Department for Business, Energy & Industrial Strategy

GOOD ENOUGH FOR GOVERNMENT WORK

Introducing a Network Approach to Quality Assurance of Operational Research in support of Public Policy Design and Implementation

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Modelling Integrity Topics

- **Motive**
  - **Why** do Quality Control and Assurance?
- **Means**
  - Embedding quality
  - **How** to do this?
    - Working tools
  - **Who** does **what** and **when**
    - 5 Steps
- **Opportunity**
  - Shaping Process and Collaboration

- **Q and A**
- **Discussion**

"Remember that all models are wrong;
the practical question is
how wrong do they have to be
to not be useful."

George E. P. Box

Modelling Integrity gives confidence in
how wrong a model is and
that it is **still useful** for the **question at hand.**

Motive - West Coast Mainline

15 August 2012 – Franchise award to FirstGroup - challenged by Virgin through High Court

3 October 2012 - Award scrapped - Virgin continue running the route during rerun

*'The **errors** exposed by our investigation are deeply concerning. They show a lack of good process and **a lack of proper quality assurance…** 'completely unacceptable mistakes'*

*'I am determined to identify exactly what went wrong and why, and to put these things right so that we **never** find ourselves in this position **again**.'*

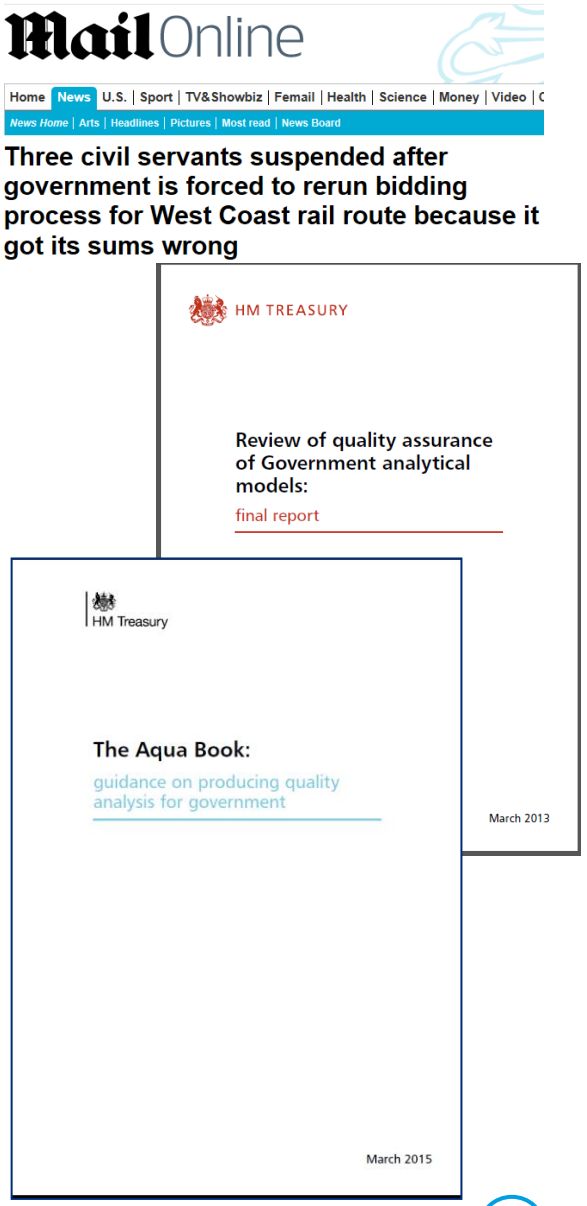
Philip Rutnam

Permanent Secretary at the Department for Transport

https://www.theguardian.com/uk/2012/oct/03/west-coast-mainline-process-derailed

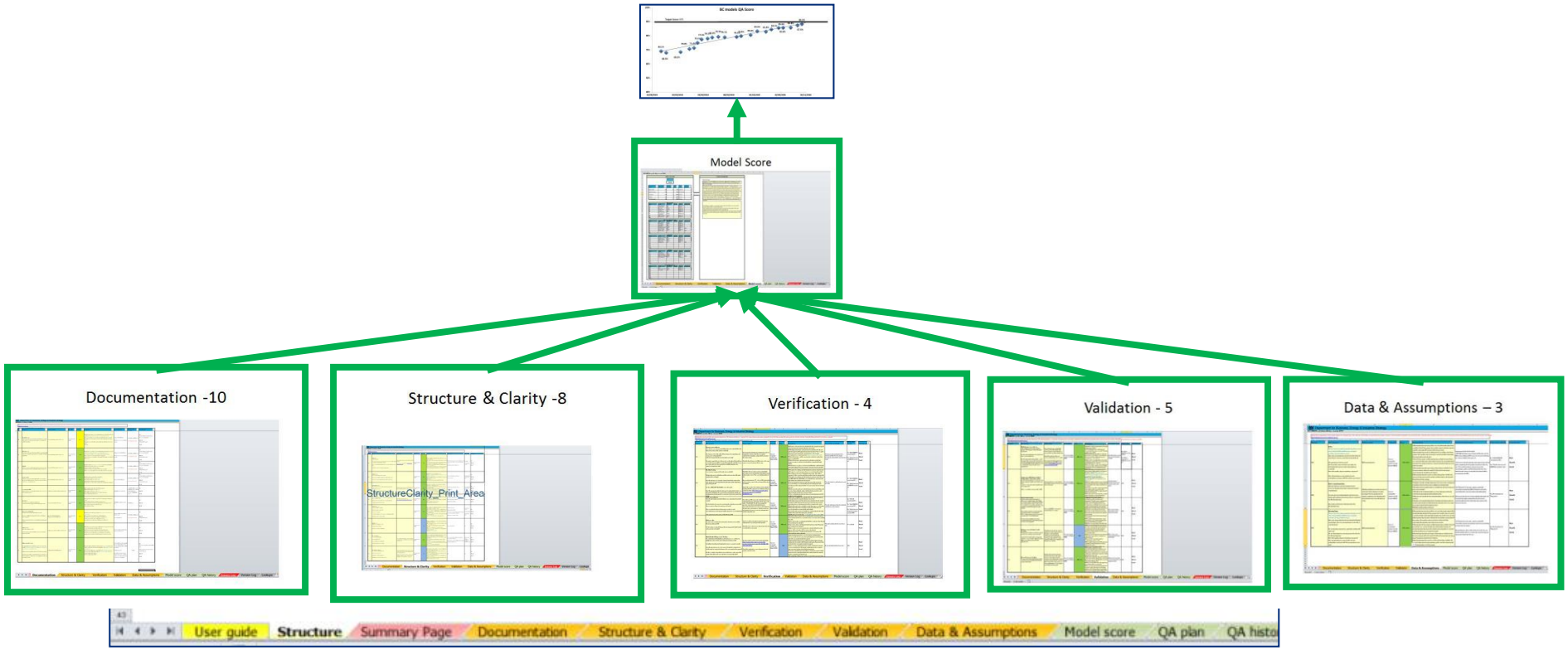
Motive - Why MI?

- **Modelling Integrity** is essential to produce requisite, reliable, rigorous evidence as a **basis for decision** and **policy design**
- **Macpherson** Review of modelling
  - Set **requirements** across Government
- The **AQUA** book
  - High level ways to implement these
- Analysis Leadership Team endorsed **Network** Approach in BEIS
  - Maintain **reputation** as quality Analysts
  - By following the process better models tend to be built



https://www.gov.uk/government/publications/review-of-quality-assurance-of-government-models
https://www.gov.uk/government/publications/the-aqua-book-guidance-on-producing-quality-analysis-for-government

