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SHAPE ACO Innovation Management

Wargaming and M&S Campaign Approach

From Sponsor Question to Traceable Decision Support

SHAPE SPT REM ACO Innovation Management Branch
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Wargaming and M&S provide the framework for SHAPE research campaigns

WARGAMING

- **Human decisions**
  Explores choices, interactions and adaptation
- **Scenario structure**
  Creates playable environment and competing courses of action

INTEGRATED FINDINGS

Together they connect operational requirements with controlled analysis

SIMULATION

- **Controlled experiment**
  Tests an identified CoA under repeatable conditions
- **Measured behaviour**
  Reveals mechanisms, sensitivities and uncertainty

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SHAPE Campaign work starts with Sponsor Requirements

Sponsor requirement

Decision to support, required timeframe, audience and acceptable basis for decision support

Research questions

Questions that define what the campaign must determine

Objectives and measures

Observable outcomes and measures linked to each question

Assumptions

Declared boundaries that shape the scenario, model and interpretation

Sponsor and research team agree the intended use, success criteria and limits of the campaign

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The campaign process runs from sponsor requirements to the report

1. Research questions framing
2. Data and ORBAT
3. Scenario and CoA design
4. Wargame
5. **Model building**
6. Simulation and data
7. Analysis and report

ASSUMPTIONS, VERIFICATION AND VALIDATION

Requirements, source data, ORBAT, scenario, model, execution, outputs and analysis remain under review throughout the campaign

Controlled feedback

New findings may reveal a weak assumption, missing data or an unsuitable scenario. The team returns to the earliest affected phase and records the change.

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Validated data and ORBAT from Stakeholders establish the campaign baseline

ORBAT

Units, composition, readiness, command relationships

Environment

Terrain, infrastructure, weather and operating conditions

Capabilities

Performance parameters, constraints and availability

Doctrine and behaviour

Tactics, decision rules and operational constraints

Data validation record

- **Source**
  Who owns it and when was it obtained?
- **Definition**
  What does each field and unit mean?
- **Quality**
  What is missing, inconsistent or uncertain?
- **Transformation**
  How was it converted for the game or model?
- **Approval**
  Who accepted its use and limitations?

OUTPUT **A versioned campaign dataset, agreed ORBAT and documented data limitations**

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Wargaming builds the scenario and rehearses competing Courses of Action

1. Scenario construction

Set initial conditions, operational scenes, decision points and adversary actions

2. CoA rehearsal

Explore how each Course of Action develops across the scenario

3. Adjudication

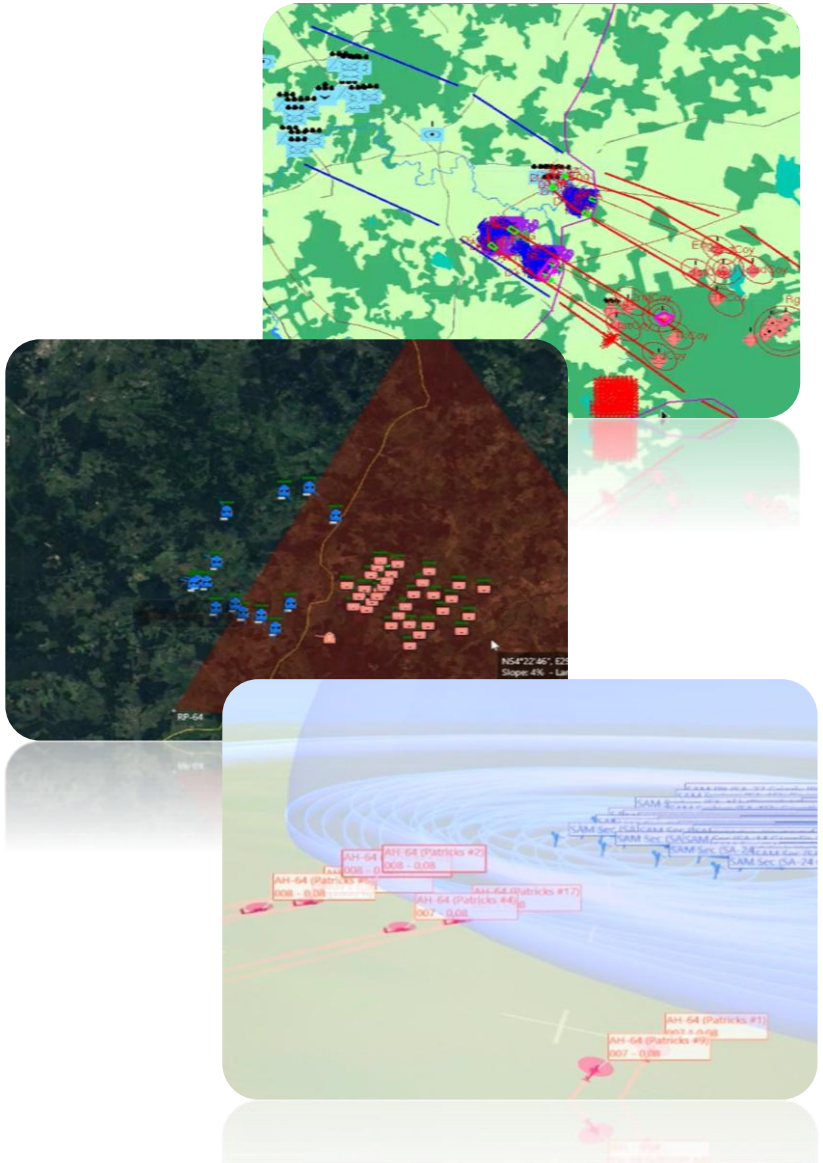
Record outcomes, causal reasoning and data or knowledge gaps

