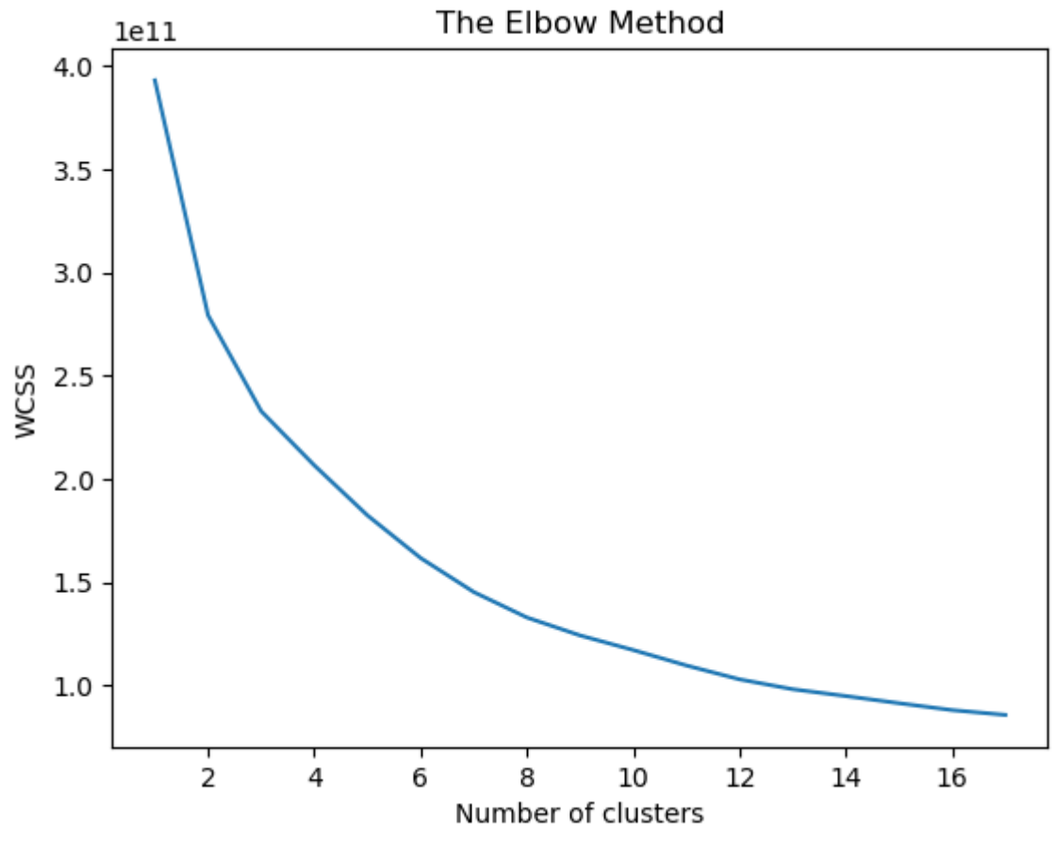
In [6]:
```
 # importing the dataset
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

import warnings
warnings.filterwarnings('ignore')

# importing the dataset
dataset = pd.read_csv('CC_GENERAL.csv')
X = dataset.iloc[: , 1:].values
X
```

Out[6]:
```
array([[4.09007490e+01, 8.18182000e-01, 9.54000000e+01, ...,
        1.39509787e+02, 0.00000000e+00, 1.20000000e+01],
       [3.20246742e+03, 9.09091000e-01, 0.00000000e+00, ...,
        1.07234022e+03, 2.22222000e-01, 1.20000000e+01],
       [2.49514886e+03, 1.00000000e+00, 7.73170000e+02, ...,
        6.27284787e+02, 0.00000000e+00, 1.20000000e+01],
       ...,
       [2.33986730e+01, 8.33333000e-01, 1.44400000e+02, ...,
        8.24183690e+01, 2.50000000e-01, 6.00000000e+00],
       [1.34575640e+01, 8.33333000e-01, 0.00000000e+00, ...,
        5.57556280e+01, 2.50000000e-01, 6.00000000e+00],
       [3.72708075e+02, 6.66667000e-01, 1.09325000e+03, ...,
        8.82889560e+01, 0.00000000e+00, 6.00000000e+00]])
```

In [15]:
```
from sklearn.impute import SimpleImputer
imp = SimpleImputer(missing_values=np.nan, copy=False, strategy="mean",).fit(X)
#imp = SimpleImputer.fit(X)
X = imp.transform(X)
```

In [16]:
```
# Using the elbow method to find the optimal number of clusters
from sklearn.cluster import KMeans
wcss = []
for i in range(1, 18):
    kmeans = KMeans(n_clusters = i, init = 'k-means++', random_state = 42)
    kmeans.fit(X)
    wcss.append(kmeans.inertia_)
plt.plot(range(1, 18), wcss)
plt.title('The Elbow Method')
plt.xlabel('Number of clusters')
plt.ylabel('WCSS')
plt.show()
```



In [17]:
```
# Fitting K-Means to the dataset
kmeans = KMeans(n_clusters = 3, init = 'k-means++', random_state = 0)
y_kmeans = kmeans.fit_predict(X)
y_kmeans
```

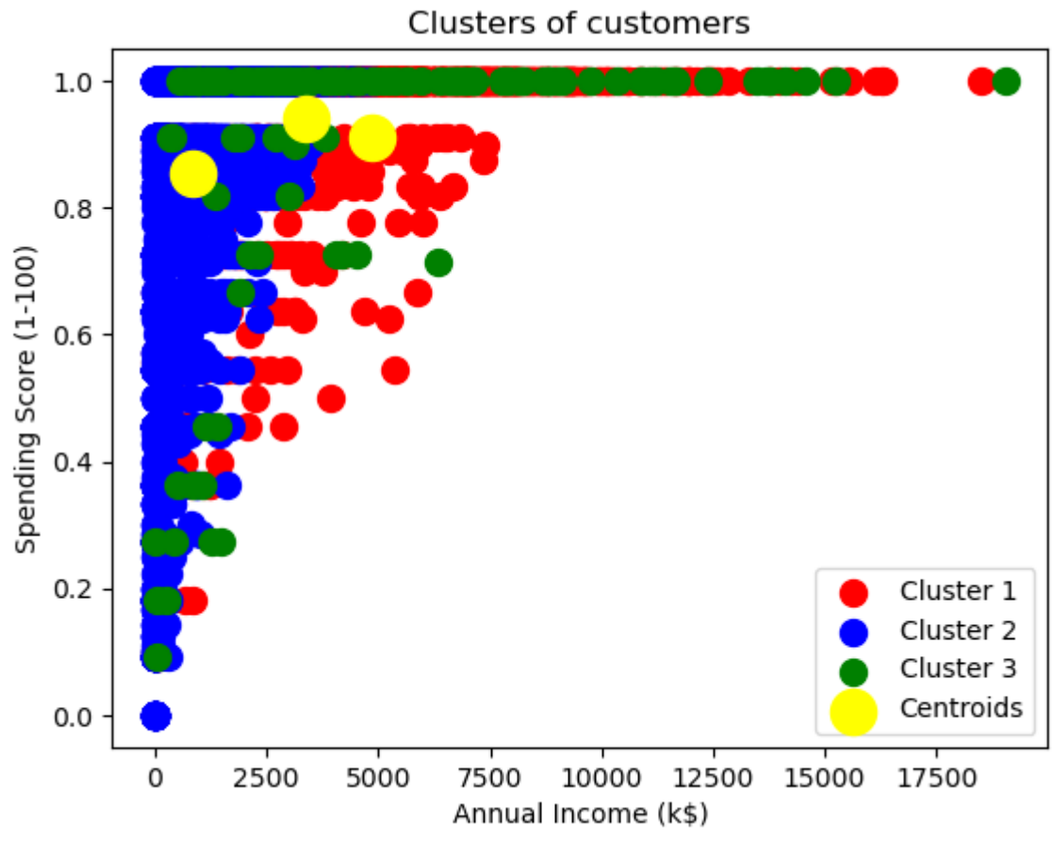
Out[17]:
```
array([1, 0, 0, ..., 1, 1, 1])
```

In [18]:
```
dataset['Cluster'] = y_kmeans
dataset.head()
```

Out[18]:

	CUST_ID	BALANCE	BALANCE_FREQUENCY	PURCHASES	ONEOFF_PURCHASES	INSTALLMENTS_PURCHASES	CASH_ADVANCE	PURCHASES_FREQUENCY	ONEOFF_PURCHASES_FREQUENCY
0	C10001	40.900749	0.818182	95.40	0.00	95.4	0.000000	0.166667	0.000000
1	C10002	3202.467416	0.909091	0.00	0.00	0.0	6442.945483	0.000000	0.000000
2	C10003	2495.148862	1.000000	773.17	773.17	0.0	0.000000	1.000000	1.000000
3	C10004	1666.670542	0.636364	1499.00	1499.00	0.0	205.788017	0.083333	0.083333
4	C10005	817.714335	1.000000	16.00	16.00	0.0	0.000000	0.083333	0.083333

In [19]:
```
# Visualising the clusters
plt.scatter(X[y_kmeans == 0, 0], X[y_kmeans == 0, 1], s = 100, c = 'red', label = 'Cluster 1')
plt.scatter(X[y_kmeans == 1, 0], X[y_kmeans == 1, 1], s = 100, c = 'blue', label = 'Cluster 2')
plt.scatter(X[y_kmeans == 2, 0], X[y_kmeans == 2, 1], s = 100, c = 'green', label = 'Cluster 3')
'''
plt.scatter(X[y_kmeans == 3, 0], X[y_kmeans == 3, 1], s = 100, c = 'cyan', label = 'Cluster 4')
plt.scatter(X[y_kmeans == 4, 0], X[y_kmeans == 4, 1], s = 100, c = 'magenta', label = 'Cluster 5')
'''
plt.scatter(kmeans.cluster_centers_[:, 0], kmeans.cluster_centers_[:, 1], s = 300, c = 'yellow', label = 'Centroids')
plt.title('Clusters of customers')
plt.xlabel('Annual Income (k$)')
plt.ylabel('Spending Score (1-100)')
plt.legend()
plt.show()
```



In [20]:
```
import numpy as np
from sklearn.cluster import KMeans
from sklearn import metrics
from sklearn.metrics import pairwise_distances

kmeans_model = KMeans(n_clusters=3, random_state=1).fit(X)
labels = kmeans_model.labels_
print(labels)
```

```
[0 2 2 ... 0 0 0]
```

In [21]:
```
metrics.silhouette_score(X, labels, metric='euclidean')
```

Out[21]:
```
0.4653592350091546
```

In [ ]: