

# Model Risk

Colin Wilson, Technical Director Government Actuary's Department  
LSE Seminar on Risk Management & Climate Change, 14<sup>th</sup> January 2014



# Why use models? – some considerations

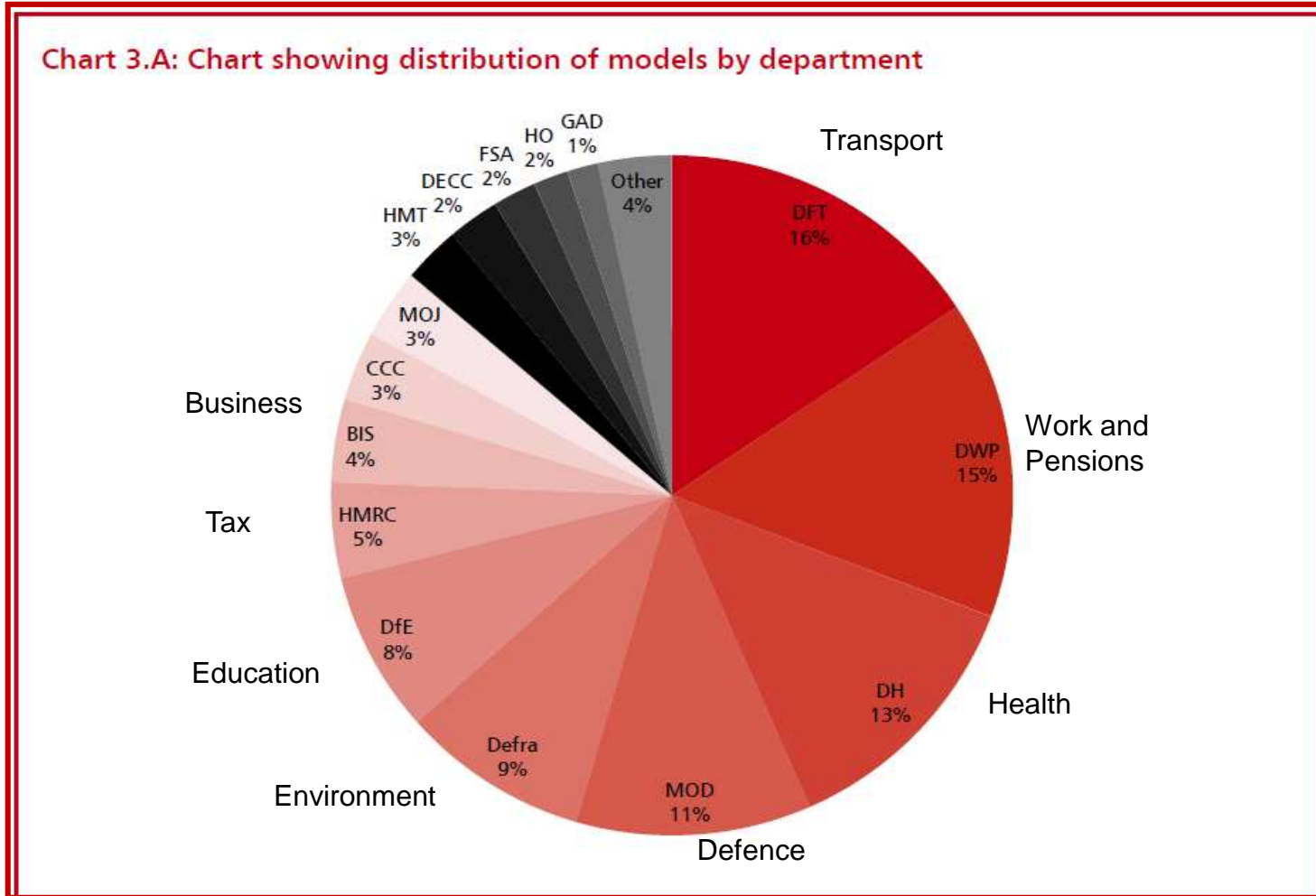
- Many problems too complex without models
- Models are simplifications of reality, but can
  - Aid understanding
  - Help predict what may happen
- Models can't
  - Quantify everything
  - Tell you what to do!
- Models should never be 'black boxes'

The image shows the cover of a report. At the top, there is a red horizontal bar with the text 'GOVERNMENT ACTUARY'S DEPARTMENT' in white. Below this is a dark blue horizontal bar with the text 'ACTUARIAL ANALYSIS FOR THE PUBLIC SECTOR — FROM THE PUBLIC SECTOR' in yellow. The main title 'A DECISION-MAKER'S GUIDE TO LONG-TERM FINANCIAL MODELLING' is centered below these bars. A yellow rounded rectangle contains the following text: 'USES', 'ABUSES', 'HOW TO IMPROVE', and 'HOW TO REVIEW'. At the bottom, the date 'December 2011' is printed.

