Offline Exercise

This notebook has the questions and instructions for the offline exercise. If you haven't already, please go through the `README.md` file before you begin answering the questions here.

Make sure you do NOT commit your answers back to the repo. Instead, copy-paste this notebook together with the `touches.sqlite3` file to a separate folder in your machine, type your answers in that copied notebook, and when you're done, share the new Jupyter notebook back with the recruiter together with additional modules, graphs etc. that you may have. You would need to use the data in the `touches.sqlite3` file to answer all the questions.

Question 1. Find the most common industry out of all the companies that were `contacted`.

Show All the Tables in Database

- I will read all the data from database into Pandas dataframes. Pandas dataframes are efficient data structure for fast data manipulation. The alternative can be read data as required but because we need same data for later exercises, therefore I will read data in dataframes.

In [1]:
```
import pandas as pd
import sqlite3

con = sqlite3.connect("touches.sqlite3")

cursor = con. cursor()
cursor. execute("SELECT name FROM sqlite_master WHERE type='table';")
print("Following tables are in the database")
print(cursor. fetchall())

con.close()
```

```
Following tables are in the database
[('opportunities',), ('companies',), ('persons',), ('touches',)]
```

Read data from Oppurtunities Table

In [3]:
```
con = sqlite3.connect("touches.sqlite3")

# Load the data into a DataFrame
print("opportunities Table Overview")
opportunities = pd.read_sql_query("SELECT * from opportunities", con)

con.close()

opportunities.head(5)
```

```
opportunities Table Overview
```

Out[3]:

	id	company_id	created_at	latest_stage
0	1	3633	2018-01-01 20:38:03.267059	Closed Lost
1	3	5639	2018-01-01 20:38:03.316160	Closed Lost
2	4	886	2018-01-01 20:38:03.334316	Closed Lost
3	5	588	2018-01-01 20:38:03.343280	Closed Lost
4	6	4798	2018-01-01 20:38:03.346662	Closed Lost

Extract Companies being contacted

- We can do this using SQL or Pandas

Extract Companies being contacted using SQL

In [4]:
```
con = sqlite3.connect("touches.sqlite3")

companies_being_contacted_sql = pd.read_sql_query("SELECT * from opportunities WHERE latest_stage IN ('Closed Won', 'Closed Lost', 'Disqualified'

con.close()

print("Total companies being contacted are {}".format(companies_being_contacted_sql.shape[0]))

companies_being_contacted_sql.head(5)
```

```
Total companies being contacted are 5627
```

Out[4]:

	id	company_id	created_at	latest_stage
0	1	3633	2018-01-01 20:38:03.267059	Closed Lost
1	3	5639	2018-01-01 20:38:03.316160	Closed Lost
2	4	886	2018-01-01 20:38:03.334316	Closed Lost
3	5	588	2018-01-01 20:38:03.343280	Closed Lost
4	6	4798	2018-01-01 20:38:03.346662	Closed Lost

Extract Companies being contacted using Pandas

In [5]:
```
companies_being_contacted_pandas = opportunities[opportunities['latest_stage'].isin(['Closed Won', 'Closed Lost', 'Disqualified'])]

print("Total companies being contacted are {}".format(companies_being_contacted_pandas.shape[0]))

companies_being_contacted_pandas.head(5)
```

```
Total companies being contacted are 5627
```

Out[5]:

	id	company_id	created_at	latest_stage
0	1	3633	2018-01-01 20:38:03.267059	Closed Lost
1	3	5639	2018-01-01 20:38:03.316160	Closed Lost
2	4	886	2018-01-01 20:38:03.334316	Closed Lost
3	5	588	2018-01-01 20:38:03.343280	Closed Lost
4	6	4798	2018-01-01 20:38:03.346662	Closed Lost

Read data from Companies Table

In [6]:
```
con = sqlite3.connect("touches.sqlite3")

# Load the data into a DataFrame
print("companies Table Overview")
companies = pd.read_sql_query("SELECT * from companies", con)

con.close()

companies.head(5)
```

```
companies Table Overview
```

Out[6]:

	id	industry	size	location
0	1	Diversified Telecommunication Services	51-200 employees	US/Eastern
1	2	Internet Software & Services	51-200 employees	US/Mountain
2	4	Internet Software & Services		US/Pacific
3	6	Diversified Financial Services	11-50 employees	US/Pacific
4	8	Telecommunications		US/Eastern

Read data from Persons Table

In [7]:
```
con = sqlite3.connect("touches.sqlite3")

# Load the data into a DataFrame
print("persons Table Overview")
persons = pd.read_sql_query("SELECT * from persons", con)

con.close()

persons.head(5)
```

```
persons Table Overview
```

Out[7]:

	id	company_id	job_seniority
0	61	1	Vice President
1	62	1	Manager
2	63	1	Executive
3	64	1	Director
4	65	1	Individual Contributor

Read data from Touches Table

In [8]:
```
con = sqlite3.connect("touches.sqlite3")

# Load the data into a DataFrame
print("touches Table Overview")
touches = pd.read_sql_query("SELECT * from touches", con)

con.close()

touches.head(5)
```

```
touches Table Overview
```

Out[8]:

	id	person_id	touch_scheduled_on	status	touch_type
0	166087	127117	2017-06-01	completed	Phone
1	166088	108969	2017-06-01	completed	Other
2	166089	107761	2017-06-01	completed	Phone
3	166091	77118	2017-06-01	completed	Other
4	166093	106696	2017-06-01	completed	Other

Data Understanding

The agent contact person in a company (the person can be of any designation) through email or phone or other ways. In this the negotiation/ engagement started. The agent carry on negotiation and then at final stages either the contract with company lost or win or disqualified.

There are 4 tables and tables are inter-connected through fields (which can be used to join tables). Different tables represent different entities.

All the columns are of categorical type except two which are date type.

In [9]:
```
print("Create Combine DataFrame")

dataset = touches.merge(persons, on='id', how='left')

dataset = dataset.merge(companies, left_on='company_id', right_on="id", how='left')
dataset['company_id'] = dataset['company_id'].fillna(0)
dataset['company_id'] = dataset['company_id'].astype(int)

dataset = dataset.merge(opportunities, on='company_id', how='left')

dataset.head(5)
```

```
Create Combine DataFrame
```

Out[9]:

	id_x	person_id	touch_scheduled_on	status	touch_type	company_id	job_seniority	id_y	industry	size	location	id	created_at	latest_stage
0	166087	127117	2017-06-01	completed	Phone	8542	Vice President	8542.0	Air Freight & Logistics		US/Pacific	NaN	NaN	NaN
1	166088	108969	2017-06-01	completed	Other	8542	Manager	8542.0	Air Freight & Logistics		US/Pacific	NaN	NaN	NaN
2	166089	107761	2017-06-01	completed	Phone	8542	Director	8542.0	Air Freight & Logistics		US/Pacific	NaN	NaN	NaN
3	166091	77118	2017-06-01	completed	Other	8542	Unknown	8542.0	Air Freight & Logistics		US/Pacific	NaN	NaN	NaN
4	166093	106696	2017-06-01	completed	Other	8542	Vice President	8542.0	Air Freight & Logistics		US/Pacific	NaN	NaN	NaN

In [10]:
```
dataset.drop_duplicates(subset=['person_id'])['latest_stage'].value_counts()
```

Out[10]:
```
Closed Lost     1014
Closed Won       428
Disqualified     284
Discovery         40
Developing        29
SDR Open          13
Name: latest_stage, dtype: int64
```

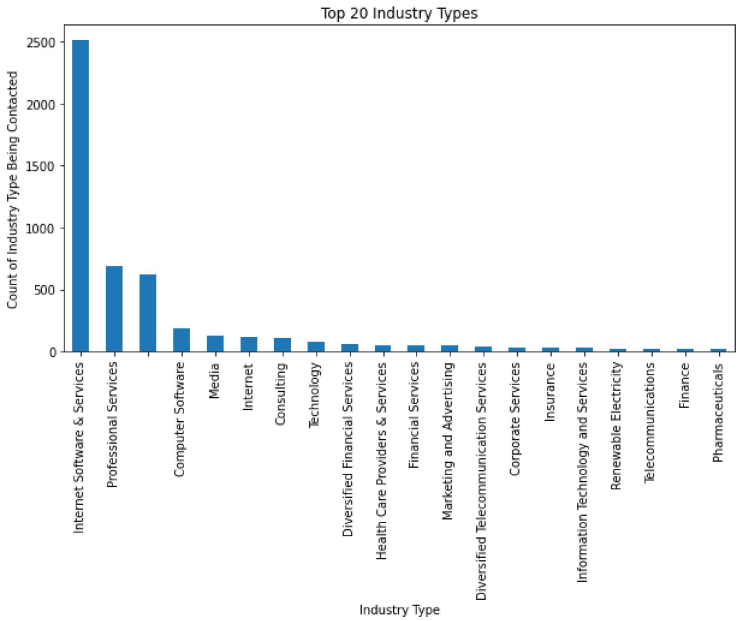
Companies Types Contacted

In [11]:
```
companies_types = companies[companies['id'].isin(companies_being_contacted_pandas['company_id'].values)]
```

In [12]:
```
%matplotlib inline
import matplotlib.pyplot as plt

plt.figure(figsize=(10, 5))
companies_types["industry"].value_counts().head(20).plot.bar()
plt.ylabel("Count of Industry Type Being Contacted")
plt.xlabel("Industry Type")
plt.title("Top 20 Industry Types")
```

Out[12]:
```
Text(0.5, 1.0, 'Top 20 Industry Types')
```



In [13]:
```
companies_types["industry"].value_counts()
```

Out[13]:
```
Internet Software & Services     2512
Professional Services             685
                                  625
Computer Software                 188
Media                             126
                                  ...
Human Resources Software            1
Not For Profit                      1
Metals & Mining                     1
Food & Beverage                     1
Software Development & Design       1
Name: industry, Length: 191, dtype: int64
```

In [14]:
```
companies_types["industry"].value_counts(normalize=True).mul(100).round(2)
```

Out[14]:
```
Internet Software & Services     44.64
Professional Services            12.17
                                 11.11
Computer Software                 3.34
Media                             2.24
                                  ...
Human Resources Software          0.02
Not For Profit                    0.02
Metals & Mining                   0.02
Food & Beverage                   0.02
Software Development & Design     0.02
Name: industry, Length: 191, dtype: float64
```

`INTERNET SOFTWARE & SERVICES` is the most common industry out of all the companies that were contacted.

Question 2. What is the most common touch type sellers use when they're making their first touch with a person? What about first touch with a company?

In [15]:
```
touches = touches.sort_values(by='touch_scheduled_on')
common_touch_type_person = touches.groupby('person_id').first().reset_index()
common_touch_type_person
```

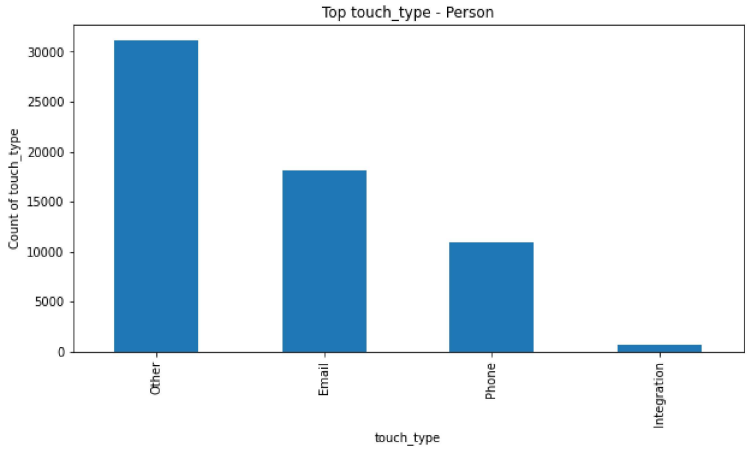
Out[15]:

	person_id	id	touch_scheduled_on	status	touch_type
0	64	614121	2018-09-11	completed	Email
1	66	166558	2017-06-01	completed	Phone
2	82	166380	2017-06-01	completed	Phone
3	84	176348	2017-06-15	completed	Email
4	88	656195	2018-10-03	completed	Email
...	...	...	...	...	...
61030	235418	597161	2018-08-31	completed	Email
61031	235419	626983	2018-09-18	completed	Email
61032	235422	626792	2018-09-18	completed	Email
61033	235423	168292	2017-06-05	completed	Email
61034	235424	444463	2018-05-02	completed	Other

61035 rows × 5 columns

In [16]:
```
plt.figure(figsize=(10, 5))
common_touch_type_person["touch_type"].value_counts().plot.bar()
plt.ylabel("Count of touch_type")
plt.xlabel("touch_type")
plt.title("Top touch_type - Person")
```

Out[16]:
```
Text(0.5, 1.0, 'Top touch_type - Person')
```



In [17]:
```
common_touch_type_person["touch_type"].value_counts()
```

Out[17]:
```
Other          31137
Email          18173
Phone          10979
Integration      746
Name: touch_type, dtype: int64
```

In [18]:
```
common_touch_type_person["touch_type"].value_counts(normalize=True).mul(100).round(2)
```

Out[18]:
```
Other          51.01
Email          29.77
Phone          17.99
Integration     1.22
Name: touch_type, dtype: float64
```

Most common type of touch is `Other` when making their first touch with person.

