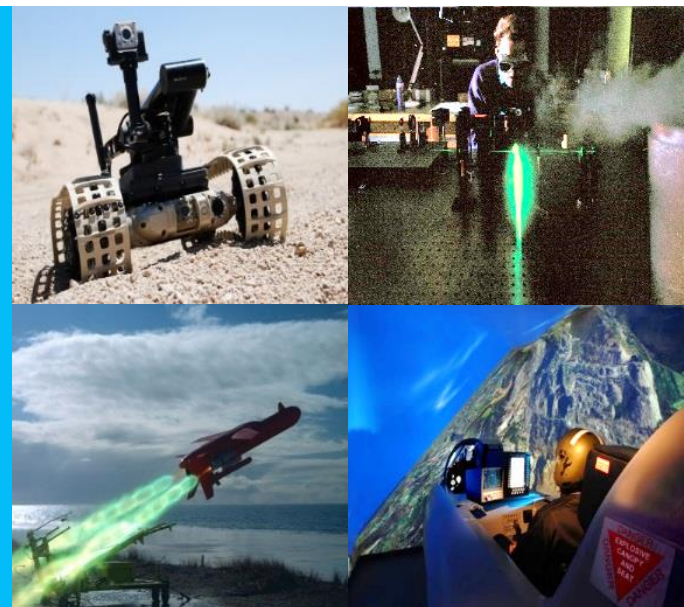


Cost Estimating : What does a mature organisation look like?

Project Controls Expo, London

16 November 2016

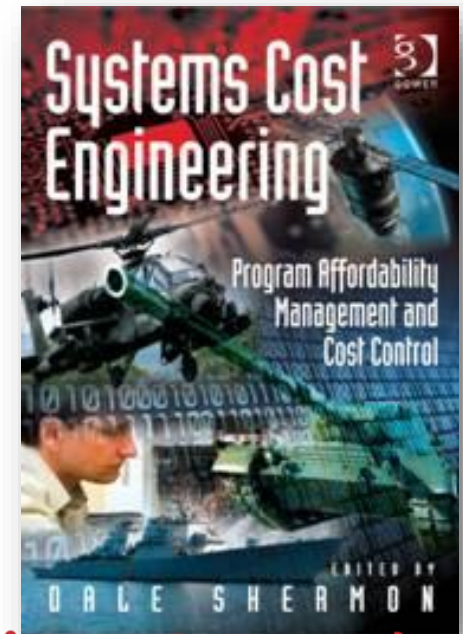


Dale Shermon

**QinetiQ Fellow / Head of
Profession – Cost**

Dale Shermon

- QinetiQ Fellow and Head of Profession – Cost Engineering
- Estimating since 1984, parametric estimating since 1987
- Life member of ICEAA and ICEAA Certified Cost Estimator / Analyst with Parametrics (CCEA-P)
- Author of “Systems Cost Engineering” book
- Fellow of ACostE and member of council
- Chairman of SCAF
- Published articles
- Member of APM
- ISPA “Frank Freiman” Award
- Thought leader



Contents

- **Introductions**
- **Cost Engineering Health Check**
- **Data gathering, normalisation and application**
- **Tool development and usage**
- **People's skills, professionalism and knowledge**
- **Process existence and utilisation**
- **Culture, leadership and management**
- **Summary**

QinetiQ Businesses



Air and Space



Maritime, land and weapons



North America



Cyber, Information & training



OptaSense®



International



Project Controls
EXPO

QinetiQ, International Business, Advisory Services



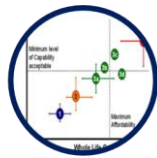
Requirements & Acceptance



WLC Modelling



Options Analysis



COEIA



Through Life Support



Benefits Analysis



Strategy Devt / Wargaming



Technology Management



Legacy & Market Surveys



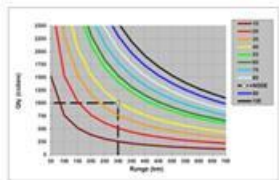
Risk Management



FACET
(Family of Advanced Cost Estimating Tools)



RMM
(Risk Maturity Model)



Joint Utility Model



EVC
(Economic Value Chains)



Industry Standard Toolsets

- Over 150 highly skilled and experienced subject matter experts
- 70%+ Professional Accreditation
 - ACostE, SCAF, APM, Prince2, MSP, ICEAA
- Based across 5 UK Sites
 - Deployed internationally
- Average experience of 10 years
- Over 40% PhD / MSc qualified



Project Controls
EXPO

Cost Engineering Health Check

Dale Shermon | QinetiQ Fellow



What is it?

- A standardised **competency assessment** framework
- Based on QinetiQ **Knowledge Based Estimating** Philosophy
- Provides an objective **evidence based audit** against both best practice and industry standard.

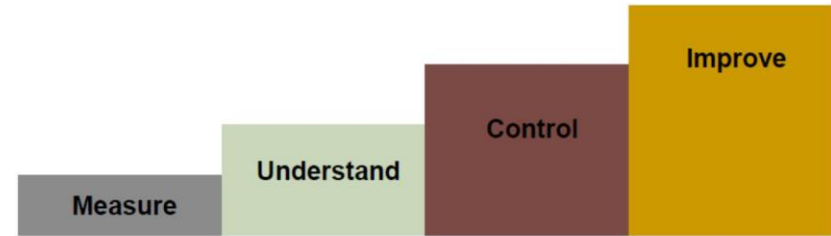


- Identifies strengths and weaknesses in costing capability, including 'intangible' enablers
 - Stakeholder engagement
 - Cultural integration



Why do it?

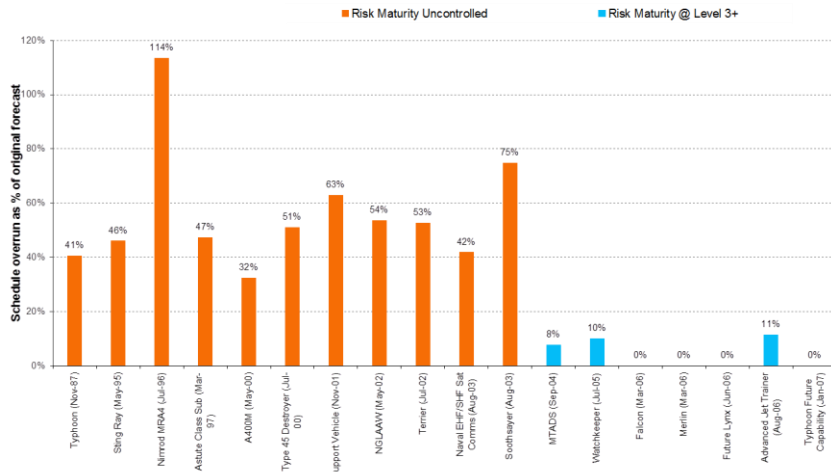
- **How good is your estimating capability?**
 - Benchmark against best practice
- **How do you compare with your peers?**
 - Benchmark against industry standards
- **How can you improve?**
 - Focus resources towards areas identified as weak



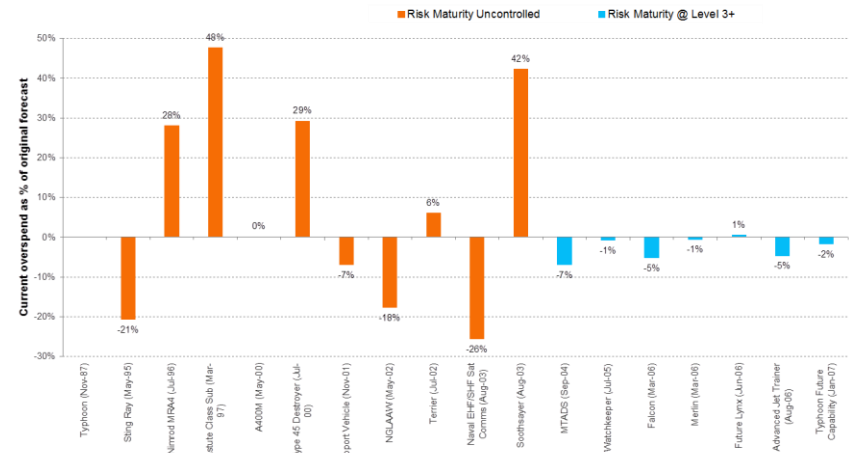
If you can't measure it, you can't understand it.
 If you can't understand it, you can't control it.
 If you can't control it, you can't improve it.

-James Harrington
The Improvement Process

Current Schedule Performance vs Original Forecast of MOD Top 20 Major Projects



Current Schedule Performance vs Original Forecast of MOD Top 20 Major Projects



How is it typically done?



Enablers include ...

- Cost Analysis and Management Plans
- Cost data and assumptions lists/databases
- Cost Models
- Analysis Toolsets
- Staff certification
- Stakeholder Maps
- Cost Review Records
- CRA Reports

Enablers include ...

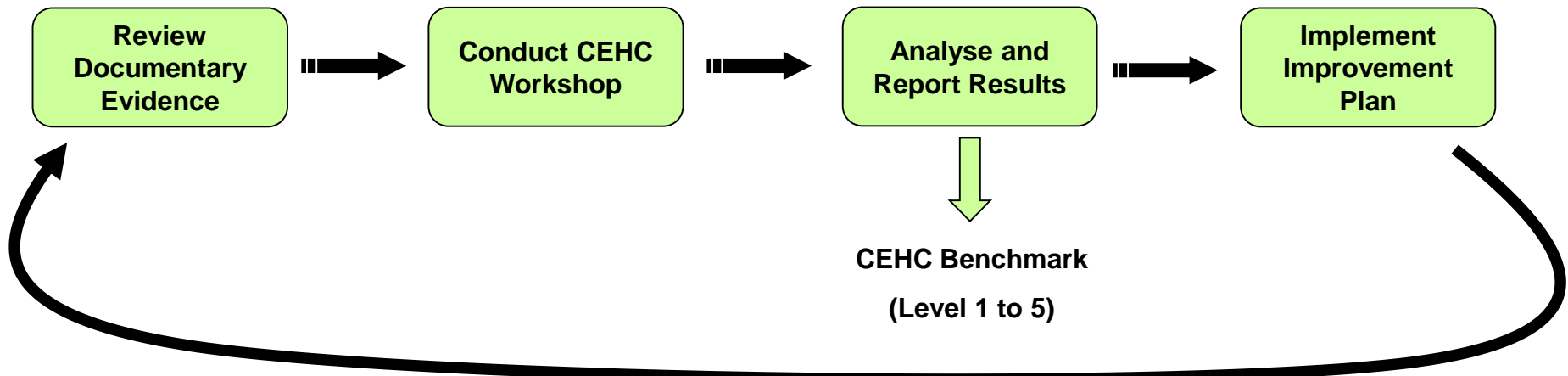
- E-voting kit
- Workshop materials
- CEHC SQEP facilitators
- Organisational Workshop attendees

Enablers include ...

- Workshop Q&A set
- Documentary evidence
- CEHC analysis SQEP
- Industry CEHC Benchmarks

Enablers include ...

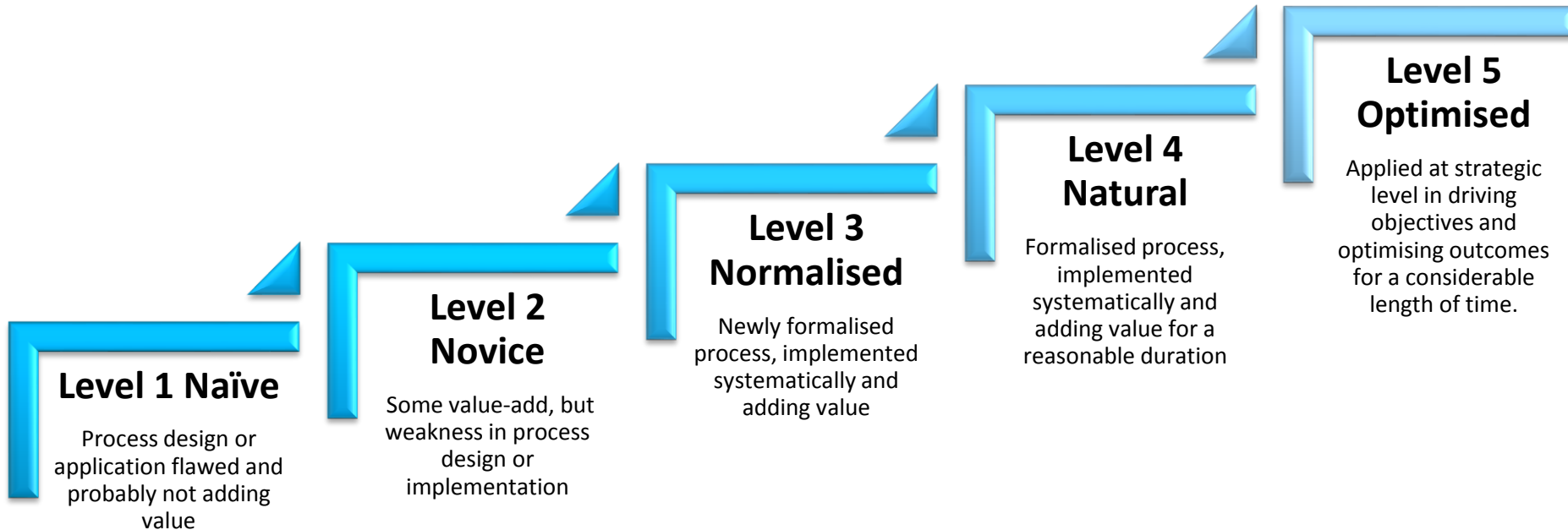
- Cost Engineering Improvement Action Plan
- SQEP stakeholder personnel



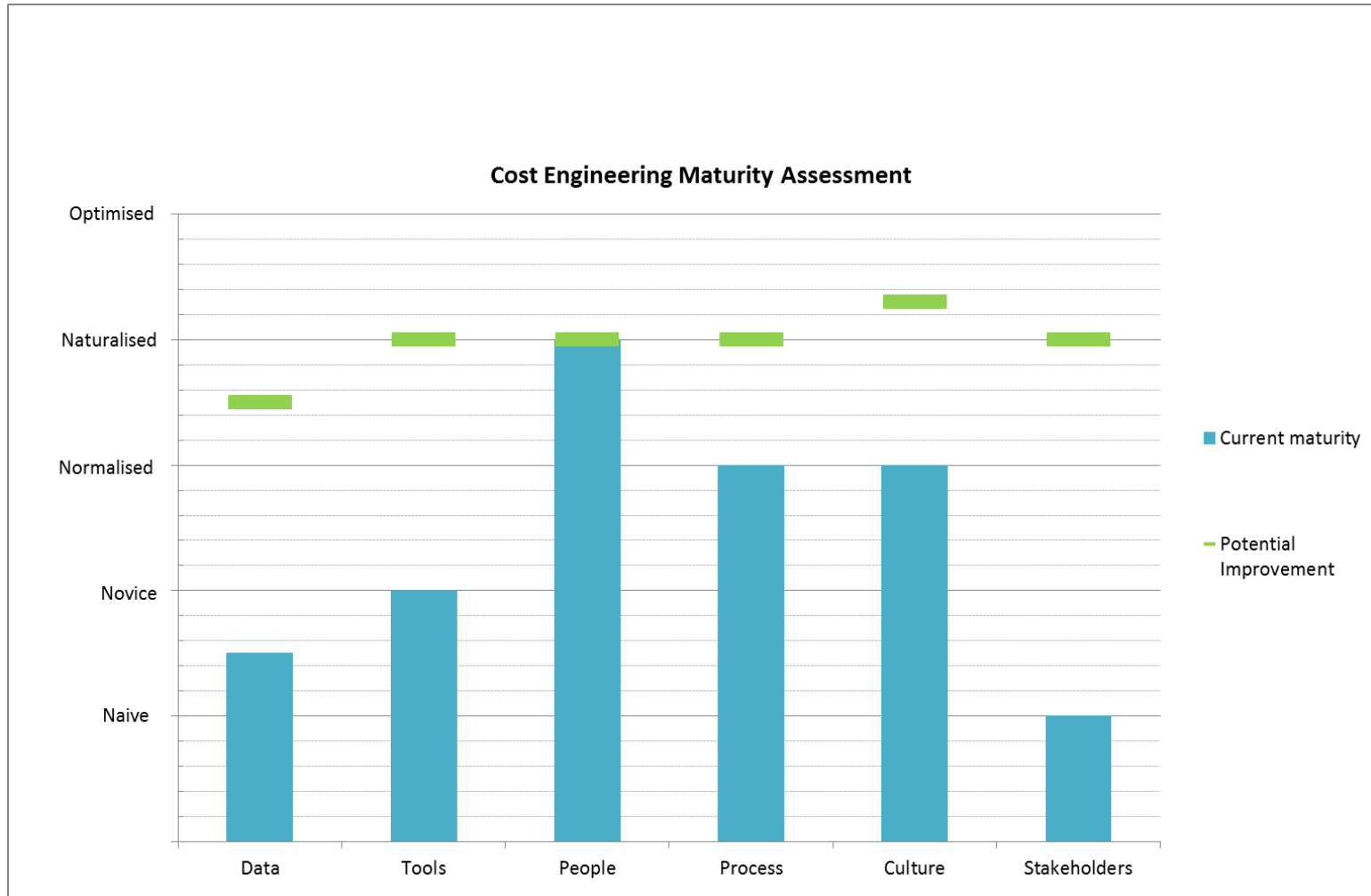
Periodic re-assessment against current benchmark



How is it measured? - Maturity Levels



Example Output



“An organisation is only as strong as its weakest element”



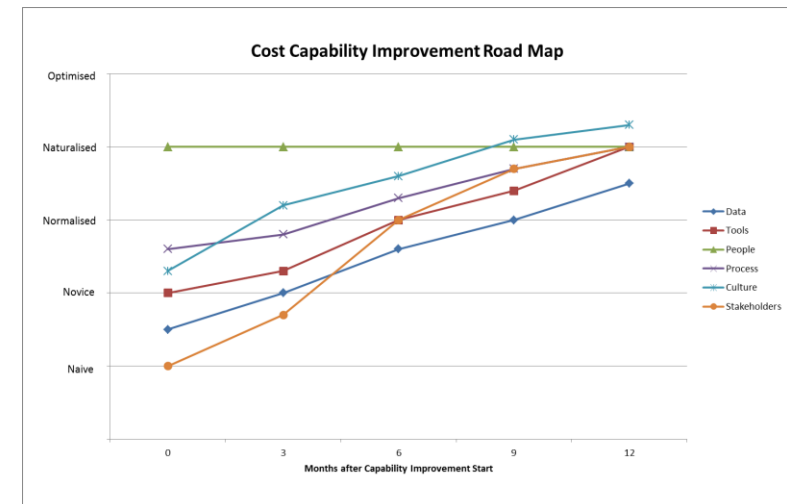
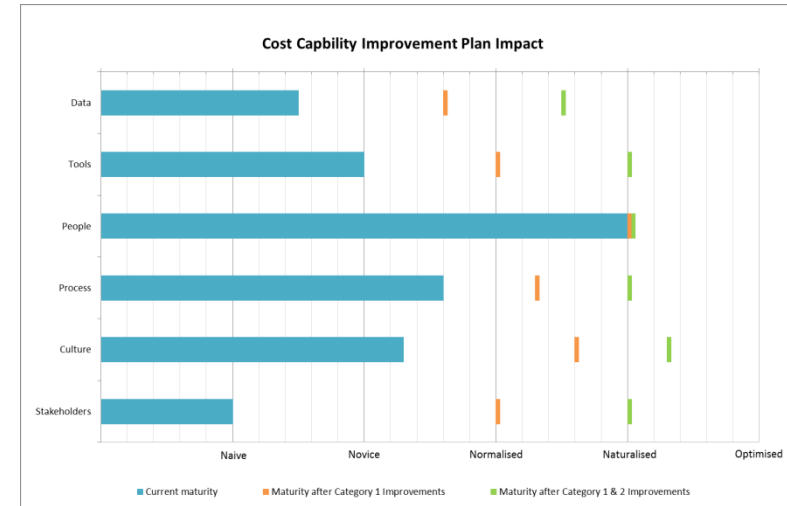
Organisational Maturity Assessment Cost Engineering Improvement Action Plan

Category 1 Recommendations - these will act to support a Cost Engineering Capability that's enables the development and generation of credible estimates

ID	Recommendation	Difficulty to Implement	Impact on Capability
R1.2	Provide staff access and training to commercial parametric models	Medium	High
R1.2	The organisation should mandate a consistent approach for including of cost and schedule risk within their cost estimates	Easy	High
R4.3	The organisation should develop a data dictionary for use in archiving historic costs and technical information	Easy	High
R3.1	The organisation should recommend an authoritative source for escalation rates (or develop their own authoritative source).	Easy	High
R1.4	The organisation should create an independent cost model verification and validation cell for the review of all costs being provided to management	Medium	High

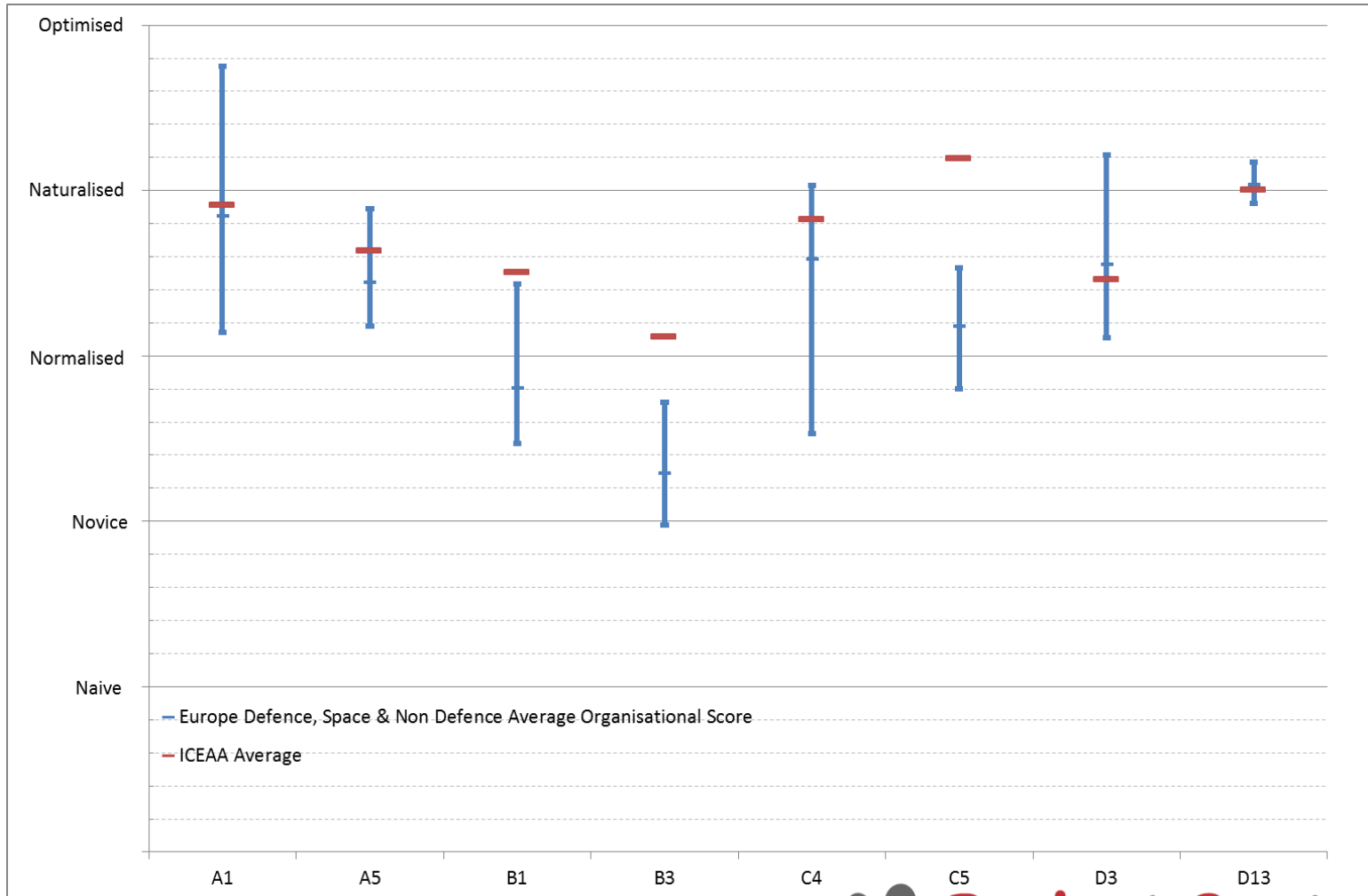
Category 2 Recommendations - these will act to support a Cost Engineering Capability that enables the development and generation of credible estimates, has the confidence of management and wider stakeholders and is posed to avail of best in class engineering approaches and new evolving principles.

ID	Recommendation	Difficulty to Implement	Impact on Capability
R3.2	Expose key customer to cost approach and methodologies	Medium	Medium
R1.6	Encourage staff to participate in professional costing organisations conferences and international conferences	Medium	Medium
R2.3	Ensure interfaces between the organisational cost analysis process and other analysis process are clear and sufficient for the transfer of information	Easy	High
R1.1	Stakeholders should be engaged to understand to fully understand the types of decisions that they are using cost information to inform, and costing outputs should be aligned to these.	Easy	High



