

MOBILE DATA ANALYSIS PROJECT

USING SQL AND POWER BI

Introduction

The Mobile Data Analysis project using SQL and Power BI provides an in-depth analysis of the mobile market in 2023. The project focuses on various aspects such as brand popularity, internal storage preferences, operating system distribution, 5G availability, battery capacity, and selfie camera specifications. The goal is to present the findings through detailed and interactive visualizations.

SQL

Structured Query Language (SQL) is a powerful tool used for managing and manipulating relational databases. It allows users to create, read, update, and delete (CRUD) data in a database. SQL is widely used in data analysis projects for querying large datasets, extracting meaningful insights, and making data-driven decisions. By leveraging SQL, analysts can perform complex operations such as filtering, grouping, joining, and aggregating data efficiently.


For this project, SQL was used to extract and analyze data from the mobile market database. The following queries and solutions were designed to address specific business questions and derive actionable insights.

Queries and Solutions

Below are some of the key SQL queries used in this project, along with the insights they provided:

Schema Creation and Data Import

sql

 Copy code

```
-- Creating the schema for mobile data analysis --  
CREATE SCHEMA mobile_data_analysis;  
  
-- Using the schema --  
USE mobile_data_analysis;  
  
-- Importing data from CSV file --  
SELECT * FROM mobile_data;
```

Solution: This setup creates a schema named `mobile_data_analysis` and uses it to query the `mobile_data` table, verifying that the data import was successful.

Query 1: Check Mobile Features and Price List

```
sql Copy code  
  
-- Query no 1: Check mobile features and price list --  
SELECT phone_name, price  
FROM mobile_data;
```

Solution: This query retrieves the names and prices of all mobile phones, providing a comprehensive list of features and their respective prices.

	A	B
1	phone_name	price
2	Realme 9 Pro 5G 128 GB, 8 GB RAM, Sunrise Blue, Mobile Phone	20999
3	Realme 9 Pro 5G 128 GB, 6 GB RAM, Sunrise Blue, Mobile Phone	18999
4	Realme 9 Pro 5G 128 GB, 8 GB RAM, Aurora Green, Mobile Phone	20999
5	Redmi 10A 64 GB, 4 GB RAM, Sea Blue, Mobile Phone	8299
6	Samsung Galaxy A33 5G 128 GB, 8 GB RAM, Awesome Black, Mobile Phone	27499
7	Samsung Galaxy A13 128 GB, 4 GB RAM, Black, Mobile Phone	14999
8	Samsung Galaxy A53 5G 128 GB, 6 GB RAM, Awesome White, Mobile Phone	31999
9	Samsung S22 Ultra 5G 512 GB, 12 GB RAM, Green, Smartphone	118999
10	Samsung S22 Ultra 5G 512 GB, 12 GB RAM, Burgundy, Mobile Phone	118999
11	Samsung S22 Ultra 5G 256 GB, 12 GB RAM, Phantom White, Mobile Phone	109999
12	Samsung Galaxy A53 5G 128 GB, 8 GB RAM, Awesome White, Mobile Phone	33499
13	Samsung Galaxy A73 5G 128 GB, 8 GB RAM, Awesome White, Mobile Phone	41999
14	Samsung Galaxy A53 5G 128 GB, 6 GB RAM, Orange, Mobile Phone	31999
15	Samsung Galaxy A23 128 GB, 6 GB RAM, Black, Mobile Phone	18499

Query 2: Find the 5 Most Expensive Phones

```
sql Copy code  
  
-- Query no 2: Find out the price of the 5 most expensive phones --  
SELECT *  
FROM mobile_data  
ORDER BY price DESC  
LIMIT 5;
```

