

Initial Report on Implementation of a Quantitative Assessment of President George W. Bush's National Security Strategy

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ABSTRACT

The Bush Administration released the United States National Security Strategy in 2006. This is an update from the last National Security Strategy that was released in 2002. In this document, the administration lays out its objectives for the United States' National Security

and their plan to achieve these objectives. It does not however contain the means to assess progress towards achieving these objectives. In this paper, we discuss Value Focused Thinking (VFT) and summarize the approach. We then develop our proposed hierarchy and explain the rationale for our structure and especially the metrics we use for our measurements. Finally, we discuss the remaining steps required to apply the assessment system to the National Security Strategy and conclude with future directions for our proposal and approach.

INTRODUCTION

The purpose of this paper is to present a feasible methodology which can assess the success of achieving the goals as listed in the National Security Strategy. This paper is an application paper developed from the original work done in “Quantitatively Assessing President George W. Bush’s National Security Strategy”. (Kwinn, 2006) This first paper discusses the methodology and maturity of Value Focused Thinking (VFT), effects assessment, and applications to national security. Furthermore this first paper created a values hierarchy which captures metrics specifically stated in the National Security Strategy.

The original values hierarchy is modified by this paper and further work is done in the areas of data collection, value curves, and weighting. In order to quantitatively assess the National Security Strategy it is important to understand the metrics that are contained within the National Security Strategy, the value curves that apply to different metrics, and the weights that decision makers place on the differing metrics.

VALUE FOCUSED THINKING (VFT) AND EFFECTS ASSESSMENT

The following five paragraphs are taken directly from “Quantitatively Assessing President George W. Bush’s National Security Strategy” in order to ensure the reader is familiar with VFT. (Kwinn, 2006)

Value Focused Thinking is a means to assess the “value” of a variety of alternatives through the development of significant metrics. It requires the development of a hierarchy which is developed through interactions with the decision maker and other actors in the system. The first step is to identify the primary goal of the problem being addressed. The goal is then decomposed into sub-functions and eventually objectives which can be directly measured. A depiction of this hierarchy is at Figure 1. (Parnell, 2003)

The metric is the “mapped” to a value score through the application of a value curve. In this approach, the analyst develops, in conjunction with a client, a “value curve”. This curve is intended to be the functional transformation of the measure of effectiveness to a value between 0 and 1. The shape of these curves is important and must be decided on based on the relative level of importance (or client value) of increasing the level of the measure.

After the development of the hierarchy including the measures and establishment of the value functions, the decision maker identifies (or the staff suggests) weights for each function, sub-function and eventually each measure. The weights for each measure, which

sum to one for each level, are then multiplied by the value of that measure which results in a “score” at each level. In the application of this approach to assessment systems, the weights represent the commander’s priorities for the varying effects the command would like to achieve.

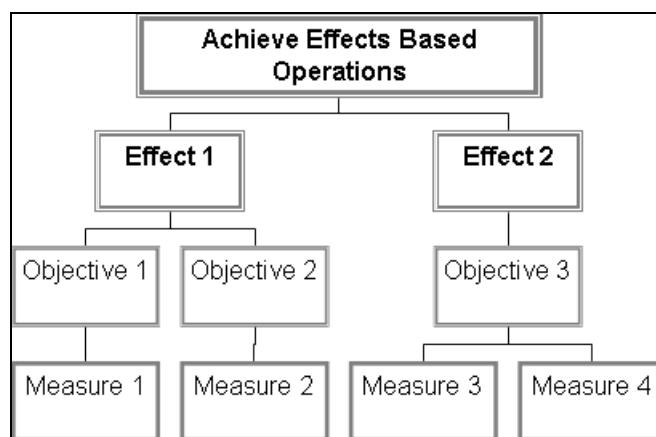


Figure 1: Effects Based Hierarchy Example.

To determine the value at each parent node in the system, the weights and values are multiplied together and then summed as shown in equation 1, below. (Kwinn, et al., 2004) Here the total value of a given node j is given as $V(X_j)$ where w_i is the weight at node i and $v_i(x_{ji})$ is the value for all n metrics which are “children” of the parent node j .

$$V(X_j) = \sum w_i * v_i(x_{ji}), \text{ where } i = 1 \text{ to } n \quad \text{Equation 1}$$

When applied to an assessment system, these values in and of themselves do not have meaning. It is only when taken over a period of time when the trends can be analyzed for meaning. In this way, the decision-maker (and/or the staff) can use the trends to identify methods which are being successful and which are not. They can also use this information to help identify the overall effect of a course of action. This is accomplished by estimating the potential impact of a given course of action on each of the metrics. The new score at each parent node will provide the insight to determine if the course of action will have a net positive effect or a net negative effect. Utilizing the methodology listed above, the first paper created a value hierarchy for assessment of the National Security Strategy. This National Security Assessment Hierarchy is depicted in Figure 2.

