

ON NARRATIVE MODELING AND ASSESSMENT FOR STRATEGIC CHANGE

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Narratives, Concept maps, Social Networks, Influence nets, Courses of Action

ABSTRACT

A methodology is presented for the quantitative modeling and assessment of master narratives in order to develop ways in which a master narrative may be modified without affecting its fundamental beliefs. The modeling approach is based on first developing a concept map of the key beliefs in the narrative and then using social network analysis measures to assess the strength and influence of these beliefs. Finally, influence net models are used to derive and evaluate strategies for modifying the effects of these beliefs.

INTRODUCTION

The twenty seven years long conflict between Greece and the Former Yugoslav Republic of Macedonia is not about land or, more generally, physical resources; it is about national master narratives. (Delaunay 2018; Kirby 2019) While the political leadership of the two countries has been attempting to resolve this issue, the populations of both countries object strongly to what they consider a violation of essential master narratives. For example, Greece's master narrative is based on ancient history: Macedonia, Philip II of Macedon and Alexander the Great. The fact is that the region known as Macedonia was split up after the 1912-14 Balkan wars with the largest part within the Greek border, a large part in now named the Republic of North Macedonia, and a small part in Bulgaria. Now that an agreement over the name has been reached, a clear challenge for the governments of both countries is to modify the prevailing narratives without altering their fundamental ideas in order to avoid public protests by the populations of the two countries. It should be noted that there is already cooperation in the financial and commercial sectors and, with Northern Macedonia joining the European Union and NATO, the cooperation will increase in other sectors.

The example above, one of many in the set of worldwide conflicts between nations and ideologies (whether national or trans-national,) indicates a need not only to understand narratives (and there is a very extensive literature on narratives; see for example

Prince (1973); Ware et al. (2013); Blum (2005)), but also to do some quantitative modeling. The purpose of this quantitative modeling is to form the basis for assessing the effect that various approaches to modify the narratives would have. To achieve this we need to establish relevant metrics that will allow us to see whether proposed small variations in the narratives will be acceptable and lead to a reduction in antagonisms and public turmoil or they will conflict with the basic concepts in the narrative and be rejected by those who espouse it. It should be noted that within the population of a nation a narrative may be espoused by different segments of the population and one segment of the population may espouse multiple narratives..

The technical approach is described in the next section. To illustrate the application of the approach a case study is presented in the third section in which one of the master narratives in a country is analyzed.

TECHNICAL APPROACH

The proposed approach for modeling, analysis and development of strategies for modifying narratives consists of five steps. The first step is the narrative deconstruction using Concept maps (Novak and Cañas 2006) and social network modeling and analysis tools (Carley 2006). In the second step, the work on assessing narrative grammars by Cobb et al. (2014) in the context of the six social orientations proposed by Van Lange and Joireman (2008) is used to define attributes that characterize a narrative and assign values to them. In the third step, the set of attributes is expanded to reflect the network analysis results of the first step. In the fourth step, the analytical results are used to identify which concepts and which relationships in the narrative are most susceptible to revision or change. Finally, in the fifth step, Influence Nets are used to evaluate potential strategies for modifying the narratives based on the results of the fourth step.

Step 1: Narrative Deconstruction

Given a narrative, the underlying concepts are identified and the relationships among them established. This is expressed in the form of a Concept Map. Concept maps are graphical tools for organizing and representing knowledge. They include concepts, usually enclosed in circles or boxes of some type, and relationships between them indicated by a connecting

line linking two concepts. Essentially the result is a network, similar in structure to a Social Network. Consequently, a number of the metrics used to analyze and evaluate social networks can be used. Typical examples are degree and geodesic centrality.

Van Lange and Joireman (2008) have proposed a set of six “social orientations.” They are Altruism (A), Equality (E), Cooperation (C_o), Competition (C_p), Individualism (I), and Aggression (A_g). Cobb et al. (2014) have used these social orientations to classify accordingly six types of narratives and have characterized the first three as Transformative and the second three as Escalatory. In their discussion they describe these orientations as follows: “Altruism favors benefit for the other, Equality favors minimizing the differences between parties, Cooperation emphasizes value creation and shared benefits, Competition favors benefits for Self over Other within shared rules of the game, Individualism favors exclusively benefits for Self, and Aggression favors minimizing benefits for the Other.”