In [19]:
```
dataset = dataset.sort_values(by='touch_scheduled_on')
common_touch_type_companies = dataset.groupby('company_id').first().reset_index()
common_touch_type_companies
```

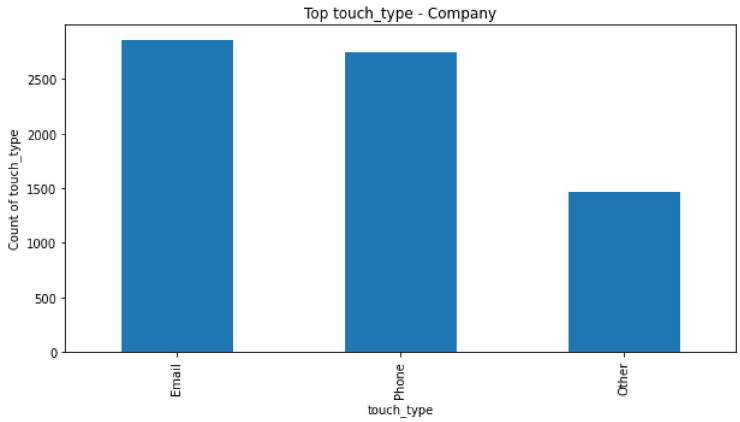
Out[19]:

	company_id	id_x	person_id	touch_scheduled_on	status	touch_type	job_seniority	id_y	industry	size	location	id	created_at	latest
0	0	166657	92895	2017-06-01	completed	Phone	None	NaN	None	None	None	NaN	None	
1	5886	166121	87516	2017-06-01	completed	Phone	Director	5886.0				1261.0	2018-02-07 15:54:32.581178	Clos
2	5889	166218	89146	2017-06-01	completed	Phone	Individual Contributor	5889.0	Software		US/Central	7199.0	2018-09-13 14:19:40.436850	Di
3	5890	166322	135460	2017-06-01	completed	Email	Director	5890.0	Diversified Telecommunication Services		US/Pacific	3585.0	2018-03-09 22:37:36.231851	Clos
4	5891	166337	34906	2017-06-01	completed	Phone	Unknown	5891.0	Internet Software & Services		US/Pacific	3174.0	2018-02-13 19:56:41.858390	Clos
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7055	14859	229485	155765	2017-09-14	completed	Other	Executive	14859.0	Internet		US/Eastern	NaN	None	
7056	14860	200257	51679	2017-07-27	completed	Other	Manager	14860.0	Internet Software & Services	51-200 employees	US/Pacific	NaN	None	
7057	14862	168208	123905	2017-06-05	completed	Email	Unknown	14862.0	Technology Hardware, Storage & Peripherals	10,001+ employees	US/Pacific	NaN	None	
7058	14864	178425	22793	2017-06-20	completed	Other	Director	14864.0	Insurance		US/Pacific	NaN	None	
7059	14865	173214	12506	2017-06-12	completed	Other	Vice President	14865.0	Media		US/Pacific	NaN	None	

7060 rows × 14 columns

In [20]:
```
plt.figure(figsize=(10, 5))
common_touch_type_companies["touch_type"].value_counts().head(20).plot.bar()
plt.ylabel("Count of touch_type")
plt.xlabel("touch_type")
plt.title("Top touch_type - Company")
```

Out[20]:
```
Text(0.5, 1.0, 'Top touch_type - Company')
```



In [21]:
```
common_touch_type_companies["touch_type"].value_counts()
```

Out[21]:
```
Email    2854
Phone    2741
Other    1465
Name: touch_type, dtype: int64
```

In [22]:
```
common_touch_type_companies["touch_type"].value_counts(normalize=True).mul(100).round(2)
```

Out[22]:
```
Email    40.42
Phone    38.82
Other    20.75
Name: touch_type, dtype: float64
```

Most common type of touch is `Email` when making their first touch with company.

Question 3. Describe the distribution of the job seniorities of people that a seller will first try to contact within a company.

To answer this question, you may use visuals, graphs, bunch of scores, tables, writeups - whatever you want. We literally want you to "describe" the distribution to us in the best way you can!

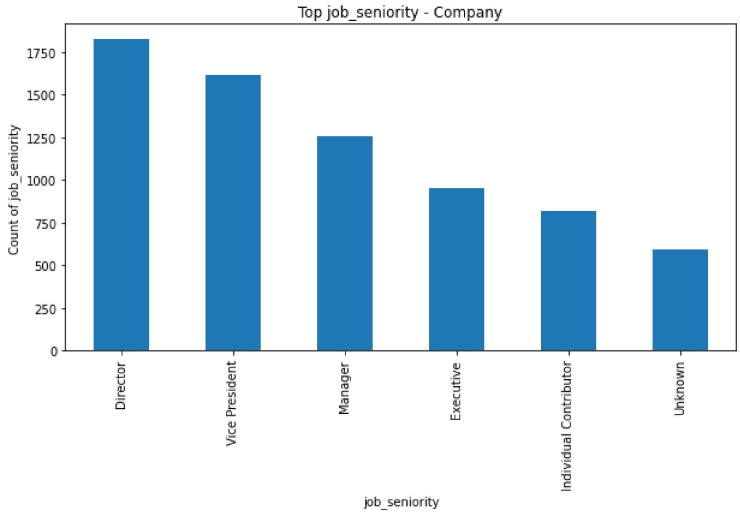
(Note: this question doesn't really have one right answer. It's more about your style of communicating the results.)

Solution

I have used `pandas groupby` to find the first ever contact with a company. So for example agent have contacted company first time with director, then with president. Similarly another company have first contact with manager and then second with director. According to the requirements in question, i have extracted the first contact only. Then I have bar plot of job seniorities, this will give us the distribution.

