

3.1. Price Analysis Dashboard

- Enhancing the dashboard's interactivity would be beneficial. Users should have the capability to delve deeper into the data and apply various filters to gain more granular insights and track changes over time.
- Incorporating a richer historical dataset into the dashboard would enable users to discern long-term trends and how the data has evolved over time.
- Moreover, providing additional context within the dashboard is vital. Users should be informed about the significance and relevance of the data, aiding their comprehension and facilitating informed decision-making.

4. Suggestions for future

4.1. Price Analysis Dashboard

- Expanding the dashboard's data scope is a valuable consideration. Incorporating additional

metrics such as customer satisfaction, website traffic, or sales figures would offer a more comprehensive perspective of the business, empowering users to make more informed decisions.

- Customization of the dashboard to align with the unique requirements of different user roles is a key improvement. For instance, tailoring data displays for a marketing manager versus a sales manager would enable users to access the specific information most relevant to their roles.
- Additionally, optimizing the dashboard for mobile accessibility is essential. This would enable users to conveniently access the dashboard on their smartphones or tablets, catering to the needs of those constantly on the move.

IV. Point of view.

1. Discuss how BI tools can contribute to effective decision-making

Broadly, Business Intelligence (BI) technologies empower organizations to leverage data for improved decision-making through streamlined data access, visual representation of information, and the generation of data-driven insights. These technologies enable companies to make informed choices, resulting in heightened operational efficiency, reduced risks, and more strategic resource allocation. Ultimately, this fosters their success and fosters growth.

1.1. Data aggregation and consolidation:

Data aggregation and consolidation are integral components of Business Intelligence (BI) as they entail the collection of data from diverse sources and transforming it into a suitable format for analysis and reporting. BI solutions play a crucial role in facilitating these processes by providing the necessary functionality and capabilities for effective data collection and integration.

Example:

An e-commerce giant, spanning various regions and online platforms, is committed to refining inventory management and operational efficiency. They achieve this by employing Business Intelligence (BI) tools for data aggregation and consolidation. With real-time insights into inventory levels across their extensive network of warehouses and sales channels, the company optimizes restocking and resource allocation, effectively preventing stockouts and overstocking. BI-driven data consolidation not only streamlines inventory management but also elevates operational excellence, enhancing decision-making quality.

1.2. Data Visualization

Data visualization involves the use of graphical elements to aid individuals in comprehending the information within datasets. By employing visual components like charts, graphs, and maps, it simplifies complex statistics, making data more accessible, understandable, and actionable. Effective data visualization can bring to the forefront trends, patterns, outliers, and insights that may not be readily discerned from raw data alone.

Example:

A financial analytics firm specializes in monitoring and presenting real-time stock market data to assess market trends and provide investors with valuable insights. They utilize interactive dashboards to offer up-to-the-minute reports on stock price movements, market indices, and emerging trends. This empowers investors to make informed decisions about their investment strategies, effectively managing their portfolios in a dynamic financial landscape. In this scenario, data visualization proves to be a potent tool for delivering critical information and guiding investment actions in the world of finance.

1.3. Real-Time Reporting

Real-time reporting using Business Intelligence (BI) technologies involves the creation and

dissemination of data visualizations, dashboards, and reports in real time, allowing users to monitor and assess data as events unfold. This approach facilitates swift access to critical information, enabling real-time data-driven decision-making.

Example:

A global logistics company operates multiple distribution centers, an online order management platform, and a mobile application to streamline its supply chain operations. To enhance their efficiency, they've integrated Tableau as their BI tool. Warehouse managers can now monitor inventory levels daily, providing precise insights into demand patterns and optimizing restocking strategies to prevent overstocking or stockout scenarios. Real-time data empowers decision-makers to make immediate adjustments to supply chain logistics and resource allocation, ensuring that they can meet demand efficiently and boost operational performance. In this scenario, real-time reporting driven by BI tools plays a pivotal role in promoting streamlined inventory management and enabling agile, data-driven decisions.