Step 2: Define Attributes and Assign Values

Cobb et al. (2014) also defined five attributes as components of escalatory and transformative narrative syntax. These five attributes in the narrative typology can be partitioned into three groups: *Value*: Positive and Negative; *Logic*: Plot Logic; and *Character*: Other and Self. The corresponding assigned values by Cobb et al. (2014) are shown in Figures. 1 and 2.

The following approach was used to quantify the values of the attributes. Consider one of the attributes,

say Positive Value, and assign to it the variable x_1 and set its range to be [0..10]. Then place the value of this attribute for each one of the narrative types on this range, as shown in Fig. 3. Note that the “distances” between the six types of narratives are, in general, not equal. The process is repeated for all five attributes and produces a five dimensional vector $x = [x_1, x_2, x_3, x_4, x_5]$ that characterizes a given narrative.

Step 3: Map to Additional Narrative Attributes

In the same way that Cobb et al. (2014) defined attributes to characterize the narratives, additional attributes can be defined for both the nodes (concepts) and the links (relationships) of the concept map of a narrative. For example, strengths can be assigned to both the concepts and the relationships. Step 3.1 expands the list to include attributes derived from the “network style” analysis of the concept caps such as the degree centrality and the geodesic centrality (a type of closeness centrality; see Agneessens et al. 2017) derived from the social network depiction of the concepts and their relationships. In step 3.2 these attributes are quantified. The scale can be numeric or reflect ranges such as High and Low.

Step 4: Vulnerability Assessment of Narratives

Algorithms already developed in Network Sciences to identify weaknesses in a network either because of nodes or because of links are applied to determine which concepts and which relationships are most vulnerable

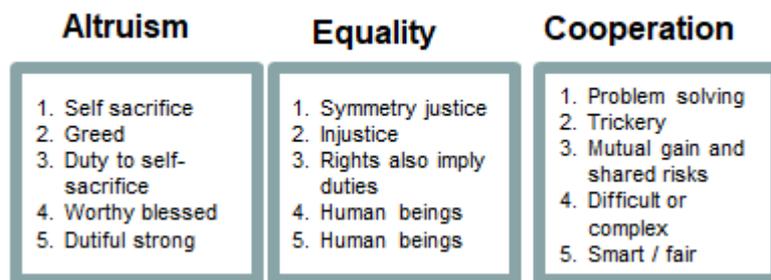


Figure 1: The Three Transformative Social Orientations

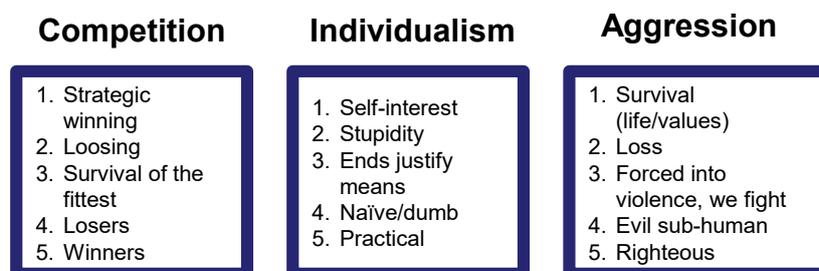


Figure 2: The Three Escalatory Social Orientations

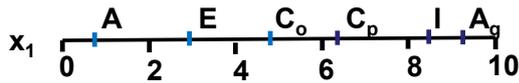


Figure 3: Attribute Quantification

. However, this is not sufficient. The next step is to assess whether a change to a concept or a relationship will nudge it towards a more desirable member of the six typologies (e.g., re-shaping the narrative from aggressive to competitive).

Step 5: Course of Action Development

With the results obtained in Step 4, it is now possible to assign influence values to an Influence Net, (Chang et al. 1994; Haider and Levis 2005; Haider et al. 2008) a specialized form of Bayesian nets, constructed from the concept map relationships and the user objectives. The Influence Net then is used to generate potential Courses of Action (Wagenhals and Levis 2000) for reshaping narratives to be more favorable (or less negative) toward the user's objectives.

