



Data Analysis Summary

NATO Allied Commander Transformation
Operations Analysis

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*Halcolm's Evaluation Laws: Qualitative inquiry cultivates
the most useful of all human capacities –
the capacity to learn from others*

Experiment Aim:

**Understand cause-and-effect or temporal
relationships that are hypothesized**

- Problem definition – Set objectives
- Model development – List requirements including assumptions, constraints. Identify decision variables (outputs) and independent variables (inputs)
- Data collection – Measuring mechanism
- Model solution – Experiment outcome

Multinational Experiment Series 4

- What and Why: A multinational experiment which explored the use of international power in areas of DIME (diplomatic, information, military, and economic) in order to influence adversaries' behavior
- Who: Australia, Canada, Finland, France, Germany, Sweden, UK, NATO, and USA (Lead)
- Where and When: US, Turkey and other eight distributed sites. Feb 17-March 17 2006
- How: Through a environment of coalition, globally distributed, modeling and simulation federation
- NATO: Tested NATO Response Force processes, organization, and technology in KBD (Knowledge base development), EBP (Effect-based planning, EPE (Effect-based execution), and EBA (Effect-based assessment)
- JCD&E (Joint Concept Development & Experiment)
Product: New concepts, prototype joint capabilities, and actionable recommendations

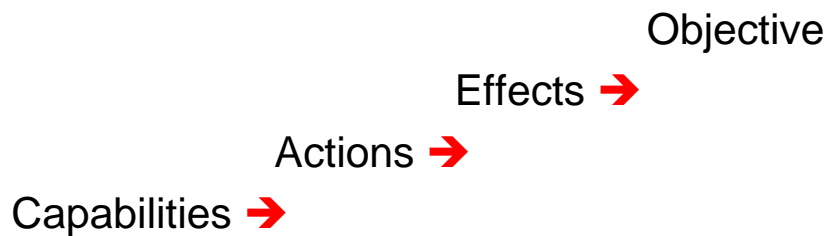
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Using Modeling and Simulation

- Composition: Capability to assemble components in various combinations in order to satisfy specific user requirements
- Science of M & S: Methodology on subject modeled & activities involved
- Technology: Standard for composability
- Understanding: Pitfalls, Code of Best Practice, Validation and Verification

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Operational Flow Path



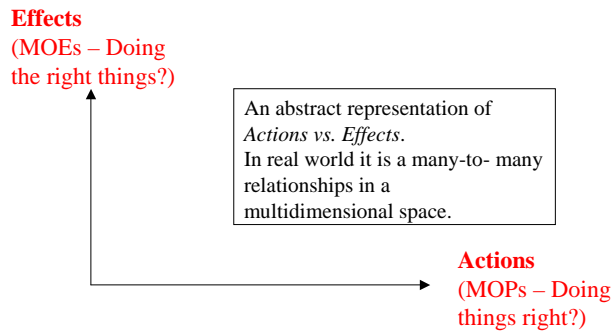
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Principles of Data Analysis

- Establish a clear link between the operational objectives, effects, actions, and their assessment
- Adopt unobtrusive and quick-turn-around approach in data collection
- Use interviews (preferred than surveys) to measure actions related attributes
- Don't be afraid of setting an initial baseline by making a best guess - even if it is an arbitrary number
- Use more descriptive and less inference statistics. Use index with emphasis on **changes** in the attributes
- Analyze "Soft" i.e. qualitative data ***Softly***. Emphases on visual inspection of data
- KISS - Identify a few significant factors, interactions and concentrate on those. Find ranges and thresholds where interesting things happened

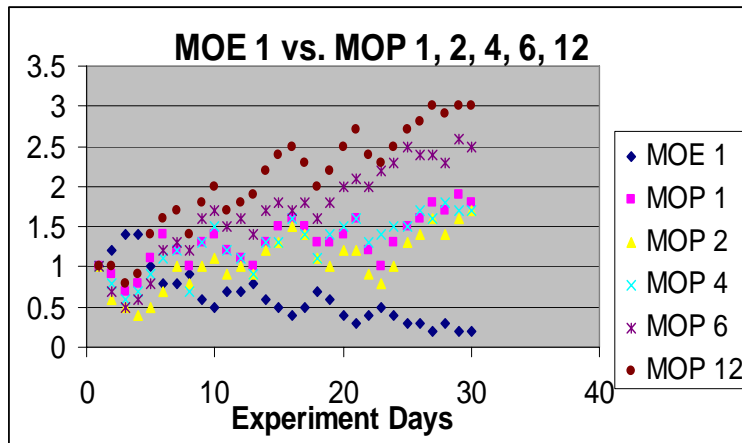
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MOE – Measure of Effectiveness MOP – Measure of Performance



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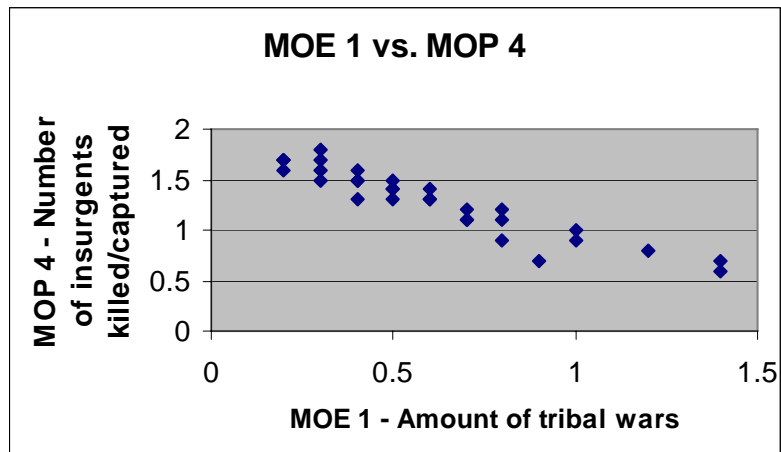
Relationships between MOE1 and several MOPs e.g. MOE1: Amount of tribal wars v. MOP1: Number of insurgents killed



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Sensitivity Analysis

How one MOE correlates with one MOP



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Using Descriptive Model with Risk Analysis

- Unknown: (Random) values of independent variables – what distributions reasonably describe them?
- Known: (Collective) relationship between independent variables and the dependent variable – how sensitive are the correlations?
- Techniques: Simulation, PERT, etc
- Six Sigma: Statistical quantification of how a process is performing – a means to measure quality

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Verification, Validation and Accreditation

Verification

- Does the model correctly represent the developer's concept and specifications?
- Are we doing things right?

Validation

- Does the model accurately represent real-world situation as intended?
- Are we doing the right things?

Accreditation

- Are the federation of M & S acceptable by the officials for the specific use?

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References

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