



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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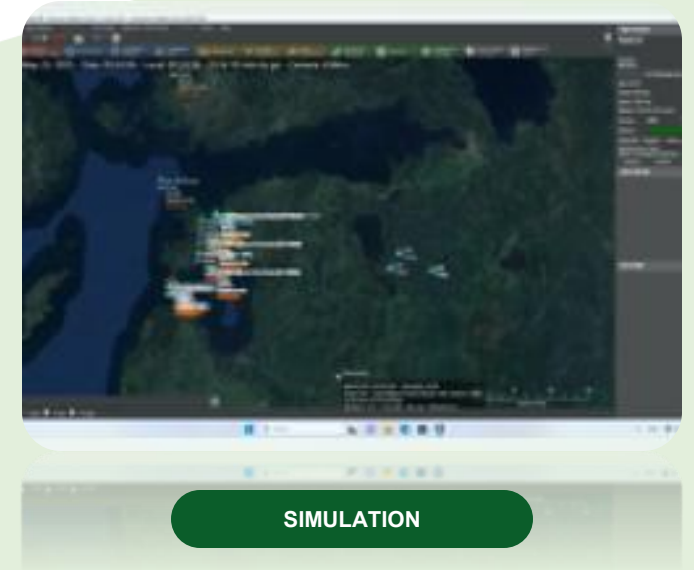
Wargaming and M&S provide the framework for SHAPE research campaigns



- **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



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

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

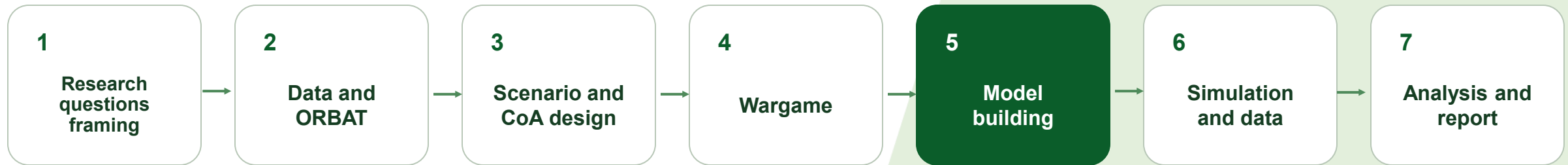
Observable outcomes and measures linked to each question

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

The campaign process runs from sponsor requirements to the 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.

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?

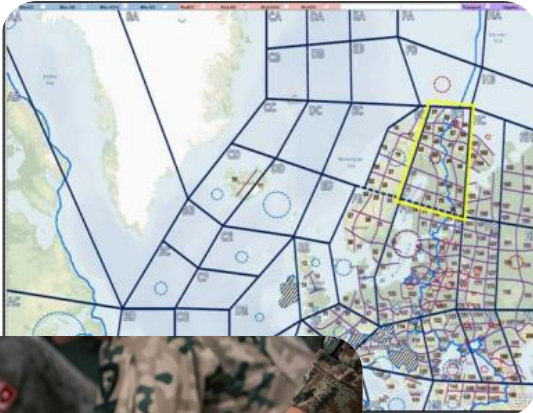
● Approval

Who accepted its use and limitations?

OUTPUT

A versioned campaign dataset, agreed ORBAT and documented data limitations

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

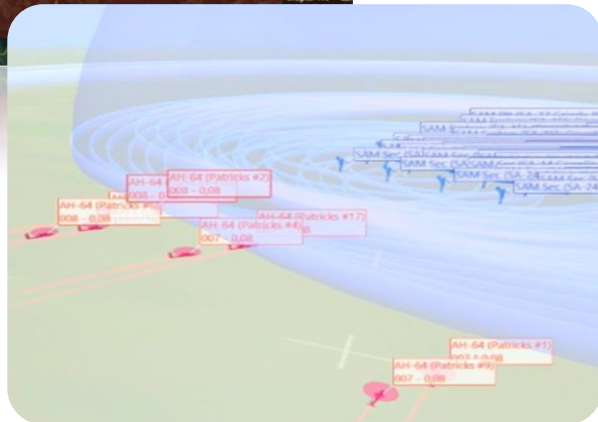
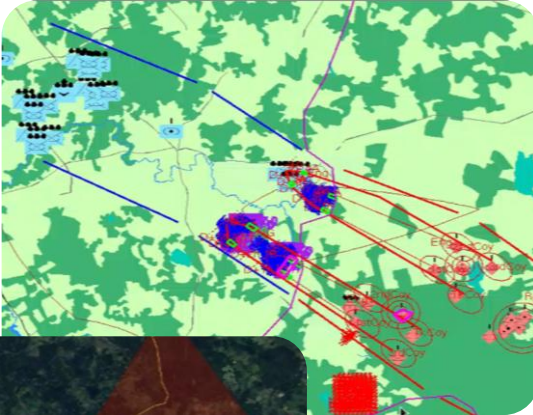
Record outcomes, causal reasoning and data or knowledge gaps