CASE STUDY

The technical approach is illustrated in a simplified form through an example based on a study conducted by Monitor 360 (2011) in which nine Master Narratives were identified for Pakistan. The narratives were also associated with overlapping population segments that espoused them. These are:

1. *Pakistan's Nuclear Pride* – broadly held across segments
2. *The US Plot Against Pakistan* - broadly held across segments
3. *Fair-Weather Ally* - broadly held across segments
4. *Hostile India* - broadly held across segments
5. *Jinnah's Modern Vision* – urban mainstream elite
6. *Jinnah's Islamist Vision* – Islamist conservatives, urban middle class
7. *Guardians of Pakistan* - broadly held especially by Pakistan Army
8. *Victims of Military Rule* - urban mainstream elite
9. *Defensive Jihad* – Islamist militants

All nine narratives were deconstructed because they contain many common concepts and relationships. Once this is done, they need to be weighted by the population segments that embrace them and by the relative importance of each population segment. For simplicity of presentation in this paper, only the first narrative is used here to illustrate the approach.

“Encircled by enemies on all sides, Pakistan has faced existential threats since its birth. Zulfikar Ali Bhutto launched Pakistan's nuclear program in response to these enemies, declaring Pakistan's commitment and

dedication by saying: “If India builds the bomb, we will eat grass and leaves for a thousand years, even go hungry, but we will get one of our own.” Thanks to the ingenuity and leadership of heroes such as AQ Khan and in defiance of Western and Indian attempts to undermine the program, Pakistan developed the greatest of all technological capabilities. Pakistan's nuclear bomb proved to the world that Pakistan was the most advanced and powerful Muslim country in the world, and deserves international respect and prestige accordingly. With the nuclear bomb, Pakistan entered the exclusive ranks of the world's nuclear powers. Today, the United States and India conspire to strip Pakistan of its nuclear capability. Pakistan must never give up the bomb and the ability to defend itself against existential threats—it is what makes the world respect Pakistan and what keeps conspiring Indians and Americans in check. To protect this capability, Pakistanis must support the Army that guards the nuclear arsenal and the civilian heroes like Khan who gave Pakistan this great gift. National survival is the reward for this vigilance: in the face of perpetual threats, the nuclear bomb is the ultimate guarantor of Pakistan's continued existence.” (Monitor 360 2011).

Step 1: Narrative Deconstruction

The narrative serves as the basis for creating a concept map. First, all the key concepts in the narrative are identified and nodes are created. Then the narrative is used to establish the relationships between the nodes. These are expressed as short verb phrases. The resulting concept map for the first narrative is shown in Fig. 4.

Step 2: Define Attributes and Assign Values

The basic attribute vector has been defined as:

$$\underline{x} = [\text{Positive Value, Negative Value, Plot Logic, Character – Other, Character – Self}]$$

A set of illustrative values for Pakistan's Nuclear Pride narrative would be: $x_1 = [10, 9.5, 10, 9, 10]$; it falls clearly within the Aggression social orientation type. The same approach (Steps 1 and 2) was applied to the other eight narratives and then each vector x_i was weighted by the fraction of the population that embraces that particular narrative. An issue that makes matters more complex is that population segments overlap and may embrace multiple alternatives. This issue requires the involvement of subject matter experts to resolve it and also to identify marginalized narratives that are embraced by small segments of the population. These narratives usually contain concepts that may be very hard to modify (e.g., the Defensive Jihad narrative).