Means - 3 working tools

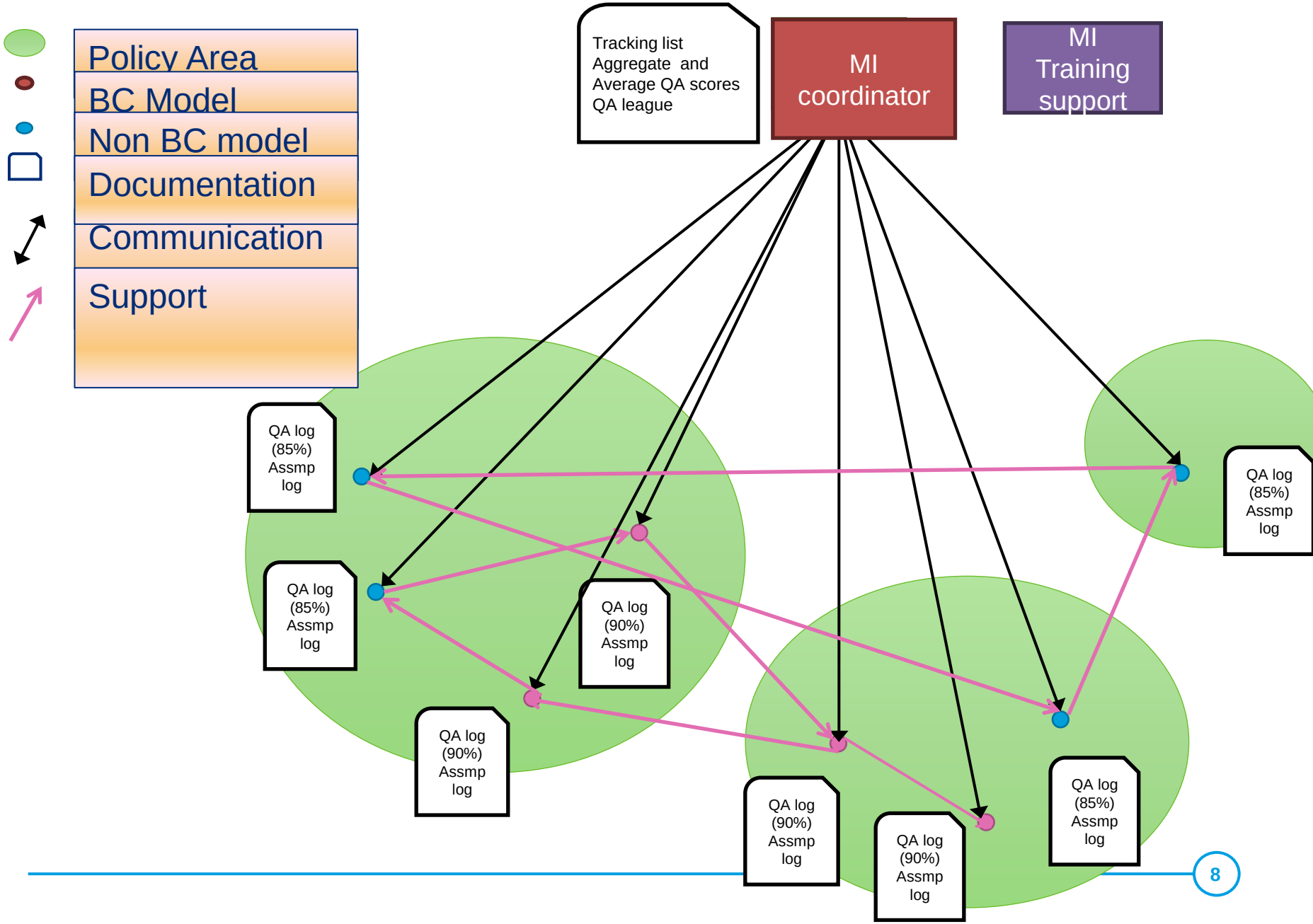


- **QA Log** is the lynchpin - 5 criteria : 30 questions => Score Target 85 or 90
  - **Sum** of model scores gives state of modelling in **BEIS**
- **Model Report** introduces the model, collecting key information in one place
- **Assumptions Log** – often essential to understand risks and uncertainties

https://intranet.beis.gov.uk/task/modellingintegrity
https://www.gov.uk/government/collections/quality-assurance-tools-and-guidance-in-decc

Means - Who

- Previously:
  - DECC **Modelling Integrity** Team and Circle of **QA Champions**
  - BIS **project support**
- Now:
  - BEIS Team of **One**
  - Scope and tempo of work need **flexible collaboration** to deliver
    - **Network** of **Mutual Support** as part of the Analyst day job
      - Annual **objectives** for Analysts
        - Analyst in one area does
          - Quality **Control** on model in **own** area
          - Quality **Assurance** for **another** area
- **Assurance** comes from **independent** view
  - *No marking of own homework*
- **QA Champions** reinforce the **network**


Policy Area
BC Model
Non BC model
Documentation
Communication
Support
Tracking list
Aggregate and
Average QA scores
QA league
MI
coordinator
MI
Training
support
QA log
(85%)
Assmp
log
QA log
(85%)
Assmp
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QA log
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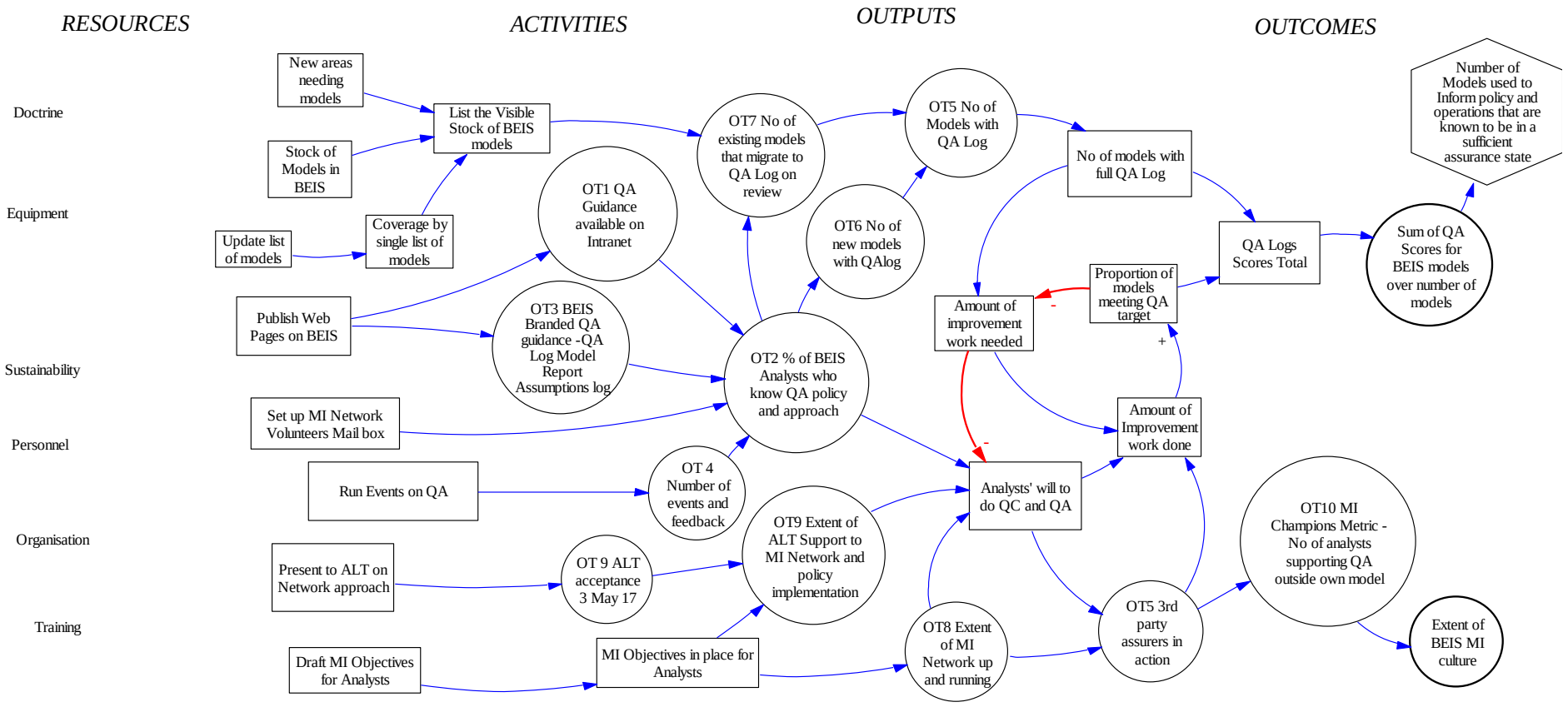
Opportunity – through Network

- Manage **Capability** rather than a team :
  - **Doctrine** – Theory and Authority
  - **Equipmen**t – the means –QA Log – plus the Tracking Sheet
  - **Sustainability** - Mapping tracking and **communication**
    - Develop **Connections –** match making
    - **Depth** of Quality Assurance needed and **Time** to implement
  - **Personnel** - Analysts
  - **Organisation** – Machinery of Government
  - **Training** – Use of QA Log
- Problem Structuring Methods assist with **Scoping models**
  - **Understand** the policy problem
    - Determine key **variables**
    - Agree what the model needs to do to be **useful**

Capability – Structuring the problem



5 Steps to QA

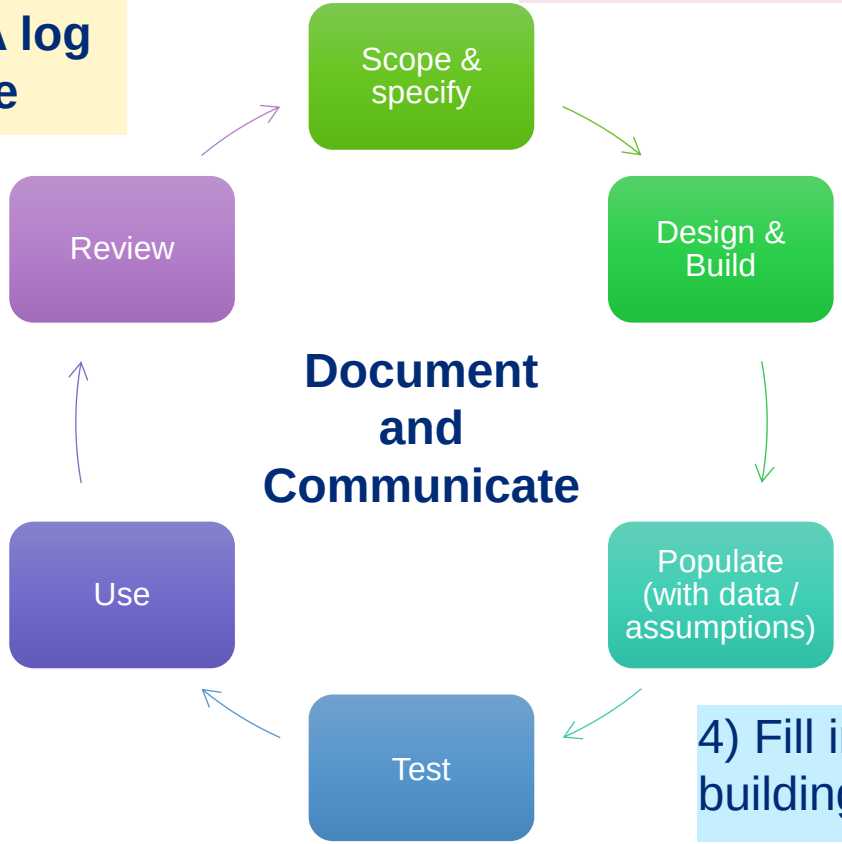
1) Start scope, specification and model map sections of **model report template**. Discuss model development plan with Modelling Integrity and QA Analyst**.**

2) Develop model using best practice (e.g. **Excel template and guidance**) so that it is easy to change and QA

3) Start **QA log**, and write **QA plan** at an early stage

4) Fill in **assumptions log** whilst building the model,

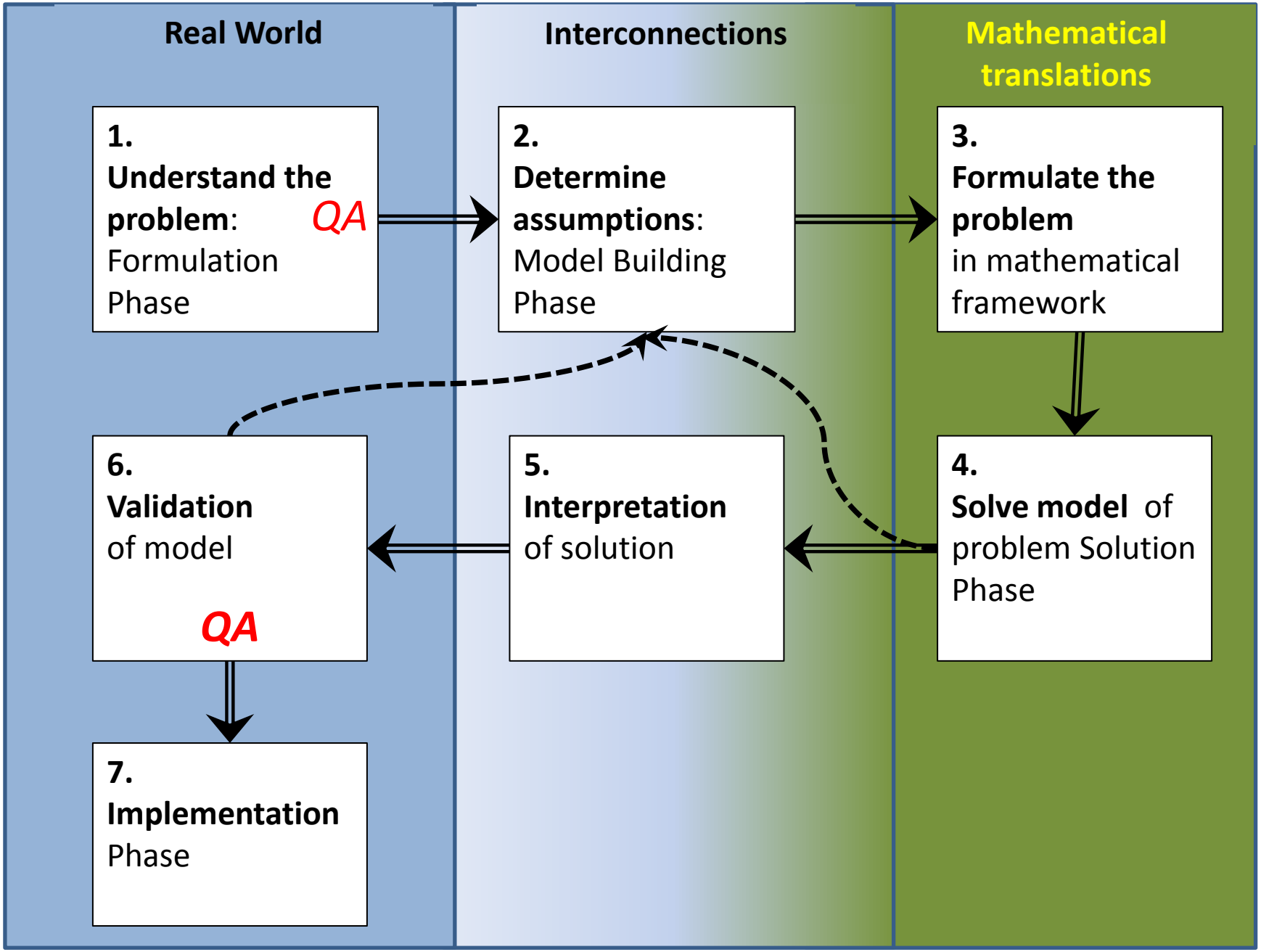
5) QA Analyst reviews the proposed **QA log** and **model score**



Means - Opportunity

- **Involvement** through process of modelling
  - Preserving **independence**
    - Quality **Control** is by the model builder
    - Quality **Assurance** (QA) is by someone else
- Beware **confusion** of augmentation of build team with QA
- Harrison's figure*
    - 7 phases
      - Real World
      - Interconnections
      - Mathematical Translations
  - Quality Assurers work on the boundary of the real world
    - **Gatekeepers**

*Figure 6 page 37 Paul Harrison Operational Research 1983 Mitchell Beazley London


Real World
Interconnections
Mathematical translations
1. Understand the problem: Formulation Phase
QA
2. Determine assumptions: Model Building Phase
3. Formulate the problem in mathematical framework
4. Solve model of problem Solution Phase
5. Interpretation of solution
6. Validation of model
QA
7. Implementation Phase

What now constitutes requisite, rigorous and reliable modelling?

- **George Box:**
- **"**Remember that **all models** are **wrong**; the practical question is **how wrong** do they have to be to not be useful."
- "In the inferential stage, the analyst acts as a **sponsor** for the model. Conditional on the assumption of its truth he selects the best statistical procedures for analysis of the data. **Having completed** the analysis, however, he must switch his role from **sponsor to critic."**
- Since all models are wrong the scientist cannot obtain a "correct" one by **excessive elaboration**."
- "Since **all models are wrong** the scientist must be alert to what is **importantly wrong**.

It is inappropriate to be concerned about **mice** when there are **tigers** abroad.

Question and Answers – Discussion

Apologies to the late Lord Kitchener

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Back to basics – What is a model?

- All models:

Take **inputs** and assumptions

Perform some **calculations**

Produce **outputs**

- Models are **simplified** versions of the real world. They can help by:
- Forecasting a particular **number** (eg pension spend);
- Better **understanding** of the market / policy drivers / intervention points;
- Identifying unintended or perverse **consequences**.
- What is a "model" – **Any Code**? Is the model **always** a **spreadsheet**?

A model is **not an end** in itself. A model is simply a tool to help intelligent people make **better decisions.**