4. Scenario baseline

Preserve decisions, assumptions and conditions for modelling and simulation

A validated scenario and decision logic guide model building

M&S turns the scenario into an executable experiment



1. Conceptual model

Translate the scenario into entities, relationships, behaviours and model boundaries

2. Implementation

Encode validated data, assumptions and scenario logic

3. Experimental design

Define factors, levels, replications and controlled conditions

4. Verification & measures

Verify execution and capture outputs linked to the research questions

An executable, controlled and traceable experiment ready for simulation runs

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Simulation execution produces controlled, traceable data

Scenario		Replications		Controls			Responses	
Name	Status	Required	Completed	LatheLeadTime	MillLeadTime	PackingLeadTime	Factory A Throughput	Factory B Throughput
001	Compl...	6	6 of 6	4	4	4	543.5	612.833
002	Compl...	6	6 of 6	2	2	2	496	657.333
003	Compl...	6	6 of 6	6	6	6	591.667	568
004	Compl...	6	6 of 6	4	2	2	495.5	650.833
005	Compl...	6	6 of 6	2	2	6	534	568.333
006	Compl...	6	6 of 6	2	6	4	528.833	598.5
007	Compl...	6	6 of 6	6	4	2	494.167	639
008	Compl...	6	6 of 6	6	2	4	527.5	605.333
009	Compl...	6	6 of 6	4	6	2	495.833	634.333
010	Compl...	6	6 of 6	4	4	6	577	570.5
011	Compl...	6	6 of 6	2	2	4	526.667	617
012	Compl...	6	6 of 6	2	6	6	539	562.333
013	Compl...	6	6 of 6	6	4	4	543.167	605
014	Compl...	6	6 of 6	4	2	6	537.167	569.167
015	Compl...	6	6 of 6	4	6	4	543.167	602.167
016	Compl...	6	6 of 6	4	4	2	496.167	648.5
017	Compl...	6	6 of 6	6	6	2	495.167	634.5
018	Compl...	6	6 of 6	4	2	4	528	613.833
019	Compl...	6	6 of 6	4	6	6	579.667	565.667
020	Compl...	6	6 of 6	2	4	4	529.667	610.167
021	Compl...	6	6 of 6	6	6	4	542.667	600.167
022	Compl...	6	6 of 6	2	4	6	541	569.333
023	Compl...	6	6 of 6	6	4	6	578.333	569.833
024	Running	6	5 of 6	2	4	2	495.8	647.4
025	Running	6	0 of 6	6	2	6		
026	Running	6	0 of 6	2	6	2		
027	Pending	6	0 of 6	6	2	2		

Multiple runs of the Model

Scenario version, factor settings, seed and timestamps

Event records

State changes, decisions, interactions and losses

Measures

Calculated outputs aligned to research objectives

Quality flags

Failed runs, anomalies, missing values and reruns

Analysis and reporting answer the sponsor's research questions

Question

What did the sponsor ask?

→

Supporting results

Which runs and observations are relevant?

→

Finding

What pattern is supported?

→

Implication

What does it mean for the decision?

Analysis package

Descriptive results and comparisons
Sensitivity and uncertainty
Explanations linked to game observations
Limitations and alternative interpretations

Sponsor report

Direct answers to each research question
Findings and confidence stated together
Recommendations within validated use
Annexes for data, methods and V&V

The report connects each answer to its supporting analysis, confidence, assumptions and validated limits

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Assumptions and V&V remain visible across the entire campaign

VERIFICATION

Did we build and execute the artefact correctly?

VALIDATION

Is the artefact suitable for this question and intended use?

1. Requirements
2. Data and ORBAT
3. Scenario
4. Model
5. Experiment
6. Output data
7. Analysis and report

Supporting records retained at every gate

Assumptions, acceptance criteria, review decisions, defects, limitations, approvals and version history accompany the work

From Sponsor Question to Traceable Decision Support

- **One campaign process**
  Wargaming and M&S support a single chain from sponsor framing to reporting

- **Assumptions remain visible**
  Data, scenarios, models and findings retain their stated boundaries

- **Findings remain traceable**
  Every reported conclusion links back to a research question

Questions

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