Step 3: Map to Additional Narrative Attributes

The Concept map of Fig. 4 indicates clearly that there is a network structure to this narrative. Consequently, a

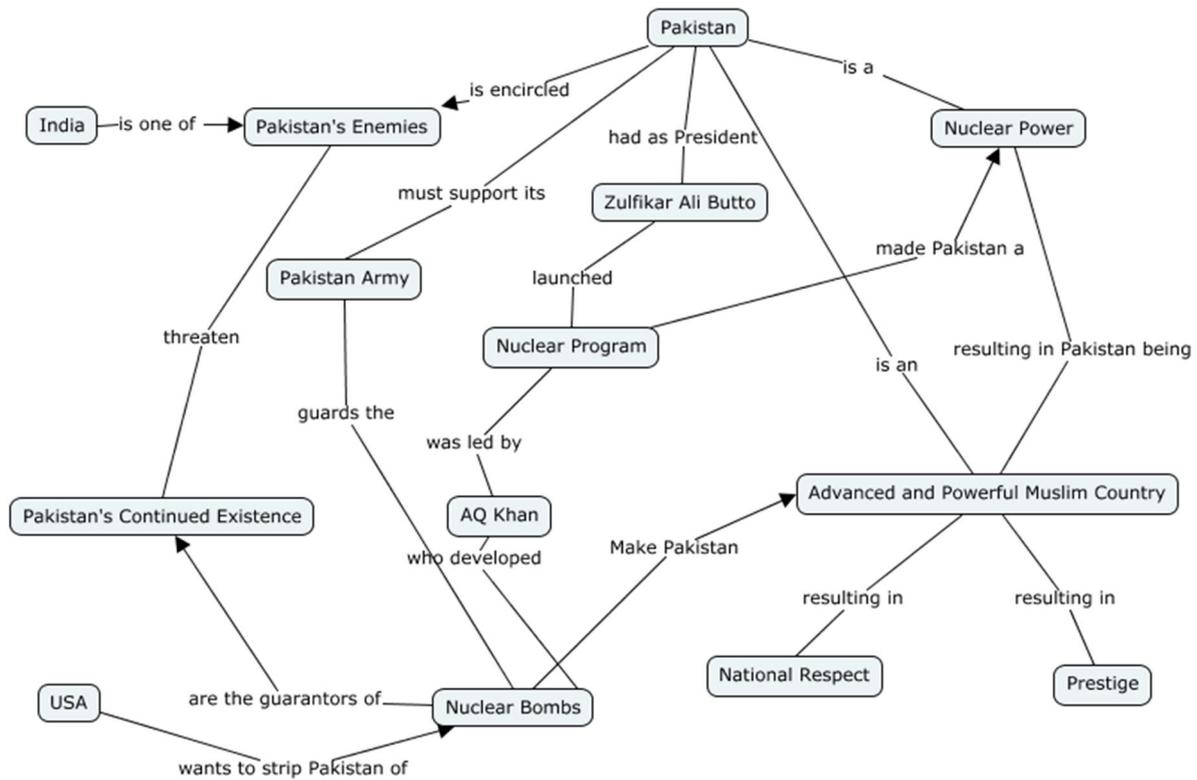


Figure. 4: Concept Map Based on “Pakistan’s Nuclear Pride” Narrative

tool such as ORA (Carley 2006) was used to construct a social network model of the narrative. One depiction of that model is presented in Fig. 5. There are many measures that have been defined to assess the properties of Social Networks. The first used is the centrality degree which focuses on the location of a node in a network, i.e., to how many nodes does it have a direct connection whether incoming or outgoing? The results of this analysis are shown in Table 1. There are 14 nodes in this network.

$$\text{Number of Links} = \frac{1}{2} \sum_{i=1}^{14} k_i = \frac{36}{2} = 18;$$

$$\text{Average Degree} = L/N = 18/14 = 1.29$$

Maximum Degree = 5.

The degree distribution is: $\rho_1 = 4/14$, $\rho_2 = 4/14$, $\rho_3 = 3/14$, $\rho_4 = 0$, $\rho_5 = 3/14$.

The size of the nodes in Figure 5 indicates the geodesic centrality, another measure of the influence a node has on another node.

