Vector Approach For Analyzing Survey Questions

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Presentation Contents

- Current survey methods

- New vector method

- Effects Based Planning

- Multi-national Experiment 3

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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

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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:
  - Morris L. Eaton (1983). *Multivariate statistics, a vector approach*. Wiley Series in Probability and mathematical statistics. John Wiley & Sons. New York, USA.

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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.
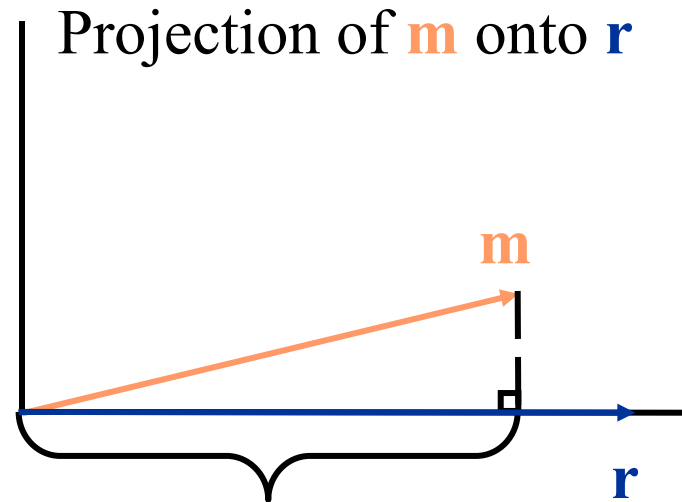
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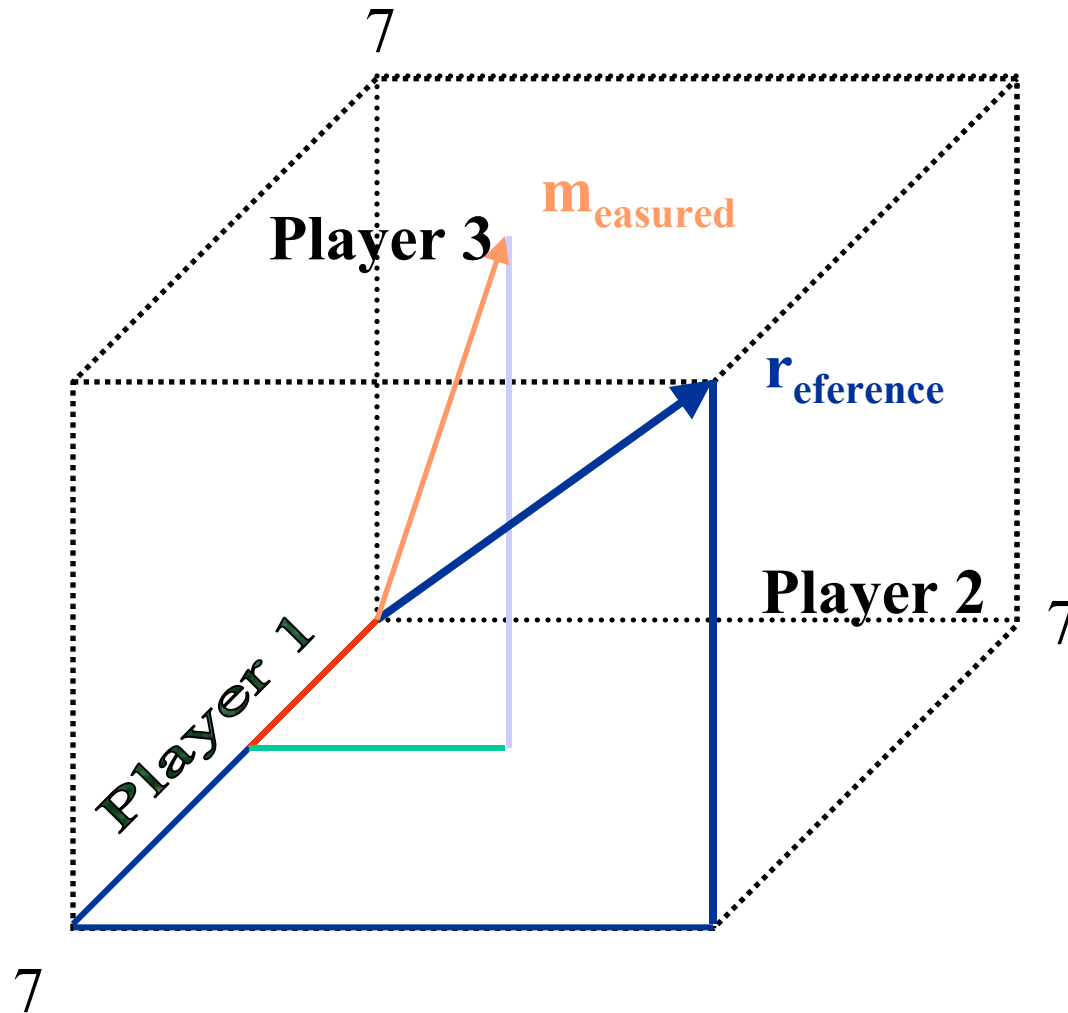
New Vector Method

