Stats 140XP: Final Project

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Explore the GLOBE

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Abstract

We wanted to answer two main questions: which leadership qualities do countries tend to view similarly and if countries align their perceptions societal practices and values. For determining leadership qualities and similar countries, we used principal component analysis (PCA) then k-means clustering to create four "clusters" of countries with similar leadership beliefs. We used the _____ method to _____. We found that _____. We also looked at _____. In the future, we recommend looking into _____. Some limitations to our project are _____.

Problem Statements

1. Which characteristics or traits do countries tend to group together when determining "good" leadership values?
    - Which countries have similar perceptions of these leadership values?
2. Do societal practices and societal values align?
    - If they do not, which practices and values deviate most significantly?

Description of Dataset

The data set we have chosen to analyze is the **Dana Landis Leadership** dataset, which comes from the GLOBE Research Survey. The data provided in the folder had survey results for (1) leadership and (2) societal and culture data and a PDF describing the nature of the survey, but nothing more. To glean more information, we found the two questionnaires (alpha and beta) described in the informational PDF to get the original questions asked in the surveys. While we do not have a "codebook" in a traditional sense, the original questions asked may help guide us in understanding what each variable means and how the survey represents respondents answers numerically. The survey is on a 1 to 7 scale, with 1 being a negative response, 4 a "neutral" score, and 7 positive.

Here is a look at 6 full and complete observations from the leadership survey:

Here is a look at 6 full and complete observations from the social and cultural survey:

Description of Variables

Visualization and Exploratory Data Analysis

Analysis

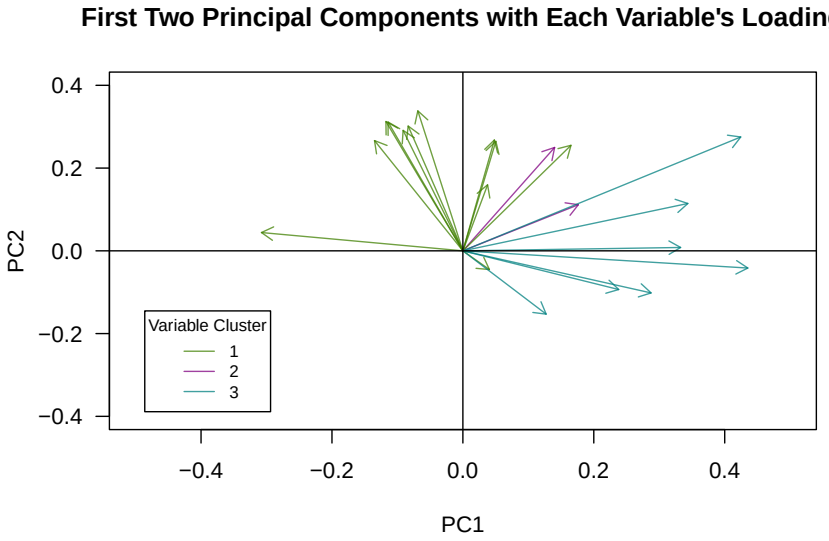
Leadership Values

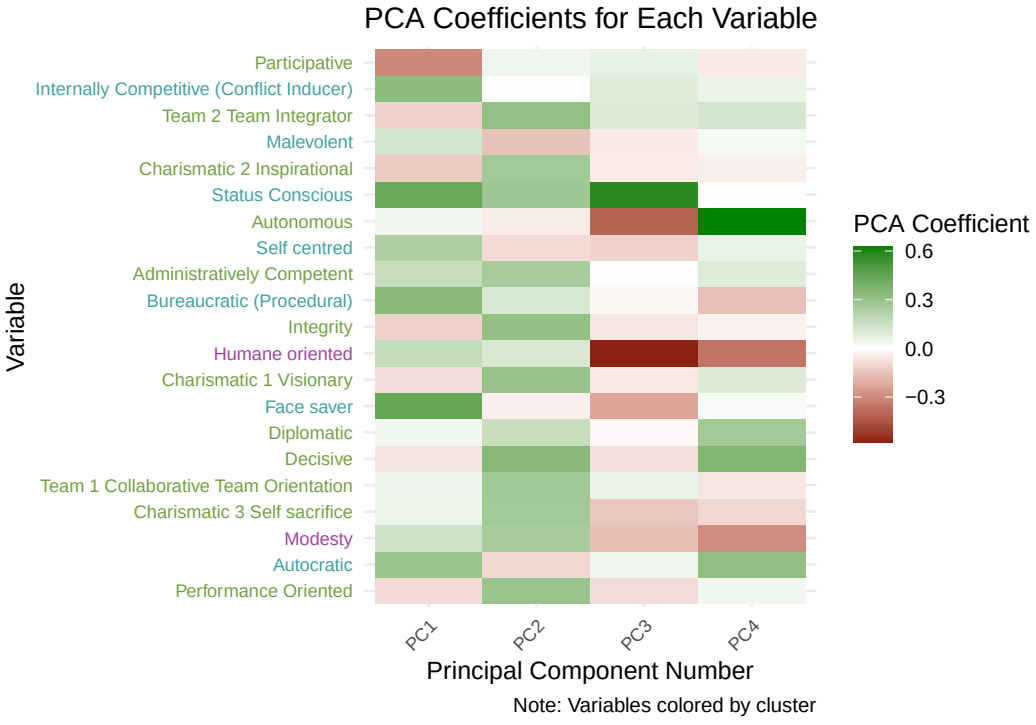
For the leadership values problem statement, the first objective is to collapse the data into the first four principal components through principal component analysis (PCA). PCA finds the directions which capture the most variability in the data, so the first four account for the maximum variation. PCA allows us to visualize trends in the leadership values: countries tend to have similar sentiments about variables that "point" in the same direction (had principal component values that aligned).

Before performing PCA, though, we remove the second-order factor analysis variables due to the heavy correlation with the original predictor variables and a more difficult interpretation of these variables. Since our

goal is to understand the relationship between certain leadership characteristics, keeping these complicated variables might reduce our understanding of some characteristics.

After performing PCA, we visualize the directions of the first two principal components. We also perform k-means clustering on the first four principal components to determine the "groups" of leadership characteristics that have similar perceptions:





After considering the leadership characteristics, we cluster countries based on similar perceptions. We do this by using the variables of the countries transformed into the first four principal components, then running PCA on those components. The clustering results segregate the countries into the following segments:

Country Clusters with Similar Leadership Values

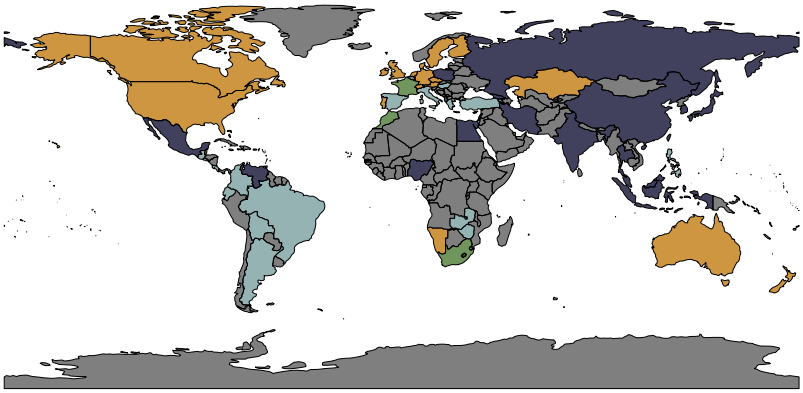
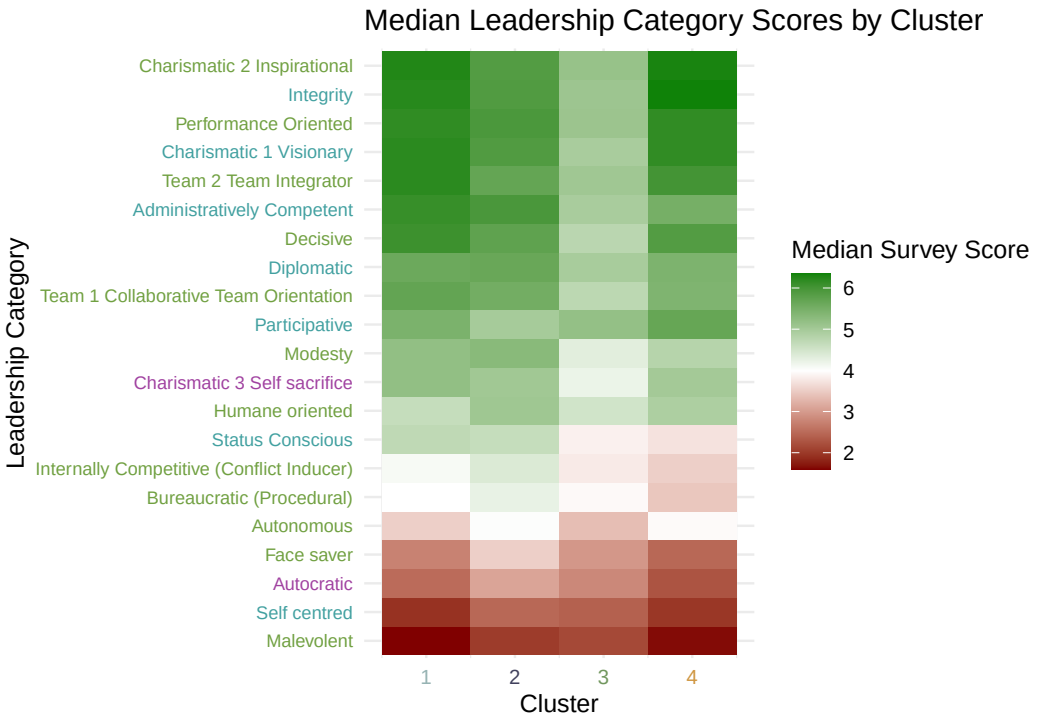


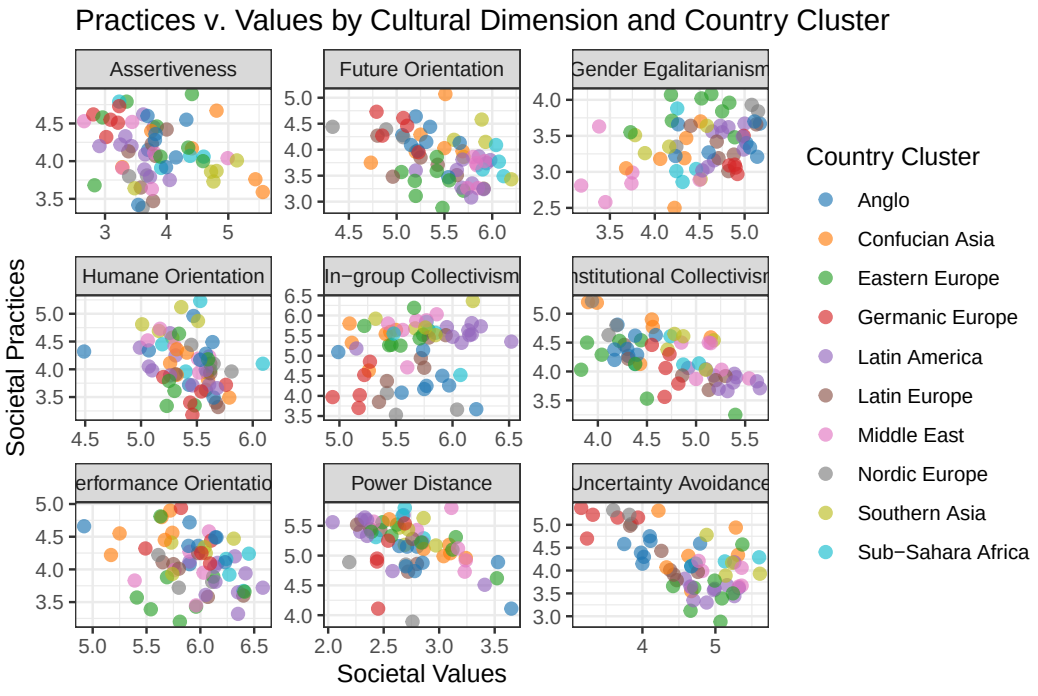
Table 1: Regions with Similar Leadership Perceptions

Cluster 1	Cluster 2	Cluster 3	Cluster 4
Costa Rica	India	Qatar	England
Italy	Venezuela	Morocco	Namibia
Ecuador	Taiwan	South Africa (Black Sample)	Czech Republic
El Salvador	Hong Kong	France	Singapore
Israel	Iran		Kazakhstan
Hungary	Mexico		Portugal
Zambia	Russia		Finland
Zimbabwe	Indonesia		Ireland
Colombia	South Korea		Austria
Turkey	China		Switzerland
Spain	Japan		Netherlands
Guatemala	Albania		French Switzerland
Bolivia	Poland		Australia
Greece	Egypt		Sweden
Brazil	Kuwait		South Africa (White Sample)
Philippines	Nigeria		Canada (English-speaking)
Argentina	Malaysia		New Zealand
Slovenia	Georgia		Germany (EAST)
	Thailand		Germany (WEST)
			Denmark
			USA



Societal Practices and Values

To determine whether societal practices and societal values align, we first create scatterplots of societal values against societal practices for each of the nine cultural dimensions:



Note: countries with missing country clusters were excluded.

From the scatterplots above, we note that societal practices and societal values do not always align. For instance, in the case of the Humane Orientation cultural dimension, there does not appear to be any correlation between practices and values at all, with societal practices in this dimension varying from less than 3.5 to more than 5.0 on the survey's seven-point scale even though societal values were rated relatively similarly across all of the surveyed countries. In some other cases, such as for the Uncertainty Avoidance cultural dimension, there appears to be a negative correlation between practices and values, as indicated by the general trend of scores for practices in this dimension decreasing even as scores for values increase. This negative correlation might suggest that, rather than aligning, societal practices and societal values are in fact in conflict.

To quantify the observations we made from our scatterplots above, we fit simple linear regression models for each of the nine cultural dimensions, using the societal values rating as the predictor and the societal practices rating as the response. In other words, we fit the model:

$$y = \beta_0 + \beta_1 x$$

Where x is the societal values rating and y is the societal practices rating for each of the nine cultural dimensions. Additionally, we performed t-tests for each dimension, to test the hypotheses $H_0 : \beta_1 = 0$ and $H_1 : \beta_1 \neq 0$. For this, we employed the *Bonferroni correction* to change the significance threshold from $\alpha = 0.05$ to $\alpha = \frac{0.05}{9} \approx 0.0056$ since maintaining a significance level of $\alpha = 0.05$ would increase the experiment-wise error rate: $P(\text{Any False Positive}) = 1 - P(\text{No False Positives}) = 1 - 0.95^9 \approx 0.3698$. The table below shows the values of β_1 that we obtained and the corresponding p-values. Cultural dimensions for which the p-value is lower than the corrected $\alpha \approx 0.0056$ are indicated with green shading.

Table 2: Results of Simple Linear Regression by Cultural Dimension

Cultural Dimension	Coefficient Value	p-value
Power Distance	-0.6240	0.0000
Uncertainty Avoidance	-0.6059	0.0000
Institutional Collectivism	-0.4619	0.0000
Humane Orientation	-0.3092	0.0603
Future Orientation	-0.2545	0.0247
Assertiveness	-0.1557	0.0352
Performance Orientation	-0.1223	0.1861
Gender Egalitarianism	0.2140	0.0266
In-group Collectivism	0.6347	0.0074

As shown above, most of the β_1 values obtained were negative, including all three values that were significant at the $\alpha = 0.56\%$ significant level as calculated using the Bonferroni correction. This means that, as the rating for the societal values of a cultural dimension increase, the rating for the societal practices of that cultural dimension actually decrease. In other words, rather than being aligned, societal practices in fact run counter to societal values.

Conclusions

Suggestions for Further Research

Limitations

While promising, there are a few issues with the data we have to consider. First, the number of observations: 62 observations is a rather small dataset, which suggest that any analysis will likely be limited. Also, the data silences are important and should not be overlooked. Why were certain countries not surveyed?