

A Novel Analysis Approach for a Key National Capability

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 1. Health
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2. Audit Applied to a Statistics Capability
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Introduction

The National Level Challenge

**Multiple
Customers**



~450 Staff

**Multiple
Suppliers**

What is the **Irreducible Minimum**?
How healthy is the capability?

The National Level Challenge: A Fictional Example that I Can Present in Detail

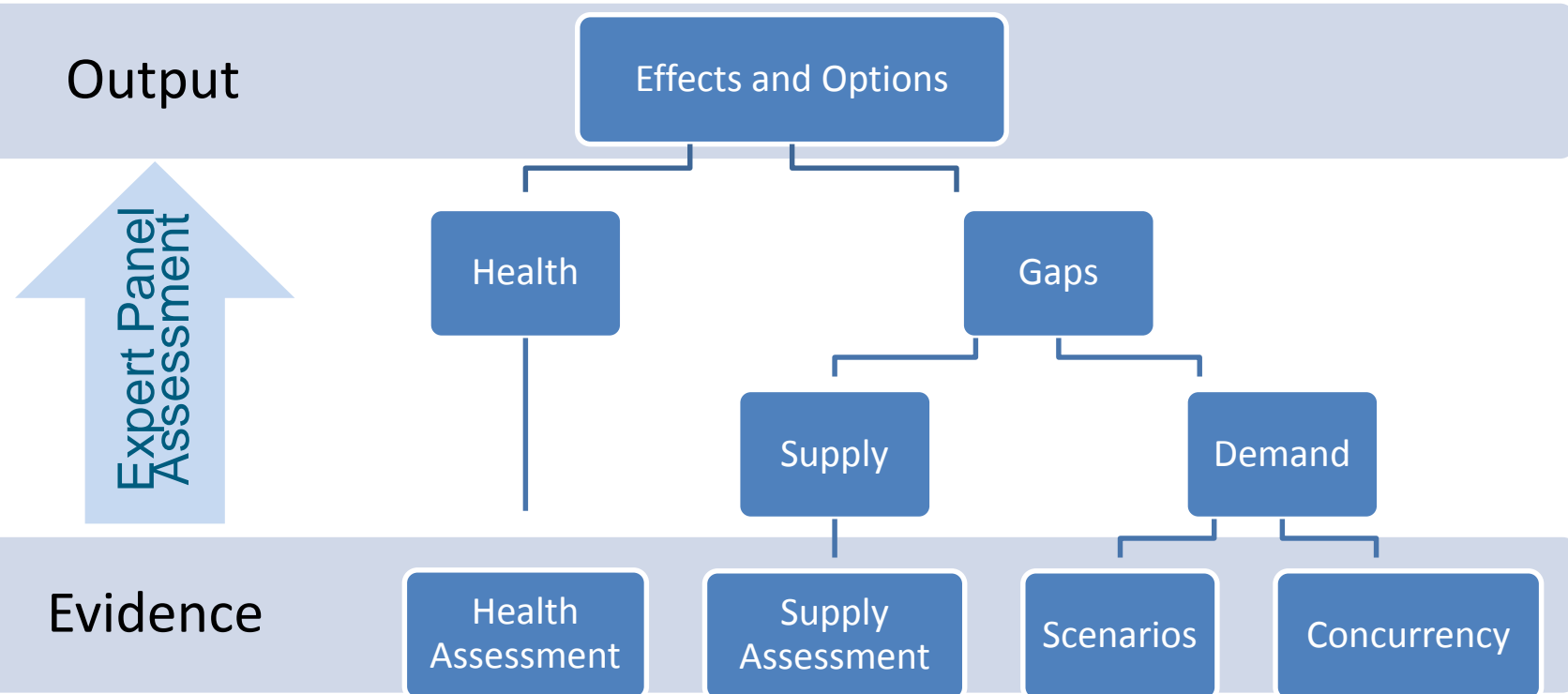
**Multiple
Customers**



**Multiple
Suppliers**

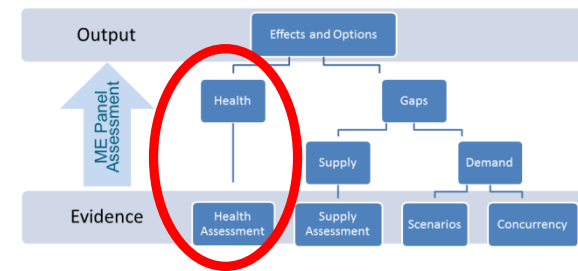
The small channel island of Herm has 2 energetics suppliers – how do we establish a national strategy?

