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Discriminating Rated Leadership in the U.S Presidency from Value Content and Stylistic Variables in State of the Union Addresses: A Data Mining Methodology

Steven Silver
California State University, San Jose.
Email: sds001@calmail.berkeley.edu

ABSTRACT

Data mining methodology is used to study the content of presidential State of the Union messages. Ratings of greatness in leadership from C-Span panels of historians are defined as the dependent variables. The set of independent variables included measures of values, rhetorical style and intellectual ability. Results of linear regression models with bootstrapped standard errors indicated a value facet related to self-direction and stylistic variables to significantly discriminate the expert ratings of presidential leadership by historians.

KEYWORDS: Presidential Leadership, Content Analysis, Value Factors, Data Mining.

INTRODUCTION

While the quality of decision-making is likely to have been increased by machine-based advances in AI and decision-support systems, individual leadership in government and corporate sectors remains irreplaceable. Events in the recent decade have directly indicated the strategic importance of leadership or the lack thereof in Washington to the public. The challenge of assessing leadership at the level of the U.S. Presidency, in particular, has attracted a number of investigators. One reason for this is the consummate level of leadership skills that the position demands. A second reason is the range of data on those who have held the position.

The most cited studies of presidential leadership have used ratings of biographical summaries (e.g. Lillienfeld et al 2012; Simonton 1988) or coding of a limited number of prepared speeches (e.g. Emrich, Brower, Feldman and Garland, 2001; Winter 2002) as the basis to discriminate leadership. The present study will use the content of text of State of the Union addresses to discriminate rated leadership in the US Presidency or a set of value, and stylistic variables.

State of the Union addresses are prepared reports delivered to Congress annually. Although these are scripted documents, the general argument in the support of the use of such documents as representative corpuses in the study of presidential leadership has been that presidents have been shown to commonly make changes in texts written by others to ensure they are congruent with their own views and style (Winter 2002)

Among prepared addresses, there are additional reasons to assess content in the running text of *State of the Union Addresses* rather than the more commonly used *Inaugural Addresses*. While *Inaugural Addresses* traditionally set out a broad statement of *goals* for an administration, they are only delivered once in a four year term. In contrast, annual *State of the Union Addresses* are more closely related to accomplishments as well as “visions” and promises. *State of the Union Addresses* can be coded for all 20th and 21st century presidents.

While previous analyses of the content of presidential documents have used human coders to generate levels of study variables, we will introduce a data mining methodology to discriminate presidents on the expert ratings of leadership. Although current capabilities data mining are best described as “works in progress” in coding the natural language of diverse documents generated by historically significant individuals, they are efficient in coding well-

defined and contextualized content.

There are both substantive and methodological objectives to this study. The first objective in this application is to further our understanding of the person component of leadership evidenced in the U.S. presidency. Since this is recognized as a consummate leadership position in the world, contributions to our understanding may have important transfers to the definition of leadership across a range of ranks in government and industry. The second objective of the study to be reported is to advance the methodology that can be applied in content analysis. The computer-based methodology that will be implemented offers the possibility of increased reliability and efficiency of coding large databases from representative content for analyses of leadership. The study can also supplement results of previous studies of motive content (e.g., Winter (2002) since personal and social values are commonly cited organizers of belief systems that remain to be comprehensively assessed across presidents.

LITERATURE REVIEW

A number of investigators have coded *Inaugural Addresses* and/or their own selection of representative speeches by presidents on cognitive style and measures of social motivation (e.g., Suedfeld, Cross and Brcic 2011, Winter 2002). In one of the more rigorously executed and influential studies of presidential leadership, Simonton (1988) had abstracts from standard biographical sources rated on an adjective checklist measure of personality traits and cross-classified traits with measures of leadership “style” abstracted from historians descriptive writings on presidents.

In this and subsequent work, Simonton (e.g. Simonton 2013) recognized that manifested greatness in presidential leadership is a function of both innate abilities and environmentally generated learning. The latter factors roughly labeled as environment enabled opportunity has been emphasized and elaborated in admirable detail by Kernell (1997), Lowi (1986) and Skowronek (1997) among others.

More recently, Lillienfeld, Waldman et al (2012) investigated what they designate as “psychopathic personality traits” that can be adaptive for political leadership. These authors used ratings of biographies by historical experts and student coders with controls for rated intelligence and power motivation. In their result, “fearlessness and interpersonal dominance” were the major traits associated with higher job performance. “Impulsiveness and anti-sociality” were associated with negative job performance.

Although limited to one or two presidents, Suedfeld, Cross and Brcic (2011) found that individual values can be tracked in presidential speeches. Additionally, there is indication that qualities of political leadership that can include values are largely robust across cultures (e.g. Dorfman et al 2012). Ahn and Etnner (2012) have documented the timelessness in leadership related values from analysis of literature across periods that begin in Ancient Greek civilization. Recent application have shown that values can be meaningfully grouped into facets that are combinatorial of the individual values to discriminate “left” and “right” political orientations (Pioro, Schwartz and Davidov 2011) and competitiveness in social dilemmas (Sagiv, Sverdlik and Schwartz 2011). Construct validity for the value facets has been reported in studies that include Pioro et al (2011) and Sagiv et al (2011).

THEORETICAL DEVELOPMENT/MODEL

Defining Factors of Leadership

There are now extensively cited differentiations of the factors of leadership (Bass, 1985; Bass, Avolio, Jung and Berson 2003). While these were initially assessed in questionnaire studies that demonstrated reliability and construct validity (e.g. Rowold and Heinitz, 2007), some measures of the factors have been applied to presidential leadership (e.g. House,

Spangler and Woycke, 1991). The most commonly cited factors have been designated as *transformational*, *transactional* and *charismatic*. Transformational leaders are considered to emphasize higher motive development and arouse followers' motivation by means of creating and representing an inspiring vision of the future (Bass, 1997). Transactional leadership emphasizes capabilities in getting procedural tasks completed (e.g. congressional approval of appointments and legislation). Charismatic leaders transform the needs, values, preferences and aspirations of followers. These leaders motivate followers to make significant personal sacrifices in the interest of some mission and to become less motivated by self-interest and more motivated to serve the interests of the larger collective (House, Spangler and Woycke, 1991).

Greatness in presidential leadership as rated by historians and political scientists, appears to have principal dependencies on transformational that, in turn these factors would seem to be closely related to values. Accordingly the values will be the predominant independent valuables in the study.

Value Facets in the Study of Presidential Leadership

Although not comprehensively studied in the presidency, background studies of corporate leadership have commonly cited the primacy of values (e.g. Kanter 2011). Values in the comprehensive Schwartz Survey of Values (SVS e.g. Schwartz 1994) have been organized in *facets* that are *constellations of values*. The facets show trade-offs inherent in value systems at higher levels of organization than individual values.

The value facets that will be operationalized in this study are to discriminate presidents on characteristics leadership are *power*, *self-direction*, *benevolence*, *universalism* and *security*. These are defined in Schwartz's (1994) values in Table 1. In combination, these value facets relate leadership to an open perspective, as in internationalism, belief in change and a willingness to transcend self-oriented motives. These are qualities that historians have recognized in defining dialogues on presidential leadership (e.g. Barber 1992).

Study Variables and Methodology

Dependent variables.

Ratings of Contextualized Leadership. We use the ratings of C-Span historians and related professionals on the leadership of US presidents on ten contexts of leadership as the dependent variable. These include international relations, economic engagement, crisis management and vision in setting an agenda. The dimensionality of ratings on each of sub-dimensions that are defined will be examined in principal component analysis.

C-SPAN Raters of Presidential Leadership

For the year 2000 ratings, C-SPAN's academic advisors used a survey in which participants used a 1 ("not effective") to 10 ("very effective") scale to rate each president on ten qualities of presidential leadership: "Public Persuasion," "Crisis Leadership," "Economic Management," "Moral Authority," "International Relations," "Administrative Skills," "Relations with Congress," "Vision/Setting An Agenda," "Pursued Equal Justice for All," and "Performance Within the Context of His Times."

Surveys were distributed to 147 historians and other professional observers of the presidency. Sixty-five agreed to participate. Participants were guaranteed that individual survey results remain confidential. Summary Ratings Survey responses were tabulated by averaging all responses in a given category for each president. Each of the ten categories was given equal weighting in the total scores. Results of ratings in 2000 were updated in 2009 to include an

additional president they generally provide evidence of the stability of the rates. The full set of ratings can be seen at www.c-span.org/presidentialsurvey <<http://www.c-span.org/presidentialsurvey>>.

Independent variables.

As indicated, measures of personal and social values will be introduced as independent variables hypothesis testing because of the importance they have demonstrated in document analysis and observed behavior and their extensive citations in self-reports on leadership and fundamentals of organizational culture (e.g. Cameron and Quinn 2011).

Facets of *power*, *self-direction*, *benevolence*, *universalism* and *security* as defined by Schwartz (e.g. 1994) and Sagiv, Sverdlik and Schwartz (2011) will be supplemented by a measure of socialized power motivation (i.e. power used for social rather than personal objective, McClelland and Boyatzis, 1982) and measures of rhetorical style. An example of socialized power motivation would be “We must not change the regime for our purposes but for the greater good of the people”. McClelland and Boyatzis (1982) have suggested use of power for social objectives to be a quality of leadership. Measures of rhetorical style that are likely to be related to leadership include *abstractness in discourse* and *inclusiveness in referents*. (Emrich, Brower, Feldman and Garland, 2001). It has been suggested by these authors that more accomplished leaders make more extensive use of these qualities in their communications. Updated ratings of presidential intellect (Simonton 2006) as an ability measure supplements the above measures.

Table 1 summarizes definitions of values and rhetorical variables investigated as independent variables. Since numbers of words are likely to relate to the counts of variables that are hypothesized to discriminate presidents on demonstrated leadership, an appropriate control for this independent variables will be included in all analysis.

Table 1: Definition of Coded Values, Motives and Rhetorical Style

Power	authority, dominance, leadership
Self Direction	choosing your own goals, creativity, curiosity, freedom, independence
Universalism	a world at peace, broadmindedness, equality, inner harmony, social justice, unity with nature,
Benevolence	forgiveness, friendship, helpfulness, honesty, loyalty, responsibility
Security	family security, health, national security, reciprocation of favors, sense of belonging, stability of social order,
Negative	Measure of activity inhibition McClelland and Boyatzis (1982); neither, never, no more, not, in contexts of power invocations.
Non-Inclusive	Level of inclusion in referents: he, she, I, it, you vs. we, us, our (Seyranian and Bligh, 2008)
Abstractness vs Concreteness	Use of nouns that have abstract referents as defined in Seyranian and Bligh (2008)
Imagery	Image based and concept based words from Martindale imagery dictionary and Toronto word pool (Emrich, Brower, Feldman and Garland, 2001).

Methodology and Procedures

Designing and Cumulating the Text Corpus for Analysis.

Annual State of the Union addresses for all 20th and 21st century presidents are available through the text of the *Congressional Record* but require recoding into machine-readable documents for the data mining.

Pre-Study Procedures.

Defining Value Facets: Schwartz's definition of individual values and value facets were designed for by this author for self-report ratings. In the SVS survey of values, each value and value facet is given a brief definition and respondents are asked to rate relative importance of the values. In the application of machine coding of values in document content, additional verbal designators were defined to adequately represent usage of an underlying value.

For this, lists of synonyms for each value in the SVS used as independent variables were compiled from *Roget's Thesaurus* (<http://www.thesaurus.com/Roget-alpha-index.html>) and *Word-net* for the English language (<http://wordnet.princeton.edu/>). Five synonyms for each value in addition to the SVS definition of the value were defined. Counts of the invocation of defined values in a facet for the document samples of a president were used to define value facet importance.

Power motivation and activity inhibition. Following a similar procedure to the one used in defining value facets definitions, a definition of power motivation and a search of synonyms for the motive as described in the procedures for defining value facets was used to construct indicators the modifier of activity inhibition from McClelland and Boyatzis (1982).

Stylistic Measures of the Rhetoric of Leadership. Modified definition of "imagery" "Abstractness vs. concreteness" and "inclusiveness" in verbal statements by Emrich et al (2001) and Seyranian and Bligh (2008) were included in the independent variables assessed here.

Content Analysis Engines. Versions of *R* and *SPSS* data mining sub-routines were adapted to the coding of study variables.

RESULTS

Controlling for Lengths of Statements in State of the Union Addresses. When counts of verbal indicators are used as measures of study variables, they generally are increasing with the length of the text that is coded. Methods to adjust counts of variables for total variables, using a constant denominator introduces its own biases. In the present study, the count for each variable was regressed on number of words and the residual was used as a measure of a variable's content. This method allows adjustment for length that can differ across variables.

Model Definition and Testing. To build multivariate regression models of the predictors of leadership given the large number of independent variables relative to the number of presidents, dimensionality of study variables were investigated with principal component analyses (PCA).

To support inference from the small sample size, bootstrapped standard errors⁴ were used in independent sample t-tests for the statistical significance of differences across expert rated charismatic leadership. As de Winter (2013) has confirmed, t-tests generally adequate power and Type 1 error rates when applied to small samples under conditions that this study meet.

For the coded value facets listed in Table 1, a three factor solution by the criterion of

eigenvalues greater than 1 was found to account for 0.73 of the total variance in the measures. The factors and their weightings are defined in Table 4.

Table 4. Principal Components of Values and Rhetorical Style Variables

	Factor1: Benevolence	Factor 2:Universalism	Factor 3: Self-Direction
Benevolence	<u>0.718</u>		
Abstractness	<u>0.943</u>		
Non-Inclusive	<u>0.835</u>		
Universalism		<u>0.807</u>	
Activity Inhibition		<u>-0.624</u>	
Security		<u>0.765</u>	
Self-direction			<u>0.788</u>
Power			<u>-0.658</u>

Confirmatory PCA indicated that factor scores accounted for .830, .609 and .871, respectively, of the total variance in the items in each of the factor definitions.

The dimensionality in the disaggregated contextual ratings of leadership in the ten sub dimension of C-Span ratings and ability measures of intelligence and openness from Simonton (2006) were also examined in a PCA. A two factor solution by the criterion of eigenvalues greater than 1 was found to account for 0.796 of the total variance in the measures. The factors and their weightings are reported in Table 5. The first factor is a composite measure of overall leadership. The second factor is a measure of intelligence and related abilities that include openness or transparency.

Table 5. Principal components of leadership and ability measures

	Factor 1: Leadership	Factor 2: Intellect
Intellectual brilliance		<u>.696</u>
Openness		<u>.965</u>
Intelligence_IC		<u>.973</u>
Intelligence_IIC		<u>.974</u>
International relation	<u>.767</u>	
Public persuasion	<u>.808</u>	
Crisis leadership	<u>.904</u>	
Economic engagement	<u>.776</u>	
Moral authority	<u>.776</u>	
Administrative skills	<u>.774</u>	

Relations with congress	<u>.887</u>	
Vision in setting an agenda	<u>.830</u>	
Pursued equal justice for all	<u>.527</u>	
Performance with context of the times	<u>.963</u>	

Confirmatory PCA indicated that the factors accounted for .884 and .714, respectively, of the total variance in the items of the factors.

The factorial representation of independent variables was then investigated in regression models with bootstrapped standard errors.

Bootstrapping (e.g. Efron and Tibshirani, 1994) generates smaller standard error estimates for small size samples by resampling methods that build the equivalent of larger sample sizes.

The resampling method that is implemented in this study is as follows.

1. Fit the model and retain the fitted values and the residuals
2. For each pair, (x_i, y_i) , in which x_i is the (possibly multivariate) explanatory variable, add a randomly resampled residual, ϵ_j , to the response variable y_i . This creates synthetic response variables where j is selected randomly from the list $(1 \dots n)$ for every i .
3. Refit the model using the fictitious response variables and retain the quantities of interest (often the parameters, estimated from the synthetic).
4. Repeat steps 2 and 3 a statistically significant number of times.

Regression Model of the Rated Greatness Factor. Results for a regression model of the factors of C-Span rated greatness in leadership indicated that only the self-direction factor was statistically significant ($b= 0.537$, $t= 2.1$, $p=0.5$). The intellect factor was in the predicted direction but not statically significant ($b= .355$, $t=1.51$, $p<.12$). Adjusted R^2 for the model was .302.)

In a detailed review of results for the universalism facet across presidents, it was noted that its invocation is greatest at the times following international treaties and founding of international institutions even when much or most of the background preparation for the events was done in a previous presidency. This observation increases the importance of more extensive controls for environmental variables that include wars and conflicts and the operation of institution in subsequent models of leadership with the defined methodology.

SUMMARY AND DISCUSSION

This study reports initial results from a data mining study of *State of the Union Addresses* for a set of concept-based predictors of presidential leadership. As noted, presidential leadership has been extensively investigated over past decades because its uniqueness and general importance to the well-being of the nation-state and the possible implications of results for high level leadership across government and industrial sectors. The empirical study reported here has used a measure expect rated of leadership as a dependent variable. A set of predictors of rated leadership in value facets, rhetorical style variables and intellectual ability have been investigated. *State of Union and Corpuses* across presidents were first adjusted for total number of words in documents since content measures are commonly correlated with total number of words.

For regression model building with a small sample size, principal component analyses of the predictors were first examined. Results for an eigenvalue criterion yielded a three-factor solution. The first factor loaded most highly on the value facet of *benevolence* and the style variables of *non-inclusiveness* and *abstractness*. The second component loaded most highly on

the value facets of *universalism* and *security* and power. The third factor loaded most highly on *self-direction* and activity inhibition as negative power.

A principal component analysis of the set of leadership ratings in ten contexts by a C-Span panel of historians and ability indicators that generally relate to intelligence yielded a two-factor solution. The first component was defined to be a combined leadership factor across leadership contexts. The second component was defined to be a measure of intellectual ability.

The relationship of the factor extracted from the ten contextualized ratings of presidential leadership by C-Span historians to the principal components of value facet and stylistic variables were then investigated in a regression model. In these results, the factor of self-direction was found to be a significant predictor of the leadership factor derived from the C-Span ratings. An intelligence factor was in a predicted direction but not statistically significant.

Results reported here are preliminary to investigation in more complex modeling value factors in predicting presidential leadership given a small sample size. While the data analysis reported here has focused upon internalized measures of values, motives and stylistic variables in presidents, as predictors of rated leadership, it has been recognized that environments of a presidency have clear influences on evidenced leadership. The extent of this influence relative to internalized orientations of presidents and ways in which both factors interact are a direction for subsequent investigation.

The challenges in analysis that these data pose are not unusual. For example, studies that use clinical histories often face similar challenges since many of the cases occur across different time periods with observations on entities that may or may not have been in the prior time periods.

The understanding of the components of leadership and the predictors of quality in these components from the US presidency as a consummate exercise in leadership retains its potential as an important contributor to the practice of management in both government and industrial sectors. Efficient methodologies including data mining can further our understanding of the combination of internal processes and environmental events that underline greatness in leadership.

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