In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
df = pd.read_csv('complaints_processed.csv')
df
```

Out[2]:

	Unnamed: 0	product	narrative
0	0	credit_card	purchase order day shipping amount receive pro...
1	1	credit_card	forwarded message date tue subject please inve...
2	2	retail_banking	forwarded message cc sent friday pdt subject f...
3	3	credit_reporting	payment history missing credit report speciali...
4	4	credit_reporting	payment history missing credit report made mis...
...	...	...	...
162416	162416	debt_collection	name
162417	162417	credit_card	name
162418	162418	debt_collection	name
162419	162419	credit_card	name
162420	162420	credit_reporting	name

162421 rows × 3 columns

In [3]:
```
data = pd.DataFrame(df.narrative)
```

In [4]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 162421 entries, 0 to 162420
Data columns (total 1 columns):
 #   Column     Non-Null Count   Dtype 
---  ------     --------------   ----- 
 0   narrative  162411 non-null  object
dtypes: object(1)
memory usage: 1.2+ MB
```

In [5]:
```
data.isnull().sum()
```

Out[5]:
```
narrative    10
dtype: int64
```

In [6]:
```
data = data.dropna()
```

Converted to Lower

In [7]:
```
data.narrative = data.narrative.str.lower()
```

Removing URL

In [8]:
```
data.narrative = data.narrative.str.replace(r'http\S+|www.\S+','',case = False)
```

In [9]:
```
data.iloc[1,0]
```

Out[9]:
```
'forwarded message date tue subject please investigate comenity bank retailer card
scam sent hello name scammed comenity bank credit card provider company childrens p
lace new york forever victoria secret original credit comenity bank lower limit beg
an charge overage fee along late fee began pay close attention card find limit also
changed well incurring overage late fee reached company comenity bank stated would
change credit limit original limit reached told summit payment account corrected co
menity bank credit card impacted credit score plummeted negative status im currentl
y paying price due corruption affected detrimental way debt due company charging ov
erage fee well late fee even initial credit limit fluctuating tremendously company
charge major fee account willing correct account nervous said attorney reason im re
aching im employee company ruining credit plz help name contact info thank'
```

Remove punctuation

In [10]:
```
import string
```

In [11]:
```
punctuation_list = string.punctuation
punctuation_list
```

Out[11]:
```
'!"#$%&\'()*+,-./:;<=>?@[\\]^_`{|}~'
```

In [12]:
```
def remove_punctuation(text):
    without_puctuation = " "
    for i in text:
        if i not in string.punctuation:
            without_puctuation +=i

    return without_puctuation

```

In [13]:
```
remove_punctuation('are you really happy??')
```

Out[13]:
```
' are you really happy'
```

Remove Number

In [14]:
```
data.narrative = data.narrative.str.replace('\d+','')
```

Removing Stop Words

In [15]:
```
import nltk
nltk.download('stopwords')
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]     C:\Users\MR.GODHADE\AppData\Roaming\nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
```

Out[15]:
```
True
```

In [16]:
```
from nltk.corpus import stopwords
stop = stopwords.words('english')
```

In [17]:
```
stop
```

Out[17]:
```
['i',
 'me',
 'my',
 'myself',
 'we',
 'our',
 'ours',
 'ourselves',
 'you',
 "you're",
 "you've",
 "you'll",
 "you'd",
 'your',
 'yours',
 'yourself',
 'yourselves',
 'he',
 'him',
```

In [18]:
```
# Exclude stopwords with Python's list comprehension and pandas.DataFrame.apply
data['narrative'] = data['narrative'].apply(lambda x: ' '.join([abc   # x = Tex
                                                                for abc in x.split() # wo
                                                                if abc not in (stop)]))
```

In [19]:
```
data['narrative'][1]
```

Out[19]:
```
'forwarded message date tue subject please investigate comenity bank retailer card
scam sent hello name scammed comenity bank credit card provider company childrens p
lace new york forever victoria secret original credit comenity bank lower limit beg
an charge overage fee along late fee began pay close attention card find limit also
changed well incurring overage late fee reached company comenity bank stated would
change credit limit original limit reached told summit payment account corrected co
menity bank credit card impacted credit score plummeted negative status im currentl
y paying price due corruption affected detrimental way debt due company charging ov
erage fee well late fee even initial credit limit fluctuating tremendously company
charge major fee account willing correct account nervous said attorney reason im re
aching im employee company ruining credit plz help name contact info thank'
```

Common Words

In [20]:
```
import nltk
nltk.download('words')
words = set(nltk.corpus.words.words())
```

```
[nltk_data] Downloading package words to
[nltk_data]     C:\Users\MR.GODHADE\AppData\Roaming\nltk_data...
[nltk_data]   Package words is already up-to-date!
```