Analysis Building Blocks



Health

A Hierarchical Approach



Group Level



Team Level



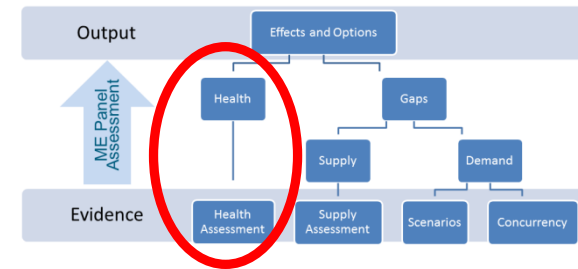
2015 Health Data: Group 1 View for Bloggs Explosives

Proportion of work undertaken by Critical SQEP <div> <div>>2/3</div> <div>1/3 to 2/3</div> <div><1/3</div> </div> <div> <div>No critical SQEP</div> <div>No Activity</div> </div>	Synthesis, Characterization & Formulation	Initiators and Fuzing	Propellants and rocket motors	Warheads	Pyrotechnics
Hazard and Safety					
Lifeing and compatibility					
Design, Prototyping and Small-scale Manufacture					
Analysis					
Advice and Assessment					
Trials and Evaluation					

2015 Health Data: Team 1 View for Bloggs Explosives

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A Hierarchical Approach



Organisation
Level

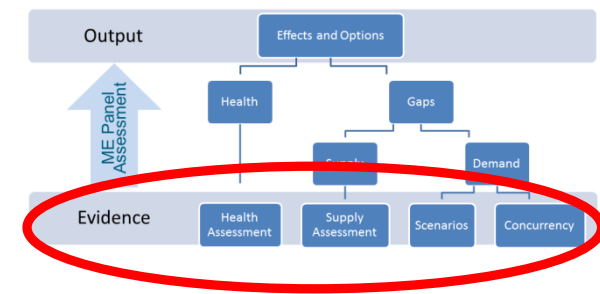
2015 Health Data: Company Level View for Bloggs Explosives					
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Hazard and Safety					
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Design, Prototyping and Small-scale Manufacture					
Analysis					
Advice and Assessment					
Trials and Evaluation					

Group Level



Taxonomy: Activities



Hazard and Safety

Lifeing and compatibility

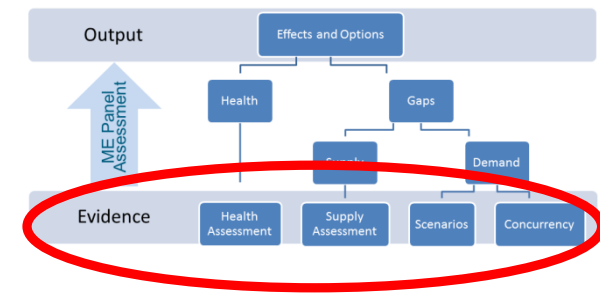
Design, Prototyping and Small-scale Manufacture

Analysis

Advice and Assessment

Trials and Evaluation

Taxonomy: Technical Focus



**Synthesis,
Characterization &
Formulation**

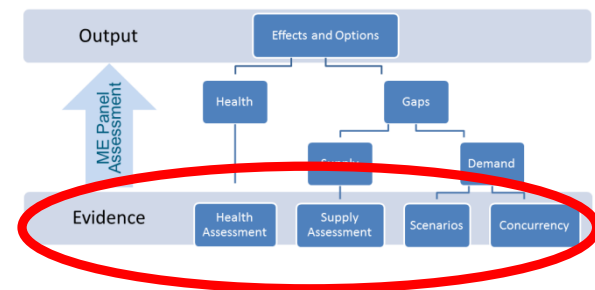
Initiators and Fuzing

**Propellants and rocket
motors**

Warheads

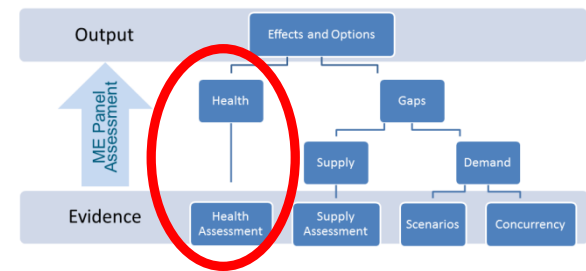
Pyrotechnics

Drawing Together Activities and Focus



<p>Proportion of work undertaken by Critical SQEP</p> <p> ■ >2/3 ■ No critical SQEP ■ 1/3 to 2/3 ■ <1/3 ■ No Activity </p>	Synthesis, Characterization & Formulation	Initiators and Fuzing	Propellants and rocket motors	Warheads	Pyrotechnics
Hazard and Safety					
Lifeing and compatibility					
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Analysis					
Advice and Assessment					
Trials and Evaluation					

Health: Green

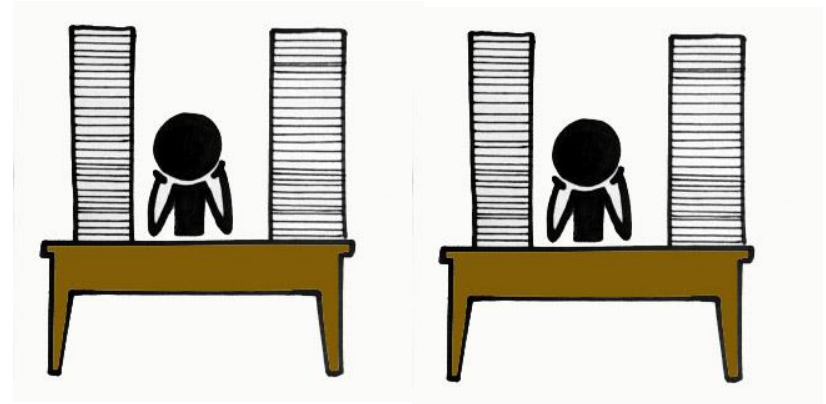


Critical SQEP



1/3 or less of
work

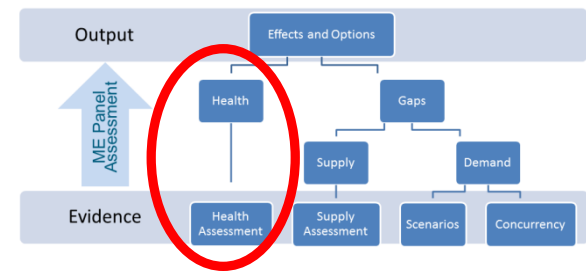
Non-Critical SQEP



Resilience

Critical: The loss of that individual would prevent or greatly inhibit delivery of a project significant to the organisation. Any mitigation in place would not significantly change the outcome

Health: Amber



Critical SQEP



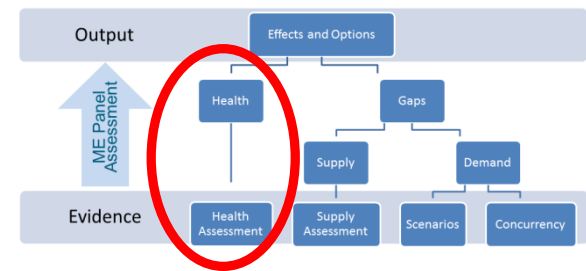
1/3 to 2/3 of
work

Non-Critical SQEP



Less Resilience

Health: Red



Critical SQEP

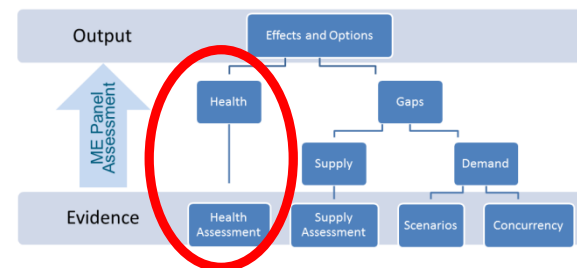


**2/3 or more of
work**

Non-Critical SQEP

**Limited Resilience
(perhaps none)**

Health: Red



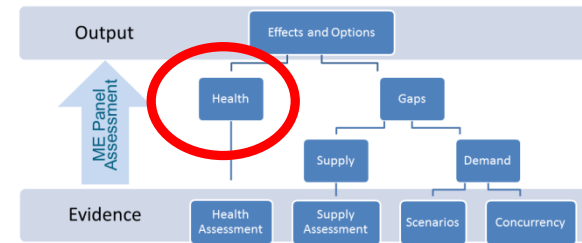
Critical SQEP



2/3 or more of work

2015 Health Data: Team 1 View for Bloggs Explosives					
Proportion of work undertaken by Critical SQEP	Synthesis, Characterization & Formulation	Initiators and Fuzing	Propellants and rocket motors	Warheads	Pyrotechnics
<div style="display: flex; flex-wrap: wrap;"> <div style="margin-right: 10px;"> <div style="width: 10px; height: 10px; background-color: red; border: 1px solid black;"></div> >2/3 </div> <div style="margin-right: 10px;"> <div style="width: 10px; height: 10px; background-color: blue; border: 1px solid black;"></div> 1/3 to 2/3 </div> <div style="margin-right: 10px;"> <div style="width: 10px; height: 10px; background-color: green; border: 1px solid black;"></div> <1/3 </div> <div> <div style="width: 10px; height: 10px; background-color: grey; border: 1px solid black;"></div> No critical SQEP </div> <div> <div style="width: 10px; height: 10px; background-color: lightgrey; border: 1px solid black;"></div> No Activity </div> </div>					
Hazard and Safety					
Lifeing and compatibility					
Design, Prototyping and Small-scale Manufacture					
Analysis					
Advice and Assessment					
Trials and Evaluation					

Health Example 1



2015 Health Data: Company Level View for Bloggs Explosives

Proportion of work undertaken by Critical SQEP	Synthesis, Characterization & Formulation	Initiators and Fuzing	Propellants and rocket motors	Warheads	Pyrotechnics
<div style="display: flex; justify-content: space-around;"> <div> <div style="width: 10px; height: 10px; background-color: red; border: 1px solid black;"></div> >2/3 </div> <div> <div style="width: 10px; height: 10px; background-color: blue; border: 1px solid black;"></div> No critical SQEP </div> </div> <div style="display: flex; justify-content: space-around;"> <div> <div style="width: 10px; height: 10px; background-color: yellow; border: 1px solid black;"></div> 1/3 to 2/3 </div> <div> <div style="width: 10px; height: 10px; background-color: green; border: 1px solid black;"></div> <1/3 </div> <div> <div style="width: 10px; height: 10px; background-color: grey; border: 1px solid black;"></div> No Activity </div> </div>					
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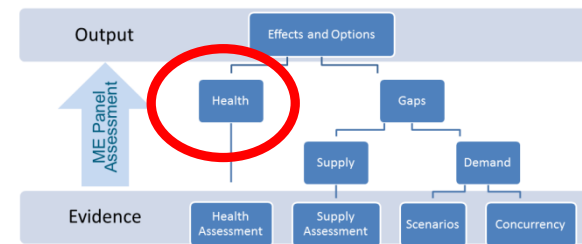
2015

2017 Health Data: Company Level View for Bloggs Explosives

Proportion of work undertaken by Critical SQEP	Synthesis, Characterization & Formulation	Initiators and Fuzing	Propellants and rocket motors	Warheads	Pyrotechnics
<div style="display: flex; justify-content: space-around;"> <div> <div style="width: 10px; height: 10px; background-color: red; border: 1px solid black;"></div> >2/3 </div> <div> <div style="width: 10px; height: 10px; background-color: blue; border: 1px solid black;"></div> No critical SQEP </div> </div> <div style="display: flex; justify-content: space-around;"> <div> <div style="width: 10px; height: 10px; background-color: yellow; border: 1px solid black;"></div> 1/3 to 2/3 </div> <div> <div style="width: 10px; height: 10px; background-color: green; border: 1px solid black;"></div> <1/3 </div> <div> <div style="width: 10px; height: 10px; background-color: grey; border: 1px solid black;"></div> No Activity </div> </div>					
Hazard and Safety					
Lifeing and compatibility					
Design, Prototyping and Small-scale Manufacture					
Analysis					
Advice and Assessment					
Trials and Evaluation					

2017: Prediction

Health Example 2



2015 Health Data: Company Level View for Smith Pyros

Proportion of work undertaken by Critical SQEP	Synthesis, Characterization & Formulation	Initiators and Fuzing	Propellants and rocket motors	Warheads	Pyrotechnics
<div>>2/3</div> <div>1/3 to 2/3</div> <div><1/3</div> <div>No critical SQEP</div> <div>No Activity</div>					
Hazard and Safety					
Lifeing and compatibility					
Design, Prototyping and Small-scale Manufacture					
Analysis					
Advice and Assessment					
Trials and Evaluation					

2015

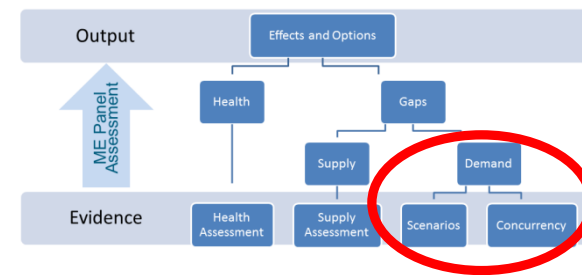
2017 Health Data: Company Level View for Smith Pyros

Proportion of work undertaken by Critical SQEP	Synthesis, Characterization & Formulation	Initiators and Fuzing	Propellants and rocket motors	Warheads	Pyrotechnics
<div>>2/3</div> <div>1/3 to 2/3</div> <div><1/3</div> <div>No critical SQEP</div> <div>No Activity</div>					
Hazard and Safety					
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2017: Prediction

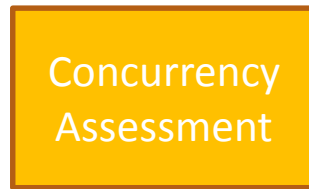
Gaps

The Irreducible Minimum

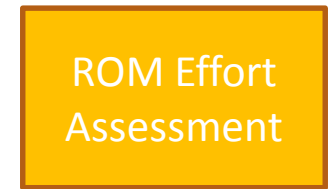


Full Scenario Set including:

- I. Procurement
- II. Advice
- III. Analysis



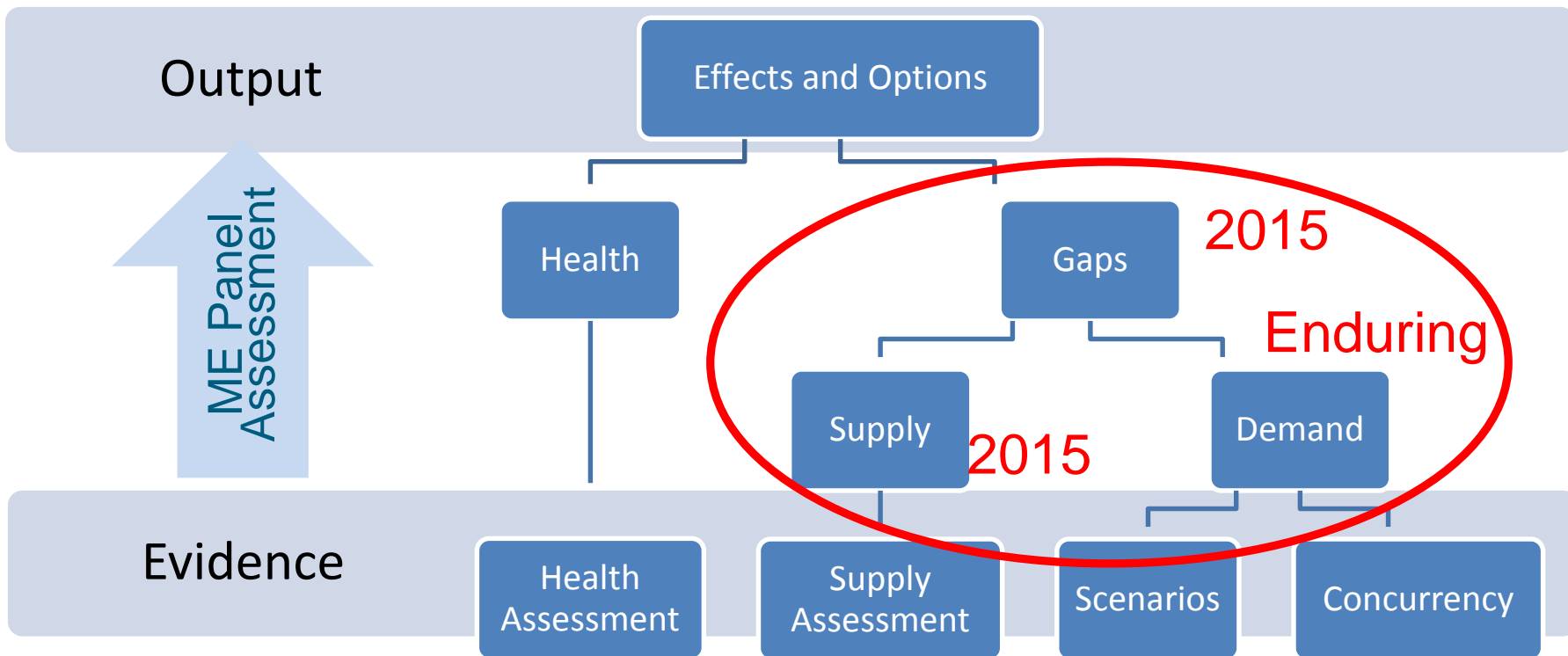
Concurrent Scenario Set



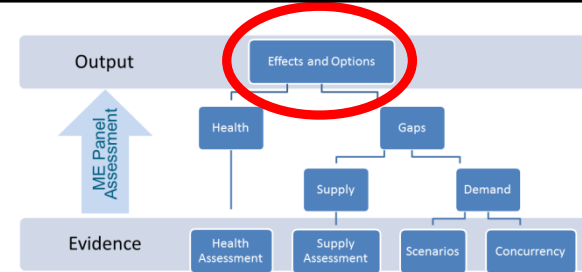
Irreducible Minimum

	System Characteristics & Formulation	Initiators and Fusing	Propulsion and rocket motors	Special devices
Hazard and Safety	200	200		10
Lifing and compatibility	200		10	10
Design Prototyping and Small scale Manufacture			10	10
Break and		200	10	10
	200		10	10
	200	10	10	10
	200	10	10	10

Analysis Building Blocks



Herm National Picture Example Only



2015 National Level Gaps					
	Synthesis, Characterization & Formulation	Initiators and Fuzing	Propellants and rocket motors	Warheads	Pyrotechnics
Hazard and Safety					
Lifeing and compatibility					
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2015 Gaps

2017 Health Data: Company Level View for Bloggs Explosives					
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Health 2017:
Prediction

Example National Summary for Herm

Considerable gaps in pyrotechnics, coupled with poor health indicating continuing decline

Analysis is healthy now but likely to decline

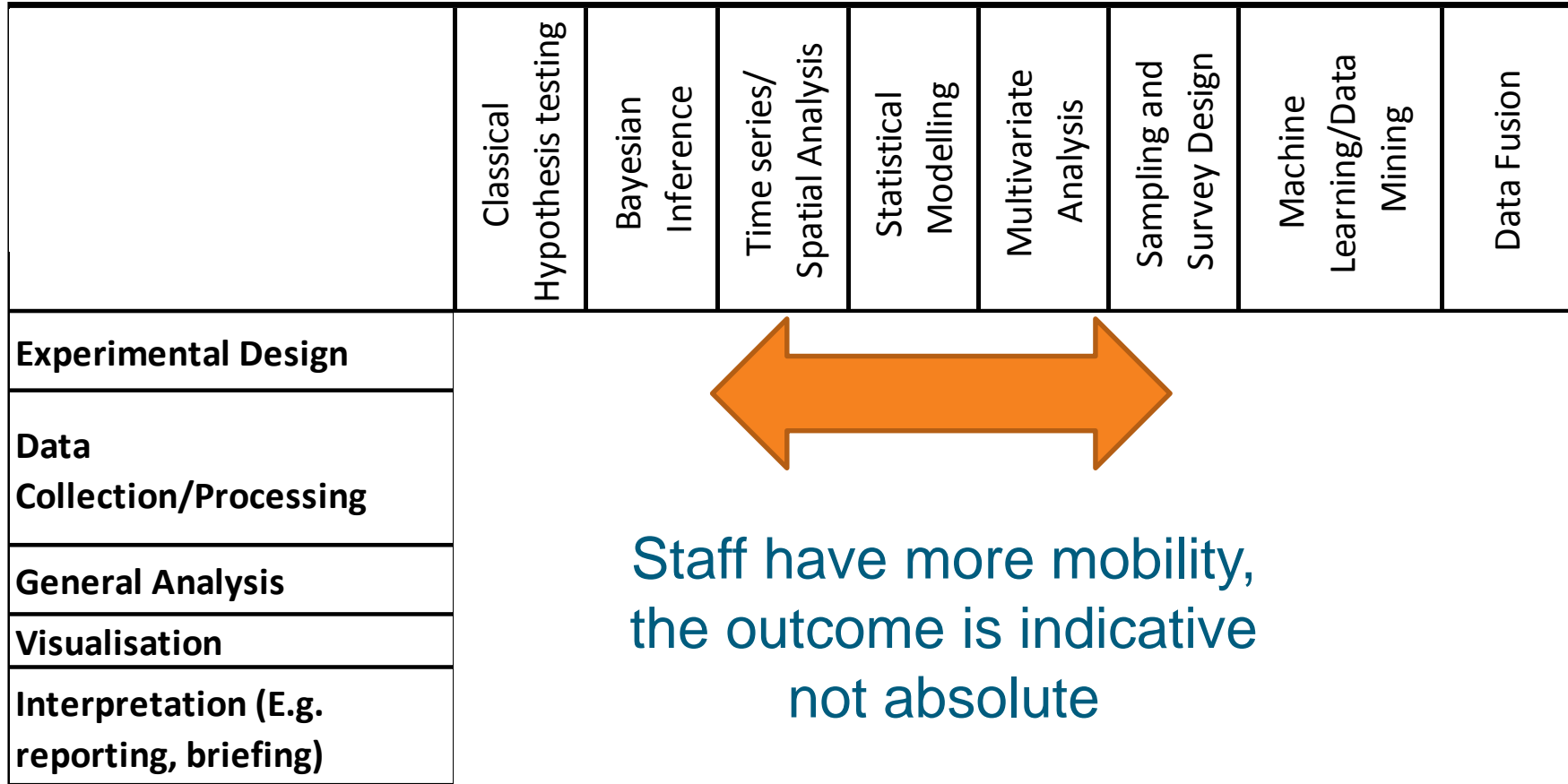
Some areas in Warheads are also likely to decline

Statistics Capability

Statistics Taxonomy

	Classical Hypothesis testing	Bayesian Inference	Time series/ Spatial Analysis	Statistical Modelling	Multivariate Analysis	Sampling and Survey Design	Machine Learning/Data Mining	Data Fusion
Experimental Design								
Data Collection/Processing								
General Analysis								
Visualisation								
Interpretation (E.g. reporting, briefing)								

Statistics Taxonomy



Example Statistics Capability Health

2015 Health Data: Company Level for Bloggs Statistics								
Proportion of work undertaken by Critical SQEP	Classical Hypothesis testing	Bayesian Inference	Time series/ Spatial Analysis	Statistical Modelling	Multivariate Analysis	Sampling and Survey Design	Machine Learning/Data Mining	Data Fusion
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Experimental Design								
Data Collection/Processing								
General Analysis								
Visualisation								
Interpretation (E.g. reporting, briefing)								

Statistics Summary

Some areas of strength, particularly in Bayesian statistics

Poorer health, particularly in machine learning, data fusion and statistical modelling

Strengths and Weaknesses of the Approach

- A robust method with a good audit trail
- Works across multiple suppliers
- Highlights national level gaps and health
- Indicative rather than absolute when people can move easily across the taxonomy
- Agreement on a taxonomy can be difficult

Questions