Vector Approach For Analyzing Survey Questions

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Presentation Contents

• Current survey methods
• New vector method
• Effects Based Planning
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Current Survey Methods

• Subjective Questionnaires:
  – “in your opinion rate the following…”
• Typically nominal ratings (low, medium, high)
• Usually ratio statistics ($mn = 4.3, S.D. = 1.53$)
  – Assuming a normal distribution
Current Survey Methods

- It’s not quite principle component analysis
- It’s not quite multi-dimensional analysis
- It’s not quite cluster analysis
- It’s probably like:
New Vector Method

• Bi-polar scales
  – “in your opinion rate the following…”
  (not high) 1 _____________________ 7 (high)
  
  4.3

• Bi-polar scales can represent nominal, interval, and ratio data.
New Vector Method
New Vector Method

• magnitude and direction from a reference vector fully defines a vector.

Measure of Effectiveness
(% of reference vector)
New Vector Method

- $q$ questions yield a $q$-dimensional vector per player
- $p$ players yield a $p$-dimensional vector per question
- Analysis may be performed for both spaces.
New Vector Method

• Impervious to missing data
• Impervious to small sample sizes
• Has no distribution nor variance concept*
• Results readily translate into a measure of effectiveness
Effects Based Planning

The Effects-Based Planning ‘expects’ to:

• Recognize (mitigate) the non-linear complexity of conflict

• Address intended, unintended and unexpected outcomes

• Rely on shared knowledge within networked environment

• Synchronize Effects across Time and Space
How to achieve ‘desired’ Effects

Types of Action

Physical
- Destroy
- Damage
- Degrade
- Divert
- Delay
- Disrupt
- Develop
- Produce
- Disable

Psychological
- Deter
- Dissuade
- Convince
- Demoralize
- Influence
- Deceive
- Disorient
- Confuse
- Paralyze

Canada
National Defence
Défense nationale
Multi-national Experiment 3

- **Who**
  - US JFCOM lead
  - CA, FR, GE, UK, AS, NATO

- **What**
  - Effects Based approaches

- **Where**
  - CFBLNET

- **When**
  - LOE I Nov 01
  - LOE II Feb 03
  - MNE 3 Feb 04
  - MNE 4 Feb 06

- **Why**
  - Revolution in Military Affairs
Multi-national Experiment 3

• Purpose:
  – to identify technology requirements to support Coalition/NRF Effects Based Planning
Multi-national Experiment 3

- Survey Design:
  - Was the tool used? YES/NO
  - If YES
    - Rate the usefulness of the tool (1...7)
    - The tool was easy to use (1…7)
    - Rate the look and feel of the tool (1…7)
      (organization/layout, colors, fonts, etc)
Multi-national Experiment 3

• Tool List:
  – Common Information Environment (CIE) Portal
  – Document Manager
  – Info Work Space (IWS)
  – Operational Net Assessment (ONA) database
  – Effects Based Planning tools
  – WebCOP
Results

Figure 2: Mean and Standard Deviation for IWS

Overall usefulness of IWS

Extremely Useless

Extremely Useful
Results

- Table 1: Statistical Values for Usefulness, Ease of Use, and Look and Feel of Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Sample size</th>
<th>Usefulness</th>
<th>Ease of Use</th>
<th>Look and Feel</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td>mean</td>
<td>s.d.</td>
<td>med.</td>
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<td>CIE Portal</td>
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<td>.33</td>
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<td>Document Manager</td>
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<td>.35</td>
<td>.67</td>
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<td>.45</td>
<td>.33</td>
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<td>EBP tools</td>
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<td>-.09</td>
<td>.52</td>
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<td>WebCOP</td>
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<td>.06</td>
<td>.59</td>
<td>0</td>
</tr>
</tbody>
</table>
Results

- Figure 3: Mean and Standard Deviation for IWS
Results

• Figure 4: Vector Methodology Applied to the Responses to the IWS Questions
Results

• Figure 5: Three Vectors having Similar Angles, but pointing in Different Directions

Reference vector

usefulness

ease of use

look and feel

21°
## Results

- **Table 2: Percentage of Usefulness, Ease of Use, and Look and Feel**

<table>
<thead>
<tr>
<th>Tool</th>
<th>Usefulness (%)</th>
<th>Ease of Use (%)</th>
<th>Look and Feel (%)</th>
</tr>
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<tbody>
<tr>
<td>CIE Portal</td>
<td>63.8</td>
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<td>ONA Database</td>
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<td>59.6</td>
<td>61.7</td>
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<td>EBP tools</td>
<td>45.2</td>
<td>28.0</td>
<td>39.2</td>
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<tr>
<td>WebCOP</td>
<td>53.0</td>
<td>53.6</td>
<td>56.5</td>
</tr>
</tbody>
</table>
Results

- Figure 9: Vector Results for 3 Tools and 3 Questions, and All Participants (65.2% useful)
Conclusions

• The vector method:
  – Is an alternative to statistical methods for reporting subjective measures
  – Is scalable
  – Can handle missing data and small sample sizes
  – Produces crisp results*
  – Readily produces a measure of effectiveness
  – Requires further investigation
Questions?