In [23]:
```
plt.figure(figsize=(10, 5))
common_touch_type_companies["job_seniority"].value_counts().head(20).plot.bar()
plt.ylabel("Count of job_seniority")
plt.xlabel("job_seniority")
plt.title("Top job_seniority - Company")
```

Out[23]:
```
Text(0.5, 1.0, 'Top job_seniority - Company')
```



In [24]:
```
common_touch_type_companies["job_seniority"].value_counts()
```

Out[24]:
```
Director                  1825
Vice President            1614
Manager                   1256
Executive                  954
Individual Contributor     817
Unknown                    593
Name: job_seniority, dtype: int64
```

In [25]:
```
common_touch_type_companies["job_seniority"].value_counts(normalize=True).mul(100).round(2)
```

Out[25]:
```
Director                  25.85
Vice President            22.86
Manager                   17.79
Executive                 13.51
Individual Contributor    11.57
Unknown                    8.40
Name: job_seniority, dtype: float64
```

Comments

As we have combine dataset (consist all information). Mostly people contact `Directors` as first contact with company. Then `Vice President` and so on.

Question 4. Describe the distribution of the mixture of job seniorities of people that a seller will touch during the entire engagement with a company.

Keep in mind that you get to decide what “mixture” means, so do begin your answer by defining it - and explaining why you think this definition makes sense. Again, feel free to use whatever visuals, graphs, bunch of scores, tables, writeups etc. that you think is appropriate for this question.

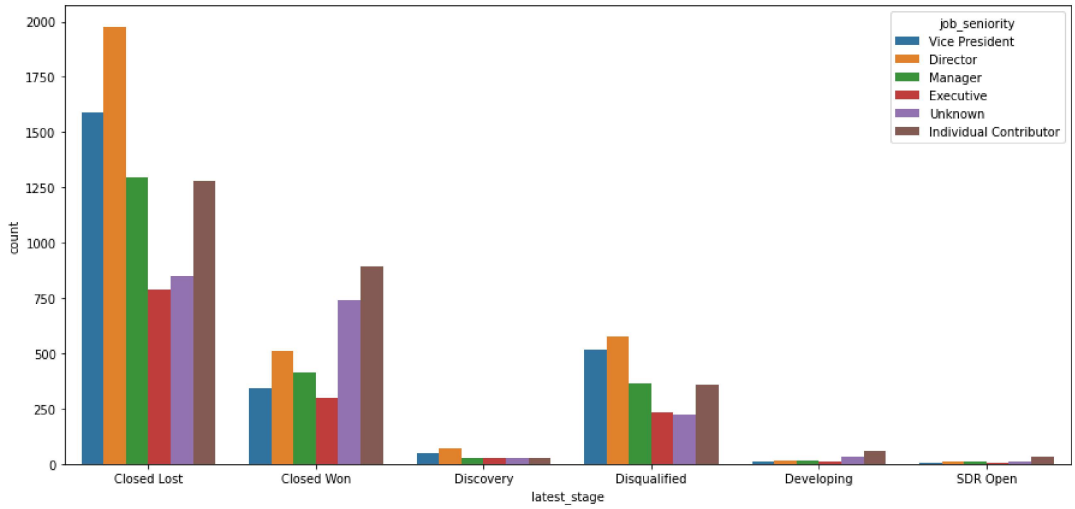
(Note: this question doesn't really have one right answer. It's more about your style of communicating the results.)

Mixture

Mixture in this is the different people called using different types during entire journey as per my understanding. Different types of scenerios can be covered.

In [26]:
```
import seaborn as sns
plt.figure(figsize=(15, 7))
sns.countplot(x='latest_stage', hue='job_seniority', data=dataset)
```

Out[26]: <AxesSubplot:xlabel='latest_stage', ylabel='count'>

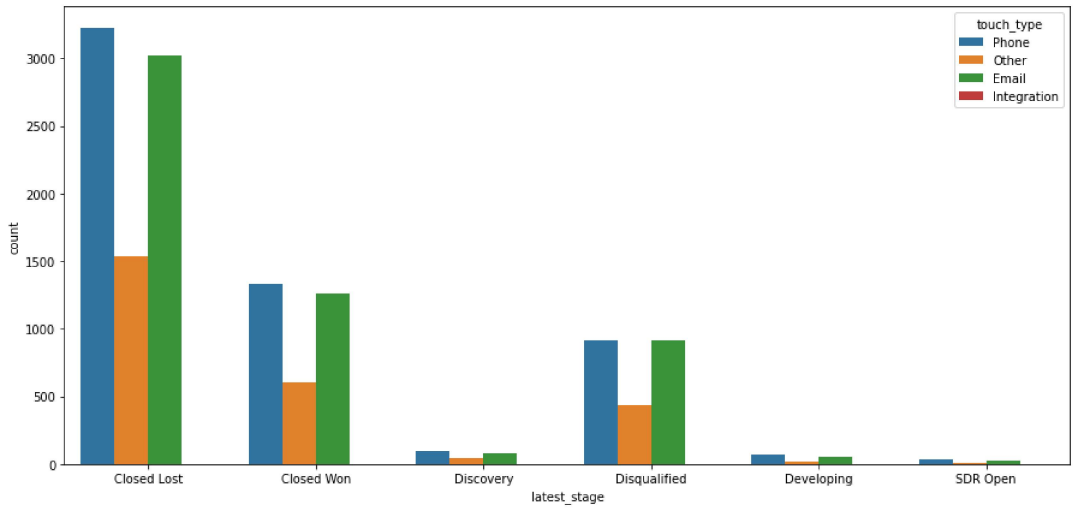


Comments on above Graph

You can see that whenever agent contact higher designations (senior people) of the companies, there is highest chance of contract to be lost. In order to won contract, its better to start negotiation with juniors of the company and then slowly approaching seniors in successive contacts.