In [21]:
```
words
```

```
'unspelled',
'conrector',
'misuse',
'overspaciousness',
'unremembrance',
'counterengagement',
'chamaerrhine',
'saccharinic',
'mayor',
'updart',
'delabialization',
'beckiron',
'Wordsworthian',
'overtrick',
'playboy',
'Martynia',
'hairlet',
'advised',
'syphiloderm',
'vatmaker',
```

In [22]:
```
import re
def  clean_text(text):
    text = re.sub(r"\b[a-zA-Z]\b"," ", text)
    text = re.sub("\b[a-zA-Z][a-zA-Z]\b","",text)
    text = " ".join( w for w in nltk.wordpunct_tokenize(text) if w.lower() in w

    return text
```

In [23]:
```
data = pd.DataFrame(data.narrative.apply(lambda x:clean_text(x)))
```

In [24]:
```
data
```

Out[24]:

	narrative
0	purchase order day shipping amount receive pro...
1	message date tue subject please investigate ba...
2	message sent subject final legal payment well ...
3	payment history missing credit report speciali...
4	payment history missing credit report made mis...
...	...
162416	name
162417	name
162418	name
162419	name
162420	name

162411 rows × 1 columns

Lemmatization

In [25]:
```
from nltk.stem import WordNetLemmatizer
lemmatizer = WordNetLemmatizer()
```

In [26]:
```
w_tokenizer = nltk.tokenize.WhitespaceTokenizer()
```

In [27]:
```
def lemmatize_text(abc):
    return [lemmatizer.lemmatize(w,"v") for w in w_tokenizer.tokenize(abc)]
```

In [28]:
```
data.narrative = data.narrative.apply(lambda x : " ".join(lemmatize_text(x)))
```

Strip extra whitespace

In [29]:
```
data.narrative = data.narrative.str.rstrip()
```

Removing Duplicate Row

In [30]:
```
data = data.drop_duplicates()
```

In [31]:
```
data.shape
```

Out[31]: (114487, 1)

Document-Term Matrix

It is used to find most important word in dicuments

In [32]:
```
data.head()
```

Out[32]:

	narrative
0	purchase order day ship amount receive product...
1	message date tue subject please investigate ba...
2	message send subject final legal payment well ...
3	payment history miss credit report specialize ...
4	payment history miss credit report make mistak...

In [33]:
```
from sklearn.feature_extraction.text import CountVectorizer
cv = CountVectorizer(stop_words='english', max_features=2500)
```

In [34]:
```
data_dtm = cv.fit_transform(data.narrative).toarray()

```

DTM- DocumentTerm Matrix

In [35]:
```
data_dtm_df = pd.DataFrame(data_dtm,columns = cv.get_feature_names())
data_dtm_df
```

Out[35]:

	abide	ability	able	abruptly	absence	absent	absolute	absolutely	absurd	abuse	...	yell	y
0	0	0	0	0	0	0	0	0	0	0	...	0	
1	0	0	0	0	0	0	0	0	0	0	...	0	
2	0	0	0	0	0	0	0	0	0	0	...	0	
3	0	0	2	0	0	0	0	0	0	0	...	0	
4	0	0	2	0	0	0	0	0	0	0	...	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	...
114482	0	0	0	0	0	0	0	0	0	0	...	0	
114483	0	0	0	0	0	0	0	0	0	0	...	0	
114484	0	0	0	0	0	0	0	0	0	0	...	0	
114485	0	0	0	0	0	0	0	0	0	0	...	0	
114486	0	0	0	0	0	0	0	0	0	0	...	0	

114487 rows × 2500 columns

TDM-Term Document matrix

In [36]:
```
tdm = data_dtm_df.transpose()
tdm
```

Out[36]:

	0	1	2	3	4	5	6	7	8	9	...	114477	114478	114479	114480	114481	114482	11448
abide	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	
ability	0	0	0	0	0	1	0	0	0	0	...	0	0	0	0	0	0	
able	0	0	0	2	2	0	0	1	0	0	...	0	0	0	0	0	0	
abruptly	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	
absence	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
youve	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	
yr	0	0	0	0	0	0	0	0	0	0	...	0	0	0	1	0	0	
zero	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	
zip	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	
zone	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	

2500 rows × 114487 columns

In [37]:
```
tdm['freq'] = tdm.sum(axis=1)

tdm.head()
```

Out[37]:

	0	1	2	3	4	5	6	7	8	9	...	114478	114479	114480	114481	114482	114483	114484	11
abide	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	
ability	0	0	0	0	0	1	0	0	0	0	...	0	0	0	0	0	0	0	
able	0	0	0	2	2	0	0	1	0	0	...	0	0	0	0	0	0	0	
abruptly	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	
absence	0	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	

5 rows × 114488 columns

In [38]:
```
tdm.reset_index(inplace=True)
tdm.head()
```

Out[38]:

	index	0	1	2	3	4	5	6	7	8	...	114478	114479	114480	114481	114482	114483	114484	11
0	abide	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	
1	ability	0	0	0	0	0	1	0	0	0	...	0	0	0	0	0	0	0	
2	able	0	0	0	2	2	0	0	1	0	...	0	0	0	0	0	0	0	
3	abruptly	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	
4	absence	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	

5 rows × 114489 columns

In [39]:
```
tdm1 = tdm[['index','freq']]
tdm1
```

Out[39]:

	index	freq
0	abide	288
1	ability	2736
2	able	14926
3	abruptly	155
4	absence	205
...	...	...
2495	youve	224
2496	yr	620
2497	zero	1300
2498	zip	211
2499	zone	191

2500 rows × 2 columns

In [40]:
```
tdm1.rename(columns={'index' : 'word'},inplace =True)
```

In [41]:
```
tdm1.sort_values(by = 'freq', ascending=False, inplace=True)
```

In [42]:
```
tdm1
```

Out[42]:

	word	freq
24	account	230957
520	credit	208798
1550	payment	113088
1841	report	104644
1131	information	89463
...	...	...
1307	maiden	132
1115	inconvenient	132
1488	oral	131
1560	perfectly	131
534	custody	131

In [43]:
```
tdm1.head(10)
```

Out[43]:

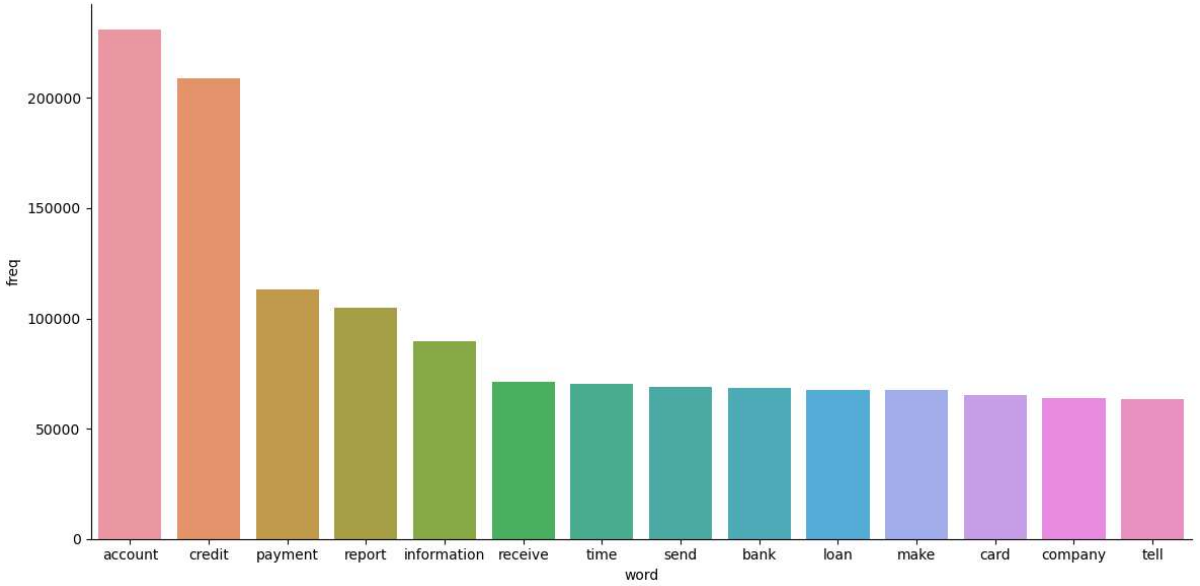
	word	freq
24	account	230957
520	credit	208798
1550	payment	113088
1841	report	104644
1131	information	89463
1754	receive	71381
2236	time	70103
1980	send	68776
220	bank	68673
1281	loan	67610

In [44]:
```
w = tdm1[tdm1['freq']>60000]
w
```

Out[44]:

	word	freq
24	account	230957
520	credit	208798
1550	payment	113088
1841	report	104644
1131	information	89463
1754	receive	71381
2236	time	70103
1980	send	68776
220	bank	68673
1281	loan	67610
1315	make	67514
312	card	65087
407	company	64029
2203	tell	63618

In [45]:
```
import seaborn as sns
fg = sns.factorplot(x = 'word', y = 'freq',size = 6, aspect =2,kind='bar',data=
```



In [46]:
```
text = " ".join(review for review in data.narrative)
print ("There are {} words in the combination of all review.".format(len(text))
```

```
There are 60021004 words in the combination of all review.
```

In [52]:
```
from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator
import matplotlib.pyplot as plt

stopwords = set(STOPWORDS)
# Generate a word cloud image
abc = WordCloud(stopwords=stopwords,
                        background_color="white",
                        collocations=False,
                        mode="RGBA",
                        max_words=30).generate(text)

# Display the generated image:
# the matplotlib way:
plt.imshow(abc, interpolation='bilinear')
plt.axis("off")
plt.show()
```

In [ ]:
```
1
```