UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Razak Faculty of Technology and Informatics

GROUP PROJECT
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COURSE : **BUSINESS INTELLIGENCE**

PROGRAMME : **MSc (BUSINESS INTELLIGENCE AND ANALYTICS)**

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THEME : **CONSUMER**

TITLE : **Decision Support for Marketing Research for ALL Life Bank**

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Introduction

Banking is one of the key drivers for the economy of any country. Banking industry acts as the financial intermediary between depositors and borrowers. It also provides additional services such as trade-based financing, guarantees, credit card etc. In the present day, banking facilities can now be easily accessible by everyone, anywhere and anytime due to the rise of internet usage in society.

Customers using the banking products can vary from individuals to corporate, from high-income to low-income, from youth to seniors and many others. Understanding the customers segmentation and their profile can assist the bank in tailoring their strategies in promoting tailored-made products for each customer.

Credit cards are one of the key products that a bank can provide to their customers. However, credit card facilities should be tailored to the type of customers that the bank has. For example, a customer with a bad credit history should not be able to access a high credit limit compared to a customer with a good credit history. Depending on the customer profile, the available facilities can vary among each other with some receiving full access to the banking products while some might only be able to access the limited version of the services.

This project is to examine the profiles of customers in ALL Life Bank especially related to its segmentation and the credit card facilities that they have. The tools that will be used for this study includes Microsoft Power BI and Python. We hope that this project with its outcomes can then be used for future strategic and beneficial purposes.

Objective

The objectives of this project are as described below:

1. To provide better understanding of the customer segmentation and their behaviour.
2. To assist stakeholders by providing key information for strategic decision-making.
3. To produce a comprehensive report that can assist the bank in utilizing their resources efficiently.

Scope

The scope of this project is to conduct an analysis on the customer data of a bank to distinguish customers based on its segmentation. Customer segmentation is one of a marketing strategy for breaking down a big and diverse customer group into a much smaller related groups of customers who are similar in certain aspects and are important for marketing a bank's goods and services. The examples of segmentation criteria include age, income, geography and purchasing patterns.

The first step was to obtain customer's information from the bank to carry out some data cleaning. After the data has been cleaned, the data mining and analysis will be performed using the technique of k-means clustering modeling.

Next, Power BI will be used to provide visualization analysis for the Decision Support Digital Intelligence Dashboard and Python will be used for data mining on the customer data. With the use of this dashboard, the bank can give their client's more specialized products and services that are tailored based on the customer segmentation.

Aims/Goal

The aims of this project are as described below:

1. To provide users with appropriate performance information they need to make the best decision possible for better customer service.
2. To transform the accessible data into useful information and knowledge in order to make business insights.
3. To boost the company's efficiency and revenue by utilizing the assessed result.

Planned method for implementation

1. Make a plan

Firstly, we discuss about the project, then found the project objectives for this project

2. Gather Requirements

We collect the data ALL Life Bank customers profile and customer behavior that the bank has ,in this segment.

3. Design

We design the interface for the dashboard. The team members will need to validate all the data before we go to build the dashboard.

4. Build and Validate

We plan to use k-means data clustering by elbow method for the data mining. Next we have to perform the data collected using Power BI visualization analysis for the Decision Support Digital Intelligence Dashboard and also Python will be used for the data mining for customers data.

5. Deploy

The deployment is that we need to complete the business intelligence dashboard and this needs to be delivered to the bank. We also need to observe the dashboard that has been made.

6. Maintain

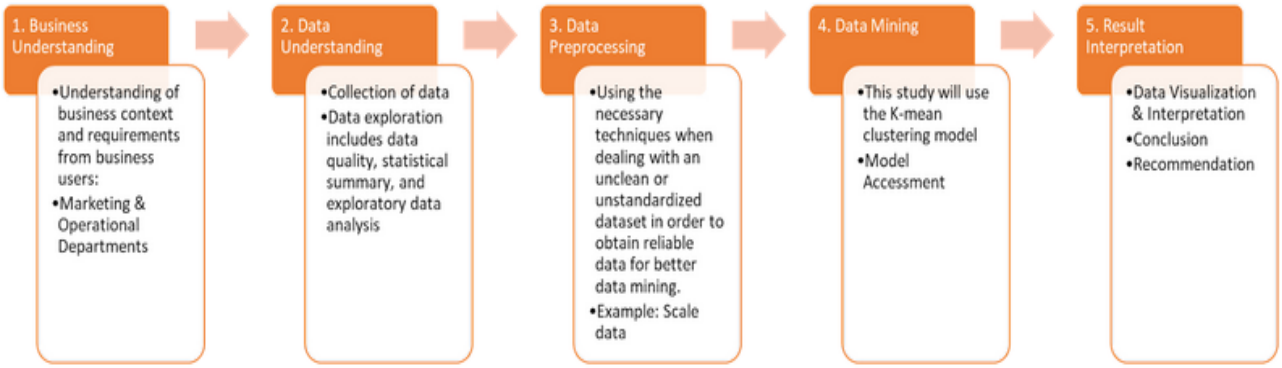
The last is we need to maintain the plan for the dashboard so it will make the maintenance process easier.

Benefits of dashboard

By using this business intelligence dashboard, it can help the bank to manage their customers' data and analyze it. With this dashboard, it will help a better customer service by segmenting the customers depending on the customer profile and their behavior in order to make a business insight so the bank can provide the better facilities that customer could get. It also will boost the bank’s efficiency and revenue by utilizing the assessed result. In this project we are using K-means clustering to analyze the customers' information from the bank and it will be easy to use by them.

Proposed Process Flow/Navigational Structure

The intended process flow is stated in the figure below. It consists of a collection of processes, starting with business understanding and data understanding. After that, data preparation will be made to make sure reliable data is ready for the next process, which is data mining. In this case study, our approach is to use k-Mean Clustering to explore customer segmentation or to cluster customers into a few segments. The insight will be used for marketing and operational purposes. And at the end of the process, the results will be interpreted and a conclusion with recommendations will be drawn.



Audience for Intelligence Dashboard

This study may be beneficial for a wide range of groups. However, for this project, there are two specific groups that can be highlighted to directly obtain insight from the business intelligence dashboard. They are:

1. Marketing Department
2. Operational Department

Marketing Department

In this study, the intention is to cluster customer data into three segments. They are: Online Visit, Bank Visit, and Call Customer Services. Then customer insight will be obtained using segmented groups of customers. From the dashboard, the marketing department can obtain insight about preferable channels from different segments of customers, as different groups of customers may require different approaches. For example, a customer who prefers to make a phone call can be upsold via telemarketing. Other than that, the marketing department can view data visualizations

on customer profiling to further understand customer behavior. For example, a group of customers that prefer online banking may have high credit limits, credit cards, etc.

These insights can hopefully help the marketing department plan their strategic moves and identify opportunities that may help increase customer retention and acquisition and improve customer loyalty through their marketing initiatives.

Operational Department

The findings also can assist the operational department in determining areas that require improvement or are expected to improve. This can be predicted by understanding some insight that will be provided to them. Understanding the size of the customer base that inquires via various channels may lead to different decisions. For example, if the data indicates that 65% of the customers prefer to make queries via an online visit, then there is a requirement for the operational department to increase the website's capacity to receive a large number of visitors at one time. Similarly, in customer service, the operational department may be able to determine the number of customer service agents entertaining customers and invest in agent training, allowing customer queries to be resolved more quickly.

This can be helpful in improving customers' experiences with the bank.

Data Sources

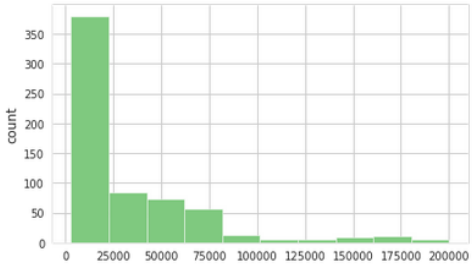
The data provided is of various customers of a bank and their financial attributes like credit limit, the total number of credit cards the customer has, and different channels through which customers have contacted the bank for any queries (including visiting the bank, online and through a call center).

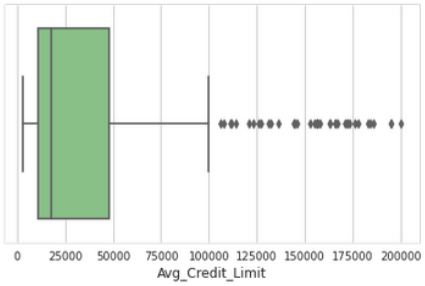
The data consist of:

- **Sl_No:** Primary key of the records.
- **Customer Key:** Customer identification number.
- **Average Credit Limit:** Average credit limit of each customer for all credit cards.
- **Total credit cards:** Total number of credit cards possessed by the customer.
- **Total visits bank:** Total number of visits that customer made (yearly) personally to the bank
- **Total visits online:** Total number of visits or online logins made by the customer (yearly).
- **Total calls made:** Total number of calls made by the customer to the bank or its customer service department (yearly).

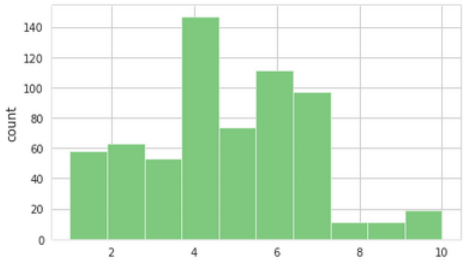
Results of Visual Analytics

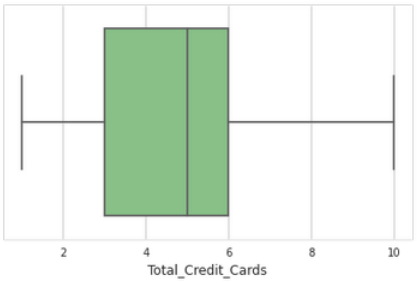
Avg_Credit_Limit
Skew : 2.19



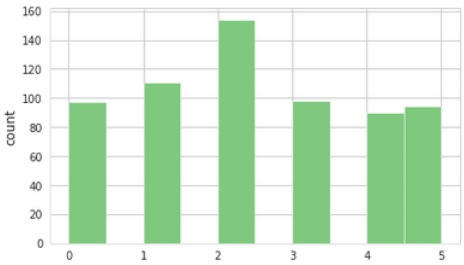


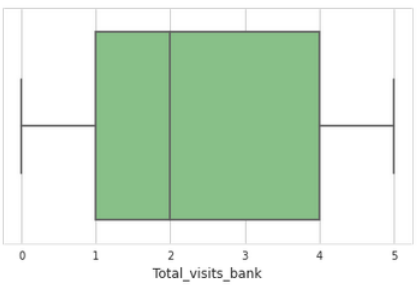
Total_Credit_Cards
Skew : 0.17





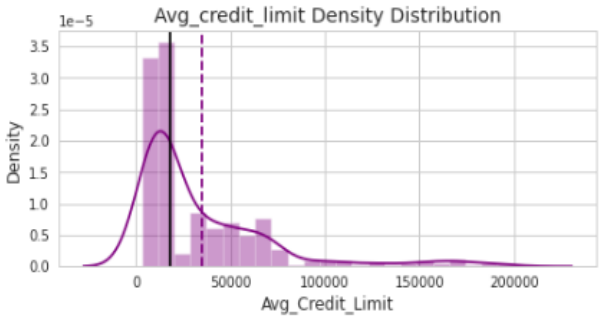
Total_visits_bank
Skew : 0.15

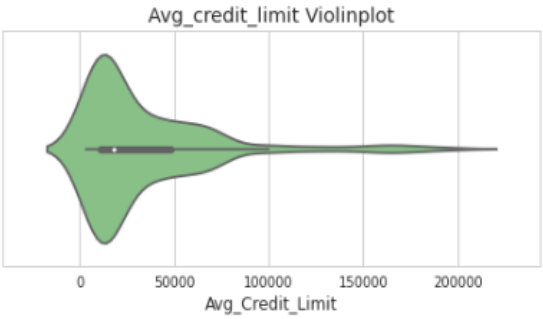


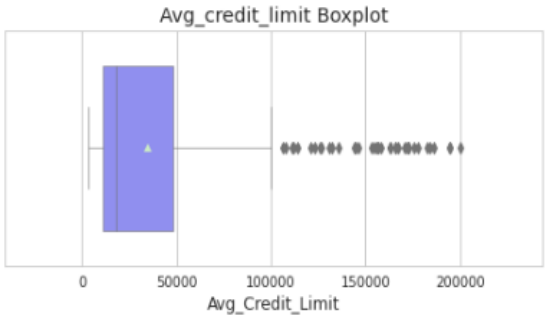


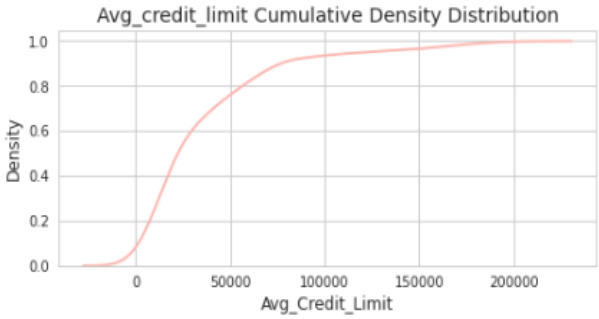
5 Point Summary of Avg_credit_limit Attribute:

	Min	Q1	Q2	Q3	Max
Value	3000	11000	18000	48000	200000



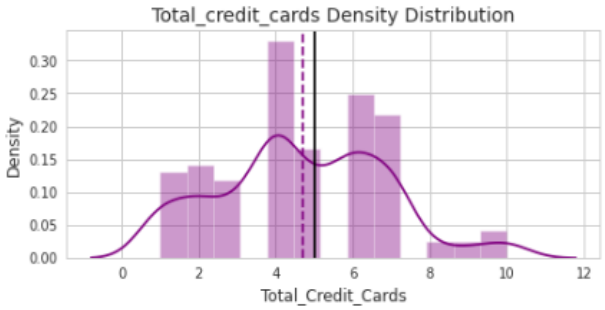


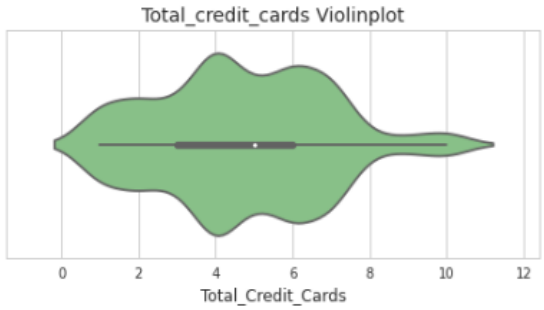


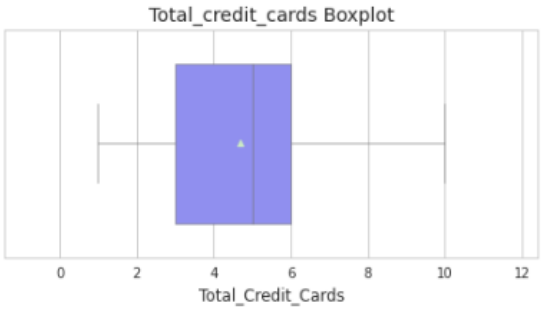


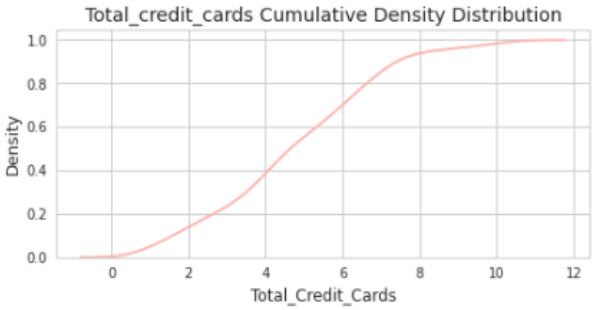
5 Point Summary of Total_credit_cards Attribute:

	Min	Q1	Q2	Q3	Max
Value	1	3	5	6	10



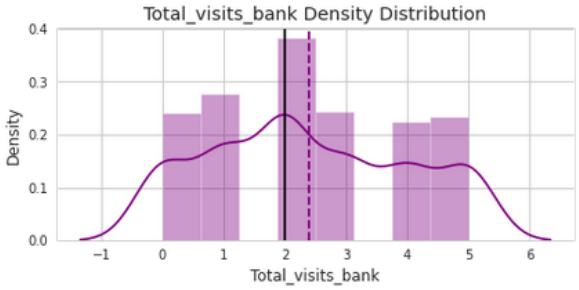


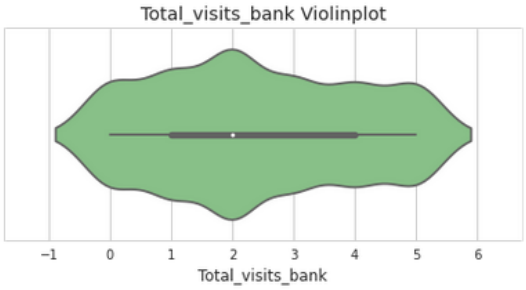


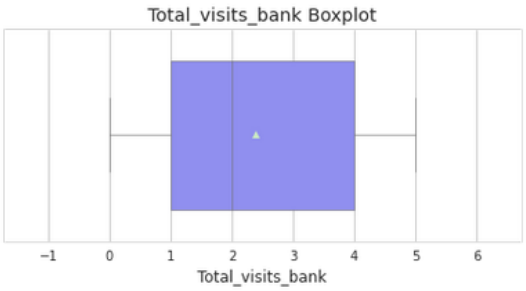


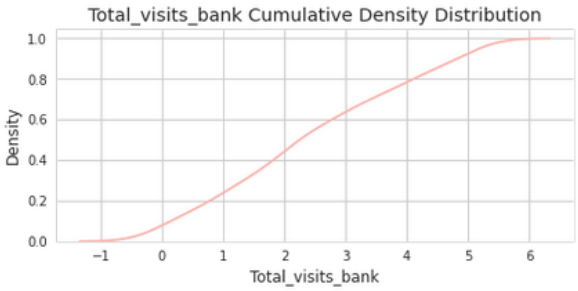
5 Point Summary of Total_visits_bank Attribute:

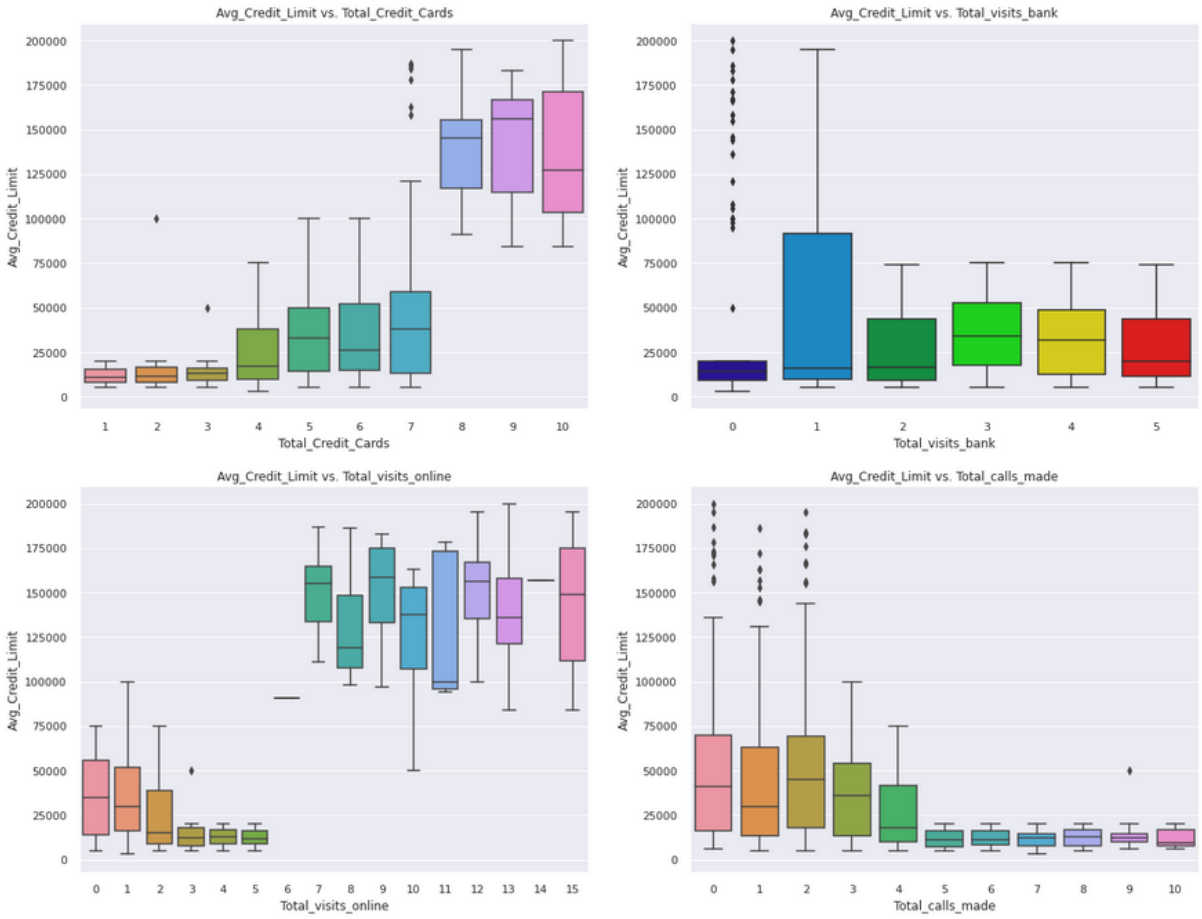
	Min	Q1	Q2	Q3	Max
Value	0	1	2	4	5











Python script for Clustering using K-means

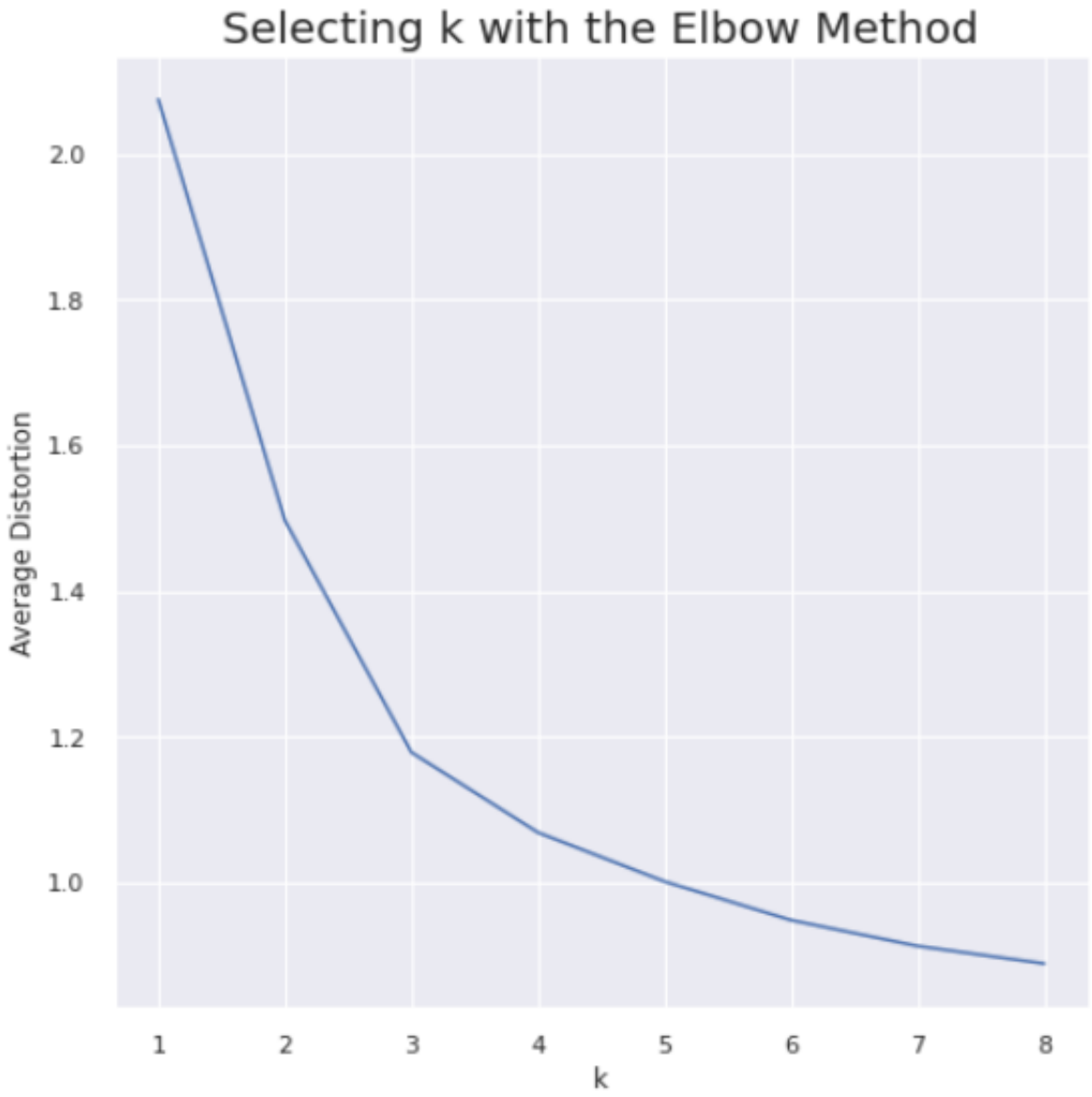
```
clusters=range(1,9)
meanDistortions=[]

for k in clusters:
    model=KMeans(n_clusters=k)
    model.fit(subset_scaled_df)
    prediction=model.predict(subset_scaled_df)
    distortion=sum(np.min(cdist(subset_scaled_df, model.cluster_centers_, 'euclidean'), axis=
1)) / subset_scaled_df.shape[0]

    meanDistortions.append(distortion)

    print('Number of Clusters:', k, '\tAverage Distortion:', distortion)

plt.plot(clusters, meanDistortions, 'bx-')
plt.xlabel('k')
plt.ylabel('Average Distortion')
plt.title('Selecting k with the Elbow Method', fontsize=20)
```