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

Simulation execution produces controlled, traceable data

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

Multiple runs of the Model

Scenario version, factor settings, seed and timestamps

Event records

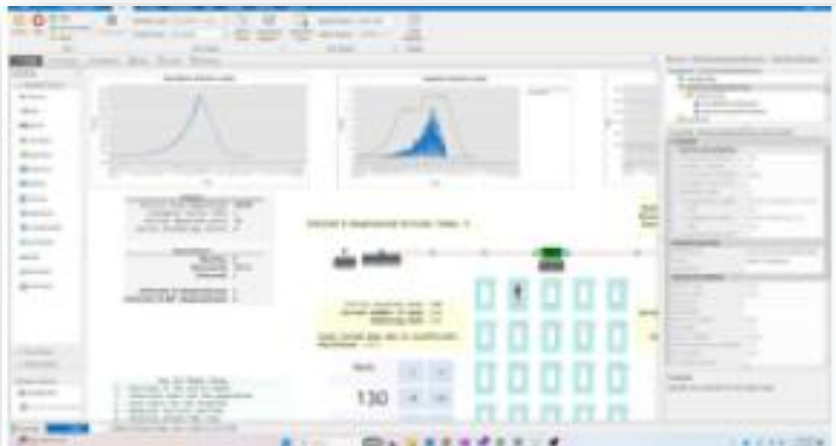
State changes, decisions, interactions and losses

Measures

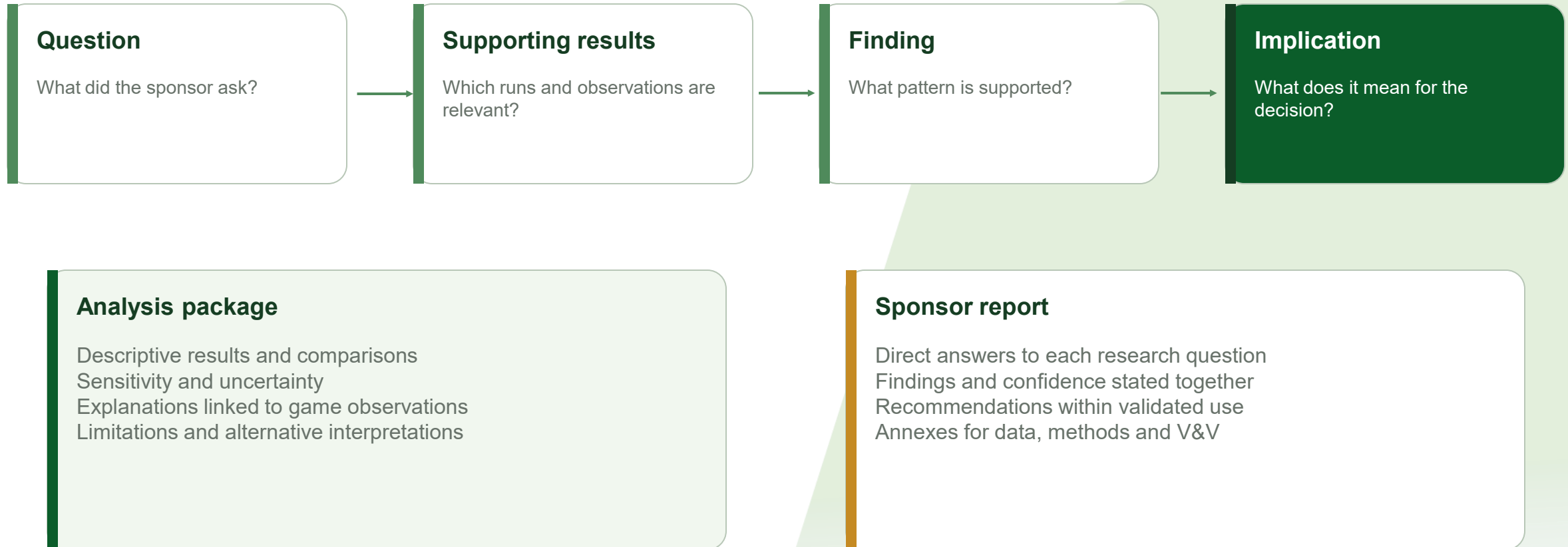
Calculated outputs aligned to research objectives

Quality flags

Failed runs, anomalies, missing values and reruns



Analysis and reporting answer the sponsor's research questions



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

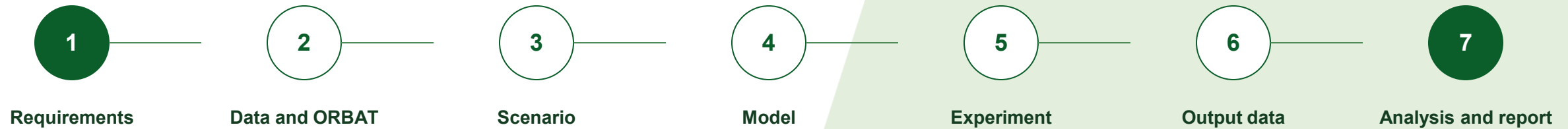
Assumptions and V&V remain visible across the entire campaign

VERIFICATION

Did we build and execute the artefact correctly?

VALIDATION

Is the artefact suitable for this question and intended use?



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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