New Vector Method

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

Projection of **m** onto **r**

m

r

Measure of Effectiveness
(% of reference vector)

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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.

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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

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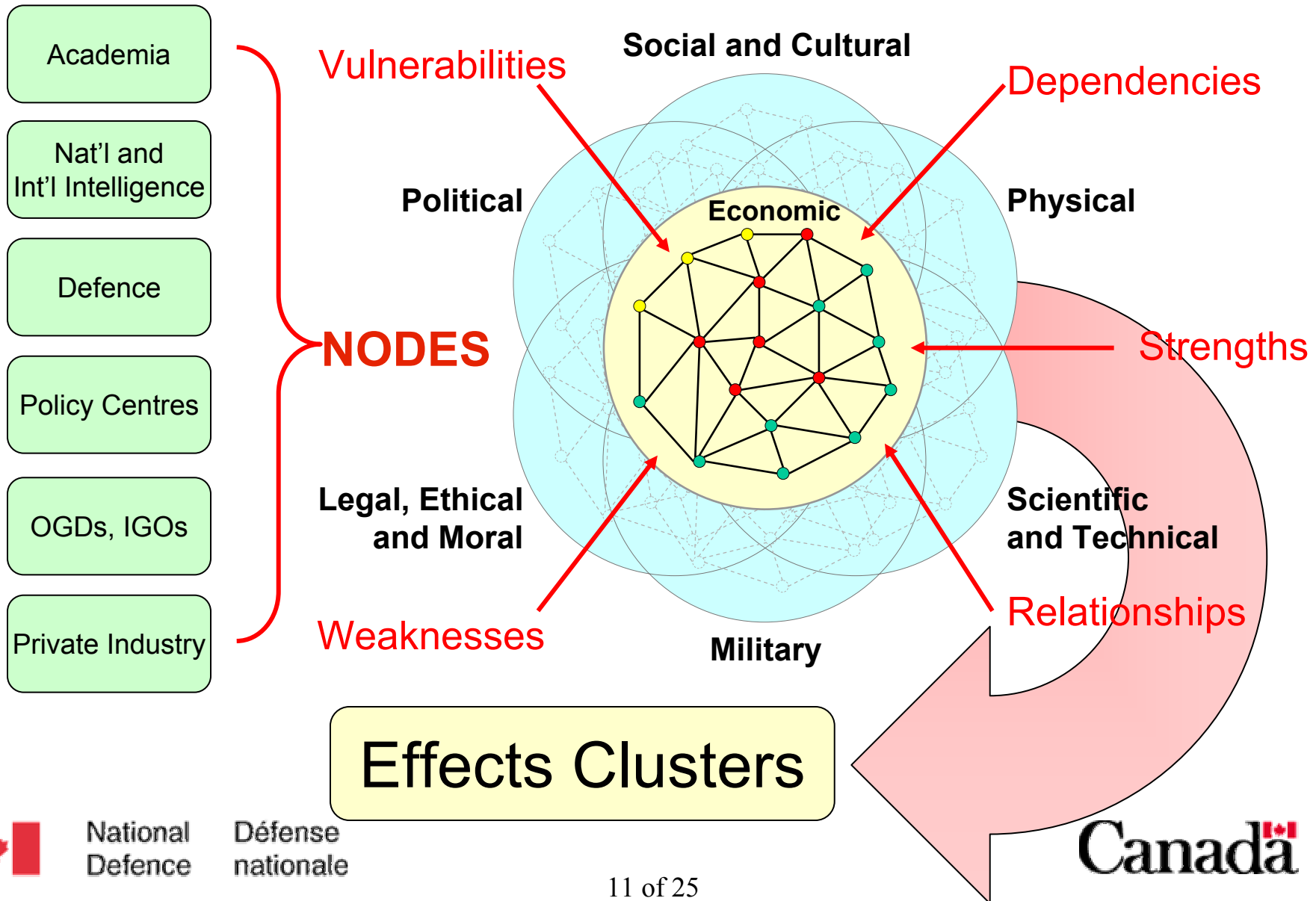Défense nationale

