Measuring the Potential Benefits of Research

- To inform Operational Analysis planning

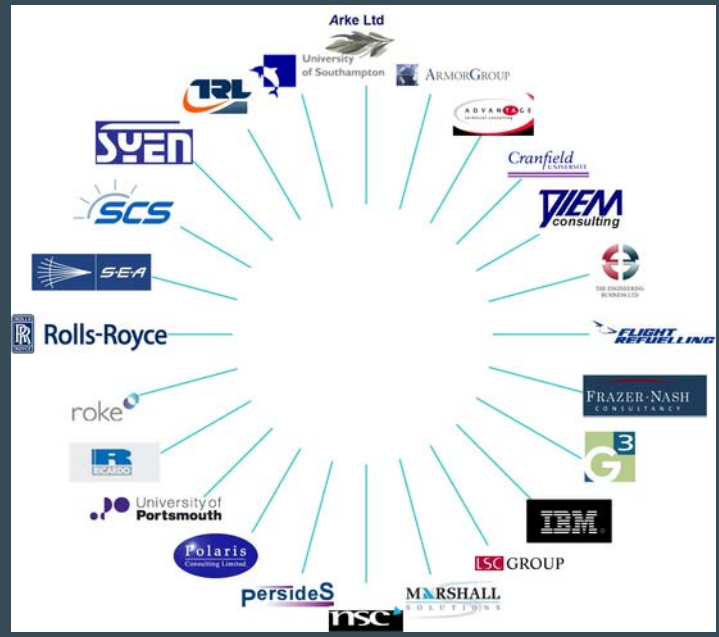
Plan Design Enable

Content of this Presentation

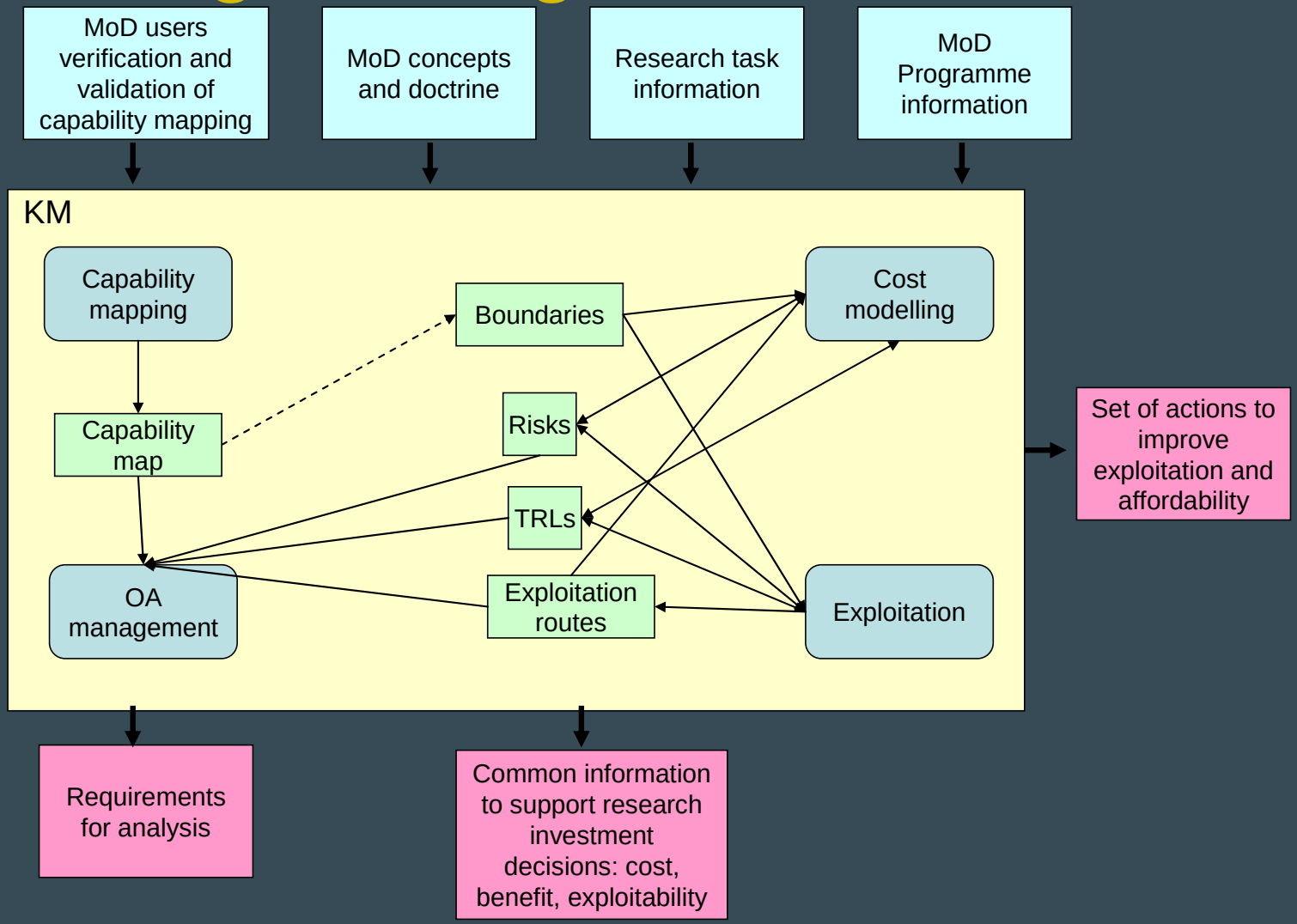
- Background to the Study
- The Requirement
- Study Approach
- Some Example Results
- Conclusions and Recommendations
- Questions and Observations

Background to the Study

- Expeditionary Logistics Support Research Programme
  - Military Capability that covers the support of forces in theatre
- Industry Consortium led by SEA Ltd
  tasked to manage the research programme
  as a result of competitive tendering
- Activities Include
  - Contracting Research
  - Research Knowledge Management



Knowledge Management Tasks



Knowledge Management – Operational Analysis

- The initial tasking is to develop an approach for relating research tasks to operational analysis
- It is necessary that the approach is capable of comparing dissimilar research activities
- The aim of the task is to help identify requirements for:
  - Expert Judgement - what experts do we need
  - Operational Analysis - what models are required
  - Direct Measures - what data do we contract suppliers to provide

The Requirement

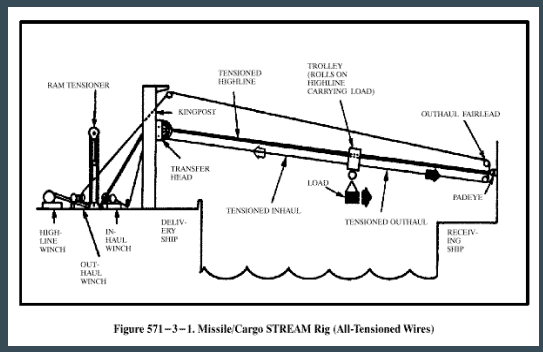


Figure 571–3–1. Missile/Cargo STREAM Rig (All-Tensioned Wires)

Study Method

- Stage 1 – Scoping the Problem
- Stage 2 – Constructing a Causal Map
- Stage 3 – Weighting the Causal Map
- Stage 4 – Identifying Research Output Measures
- Stage 5 – Modelling

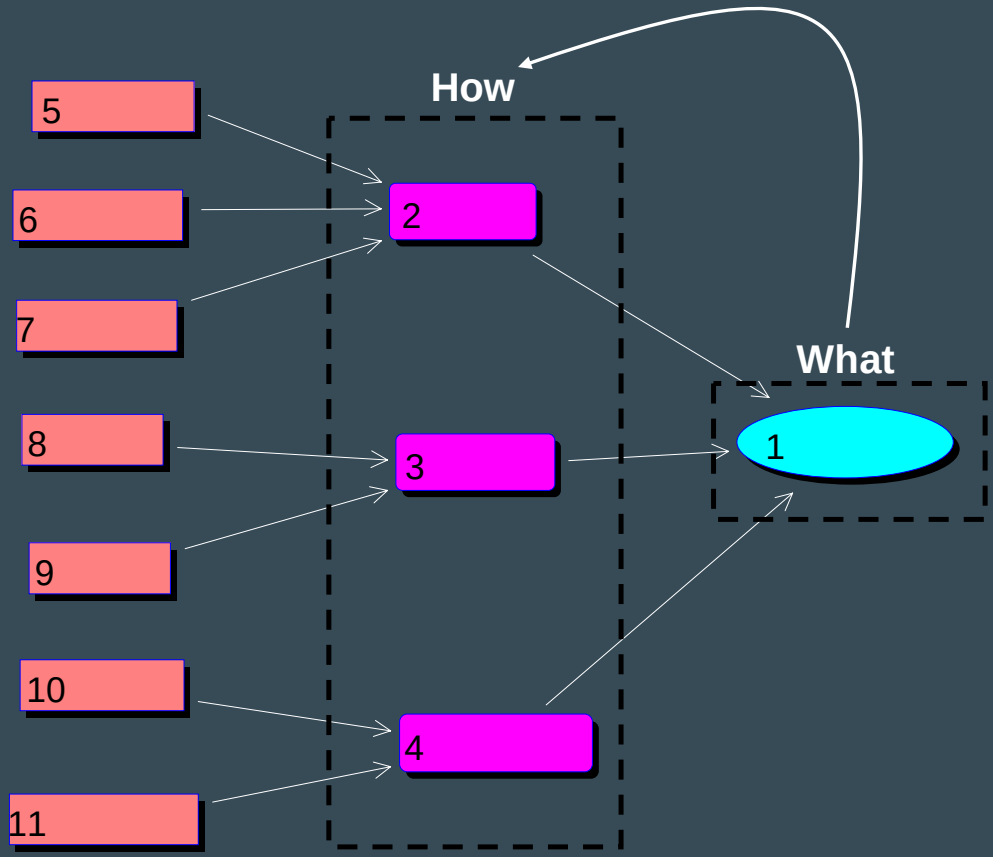
Stage 1 - Scope

- Capability Topic
  - Intra-theatre Maritime Support
    - Ship Load Transfer
      - Ship to Ship
      - Ship to Shore
      - Ship to Air

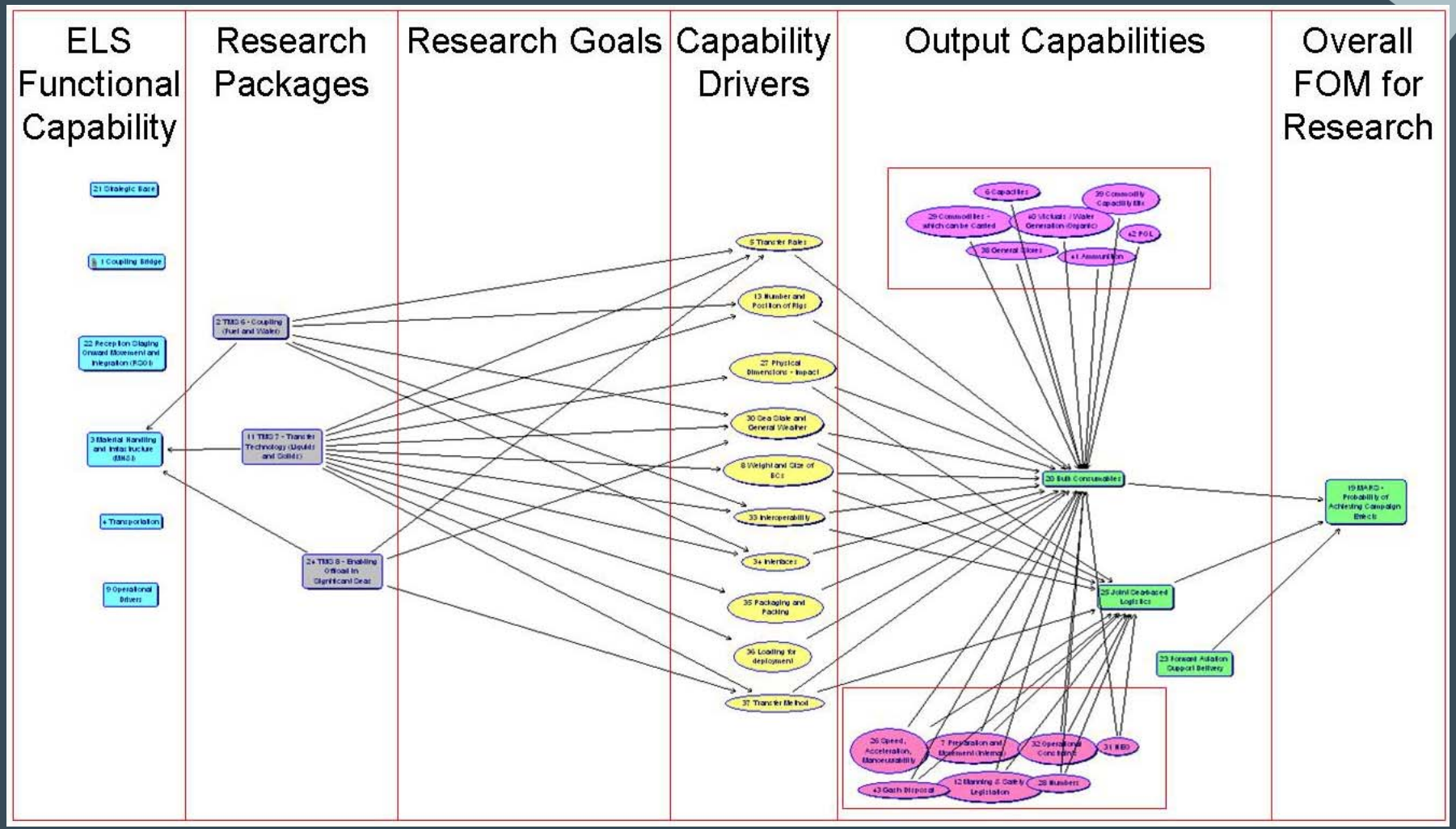
- Research Topics
  - Coupling Fuel and Water
  - Transfer Technologies (Liquids and Solids)
  - Enabling Offload in Significant Seas

- It was agreed that the Maritime Afloat Reach and Sustainability (MARS) project would be a good example of how these technologies could be exploited in the future

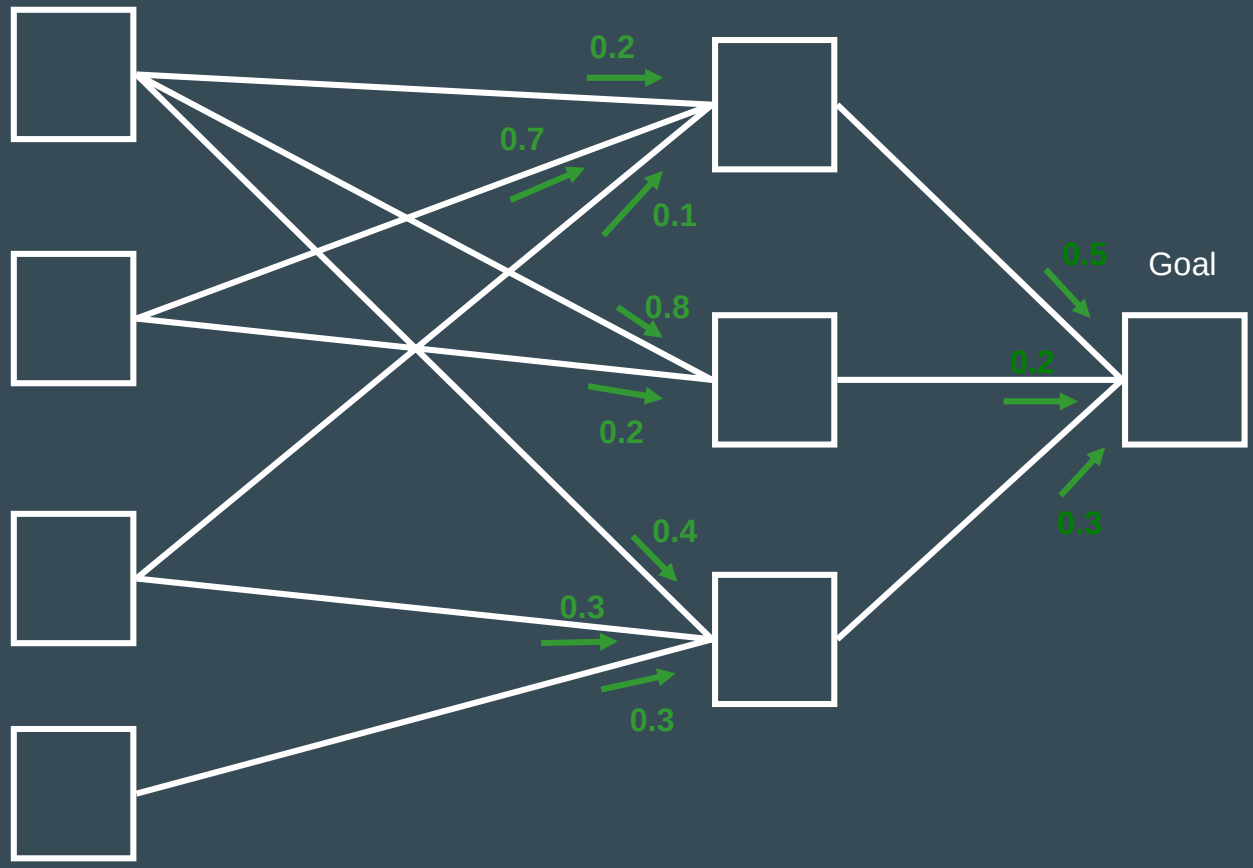
Stage 2 - Constructing a Causal Map



ELS Example


ELS Functional Capability
Research Packages
Research Goals
Capability Drivers
Output Capabilities
Overall FOM for Research
21 Strategic Base
1 Coupling Bridge
22 Reception Staging Onward Movement and Integration (RSOI)
3 Material Handling and Initial Increase (MHI)
4 Transportation
9 Operational Others
2 TMD 6 - Coupling (Fuel and Water)
11 TMD 7 - Transfer Technology (Liquid) and Solid)
24 TMD 8 - Enabling Critical In Significant Deal
5 Transfer Rates
13 Number and Position of Rigs
27 Physical Dimensions - Impact
30 Sea State and General Weather
8 Weight and Size of BCs
33 Interoperability
34 Interfaces
35 Packaging and Packing
36 Loading for deployment
37 Transfer Method
6 Capacities
39 Commodity Capability Effs
29 Commodities - which can be Carried
40 Victuals / Water Generation (Organic)
42 POL
38 General Stores
41 Ammunition
20 Bulk Consumables
25 Joint Deployed Logistics
23 Forward Addition Support Delivery
26 Speed, Acceleration, Manoeuvrability
7 Preparation and Movement (Inland)
32 Operational Constraints
31 RSO
43 Cash Disposal
12 Planning & Safety Legislation
28 Numbers
19 MARS - Probability of Achieving Campaign Effects

Stage 3 – Weighting the Causal Map



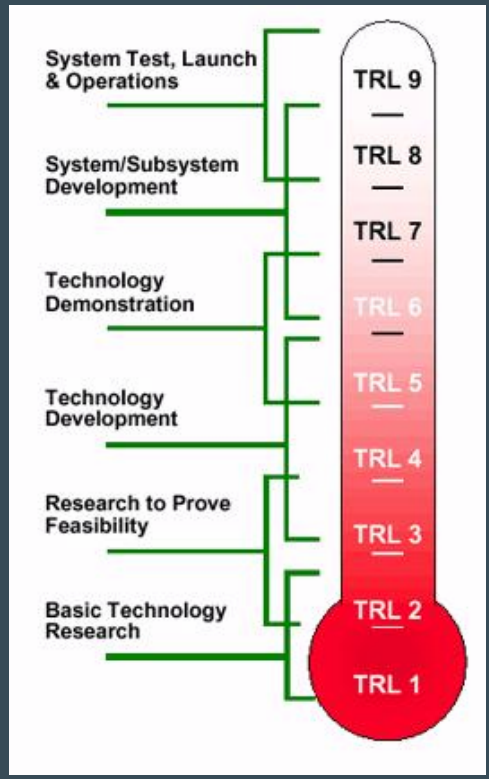
ELS Example
Research Goal Weightings

Research Stream	Decision Making Driver	Weighting
TMS 6 - Coupling (Fuel and Water)	Transfer Rates	0.33333333
TMS 6 - Coupling (Fuel and Water)	Number & Position of Rigs	0.5
TMS 6 - Coupling (Fuel and Water)	Sea state & General Weather	0.33333333
TMS 6 - Coupling (Fuel and Water)	Interoperability – Able to carry & deliver non-UK BC to non-UK assets	0.5
TMS 6 - Coupling (Fuel and Water)	Interface with all customers – LC, T23, CVS etc	0.5
TMS 7 - Transfer Technology (Liquids and Solids)	Transfer Rates	0.33333333
TMS 7 - Transfer Technology (Liquids and Solids)	Number & Position of Rigs	0.5
TMS 7 - Transfer Technology (Liquids and Solids)	Physical Dimensions – Impact	1

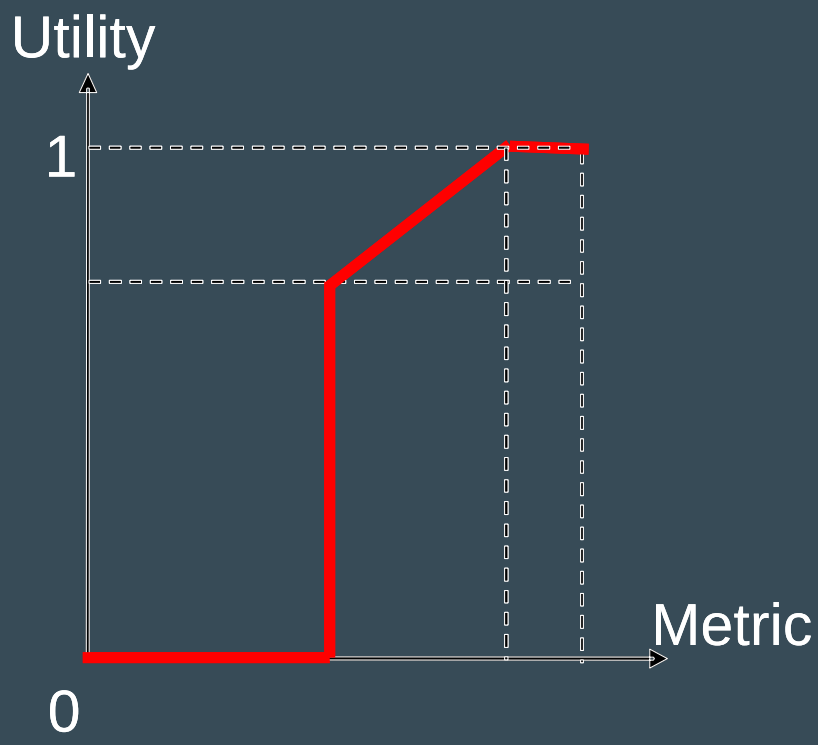
ELS Example
Research Driver Weightings

Driver	Weighting
Transfer Rates	0.1
Number & Position of Rigs	0.1
Physical Dimensions – Impact	0.1
Sea state & General Weather	0.1
Weight & Size of BC's (Height, Width, Length)	0.1
Interoperability – Able to carry & deliver non-UK BC to non-UK assets	0.1
Interface with all customers – LC, T23, CVS etc	0.1
Packaging & Packing	0.1
Loading for Deployment	0.1
Transfer Method	0.1

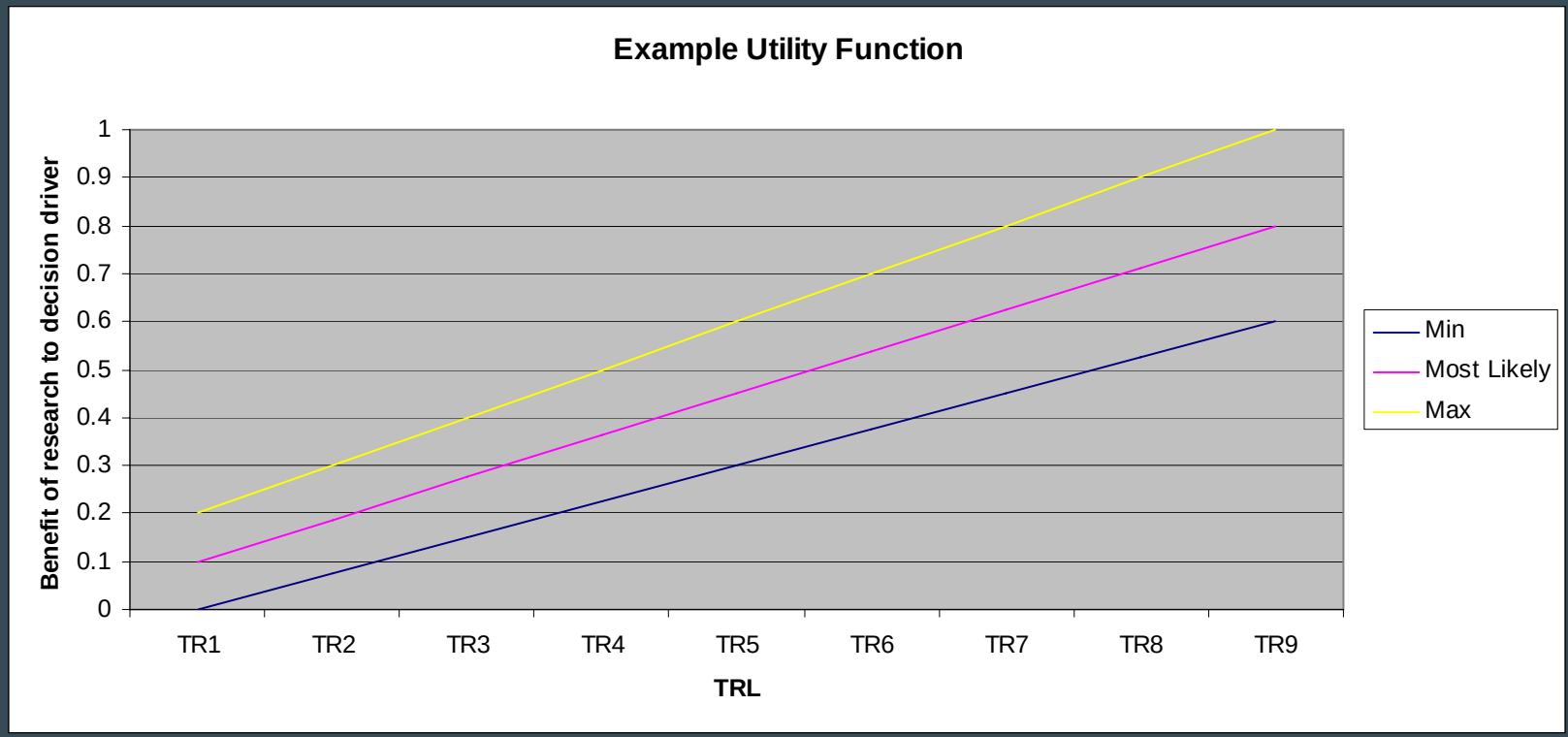
Stage 4 – Research Output Measures



Stage 5 - Modelling



ELS Example


Example Utility Function
Benefit of research to decision driver
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
TR1
TR2
TR3
TR4
TR5
TR6
TR7
TR8
TR9
TRL
Min
Most Likely
Max

Weighted Summation

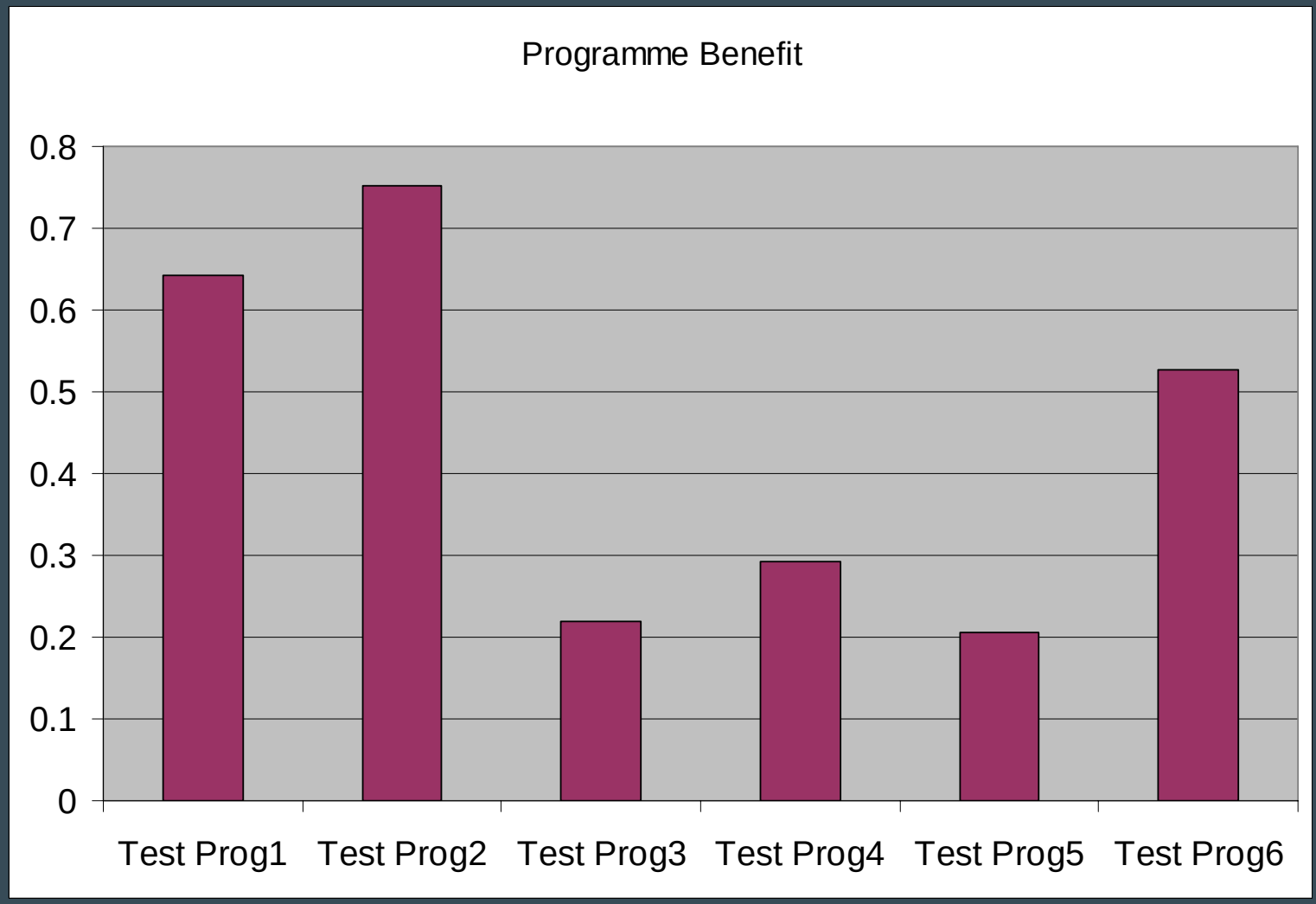
$$FOM = \sum_{driver} weight \sum_{goal} weight(value(trl))$$

Some Example Results

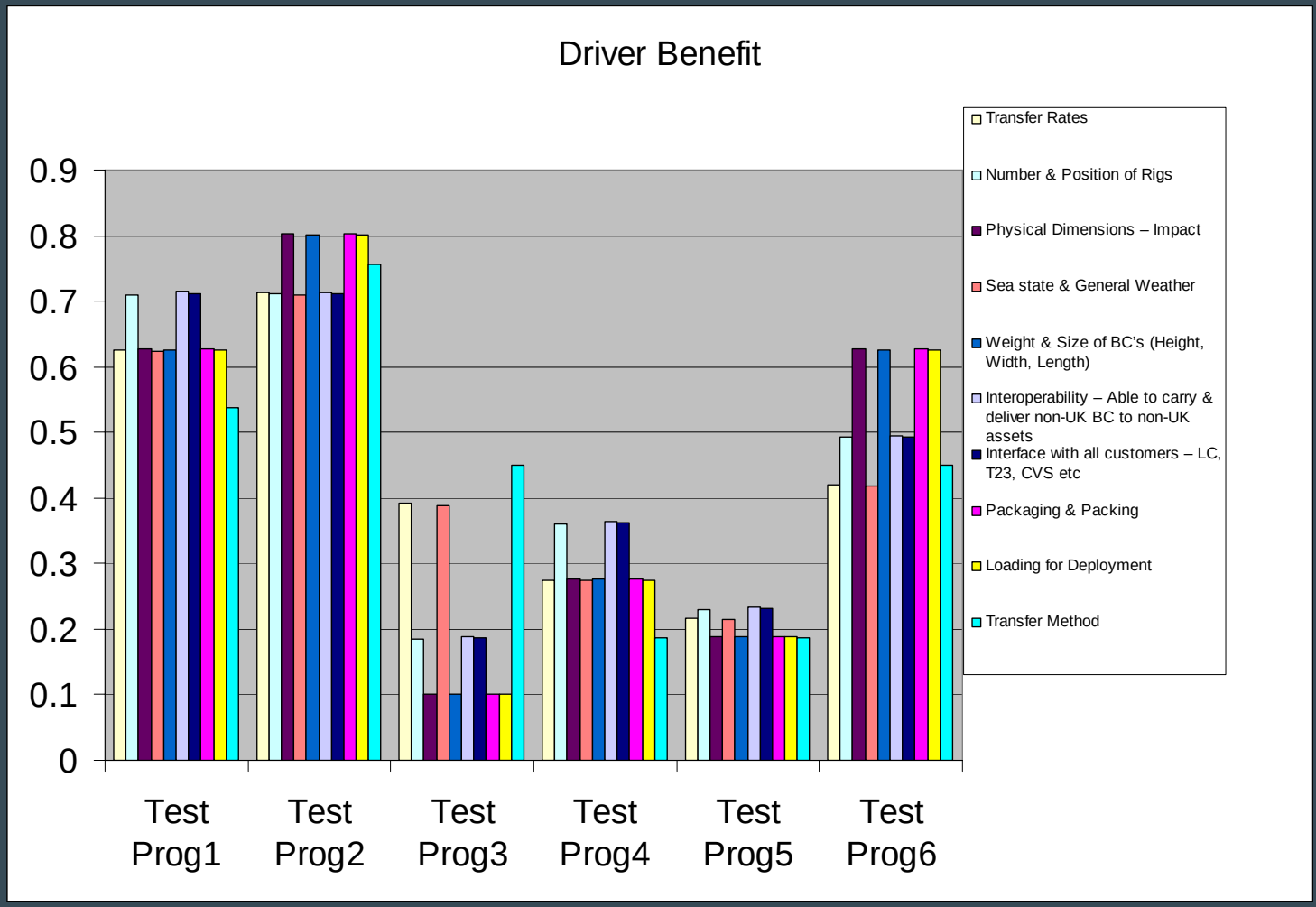
Research Experiments

		TMS 6 - Coupling (Fuel and Water)	TMS 7 - Transfer Technology (Liquids and Solids)	TMS 8 - Enabling Offload in Significant Seas
Research Program Option	Indicative Cost £(M)	Target TRL		
Test Prog1	£129	9	7	5
Test Prog2	£111	7	9	8
Test Prog3	£56	3	1	9
Test Prog4	£37	5	3	1
Test Prog5	£25	3	2	2
Test Prog6	£46	4	7	3

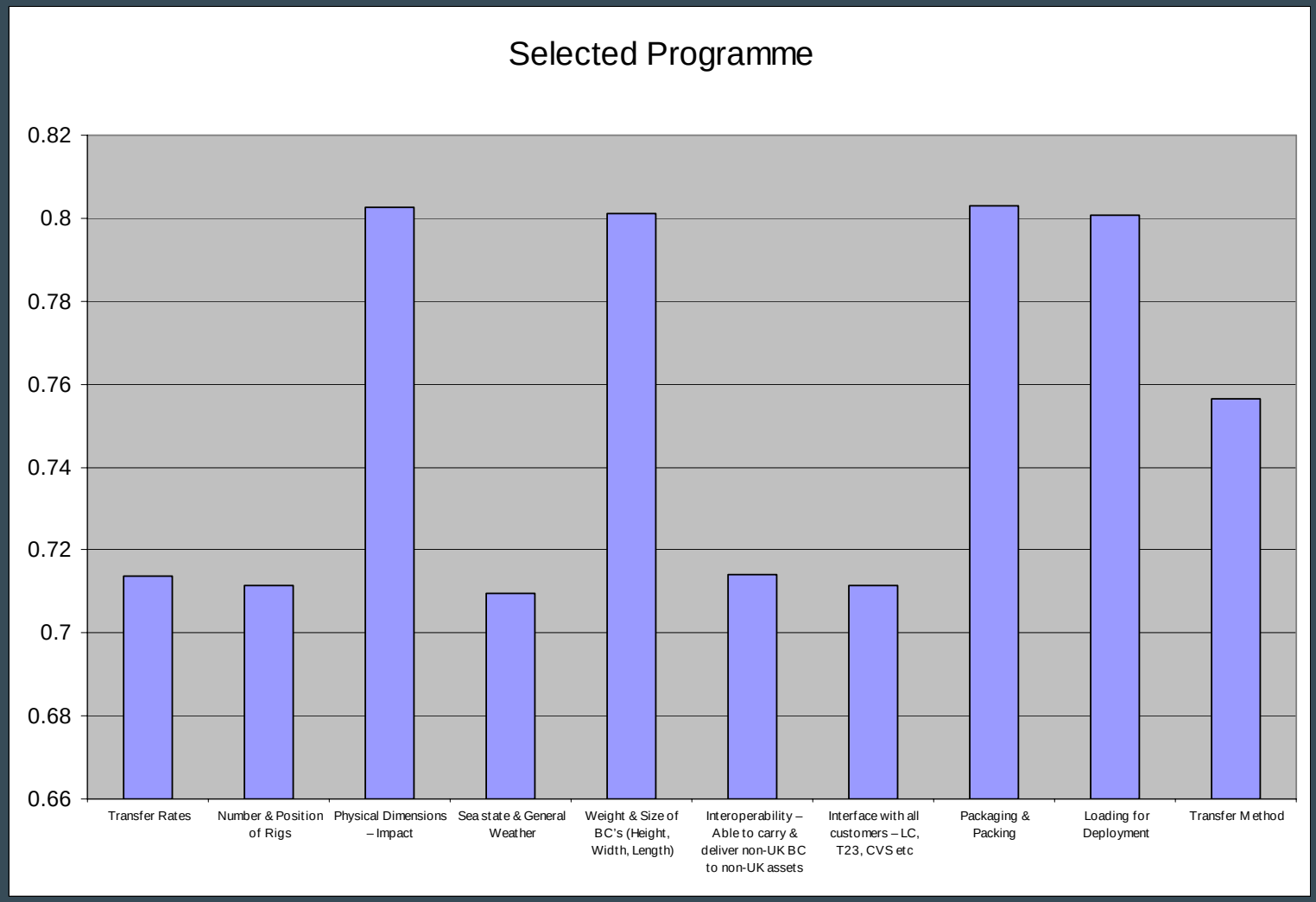
Benefits to Programme (FOM)



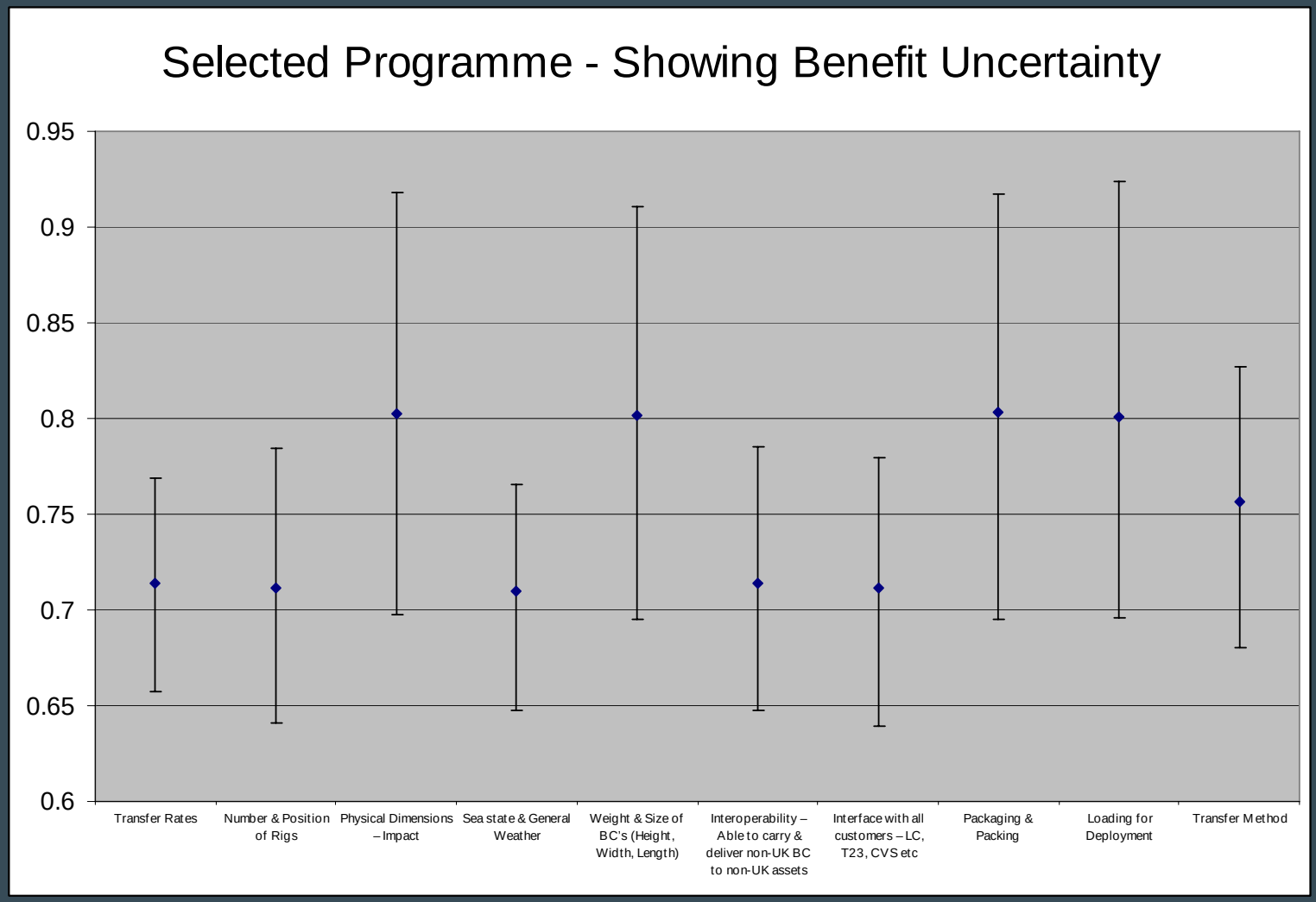
Benefit to Output Drivers (MOEs)



Benefit to Output Drivers (Detail)



Benefit Uncertainty



Conclusions and Recommendations

Why Use This Approach ?

- Allows stakeholders to agree the benefits expected from the various research work strands
- Provides a framework for assessing new proposals for research
- Provides the framework for the measurement of research outputs
- Provides justification for research and OA investment decisions, this in turn is useful on long term and large programmes where turnover of staff is inevitable

Proposed Way Ahead

- Construct a full scale causal map covering Expeditionary Logistics and Support research and a full range of output capabilities
- Identify a comprehensive set of capability drivers
- Hold a stakeholder workshop to validate the map and to weight the research goals and capability drivers
- Meet with research staff to validate utility functions
- Run a full simulation and present results to stakeholders for discussion

Questions?

Plan Design Enable

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