Solution: This query identifies the 5 most expensive phones by ordering the data in descending order of price and selecting the top 5 entries.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Phone_na	Brands	Price	Internal_S	Operating	USB_Type	5G_Availa	Selfie_Can	RAM_Stor	Country_o	Battery_C	Price_Ran	Battery_C	Total_Mobile	
2	Apple iPhc	Apple	189900	Not Specif	iOS	Yes	No	12 MP	Not Specif	China	Not Specif	Between 1	Not Specif	1	
3	Apple iPhc	Apple	189900	Not Specif	iOS	Yes	No	12 MP	Not Specif	China	Not Specif	Between 1	Not Specif	1	
4	Apple iPhc	Apple	189900	Not Specif	iOS	Not Specif	No	12 MP	Not Specif	China	Not Specif	Between 1	Not Specif	1	
5	Apple iPhc	Apple	189900	Not Specif	iOS	Yes	No	12 MP	Not Specif	China	Not Specif	Between 1	Not Specif	1	
6	Apple iPhc	Apple	179900	Not Specif	iOS	Yes	No	12 MP	Not Specif	Not Specif	Not Specif	Between 1	Not Specif	1	

Query 3: Find the 5 Cheapest Phones

sql	Copy code
<pre>-- Query no 3: Find out the price of the 5 cheapest phones -- SELECT * FROM mobile_data ORDER BY price ASC LIMIT 5;</pre>	

Solution: This query identifies the 5 cheapest phones by ordering the data in ascending order of price and selecting the top 5 entries.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Phone_na	Brands	Price	Internal_S	Operating	USB_Type	5G_Availa	Selfie_Can	RAM_Stor	Country_o	Battery_C	Price_Ran	Battery_C	Total_Mobile	
2	itel A23 Pr	Itel	4040	8 GB	Android	Not Specif	No	0.3 MP	1 GB	India	2400 mAh	Less than 5	Between 2	1	
3	itel A23 Pr	Itel	4040	8 GB	Android	Not Specif	No	0.3 MP	1 GB	India	2400 mAh	Less than 5	Between 2	1	
4	JioPhone N	JioPhone	4499	Not Specif	Android	Not Specif	No	8 MP	2 GB	Not Specif	3500 mAh	Less than 5	Between 3	1	
5	JioPhone N	JioPhone	4499	Not Specif	Android	Not Specif	No	8 MP	2 GB	Not Specif	3500 mAh	Less than 5	Between 3	1	
6	Samsung C	Samsung	5199	Not Specif	Android	USB 2.0	No	5 MP	1 GB	Not Specif	3000 mAh	Between 5	Between 2	1	

Query 4: Top 5 Samsung Phones with Price and Features

sql	Copy code
<pre>-- Query no 4: List of top 5 Samsung phones with price and all features -- SELECT * FROM mobile_data WHERE brands = 'Samsung' ORDER BY price DESC LIMIT 5;</pre>	

Solution: This query lists the top 5 Samsung phones by price, showing all features for each phone.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Phone_nar	Brands	Price	Internal_S	Operating	USB_Type	5G_Availa	Selfie_Cam	RAM_Stor	Country_o	Battery_C	Price_Ran	Battery_C	Total_Mobile	
2	Samsung	C Samsung	164999	512 GB	Android	Yes	No	4 MP	12 GB	Not Specif	4400 mAh	Between 1	Between 4	1	
3	Samsung	C Samsung	164999	512 GB	Android	Yes	No	4 MP	12 GB	Not Specif	4400 mAh	Between 1	Between 4	1	
4	Samsung	C Samsung	119999	Not Specif	Android	Yes	No	10 MP	12 GB	Not Specif	4500 mAh	Between 1	Between 4	1	
5	Samsung	S Samsung	118999	Not Specif	Android	Not Specif	No	40 MP	12 GB	Not Specif	5000 mAh	Between 1	Between 4	1	
6	Samsung	S Samsung	118999	Not Specif	Android	Not Specif	No	40 MP	12 GB	Not Specif	5000 mAh	Between 1	Between 4	1	

Query 5: Top 5 Highest Price Android Phones

```

sql
-- Query no 5: Must have android phone list then top 5 highest price android phones --
SELECT *
FROM mobile_data
WHERE Operating_System_Type = 'Android'
ORDER BY price DESC
LIMIT 5;

```

Solution: This query lists the top 5 most expensive Android phones, providing all relevant features and prices.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Phone_nar	Brands	Price	Internal_S	Operating	USB_Type	5G_Availa	Selfie_Cam	RAM_Stor	Country_o	Battery_C	Price_Ran	Battery_C	Total_Mobile	
2	Samsung	C Samsung	164999	512 GB	Android	Yes	No	4 MP	12 GB	Not Specif	4400 mAh	Between 1	Between 4	1	
3	Samsung	C Samsung	164999	512 GB	Android	Yes	No	4 MP	12 GB	Not Specif	4400 mAh	Between 1	Between 4	1	
4	Samsung	C Samsung	119999	Not Specif	Android	Yes	No	10 MP	12 GB	Not Specif	4500 mAh	Between 1	Between 4	1	
5	Samsung	S Samsung	118999	Not Specif	Android	Not Specif	No	40 MP	12 GB	Not Specif	5000 mAh	Between 1	Between 4	1	
6	Samsung	S Samsung	118999	Not Specif	Android	Not Specif	No	40 MP	12 GB	Not Specif	5000 mAh	Between 1	Between 4	1	

Query 6: Top 5 Lowest Price Android Phones

```

sql
-- Query no 6: Must have android phone list and top 5 lowest price android phones --
SELECT *
FROM mobile_data
WHERE Operating_System_Type = 'Android'
ORDER BY price ASC
LIMIT 5;

```

Solution: This query lists the top 5 cheapest Android phones, providing all relevant features and prices.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Phone_nam	Brands	Price	Internal_S	Operating	USB_Type	5G_Availa	Selfie_Cam	RAM_Stor	Country_o	Battery_C	Price_Ran	Battery_C	Total_Mobile	
2	itel A23 Pr	itel	4040	8 GB	Android	Not Specif	No	0.3 MP	1 GB	India	2400 mAh	Less than	Between 2	1	
3	itel A23 Pr	itel	4040	8 GB	Android	Not Specif	No	0.3 MP	1 GB	India	2400 mAh	Less than	Between 2	1	
4	JioPhone N	JioPhone	4499	Not Specif	Android	Not Specif	No	8 MP	2 GB	Not Specif	3500 mAh	Less than	Between 3	1	
5	JioPhone N	JioPhone	4499	Not Specif	Android	Not Specif	No	8 MP	2 GB	Not Specif	3500 mAh	Less than	Between 3	1	
6	Samsung C	Samsung	5199	Not Specif	Android	USB 2.0	No	5 MP	1 GB	Not Specif	3000 mAh	Between 5	Between 2	1	

Query 7: Top 5 Highest Price iOS Phones

sql	Copy code
<pre>-- Query no 7: Must have IOS phone list then top 5 highest price IOS phones -- SELECT * FROM mobile_data WHERE Operating_System_Type = 'ios' ORDER BY price DESC LIMIT 5;</pre>	

Solution: This query lists the top 5 most expensive iOS phones, providing all relevant features and prices.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Phone_nam	Brands	Price	Internal_S	Operating	USB_Type	5G_Availa	Selfie_Cam	RAM_Stor	Country_o	Battery_C	Price_Ran	Battery_C	Total_Mobile	
2	Apple iPhc	Apple	189900	Not Specif	iOS	Yes	No	12 MP	Not Specif	China	Not Specif	Between 1	Not Specif	1	
3	Apple iPhc	Apple	189900	Not Specif	iOS	Yes	No	12 MP	Not Specif	China	Not Specif	Between 1	Not Specif	1	
4	Apple iPhc	Apple	189900	Not Specif	iOS	Yes	No	12 MP	Not Specif	China	Not Specif	Between 1	Not Specif	1	
5	Apple iPhc	Apple	189900	Not Specif	iOS	Not Specif	No	12 MP	Not Specif	China	Not Specif	Between 1	Not Specif	1	
6	Apple iPhc	Apple	179900	Not Specif	iOS	Yes	No	12 MP	Not Specif	Not Specif	Not Specif	Between 1	Not Specif	1	

Query 8: Top 5 Lowest Price iOS Phones

sql	Copy code
<pre>-- Query no 8: Must have IOS phone list then top 5 lowest price IOS phones -- SELECT * FROM mobile_data WHERE Operating_System_Type = 'ios' ORDER BY price ASC LIMIT 5;</pre>	

Solution: This query lists the top 5 cheapest iOS phones, providing all relevant features and prices.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Phone_nar	Brands	Price	Internal_Si	Operating	USB_Type	5G_Availa	Selfie_Cam	RAM_Stor	Country_o	Battery_C	Price_Ran	Battery_C	Total_Mobile	
2	Apple iPhc	Apple	43900	128 GB	iOS	Yes	Yes	7 MP	Not Specif	India	Not Specif	Between 3	Not Specif	1	
3	Apple iPhc	Apple	43900	128 GB	iOS	Yes	No	7 MP	Not Specif	India	Not Specif	Between 3	Not Specif	1	
4	Apple iPhc	Apple	43900	64 GB	iOS	Not Specif	No	7 MP	Not Specif	Not Specif	Not Specif	Between 3	Not Specif	1	
5	Apple iPhc	Apple	43900	64 GB	iOS	Not Specif	No	7 MP	Not Specif	Not Specif	Not Specif	Between 3	Not Specif	1	
6	Apple iPhc	Apple	43900	64 GB	iOS	Not Specif	No	12 MP	Not Specif	China/Indi	Not Specif	Between 3	Not Specif	1	

Query 9: Top 5 Phones Supporting 5G

```

sql
-- Query no 9: Write a query which phone supports 5G and also top 5 phones with 5G support
SELECT *
FROM mobile_data
WHERE 5G_Availability = 'Yes'
ORDER BY price DESC
LIMIT 5;

```

Solution: This query identifies the top 5 most expensive phones that support 5G, providing all relevant features and prices.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Phone_nar	Brands	Price	Internal_Si	Operating	USB_Type	5G_Availa	Selfie_Cam	RAM_Stor	Country_o	Battery_C	Price_Ran	Battery_C	Total_Mobile	
2	Samsung C	Samsung	88999	Not Specif	Android	Yes	Yes	10 MP	8 GB	India	3300 mAh	Between 8	Between 3	1	
3	Apple iPhc	Apple	59900	128 GB	iOS	Not Specif	Yes	12 MP	Not Specif	China	Not Specif	Between 5	Not Specif	1	
4	Apple iPhc	Apple	59900	128 GB	iOS	Not Specif	Yes	12 MP	Not Specif	China	Not Specif	Between 5	Not Specif	1	
5	Apple iPhc	Apple	59900	128 GB	iOS	Not Specif	Yes	12 MP	Not Specif	China	Not Specif	Between 5	Not Specif	1	
6	Apple iPhc	Apple	59900	128 GB	iOS	Not Specif	Yes	12 MP	Not Specif	China	Not Specif	Between 5	Not Specif	1	

Query 10: Total Price of All Mobiles Grouped by Brand

```

sql
-- Query no 10: Total price of all mobile is to be found with brand name --
SELECT brands, SUM(price) AS Total_Price
FROM mobile_data
GROUP BY brands;

```

Solution: This query calculates the total price of all mobile phones grouped by brand, providing the cumulative price for each brand.

	A	B
1	brands	sum(price)
2	realme	1461118
3	Redmi	1086928
4	Samsung	4148103
5	OnePlus	801977
6	Vivo	1122844
7	Motorola	520979
8	Infinix	200984

9	Tecno	41196
10	Moto	19998
11	Oppo	629336
12	Xiaomi	1282956
13	Itel	42575
14	Mi	440488
15	Apple	10572900
16	Nokia	269778
17	JioPhone	8998

These SQL queries provide essential insights into mobile phone sales data, supporting data-driven decision-making in inventory management and marketing strategies.

