SnapTravel Case Study: Data Analyst

Context

SnapTravel is an online travel agency that sells hotel rooms to consumers through our automated chat-bot, accessible through Google Hotel Ads, Kayak, and other external meta channels. We constantly strive to make business changes at each stage of our business funnel that help users find the best deal in the easiest way possible. The data dictionary can be found at the end of this document.

Question 1 Using the attached data, find 1-2 things about our booking funnel that you think are important to track and then create 5 visualizations that would help you track that metric:

- What other data sources would you add assuming they were available?
- Please prepare your presentation for a business audience but be ready to answer technical questions (perhaps in an appendix).

Question 2 If you were tasked with expanding the snaptravel business into a new area of the world, how would you approach that problem? What data would you need? Who would you involve? Provide a brief description of your process (300 words or less).

Data Dictionary The below table has data on a subset of itineraries from a specific meta channel between the dates of July 1st 2019 and September 15th, 2019. For these purposes, Snaptravel's booking funnel can be defined as:

1. Impression on a Snaptravel ad
2. Transition page open
3. Booking form open
4. Booking

Field Data

```
Type                        Description
```

SEARCH_DATE : date Date that the search occurred on.

HOTEL_ID : int Unique identifier for a hotel

CHECK_IN_DATE : date Date first night of the users hotel stay

ELIGIBLE_IMPRESSIONS : int Number of total users that viewed that itinerary (not specific to Snaptravel)

IMPRESSIONS : int Number of total users that viewed Snaptravel's advertisement for the searched itinerary

TRANSITION_PAGE_OPENS : int Number of times that the transition page that redirects and user to the Snaptravel platform was opened

BOOKING_FORM OPENS : int Number of times that the booking form that delineates all of the booking details before finalizing the booking

BOOKINGS : int Number of completed bookings

reading of file or loading csv file into pandas dataframe

and importing all the required libraries for initial exploration

# of the dataset

In [1]:

```
#importing of libraries in python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import scipy.stats as st
import datetime


# to suppress warnings
from warnings import filterwarnings
filterwarnings('ignore')

#pd.options.display.max_columns=True

# pd.options.display.max_rows=True
```

In [2]:

```
#reading of file or loading csv file into pandas dataframe

df = pd.read_csv("funnel_analysis.csv")

df.head()
```

Out[2]:

	SEARCH_DATE	HOTEL_ID	CHECK_IN_DATE	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE
0	2019-08-31	122695	2019-08-31	1927	1715	

	SEARCH_DATE	HOTEL_ID	CHECK_IN_DATE	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE
1	2019-09-01	118583	2019-09-01	2052	1114	
2	2019-07-03	139402	2019-07-05	2482	1398	
3	2019-07-05	122212	2019-07-05	1838	802	
4	2019-08-31	125186	2019-09-02	3484	774	

In [3]:

```
#shape of the data

df.shape

#so there are 74582 rows and 8 columns in the dataset
```

Out[3]:

```
(74582, 8)
```

In [4]:

```
#general info of the dataset
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 74582 entries, 0 to 74581
Data columns (total 8 columns):
 #   Column                 Non-Null Count  Dtype 
---  ------                 --------------  ----- 
 0   SEARCH_DATE            74582 non-null  object
 1   HOTEL_ID               74582 non-null  int64 
 2   CHECK_IN_DATE          74582 non-null  object
 3   ELIGIBLE_IMPRESSIONS   74582 non-null  int64 
 4   IMPRESSIONS            74582 non-null  int64 
 5   TRANSITION_PAGE_OPENS  74582 non-null  int64 
 6   BOOKING_FORM_OPENS     74582 non-null  int64 
 7   BOOKINGS               74582 non-null  int64 
dtypes: int64(6), object(2)
memory usage: 4.0+ MB
```

checking data-types and making changes if required

In [5]:

```
#checking of dtypes and chaning of data -types if required

df.dtypes
```

Out[5]:

```
SEARCH_DATE              object
HOTEL_ID                  int64
CHECK_IN_DATE            object
ELIGIBLE_IMPRESSIONS      int64
IMPRESSIONS               int64
TRANSITION_PAGE_OPENS     int64
BOOKING_FORM_OPENS        int64
BOOKINGS                  int64
dtype: object
```

In [6]:

```
#so above we found date search_date and check_in_date are datetype object but here are
```

```
#are considered as object datatype so it is better to convert it back to original type

#so lets make the datatype right for date columns

df["SEARCH_DATE"] = pd.to_datetime(df["SEARCH_DATE"])
df["CHECK_IN_DATE"] = pd.to_datetime(df["CHECK_IN_DATE"])

#also i feel the Hotel id is also seems to be not right
#datatype as integer so it is better to convert it to
#the category columns

df["HOTEL_ID"] = df["HOTEL_ID"].astype("category")

df.dtypes
```

Out[6]:

```
SEARCH_DATE             datetime64[ns]
HOTEL_ID                      category
CHECK_IN_DATE           datetime64[ns]
ELIGIBLE_IMPRESSIONS             int64
IMPRESSIONS                      int64
TRANSITION_PAGE_OPENS            int64
BOOKING_FORM_OPENS               int64
BOOKINGS                         int64
dtype: object
```

In [7]:

```
df.head()

#so using above method we have convert the date columns from object dtypes to original
#date types in python and now all datatypes are seems to be correct and
#we are ready for more exploration
```

Out[7]:

	SEARCH_DATE	HOTEL_ID	CHECK_IN_DATE	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE
0	2019-08-31	122695	2019-08-31	1927	1715	
1	2019-09-01	118583	2019-09-01	2052	1114	
2	2019-07-03	139402	2019-07-05	2482	1398	
3	2019-07-05	122212	2019-07-05	1838	802	
4	2019-08-31	125186	2019-09-02	3484	774	

checking of missing values

In [8]:

```
#checking missing values in the dataset

df.isnull().sum()
```

Out[8]:

```
SEARCH_DATE              0
HOTEL_ID                 0
CHECK_IN_DATE            0
ELIGIBLE_IMPRESSIONS     0
IMPRESSIONS              0
TRANSITION_PAGE_OPENS    0
BOOKING_FORM_OPENS       0
```

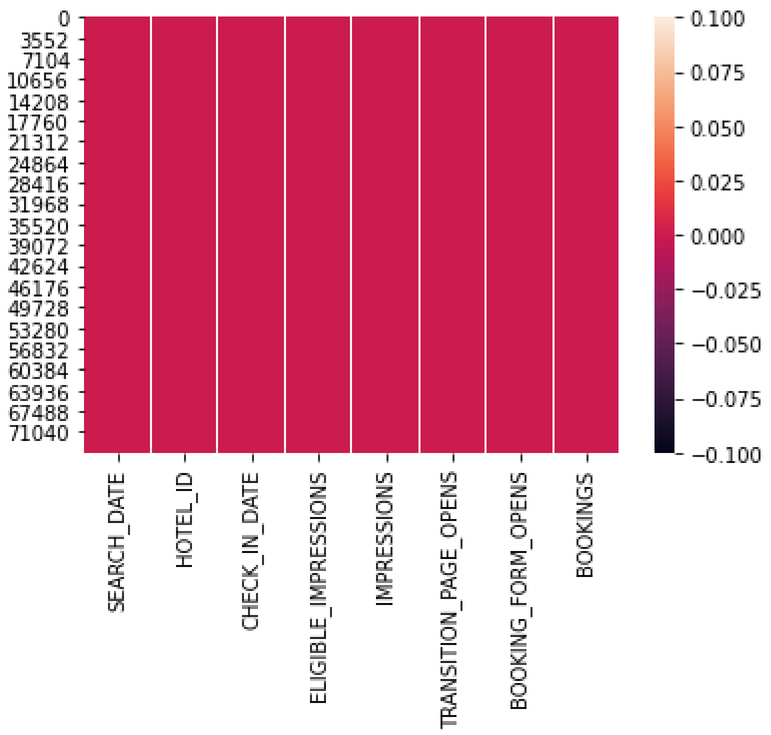
```
BOOKINGS                 0
dtype: int64
```

In [9]:

```
#visualization to analyze for missing values

sns.heatmap(df.isnull())

#so from the heatmap and seeing the above results we found'
#that there is no missing values present in the datastet
#so we can go further for our analysing
```

Out[9]:

```
<AxesSubplot:>
```



checking for duplicated values in the dataset

In [10]:

```
#checking for duplicated values in the dataset

df.duplicated().sum()

#so there seems to be no duplicate values also present in the dataset
```

Out[10]:

```
0
```

In [11]:

```
#sorting the dataframe in  ascending order on the basis of

df= df.sort_values(by="SEARCH_DATE")
df= df.reset_index(drop=True)
df.head()
```

Out[11]:

	SEARCH_DATE	HOTEL_ID	CHECK_IN_DATE	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE

	SEARCH_DATE	HOTEL_ID	CHECK_IN_DATE	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE
0	2019-07-01	107590	2019-07-01	82	3	
1	2019-07-01	169933	2019-07-01	118	13	
2	2019-07-01	152618	2019-07-02	24	10	
3	2019-07-01	252608	2019-07-01	28	1	
4	2019-07-01	145352	2019-07-02	7	1	

In [12]:

```
#looking for unique date in the dataset

df["SEARCH_DATE"].unique()[:5]
```

Out[12]:

```
array(['2019-07-01T00:00:00.000000000', '2019-07-02T00:00:00.000000000',
       '2019-07-03T00:00:00.000000000', '2019-07-04T00:00:00.000000000',
       '2019-07-05T00:00:00.000000000'], dtype='datetime64[ns]')
```

In [13]:

```
df["SEARCH_DATE"].nunique()
```

Out[13]:

```
77
```

In [14]:

```
df["CHECK_IN_DATE"].unique()[:5]
```

Out[14]:

```
array(['2019-07-01T00:00:00.000000000', '2019-07-02T00:00:00.000000000',
       '2019-09-20T00:00:00.000000000', '2019-07-03T00:00:00.000000000',
       '2019-07-05T00:00:00.000000000'], dtype='datetime64[ns]')
```

In [15]:

```
df["CHECK_IN_DATE"].nunique()
```

Out[15]:

```
186
```

general statistics of the data

In [16]:

```
# general statistics for the data

df.describe(include = "all").round(2)
```

Out[16]:

	SEARCH_DATE	HOTEL_ID	CHECK_IN_DATE	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION
count	74582	74582.0	74582	74582.00	74582.00	
unique	77	19149.0	186	NaN	NaN	
top	2019-08-31 00:00:00	139402.0	2019-08-31 00:00:00	NaN	NaN	
freq	1528	295.0	2155	NaN	NaN	
first	2019-07-01 00:00:00	NaN	2019-07-01 00:00:00	NaN	NaN	

	SEARCH_DATE	HOTEL_ID	CHECK_IN_DATE	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_
last	2019-09-15 00:00:00	NaN	2020-01-14 00:00:00	NaN	NaN	
mean	NaN	NaN	NaN	53.98	11.12	
std	NaN	NaN	NaN	134.73	29.39	
min	NaN	NaN	NaN	0.00	0.00	
25%	NaN	NaN	NaN	7.00	2.00	
50%	NaN	NaN	NaN	23.00	5.00	
75%	NaN	NaN	NaN	54.00	10.00	
max	NaN	NaN	NaN	4066.00	1715.00	

In [ ]:

```
# #Impressions :--->>>

# 1.so from general statistics we have seen that date range is from july 2019 to septem
# search _date  also as mentioned in the question

# search_date column : ==
# min_date of search_date column = 2019-07-01 00:00:00
# max_date of search_date column = 2019-09-15 00:00:00
# unique dates count in search_date column = 77
# most number of searched occur on date = 2019-08-31 00:00:00 and frequency = 1528

# similary for "check_in_date" column= range of date values in the dataset is as given

# min_date of check_in_date column = 2019-07-01 00:00:00
# max_date of check_in_date column = 2020-01-14 00:00:00
# unique dates count in check_in_date column = 186

# most number of check_in occur on date = 2019-08-31 00:00:00 and frequency = 2155

# 2.aslo talking about the hotel_ids :-

#   unique hotel_ids count = 19149
#   most number of times booked hotel_id = ""139402"" and frequence = 295



# 3.as we have recurrent values in dataset about user related to search_date so talking
#   is not valid at present .
#   To get better overview we need to group by the data on search_date to derive furthe
#   with respect to date wise interpretation
```

In [17]:

```
#just a general view to see for the data related to max_search_date
df[df["SEARCH_DATE"]==datetime.datetime(2019,8,31)].head()
```

Out[17]:

	SEARCH_DATE	HOTEL_ID	CHECK_IN_DATE	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_
58018	2019-08-31	108029	2019-09-02	47	7	
58019	2019-08-31	149730	2019-08-31	45	5	

	SEARCH_DATE	HOTEL_ID	CHECK_IN_DATE	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_
58020	2019-08-31	148501	2019-09-01	14	3	
58021	2019-08-31	647018	2019-08-31	39	6	
58022	2019-08-31	126453	2019-09-23	3	1	

In [18]:
```
#each day count of users specific to search_date

(df["SEARCH_DATE"].value_counts())[:5]
```

Out[18]:
```
2019-08-31    1528
2019-08-30    1433
2019-08-16    1352
2019-09-01    1327
2019-08-17    1309
Name: SEARCH_DATE, dtype: int64
```

In [19]:
```
(df["SEARCH_DATE"].value_counts(normalize=True)*100)[:5]
```

Out[19]:
```
2019-08-31    2.048752
2019-08-30    1.921375
2019-08-16    1.812770
2019-09-01    1.779250
2019-08-17    1.755115
Name: SEARCH_DATE, dtype: float64
```

In [20]:
```
#each day count of users specific to check_in_date

df["CHECK_IN_DATE"].value_counts()[:5]
```

Out[20]:
```
2019-08-31    2155
2019-08-17    1955
2019-08-30    1869
2019-08-24    1848
2019-09-14    1813
Name: CHECK_IN_DATE, dtype: int64
```

In [21]:
```
(df["CHECK_IN_DATE"].value_counts(normalize=True)*100)[:5]
```

Out[21]:
```
2019-08-31    2.889437
2019-08-17    2.621276
2019-08-30    2.505967
2019-08-24    2.477810
2019-09-14    2.430881
Name: CHECK_IN_DATE, dtype: float64
```

# Question 1

Using the attached data, find 1-2 things about our booking funnel that you think are important to track and then create 5 visualizations that would help you track that metric:

What other data sources would you add assuming they were available? Please prepare your presentation for a business audience but be ready to answer technical questions (perhaps in an appendix).

In [ ]:
```
# 1-2 things about our booking funnel that you think are important to track

# answer :---->>

# 1. daily summary of the data related to booking of searched_date
#    ranging from july 2019 to september 2019 .
#    the idea is :
#    to group the data on search_date and then aggrgating the sum of
#    other relevant information to track the daily metrics and
#    to get an idea about snaptravels business on daily basis i.e. what's the
#    count of total number of booking on an average on a given day



# 2. we can also track information related to hotel
#    ids that on particular date which hotel_id is booked maximum time
#    and also we can generate the summary statistics related to each hotel_id
#    if required on daily basis i.e on a given
#    day whats the chance that people will book that particular
#    hotel from snaptravels hotel ads

# 3. we can also check the trend of other numeric information related
#    to search date to find out if is there any seasonality
#    factor availaible or not like is there any possibility
#    like bookings are higher in mid of the month or end of the month or
#    so

# 4. checking for outliers is also required and removal
#    of outliers is also necessary going further


# 5. next we can also use TIME SERIES FORECASTING APPROACH like
#    ARIMA OR SARIMA to forecast the booking based on the past
#    data availaible
```

group by on search_date to see for the values to comment related to daiy happening

In [22]:
```
#group by on search_date to see for the values

new_df = df.groupby(["SEARCH_DATE"]).sum()
new_df.head()
```

Out[22]:

	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE_OPENS	BOOKING_FORM_OPEN
SEARCH_DATE				
2019-07-01	40792	6446	1423	11
2019-07-02	53443	10318	2308	19

	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE_OPENS	BOOKING_FORM_OPEN
SEARCH_DATE				
2019-07-03	81992	18516	4105	39
2019-07-04	46390	10567	2319	20
2019-07-05	72573	17200	4033	39

In [23]:

```
#decibring the information related to each search_date

new_df.describe()
```

Out[23]:

	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE_OPENS	BOOKING_FORM_OPENS	BOOI
count	77.000000	77.000000	77.000000	77.000000	77.0
mean	52289.090909	10766.792208	2403.636364	213.532468	1.5
std	20290.617438	5790.215641	1319.714043	153.515264	2.8
min	22905.000000	4522.000000	958.000000	61.000000	0.0
25%	37742.000000	6843.000000	1502.000000	118.000000	0.0
50%	47253.000000	8813.000000	1944.000000	160.000000	1.0
75%	62295.000000	13726.000000	3096.000000	281.000000	2.0
max	117948.000000	39833.000000	9129.000000	1058.000000	19.0

In [ ]:

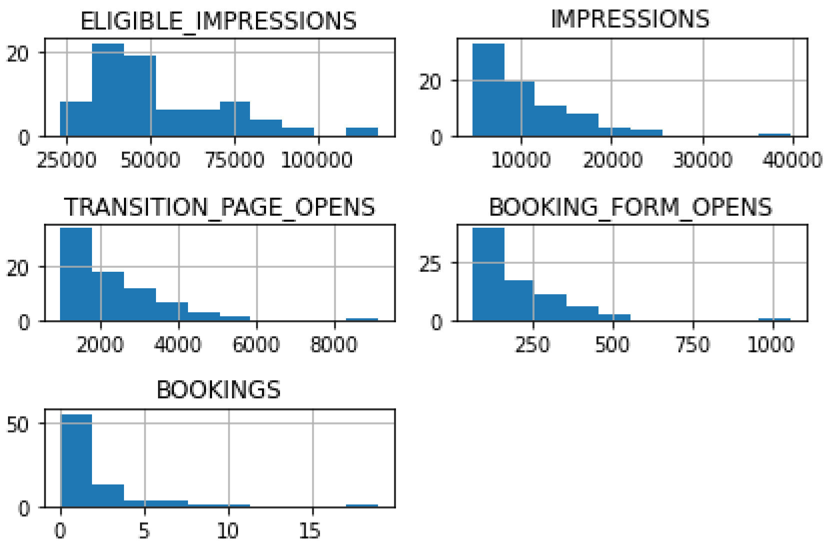
```
#impression on each_day_search data :>>>>>>>>>>

# 1.mean value for eligible impression per day is around 52289

# 2.max value for eligible impression per day is around 1lakh

# 3.talking about impressions variable :- we have mean value of
#   around 10766 (10.5k) on daily basis for snaptravel

# 4.maximum impression value on a particular day is around 39k
#   and minimum impression on given day is around 4522

# 5.talking about transition pages :->> on an average in a
#   day  2k times transition page is opened .

# 6.maximum value on a single day for transition_page_open is
#   around 9k and minimum value is around 958

# 7. taking about booking form :>>
#   on an average booking form opens up around 200 times in a given day

# 8. maximum number of times booking form open on a given day
#    is 1058 times and minimum is 61

# 9.while talking about bookings on an average 1.5 means
#   around 2 people compelte the booking using snaptravel on daily basis

# 10 maximum count of  completed booking has occured on a given day
#   is 19 and minimum is 0 it means there are days when there is
#   no booking done from snaptrevels service
```

In [24]:

```
#plotting the histogram for the numeric data

plt.figure(figsize=(15,15))
new_df.hist()
plt.tight_layout()
new_df.skew()

#the data is not distributed normally
#there seems to be +ve skewness is all variables
#which means there are outliers which can affect the mean values
```

Out[24]:

```
ELIGIBLE_IMPRESSIONS     1.185322
IMPRESSIONS              2.212769
TRANSITION_PAGE_OPENS    2.260616
BOOKING_FORM_OPENS       2.680979
BOOKINGS                 3.882307
dtype: float64
<Figure size 1080x1080 with 0 Axes>
```

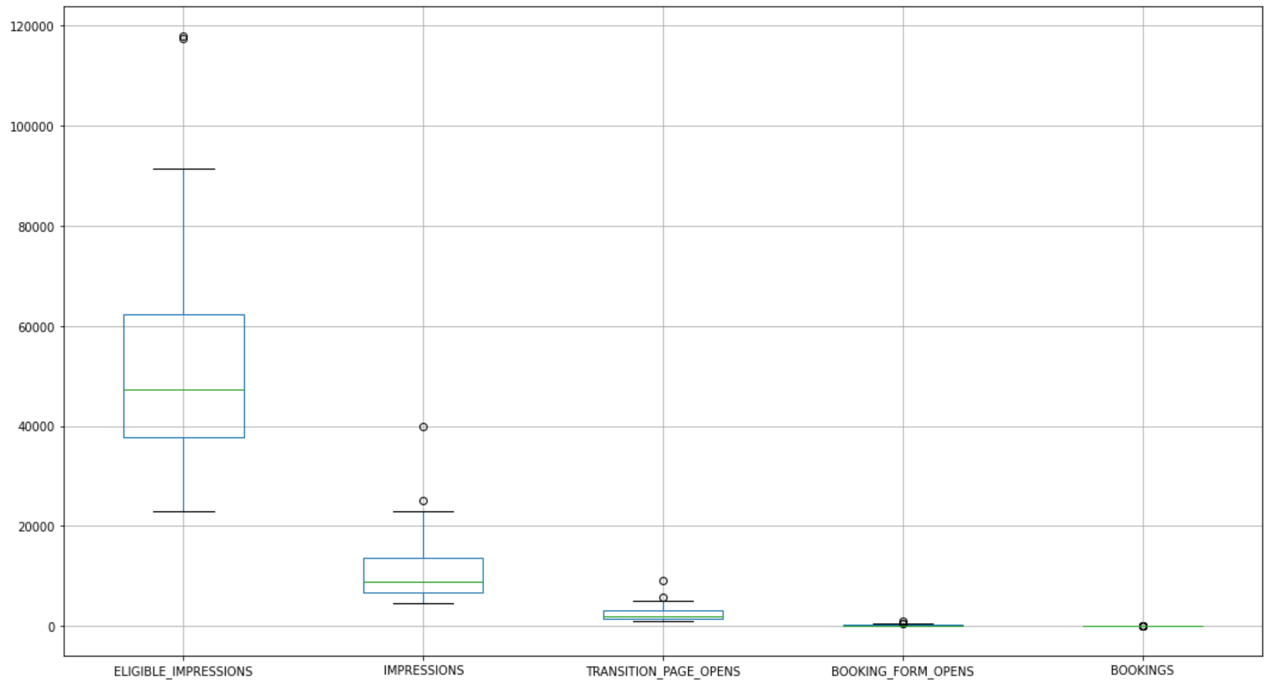


In [25]:

```
#visualizing the boxplot
plt.figure(figsize=(18,10))
new_df.boxplot()

#plotting the boxplot to look for the outliers in the dataset
```

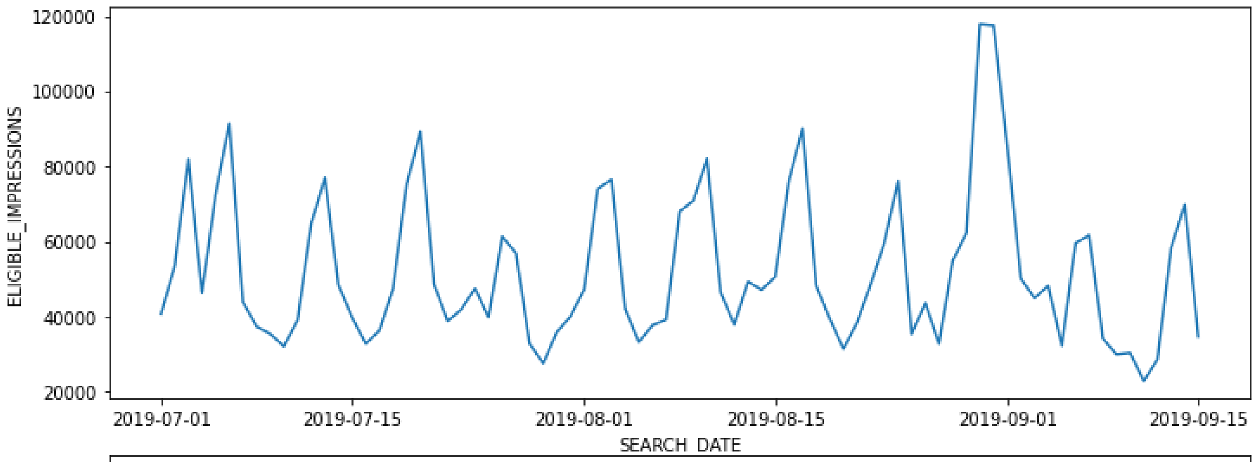
Out[25]:

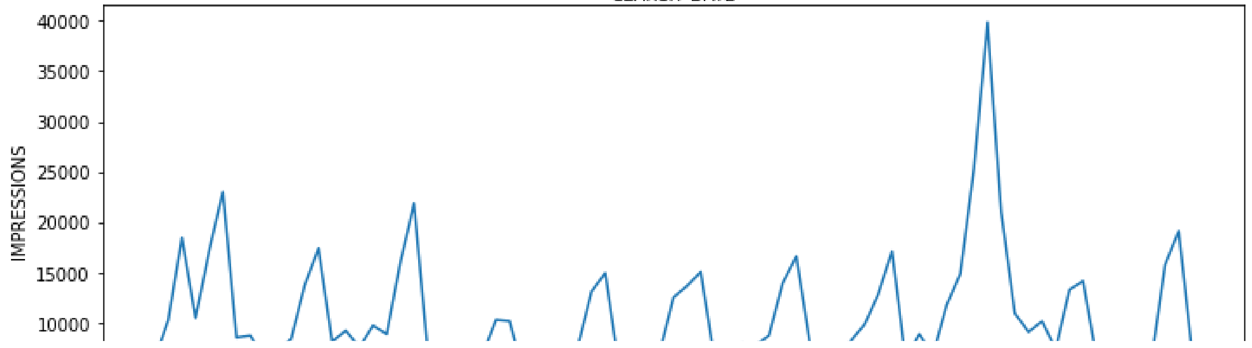
```
<AxesSubplot:>
```

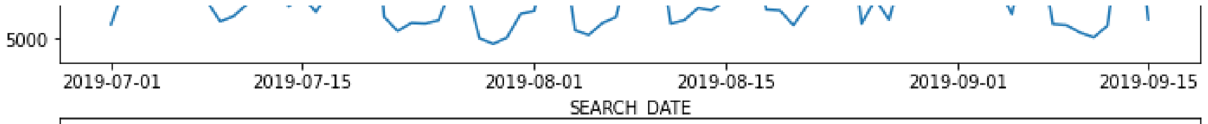


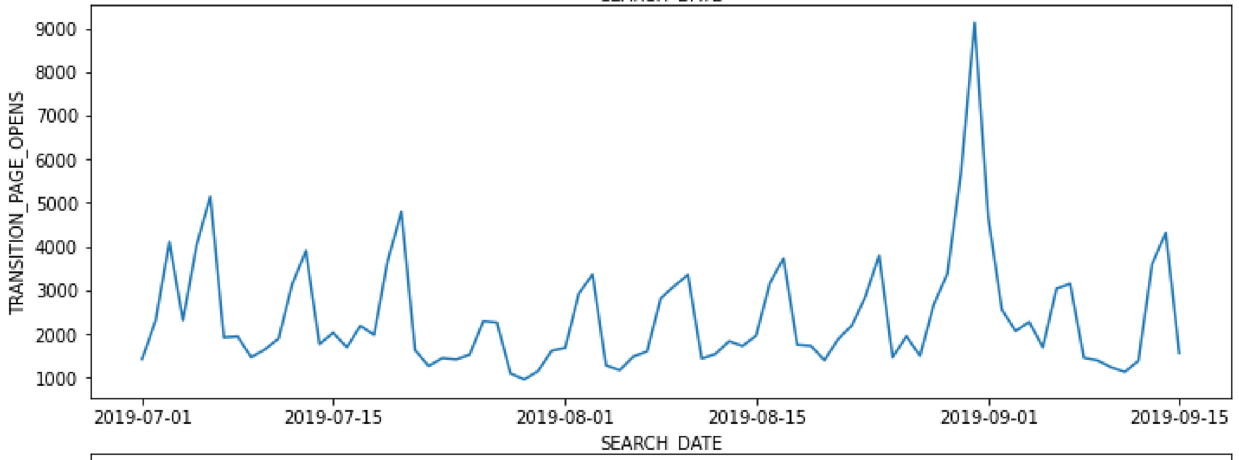
In [26]:

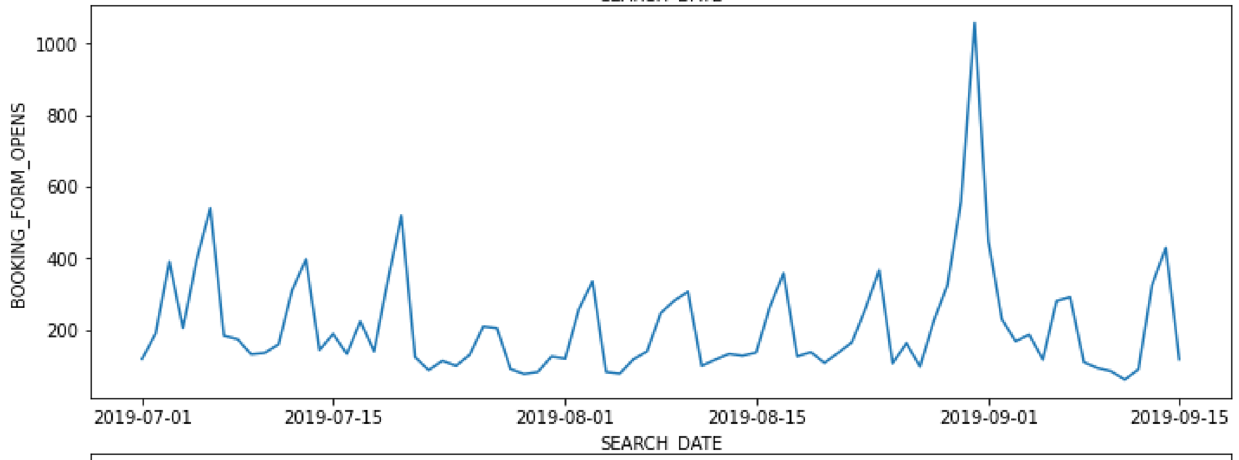
```
#visualization related to search_date and booking form_opens



fig,ax = plt.subplots(5,1,figsize=(10,18))

for var,subplot in zip(new_df.columns,ax.flatten()):

    sns.lineplot(new_df.index,new_df[var], ax=subplot)
    plt.tight_layout(pad=0.05)

#so from the plot we can see that
```

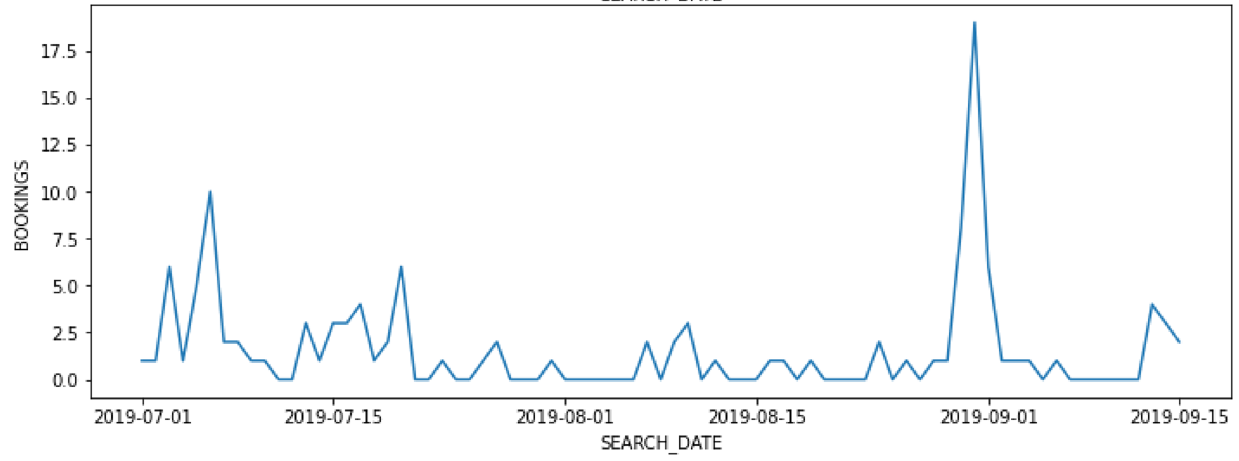






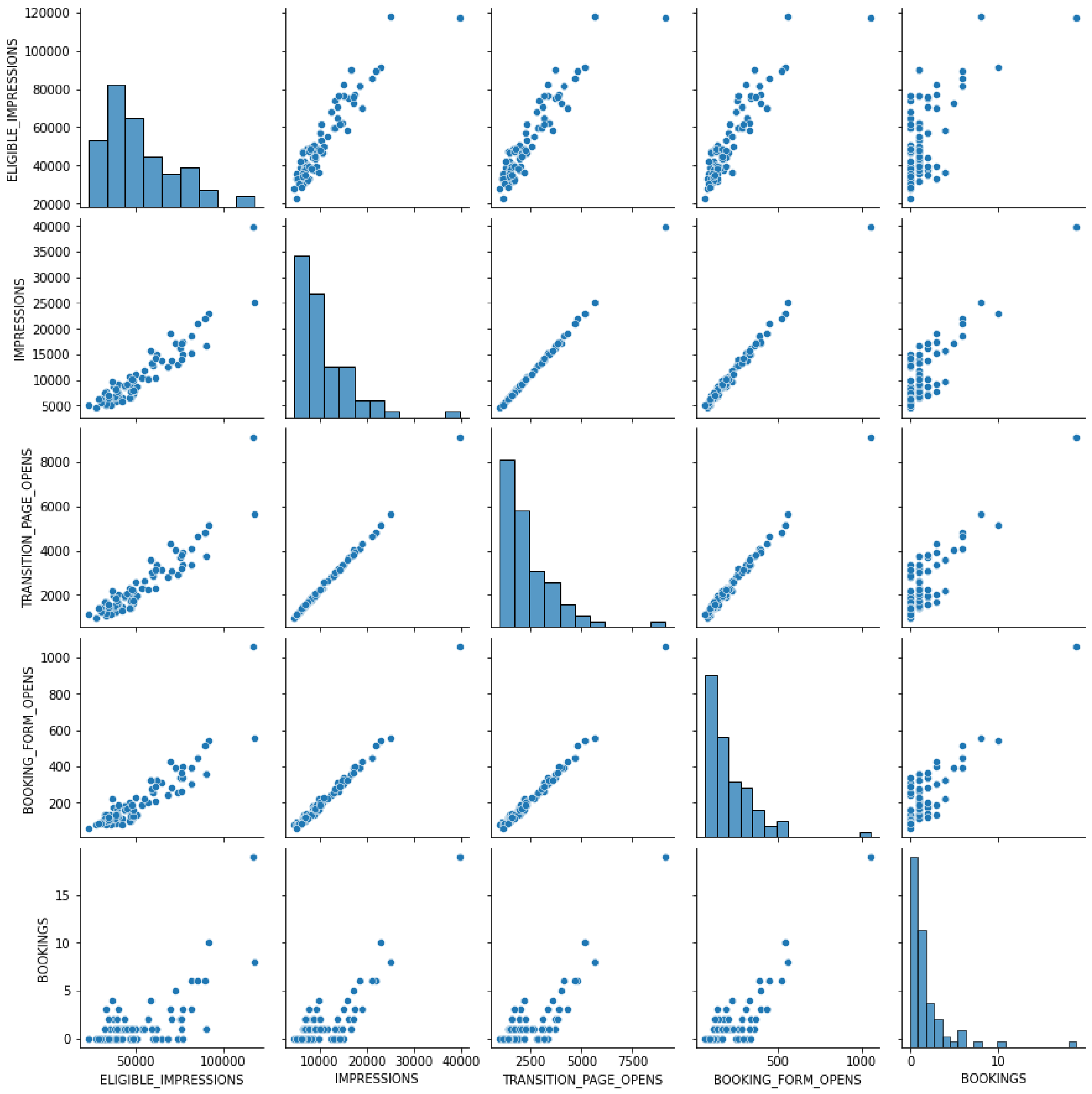






In [27]:
```
#to see the variables performance

sns.pairplot(new_df)
```

Out[27]:
```
<seaborn.axisgrid.PairGrid at 0x12959970>
```

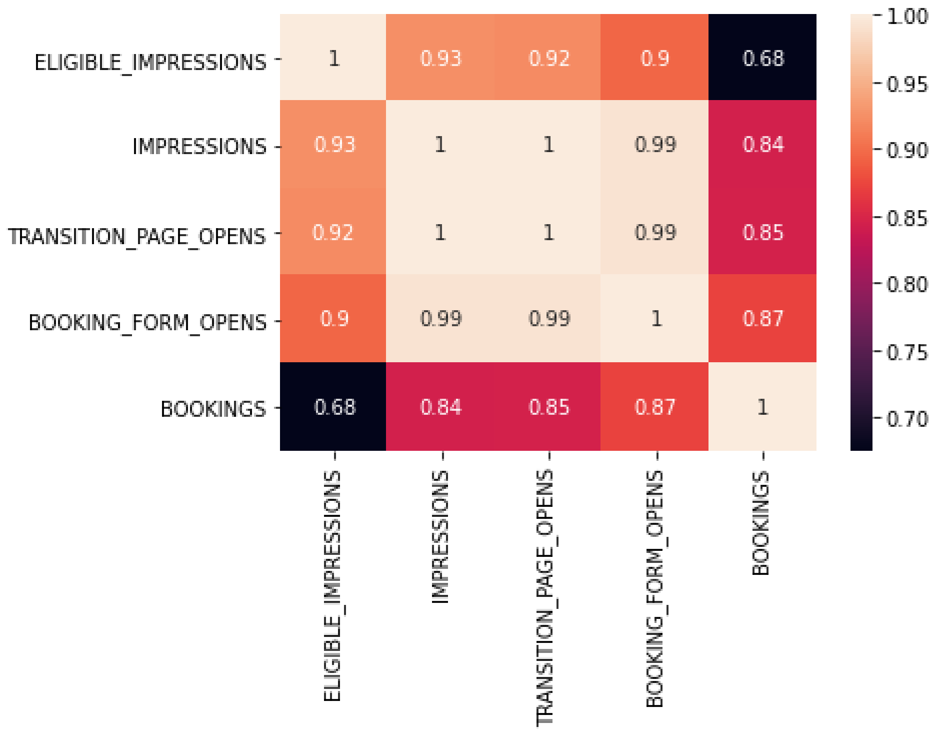


In [28]:

```
#plotting the correlation heatmap for tracking the correlation on daily search data rel
#to snaptravel

sns.heatmap(new_df.corr(),annot=True)


#so from the heatmap it is clearly visible that on daily basis
#no of complete booking is directly dependent on all the other numeric variables
# and also we can think about it practically also as more number of impression will gen
#more number of people tracking the add and clicking or opening the transition page and
```

Out[28]:

```
<AxesSubplot:>
```



In [31]:

```
# we can also check about which hotel_id is booked for maximum time on give day

df.groupby(["SEARCH_DATE","HOTEL_ID"]).sum().head()
```

Out[31]:

SEARCH_DATE	HOTEL_ID	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE_OPENS	BOOKING_F
2019-07-01	4110	0	0	0	
	6295	0	0	0	
	8957	73	28	6	
	21227	0	0	0	
	105302	0	0	0	

In [ ]:

```
# #intepretation >>-----

# from the above data and created eda there are many things and matrices to explore rel

# 1. daily search_date we have found out when there are maximum_impressions and booking
#    i.e what is the trend on daily basis related to booking on snaptravel

# 2. we also created summary by aggregating the data on search_date and then finding ou
#    mean score related to booking on daily basis

# 3. we also searched and looked for maximum and minimum booking

# 4. we also had seen the graphs and plot related to finding out the correlation betwee
#    variables and we found out that booking is directly correlated with the other vari
#    such as imressions,booking_form_opens
#  5. next we can also generate the percentage impression and percentage_booking_funnel
#   perc_impression_funnel :-- ((impression/eligible impression)*100) and
#   percentage booking funnel :--- ((booking/booking_form_opens)*100)
#    can also be calculated to get better idea


# What other data sources would you add assuming they were available?

# answer :-->>

# 1. as there is only information related to hotel_id if data related to mapping of hot
#    name of the hotel and other information related to hotels like ratings by people,
#    location etc would givem nice indepth idea about choosing particular hotel by peop
#    and may be we could prepare a good recommendation and ads regarding to that partic

# 2. also we can generate more information using pivot table by combining and creating 


# 3. we can generate impression share i.e. it is the percentage of impressions that our
#    receive compared to the total number of impressions that our ads could get.
#     Impression share = impressions / total eligible impressions.
```

In [32]:

```
#new column is added as impression share
new_df["Impression_share"] = (new_df["IMPRESSIONS"]/new_df["ELIGIBLE_IMPRESSIONS"])*100
new_df.head()
```

Out[32]:

	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE_OPENS	BOOKING_FORM_OPEN
SEARCH_DATE				
2019-07-01	40792	6446	1423	11
2019-07-02	53443	10318	2308	19
2019-07-03	81992	18516	4105	39
2019-07-04	46390	10567	2319	20
2019-07-05	72573	17200	4033	39

In [36]:

```
#maximum impression share was on august 31,2019

new_df[new_df["Impression_share"]==new_df["Impression_share"].max()]
```

Out[36]:

	ELIGIBLE_IMPRESSIONS	IMPRESSIONS	TRANSITION_PAGE_OPENS	BOOKING_FORM_OPEN
SEARCH_DATE				
2019-08-31	117557	39833	9129	105

next we can also use TIME SERIES

FORECASTING

APPROACH like ARIMA OR SARIMA

to forecast the booking based on the

past booking data availaible for snaptravel website

Question 2

If you were tasked with expanding the snaptravel business into a new area of the world,

how would you approach that problem?

What data would you need? Who would you involve? Provide a brief description of your process

(300 words or less).

In [ ]:

```
#to expand the snaptravel business into new area of the world we
#have to look and expand our hotels list and campaigns with respect
#to hotels accross the various countries and we need to create
#ads campaigns in most relevant way that our companies ads should
#get the maximum impressions.

#also we need to make the interface and booking process
#easy and fast it means the new user should easily
#walkthough the website and can book the hotel without
#problem .

#a good customer support team should also be there to help
#the customers in resolving the queries in fast way

#a good discounted and prominent pricing strategy needs to be
#followed to attract the customers

#the data related to country ,hotel_ids,impression share
#can give us idea about which country to choose
#by seeing the country-wise impression share and also
#where we are getting less eligible impression and relatively
#our impression share is good

#a good recommendation system is also a key factor
#for any business i.e showing the audience most
#appropriate option to choose from when they
#are visiting our website.The best example is
#netflix who has increased their profits to
#much more by making a good and perosnalized recommendation
#system for the audience .
```

```
#we can track the performance of our ads and can decide on various things
#to improve our business and earnings
```