Summary – USA compared to UK

Average Organisational Maturity Assessments



Data gathering, normalisation and application

Dale Shermon | QinetiQ Fellow

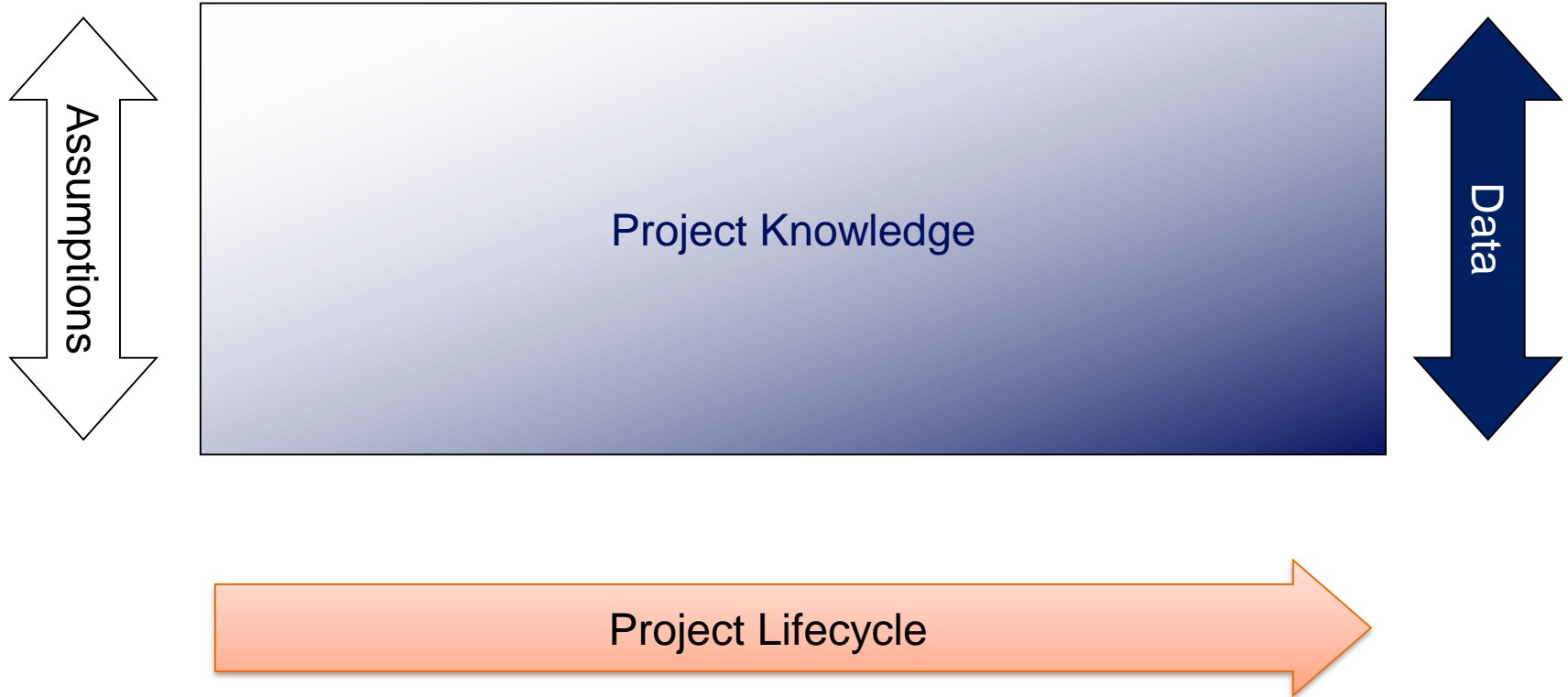


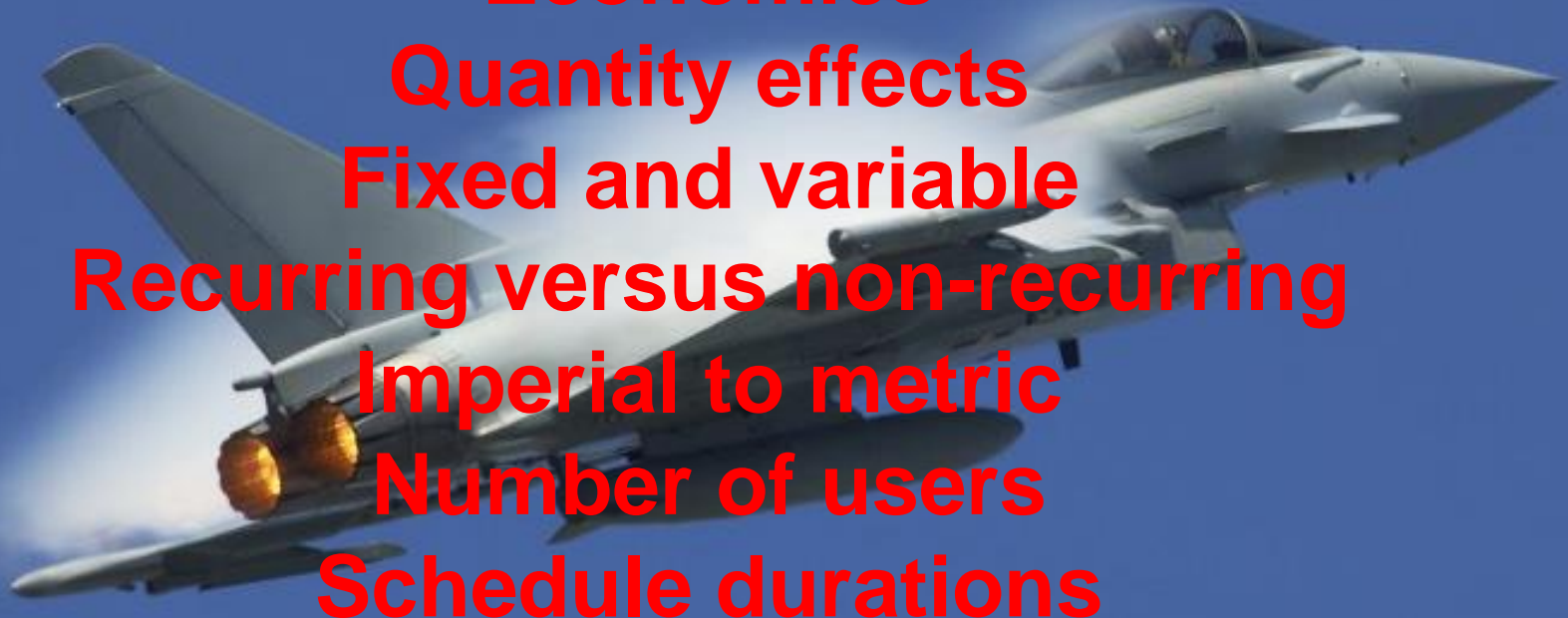


Historic project cost data
Technical Data
Historical Schedule
Risk and Opportunities
Inflation / cost trend indices



Data poor!





Currency
Economics
Quantity effects
Fixed and variable
Recurring versus non-recurring
Imperial to metric
Number of users
Schedule durations



QinetiQ P3+ Observatory

The QinetiQ P3+ Observatory

The P3+ observatory is a P3M research asset for the storage of Portfolio, Programme and Project related documentation. It is a library and search facility to enable schedule, risk, and cost analysts and managers the opportunity to learn from their peers.

QinetiQ prides itself in the research that it has conducted and the future research that it will produce. The foundation of learning is to understand what is already known and extend that knowledge for the future.

Getting Started

- Share this site
- Change site theme
- Set a site icon
- Customize the Quick Launch

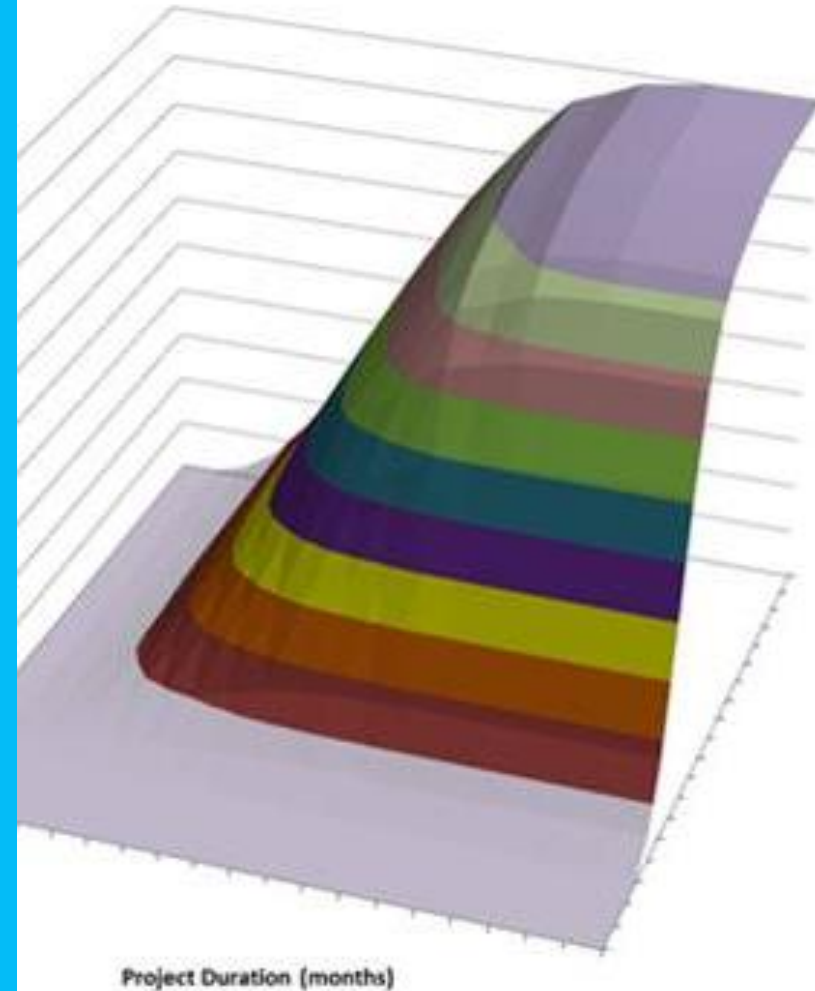
QinetiQ P3+ Observatory

- More than 2,300 papers and presentations on P3M topics including risk, schedule, project control, cost forecasting, project management, benefits and so forth.
- Full literature search capability
- Knowledge Manager ensuring quality of content
- Structured searching or key word searching
- Web access

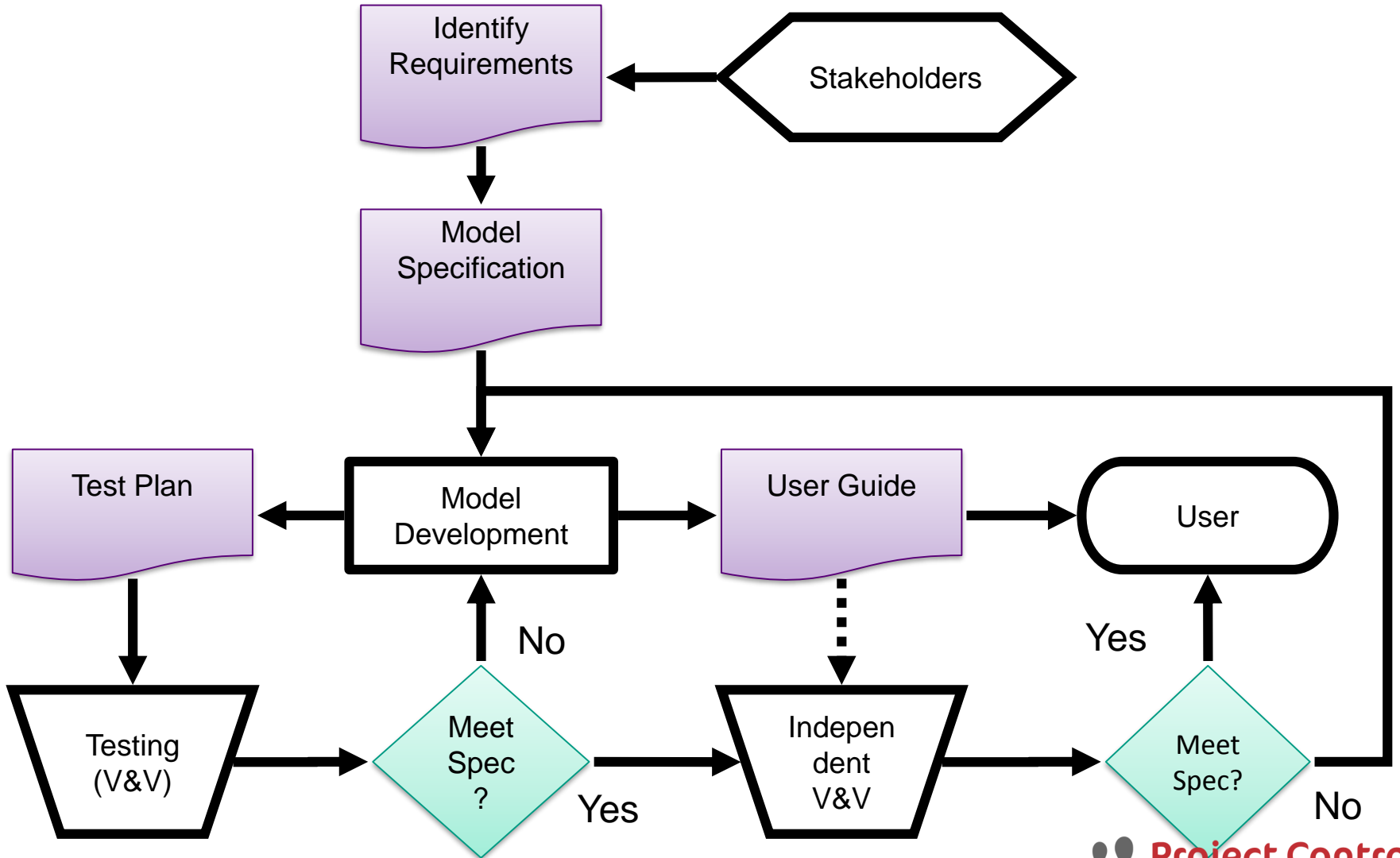
Tool development and usage

Dale Shermon | QinetiQ Fellow

Project Cost-Time-Confidence S-Curve

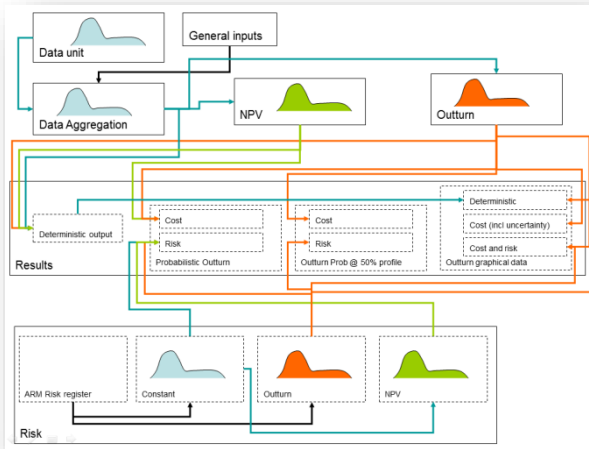


Not sexy, but essential



Cost Modelling

- **Generic cost model**



- **Generic Cost Model** – The generic cost model uses individual components to build options. It then calculates deterministic cost estimates for Whole Life Cost (WLC) covering all phases of the project lifecycle and the capability costs. This tool also aids the identification of cost drivers, performs cost trade-offs and captures procurement costs. With the addition of quantified risk register data the model is able to produce costs in Constant cost, Discounted cost and Then year cost.

- **FACET**

- **Family of Advanced Cost Estimating Tools (FACET)** – a primarily Defence-based parametric cost model. It rapidly enables economic decision makers to estimate the through life costs of procuring equipment, ensuring correct decisions are made very early on in the project life cycle. FACET is uniquely positioned to provide these estimates through its ability to use performance characteristics to calculate future costs.

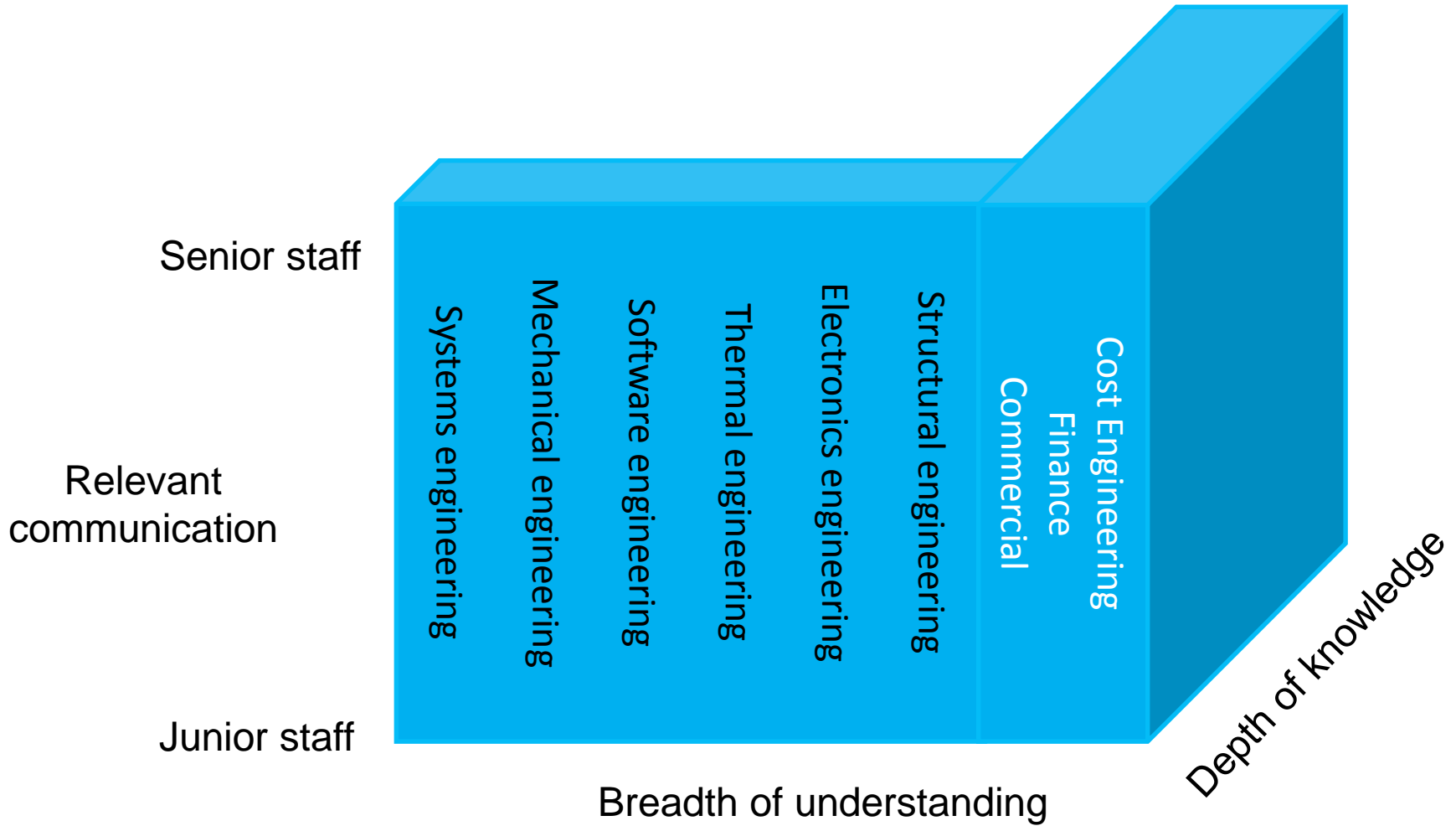


People's skills, professionalism and knowledge

Dale Shermon | QinetiQ Fellow



Knowledgeable

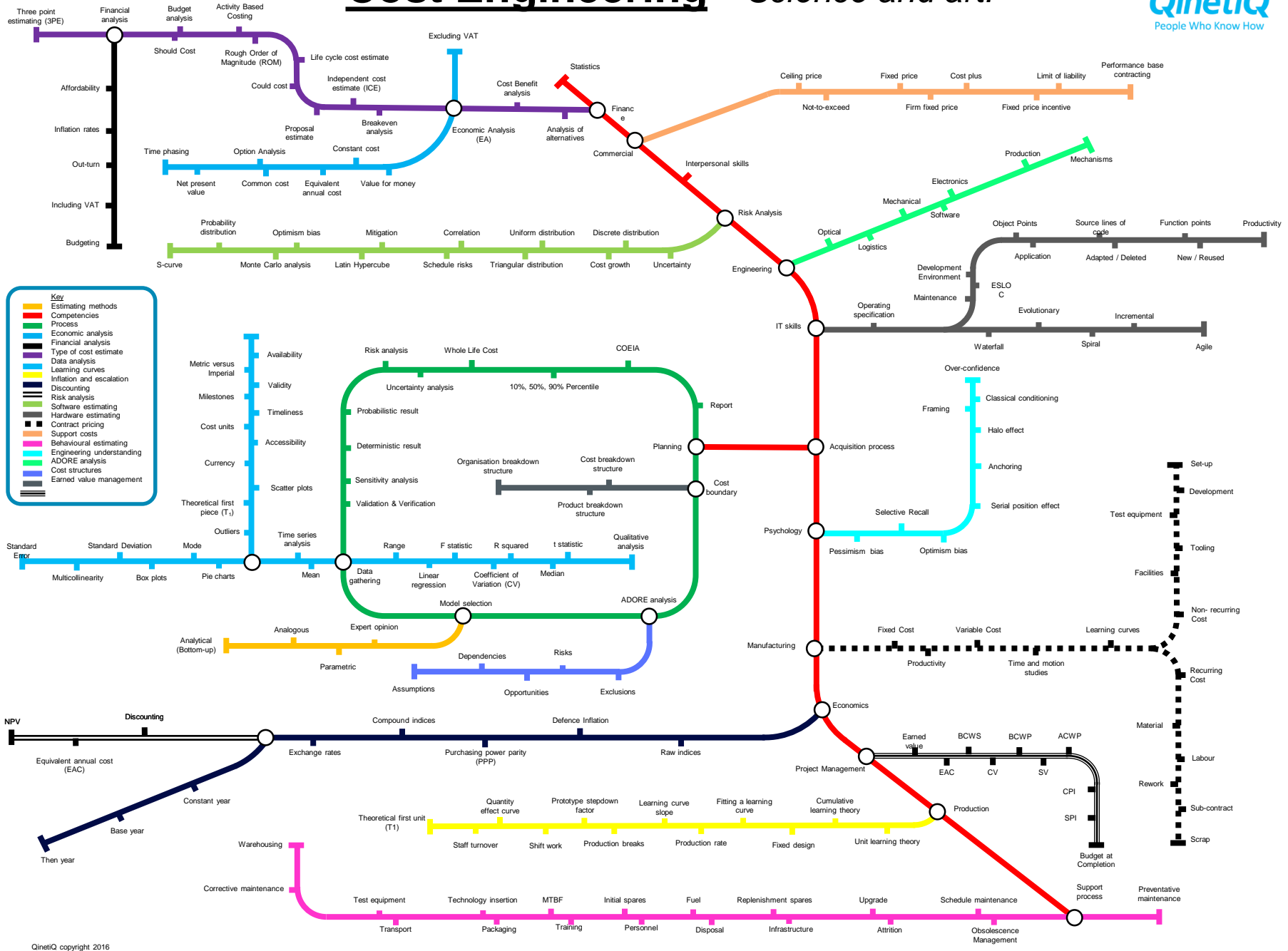


Jack of all trades – Master of none!

A fighter jet is shown on a runway at night with its nose open. The jet is illuminated by ground lights, and the background is dark. The text is overlaid in red on this image.

Organisational experience
Technical experience
Mathematical & statistical skills
Commercial experience
Finance experience
Communication and interpersonal skills
Computer and IT skills
Principles of Project Management

Cost Engineering - Science and art!

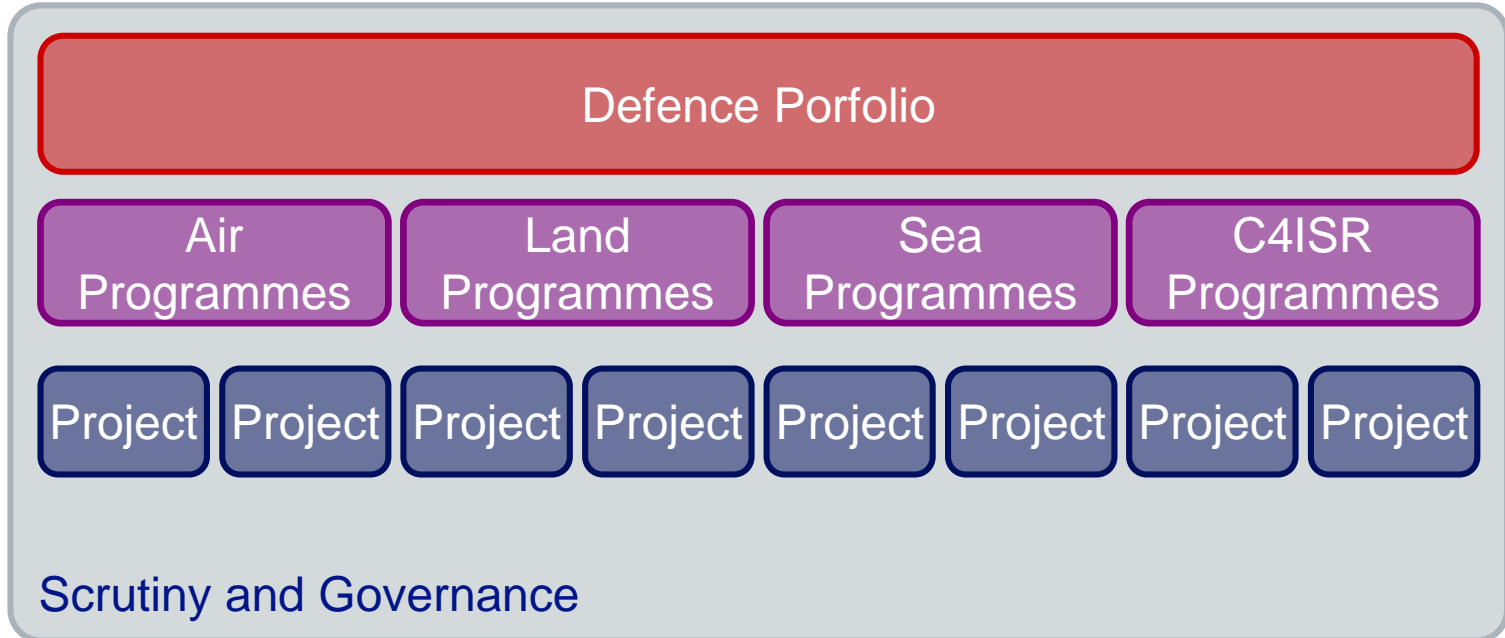


Process existence and utilisation

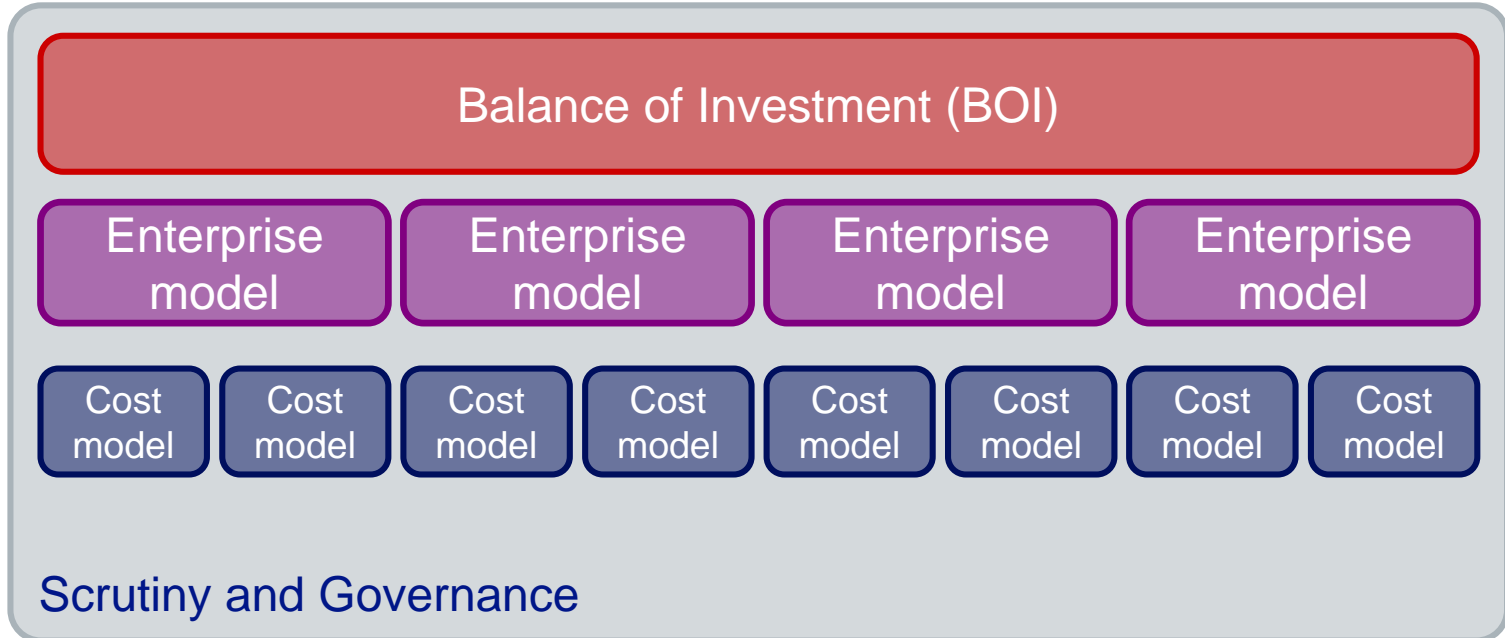
Dale Shermon | QinetiQ Fellow



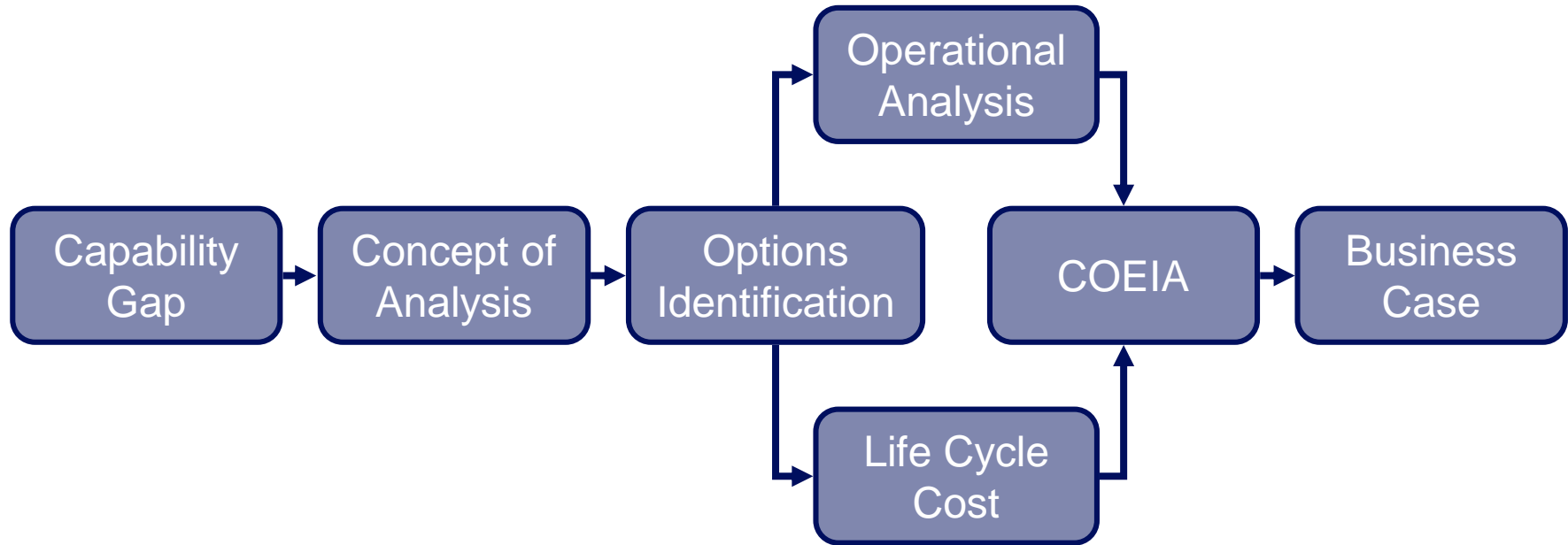
Analysis process



Analysis process

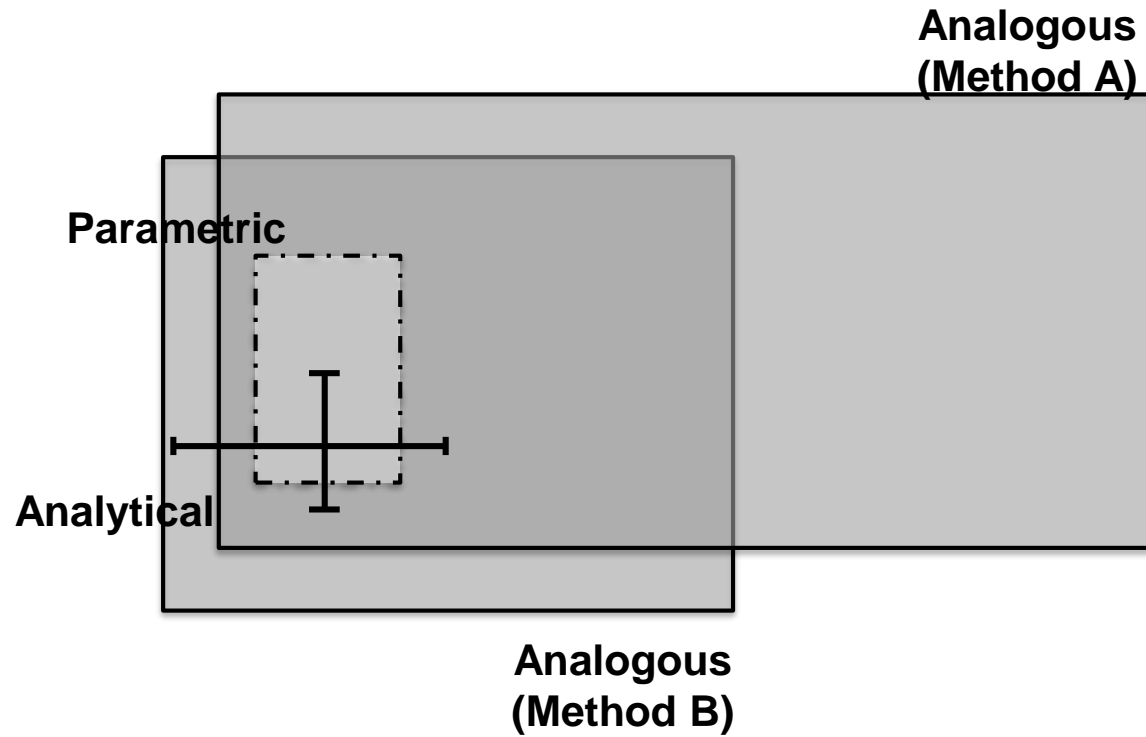


Decision making process



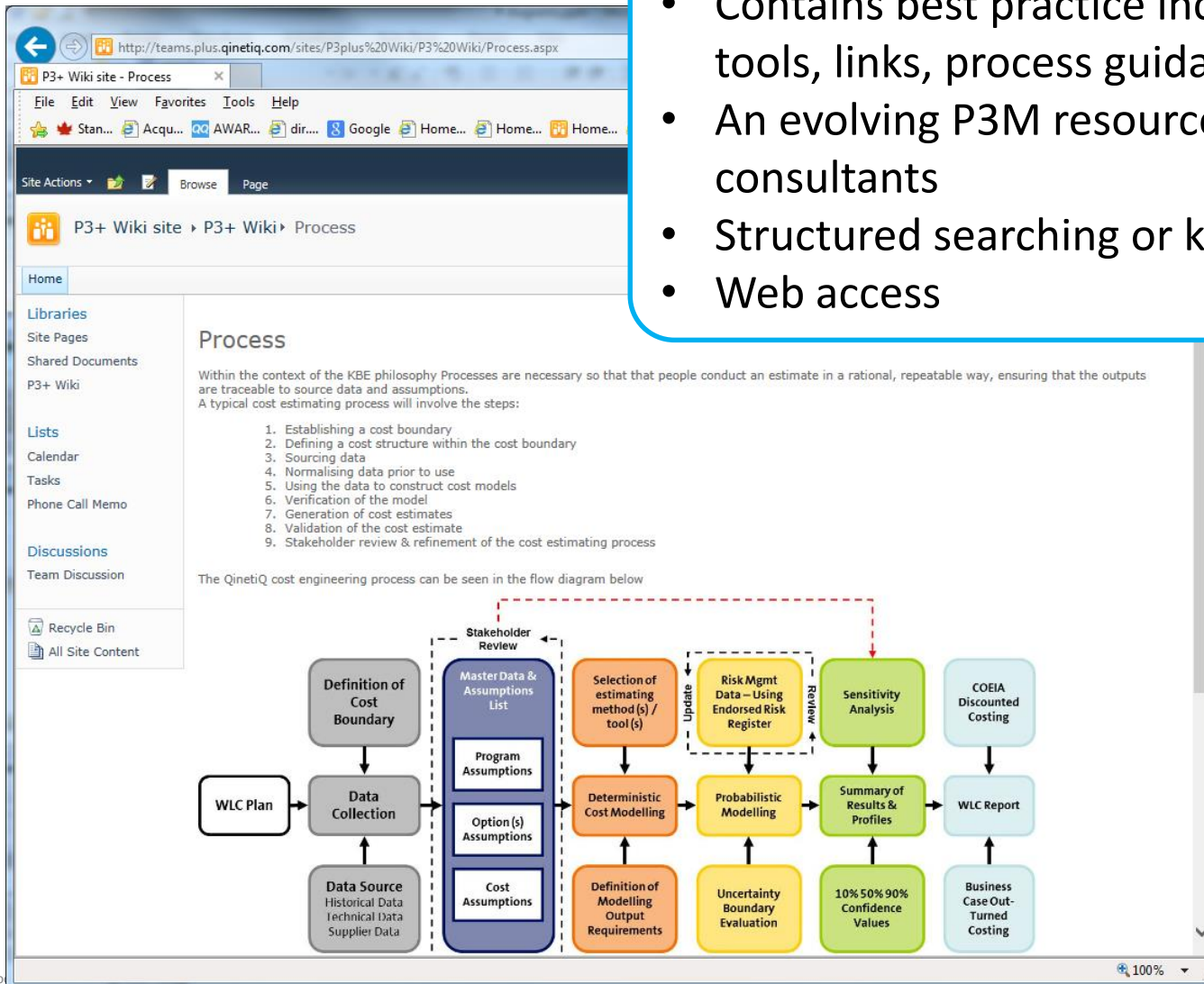
An analysis - not an opinion!

Cost



QinetiQ P3+ Wiki

- Contains best practice including templates, tools, links, process guidance and so forth.
- An evolving P3M resources for QinetiQ consultants
- Structured searching or key word searching
- Web access



Process

Within the context of the KBE philosophy Processes are necessary so that that people conduct an estimate in a rational, repeatable way, ensuring that the outputs are traceable to source data and assumptions.
A typical cost estimating process will involve the steps:

1. Establishing a cost boundary
2. Defining a cost structure within the cost boundary
3. Sourcing data
4. Normalising data prior to use
5. Using the data to construct cost models
6. Verification of the model
7. Generation of cost estimates
8. Validation of the cost estimate
9. Stakeholder review & refinement of the cost estimating process

The QinetiQ cost engineering process can be seen in the flow diagram below

```

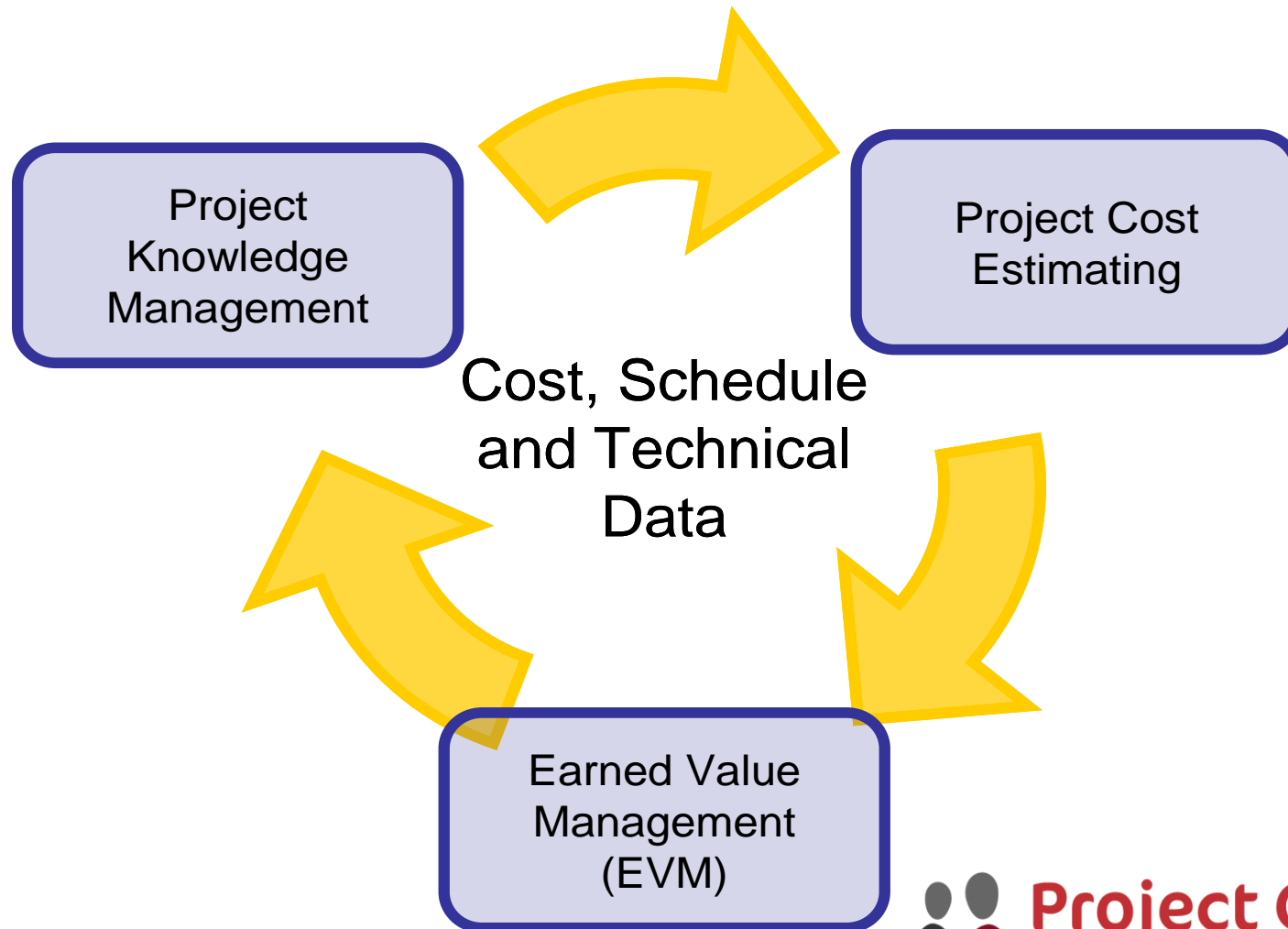
    graph TD
      WLCPlan[WLC Plan] --> DataCollection[Data Collection]
      DataSource[Data Source  
Historical Data  
Technical Data  
Supplier Data] --> DataCollection
      DataCollection --> MC[Master Data & Assumptions List  
Program Assumptions  
Option(s) Assumptions  
Cost Assumptions]
      MC --> DefCost[Definition of Cost Boundary]
      DefCost --> DataCollection
      MC --> SelMethod[Selection of estimating method(s) / tool(s)]
      SelMethod --> ProbMod[Probabilistic Modelling]
      ProbMod --> SensAnalysis[Sensitivity Analysis]
      SensAnalysis --> WLCReport[WLC Report]
      WLCReport --> COEIA[COEIA Discounted Costing]
      WLCReport --> BusinessCase[Business Case Out-Turned Costing]
      
      DefCost --> DetMod[Deterministic Cost Modelling]
      DetMod --> ProbMod
      
      SelMethod --> RiskMgmt[Risk Mgmt Data - Using Endorsed Risk Register]
      RiskMgmt --> ProbMod
      
      DetMod --> UncEval[Uncertainty Boundary Evaluation]
      UncEval --> ProbMod
      
      ProbMod --> SumRes[Summary of Results & Profiles]
      SumRes --> SensAnalysis
      
      SumRes --> ConfVal[10% 50% 90% Confidence Values]
      ConfVal --> SensAnalysis
      
      SensAnalysis --> StakeholderReview[Stakeholder Review]
      StakeholderReview --> SelMethod
      StakeholderReview --> RiskMgmt
      StakeholderReview --> ProbMod
      
      StakeholderReview --> DefCost
      StakeholderReview --> DetMod
      StakeholderReview --> UncEval
      StakeholderReview --> SumRes
      StakeholderReview --> ConfVal
  
```

Culture, leadership and management

Dale Shermon | QinetiQ Fellow



Managing learning and calibrating



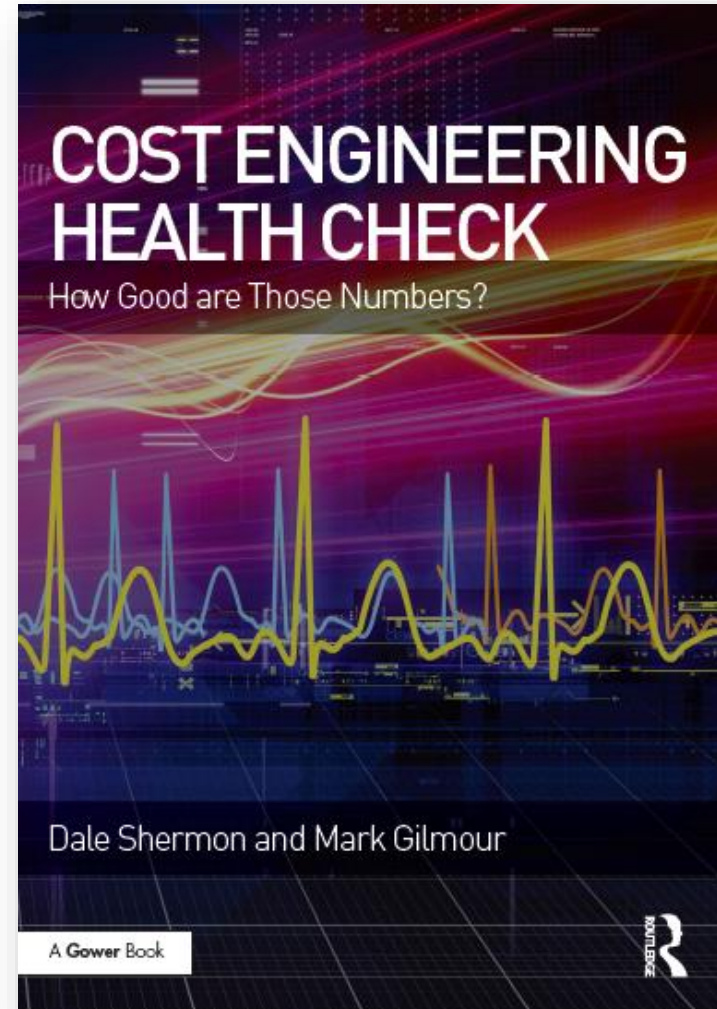
Summary

Dale Shermon | QinetiQ Fellow



How mature is your cost organisation?

- **How good is your estimating capability?**
 - Benchmark against best practice
- **How do you compare with your peers?**
 - Benchmark against industry standards
- **How can you improve?**
 - Focus resources towards areas identified as weak
- **Many thanks for your time**
 - Any questions?





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