**ATM Usage Patterns Analysis Dashboard**

**AIM**

The ATM Usage Patterns Analysis dashboard aims to provide comprehensive insights into ATM transaction behaviours, geographic distribution, usage trends, and operational metrics across different states and location types. It helps identify peak usage hours, transaction volumes, maintenance needs, and cash management requirements to support data-driven decisions for ATM network optimization and customer service improvement.

**FEATURES:**

* State: The state where the ATM is located (Categorical)
* Average Amount: The average transaction amount (Numeric)
* Transaction Count: Number of transactions (Numeric)
* Max Amount: Maximum transaction amount (Numeric)
* Min Amount: Minimum transaction amount (Numeric)
* Location Type: Type of location where ATM is installed (Categorical)
* Peak Hour: Hour of the day with highest usage (Numeric)
* Malfunctions: Number of malfunctions by state (Numeric)
* Cash Refill Frequency: Frequency of cash refills by state (Numeric)
* ATM Age: Average age of ATMs (Numeric)
* Last Maintenance Date: Date of last maintenance (Date)

**METHODOLOGY:**

1. **Data Cleaning and Preparation:**
   * Checked for data consistency and accuracy.
   * Cleaned the data by Removing null, blanks
   * Using statistical mean in Python.
   * Imported the data into Power BI.
   * Transformed the data by using necessary functions like transpose, use first row as header.
   * Created necessary calculated columns or measures.
2. **Data Visualization:**
   * Created visuals to represent the key metrics and trends.
   * Used appropriate chart types to effectively communicate the data.

**OUTPUT:**

A screenshot of a computer

Description automatically generated

**RESULT ANALYSIS:**

1. Box Plot Analysis:

* Median (Central Line):
* California (CA) has the highest median transaction amount.
* Arizona (AZ) and New York (NY) show lower median values.
* Texas (TX) and Pennsylvania (PA) seem to have similar median values, lower than CA.
* Illinois (IL) has the lowest median transaction amount.
* Interquartile Range (IQR - Box Size):
  + Texas (TX) shows the largest IQR, indicating the most variability in transaction amounts.
  + Pennsylvania (PA) displays the second-largest IQR, suggesting a wide range of transaction amounts.
  + Arizona (AZ) has a smaller IQR compared to the states mentioned above.
  + New York (NY) and California (CA) have similar, moderately sized IQRs, smaller than TX and PA but still showing significant variability.
  + Illinois (IL) shows the smallest IQR, suggesting the most consistent transaction amounts among all states.
* Whiskers and Outliers:
  + All states show upper whiskers extending to around $7000-$8000, indicating some high-value transactions across all regions.
  + Lower whiskers vary more, with NY and CA extending lower than other states, suggesting more small transactions in these areas.
  + Several outliers are visible, particularly for NY, CA, and TX, representing extremely high transaction amounts.
* Skewness:
* All distributions appear positively skewed (right-skewed), as the upper whiskers are longer than the lower whiskers.

1. Distribution by Location Type:
   * Banks have the highest share of ATMs at 20.4%
   * Malls follow closely at 21.8%
   * Supermarkets (SM) account for 19.8%
   * Convenience stores (CS) have 19.2%
   * Gas stations have the lowest share at 18.8%
2. Transactions by State:
   * California (CA) has the highest number of transactions
   * Arizona (AZ) and New York (NY) follow
   * Pennsylvania (PA) and Texas (TX) have similar transaction levels
   * Illinois (IL) has the lowest number of transactions
3. Peak Hour Analysis:
   * Major peaks observed around 6-7 AM, 12-1 PM, and 5-6 PM
   * Evening peak (5-6 PM) is second highest, possibly due to after-work withdrawals
   * Early morning peak suggests pre-work withdrawals
4. Transaction Metrics:
   * Average Amount: $263.09
   * Transaction Count: 283.72 (likely an average per ATM)
   * Max Amount: $1,230
   * Min Amount: $54.77
5. Geographic Distribution:
   * The map shows concentration in the eastern and western coastal areas
   * Midwest and southern states appear to have lower ATM density
6. Malfunctions by State:

* California has the highest number of malfunctions, correlating with its high transaction count
* Illinois has the lowest number of malfunctions

1. Cash Refill Frequency:

* Texas and New York seem to require more frequent cash refills
* Illinois has the lowest cash refill frequency

1. ATM Operational Metrics:

* Average ATM Age: 9.78 years
* Last Maintenance Date: 2024-07-22

**SUMMARY OF ANALYSIS:**

The ATM Usage Patterns dashboard reveals significant insights into transaction behaviors and ATM distribution. Banks and malls are the most common ATM locations, suggesting high foot traffic in these areas.

California consistently leads in various metrics, including transaction volume and malfunctions, indicating high usage but also increased maintenance needs. The peak hour analysis reveals three main usage spikes throughout the day, which can inform staffing and maintenance schedules.

The wide range between minimum and maximum transaction amounts ($54.77 to $1,230) suggests diverse user needs, from small cash withdrawals to larger transactions.

The geographic distribution highlights potential areas for ATM expansion, particularly in the Midwest and southern states where coverage appears less dense.

The box plot reveals variations in transaction amounts across states, with California and Texas showing wider ranges. This could reflect diverse economic activities or customer bases in these states.

The addition of malfunction data and cash refill frequency offers insights into operational challenges. States with high transaction volumes like California and New York also show higher maintenance needs, suggesting a correlation between usage and wear.

The average ATM age of 9.78 years and the recent maintenance date indicate an aging fleet that's being actively maintained. This could inform decisions on ATM replacement or upgrade strategies.