In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import os
from sklearn.preprocessing import normalize
import scipy.cluster.hierarchy as shc
from sklearn.cluster import AgglomerativeClustering
from sklearn import decomposition
os.chdir('/Users/Lenovo/Desktop/EBAC')
```

In [5]:
```
data = pd.read_excel('Amazon.xlsx')
data.head()
```

Out[5]:

	Unnamed: 0	Velocidad Entrega	Precio	Durabilidad	Imagen Producto	Valor Educativo	Servicio Retorno	Tamano Paquete	Calidad Producto	Numero Estrellas
0	Adam	205	3	345	235	24	23	26	21	17
1	Anna	9	15	315	33	25	4	42	215	28
2	Bernard	17	26	285	3	43	27	41	26	33
3	Edward	135	5	355	295	18	23	39	195	17
4	Emilia	3	45	48	39	34	46	225	34	43

In [7]:
```
data.rename(columns={'Unnamed: 0': 'Comprador'}, inplace=True)
data
```

Out[7]:

	Comprador	Velocidad Entrega	Precio	Durabilidad	Imagen Producto	Valor Educativo	Servicio Retorno	Tamano Paquete	Calidad Producto	Numero Estrellas
0	Adam	205	3	345	235	24	23	26	21	17
1	Anna	9	15	315	33	25	4	42	215	28
2	Bernard	17	26	285	3	43	27	41	26	33
3	Edward	135	5	355	295	18	23	39	195	17
4	Emilia	3	45	48	39	34	46	225	34	43
...	...	...	...	...	...	...	...	...	...	...
95	Teofan	3	8	32	25	7	21	42	17	1
96	Teofil	305	25	46	24	33	28	355	26	45
97	Teofila	1	14	26	25	24	27	42	185	23
98	Teon	155	11	335	34	26	29	42	215	27
99	Teresa	125	9	45	25	22	3	3	22	18

100 rows × 10 columns

In [11]:
```
# Normalizamos los datos
feature_cols = ['Velocidad Entrega', 'Precio', 'Durabilidad', 'Imagen Producto', 'Valor Educativo', 'Servicio R
new_data = data[feature_cols]
data_scaled = normalize(new_data)
data_scaled
```

Out[11]:
```
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```
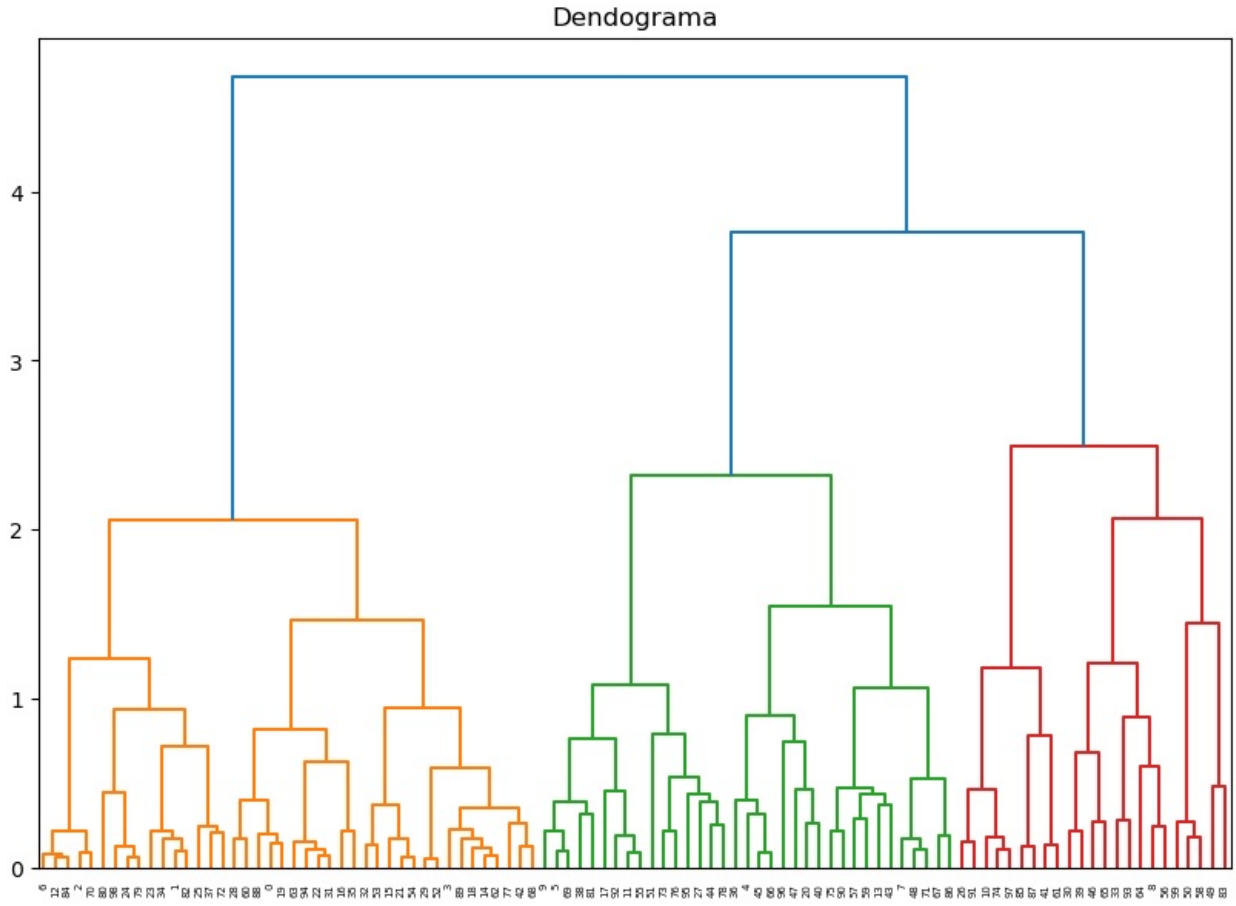

