Customer Support Ticket Analysis

June 8, 2025

1 OBJECTIVE

1.1 Analyze Customer Support Tickets To Identify Frequently Reported Problems And Suggest Process Improvements To Reduce Response / Resolution Time.

[1]:

```
import pandas as pd
df = pd.read_csv("E:/excel/customer_support_tickets.csv")
df.info()
df.head()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8469 entries, 0 to 8468
Data columns (total 17 columns):
 #   Column                        Non-Null Count  Dtype
---  ------                        --------------  -----
 0   Ticket ID                     8469 non-null   int64
 1   Customer Name                 8469 non-null   object
 2   Customer Email                8469 non-null   object
 3   Customer Age                  8469 non-null   int64
 4   Customer Gender               8469 non-null   object
 5   Product Purchased             8469 non-null   object
 6   Date of Purchase              8469 non-null   object
 7   Ticket Type                   8469 non-null   object
 8   Ticket Subject                8469 non-null   object
 9   Ticket Description            8469 non-null   object
 10  Ticket Status                 8469 non-null   object
 11  Resolution                    2769 non-null   object
 12  Ticket Priority               8469 non-null   object
 13  Ticket Channel                8469 non-null   object
 14  First Response Time           5650 non-null   object
 15  Time to Resolution            2769 non-null   object
 16  Customer Satisfaction Rating  2769 non-null   float64
dtypes: float64(1), int64(2), object(14)
memory usage: 1.1+ MB
```

[1]:

```
   Ticket ID        Customer Name              Customer Email  Customer Age  \
0          1        Marisa Obrien  carrollallison@example.com            32
```

```
1          2         Jessica Rios    clarkeashley@example.com            42
2          3  Christopher Robbins   gonzalestracy@example.com            48
3          4     Christina Dillon    bradleyolson@example.org            27
4          5    Alexander Carroll     bradleymark@example.com            67

  Customer Gender Product Purchased Date of Purchase      Ticket Type  \
0           Other        GoPro Hero       2021-03-22  Technical issue   
1          Female       LG Smart TV       2021-05-22  Technical issue   
2           Other          Dell XPS       2020-07-14  Technical issue   
3          Female  Microsoft Office       2020-11-13  Billing inquiry   
4          Female  Autodesk AutoCAD       2020-02-04  Billing inquiry   

             Ticket Subject  \
0             Product setup   
1  Peripheral compatibility   
2           Network problem   
3            Account access   
4                 Data loss   

                                  Ticket Description  \
0  I'm having an issue with the {product_purchase…   
1  I'm having an issue with the {product_purchase…   
2  I'm facing a problem with my {product_purchase…   
3  I'm having an issue with the {product_purchase…   
4  I'm having an issue with the {product_purchase…   

              Ticket Status                                     Resolution  \
0  Pending Customer Response                                            NaN   
1  Pending Customer Response                                            NaN   
2                     Closed   Case maybe show recently my computer follow.   
3                     Closed  Try capital clearly never color toward story.   
4                     Closed                    West decision evidence bit.   

  Ticket Priority Ticket Channel  First Response Time   Time to Resolution  \
0        Critical   Social media  2023-06-01 12:15:36                  NaN   
1        Critical           Chat  2023-06-01 16:45:38                  NaN   
2             Low   Social media  2023-06-01 11:14:38  2023-06-01 18:05:38   
3             Low   Social media  2023-06-01 07:29:40  2023-06-01 01:57:40   
4             Low          Email  2023-06-01 00:12:42  2023-06-01 19:53:42   

   Customer Satisfaction Rating  
0                           NaN  
1                           NaN  
2                           3.0  
3                           3.0  
4                           1.0  
```

[2]:
```python
print(df.isna().sum())
print(f"Status: {df['Ticket Status'].unique()}")
print(f"Type: {df['Ticket Type'].unique()}")
print(f"Priority: {df['Ticket Priority'].unique()}")
print(f"Channel: {df['Ticket Channel'].unique()}")
```

```
Ticket ID                              0
Customer Name                          0
Customer Email                         0
Customer Age                           0
Customer Gender                        0
Product Purchased                      0
Date of Purchase                       0
Ticket Type                            0
Ticket Subject                         0
Ticket Description                     0
Ticket Status                          0
Resolution                          5700
Ticket Priority                        0
Ticket Channel                         0
First Response Time                 2819
Time to Resolution                  5700
Customer Satisfaction Rating        5700
dtype: int64
Status: ['Pending Customer Response' 'Closed' 'Open']
Type: ['Technical issue' 'Billing inquiry' 'Cancellation request'
 'Product inquiry' 'Refund request']
Priority: ['Critical' 'Low' 'High' 'Medium']
Channel: ['Social media' 'Chat' 'Email' 'Phone']
```

[3]:
```python
df['Ticket Description'] = df['Ticket Description'].str.replace(r'\{.*?\}', '',␣
 ↪regex=True).str.strip()
```

[4]:
```python
df['Ticket Subject'] = df['Ticket Subject'].str.lower().str.strip()
df['Ticket Subject']
```

[4]:
```
0                  product setup
1       peripheral compatibility
2                network problem
3                 account access
4                      data loss
                  …
8464        installation support
8465              refund request
8466              account access
8467               payment issue
8468              hardware issue
Name: Ticket Subject, Length: 8469, dtype: object
```

[5]:
```
df['Resolution'] = df.apply(lambda x: 'Not Yet Resolved' if pd.isna(x['Resolution']) and x['Ticket Status'] in ['Open', 'Pending Customer Response'] else x['Resolution'], axis = 1)
```

[6]:
```
df['Customer Satisfaction Rating'] = df.apply(lambda x: 'Not Rated' if pd.isna(['Customer Satisfaction Rating']) and x['Ticket Status'] != 'Closed' else x['Customer Satisfaction Rating'], axis = 1)
```

[7]:
```
df['Time to Resolution'] = pd.to_datetime(df['Time to Resolution'], errors = 'coerce')
df['First Response Time'] = pd.to_datetime(df['First Response Time'], errors = 'coerce')
```

[8]:
```
df['Resolution Duration(Hrs)'] = (df['Time to Resolution']-df['First Response Time']).dt.total_seconds()/3600
```

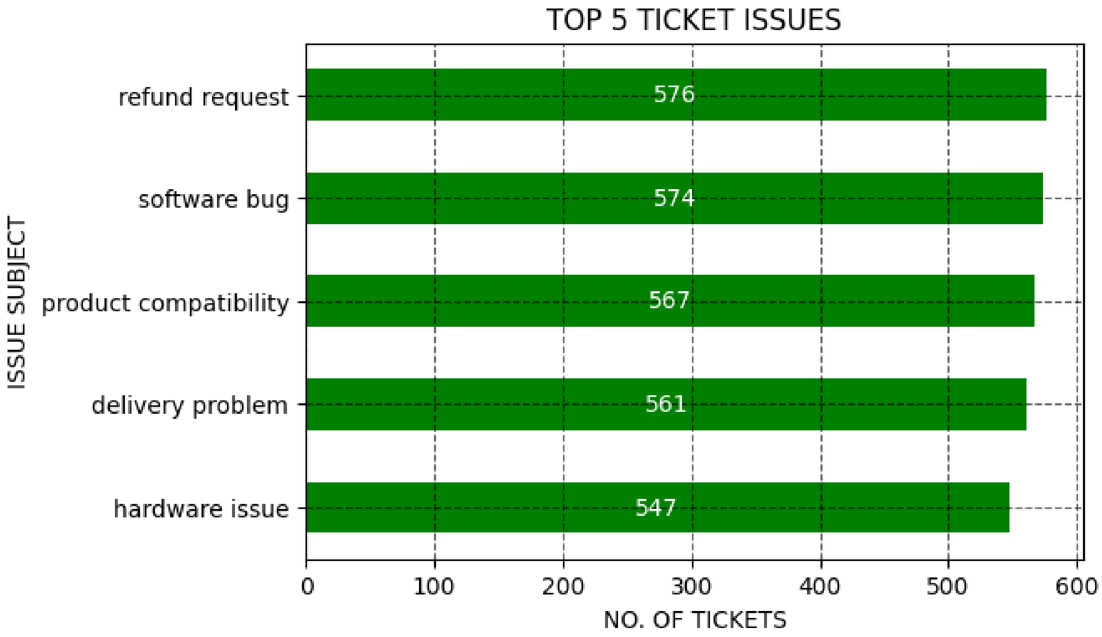
[9]:
```
df[['Ticket Description', 'Ticket Subject', 'Resolution', 'Customer Satisfaction Rating', 'Resolution Duration(Hrs)']].sample(5)
```

[9]:
```
                                     Ticket Description  \
1683  I'm having an issue with the . Please assist.\…
3854  I'm having an issue with the . Please assist. …
2054  I'm having an issue with the . Please assist.\…
4548  I've noticed a software bug in the  app. It's …
1792  I'm having an issue with the . Please assist.\…

              Ticket Subject        Resolution  Customer Satisfaction Rating  \
1683        delivery problem  Not Yet Resolved                           NaN
3854           product setup  Not Yet Resolved                           NaN
2054            software bug  Not Yet Resolved                           NaN
4548  product recommendation  Not Yet Resolved                           NaN
1792            software bug  Not Yet Resolved                           NaN

      Resolution Duration(Hrs)
1683                       NaN
3854                       NaN
2054                       NaN
4548                       NaN
1792                       NaN
```

2 MOST FREQUENT ISSUES (SUBJECTS)

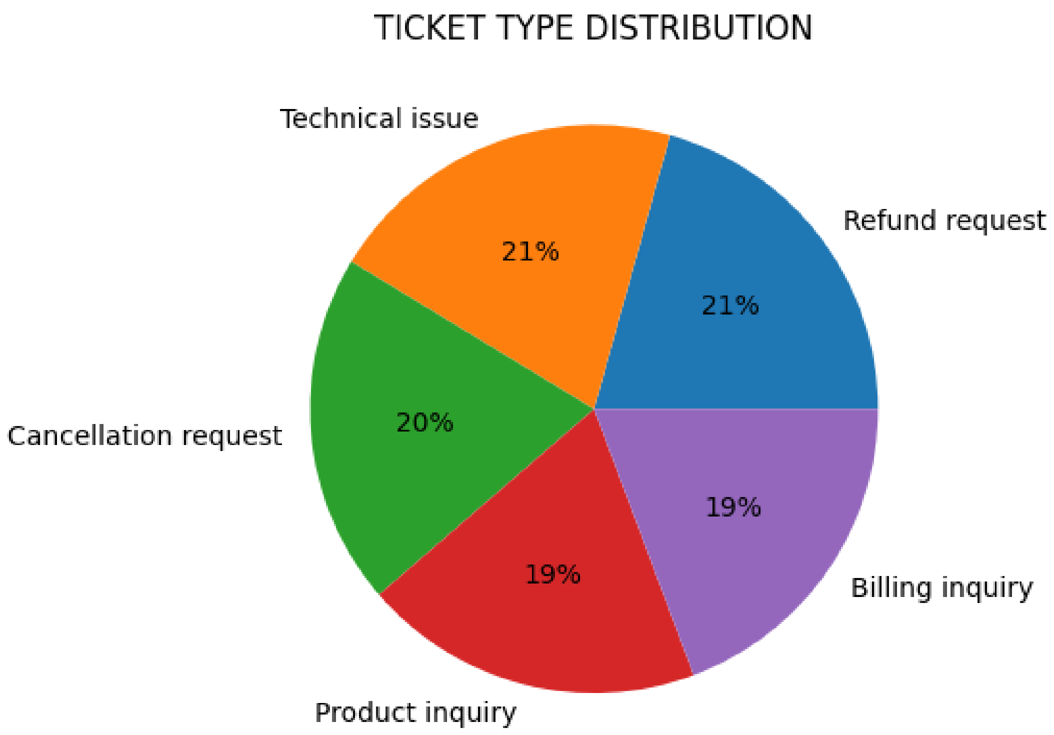
[10]:
```
import matplotlib.pyplot as plt
subject = df['Ticket Subject'].value_counts().head(5)
ax = subject.plot(kind = 'barh', color = 'Green', figsize = (6,4))
```

```
ax.bar_label(ax.containers[0], label_type = 'center', fontsize = 10, color =␣
 ↪'white')
ax.grid(True, linestyle = '--' , alpha = 0.6, color = 'black' )
plt.title('TOP 5 TICKET ISSUES')
plt.xlabel('NO. OF TICKETS')
plt.ylabel('ISSUE SUBJECT')
plt.gca().invert_yaxis()
plt.savefig("Ticket_Issues", dpi = 300)
plt.show()
```



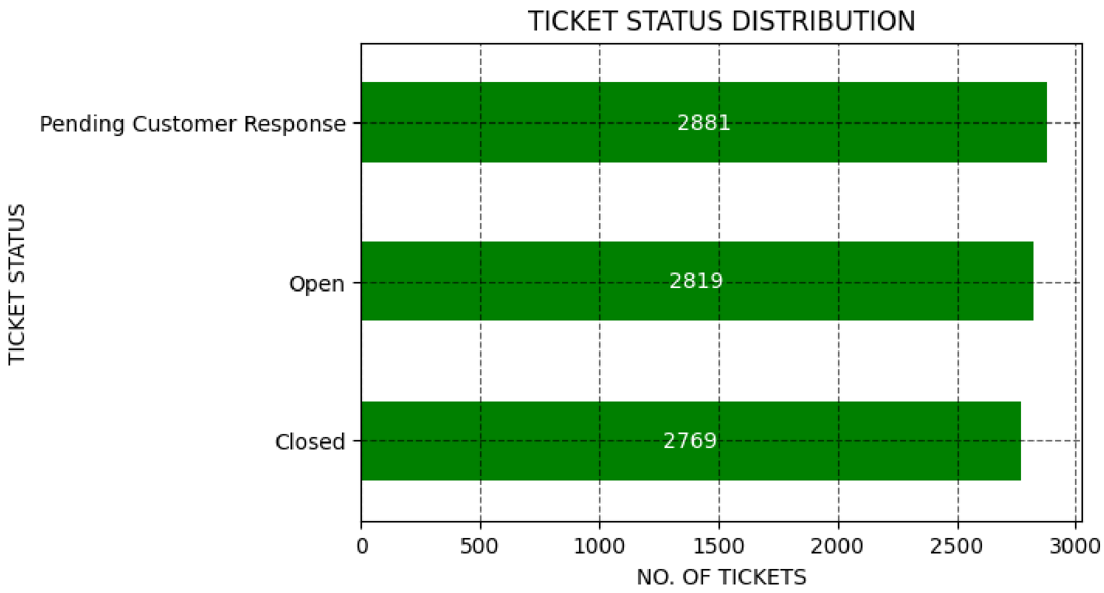
3 TICKET DISTRIBUTION BY TYPE

[11]:
```
import matplotlib.pyplot as plt
df['Ticket Type'].value_counts().plot(kind = 'pie', autopct = '%1.0f%%')
plt.title('TICKET TYPE DISTRIBUTION')
plt.ylabel("")
plt.savefig("Ticket_Tyoe_Distribution", dpi = 300)
plt.show()
```



4 TICKET DISTRIBUTION BY STATUS

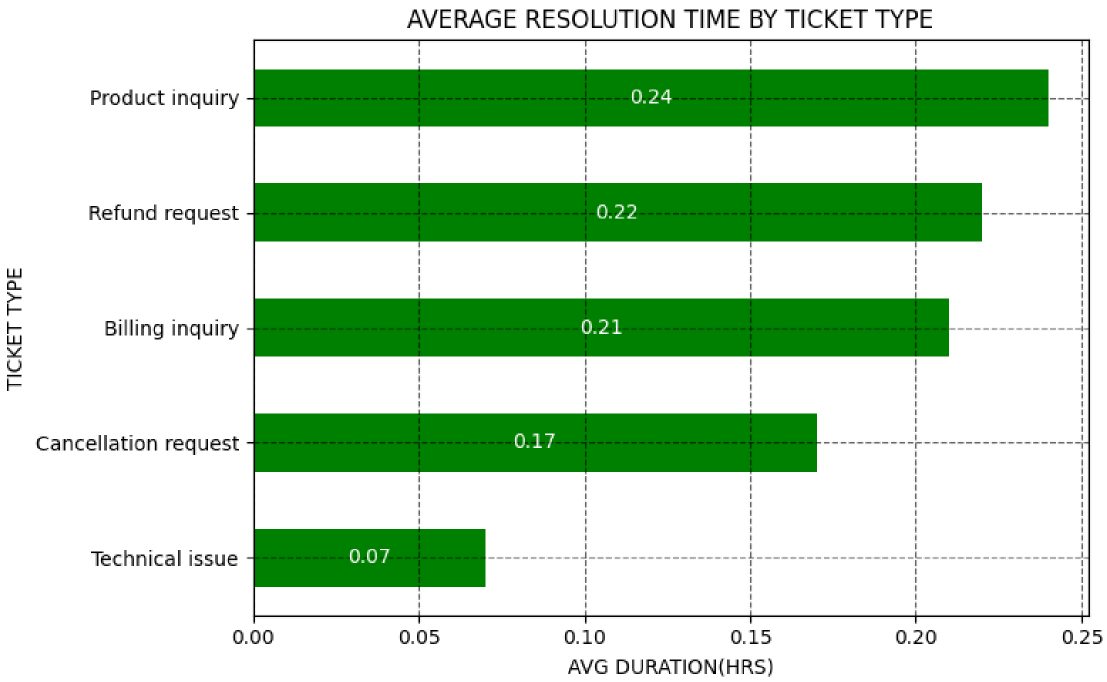
```
[12]: status = df['Ticket Status'].value_counts()
      ax = status.plot(kind = 'barh', color = 'Green', figsize = (6,4))
      ax.bar_label(ax.containers[0], label_type = 'center', fontsize = 10, color =␣
       ↪'white')
      ax.grid(True, linestyle = '--' , alpha = 0.6, color = 'black' )
      plt.title('TICKET STATUS DISTRIBUTION')
      plt.xlabel('NO. OF TICKETS')
      plt.ylabel('TICKET STATUS')
      plt.gca().invert_yaxis()
      plt.savefig("Ticket_Status_Distribution", dpi = 300)
      plt.show()
```



5 AVG RESOLUTION TIME BY TICKET TYPE

[13]:

```
avg_resolution = df.groupby('Ticket Type')['Resolution Duration(Hrs)'].mean().abs().round(2).sort_values()
ax = avg_resolution.plot(kind = 'barh', color = 'Green', figsize = (8,5))
ax.bar_label(ax.containers[0], label_type = 'center', fontsize = 10, color = 'white')
ax.grid(True, linestyle = '--' , alpha = 0.6, color = 'black' )
plt.title('AVERAGE RESOLUTION TIME BY TICKET TYPE')
plt.xlabel('AVG DURATION(HRS)')
plt.ylabel('TICKET TYPE')
plt.tight_layout()
plt.savefig("Avg_Resolution_Time", dpi = 300)
plt.show()
```



[14]:
```
import nltk
from nltk.tokenize import word_tokenize
from nltk.corpus import stopwords
import string
from collections import Counter
```

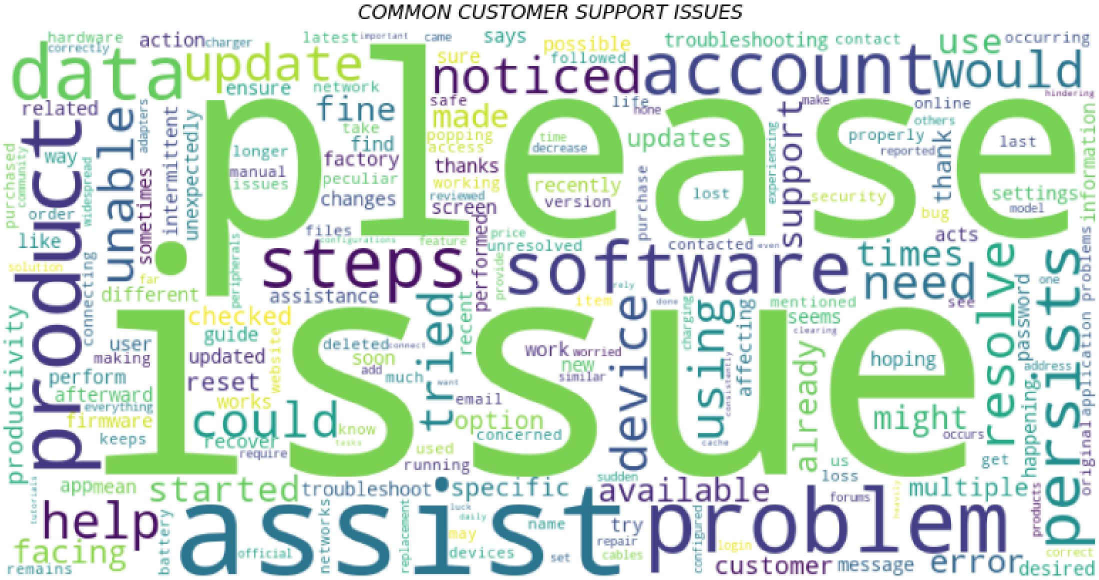
[15]:
```
stop_words = set(stopwords.words('english'))
punct = set(string.punctuation)

def clean_text(text):
    tokens = word_tokenize(str(text).lower())
    tokens = [word for word in tokens if word not in stop_words and word not in␣
 ↪punct and word.isalpha()]
    return tokens

df['Cleaned Words'] = df['Ticket Description'].apply(clean_text)
```

[16]:
```
all_words = [word for tokens in df['Cleaned Words'] for word in tokens]
word_freq = Counter(all_words)
word_freq.most_common(10)
```

[16]:
```
[('issue', 11517),
 ('please', 8809),
 ('assist', 6143),
 ('problem', 2285),
 ('product', 2207),
 ('data', 1650),
 ('software', 1530),
 ('account', 1462),
 ('steps', 1390),
 ('persists', 1178)]
```

6 COMMON CUSTOMER SUPPORT ISSUES

```
[17]: from wordcloud import WordCloud

wordcloud = WordCloud(width = 800, height = 400, background_color = 'white').
 ↪generate_from_frequencies(word_freq)
plt.figure(figsize = (10,5))
plt.imshow(wordcloud, interpolation = 'bilinear')
plt.axis('off')
plt.title('COMMON CUSTOMER SUPPORT ISSUES', size = 10, style = 'oblique')
plt.savefig("Common_Customer_Support_Issues", dpi = 300)
plt.show()
```



7 —- KEY INSIGHTS —-

7.0.1 -Most Tickets Are In Pending Customer Response Status, Indicating Delay From Customer Side.

7.0.2 -Technical Issues Have The Lowest Average Resolution Time (0.07 HRS = 4.2 MIN) Shows Effective Handling.

7.0.3 -Product Inquiry Take The Longest Time To Resolve Which Is (0.24 HRS = 14.4 MIN).

7.1 -Top Keywords In Customer Tickets:

7.1.1 Text Analysis Revealed That Customers Frequently Use Words Like 'Issue', 'Please', 'Assist', 'Problem', 'Product', 'Account'. This Indicates That Majority Of Support Requests Are Related To Product Issue, Technical Problems And Account Related Assistance.

8 —- RECOMMENDATIONS —-

8.0.1 -Add a chatbot so people can get quick answers to common questions about products or billing, without waiting for an agent.

8.0.2 -Make the cancellation process easier and faster so customers don't have to wait too long.

8.0.3 -Collect the questions that come up most often and make a clear FAQ page on the website, so people can find answers on their own. -

8.0.4 -Whenever any major change, maintenance, or known issue is coming up, send an email or app notification in advance. This way, customers know what's happening and won't need to contact support as much.

8.0.5 -Every month, check which topics are getting the most support tickets, so you can focus on improving those areas.

8.0.6 -Keep the FAQ updated regularly, so whenever a new question starts coming up often, it's added quickly and customers always have the latest info.