Step 4: Vulnerability Assessment of Narratives

We now define two spaces, a 3-dimensional space on Values and Plot Logic with Positive Value for the x axis and Negative value for the y axis and Plot Logic on the z

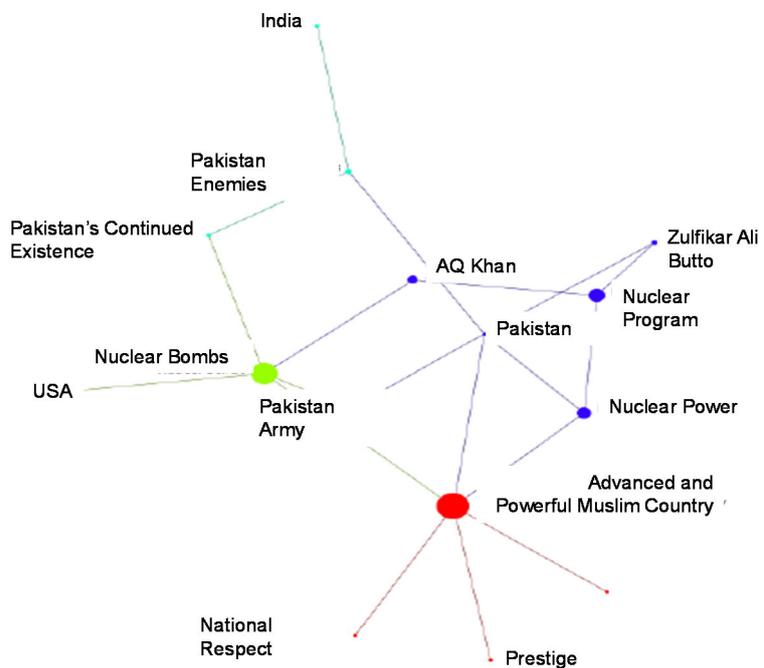


Figure. 5: The SN of Narrative #1

axis and a second 2-dimensional space on Character with the axes being Other and Self. The computation of the vector of attributes x would place the particular issue on these two spaces. The Pakistan’s Nuclear Pride narrative

Table 1: The Centrality Degree of the Network in Figure 5

	Node	Degree ->	k(in)	k(out)	k
1	Pakistan		0	5	5
2	Pakistan's Enemies		2	1	3
3	Nuclear Power		2	1	3
4	India		0	1	1
5	Zulfikar Al Butto		1	1	2
6	Pakistan Army		1	1	2
7	Nuclear Program		1	2	3
8	Pakistan's Continued Existence		2	0	2
9	AQ Khan		1	1	2
10	Advanced and Powerful Nuclear Country		3	2	5
11	USA		0	1	1
12	Nuclear Bombs		3	2	5
13	National Respect		1	0	1
14	Prestige		1	0	1

has been set in this illustrative case study to have a narrative typology state with respect: to the US as $x_1 = [10, 9.5, 10, 9, 10]$. This is a clearly a highly escalatory narrative syntax with respect to all attributes. The question arises: Can this narrative be moved from the Aggression type to the Competitive and Cooperation types, i.e., get the values of the attributes be less than 5? This is depicted graphically in Figure 6.

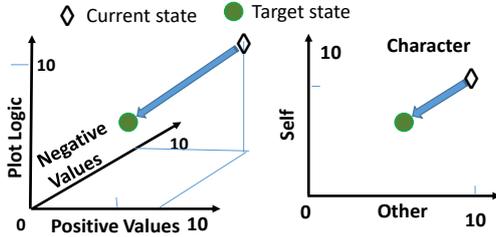


Figure 6: Current and Target State of the Narrative

Cobb (2016) advises that “Marginalized narratives [] need to be engaged [to] form the basis for programs/interventions.” Consequently, the next step is to identify which beliefs are fundamental and highly ranked in their relative assessment with respect to the other beliefs in the narrative. The centrality measures can be used to determine these beliefs. The results for the example narrative are shown in Figure 7.

Five out of the 14 beliefs (nodes) had the percentage of measures for the particular belief node rank in the top three. Furthermore, Cobb (2016) states that narratives evolve not by changing minds but by downgrading legitimacy, changing interaction, altering positioning. She advises that the root beliefs should be identified as they anchor that or related narratives. These insights lead to Step 5, the design of potential courses of action to reposition the narratives.

Step 5: Course of Action Development

The problem can be formulated as follows: What courses of action (COAs) could country Y take to move the location of the attribute vector at time t_0 of the narrative(s) of country Z to a more desirable position at time t_1 . The solution to this type of problem is well documented and tools exist for carrying out the modeling and the analysis. In this case, Influence nets will be used and the associated software application Pythia. (Levis 2014).

