

## **Extended Discussion of Applied Forecasting: Promises and Performances Workshop (3 March 2006)**

### **Dr. John Hiles - Light Games**

Complex Environment – actors have to deal with each other

Change – can be gradual or disruptive (crisis)

Contention between actors limited by social, economic, and psychological

Triggering event melts the limiting constraints and allows for disruptive change

1. Computer War Games – simulation laden with high content of knowledge
2. High Gloss PC Games – suspends reality, the game becomes the reality (not flexible)
3. Light Games – combination of 1 and 2, information brought by participants, game captures the interaction information brought forth during the game

15 minute learning time

Factions: Coalition, Government, Shiite Groups (2), Sunnis, Insurgents, NGOs

Force Control Panel – allows player to choose how much/what kind of force used

Rules, Goals, and intent of each player are defined by the player; including concept of Win/Loss

News agents – can be manipulated by the players (e.g. – CNN, Al Jazeera)

Wrapper – the environment the players interact within, created specifically for each topic, game, certain area of interest

Representation of complex environment inside the “wrapper” – not real representation of current environment

Use of light game to harness tacit knowledge brought by skilled players

Informed players use light game as simulation of governance

How is it useful to policy makers who don't participate in game?

- Multiple runs, after action review (AAR) contains all actions, discussions, and deals made within the game
- Convert the AAR into a “narrative” story describing the multiplicity of action
- Briefing based upon the narrative

Example of Session

- Contemporary Iraq, intelligence analysts play leader roles of the different factions
- 1<sup>st</sup> run through followed stereotypes and external restraints
- 2<sup>nd</sup> run through was more innovative, more creativity after player awareness of biases and restraints

Core software engine supports AAR and complex environment

Get policymakers to pay attention to insights gleaned from the game experience (overcome Western Bias)

Multicultural participants – Internet allows for players from many diverse geographical locations

### Classic Seminar Games

1. Scripted
2. Balance of rules, goals
3. Very detailed, planned

### Light Games

1. Unscripted
2. Variance of Goals
3. Controlled by players

### Success

1. Report can be pulled down into a single narrative story line with insight and tacit knowledge which can be given to policymakers for review
2. Anticipate the disruptive events – time frame constraints
3. Separation of analytical tools and training devices
  - Analytical input integrated with human goals to show the collage of the future
4. Give awareness of proximity and danger of hubris
5. In crises, walls turn to doors – forecasting teaches players and policymakers to be aware of such changes and seize the opportunity

### **Dr. Barry Hughes – International Futures (IFs)**

Heavy simulation

Long term future forecasts for country or region levels

Scenario analysis for intervention tools

Data analysis - cross sectional or longitudinal

Long term – time

Short term – country

Stock and Flow Model with dynamics of economics and demographics, multivariable (technical, social, economic)

IFs is the only formal education model available

Great range of models, sub-models – extreme weighting of values and calculations

### Scenario Analysis

Allows for intervention of any parameter

Shows newly calculated intervention against the original base case

Analysis/Forecasting is not set up yet to effect policy making in regards for US

Not in place to utilize forecasting for policy

Requires analytical expertise, time to look at results to generate viable “what ifs?”

No built in confidence intervals – too wide and possibly not useful

Can answer questions regarding worrisome trends from history (Post 1960) that apply to national security

Ability to look at movement of democratic limits in nations

Combine this model with lighter models that handle partial information and data; satellite

programs that can forecast things like drugs/narcotics, etc.  
 Political component – can identify options but not the political move/risk  
 Avenues to provide quality information that is more succinct to Staff – for specific situations, factors

- The disconnect between the package and what Staff requires

Looking at countries by region, not as a whole which can be too large  
 Necessity for more Qualitative questions

- IFs is a Quantitative tool, find quantitative analysis for qualitative questions