TRANSITIONING PREVIOUS MEASURES TO NEW MEASURES

The effects, objectives, and measures for the paper “Quantitatively Assessing President George W. Bush’s National Security Strategy” were selected because of direct references to these areas of concern in the National Security Strategy. Once data collection began it became obvious that it was not tenable to collect numerical data on some of these measures. Therefore it became necessary to evaluate each measure and determine if a similar measure could be substituted in its place. In doing this the number of measures was reduced from forty-two in the original paper to twenty-seven in this paper.

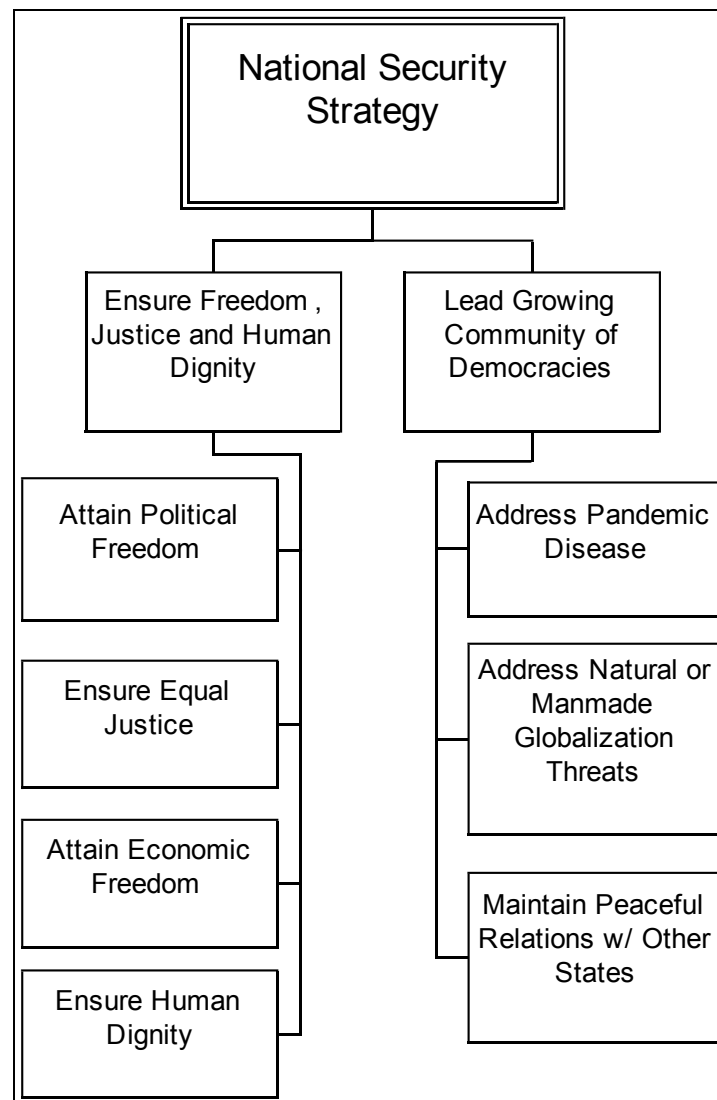


Figure 2: Top Level for National Security Assessment Hierarchy.

DEVELOP THE VALUE CURVES

When developing value curves it is important to use input from subject matter experts. A method for doing this is to have the expert initially identify the general shape of the curve. Next the expert will identify their increase (or decrease) in value from a specific incremental increase in the measured scale. (Parnell, et al, 2006) In order to assign value curves to each individual value measures typical value functions shapes are adopted. The three types of curves used for this study are the sigmoid curve (s-shaped curve), exponential, and linear. These three types of curves can either be increasing or decreasing.

An s-shaped curve is to be used when a gradual increase for a value measure possessing a concave up curve until the inflection point then a concave down curve to the endpoint. For the purposes of this paper the inflection point was selected to be the midpoint. An example is an increasing s-shaped curve is displayed in Figure 3. The x-axis unit of measure “Number

of Countries” is used strictly for example purposes. Each value measure has a unique unit of measure described by the value measure name.

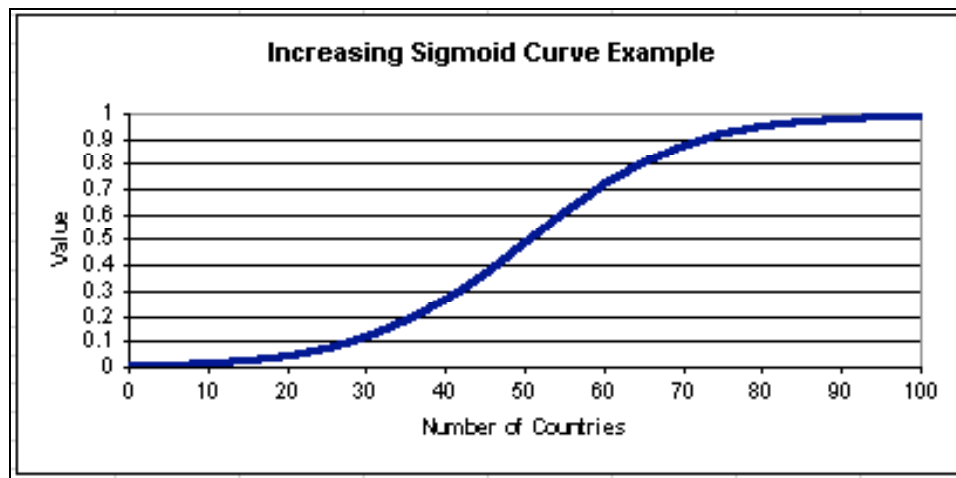


Figure 3: Increasing Sigmoid Curve Example.

Of the twenty-seven Value Measures chosen twelve were selected to have an increasing s-shaped value curve and three were selected to have a decreasing s-shaped value curve. This determination was based on the similarities of these value measures with respect to nation development.

Increasing Sigmoid Value Curve
VM 1.1.1.1: Number of countries with elected leaders
VM 1.1.1.2: Number of “free” countries
VM 1.1.3.1: Number of countries with freedom of press
VM 1.2.1.1: Number of countries with Supreme Court for judiciary branch
VM 1.2.2.1: Number of countries who are members of the World Customs Organization
VM 1.2.3.1: Number of countries represented in the international law commission
VM 1.3.1.1: Number of countries that receive Debt Relief (HIPC)
VM 1.3.3.1: Number of countries in the World Trade Organization
VM 1.4.1.1: Girls’ primary net enrollment/attendance ratios in developing countries
VM 1.4.1.2: Women in parliament (% of total seats)
VM 1.4.3.1: Number of Tier 1 Nations (Nations that fully comply with the Trafficking Victims Protection Act (TVPA))
VM 2.3.2.1: Number of countries in compliance with the Nuclear Proliferation Treaty (NPT)
Decreasing Sigmoid Value Curve
VM 1.3.3.2: Number of countries whose exports of goods and services account for less than 15% of it’s GDP
VM 2.3.1.1: Number of countries with a Failed States Index (FSI) rating of greater than 90
VM 2.3.1.2: Number of countries that are listed as State Sponsors of International Terrorism by the U.S. Department of State

Table 1: Value Measures Represented with Sigmoid Value Curves.

An exponential value curve is to be used when a very gradual increase for a value measure possessing a concave up curve which increases very rapidly to the endpoint. For the purposes of this paper the rate of increase was chosen to double every increment of 1/10 the total length of the x-axis. An example is an increasing exponential curve is displayed below in Figure 4.

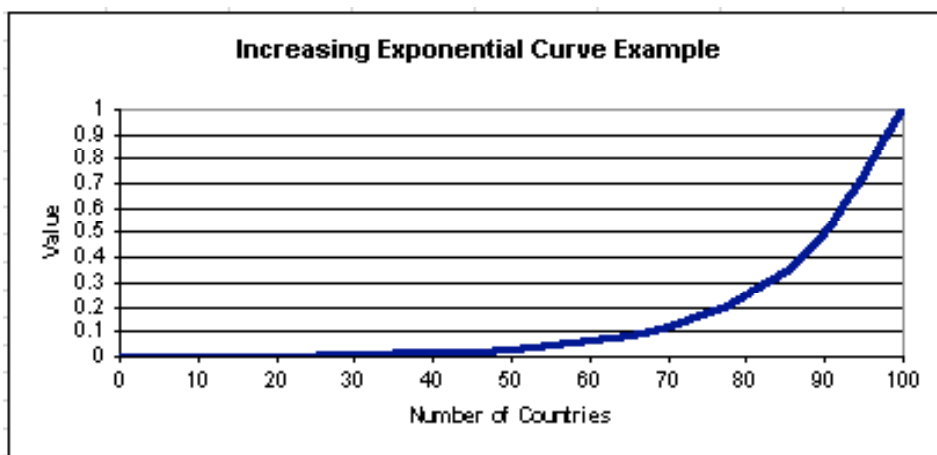


Figure 4: Increasing Exponential Curve Example.

Of the twenty-seven Value Measures chosen four were selected to have a decreasing exponential value curve. This determination was based on the similarities of these value measures with respect to military attacks and reprisals.

Decreasing Exponential Value Curve
VM 1.1.2.1: Number of significant attacks by terrorist groups
VM 1.1.2.2: Number of attacks by terrorist groups
VM 1.1.2.3: Number of people killed due to terrorist attacks
VM 1.4.2.1: Number of countries where the U.S. conducted actions because of religious and ethnic tolerance concerns

Table 2: Value Measures Represented with Exponential Value Curves.

A linear value curve is to be used when a one for one increase for a value measure exists. An example is an increasing linear curve is displayed in Figure 5.

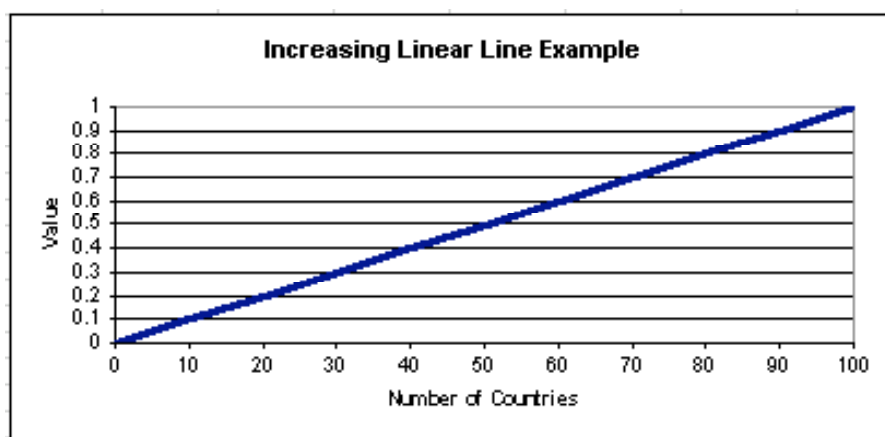


Figure 5: Increasing Linear Curve Example.

Of the twenty-seven Value Measures chosen two were selected to have an increasing linear value curve and seven were selected to have a decreasing linear value curve. This determination was based on the similarities of these value measures with respect to death, disease, drug use, and famine.

Increasing Linear Value Curve
VM 1.2.3.2: Number of countries who abolished the death penalty
VM 2.1.1.1: Number of countries reporting funds spent on anti-malaria efforts
Decreasing Linear Value Curve
VM 1.3.2.1: Number of countries where 10% or more of it's population is undemourished
VM 2.1.2.1: Number of worldwide AIDS/HIV cases
VM 2.1.2.2: Number of human cases of avian influenza (H5N1) reported to the WHO
VM 2.1.2.3: Number of cases of malaria reported to the WHO
VM 2.2.1.1: Number of illegal drug users globally in millions
VM 2.3.3.1: Number of Internally Displaced Persons (IDP) in millions

Table 3: Value Measures Represented with Linear Value Curves.

DATA AND WEIGHTS

Data collection was achieved through open sources and was primarily internet based research. Resources most commonly used were from the U.S. Department of State, United Nations reports, UNICEF documents, and third party political science organizations. In areas where data was not recorded for a specific year the last known data points were utilized to either interpolate a reasonable number or the last known data value was extended out to the remaining years. The numbers either interpolated or extended are listed in Appendix as bold type face.

The weights for all effects, objectives, and measures would be determined by the stakeholder in an interview process. A methodology selected for this study is to initially keep all weights equal and then to only vary the weights of the two effects at the second highest level of the hierarchy. These two effects are titled “Ensure Freedom, Justice, and Human Dignity” and “Lead Growing Community of Democracies”. The dashed outlined boxes in Figure 6 are the effects that had varying weights.

MODEL RESULTS

Table 4 presents the results of modifying the weights as outlined above. It is notable that as long as the weighting for the effect of “Ensure Freedom, Justice, and Human Dignity” is heavily weighted then the overall value score is higher. An overall higher value score indicates a more successful result from the National Security Strategy. However, once the effect of “Lead Growing Community of Democracies” is more heavily weighted the model’s value score indicates that over the period of the past eleven years there has been a failing in reaching the goals as outlined by the National Security Strategy. Obviously this is only scratching the surface. Each objective and sub-objective weights could be manipulated in order to see whether or not a positive or negative value score resulted from the past eleven year time period being evaluated. Furthermore it is notable that a break-even point is achieved when the two main effects are weighted .6 and .4. A graph representing the value with a .6 and .4 weighting is displayed in Figure 7.

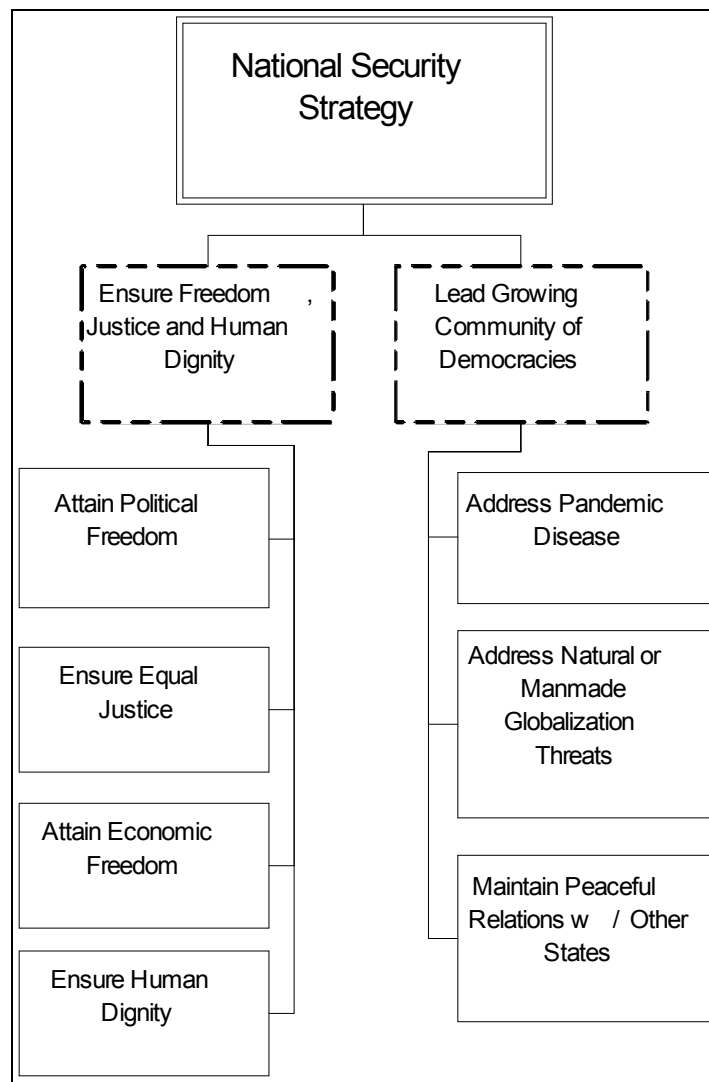


Figure 6: Effects with Varying Weights.

Ensure Freedom Justice and Human Dignity	Lead Growing Community of Democracies	1997 value	2007 value	+/-
0	1	0.96	0.5	-0.46
0.1	0.9	0.97	0.53	-0.44
0.2	0.8	0.78	0.56	-0.22
0.3	0.7	0.7	0.58	-0.12
0.4	0.6	0.61	0.61	0
0.5	0.5	0.52	0.64	0.12
0.6	0.4	0.43	0.66	0.23
0.7	0.3	0.35	0.69	0.34
0.8	0.2	0.26	0.72	0.46
0.9	0.1	0.17	0.75	0.58
1	0	0.08	0.77	0.69

Table 4: Models Results.



Figure 7: Break-even Scores with 0.6/0.4 Effect Weighting.

FUTURE WORK AND CONCLUSIONS

Further refinement of our work will address areas of concerns such as the linkages between value measures stated in the National Security Strategy and the value measures chosen for their similarities and abundant data sources. Furthermore the data sources themselves may come under scrutiny should more exhaustive sources be discovered. Lastly much more sensitivity analysis need to be conducted in order to explore the different weighting combinations and it's effects on the final score. This paper illustrates how an analytical approach can have potential implications to national security. Operations research techniques will continue to play in increasing role in the assessment of national strategy. Through studious efforts we can attempt to provide decision-makers with analysis that can make this a safer and stronger nation.

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