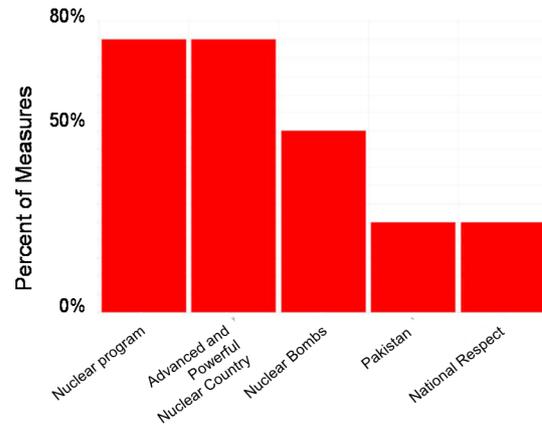


Figure 7: The Five Highest Ranked Beliefs

An Influence Net can be considered as a special instance of a Bayesian Network using CAST logic (Chang et al. 1994) for knowledge elicitation and loopy belief propagation for probabilistic inference. To generate timed Influence Nets Wagenhals *et al.* (2000) have added a special set of temporal constructs to the basic formalism. Influence nets have been used for developing alternate COAs and evaluating their effectiveness in achieving objectives. The modeling of the causal relationships is accomplished by creating a series of cause-and-effect relationships between some

desired effects and the set of actions that might impact their occurrence in the form of an acyclic graph. The directed edges between nodes are inscribed with two influence coefficients and a time delay. An Influence Net based on the concepts and relationships in the Concept Map of Fig. 1 is shown in Fig. 8. Directed arrow with arrowheads indicate a positive influence while round arrowheads indicate negative influence.

To indicate how this models works, consider the case where India makes vigorous diplomatic efforts to de-escalate the relationship with Pakistan, the Pakistan Army decreases its influence on the government, and the US increases its diplomatic efforts to support the peaceful use of nuclear power. The results are shown in Fig. 9 where the values in the nodes indicate the

probability that the described belief will hold. The results show that the effect of India's and the Army's actions increase the belief in Pakistan's continued existence, agreement to reduce nuclear weapons and focus on peaceful nuclear power have a serious negative impact on the belief that Pakistan is an Advanced and Powerful Nuclear Country with negative consequences on the beliefs for Prestige and National Respect. However, Fig. 7 shows that "Advanced and Powerful Nuclear Country" is a key belief that cannot be easily shaped. It is clear that additional intervention nodes need to be introduced that will influence various intermediate beliefs. Then the evolutionary algorithms embedded in Pythia can be used to obtain courses of action, if they exist, that will shift the narrative down to less Aggressive position.