### **Dr. Nazli Choucri, MIT - Forecasting in International Relations**

- Dr. Choucri described a modeling technique well suited for the analysis of complex dynamics.
- Case Study 1: Oil Prices
  - Dr. Choucri's model attempted to capture the causal loops surrounding oil prices. E.g., the effect of prices on supply and demand, and the effect of supply and demand on prices; the effect of refining capacity on prices, and the effect of prices on refining capacity; and so on. The model tries to encompass all the players, processes, and transactions.
  - The model's major revelation was that the supply side of the equation had a much bigger effect on price than anyone thought. The previous focus had been on demand, not capacity and capacity utilization. (This initial work was being done not long after the '73 oil crisis).
  - Choucri's model was compared to several others at the Stanford Energy Forum (SEF) in 1980. All of the models were incorrect in forecasting future oil prices – their estimates were much too high. Choucri's model, though, was closest to the mark.
  - The SEF in 1990 repeated the same drill. This time, Choucri's model was a clear outlier from the rest of the predictions, and was significantly closer to what came to pass. Again, the other predictions ran much higher than the actual price.
  - What made Choucri's model better? The focus on supply, on surplus production capacity.
  - Why do we care today? Projected production surpluses are going down and refinery utilization is increasing – this is a volatile period.
  - Conclusion:
    - Avoid the tendency to conform to the mean
      - Useful forecasts reveal the unexpected
      - [this is just me talking here: forecasting with the explicit intention of being different seems equally problematic]
    - Understand the whole process. What are all the factors and linkages?
    - Generate ranges, rather than point outcomes. For policymaking, a general trajectory is what's important.
    - Formulate an insurance policy. What if the forecast is wrong?

- Allow analysts to test different inputs and contingencies
- Choucri touched briefly on the second Case Study she'd prepared, this one on State Stability. Basically:
  - The stability of the state is a function of the relationship between loads and capacities.
  - Loads include: insurgents, dissidents, protests, violent incidents
  - Capacities include: regime legitimacy, economic performance, social capacity, political capacity

*Justin's Notes on Choucri*

Reducing uncertainty within future outcomes

2 Cases

1. Oil Crisis in 1973
2. State Stability 2005

Systems Dynamic Modeling (SDM)

- complex systems and evolving environments of **extreme uncertainty**

Case 1

- Oil crisis
- Lots of hands, investment
- Attempt to model the different players in the game
  - Players
  - Processes
- Avoid tendency to conform (mean) – useful forecasts reveal the unexpected
- Understand process from start to finish: factors and linkages that lead to the outcome
- Generate ranges and trajectories rather than point outcomes
- Formulate (insurance policy) – what if forecast wrong? How/Why?
- Allows analysts to try alternative inputs for emergencies/contingencies

To Avoid Group Think, re-parameterize basis/configuration to generate alternative scenarios

Case 2: State Stability

- Relationship between loads (pressure) and capabilities (powers) to handle those loads
- Structure vs. Parameter
- System seeks equilibrium, when a disruption occurs, other parts of the system act to counterbalance and re-achieve equilibrium
- How to equip policymakers to utilize these forecasts? Still unsure

## **Dr. Jacek Kugler and Dr. Michael Baranick – Senturion**

### Stakeholder Model

Analyzes and predicts behavior of stakeholders on political and military issues

Sources: Open and Clandestine

1. Who are actors, internal and/or external?
2. Relative potential influence of stakeholders?
3. Stated position of each stakeholder?
4. How important is each issue to the stakeholder?

24 month time horizon

Quality of data will affect forecast

Not applicable to economic/market driven events

### Bolivia

1. Stakeholders: Evo Morales, Limera (VP)
2. Position: Legalization of cocaine – assigns a position value to each stakeholder
3. Influence: value assigned by stakeholder's role and influence on position
4. Issue: value assigned to importance of issue  
\* Monotonic scales – multi-polar issues must be divided

Random Shocks – assigned value according to weights

Generates political landscape based upon collected data

Spreads results across the position range (bar graph, line graph, etc.)

1. Shows who you can make offers to, who can make the offers, what the results of these offers will be
2. Prevents you from making ineffective offers
3. Makes sure the coalitions you form will be stable

Degree of familiarity will affect the results

- number of actors, influence, position

Expert information is critical for realm of politics

### Methodology

#### Data

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- |                 |               |
|-----------------|---------------|
| 1. Median Voter | 4. Perception |
| 2. Risk         | 5. Proposals  |
| 3. Decision     | 6. Dynamics   |

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|-------------------|----------------|
| 1. Results        | 4. Consensus   |
| 2. Issue Outcomes | 5. Action Plan |
| 3. Paths          |                |

## Errors

1. Stakeholders die, change quickly
2. Deception
3. Does not give the optimal policy – it gives stable or achievable policy

## Notes from Robert Lempert's Presentation

Using models for policymakers

Why Forecast? – Forecast demonstrates mastery. Predict -> Paradigm

Forecasting the Unpredictable -> Best Decision

Supporting Good Decisions with Bad Models – large ensembles, robust strategies, strategies that adapt over time – tools that allow you to find and fix vulnerabilities.

Robust decisionmaking – an iterative, analytic process.

- Models to find and fix vulnerabilities.
- Decisionmakers find credible.
- Strategies show range of forecasts

## Dr. Robert Lempert

Why Forecast?

1. Demonstrate accurate forecasts = mastery of forecasting
2. Analysis methods require forecasts as prelude to decisions

Important decisions bring deep uncertainty, thus causing decision makers to distrust models and forecasts

Decisions go awry when made upon assumption of well-characterized future

- Underestimate uncertainties
- Gridlock
- Blinded by misplaced concreteness

4 Principles to support good decisions with Bad Models

1. Large ensembles
2. Seek robust, not optimal estimates
3. Achieve robustness with adaptive strategies (over time)
4. Interactive Exploration

Robust Decision Making (RDM)

1. Robust Ideas
2. Characterize vulnerabilities
3. Trade-off and hedge against vulnerabilities

2 Classes of Models

1. State Fragility Model
2. Policy Effectiveness Model
  - Levers - act upon the world
  - Uncertainties - world acts upon us
  - Regret – difference between strategy performance and optimum performance in any given future state of the world

Under deep uncertainty all models can produce poor forecasts

Poor forecasts still used to support good decisions  
Using forecast models to identify and fix vulnerabilities in strategies can effectively engage decision makers

From Q&A:

Q: What do you do with thousands of decisions?

A: Model yields different combinations of effectiveness of different policies over time; variations on the portfolio. You can take policies that were close to the budget.

Q: You present a range of options on a plateau.

A: When you the cost out of it, yields a range of performance.

### **Mr. Joseph Eash**

Models aid humans, not replace them

Many models to choose from

No model is accurate in all situations

Good input = good model

- Accuate
- Timely
- Geospatial resolution

Model needs traceability

Characteristics

1. Unclassified input data
2. Multiple independent sources
3. Fully disclosed models
4. Local data
5. Recent data

Challenges

1. Classified data bias
2. Data sampling from sources
3. Copyrighted proprietary models
4. Company proprietary models
5. Quantitative data is national
6. Quantitative data is old
7. How to Quantify Qualitative information

Leadership Network Categories

- General Topics
- Multi National Experiment Topics
- Determinations – Relative Power, Focus

Find Robust Policy Options

- Consider multiple models, large number of scenarios
- Robust instead of narrowly optimized options
- Employ adaptive strategies that accommodate new information

On the issue of information gathering – you want the latest information for decision-makers. You can run into the problems of: different formats, hence the need for data conditioning; not all of the information is relevant to the problem. After exercising the model, you propose actions, then run the model again to come up with a robust solution.

Assumption for designing models – no one model is good for all situations. Models are only as good as the data you put into it.

Forecasting Models – just because you have two different models, they may use the same science. PCMT used different models with different sciences. Models need to have traceability.

Source Data Biases – can be useful to case foreign media to get a feel on what policymakers in other countries are like. Use media that is native to the country you are studying.

Leadership Network Categories – help analyze what is happening on the ground. Need to identify “movers and shakers.” Look at how the various groups work together.

Final Policy Options – need to monitor feedback to make sure strategies work. Need to be adaptive.

From Q&A:

Q: How difficult is it to get policymakers to buy into these technologies?

A: Change of Administrations can be a factor. The models present a long term approach to dealing with problems. Also, the focus is on process not a particular model.

Q: Message to Policymakers?

A: Someone needs to make the investment. There are tools out there, a wealth of information that is not used; find out how to take advantage of it. There is a need to build the infrastructure to fund research and build relationships.

### **Notes from Pauline Baker – Fund for Peace**

Purpose of the Fund for Peace model was to assess vulnerability in weak, failed states; took eleven years to develop.

- Twelve top indicators for state collapse; uses open source media, 11,000 sources, scanned and indexed.
- Assess coping capabilities of a state. Minimum conditions.
- “Stains” – factors that are not repetitious, surprising (ie., coup), idiosyncratic factors.
- “Conflict Map” provides a conceptual framework of conflict.

Most utilized is the “Failed States Index” first published in 2005 in *Foreign Policy Magazine*. The 2006 edition will have 148 states.

### **Final Thoughts – Policy makers want...**

1. Credible knowledge
2. Ability to assess risks
3. Comparative analysis
4. Probability of change
5. To establish priorities
6. To use what has been proven useful and accurate