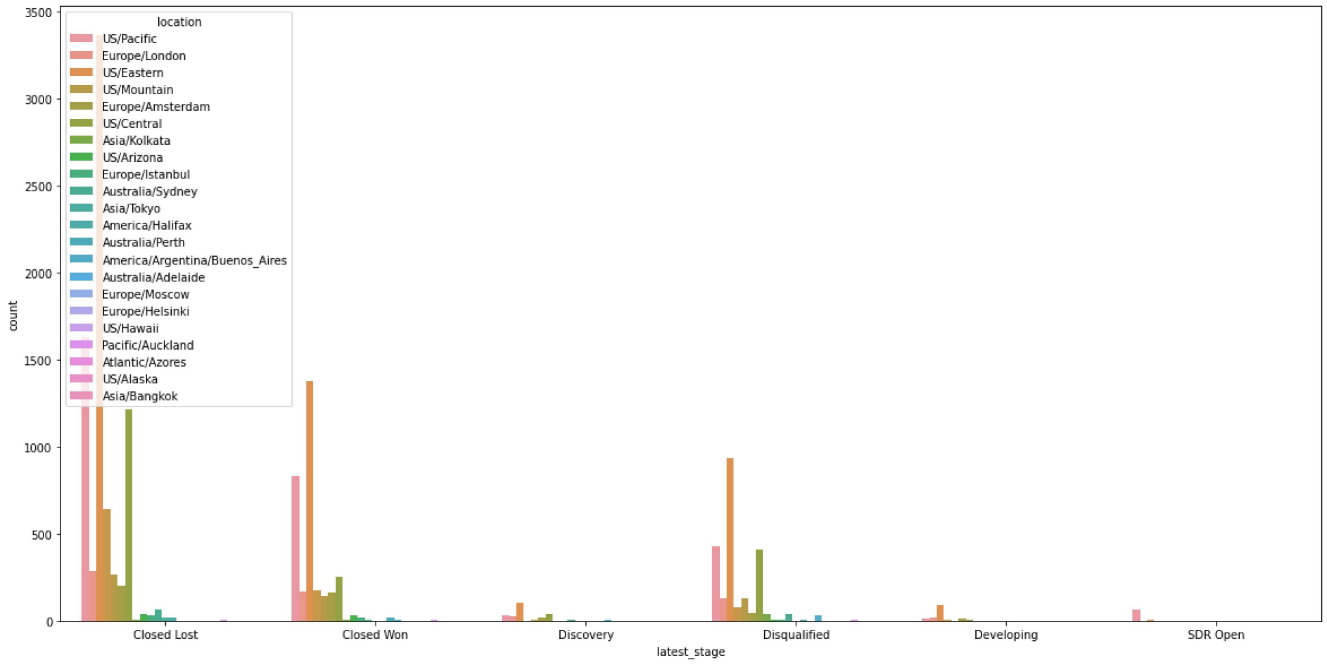
In [27]:
```
plt.figure(figsize=(15, 7))
sns.countplot(x='latest_stage', hue='touch_type', data=dataset)
```

Out[27]: <AxesSubplot:xlabel='latest_stage', ylabel='count'>



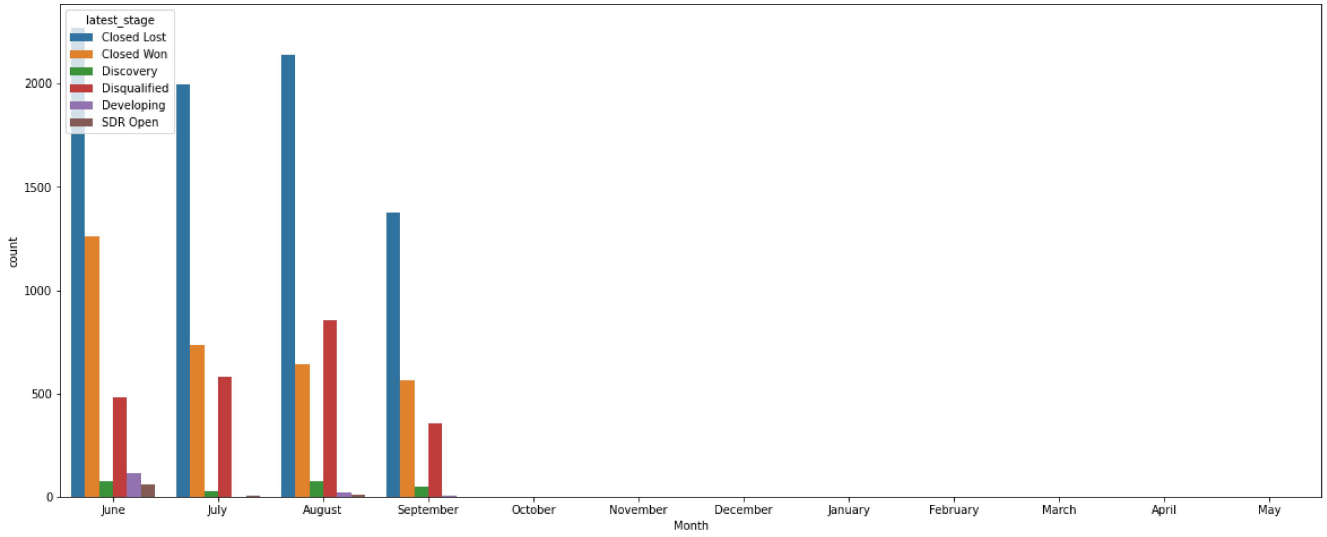
In [28]:
```
plt.figure(figsize=(20, 10))
sns.countplot(x='latest_stage', hue='location', data=dataset)
```