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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

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Operational Net Assessment (ONA)

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

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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

United States Joint Forces Command's
Multinational Experiment

Final Report
February 2004
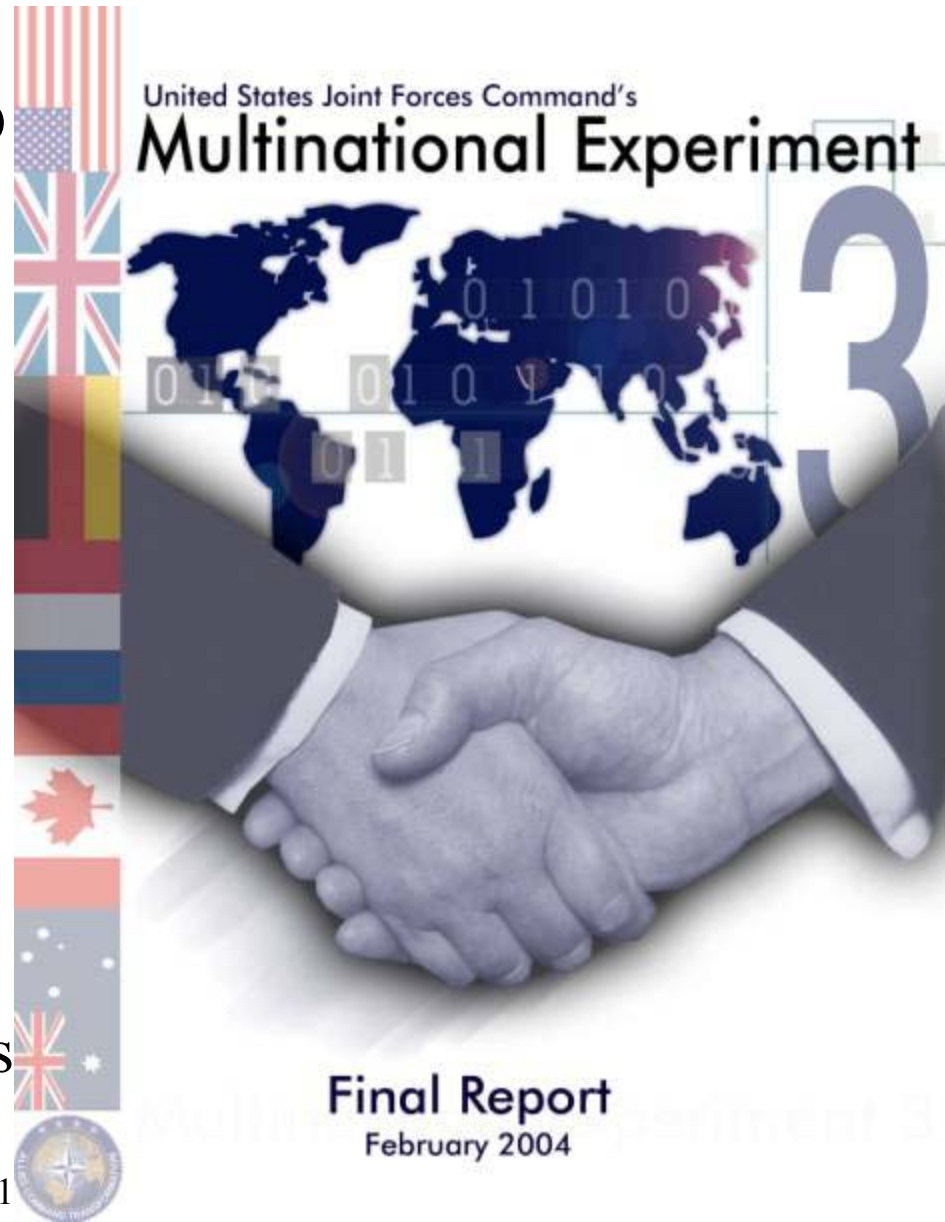
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Multi-national Experiment 3