# Types of model used in Government

Model type	Purpose	Examples
Policy simulation	Appraisal of policy options, analysis of impact on people, finances, etc	Intra Government Tax Benefit Model
Forecasting	Assessing the future, perhaps to provide base information for policy development or financial planning	State Pension expenditure forecast
Financial evaluation	Assessment of liability or future cost	Pension liabilities, higher education loan repayment model
Procurement and commercial	Evaluation of VfM or affordability and award of contracts	Awarding of rail franchises
Planning	Planning current actions based on future forecasts	Teachers, NHS
Science-based	Understanding and forecasting natural systems	Climate change
Allocation	Distribution of funding across organisations responsible for service delivery	Police allocation formula

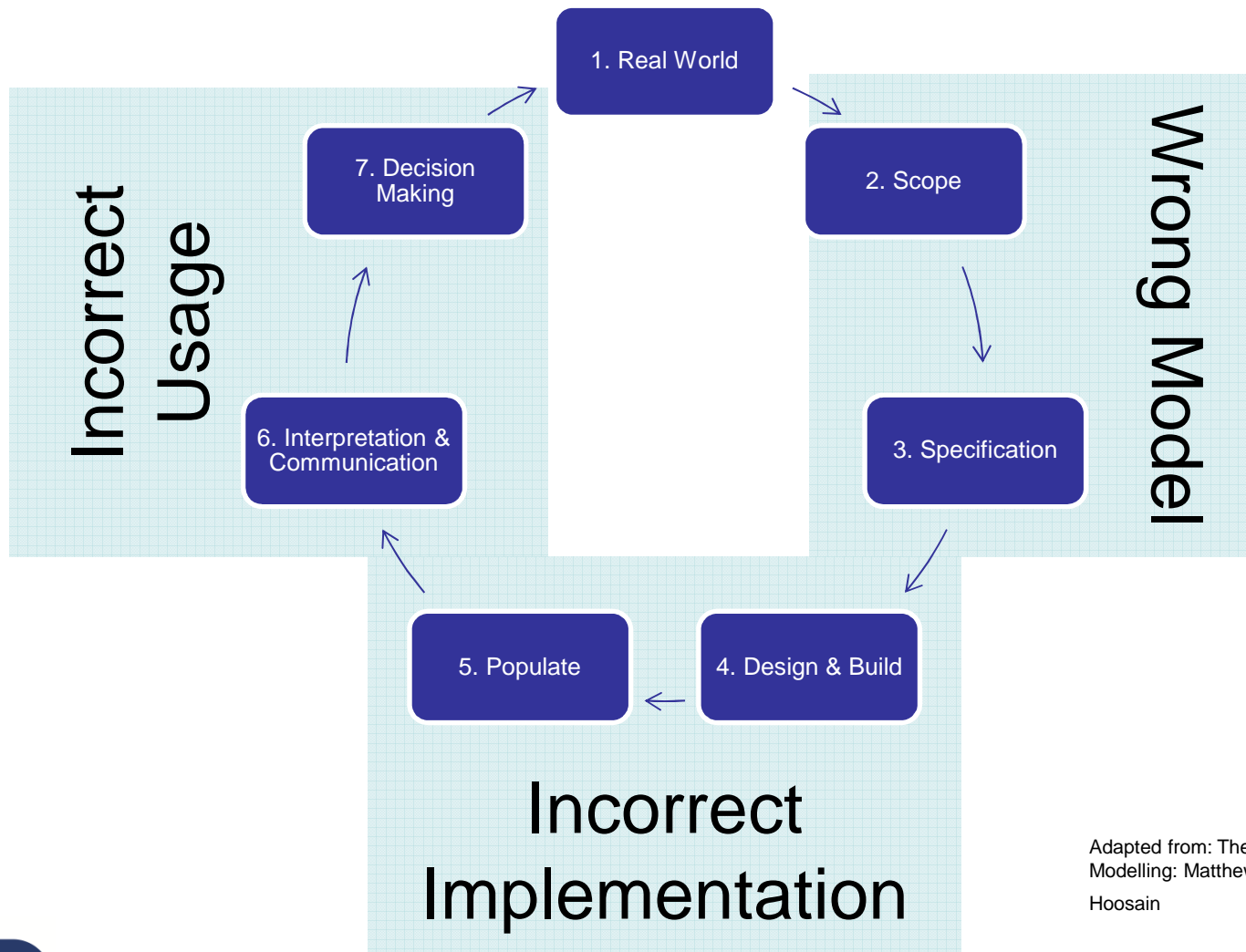
# “Business-critical” model use in Government



Source: Review of quality assurance of Government analytical models: final report

([https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/206946/review\\_of\\_qa\\_of\\_govt\\_analytical\\_models\\_final\\_report\\_040313.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/206946/review_of_qa_of_govt_analytical_models_final_report_040313.pdf))

# Where things go wrong



Adapted from: The Philosophy of Modelling: Matthew Edwards, Zaid Hoosain

# Potential consequences

## Failure

## Potential consequences

Errors of omission

Miscommunication of caveats

Misinterpretation of results

Drift in model use

Lack of documentation

Wrong policy choice

Misallocation of resource

Reputational damage

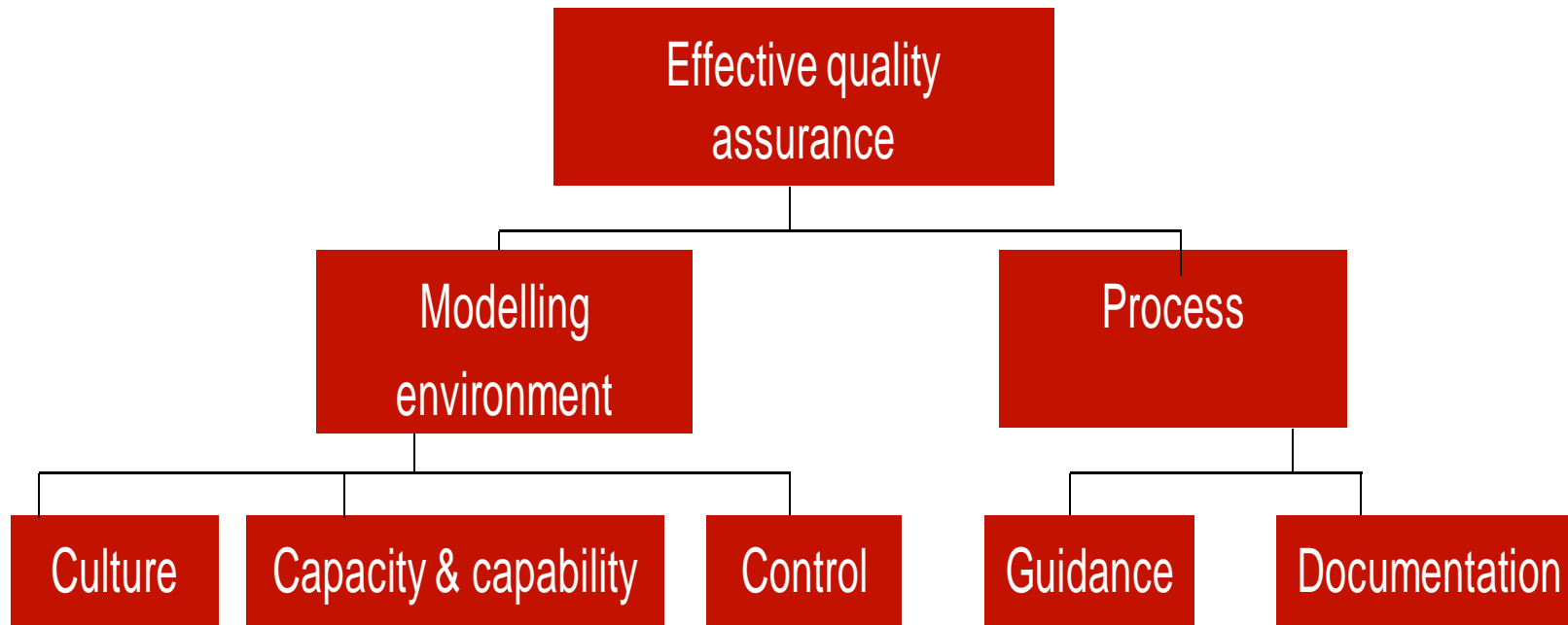
Duplication of effort/Wasted time

Service failure

Remedial costs (e.g. for procurement)

Financial shortfall

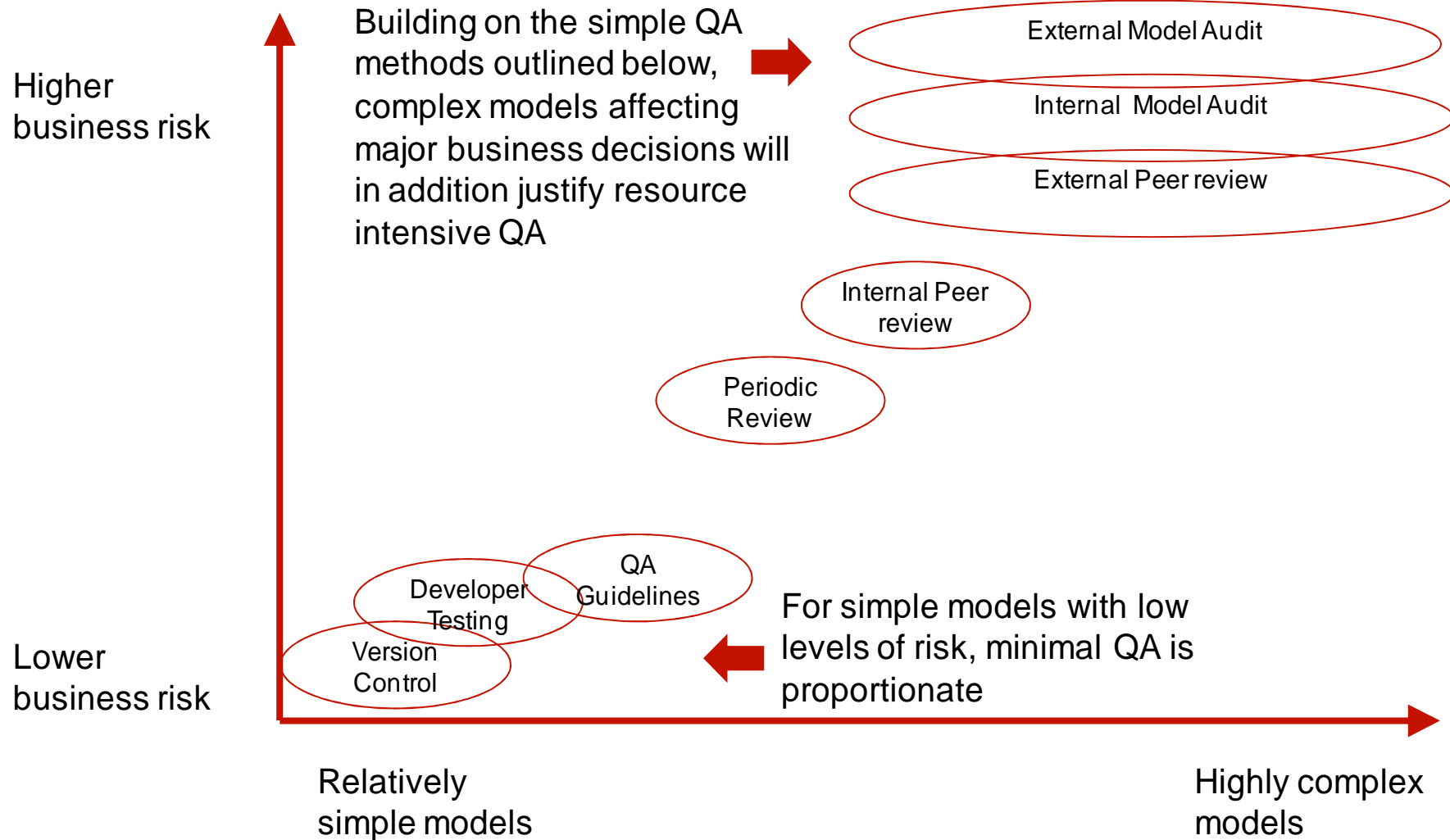
# Macpherson review - elements of effective QA



Source: Review of quality assurance of Government analytical models: final report

([https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/206946/review\\_of\\_qa\\_of\\_govt\\_analytical\\_models\\_final\\_report\\_040313.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/206946/review_of_qa_of_govt_analytical_models_final_report_040313.pdf))

# Macpherson review – schematic for types of QA





## Recap of key messages from Macpherson review

- Environment as important as process
- Achieve accountability by clear SRO for each model plus annual Accounting Officer sign-off
- Ongoing QA is vital where circumstances change or there is a change of model SRO
- External review/audit and/or transparency via publication often particularly effective
- Also key is control over use of models
  - e.g. importance of communicating limitations and uncertainty

## Lessons / Conclusions – why use an actuary?

- Actuaries do not have a monopoly on these ideas ...
- ... but are used to handling uncertainty and a full range of quantification techniques
- Recognise that models should inform decisions not dictate them
- External, professional challenge and assurance are valuable
- ... including a “big picture” perspective to assess reasonableness of results