Out[28]: <AxesSubplot:xlabel='latest_stage', ylabel='count'>



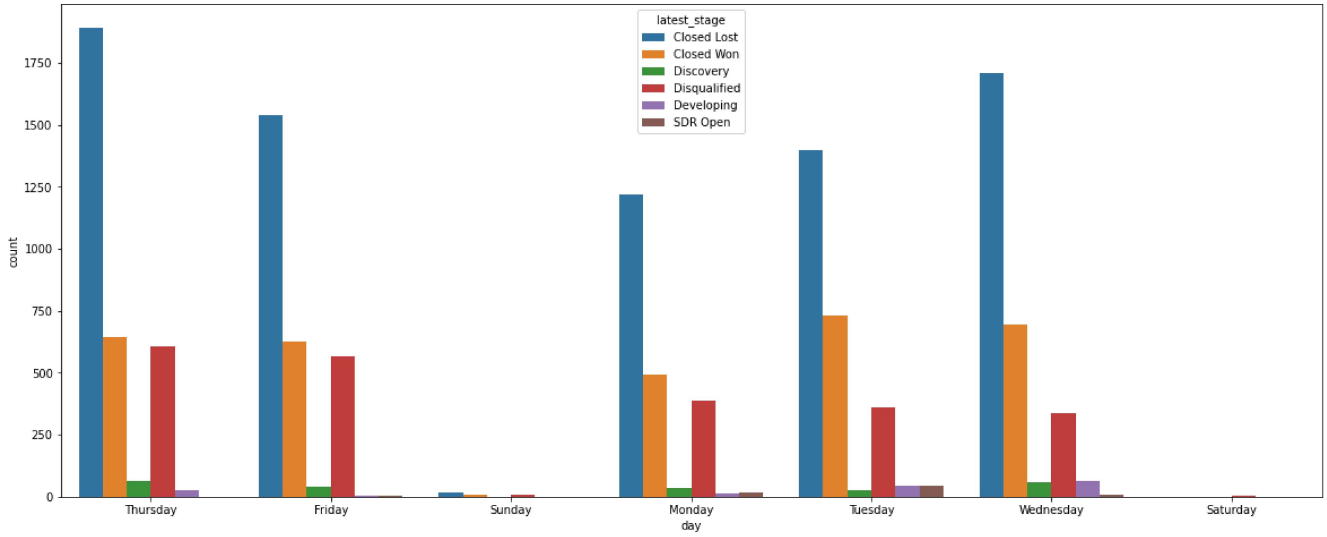
In [29]:
```
dataset['touch_scheduled_on'] = pd.to_datetime(dataset['touch_scheduled_on'])
dataset['Month'] = dataset['touch_scheduled_on'].dt.month_name()
plt.figure(figsize=(20, 8))
sns.countplot(x='Month', hue='latest_stage', data=dataset)
```

Out[29]: <AxesSubplot:xlabel='Month', ylabel='count'>



In [30]:
```
dataset['touch_scheduled_on'] = pd.to_datetime(dataset['touch_scheduled_on'])
dataset['day'] = dataset['touch_scheduled_on'].dt.day_name()
plt.figure(figsize=(20, 8))
sns.countplot(x='day', hue='latest_stage', data=dataset)
```

Out[30]:
```
<AxesSubplot:xlabel='day', ylabel='count'>
```



Comments

There is high chance of winning contract when agent call/ touch people of companies on `Monday` , `Tuesday` or `Friday` . On other days due to busy schedule, chance of losing contracts increases.

Question 5. Build an algorithm that, when a seller is about to contact a company it never reached out to before, recommends the best/optimal mixture of job seniorities (with "mixture" as defined by you in Question 4.) they should be targeting within that company during the entire engagement.

This is the hardest question in this exercise. If you feel you have a good idea what the algorithm should look like but either feel uncomfortable coding-wise or feel pressed for time, it is perfectly OK to describe your idea in words. Be clear, explain both what it does and why you think this is the right approach.

Whether or not you go the code-route or writeup-route, be sure to explain the assumptions and choices you made, why you made them and how you would test them.

(Note: like with the previous two questions, this question doesn't really have one right answer either!)

In [31]:
```
data_for_algo = dataset[~dataset['latest_stage'].isna()]
data_for_algo = data_for_algo[data_for_algo['latest_stage'].isin(['Closed Won', 'Closed Lost', 'Disqualified'])]
data_for_algo
```

Out[31]:

	id_x	person_id	touch_scheduled_on	status	touch_type	company_id	job_seniority	id_y	industry	size	location	id	created_at	latest_stage
425	166683	76349	2017-06-01	completed	Phone	5906	Director	5906.0	Internet Software & Services	25-50	Europe/London	7770.0	2018-10-30 18:15:02.584597	Closed Lost
426	166684	148739	2017-06-01	completed	Phone	5906	Vice President	5906.0	Internet Software & Services	25-50	Europe/London	7770.0	2018-10-30 18:15:02.584597	Closed Lost
424	166682	102048	2017-06-01	completed	Phone	5906	Director	5906.0	Internet Software & Services	25-50	Europe/London	7770.0	2018-10-30 18:15:02.584597	Closed Lost
423	166680	3006	2017-06-01	completed	Email	5906	Unknown	5906.0	Internet Software & Services	25-50	Europe/London	7770.0	2018-10-30 18:15:02.584597	Closed Lost
421	166677	148112	2017-06-01	completed	Phone	5906	Manager	5906.0	Internet Software & Services	25-50	Europe/London	7770.0	2018-10-30 18:15:02.584597	Closed Lost
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
48029	235318	159021	2017-09-25	completed	Email	8302	Unknown	8302.0	Software Development & Design		US/Eastern	8292.0	2018-12-18 19:37:45.473243	Disqualified
48031	235321	88574	2017-09-25	completed	Email	8302	Executive	8302.0	Software Development & Design		US/Eastern	8292.0	2018-12-18 19:37:45.473243	Disqualified
48032	235323	121900	2017-09-25	completed	Phone	8302	Director	8302.0	Software Development & Design		US/Eastern	8292.0	2018-12-18 19:37:45.473243	Disqualified
48033	235324	70828	2017-09-25	completed	Other	8302	Director	8302.0	Software Development & Design		US/Eastern	8292.0	2018-12-18 19:37:45.473243	Disqualified
48030	235320	56350	2017-09-25	completed	Email	8302	Individual Contributor	8302.0	Software Development & Design		US/Eastern	8292.0	2018-12-18 19:37:45.473243	Disqualified

13245 rows × 16 columns

In [32]:
```
features = ['touch_type', 'job_seniority', 'industry', 'size', 'location', 'day', 'latest_stage']
data_for_algo = data_for_algo[features]
data_for_algo = data_for_algo.drop_duplicates()
data_for_algo
```

Out[32]:

	touch_type	job_seniority	industry	size	location	day	latest_stage
425	Phone	Director	Internet Software & Services	25-50	Europe/London	Thursday	Closed Lost
426	Phone	Vice President	Internet Software & Services	25-50	Europe/London	Thursday	Closed Lost
423	Email	Unknown	Internet Software & Services	25-50	Europe/London	Thursday	Closed Lost
421	Phone	Manager	Internet Software & Services	25-50	Europe/London	Thursday	Closed Lost
422	Other	Director	Internet Software & Services	25-50	Europe/London	Thursday	Closed Lost
...	...	...	...	...	...	...	...
48029	Email	Unknown	Software Development & Design		US/Eastern	Monday	Disqualified
48031	Email	Executive	Software Development & Design		US/Eastern	Monday	Disqualified
48032	Phone	Director	Software Development & Design		US/Eastern	Monday	Disqualified
48033	Other	Director	Software Development & Design		US/Eastern	Monday	Disqualified
48030	Email	Individual Contributor	Software Development & Design		US/Eastern	Monday	Disqualified