- Purpose:
  - to identify technology requirements to support Coalition/NRF Effects Based Planning

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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)

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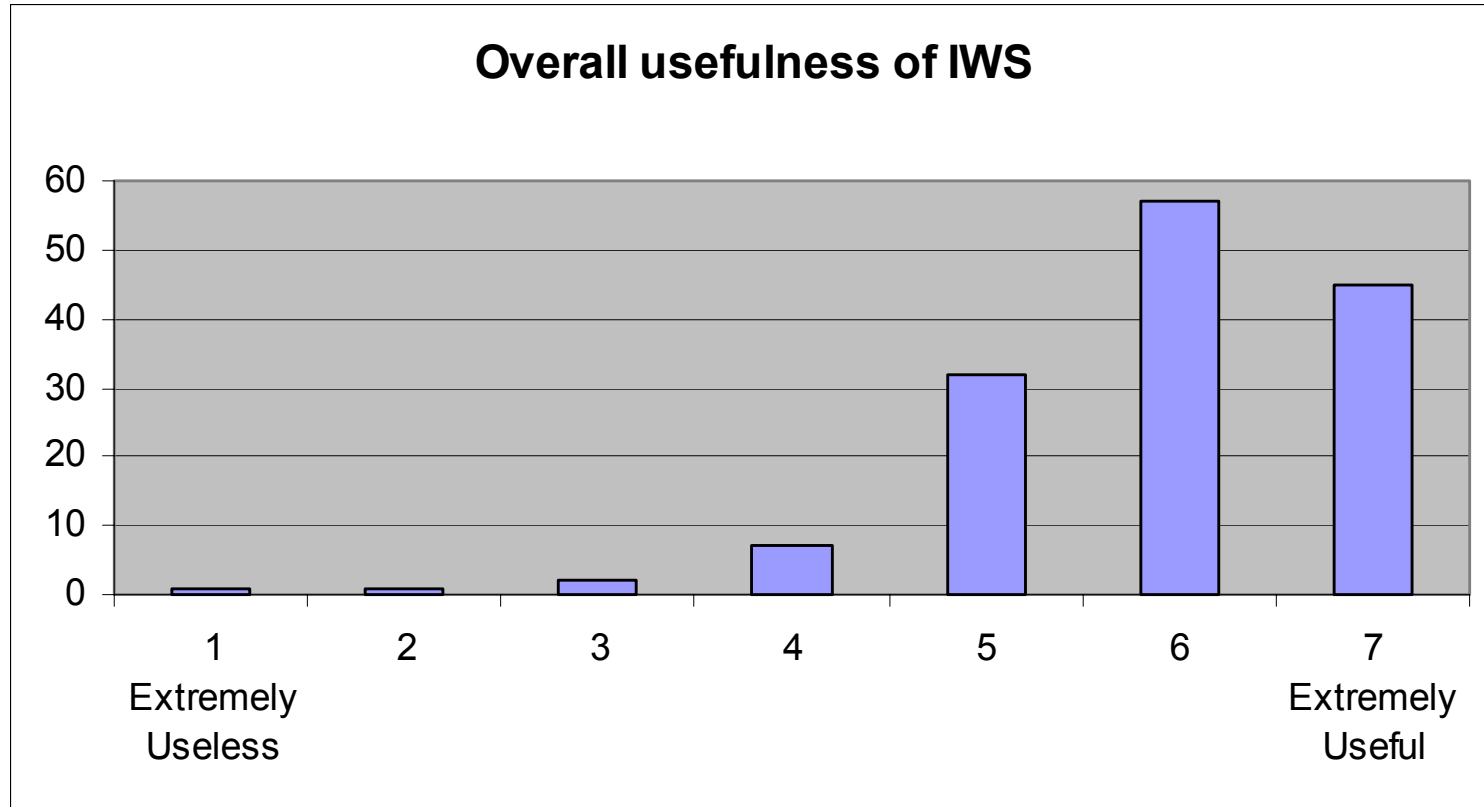# Multi-national Experiment 3

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

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Results

Figure 2: Mean and Standard Deviation for IWS

Overall usefulness of IWS

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Results

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

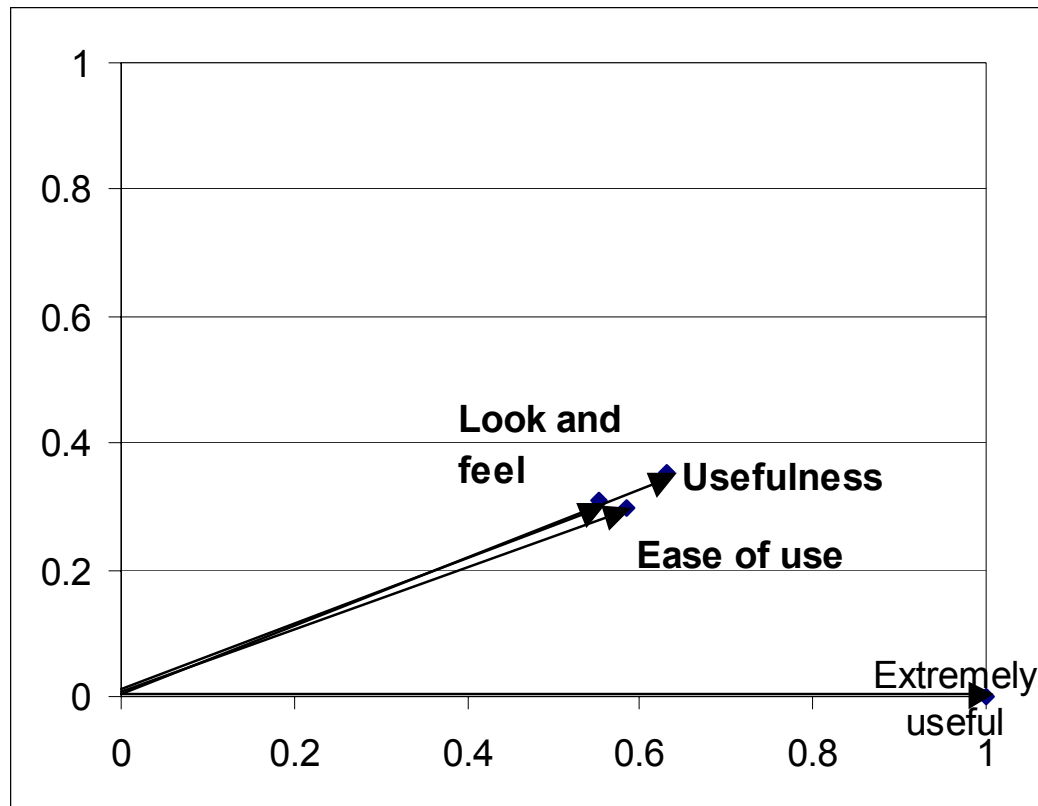| Tool	Sample size	Usefulness				Ease of Use				Look and Feel			
		mean	s.d.	med.	skew	mean	s.d.	med.	skew	mean	s.d.	med.	skew
CIE Portal	145	.28	.43	.33	-.35	.22	.47	.33	-.67	.10	.43	.33	-.40
Document Manager	55	.38	.38	.33	.10	.33	.42	.33	-.20	.32	.40	.33	.07
IWS	145	.63	.35	.67	-1.4	.58	.30	.67	-.50	.55	.31	.67	-.50
ONA Database	114	.30	.45	.33	-.15	.19	.47	.33	-.25	.23	.42	.33	-.30
EBP tools	62	-.09	.52	0	.18	-.44	.52	-.67	.84	-.22	.49	-.33	.17
WebCOP	28	.06	.59	0	-.12	.07	.59	0	-.18	.13	.52	0	-.16

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Results

- Figure 3: Mean and Standard Deviation for IWS
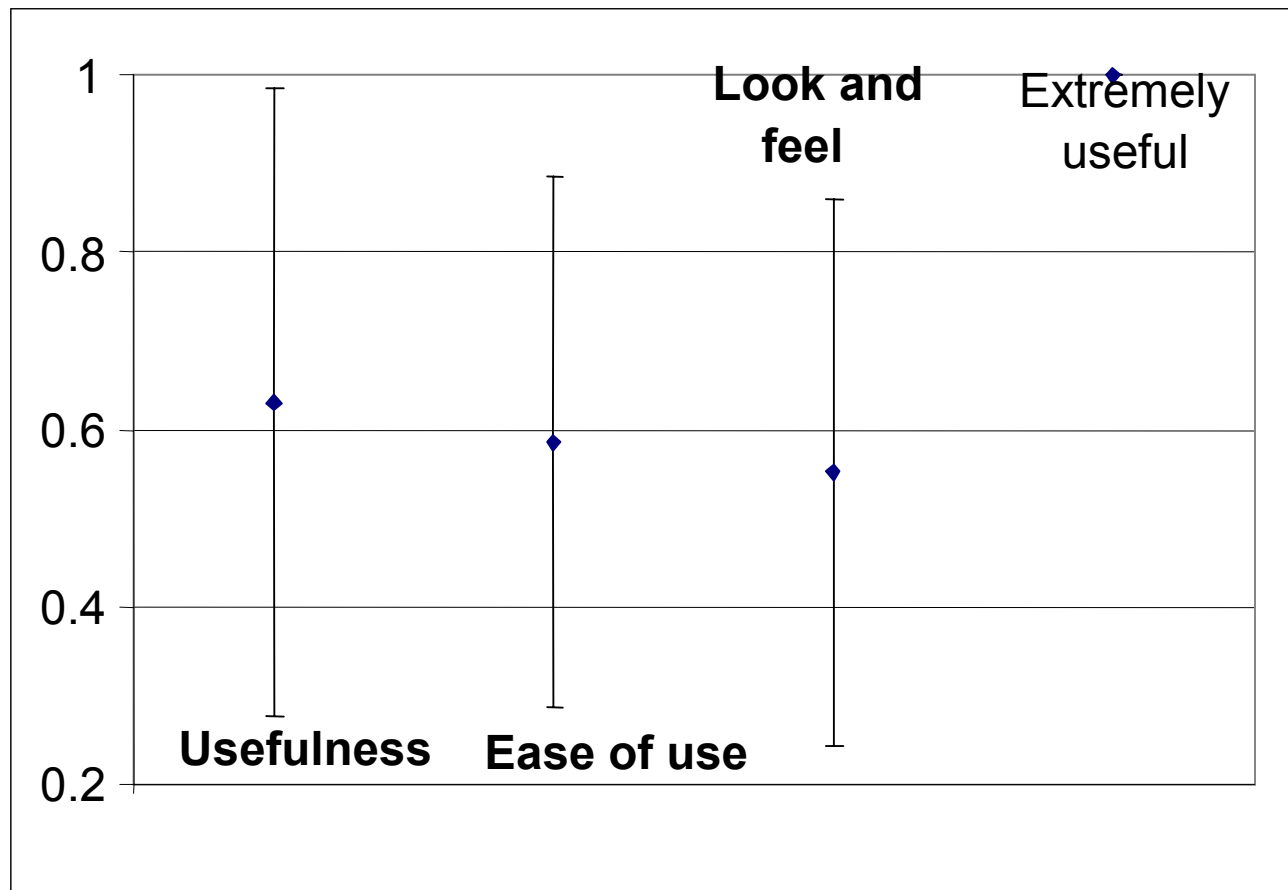
Results

- Figure 4: Vector Methodology Applied to the Responses to the IWS Questions

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Results

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

Reference vector

usefulness

ease of use

look and feel

21°

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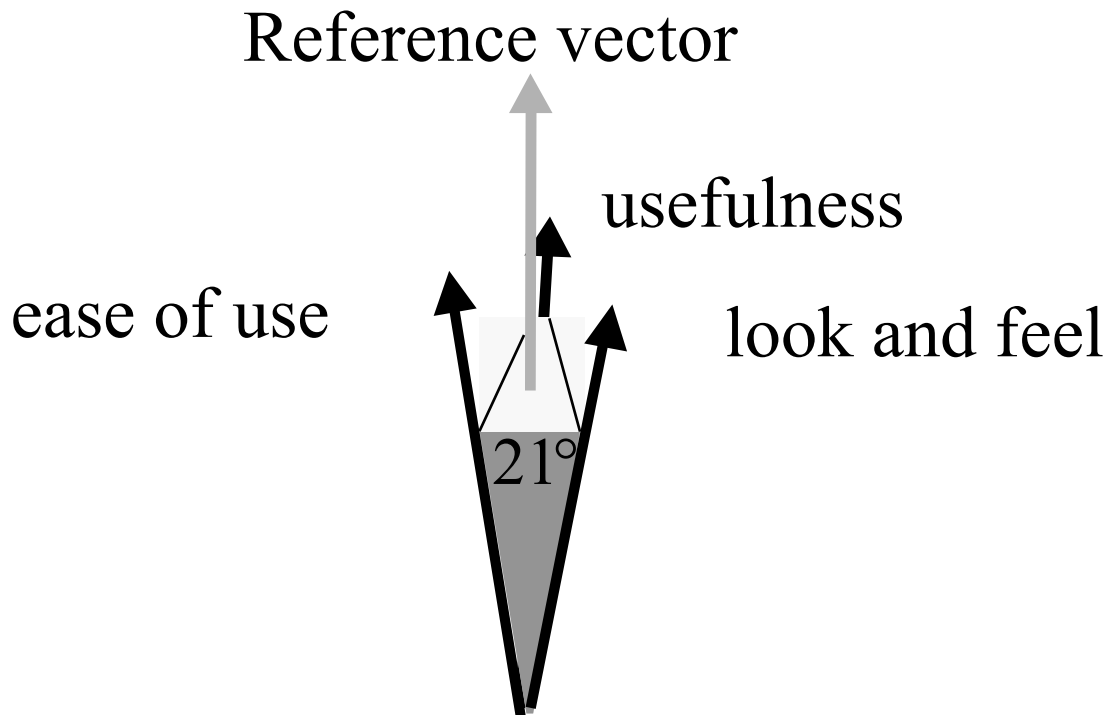
Results

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

Tool	Usefulness (%)	Ease of Use (%)	Look and Feel (%)
CIE Portal	63.8	60.9	55.2
Document Manager	69.1	66.4	66.1
IWS	81.5	79.2	77.6
ONA Database	64.9	59.6	61.7
EBP tools	45.2	28.0	39.2
WebCOP	53.0	53.6	56.5

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Results

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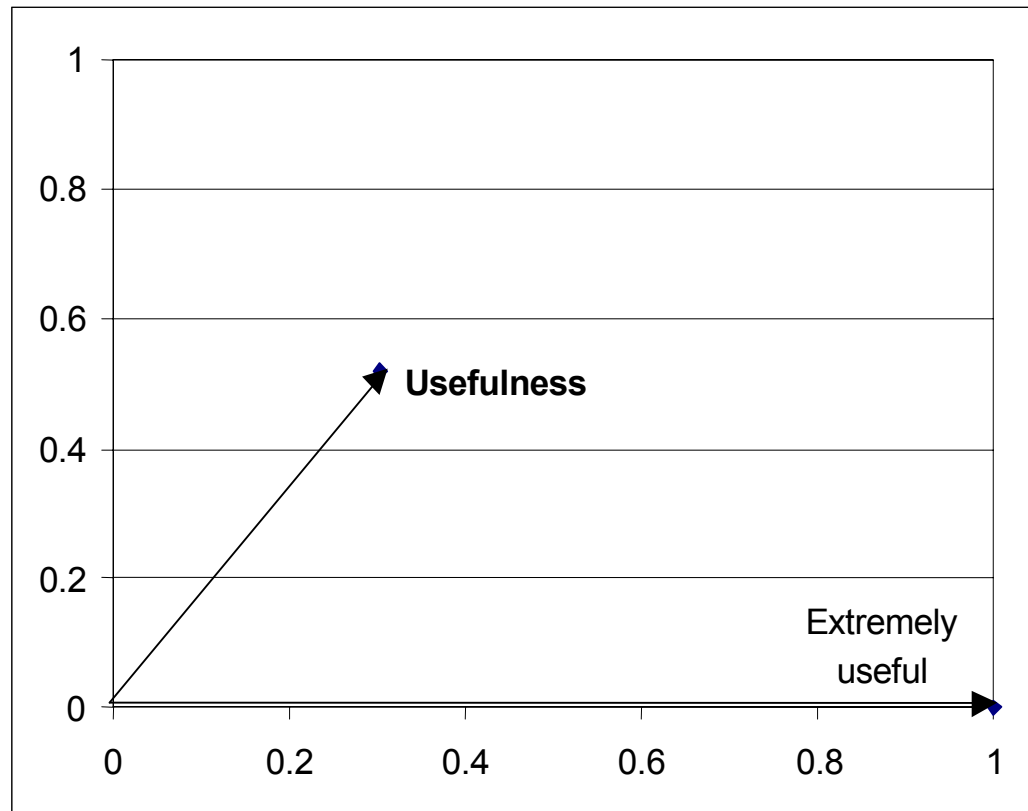
Conclusions

- 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

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Questions?