Connecting Power BI to a SQL Database

To connect Power BI to your SQL database, start by launching Power BI Desktop. Click on the "Home" tab, then select "Get Data." Choose "SQL Server" from the data source options. In the "SQL Server database" dialog, enter your SQL Server instance name in the "Server" field. Optionally, specify the database name. Select your data connectivity mode: "Import" for loading data into Power BI or "DirectQuery" for querying directly from SQL Server. Click "OK" and provide your authentication details, either Windows Authentication or Database Authentication with your SQL Server credentials. After successful authentication, the "Navigator" window will display available databases and tables. Select the tables or views you want to load by checking the corresponding boxes. Click "Load" to import data or "Connect" for DirectQuery mode. Power BI will establish the connection and load the data into your workspace, enabling you to create visualizations and reports. For custom SQL queries, use the "Advanced options" in the "SQL Server database" dialog. Additionally, if using Import mode, set up a data refresh schedule to keep your data up-to-date. This process integrates your SQL data with Power BI, facilitating comprehensive data analysis and visualization.

Power BI

Power BI is a powerful business analytics tool developed by Microsoft, designed to help users visualize and share insights from their data. It provides a suite of services, including Power BI Desktop, Power BI Service (an online SaaS), and Power BI Mobile, catering to different needs from data preparation and analysis to real-time collaboration and sharing. Power BI enables users to connect to a wide variety of data sources, transform raw data into meaningful insights through interactive dashboards, and create stunning visualizations that aid in data-driven decision-making. Its intuitive interface and robust features, such as custom visuals, DAX (Data Analysis Expressions) for complex calculations, and integration with other Microsoft products like Excel and Azure, make it a go-to tool for professionals across various industries looking to harness the full potential of their data.

Insights Derived from Each Chart

Phone Name and Brand Distribution

This chart displays the various phone names along with their respective brands available in the market.

Internal Storage

This bar chart shows the distribution of phones based on their internal storage capacities.

- **128 GB:** Most common with 240 phones.
- **Not Specified:** 132 phones.
- **64 GB:** 101 phones.
- **256 GB:** 59 phones.
- **32 GB:** 41 phones.
- **512 GB:** 23 phones.
- **Other Capacities:** Lesser numbers.

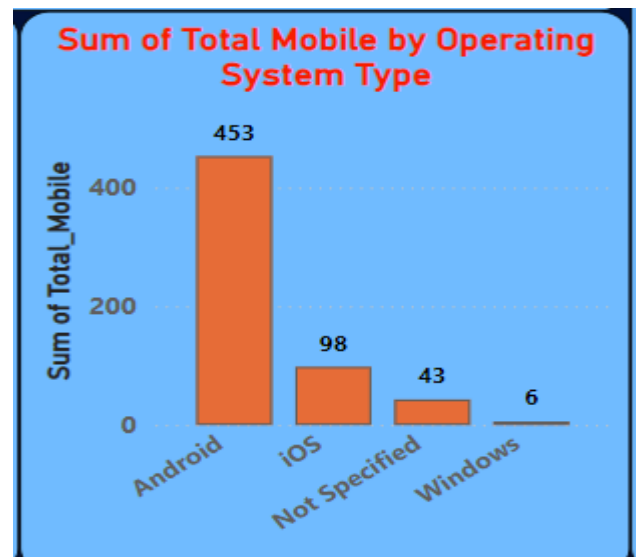


Phone_name
Apple iPhone 11 128 GB, (Product) Red (without Earpods and Adapter)
Apple iPhone 11 128 GB, Black (without Earpods and Adapter)
Apple iPhone 11 128 GB, Purple (without Earpods and Adapter)
Apple iPhone 11 128 GB, White (without Earpods and Adapter)
Apple iPhone 11 128 GB, Yellow (without Earpods and Adapter)
Apple iPhone 11 64 GB, Black (without Earpods and Adapter)
Apple iPhone 11 64 GB, Green (without Earpods and Adapter)
Apple iPhone 11 64 GB, Purple (without Earpods and Adapter)

Total Mobile by Operating System Type

This chart shows the distribution of phones based on their operating systems.

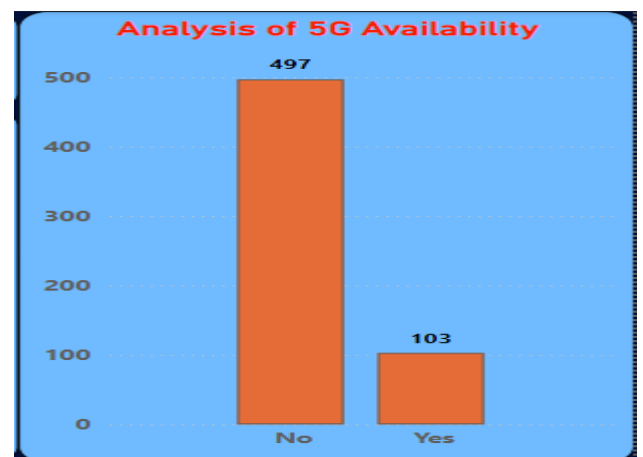
- **Android:** 453 phones.
- **iOS:** 98 phones.
- **Not Specified:** 43 phones.
- **Windows:** 6 phones.



5G Availability

This chart shows the availability of 5G technology in the phones.

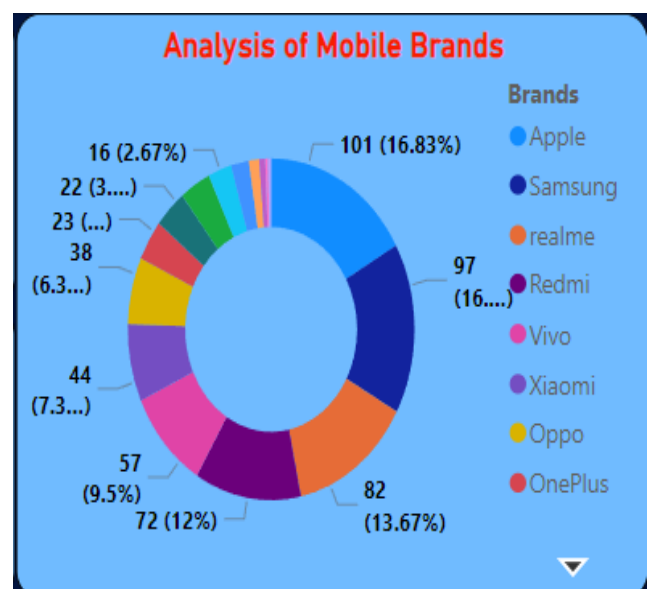
- **No 5G:** 497 phones.
- **5G Available:** 103 phones.



Analysis of Mobile Brands

This pie chart shows the distribution of mobile brands in the market.

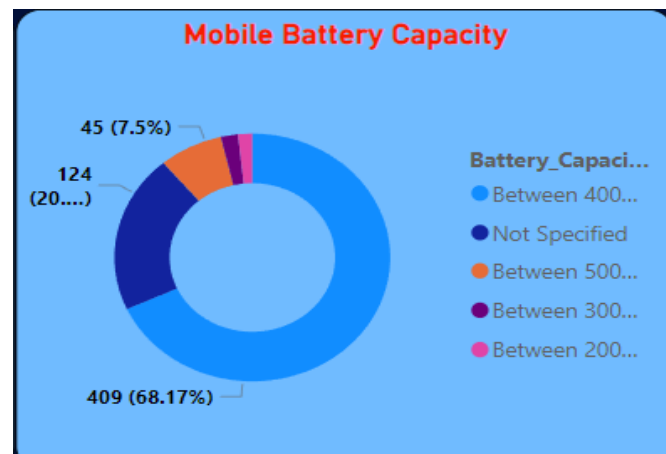
- **Apple:** 101 phones (16.83%).
- **Samsung:** 97 phones (16.17%).
- **Redmi:** 72 phones (12%).
- **Vivo:** 59 phones (9.83%).
- **Xiaomi:** 44 phones (7.33%).
- **Oppo:** 37 phones (6.17%).
- **Other Brands:** Lesser numbers.



Mobile Battery Capacity

This pie chart shows the distribution of phones based on their battery capacities.

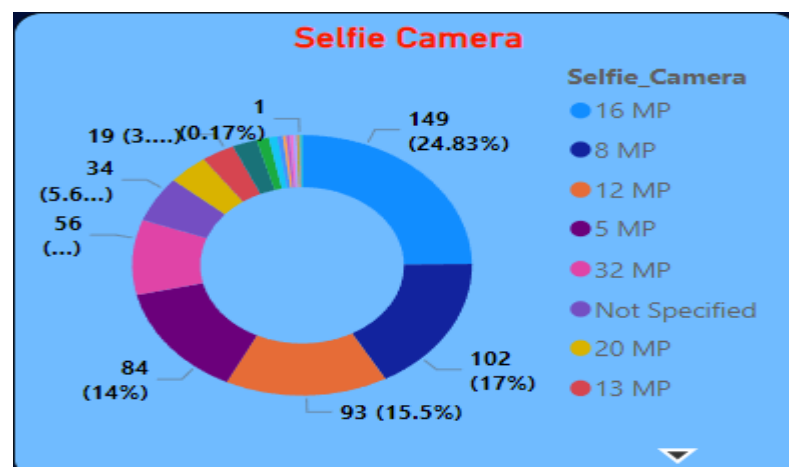
- **4000-5000 mAh:** 409 phones (68.17%).
- **Not Specified:** 124 phones (20.67%).
- **5000-6000 mAh:** 45 phones (7.5%).
- **3000-4000 mAh:** 34 phones (5.67%).
- **Other Capacities:** Lesser numbers.



Selfie Camera Specifications

This pie chart shows the distribution of phones based on their selfie camera specifications.

- **16 MP:** 149 phones (24.83%).
- **8 MP:** 102 phones (17%).
- **12 MP:** 93 phones (15.5%).
- **5 MP:** 84 phones (14%).
- **Other Specifications:** Lesser numbers.



Inferences

Brand Popularity

- **Apple and Samsung:** Leading brands with the highest number of phones in the market.
- **Redmi and Vivo:** Also significant players in the market.

Storage Preferences

- **128 GB:** The most preferred internal storage capacity.
- **64 GB and 256 GB:** Also popular among users.

Operating System Distribution

- **Android:** Dominates the market.
- **iOS:** Holds a significant share.

5G Availability

- Majority of the phones do not support 5G technology.
- **103 phones:** Support 5G.

Battery Capacity

- **4000-5000 mAh:** The most common battery capacity.
- **5000-6000 mAh and 3000-4000 mAh:** Also common.

Selfie Camera Specifications

- **16 MP and 8 MP:** The most common selfie camera specifications.
- **12 MP and 5 MP:** Also popular.

PROBLEM STATEMENTS AND ANSWERS

Problem Statement 1

Which brand has the highest number of phones in the market?

- **Answer:** Apple has the highest number of phones in the market with 101 phones.

Problem Statement 2

What is the most preferred internal storage capacity among available phones?

- **Answer:** 128 GB is the most preferred internal storage capacity with 240 phones.

Problem Statement 3

How is the mobile market segmented by operating system?

- **Answer:** The market is dominated by Android with 453 phones, followed by iOS with 98 phones.

Problem Statement 4

What is the availability of 5G technology in the mobile market?

- **Answer:** Majority of the phones do not support 5G technology, with only 103 phones supporting it.

Problem Statement 5

What are the common selfie camera specifications in the market?

- **Answer:** The most common selfie camera specifications are 16 MP (149 phones) and 8 MP (102 phones).

Conclusion

The Mobile Data Analysis project using SQL and Power BI provides a comprehensive overview of the mobile market in 2023. The detailed visualizations and insights offer valuable information on brand popularity, storage preferences, operating system distribution, 5G availability, battery capacity, and selfie camera specifications. These findings can aid in strategic planning, optimizing product offerings, and enhancing market strategies.