2. Legal issues involved in exploiting user data for business intelligence

Leveraging user data for corporate insights can introduce a host of legal and ethical concerns, particularly as global data protection standards become increasingly stringent. Some of the legal considerations and challenges related to the acquisition and utilization of user data for business intelligence encompass the following:

- **Data Privacy Regulations**: Notably, the General Data Protection Regulation (GDPR) mandates that enterprises operating within the European Union obtain explicit consent from individuals before collecting and processing their personal data. GDPR also stipulates the necessity of data protection impact assessments and the appointment of data protection officers.
- **Data Consent and Transparency**: Businesses are obliged to seek informed consent from users before gathering and processing their data. Upholding transparency requires the provision of clear, easily accessible privacy policies and terms of service.
- **Data Security**: Legal obligations dictate the safeguarding of user data against breaches and unauthorized access. This necessitates the implementation of robust security measures, such as encryption and access controls, to protect sensitive data.
- **Data Minimization**: Organizations must adhere to the principle of collecting only the data that is essential for their intended business intelligence purposes. Over-collection of user data can potentially lead to legal entanglements and privacy infringements.

It is imperative to embrace a proactive and ethical approach to user data collection and business intelligence to ensure compliance with legal requirements and safeguard user privacy.

Contribution Table

Task	Work	Status	Name	Self-Evaluate	Evaluate (Leader)
3: BI Applications	Give information for General about BI	Person	Minh Man	Good	Good
	Find out BI techniques & Tools	Person	Xuan Truong	Good	Good
	Explain Dataset & Perform Pre-process Data	Group	Minh Man Xuan Truong	Rather	Rather
	Draw & Explain Dashboards	Group	Minh Man	Rather	Rather
	Receive Feedbacks/Comments	Group	Minh Man Xuan Truong Nhat Truong	Good	Good
	Discuss how BI Tools contribute to effective Decision Making	Person	Nhat Truong	Good	Good
4: Point Of View (Research)	Give information for Legal issues	Person	Nhat Truong	Good	Good
	Specific examples	Group	Minh Man Xuan Truong Nhat Truong	Good	Good
	Evaluate	Group	Minh Man Xuan Truong Nhat Truong	Good	Good
	Prepare slides Presentation & write Report	Group	Minh Man Xuan Truong Nhat Truong	Good	Good

REFERENCES

1. Python Software Foundation (2019). What is Python? Executive Summary. [online] Python.org. Available at: https://www.python.org/doc/essays/blurb/ [Accessed 23 Oct. 2023].
2. Hughes, A. (2019). What is Microsoft SQL Server? A definition from WhatIs.com. [online] SearchDataManagement. Available at: https://www.techtarget.com/searchdatamanagement/definition/SQL-Server [Accessed 23 Oct. 2023].
3. Microsoft (2019). What is Power BI | Microsoft Power BI. [online] Microsoft.com. Available at: https://powerbi.microsoft.com/en-us/what-is-power-bi/ [Accessed 23 Oct. 2023].
4. Beatrice, A. (2021). Top Business Intelligence Techniques to Streamline Data processing. [online] Analytics Insight. Available at: https://www.analyticsinsight.net/top-business-intelligence-techniques-to-streamline-data-processing/ [Accessed 23 Oct. 2023].
5. Adair, B., 2017. Business Intelligence Systems and the Different Types of BI Tools. [Online] Available at: https://www.selecthub.com/business-intelligence/key-types-business-intelligence-tools/ [Accessed 23 Oct. 2023].
6. 4. Mesevage, T. G., 2021. Data Cleaning Steps & Process to Prep Your Data for Success. [Online] Available at: https://monkeylearn.com/blog/data-cleaning-steps/ [Accessed 23 Oct. 2023].
7. 5. Morris, A., 2021. 23 Case Studies and Real-World Examples of How Business Intelligence Keeps Top Companies Competitive. [Online] Available at: https://www.netsuite.com/portal/resource/articles/business-strategy/business-intelligence-examples.shtml [Accessed 23 Oct. 2023].
8. 6. myabcm, 2021. Business Intelligence: how it influences decision making. [Online] Available at: https://myabcm.com/business-intelligence-influences-decision-making/ [Accessed 23 Oct. 2023].

ZIP Folder:
https://drive.google.com/drive/folders/12j2KVQEt1LPZsNud91idYM8fr_HgwchM?usp=sharing