6111 rows × 7 columns

In [33]:
```
data_for_algo.isna().sum()
```

Out[33]:
```
touch_type       0
job_seniority    0
industry         0
size             0
location         0
day              0
latest_stage     0
dtype: int64
```

We have tried Machine Learning to detect the Percentage of Lost Contract using Random Forest Classification

In [36]:
```
import warnings
warnings.filterwarnings('ignore')

encoding = {}
for c in data_for_algo.columns:
    if c in ["latest_stage"]:
        continue
    else:
        data_for_algo[c] = data_for_algo[c].fillna("Others")
        d = pd.get_dummies(data_for_algo[c], prefix=c)
        data_for_algo = data_for_algo.drop(columns=[c])
        data_for_algo[d.columns] = d
        encoding.update({c:d.columns})
Y = data_for_algo[["latest_stage"]]
X = data_for_algo.drop(columns=["latest_stage"])
```

In [37]:
```
# library for Machine Learning Models
from sklearn.ensemble import RandomForestClassifier

# Library for Training and testing data split
from sklearn.model_selection import train_test_split

# libraries for confusion Matrix, Classification Repports, ROC and AUC
from sklearn.metrics import confusion_matrix, classification_report, roc_curve, auc

X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size=0.30, stratify=Y)

# make Random Forest Classifier object
forest = RandomForestClassifier(n_estimators=500, random_state=1)

# Train Algo on training data
forest.fit(X_train, y_train)

# Predict target for testing data
y_pred = forest.predict(X_test)

print("Classification Report")
confusion_report = classification_report(y_test, y_pred)
print(confusion_report)

print("\nConfusion Matrix")
confusion_attack = confusion_matrix(y_test, y_pred)
print(confusion_attack)
```

```
Classification Report
              precision    recall  f1-score   support

 Closed Lost       0.71      0.84      0.77      1017
  Closed Won       0.62      0.51      0.56       444
Disqualified       0.61      0.45      0.52       373

    accuracy                           0.68      1834
   macro avg       0.65      0.60      0.62      1834
weighted avg       0.67      0.68      0.67      1834


Confusion Matrix
[[852  97  68]
 [178 225  41]
 [162  42 169]]
```

In [38]:
```
X.columns
```

Out[38]:
```
Index(['touch_type_Email', 'touch_type_Other', 'touch_type_Phone',
       'job_seniority_Director', 'job_seniority_Executive',
       'job_seniority_Individual Contributor', 'job_seniority_Manager',
       'job_seniority_Unknown', 'job_seniority_Vice President', 'industry_',
       ...
       'location_US/Eastern', 'location_US/Mountain', 'location_US/Pacific',
       'day_Friday', 'day_Monday', 'day_Saturday', 'day_Sunday',
       'day_Thursday', 'day_Tuesday', 'day_Wednesday'],
      dtype='object', length=213)
```

User System Example

- If the company is of type `Internet Software & Services` AND
- Size of company is `25-30` AND
- Location of company is `Europe/London` , then how you should touch and whom should be contacted?

In [39]:
```
rec = [0]*len(X.columns)
for designation in encoding['job_seniority']:
    for touch_typ in encoding['touch_type']:
        for day in encoding['day']:
            for c in ['Internet Software & Services', '25-30', 'Europe/London']:
                for i in range(len(X.columns)):
                    if c in X.columns[i]:
                        rec[i] = 1
            rec[X.columns.values.tolist().index(designation)] = 1
            rec[X.columns.values.tolist().index(touch_typ)] = 1
            rec[X.columns.values.tolist().index(day)] = 1
            print("If you contact {0} through {1} on {2}, then there is {3}% chance to LOST".format(designation.split("_")[-1], touch_typ.split('
            print("--------------------------------------------------------------------------------")
```

```
If you contact Director through Email on Friday, then there is 40.4% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Email on Monday, then there is 39.17% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Email on Saturday, then there is 39.17% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Email on Sunday, then there is 41.84% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Email on Thursday, then there is 43.19% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Email on Tuesday, then there is 47.3% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Email on Wednesday, then there is 48.17% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Other on Friday, then there is 52.97% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Other on Monday, then there is 52.97% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Other on Saturday, then there is 52.97% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Other on Sunday, then there is 52.97% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Other on Thursday, then there is 52.97% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Other on Tuesday, then there is 52.97% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Other on Wednesday, then there is 52.97% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Phone on Friday, then there is 50.85% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Phone on Monday, then there is 50.85% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Phone on Saturday, then there is 50.85% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Phone on Sunday, then there is 50.85% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Phone on Thursday, then there is 50.85% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Phone on Tuesday, then there is 50.85% chance to LOST
--------------------------------------------------------------------------------
If you contact Director through Phone on Wednesday, then there is 50.85% chance to LOST
--------------------------------------------------------------------------------
If you contact Executive through Email on Friday, then there is 48.55% chance to LOST
--------------------------------------------------------------------------------
If you contact Executive through Email on Monday, then there is 48.55% chance to LOST
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If you contact Executive through Email on Saturday, then there is 48.55% chance to LOST
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If you contact Executive through Email on Sunday, then there is 48.55% chance to LOST
--------------------------------------------------------------------------------
If you contact Executive through Email on Thursday, then there is 48.55% chance to LOST
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If you contact Executive through Email on Tuesday, then there is 48.55% chance to LOST
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If you contact Executive through Email on Wednesday, then there is 48.55% chance to LOST
--------------------------------------------------------------------------------
If you contact Executive through Other on Friday, then there is 48.55% chance to LOST
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If you contact Executive through Other on Monday, then there is 48.55% chance to LOST
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If you contact Executive through Other on Saturday, then there is 48.55% chance to LOST
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If you contact Executive through Other on Sunday, then there is 48.55% chance to LOST
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If you contact Executive through Other on Thursday, then there is 48.55% chance to LOST
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If you contact Executive through Other on Tuesday, then there is 48.55% chance to LOST
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If you contact Executive through Other on Wednesday, then there is 48.55% chance to LOST
--------------------------------------------------------------------------------
If you contact Executive through Phone on Friday, then there is 48.55% chance to LOST
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If you contact Executive through Phone on Monday, then there is 48.55% chance to LOST
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If you contact Executive through Phone on Saturday, then there is 48.55% chance to LOST
--------------------------------------------------------------------------------
If you contact Executive through Phone on Sunday, then there is 48.55% chance to LOST
--------------------------------------------------------------------------------
If you contact Executive through Phone on Thursday, then there is 48.55% chance to LOST
```