From the observation, the appropriate value of k from the elbow curve seems to be 3, 4 or 5.

For this project, we chose k = 3 and hence there are 3 clusters for this data-set.

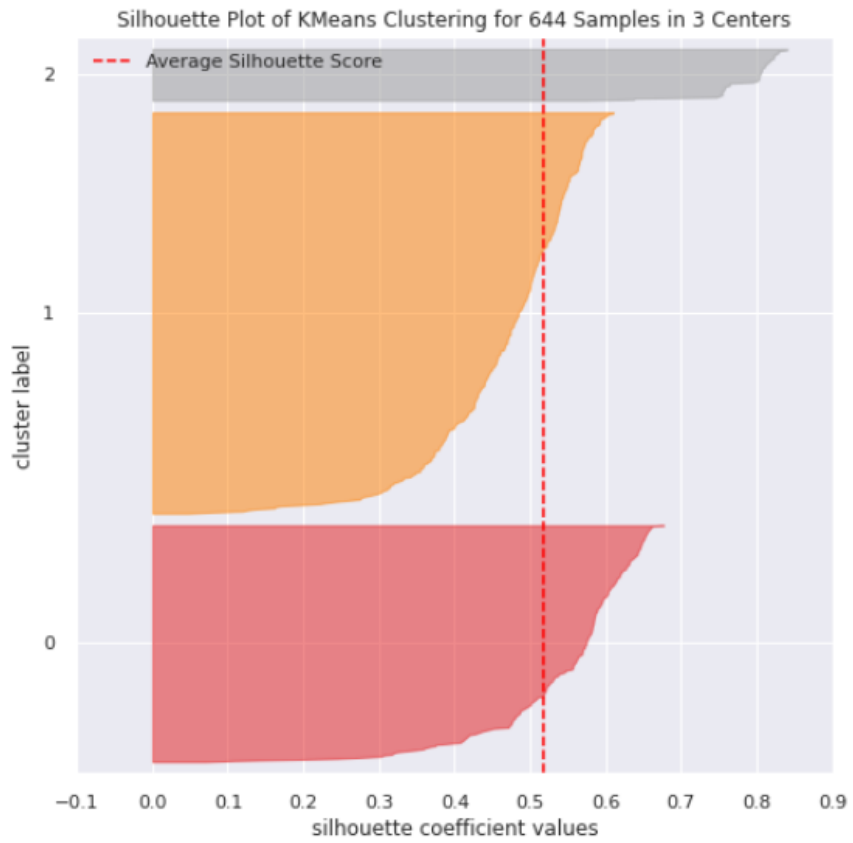
Data preprocessing

Before clustering, we should always scale the data, because different scales of features would result in unintentional importance to the feature of higher scale while calculating the distances.

```
# Scaling the data set before clustering
scaler=StandardScaler()
subset=cccd[all_col].copy()
subset_scaled=scaler.fit_transform(subset)
```

```
#Creating a dataframe from the scaled data above
subset_scaled_df=pd.DataFrame(subset_scaled,columns=subset.columns)
subset_scaled_df
```

	Avg_Credit_Limit	Total_Credit_Cards	Total_visits_bank	Total_visits_online	Total_calls_made
0	2.422008	-1.239437	-0.858684	-0.622573	-1.253982
1	0.651470	-0.779381	-1.473803	2.687308	1.873420
2	0.651470	1.060843	-0.858684	0.260062	0.135974
3	-0.056745	0.140731	-0.858684	-0.622573	0.135974
4	2.422008	0.600787	-1.473803	2.687308	-0.211515
...	...	...	...	...	...
639	2.386597	2.441011	-0.858684	2.687308	-1.253982
640	1.855436	2.441011	-0.858684	2.687308	-0.559004
641	2.545945	1.520899	-0.858684	2.687308	-0.906493
642	2.545945	2.441011	-0.858684	2.687308	-1.253982
643	2.545945	1.980955	-1.473803	2.687308	-0.559004



:

```
<AxesSubplot:title={'center':'Silhouette Plot of KMeans Clustering for 644 Samples in 3 Cen
ters'}, xlabel='silhouette coefficient values', ylabel='cluster label'>
```

From the observation, as expected, all three clusters have excellent silhouette scores. Two of the clusters are similar in size, with one being quite small.

Group 0: Vocalizers

- Second largest group
- Very low credit limit
- Low number of credit cards
- Almost never visits the bank or uses online services
- Huge number of calls made

Group 1: In-Person

- Largest group
- Mid number of credit cards
- Visits the bank often
- Almost no online usage
- Calls rarely

Group 2: Online

- Smallest group, and by a large margined
- Huge credit limit
- Lots of credit cards
- Almost never visits the bank
- Banks online extensively
- Almost never calls

Suggestions and Recommendations

Looking at the data, we see that there is a group which prefers online interactions with their bank, they have a much higher credit limit and more credit cards (cluster - 2).

The customers who prefer in-person interactions tend to have the mid-range of credit cards and credit limit (cluster - 0).

The customers who contact via phone call are in another segment, who have the lowest credit limit and number of cards (cluster - 1).

These three groups are defined most sharply by how they interact with the bank, as there is almost no overlap when it comes to their primary interaction variable. For whatever reason, customers overwhelmingly prefer one method of contacting the bank.

Potential Challenges

By having this intelligence dashboard, some potential challenges can be identified. First, we need to keep analyzing the customer data because the human characteristics will always change based on certain issues. Besides that, the available and current data had some missing values, so it is hard for a business intelligence dashboard to make a very accurate analysis. We are not able to implement the data directly because of unorganized data, sorting problems and some missing values. The data quality should be more organized and detailed with more attributes in order to perform a more detailed analysis.

How can business analysts help with decision making?

First, the company can identify new business opportunities. This is because it can give a clear picture on what methods or ways of promoting online banking should be focused on. It also helps to highlight the key areas to be concerned so that respective departments can fully concentrate on their own R&D.

Secondly, the company can have a better targeting of customers. By using the analytics, the analyzed data to make better marketing decisions that can increase marketing productivity. The company can just target a specific group of customers by understanding their characteristics and providing their needs. It also helps to streamline the customer's experience with a brand.

Lastly, a business/marketing plan can be created by using business analytics. By using business analytics, it can help to identify the hidden pattern and relations behind the big sets of data. The hidden pattern and relations are useful for decision makers as they can forecast business trends and growth. The customer preferences should be used to contact the customers. Online/phone users will probably prefer email/text notifications, while in-person users prefer mail notifications and up-selling (when at the bank location). Also, the phone and in-person customers should be reached out to promote online banking.

References

1) https://blog.markgrowth.com/why-customer-data-matters-so-much-for-your-business-2d6f072f16c6
2) https://c1.sfdcstatic.com/content/dam/web/en_us/www/documents/e-books/state-of-the-connected-customer-report-second-edition2018.pdf
3) https://www.optimove.com/blog/customer-segmentation-for-more-effective-marketing
4) http://www.ijera.com/papers/Vol4_issue9/Version%203/K49037079.pdf