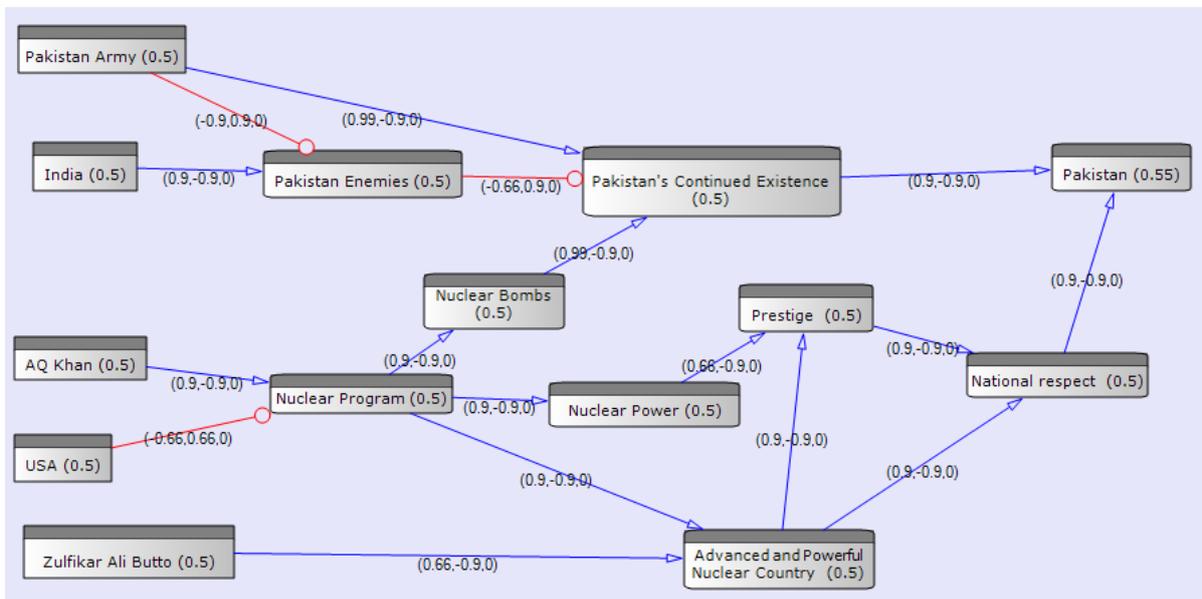


Figure 8: Initial Influence Net Representing the Influencing Relations in the Narrative

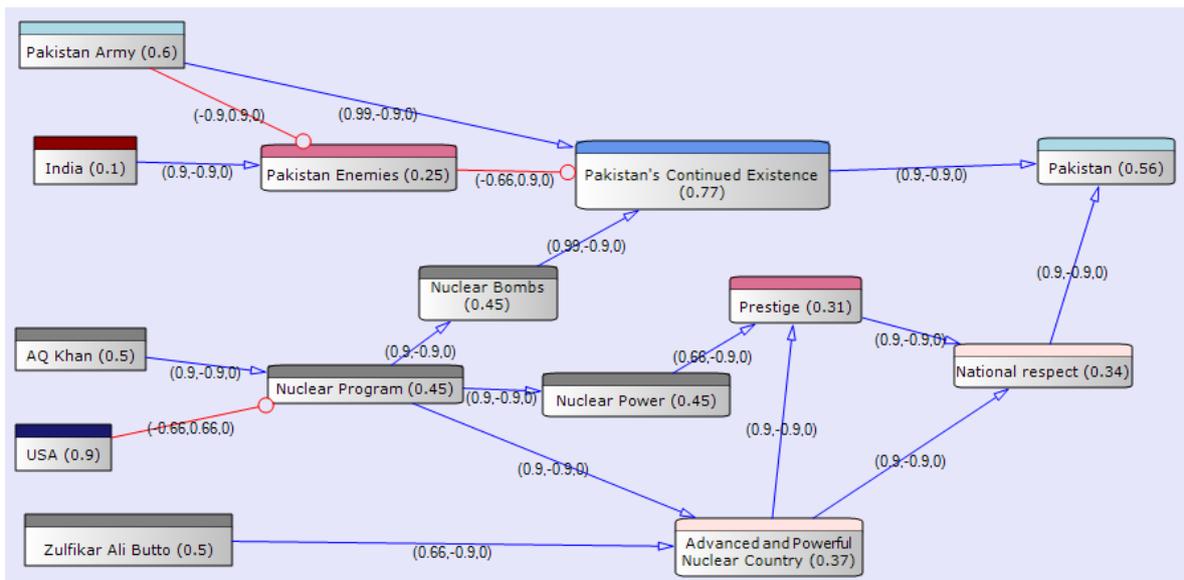


Figure 9: Influence net representing the effect of a suggested course of action

CONCLUSION

A quantitative approach to modeling and analyzing master narratives has been presented where a variety of modeling and simulation tools is used. The approach has been illustrated by a simple case study in which many of the complexities of the problem have been suppressed. In an actual case, all relevant narratives should be analyzed in parallel and an Influence Net in which all the concepts and relationships are present should be included. The reason for this is that population segments that embrace narratives overlap a lot – a particular segment may embrace 3 or 4 narratives but with different degrees of conviction. Furthermore, small segments of the population (the “elites” or an extremist group) may have very strong influence in changing the narratives.

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