If you contact Executive through Phone on Tuesday, then there is 48.55% chance to LOST

If you contact Executive through Phone on Wednesday, then there is 48.55% chance to LOST

If you contact Individual Contributor through Email on Friday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Email on Monday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Email on Saturday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Email on Sunday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Email on Thursday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Email on Tuesday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Email on Wednesday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Other on Friday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Other on Monday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Other on Saturday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Other on Sunday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Other on Thursday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Other on Tuesday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Other on Wednesday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Phone on Friday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Phone on Monday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Phone on Saturday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Phone on Sunday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Phone on Thursday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Phone on Tuesday, then there is 45.18% chance to LOST

If you contact Individual Contributor through Phone on Wednesday, then there is 45.18% chance to LOST

If you contact Manager through Email on Friday, then there is 47.87% chance to LOST

If you contact Manager through Email on Monday, then there is 47.87% chance to LOST

If you contact Manager through Email on Saturday, then there is 47.87% chance to LOST

If you contact Manager through Email on Sunday, then there is 47.87% chance to LOST

If you contact Manager through Email on Thursday, then there is 47.87% chance to LOST

If you contact Manager through Email on Tuesday, then there is 47.87% chance to LOST

If you contact Manager through Email on Wednesday, then there is 47.87% chance to LOST

If you contact Manager through Other on Friday, then there is 47.87% chance to LOST

If you contact Manager through Other on Monday, then there is 47.87% chance to LOST

If you contact Manager through Other on Saturday, then there is 47.87% chance to LOST

If you contact Manager through Other on Sunday, then there is 47.87% chance to LOST

If you contact Manager through Other on Thursday, then there is 47.87% chance to LOST

If you contact Manager through Other on Tuesday, then there is 47.87% chance to LOST

If you contact Manager through Other on Wednesday, then there is 47.87% chance to LOST

If you contact Manager through Phone on Friday, then there is 47.87% chance to LOST

If you contact Manager through Phone on Monday, then there is 47.87% chance to LOST

If you contact Manager through Phone on Saturday, then there is 47.87% chance to LOST

If you contact Manager through Phone on Sunday, then there is 47.87% chance to LOST

If you contact Manager through Phone on Thursday, then there is 47.87% chance to LOST

If you contact Manager through Phone on Tuesday, then there is 47.87% chance to LOST

If you contact Manager through Phone on Wednesday, then there is 47.87% chance to LOST

If you contact Unknown through Email on Friday, then there is 49.95% chance to LOST

If you contact Unknown through Email on Monday, then there is 49.95% chance to LOST

If you contact Unknown through Email on Saturday, then there is 49.95% chance to LOST

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If you contact Unknown through Email on Sunday, then there is 49.95% chance to LOST
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If you contact Unknown through Email on Thursday, then there is 49.95% chance to LOST
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If you contact Unknown through Email on Tuesday, then there is 49.95% chance to LOST
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If you contact Unknown through Email on Wednesday, then there is 49.95% chance to LOST
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If you contact Unknown through Other on Friday, then there is 49.95% chance to LOST
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If you contact Unknown through Other on Monday, then there is 49.95% chance to LOST
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If you contact Unknown through Other on Saturday, then there is 49.95% chance to LOST
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If you contact Unknown through Other on Sunday, then there is 49.95% chance to LOST
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If you contact Unknown through Other on Thursday, then there is 49.95% chance to LOST
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If you contact Unknown through Other on Tuesday, then there is 49.95% chance to LOST
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If you contact Unknown through Other on Wednesday, then there is 49.95% chance to LOST
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If you contact Unknown through Phone on Friday, then there is 49.95% chance to LOST
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If you contact Unknown through Phone on Monday, then there is 49.95% chance to LOST
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If you contact Unknown through Phone on Saturday, then there is 49.95% chance to LOST
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If you contact Unknown through Phone on Sunday, then there is 49.95% chance to LOST
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If you contact Unknown through Phone on Thursday, then there is 49.95% chance to LOST
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If you contact Unknown through Phone on Tuesday, then there is 49.95% chance to LOST
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If you contact Unknown through Phone on Wednesday, then there is 49.95% chance to LOST
--------------------------------------------------------------------------------
If you contact Vice President through Email on Friday, then there is 47.55% chance to LOST
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If you contact Vice President through Email on Monday, then there is 47.55% chance to LOST
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If you contact Vice President through Email on Saturday, then there is 47.55% chance to LOST
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If you contact Vice President through Email on Sunday, then there is 47.55% chance to LOST
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If you contact Vice President through Email on Thursday, then there is 47.55% chance to LOST
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If you contact Vice President through Email on Tuesday, then there is 47.55% chance to LOST
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If you contact Vice President through Email on Wednesday, then there is 47.55% chance to LOST
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If you contact Vice President through Other on Friday, then there is 47.55% chance to LOST
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If you contact Vice President through Other on Monday, then there is 47.55% chance to LOST
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If you contact Vice President through Other on Saturday, then there is 47.55% chance to LOST
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If you contact Vice President through Other on Sunday, then there is 47.55% chance to LOST
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If you contact Vice President through Other on Thursday, then there is 47.55% chance to LOST
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If you contact Vice President through Other on Tuesday, then there is 47.55% chance to LOST
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If you contact Vice President through Other on Wednesday, then there is 47.55% chance to LOST
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If you contact Vice President through Phone on Friday, then there is 47.55% chance to LOST
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If you contact Vice President through Phone on Monday, then there is 47.55% chance to LOST
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If you contact Vice President through Phone on Saturday, then there is 47.55% chance to LOST
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If you contact Vice President through Phone on Sunday, then there is 47.55% chance to LOST
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If you contact Vice President through Phone on Thursday, then there is 47.55% chance to LOST
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If you contact Vice President through Phone on Tuesday, then there is 47.55% chance to LOST
--------------------------------------------------------------------------------
If you contact Vice President through Phone on Wednesday, then there is 47.55% chance to LOST
--------------------------------------------------------------------------------
```

In [ ]: