Situation: AAL, an Australian clothing company, is growing and looking to expand its business.

Task: The Head of Sales needs to analyze fourth-quarter sales data to identify the highest and lowest-performing states. This will help the company decide where to invest and how to improve sales.

Action:

1. Analyze sales data for each state from the fourth quarter.
2. Identify the states generating the most revenue.
3. Identify the states generating the least revenue.
4. Provide insights and recommend sales programs based on the data.

Result: To provide a clear, data-driven analysis that helps AAL's management make informed decisions about where to expand and how to boost sales in underperforming areas for the upcoming year.

Import required libs

In [61]:

```
import pandas as pd
import numpy as np
import scipy.stats as stats
import matplotlib.pyplot as plt
import seaborn as sns
```

Load dataset into dataframe

In [62]:

```
df = pd.read_csv('../dataset/AusApparalSales4thQrt2020.csv')
df.head()
```

Out[62]:

	Date	Time	State	Group	Unit	Sales
0	1-Oct-2020	Morning	WA	Kids	8	20000
1	1-Oct-2020	Morning	WA	Men	8	20000
2	1-Oct-2020	Morning	WA	Women	4	10000
3	1-Oct-2020	Morning	WA	Seniors	15	37500
4	1-Oct-2020	Afternoon	WA	Kids	3	7500

Do some quick data analysis.

In [63]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7560 entries, 0 to 7559
Data columns (total 6 columns):
 #   Column  Non-Null Count  Dtype 
---  ------  --------------  ----- 
 0   Date    7560 non-null   object
 1   Time    7560 non-null   object
 2   State   7560 non-null   object
 3   Group   7560 non-null   object
 4   Unit    7560 non-null   int64 
 5   Sales   7560 non-null   int64 
dtypes: int64(2), object(4)
memory usage: 354.5+ KB
```

In [64]:

```
df.describe()
```

Out[64]:

	Unit	Sales
count	7560.000000	7560.000000
mean	18.005423	45013.558201
std	12.901403	32253.506944
min	2.000000	5000.000000
25%	8.000000	20000.000000
50%	14.000000	35000.000000
75%	26.000000	65000.000000
max	65.000000	162500.000000

In [65]:

```
df.columns
```

Out[65]:

```
Index(['Date', 'Time', 'State', 'Group', 'Unit', 'Sales'], dtype='object')
```

In [66]:

```
#find all possible values for object columns
for col in df.select_dtypes(include=['object']).columns:
    print(f"{col}: {df[col].value_counts().index.tolist()}")
```

```
Date: ['1-Oct-2020', '2-Oct-2020', '3-Oct-2020', '4-Oct-2020', '5-Oct-2020', '6-Oc
t-2020', '7-Oct-2020', '8-Oct-2020', '9-Oct-2020', '10-Oct-2020', '11-Oct-2020', '1
2-Oct-2020', '13-Oct-2020', '14-Oct-2020', '15-Oct-2020', '16-Oct-2020', '17-Oct-202
0', '18-Oct-2020', '19-Oct-2020', '20-Oct-2020', '21-Oct-2020', '22-Oct-2020', '23-O
ct-2020', '24-Oct-2020', '25-Oct-2020', '26-Oct-2020', '27-Oct-2020', '28-Oct-2020',
'29-Oct-2020', '30-Oct-2020', '1-Nov-2020', '2-Nov-2020', '3-Nov-2020', '4-Nov-202
0', '5-Nov-2020', '6-Nov-2020', '7-Nov-2020', '8-Nov-2020', '9-Nov-2020', '10-Nov-20
20', '11-Nov-2020', '12-Nov-2020', '13-Nov-2020', '14-Nov-2020', '15-Nov-2020', '16-
Nov-2020', '17-Nov-2020', '18-Nov-2020', '19-Nov-2020', '20-Nov-2020', '21-Nov-202
0', '22-Nov-2020', '23-Nov-2020', '24-Nov-2020', '25-Nov-2020', '26-Nov-2020', '27-N
ov-2020', '28-Nov-2020', '29-Nov-2020', '30-Nov-2020', '1-Dec-2020', '2-Dec-2020',
'3-Dec-2020', '4-Dec-2020', '5-Dec-2020', '6-Dec-2020', '7-Dec-2020', '8-Dec-2020',
'9-Dec-2020', '10-Dec-2020', '11-Dec-2020', '12-Dec-2020', '13-Dec-2020', '14-Dec-20
20', '15-Dec-2020', '16-Dec-2020', '17-Dec-2020', '18-Dec-2020', '19-Dec-2020', '20-
Dec-2020', '21-Dec-2020', '22-Dec-2020', '23-Dec-2020', '24-Dec-2020', '25-Dec-202
0', '26-Dec-2020', '27-Dec-2020', '28-Dec-2020', '29-Dec-2020', '30-Dec-2020']
Time: [' Morning', ' Afternoon', ' Evening']
State: [' WA', ' NT', ' SA', ' VIC', ' QLD', ' NSW', ' TAS']
Group: [' Kids', ' Men', ' Women', ' Seniors']
```

Data Analysis

1. Data Wrangling

a. Identify missing data

In [67]:

```python
#Althouh from describe we can see that there are no null values, we can still check
print(df.isna().sum())
print(df.notna().sum())
print(df.isnull().sum())
print(f'there are {df.isnull().sum().sum()} null values in the dataset')
#Check for duplicates
print(f'there are {df.duplicated().sum()} duplicate rows in the dataset')
```

```
Date     0
Time     0
State    0
Group    0
Unit     0
Sales    0
dtype: int64
Date     7560
Time     7560
State    7560
Group    7560
Unit     7560
Sales    7560
dtype: int64
Date     0
Time     0
State    0
Group    0
Unit     0
Sales    0
dtype: int64
there are 0 null values in the dataset
there are 0 duplicate rows in the dataset
```

Result 1.a As per above analysis there is no missing data in the dataset

b. Treat Missing Values

Result 1.b As there is no missing/incorrect value we do not need to use any of the imputation techniques

c. Standardize or normalize the data

In [68]:
```
df.describe()
```

Out[68]:

	Unit	Sales
count	7560.000000	7560.000000
mean	18.005423	45013.558201
std	12.901403	32253.506944
min	2.000000	5000.000000
25%	8.000000	20000.000000
50%	14.000000	35000.000000
75%	26.000000	65000.000000
max	65.000000	162500.000000

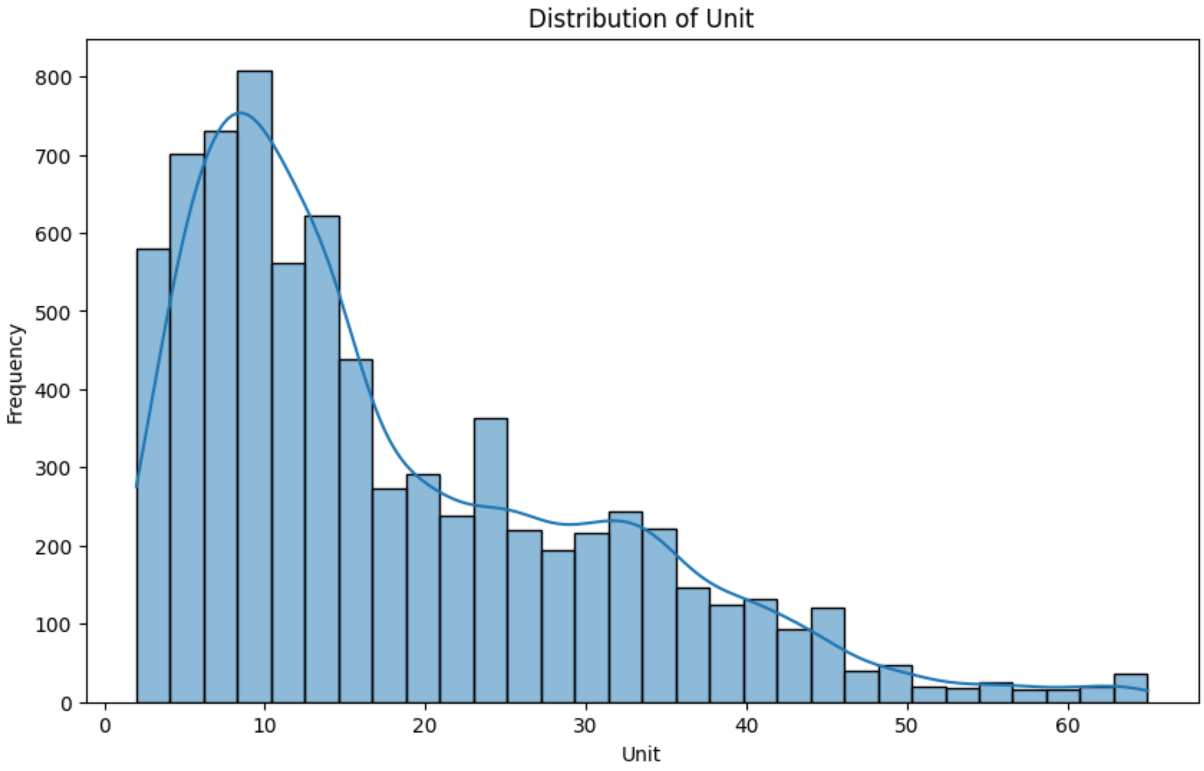
In [69]:

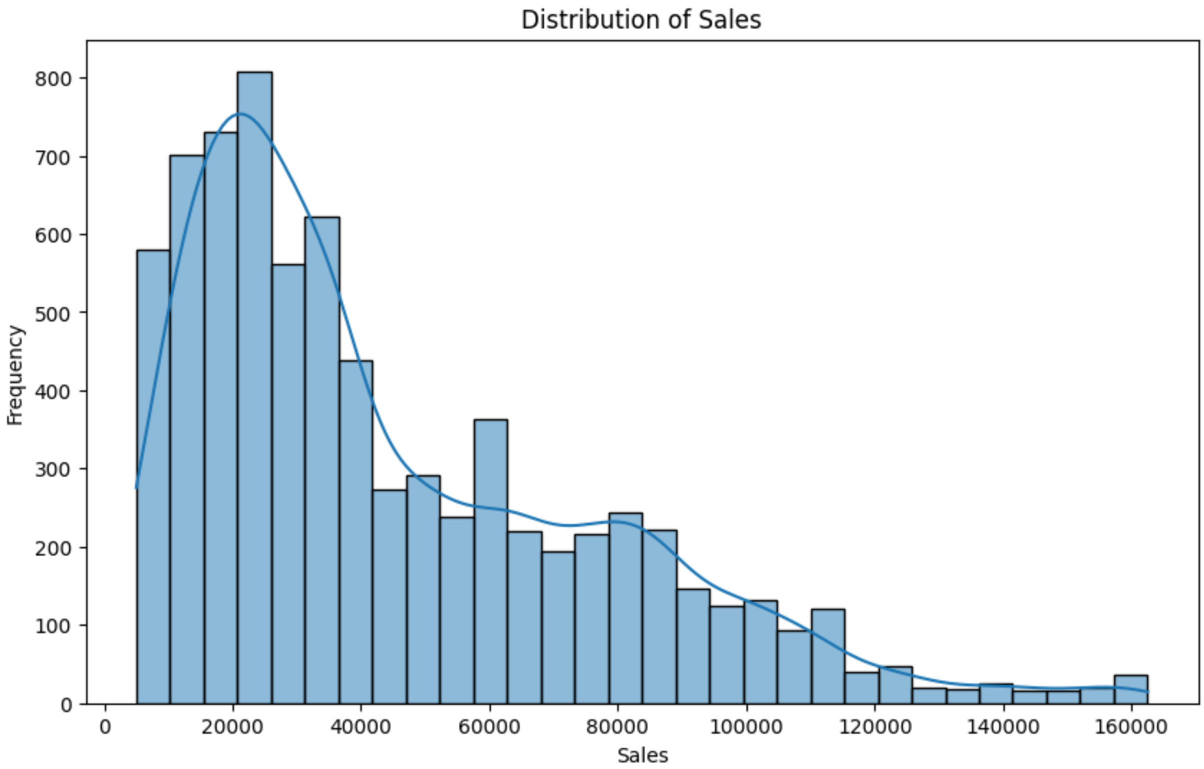
```
#identify columns for normalization using box-cox method
_,lmbda = stats.boxcox(df['Sales'])
print(f'Skewness lambda for Sales: {lmbda}')
if lmbda > .25:
    print('square root transformation is recommended')
elif lmbda < .25 and lmbda > 0:
    print('log transformation is recommended')
```

```
Skewness lambda for Sales: 0.14855568578334477
log transformation is recommended

log transformation is recommended
```

In [70]:

```
#visualise the distribution of the columns
def plot_distribution(df, column):
    plt.figure(figsize=(10, 6))
    sns.histplot(df[column], kde=True, bins=30)
    plt.title(f'Distribution of {column}')
    plt.xlabel(column)
    plt.ylabel('Frequency')
    plt.show()

for col in df.select_dtypes(include=[np.number]).columns:
    plot_distribution(df, col)
```





Although Sales column could be **log normalised**, we have an **interesting observation** Sales and Unit column look **highly correlated**.

```
In [71]: # visualise correlation between numerical columns
         df[df.select_dtypes(include=[np.number]).columns].corr()
```

Out[71]:

	Unit	Sales
Unit	1.0	1.0
Sales	1.0	1.0

Recommend Performing **Feature Selection** by **Dropping** Sales column and **Renaming** Unit to Units Sold for clarity as Sales and Unit column correlation is 1 and Sales is a constant multiple of Unit

```
In [72]: #df.drop(columns=['Sales'], inplace=True)  # Drop 'Sales' column as it is not neede
         #df.rename(columns={'Unit': 'Units_Sold'}, inplace=True)  # Rename for consistency
         #df.head()
```

```
In [73]: #df.describe()
```

Transforming date column from object to date

```
In [84]: df['Date'] = pd.to_datetime(df['Date'])
         df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7560 entries, 0 to 7559
Data columns (total 6 columns):
 #   Column  Non-Null Count  Dtype         
---  ------  --------------  -----         
 0   Date    7560 non-null   datetime64[ns]
 1   Time    7560 non-null   object        
 2   State   7560 non-null   object        
 3   Group   7560 non-null   object        
 4   Unit    7560 non-null   int64         
 5   Sales   7560 non-null   int64         
dtypes: datetime64[ns](1), int64(2), object(3)
memory usage: 354.5+ KB
```

Result 1.c Although **Sales column** could be **log normalized**, but it is **directly correlated** with Unit column i.e sales = 2500 per unit, so we recommend **feature selection** to be applied and Sales column be **dropped**.

d. Apply group_by()

In [75]:

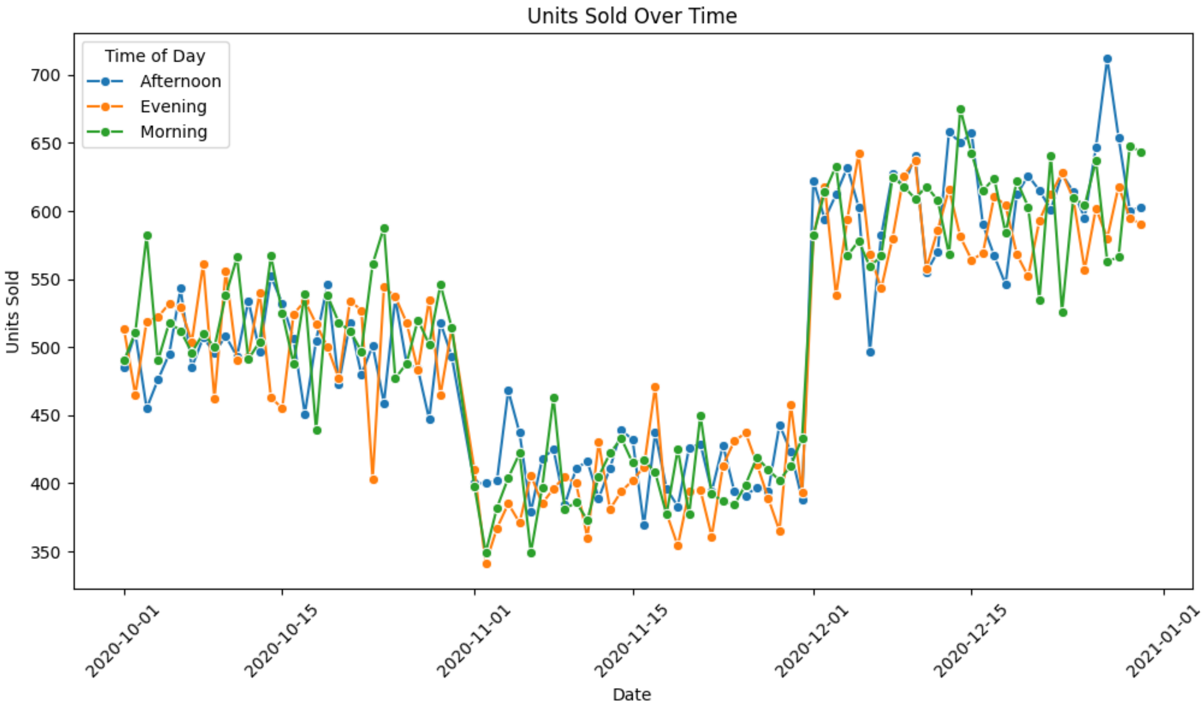
```
#group by date and time and sum the units sold
df_grouped = df.groupby(['Date','Time']).agg({'Unit': 'sum'}).reset_index()
df_grouped.head()
```

Out[75]:

	Date	Time	Unit
0	2020-10-01	Afternoon	485
1	2020-10-01	Evening	513
2	2020-10-01	Morning	490
3	2020-10-02	Afternoon	510
4	2020-10-02	Evening	465

In [76]:

```
#plot distribution of units sold over date by time of day
plt.figure(figsize=(12, 6))
sns.lineplot(data=df_grouped, x='Date', y='Unit', hue='Time', marker='o')
plt.title('Units Sold Over Time')
plt.xlabel('Date')
plt.ylabel('Units Sold')
plt.xticks(rotation=45)
plt.legend(title='Time of Day')
plt.show()
```

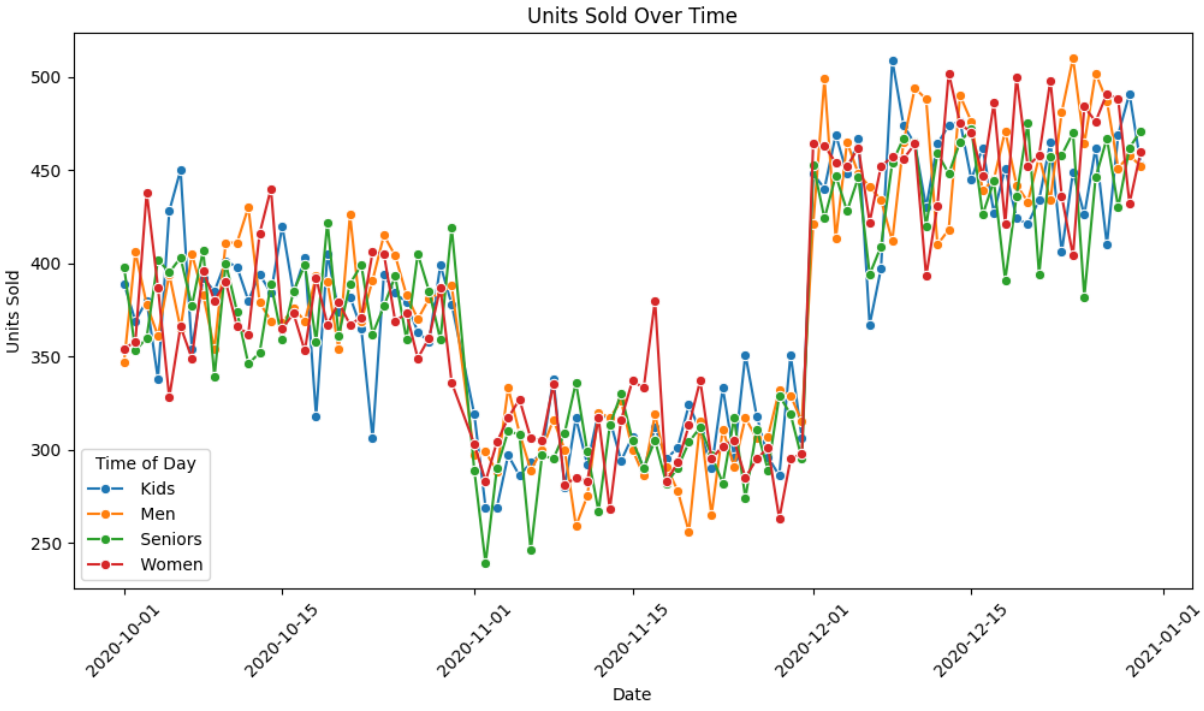


In [77]:
```
#group by date and group and sum the units sold
df_grouped = df.groupby(['Date', 'Group']).agg({'Unit': 'sum'}).reset_index()
df_grouped.head()
```

Out[77]:

	Date	Group	Unit
0	2020-10-01	Kids	389
1	2020-10-01	Men	347
2	2020-10-01	Seniors	398
3	2020-10-01	Women	354
4	2020-10-02	Kids	369

In [78]:
```
#plot distribution of units sold over date by group
plt.figure(figsize=(12, 6))
sns.lineplot(data=df_grouped, x='Date', y='Unit', hue='Group', marker='o')
plt.title('Units Sold Over Time')
plt.xlabel('Date')
plt.ylabel('Units Sold')
plt.xticks(rotation=45)
plt.legend(title='Time of Day')
plt.show()
```



In [79]:

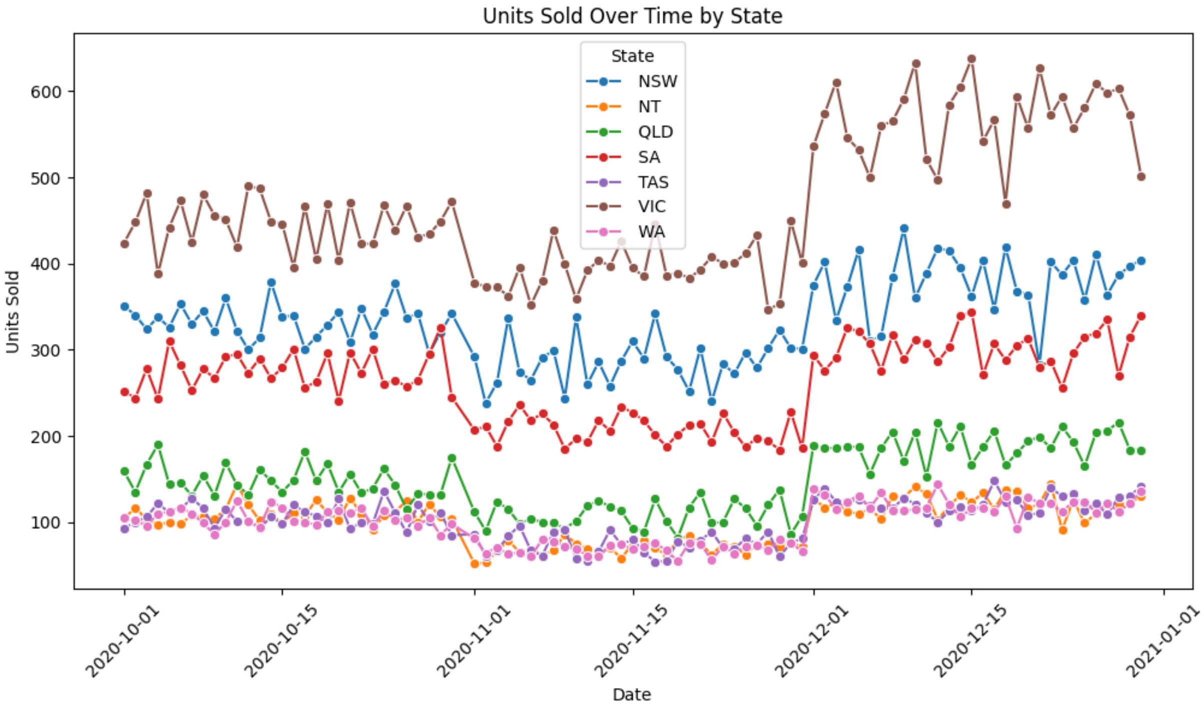
```
#group by date and State and sum the units sold
df_grouped = df.groupby(['Date', 'State']).agg({'Unit': 'sum'}).reset_index()
df_grouped.head()
```

Out[79]:

	Date	State	Unit
0	2020-10-01	NSW	351
1	2020-10-01	NT	104
2	2020-10-01	QLD	159
3	2020-10-01	SA	252
4	2020-10-01	TAS	93

In [80]:

```
#plot distribution of units sold over date by state
plt.figure(figsize=(12, 6))
sns.lineplot(data=df_grouped, x='Date', y='Unit', hue='State', marker='o')
plt.title('Units Sold Over Time by State')
plt.xlabel('Date')
plt.ylabel('Units Sold')
plt.xticks(rotation=45)
plt.legend(title='State')
plt.show()
```



Result 1.d by grouping data with date and across Time,Group,State, we can see when grouping across State we can abserve some interesting trend, where some states are doing much better than others. We **recommend** grouping data with date and state to merge them across Group/Time.

2. Data analysis

a. Discriptive statistical analysis

In [81]:
```
df.describe()
```

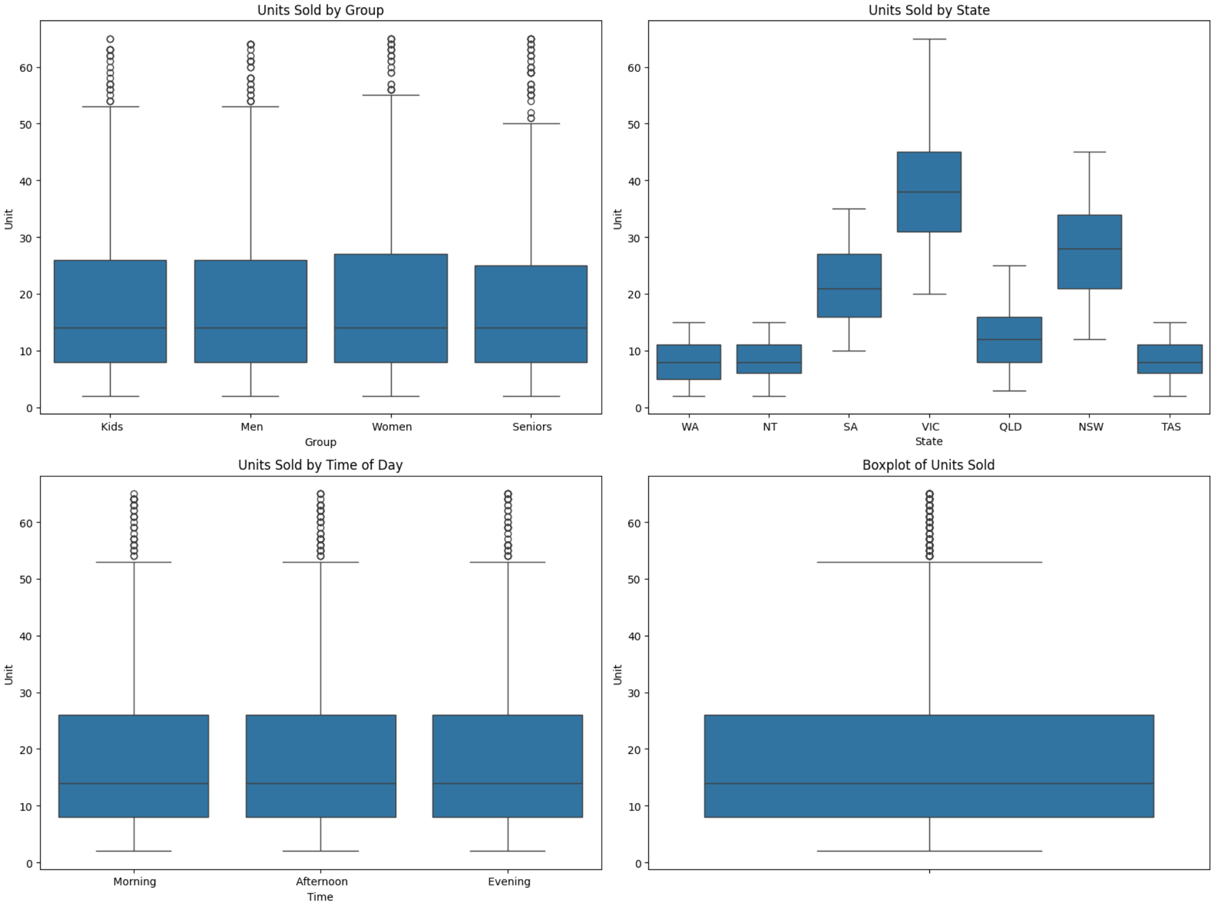
Out[81]:

	Date	Unit	Sales
count	7560	7560.000000	7560.000000
mean	2020-11-15 04:00:00.000000256	18.005423	45013.558201
min	2020-10-01 00:00:00	2.000000	5000.000000
25%	2020-10-23 00:00:00	8.000000	20000.000000
50%	2020-11-15 12:00:00	14.000000	35000.000000
75%	2020-12-08 00:00:00	26.000000	65000.000000
max	2020-12-30 00:00:00	65.000000	162500.000000
std	NaN	12.901403	32253.506944

In [97]:
```
# Check for outliers in the 'Unit' column using IQR method
Q1 = df['Unit'].quantile(0.25)
Q3 = df['Unit'].quantile(0.75)
```

```
IQR = Q3 - Q1
outliers = df[(df['Unit'] < (Q1 - 1.5 * IQR)) | (df['Unit'] > (Q3 + 1.5 * IQR))]
print(f'There are {outliers.shape[0]} outliers in the dataset based on the IQR meth

fig, axs = plt.subplots(2, 2, figsize=(16, 12))
sns.boxplot(x='Group', y='Unit', data=df, ax=axs[0, 0])
sns.boxplot(x='State', y='Unit', data=df, ax=axs[0, 1])
sns.boxplot(x='Time', y='Unit', data=df, ax=axs[1, 0])
sns.boxplot(y='Unit', data=df, ax=axs[1, 1])
axs[0, 0].set_title('Units Sold by Group')
axs[0, 1].set_title('Units Sold by State')
axs[1, 0].set_title('Units Sold by Time of Day')
axs[1, 1].set_title('Boxplot of Units Sold')
plt.tight_layout()
plt.show()
```

```
There are 123 outliers in the dataset based on the IQR method.
```



b/c. Group with highest ands lowest sales

In [82]:

```
#cut and slice the table to find the top combination with the highest sales
combinations = df.groupby(['Group', 'State']).agg({'Unit': 'sum'}).reset_index()
top_combinations = combinations.sort_values(by='Unit', ascending=False).head(3)
lowest_combinations = combinations.sort_values(by='Unit', ascending=True).head(3)
print("Top 10 combinations of Group and State with lowest sales:")
print(lowest_combinations)
print("Top 10 combinations of Group and State with highest sales:")
print(top_combinations)
```

```
Top 10 combinations of Group and State with lowest sales:
       Group State  Unit
27     Women    WA  2105
15   Seniors    NT  2186
20   Seniors    WA  2205
Top 10 combinations of Group and State with highest sales:
     Group State   Unit
26   Women   VIC  10593
12     Men   VIC  10563
5     Kids   VIC  10544
```

Result 2.b/c the best group is Kids in VIC with 10544 units sold and worst grouping is Women in QA with 2105 units sold.

d. Generate weekly, monthly, and quarterly reports to document and present the results of the analysis conducted.

In [93]:

```python
def generate_pivot_report(df, freq='W'):
    # Set 'Date' as index temporarily for grouping
    df_temp = df.set_index('Date')
    pivot_table = df_temp.pivot_table(
        index=pd.Grouper(freq=freq),
        columns=['Group', 'State'],
        values='Unit',
        aggfunc='sum'
    )
    return pivot_table

# Generate weekly report
weekly_report = generate_pivot_report(df, freq='W')
# Generate monthly report
monthly_report = generate_pivot_report(df, freq='M')
# Generate quarterly report
quarterly_report = generate_pivot_report(df, freq='Q')
# Display the reports
print("Weekly Report:")
display(weekly_report)
print("Monthly Report:")
display(monthly_report)
print("Quarterly Report:")
display(quarterly_report)
```

```
Weekly Report:
```

```
C:\Users\prate\AppData\Local\Temp\ipykernel_5784\2818158233.py:5: FutureWarning: 'M'
is deprecated and will be removed in a future version, please use 'ME' instead.
  index=pd.Grouper(freq=freq),
C:\Users\prate\AppData\Local\Temp\ipykernel_5784\2818158233.py:5: FutureWarning: 'Q'
is deprecated and will be removed in a future version, please use 'QE' instead.
  index=pd.Grouper(freq=freq),
```

Group	Kids							Men			...	Seniors		
State	NSW	NT	QLD	SA	TAS	VIC	WA	NSW	NT	QLD	...	TAS	VIC	WA
Date														
2020-10-04	347	111	166	201	95	457	99	335	100	168	...	114	403	105
2020-10-11	656	207	249	499	205	810	182	597	198	259	...	182	823	178
2020-10-18	570	200	283	461	199	765	205	540	198	281	...	179	780	197
2020-10-25	574	175	243	483	201	752	182	646	206	257	...	200	778	209
2020-11-01	455	177	230	404	149	644	137	465	155	202	...	154	640	131
2020-11-08	474	119	180	388	123	634	132	509	121	192	...	120	658	105
2020-11-15	528	107	181	326	129	742	113	474	130	192	...	135	691	139
2020-11-22	471	134	199	337	133	736	111	489	118	192	...	125	689	122
2020-11-29	516	136	198	375	154	696	156	577	121	169	...	135	680	112
2020-12-06	672	196	274	471	211	907	214	622	190	297	...	197	875	204
2020-12-13	656	188	368	577	199	990	234	660	220	315	...	208	1060	213
2020-12-20	604	216	361	542	205	978	200	691	236	323	...	207	990	196
2020-12-27	610	191	341	505	208	1004	193	694	232	360	...	201	1035	203
2021-01-03	302	123	131	237	99	429	92	310	80	150	...	103	424	91

14 rows × 28 columns

```
Monthly Report:
```

Group	Kids							Men			...	Seniors		
State	NSW	NT	QLD	SA	TAS	VIC	WA	NSW	NT	QLD	...	TAS	VIC	WA
Date														
2020-10-31	2536	856	1135	1996	820	3325	786	2508	849	1142	...	809	3347	795
2020-11-30	2125	533	817	1524	589	3017	548	2196	512	793	...	554	2893	518
2020-12-31	2774	891	1452	2286	901	4202	916	2905	944	1422	...	897	4286	892

3 rows × 28 columns

```
Quarterly Report:
```

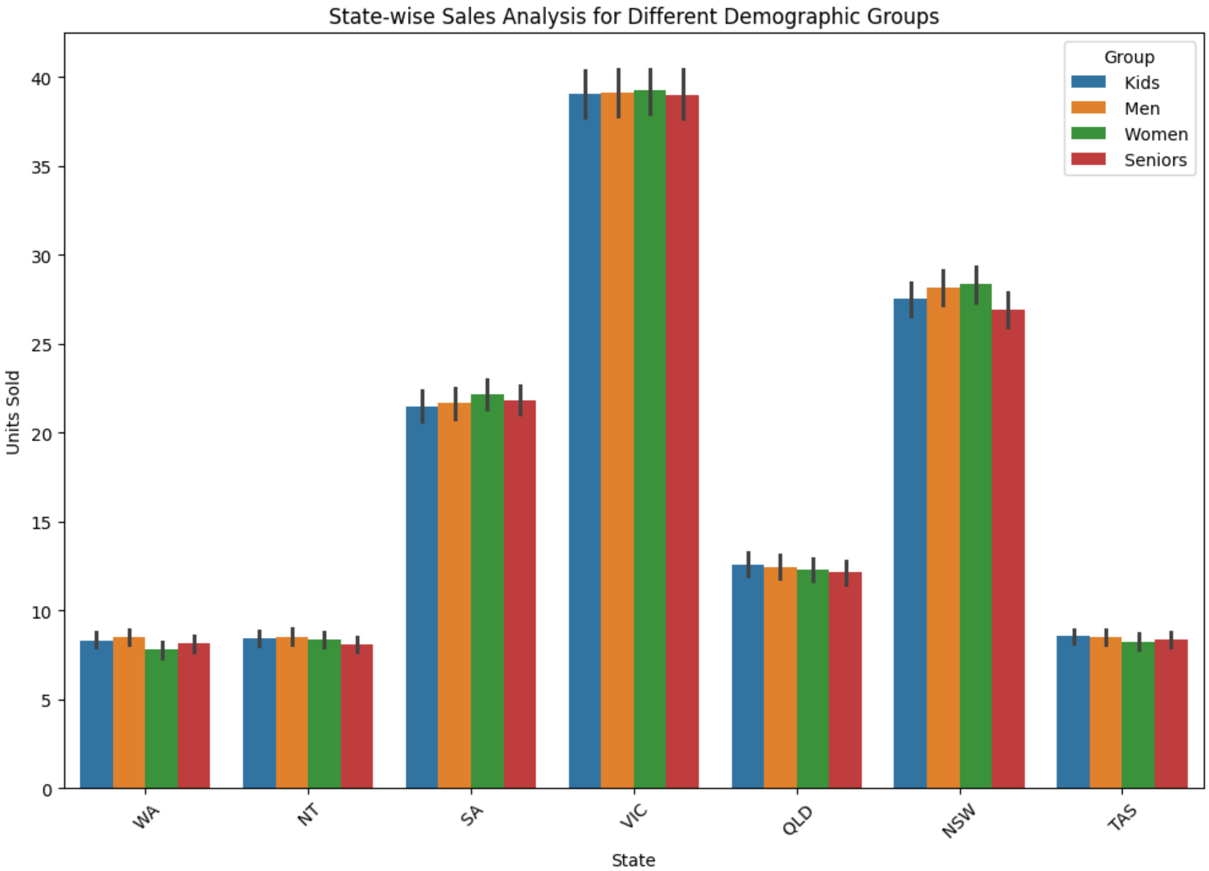
Group	Kids							Men			...	S	
State	NSW	NT	QLD	SA	TAS	VIC	WA	NSW	NT	QLD	...	TAS	VIC
Date													
2020-12-31	7435	2280	3404	5806	2310	10544	2250	7609	2305	3357	...	2260	10526

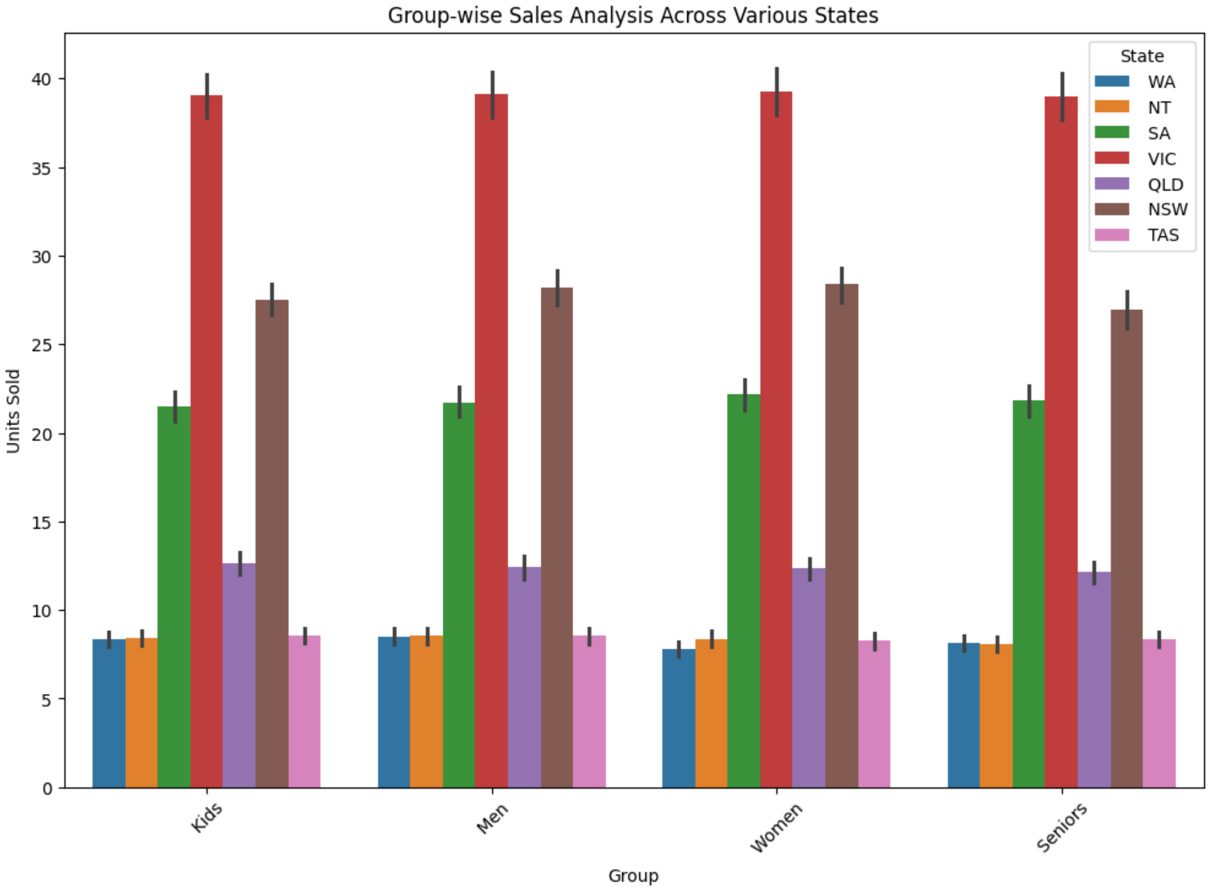
1 rows × 28 columns

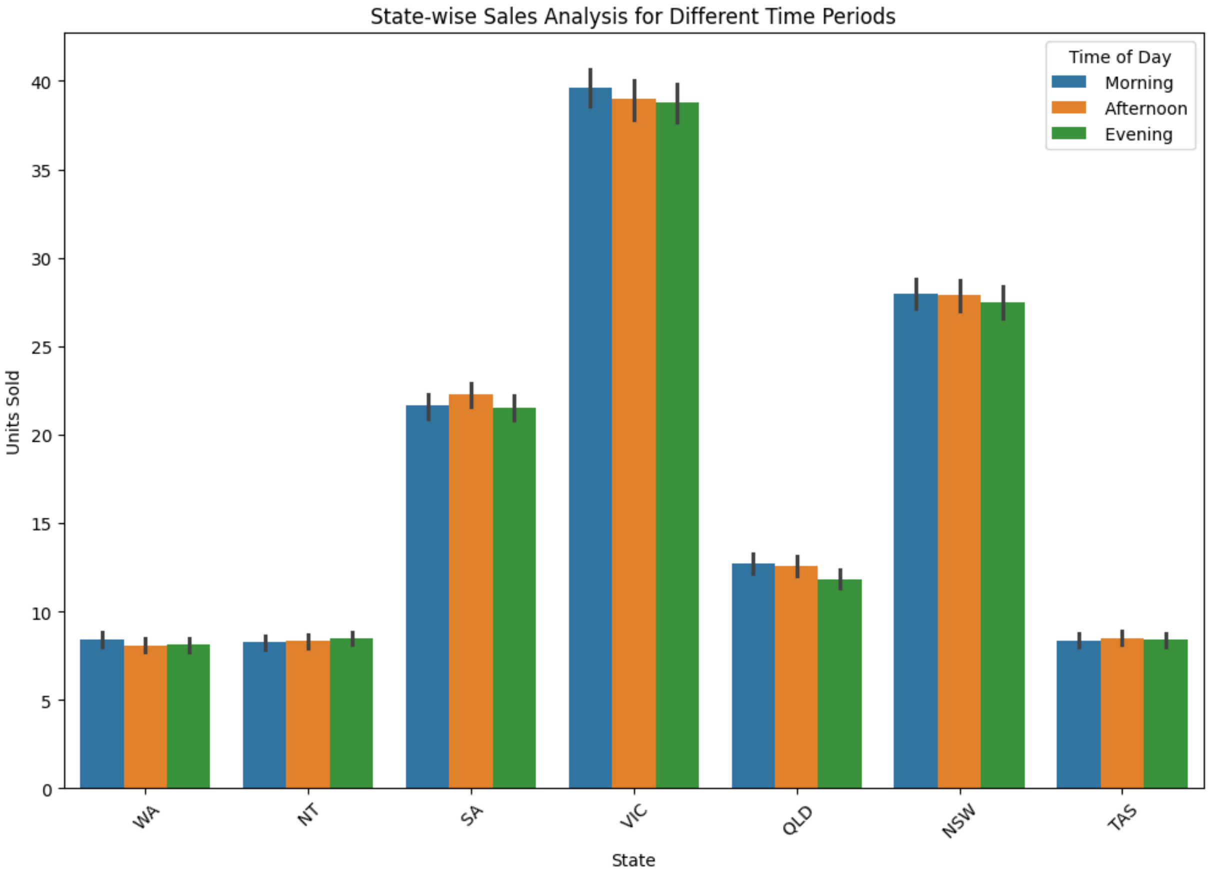
3. Data visualization

a. construct a dashboard for the head of sales and marketing

```
In [87]: #construct a dashboard for the head of sales and marketing
         #state-wise sales analysis for different demographic groups
         def state_wise_sales_analysis(df):
             plt.figure(figsize=(12, 8))
             sns.barplot(data=df, x='State', y='Unit', hue='Group')
             plt.title('State-wise Sales Analysis for Different Demographic Groups')
             plt.xlabel('State')
             plt.ylabel('Units Sold')
             plt.xticks(rotation=45)
             plt.legend(title='Group')
             plt.show()
         state_wise_sales_analysis(df)
         #Group-wise sales analysis (Kids, Women, Men, and Seniors) across various states.
         def group_wise_sales_analysis(df):
             plt.figure(figsize=(12, 8))
             sns.barplot(data=df, x='Group', y='Unit', hue='State')
             plt.title('Group-wise Sales Analysis Across Various States')
             plt.xlabel('Group')
             plt.ylabel('Units Sold')
             plt.xticks(rotation=45)
             plt.legend(title='State')
             plt.show()
         group_wise_sales_analysis(df)
         #state-wise sales analysis for different time periods (morning, afternoon, evening)
         def time_period_sales_analysis(df):
             plt.figure(figsize=(12, 8))
             sns.barplot(data=df, x='State', y='Unit', hue='Time')
             plt.title('State-wise Sales Analysis for Different Time Periods')
             plt.xlabel('State')
             plt.ylabel('Units Sold')
             plt.xticks(rotation=45)
             plt.legend(title='Time of Day')
             plt.show()
         time_period_sales_analysis(df)
```


State-wise Sales Analysis for Different Demographic Groups
Units Sold
0
5
10
15
20
25
30
35
40
State
WA
NT
SA
VIC
QLD
NSW
TAS
Group
Kids
Men
Women
Seniors


Group-wise Sales Analysis Across Various States
Units Sold
0
5
10
15
20
25
30
35
40
Group
Kids
Men
Women
Seniors
State
WA
NT
SA
VIC
QLD
NSW
TAS



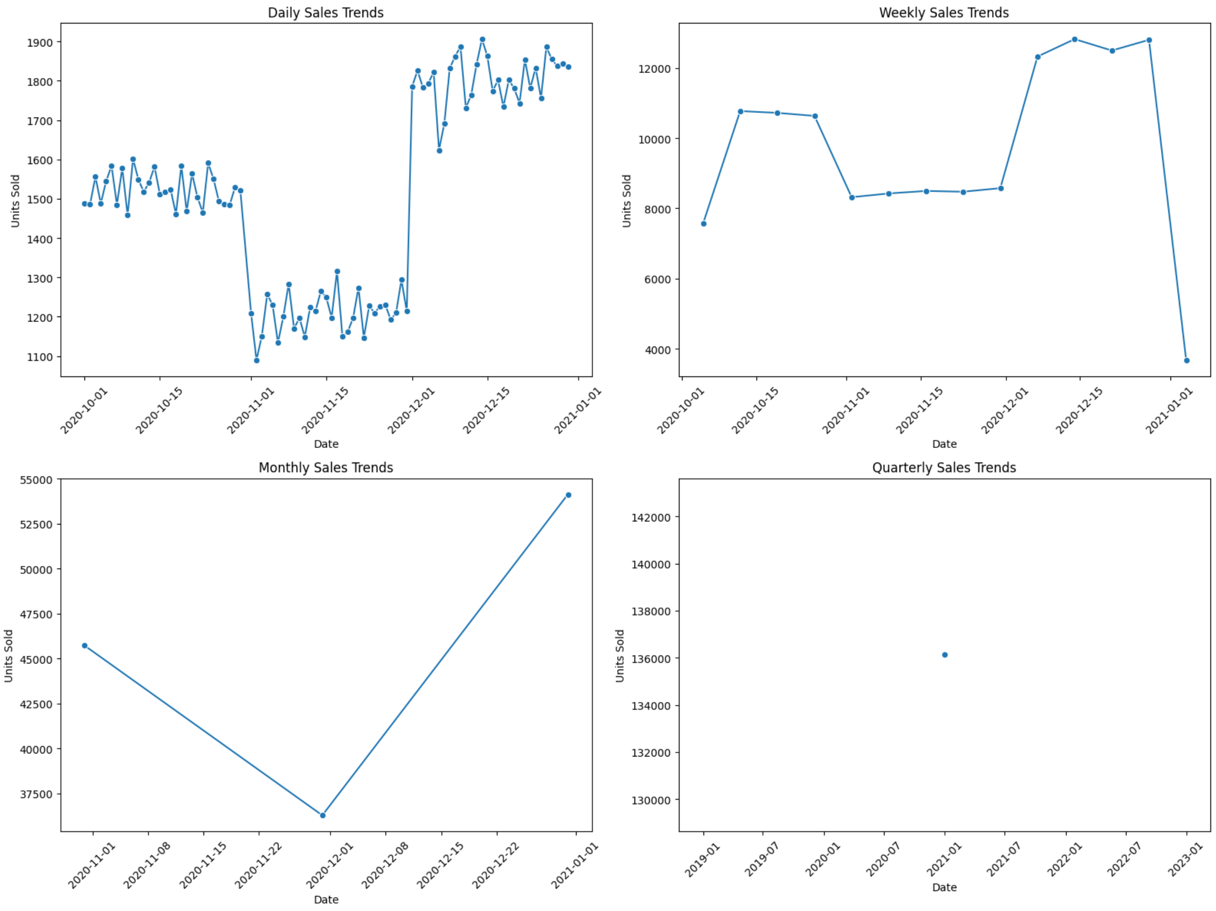
Result 3.a Dashboard little vcariance in data with respect to groupings except by State.

b. construct a dashboard for daily weekly monthly and quarterly charts

In [91]:

```
#Ensure the visualization is clear and accessible for effective decision-making by
#The dashboard must contain daily, weekly, monthly, and quarterly charts.
# Generate daily, weekly, monthly, and quarterly sales trends
def generate_sales_trends(df):
    daily_sales = df.groupby('Date').agg({'Unit': 'sum'}).reset_index()
    weekly_sales = df.resample('W-Mon', on='Date').agg({'Unit': 'sum'}).reset_index
    monthly_sales = df.resample('M', on='Date').agg({'Unit': 'sum'}).reset_index()
    quarterly_sales = df.resample('Q', on='Date').agg({'Unit': 'sum'}).reset_index(

    return daily_sales, weekly_sales, monthly_sales, quarterly_sales
daily_sales, weekly_sales, monthly_sales, quarterly_sales = generate_sales_trends(d
def plot_all_sales_trends(daily, weekly, monthly, quarterly):
    fig, axs = plt.subplots(2, 2, figsize=(16, 12))

    sns.lineplot(data=daily, x='Date', y='Unit', marker='o', ax=axs[0, 0])
    axs[0, 0].set_title('Daily Sales Trends')
    axs[0, 0].set_xlabel('Date')
    axs[0, 0].set_ylabel('Units Sold')
    axs[0, 0].tick_params(axis='x', rotation=45)

    sns.lineplot(data=weekly, x='Date', y='Unit', marker='o', ax=axs[0, 1])
    axs[0, 1].set_title('Weekly Sales Trends')
    axs[0, 1].set_xlabel('Date')
    axs[0, 1].set_ylabel('Units Sold')
    axs[0, 1].tick_params(axis='x', rotation=45)

    sns.lineplot(data=monthly, x='Date', y='Unit', marker='o', ax=axs[1, 0])
    axs[1, 0].set_title('Monthly Sales Trends')
    axs[1, 0].set_xlabel('Date')
    axs[1, 0].set_ylabel('Units Sold')
    axs[1, 0].tick_params(axis='x', rotation=45)

    sns.lineplot(data=quarterly, x='Date', y='Unit', marker='o', ax=axs[1, 1])
    axs[1, 1].set_title('Quarterly Sales Trends')
    axs[1, 1].set_xlabel('Date')
    axs[1, 1].set_ylabel('Units Sold')
    axs[1, 1].tick_params(axis='x', rotation=45)

    plt.tight_layout()
    plt.show()
plot_all_sales_trends(daily_sales, weekly_sales, monthly_sales, quarterly_sales)
# Generate a summary report for the head of sales and marketing
def generate_summary_report(df):
    total_units_sold = df['Unit'].sum()
    total_sales_by_group = df.groupby('Group')['Unit'].sum().reset_index()
    total_sales_by_state = df.groupby('State')['Unit'].sum().reset_index()

    summary = {
        'Total Units Sold': total_units_sold,
        'Total Sales by Group': total_sales_by_group,
        'Total Sales by State': total_sales_by_state
    }

    return summary
```

```
C:\Users\prate\AppData\Local\Temp\ipykernel_5784\875714594.py:7: FutureWarning: 'M'
is deprecated and will be removed in a future version, please use 'ME' instead.
  monthly_sales = df.resample('M', on='Date').agg({'Unit': 'sum'}).reset_index()
C:\Users\prate\AppData\Local\Temp\ipykernel_5784\875714594.py:8: FutureWarning: 'Q'
is deprecated and will be removed in a future version, please use 'QE' instead.
  quarterly_sales = df.resample('Q', on='Date').agg({'Unit': 'sum'}).reset_index()
```



Result 3.c Choose seaborn over Mathplotlib as it has better color schemes, and works better for statistical plots.

4. Report Generation

Sales Analysis Report & Recommendations for Low Sales States

Executive Summary

Analysis of AAL's fourth-quarter sales data reveals significant variation in performance across Australian states and demographic groups. The data-driven insights below highlight the highest and lowest-performing states, with targeted recommendations for improving sales in underperforming regions.

Key Findings

- **Top Performing State:** Victoria (VIC) consistently leads in total units sold across all demographic groups.
- **Lowest Performing States:** Western Australia (WA) and Northern Territory (NT) have

the lowest sales figures, especially for the Women and Seniors groups.

Lowest Sales Combinations (Units Sold)

Group	State	Units Sold
Women	WA	2,105
Seniors	NT	2,186
Seniors	WA	2,205

Highest Sales Combinations (Units Sold)

Group	State	Units Sold
Women	VIC	10,593
Men	VIC	10,563
Kids	VIC	10,544

Recommendations for Low Sales States

1. **Western Australia (WA)**

- **Observation:** WA has the lowest sales for Women (2,105 units) and low sales for Seniors (2,205 units).
- **Recommendation:**
  - **Targeted Promotions:** Launch marketing campaigns focused on Women and Seniors, such as loyalty programs, discounts, or exclusive product lines.
  - **Local Partnerships:** Collaborate with local influencers or community groups to increase brand visibility.
  - **Product Mix Review:** Assess if the current product offerings align with the preferences of Women and Seniors in WA.

2. **Northern Territory (NT)**

- **Observation:** NT shows low sales, especially for Seniors (2,186 units) and Kids (2,280 units).
- **Recommendation:**
  - **Community Engagement:** Organize events or pop-up stores in key locations to boost brand awareness.
  - **Demographic-Specific Offers:** Introduce special bundles or promotions for Seniors and families with children.
  - **Market Research:** Conduct surveys to understand barriers to purchase and tailor strategies accordingly.

Additional Insights

- **Sales are highly correlated with units sold** (Sales = 2,500 × Units), so focusing on increasing unit sales will directly impact revenue.
- **No missing or duplicate data** was found, ensuring reliability of the analysis.
- **Sales trends** show consistent underperformance in WA and NT across all time periods (weekly, monthly, quarterly).

Conclusion

To drive growth in underperforming states, AAL should implement targeted, data-driven marketing and engagement strategies, focusing on the specific demographic groups identified. Continuous monitoring and adaptation of these strategies will be essential for improving sales performance in WA and NT.