In [13]:
```
data_scaled = pd.DataFrame(data_scaled, columns = new_data.columns)
data_scaled.head()
```

Out[13]:

	Velocidad Entrega	Precio	Durabilidad	Imagen Producto	Valor Educativo	Servicio Retorno	Tamano Paquete	Calidad Producto	Numero Estrellas
0	0.438263	0.006414	0.737565	0.502399	0.051309	0.049171	0.055585	0.044895	0.036344
1	0.023235	0.038725	0.813234	0.085196	0.064542	0.010327	0.108431	0.555065	0.072287
2	0.057235	0.087535	0.959520	0.010100	0.144770	0.090902	0.138036	0.087535	0.111102
3	0.258856	0.009587	0.680696	0.565649	0.034514	0.044101	0.074781	0.373904	0.032597
4	0.011975	0.179625	0.191600	0.155675	0.135717	0.183617	0.898127	0.135717	0.171642

In [15]:
```
plt.figure(figsize = (10,7))
plt.title('Dendograma')
dend = shc.dendrogram(shc.linkage(data_scaled, method = 'ward'))
```

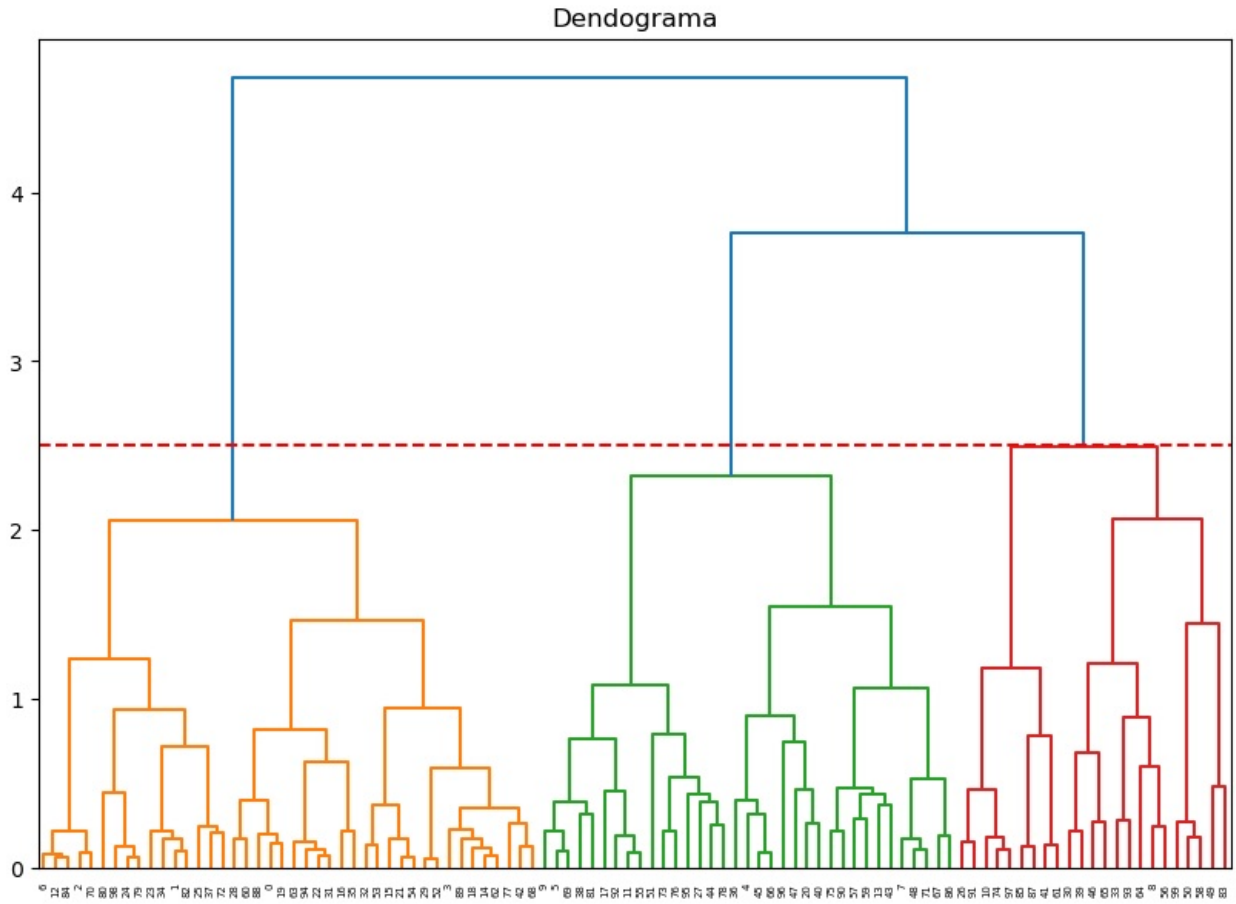


In [19]:
```
colores_unicos = set(dend['color_list'])
num_clusters_optimo = len(colores_unicos) - 1
num_clusters_optimo
```

Out[19]: 3

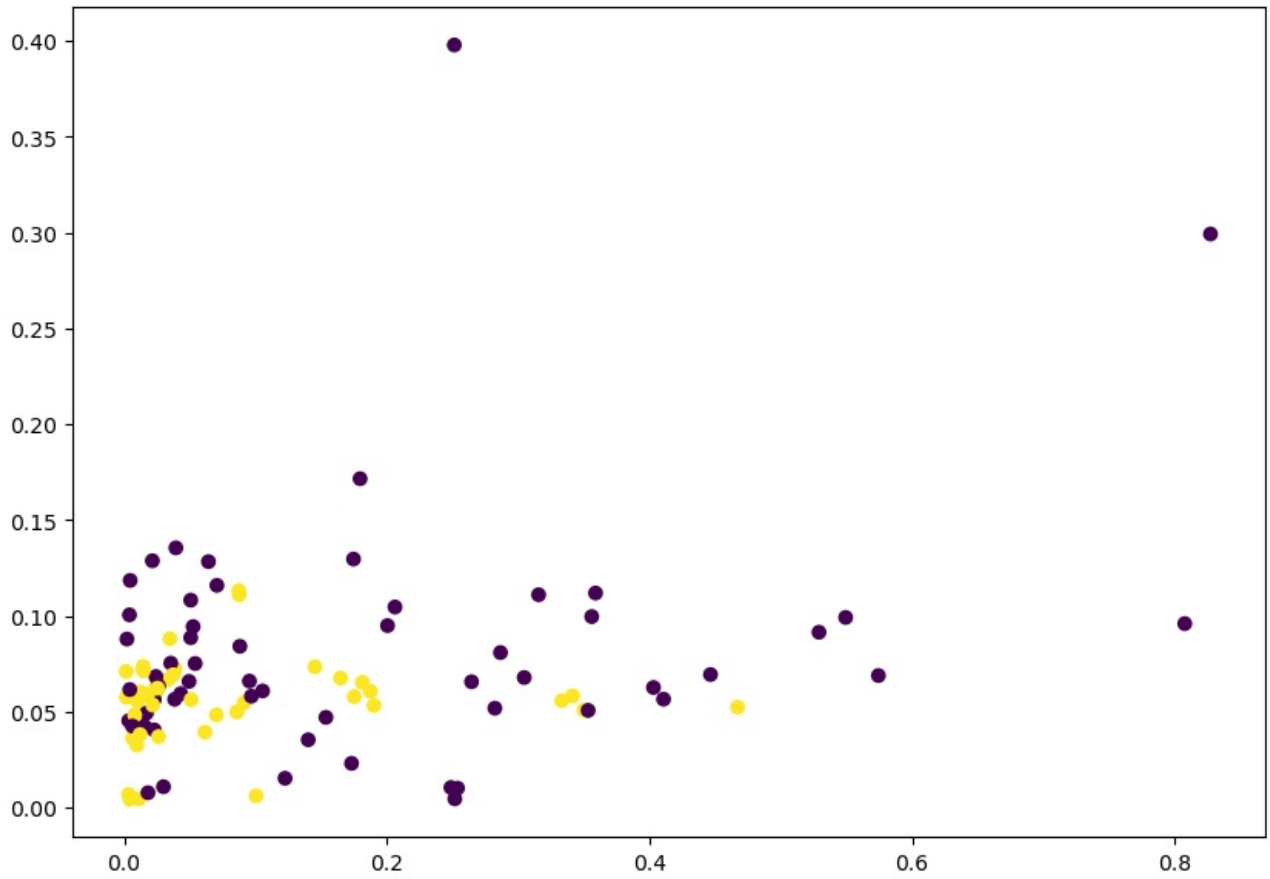
In [21]:
```
# Graficamos
plt.figure(figsize = (10,7))
plt.title('Dendograma')
dend = shc.dendrogram(shc.linkage(data_scaled, method = 'ward'))
plt.axhline(y = 2.5, color = 'r', linestyle = '--')
```

Out[21]: <matplotlib.lines.Line2D at 0x28fd1a297f0>



In [29]:
```
cluster = AgglomerativeClustering(n_clusters = 2, metric = 'euclidean', linkage = 'ward')
grupos = cluster.fit_predict(data_scaled)
plt.figure(figsize = (10, 7))
plt.scatter(data_scaled['Precio'], data_scaled['Numero Estrellas'], c = cluster.labels_)
```

Out[29]: <matplotlib.collections.PathCollection at 0x28fd747c0b0>



In [31]:
```
# Separacion de grupos mediante PCA
campos = data_scaled
```

```
from sklearn import decomposition
pca = decomposition.PCA(n_components = 2)
pca.fit(campos)
campos = pca.transform(campos)
campos
```

Out[31]:

```
array([[-0.39993219,  0.06035374],
       [-0.40829583, -0.06402268],
       [-0.49703182, -0.35955286],
       [-0.33996675,  0.18434501],
       [ 0.58207751, -0.38797653],
       [ 0.1723403 , -0.52962573],
       [-0.56528441, -0.33770585],
       [ 0.5335887 ,  0.06994712],
       [ 0.09981604,  0.47165743],
       [ 0.22195207, -0.56503313],
       [ 0.08274005,  0.39712712],
       [-0.00143465, -0.48936583],
       [-0.57292039, -0.35927774],
       [ 0.51350639,  0.01301312],
       [-0.35272162,  0.20639728],
       [-0.4688626 ,  0.0168001 ],
       [-0.25142488,  0.04599019],
       [-0.05456876, -0.22302796],
       [-0.36123131,  0.20553368],
       [-0.41087067,  0.02173183],
       [ 0.54207892, -0.03308916],
       [-0.5138909 , -0.0900875 ],
       [-0.4284552 , -0.0601418 ],
       [-0.42320562, -0.09945498],
       [-0.42610215,  0.06318626],
       [-0.10615885, -0.20376697],
       [ 0.19058214,  0.3966612 ],
       [-0.096838  , -0.33104612],
       [-0.51505714, -0.10893109],
       [-0.17050111,  0.33261099],
       [ 0.13793391,  0.63651115],
       [-0.42206647, -0.05789717],
       [-0.40326074,  0.12516351],
       [ 0.21346687,  0.37300285],
       [-0.48923475, -0.13003385],
       [-0.37549596, -0.08899848],
       [ 0.70102522, -0.46745429],
       [-0.03811566, -0.37986053],
       [ 0.18646361, -0.43630007],
       [ 0.14284545,  0.50096372],
       [ 0.62260912, -0.19528624],
       [ 0.36295672,  0.28878811],
       [-0.34697878,  0.19244643],
       [ 0.42217536,  0.03448406],
       [ 0.16141571, -0.48420739],
       [ 0.65108758, -0.4197626 ],
       [ 0.19657428,  0.70259997],
       [ 0.66940341, -0.17418122],
       [ 0.50314121,  0.04478847],
       [ 0.37827002,  0.22768866],
       [ 0.09257978,  0.29000069],
       [ 0.15947025, -0.08591885],
       [-0.16414836,  0.33801587],
       [-0.35892963,  0.07853561],
       [-0.49880502, -0.06450716],
       [ 0.04236318, -0.50393996],
       [ 0.13801031,  0.49375593],
       [ 0.57613865, -0.17095284],
       [ 0.0783886 ,  0.35710609],
       [ 0.67312488, -0.09618175],
       [-0.47969491, -0.06068297],
       [ 0.39939783,  0.25539679],
       [-0.3695398 ,  0.16814344],
       [-0.42508059,  0.03242069],
       [ 0.02636687,  0.46187498],
       [ 0.10479979,  0.62527833],
       [ 0.66976445, -0.42777742],
       [ 0.55740005,  0.0791324 ],
       [-0.36929226,  0.16505085],
       [ 0.12646304, -0.50126007],
       [-0.49481837, -0.32229269],
       [ 0.50365854,  0.01974903],
       [-0.23024785, -0.32414928],
       [-0.02497426, -0.23000985],
       [ 0.15056994,  0.39659029],
       [ 0.59247292, -0.24149892],
       [-0.10475686, -0.09868653],
```

```
       [-0.45279472,  0.0665795 ],
       [ 0.2099264 , -0.34219382],
       [-0.41622673,  0.03730307],
       [-0.14855054, -0.1595983 ],
       [ 0.11014101, -0.56579396],
       [-0.40616865, -0.06841998],
       [ 0.23672835,  0.24043862],
       [-0.56568028, -0.36408458],
       [ 0.23730948,  0.44802811],
       [ 0.49928987,  0.14100592],
       [ 0.21649152,  0.46796438],
       [-0.42855949,  0.06683056],
       [-0.31814994,  0.22452555],
       [ 0.53277044, -0.10971321],
       [ 0.15466959,  0.45884497],
       [ 0.11664927, -0.41801606],
       [ 0.21734196,  0.44145587],
       [-0.45720098, -0.11118217],
       [ 0.18527671, -0.23439125],
       [ 0.53527538, -0.14792444],
       [ 0.19164058,  0.36824856],
       [-0.38487326,  0.03658414],
       [-0.08413049,  0.3546116 ]])
```

In [33]:
```
# Hacemos un dataframe con la segmentacion creada
dataframe = pd.DataFrame(grupos, columns = ['grupo'])
dataframe
```

Out[33]:

	grupo
0	1
1	1
2	1
3	1
4	0
...	...
95	0
96	0
97	0
98	1
99	0

100 rows × 1 columns

In [35]:
```
dataframe_final = pd.concat([data, dataframe], axis = 1, join = 'inner')
dataframe_final
```

Out[35]:

	Comprador	Velocidad Entrega	Precio	Durabilidad	Imagen Producto	Valor Educativo	Servicio Retorno	Tamano Paquete	Calidad Producto	Numero Estrellas	grupo
0	Adam	205	3	345	235	24	23	26	21	17	1
1	Anna	9	15	315	33	25	4	42	215	28	1
2	Bernard	17	26	285	3	43	27	41	26	33	1
3	Edward	135	5	355	295	18	23	39	195	17	1
4	Emilia	3	45	48	39	34	46	225	34	43	0
...	...	...	...	...	...	...	...	...	...	...	...
95	Teofan	3	8	32	25	7	21	42	17	1	0
96	Teofil	305	25	46	24	33	28	355	26	45	0
97	Teofila	1	14	26	25	24	27	42	185	23	0
98	Teon	155	11	335	34	26	29	42	215	27	1
99	Teresa	125	9	45	25	22	3	3	22	18	0

100 rows × 11 columns

In [37]:
```
Salome = dataframe_final[dataframe_final['Comprador'] == 'Salome']
Salome
```

Out[37]:

	Comprador	Velocidad Entrega	Precio	Durabilidad	Imagen Producto	Valor Educativo	Servicio Retorno	Tamano Paquete	Calidad Producto	Numero Estrellas	grupo
81	Salome	17	23	275	41	4	44	315	28	32	0

En el caso de Salome, le recomendaria los productos que compra Teofila, ya que en base a sus datos, tienen el mismo comportamiento de compra.

In [41]:
```
Stephania = dataframe_final[dataframe_final['Comprador'] == 'Stephania']
Stephania
```

Out[41]:

	Comprador	Velocidad Entrega	Precio	Durabilidad	Imagen Producto	Valor Educativo	Servicio Retorno	Tamano Paquete	Calidad Producto	Numero Estrellas	grupo
89	Stephania	215	125	465	315	34	4	37	305	45	1

En el caso de Stephania, le recomendaria los productos que compra Edward, ya que en base a sus datos, tienen el mismo comportamiento de compra.

In [43]:
```
Lydia = dataframe_final[dataframe_final['Comprador'] == 'Lydia']
Lydia
```

Out[43]:

	Comprador	Velocidad Entrega	Precio	Durabilidad	Imagen Producto	Valor Educativo	Servicio Retorno	Tamano Paquete	Calidad Producto	Numero Estrellas	grupo
54	Lydia	19	4	435	145	16	21	28	185	24	1

En el caso de Lydia, le recomendaria los productos que compra Teon, ya que en base a sus datos, tienen el mismo comportamiento de compra.

Conclusion

Una vez evaluado el comportamiento de compra de cada una de la scandidatas, pudimos asignarles un grupo en el cual el comportamiento de compra tiene muchas similitudes, con esto podriamos asegurar que estas candidatas tienen alta probabilidad de que compren los prodcutos recomendados.

In [ ]:
```

```