This standard is part of a set of operational standards which set the expectations regarding how government is managed. Standards may include both mandatory and advisory elements. The following conventions are used to denote the intention:

<table>
<thead>
<tr>
<th>Term</th>
<th>Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>shall</td>
<td>denotes a requirement: a mandatory element.</td>
</tr>
<tr>
<td>should</td>
<td>denotes a recommendation: an advisory element.</td>
</tr>
<tr>
<td>may</td>
<td>denotes approval.</td>
</tr>
<tr>
<td>might</td>
<td>denotes a possibility.</td>
</tr>
<tr>
<td>can</td>
<td>denotes both capability and possibility.</td>
</tr>
<tr>
<td>is/are</td>
<td>denotes a description.</td>
</tr>
</tbody>
</table>

The meaning of words is as defined in the Shorter Oxford English Dictionary, except where defined in the Glossary in Annex B.

It is assumed that legal and regulatory requirements are always met.
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About this government functional standard

Principles

Context

Governance of analysis

Life cycle for analytical work

1. Scoping the analysis
2. Designing the analysis
3. Conducting and checking the analysis
4. Delivering analytical work to the commissioner
5. Approving analysis
6. Disseminating the analysis

Analytical practices

- Risk and uncertainty
- Verification and validation
- Third party analysis
- Data and information management
- Analytical best practices, models, methods and tools

Figure 1. Structure and scope of this functional standard
1 About this government functional standard

1.1 Purpose of this standard
The purpose of this government functional standard is to set expectations for the planning and undertaking of analysis, to build trust and confidence and enable better informed decision making relating to government policy, operational and financial matters, and the wider public debate.

This standard provides direction and guidance for:

- permanent secretaries, directors general and chief executive officers of arm’s length bodies and suppliers, to ensure an environment which promotes delivery success and integrates with their other activities
- users and producers of government analysis, including non-analysts and external consultants, ensuring clarity of terminology and language and to facilitate multidisciplinary working.

1.2 Scope of this standard
This standard applies to all government analysis (including the generation, processing and presentation of data, evidence and research) carried out by anyone within or on the behalf of government, whether they are an analyst or not:

- in all departments and arm’s length bodies
- informing policies ranging from publications listed on gov.uk to those at a local business level

- whether for programmes, projects or operational services
- regardless of analytical methodology or technique used.

Other public sector organisations, devolved or local authorities may find this standard useful.

1.3 Government standards references
The following functional standards should be used in association with this standard.

- GovS 002, Project Delivery
- GovS 007, Security
- GovS 008, Commercial
- GovS 011, Communication

2 Principles
Those responsible for commissioning and undertaking analysis shall ensure:

1. that analytical work addresses a question or outcome relating to government policy or organisational strategy
2. that accountabilities and responsibilities with respect to analysis are defined, mutually consistent, and traceable across disciplines
3. the right interdisciplinary analysis team is built, collaborating across the relevant professions, to inform Ministers and other leaders from the outset through interdisciplinary working
4. the analysis is widely consulted upon, open to and encompasses a range of different perspectives from partners and users of analysis
5. that results are independently validated by analytically qualified professionals, or experienced subject matter experts
6. the results of the analysis are written and presented so they can be easily understood by, and are useful to, the user

7. the effort and costs of analysis demonstrate evidence reliability, value for money and are proportionate to the impact expected from the results

8. innovative approaches are considered and follows analytical professional guidance so judgements and facts are presented impartially, without bias, with limitations and assumptions clearly stated

9. user needs are responded to while applying analytical best practice, precision and rigour in their work

10. the investment in their own and their team’s continuous professional development

11. that public service codes of conduct and ethics and those of associated professions are upheld.

3 Context

3.1 Analysis in government

The management of analysis for, and on behalf of, government is distributed across departments, arm’s length bodies, or any other organisation within the scope of the functional standard (see 1.2).

Ministers and other leaders rely on analysis to inform their decisions. Understanding the rationale for a decision enables the appropriate type and rigour of analysis to be undertaken. A variety of analytical approaches are used to build the evidence to support decision-makers and different approaches can be used at different points in the development of the analysis results.

Analysis is a collaborative activity supporting the development and delivery of policy (see figure 2).

Analysis is commonly carried out by analysts, non-analysts and third parties.

3.2 Authority arrangements

 Whilst accountability for analysis rests ultimately with the Accounting Officer of each government organisation, the following independent assessments are carried out, supported by analysis specialists:

- value for money by HM Treasury
- official statistics by the UK Statistics Authority.

3.3 Types of analysis

Types of analysis, which are commonly needed in the generation, delivery and review of policy include:

- actuarial analysis
- economic analysis
- financial analysis
- operational research / analysis
- scientific, technical and engineering research
- social research
- statistical analysis
• workforce analysis
• data analytics
• data science.

3.4 Analytical best practice guidance, models, methods and tools

Analysis can be supported by best practice, models, methods and tools so that consistent and, where necessary, comparable results can be achieved by different teams in different parts of government.

3.4.1 Analytical best practice guidance

Government analytical best practice guidance provides a framework for models, methods and tools to be used by analysts to produce consistent, trusted and transparent results.

3.4.2 Analytical models

Analytical models use information or data to provide insight into a question. Different types of models, for example, analytical, mathematical, simulation or forecasting can help better understand a problem or indicate a solution as part of the analytical method or identify negative impacts.

Analysis models are used for a variety of purposes including:

• testing systems under different scenarios
• carrying out investigations to understand a problem in more detail
• enabling the monitoring and evaluation of processes to facilitate risk management
• comparing and appraising options
• understanding past behaviour or operations to better prepare for the future.

Analytical models can be used to simulate, conceptually describe or forecast the real world, as well as allocate resource, such as:

• policy simulation to better understand policy options that drive government decisions
• forecasting to predict the future and inform today’s policy choices.
• financial evaluation to better understand future liabilities or costs
• procurement and commercial evaluation for the letting and management of large contracts, and to ensure value for money
• planning to make workforce decisions which affect the delivery of future services
• science based to better understand and simulate the physical environment, to evaluate possible solutions or to mitigate potentially devastating impacts
• allocation of funds to determine how funds allocated to departments are then distributed
• conceptual, to help understand the key influences that are important to a system being modelled.

3.4.3 Analytical and scientific methods

Analytical and scientific methods can be used to better understand possible solutions or to mitigate against adverse impacts.

Analytical methods provide a defined process which, combined with the scientific method, provide a series of steps to identify a problem, test a hypothesis, implement a solution, then continuously improve the solution. Following a defined process encourages the identification of the root cause of a problem and provides a structure to measure, test and subsequently address it.
3.4.4 Analytical tools (or techniques)

Analytical tools are used to produce calculations (especially repetitive or lengthy ones) in a consistent and efficient manner when following best practice guidance and analytical methods. Computer applications are analytical tools which include verbal or written qualitative data which can also be used as tools.

4 Governance

4.1 Governance framework

Governance comprises authorising, directing, empowering and overseeing management. The governance of analysis should be an integrated part of an organisation’s overall governance.

A governance framework should include the authority limits, decision making roles and rules, degree of autonomy, assurance needs, reporting structure, accountabilities and responsibilities together with the appropriate management frameworks for undertaking the practices defined in this functional standard.

4.2 Cross government management framework

A governance framework should be defined and established by a nominated senior accountable officer (see 4.7.1) to provide common best practice, models, methods and tools to enable a consistent approach to the conduct and presentation of analysis across government.

Such best practice, models, methods and tools should:

- be registered and accessible to potential users
- have a defined owner (see 4.7.6)
- be periodically reviewed for currency and appropriateness.

A consistent approach to assurance should be implemented (see 4.6) to ensure the results of analysis can be trusted by users, regardless of the organisation which commissioned or conducted it.

4.3 Organisational management framework

A governance framework for the management of analysis shall be established which complies with government and departmental policies and directives, and with this standard.

Each organisation should define a management framework for analysis which includes roles, business processes and terminology reflecting the organisation’s needs, this functional standard and with which those involved in analysis should comply.

Each organisation should have a senior officer accountable for analysis.

Analytical activity should be incorporated into an organisation’s single departmental plan (or equivalent in an arm’s length body) by association with the policy or work it supports, in particular where:

- government transformation objectives are dependent on the organisation’s objectives
- organisational objectives are dependent on objectives of the analysis
- performance indicators, inputs, milestones, deliverables, risks and dependencies inform the above.

4.4 Management framework for an analysis assignment

A management framework for undertaking each analysis assignment should be defined and communicated to those involved in its conduct or who have an interest in its
The management framework should cover all aspects of this functional standard throughout the analysis life cycle (see 5), including:

- the authority and decision-making roles and rules (see 4.7)
- names of key role holders, including the commissioner, lead analyst and analytical assurer (see 4.7.7)
- the specification of any necessary best practice, methods, models and tools to be used
- routes to enable analysts and stakeholders to raise concerns
- the approaches to be used to identify, quantify and communicate uncertainty
- how verification and validation of analysis are to be conducted
- timescales, phasing, costs and resources needed.

The management framework may be incorporated within the management framework of the work the analysis supports (such as in a project management framework).

4.5 Decision making relating to analysis

Decisions relating to analysis should be made in a timely manner by evaluating alternative choices against agreed criteria. Stakeholders and subject matter experts should be consulted. Decisions might relate to:

- approving best practices, methods, models and tools and the applications they are approved for
- defining an analysis brief
- approving the analysis design, including the selection of best practices, methods, models and tools to be used in a particular analysis assignment
- the ethics relating the conduct of the analysis and the use of subjects and data
- selecting analysis team members and suppliers
- deciding options for further study
- approving the results and output
- approving the form and timing of the distribution of the results and output
- terminating or suspending analysis work if it is deemed to be unfit for purpose.

Decisions may be conditional, with responsibility for fulfilling such conditions defined. Decisions should be:

- holistic, taking account of the external context and uncertainty
- where appropriate, phased to consider risk
- communicated to the relevant stakeholders.

4.6 Analytical assurance

Assurance is the systematic set of actions necessary to provide confidence to the commissioner and users of the results that the analysis can be relied on for decision making and that appropriate assurance has been, and is being, undertaken.

Each organisation should have a defined and consistent approach to analytical assurance as a part of overall organisational assurance, which should incorporate:

- procedures used and testing undertaken by the analysts
- analytical peer review by skilled and competent persons
- analytical audits (which may be undertaken by internal or external specialists).
Those providing analytical assurance reviews shall be independent of those carrying out the analysis and shall ensure they obtain evidence that appropriate analytical assurance activities have been conducted and that residual uncertainties and risks are understood and communicated.

Before analytical output can be used to inform a decision, an appreciation of its fitness-for-purpose shall be assured, including that:

- the analysis undertaken aligns with its intended purpose and is relevant to the original problem
- appropriate analysis methods, models and tools have been used
- the analysis has been conducted correctly and it is accurate
- the analytical output was provided in time to be useful to decision makers
- the analytical output is presented in an accessible and clear manner
- the analysis is comparable and repeatable.

In the cases of complex analysis or analysis that drives a significant business decision, the commissioner or analytical assurer should ensure formal peer reviews or analytical quality assurance audits are included in the analysis plan. The terms of reference for such reviews or audits should be defined to ensure the assurance is focussed on the right issues and scope.

4.7 Roles and responsibilities

Roles and responsibilities for those involved in analysis shall be defined. This includes, but is not limited to, who each person is accountable to and what activities, outputs or outcomes they are accountable or responsible for. The level of capability of each person undertaking each role should be appropriate to the scope and impact of the analysis being undertaken.

4.7.1 Senior officer accountable for cross-government analysis

The senior officer accountable for cross government analysis is accountable to a defined higher authority for the quality, completeness, reliability and dissemination of good practice in government organisations by:

- providing common best practice, models, methods and tools for use by government organisations
- ensuring each cross government best practice, method, model or tool is identified, and accessible to those who need it
- ensure ownership is assigned and visible for each cross government best practice, method, model or tool (see 4.7.6)
- prompting the use of common approaches and encouraging feedback to owners of analytical best practice, models, methods and tools in order to continually improve the reliability of analysis for decision makers.

This role may be divided across several individuals provided the scope of each individual’s accountabilities is defined and the full scope of what is required is covered.

Note: if commissioning an external peer review or audit, it can be beneficial to undertake an internal peer review or audit first to establish the appropriate specification.
4.7.2 Accounting Officer

The Accounting Officer is the senior executive in a central government organisation, accountable to Parliament and the public for the stewardship of public resources, ensuring they are used effectively and to high standards of probity. The Accounting Officer has ultimate accountability for analysis in their organisation.

Note: The permanent head of a government department is its Principal Accounting Officer. The Principal Accounting Officer generally appoints the most senior executive in organisations under the department’s ambit as an Accounting Officer. Chapter 3 of Managing Public Money [1] explains the role of Accounting Officers.

4.7.3 Senior Officer accountable for analysis in an organisation

The senior officer accountable for analysis in an organisation is accountable to a defined higher authority for the quality of analysis undertaken by the organisation employees, ensuring:

- analysis is compliant and appropriate for its intended use
- the risks, limitations and major assumptions are understood by the users of the model
- the analysis output is appropriate to the business, analytical need
- each organisational best practice, method, model or tool is identified, accessible to those who need it
- ownership of each organisational best practice, method, model or tool is assigned (see 4.7.6).

This role may be divided across several individuals provide the scope of each individual’s accountabilities is defined and the full scope of what is required is covered.

Note: this person is normally the Director of Analysis within a department.

4.7.4 Analysis commissioner

The analysis commissioner is accountable to a named higher authority, for ensuring the brief and context for the analysis are defined and clearly communicated and that the results of the analysis are used appropriately, bearing in mind any stated risks and constraints. The commissioner should ensure:

- there is proportionate governance in place to support the analysis and its intended use
- the scope of the analysis is proportionate to the issue being addressed and that the criticality of the analysis is understood by the analyst and the analytical assurer
- key stakeholders have been identified so their views can be considered
- key aspects of the problem, scope and complexities, including constraints, are captured and clearly communicated
- identification of where the boundaries are between the problem in question and other topical issues or problem areas, including any dependencies
- agreement to the use of specific data and assumptions
- appropriate resources, including specialists, are appointed for the analysis
- the analyst and analytical assurer are notified of changes to the scope, importance or intended use of the analysis
- onward dissemination of the results is clear and effective in the context of the problem being considered.
4.7.5 Analyst

The analyst is accountable to the analysis commissioner for designing, conducting and delivering the analysis, and in particular:

- assisting the analysis commissioner in structuring the question to ensure the appropriate analysis is performed
- defining the scope and boundaries of the analysis
- identifying stakeholders so that the scope and boundaries of the problem can be appropriately explored
- ensuring stakeholder expectations are managed to keep them aligned with what can be delivered
- assumptions relating to the analysis have been agreed with the commissioner
- recording and reviewing the trail of decisions from structuring the problem to developing the analytical plan
- developing the plan for delivering the analysis (schedule, cost and resources)
- defining or choosing the methods to be used and, where appropriate, producing appropriate design documentation
- conducting the analysis in accordance with the agreed plan and method
- ensuring the results of the analysis are delivered and signed off.

For large, complicated or multi-disciplinary analyses, an assigned analyst should act as a lead, supported by a team of specialist analysts.

4.7.6 Officer accountable for an analysis best practice, method, model or tool

The officer accountable for their assigned analysis best practice, method, model or tool (or grouping thereof) is accountable to a defined higher authority for the on-going robustness and associated quality assurance processes related to each best practice, model method or tool, ensuring:

- the best practice, method, model or tool is appropriate for its intended use
- the risks, limitations and major assumptions are understood by the users of the model
- the output is appropriate to the business, analytical need.

Where best practice, methods, models or tools are intended to be used together, the accountable officer should verify that such integration or inter-operability is sound especially when one component is updated.

4.7.7 Analytical assurer

The analytical assurer is accountable to the analysis commissioner for providing independent advice on whether appropriate analytical quality assurance has taken place and for highlighting any outstanding risks. In particular, the analytical assurer should:

- challenge and test the understanding of the problem
- challenge the requirements, boundaries and scope and assess whether sufficient views have been considered
- ensure the planned and actual level of quality checking of the analysis is appropriate for the decision being supported, consulting suitable and competent persons through a peer review
- ensure an audit trail is in place that clarifies the level of validation, scope,
risks associated with the analysis and owners of the model and tools used for the analytical work.

The analytical assurer:

- shall be independent of the analytical team
- may be the same person as the officer accountable for an analysis model, method or tool if such is used a business-critical situation.

4.7.8 Other specialist analysis roles

Other analysis roles should be defined to suit the needs of the activity being undertaken. This can be for a particular type of analysis or for managing a variety of aspects of analytical practice in accordance with this standard. Such roles may be for assurance or advisory, as part of an analysis team or taking a leadership or executive role, with accountability assigned.

Those undertaking specialist roles should hold appropriate professional qualifications.

Note: examples of a specialist role would be engineers, actuaries, statisticians, social researchers, economists, data scientists, social researchers, finance, workforce or business analyst.

4.8 Other requirements

The following should be complied with if relevant to the analysis being undertaken.

4.8.1 Use of official statistics

The management of official statistics shall be undertaken in accordance with the Code of Practice for Statistics [2].

4.8.2 Actuarial regulation

Actuaries working in the UK are typically members of the Institute and Faculty of Actuaries, a professional body established under Royal Charter. The IFoA sets mandatory ethical standards for its members including the Actuaries’ Code [3]. Technical actuarial standards must also be followed by those carrying out work in the UK. Further information on the regulation of actuarial work is available on the IFoA’s website [4].

4.8.3 Technical standards for actuaries

The Financial Reporting Council sets technical standards for actuaries. In the UK actuaries work should be produced in accordance with the Financial Reporting Council’s Technical Actuarial Standards [5]. The generic standard, TAS 100, applies to all work which meets the Financial Reporting Council’s definition of technical actuarial work. Additional technical actuarial standards should be applied in specified areas of work, where the Financial Reporting Council has identified risks to the public interest.
5 Life cycle for analytical work

5.1 Analytical cycle

The primary activities required for analysis are shown in Figure 3 and described in the following sections 5.2 to 5.7. These activities may be iterative and incremental in nature, requiring reworking of the steps until an acceptable result has been achieved. The activities in section 5 should be supported by those in section 6 where appropriate.

Figure 3. The analytical cycle

Guidance on the commissioning and delivery of analysis, included in the Aqua Book, should be followed. [6]
5.2 Scoping the analysis

The purpose of scoping the analysis is to ensure the question to be answered is defined to a level where analysis can proceed with confidence.

The analysis commissioner should work in partnership with the analyst to ensure the requirements and scope for the work are defined, including:

- recording the perceived purpose of the analysis and/or modelling and the levels of quality and certainty that are required for this purpose
- exploring the requirements, boundaries, and scope with the stakeholders, ensuring a wide range of perspectives are sought.

5.3 Designing the analysis

The purpose of designing the analysis is to ensure that the analysis work undertaken is appropriate to answer the question posed, is proportionate to the question being posed and represents value for money.

Analysis should be designed to be fit for purpose, proactive and pragmatic. From the outset, analysts should be proactively engaged to ensure both the analytical methods, and options under analysis, are as innovative and creative as appropriate. Analysts should work with appropriate subject matter experts to structure the problem and questions of interest clearly, and jointly agree the objectives, resources, time, skills and funding required as far as possible. Experience of relevant previous work should be drawn on (see 6.6).

The analyst should develop an analytical management framework (4.4), considering the inputs, possible analytical best practice, models, methods and tools to be used (see 6.5), and the expected outputs to be produced. The designed approach should:

- be repeatable; producing the same results for the same inputs if the analysis is undertaken by different analysts
- be independent of bias
- be grounded to ensure the analysis is relevant to the question posed
- be objective
- consider uncertainty
- be robust enough to survive challenges.

The need for, and risk of, options development and iterations in the life cycle should be considered when planning the work.

The analytical assurer should, in consultation with relevant subject matter experts, check that the proposed design meets the commissioner’s requirements, in particular:

- ensuring the approach to the analysis is well-structured for the purpose, data driven, and reflects a robust overall design which is likely to meet the analysis commissioner’s needs
- ensuring the accuracy and limitations of the chosen methods are understood – and where appropriate tested
- where possible baselining the approach against independent reference cases
- ensuring the basis of the work is accurate, transparent and results can be unambiguously recorded
- confirming the approaches are in accordance with the organisation’s ethics policy.

A trial run of the proposed approach may be undertaken to verify if it delivers as intended.

The analysis design should be approved by the analysis commissioner (or as design in the assignment management framework, see 4.4).
before work proceeds, including ensuring the:

- design reflects the analysis commissioners needs including
- the appropriate stakeholders and specialists have been identified
- risks, timescales and costs are acceptable.

Where analysis is extensive, involving a team over a protracted time scale, the management of the work as a programme or project in accordance with GovS 002 Project delivery, should be considered.

5.4 Conducting and checking analysis

The analysis should be undertaken in accordance with the approved analytical plan and management framework.

The collection of data on policy performance, impact and outcomes, as well as operational and financial decisions, should include collecting contextual data so that the impact of complex variables and wider societal and economic trends can be appropriately considered.

The analysis commissioner, working with the analytical assurer, should monitor progress and be satisfied that the analysis is proceeding as planned, remains relevant and is likely to produce a result which can inform subsequent decisions. When necessary the analysis plan may be amended to take into account emerging information or changing circumstances.

The analyst should:

- maintain a record of the analysis, noting any deviations and checking their analysis, commissioning other verification and validation activities as required by the plan or from arising circumstances
- keep the commissioner informed of progress, agreeing assumptions and raising any relevant issues or requests for direction
- provide the analytical assurer access to the work and information, as required
- identify lessons which are likely to benefit future analysis work and best practice, models, methods and tools, as appropriate (see 6.6).

5.5 Delivering analytical work to the commissioner

The purpose of delivering the analysis is to ensure the results are understood by the analysis commissioner sufficiently prior approval.

The draft analysis results should be delivered to the analysis commissioner.

The results of the analysis should include:

- source of funding and sponsorship for the analysis work and the declaration of any interests by the parties involved
- assumptions made
- residual uncertainty and risk relating to the analysis
- limitations and constraints on the applicability and use of the results
- references, data and variables used in the analysis together with their sources
- weighting method and weightings used (if any)
- how any sampling represents the population which is the subject of the analysis
- statements of the analytical quality assurance
• original survey questions (if the analysis includes a survey)
• underlying data for any graphs included in the result (in an associated electronic format).

Note: it important that even obvious assumptions are stated as what is obvious to one reader, might not be obvious to another.

5.6 Approving the analysis

The purpose of approval is for the analysis commissioner to formally approve the results for dissemination.

The analysis commissioner should:
• be satisfied they understand and can interpret and communicate the results fully and faithfully
• confirm, or otherwise, that the brief has been fulfilled.

The analysis commissioner, once satisfied that the analysis has been undertaken competently and the results are valid, should approve the analysis work as complete and that the results should be disseminated.

If the results or recommendations are not accepted, this should be stated with reasons given. The analysis commissioner may:
• ask for the work to be revised
• terminate the work
• reassign the work to another analyst.

5.7 Disseminating the analysis

Dissemination covers the:
• dissemination of the results
• dissemination of lessons which might benefit future analyses.

5.7.1 Dissemination of results

The dissemination of results is the accountability of the analysis commissioner. The results of the analysis should be presented in a clear, comprehensible and transparent manner which is appropriate for those who are to receive those results.

The results may be published in different formats for different audiences.

Before dissemination, the analysis commissioner should confirm:
• who should receive the results and in what form
• the security classification of the results (See 6.4)
• how feedback, if any, should be gathered and dealt with.

Where the dissemination of the results involves a wide group of stakeholder communication should be undertaken in accordance with GovS 011, Communications.

The analyst should ensure an analytical record of the analysis is retained and accessible to:
• facilitate access to the analysis by broader stakeholders and those undertaking similar analysis in future
• make the analysis exploitable for wider decisions, and
• inform continual improvement.

5.7.2 Dissemination of lessons

The lessons learned throughout the analysis should be reviewed by the analysis team who should recommend, where appropriate, improvements to the owners of best practice, models, methods and tools to improve analysis in government generally.
6 Analytical practices

6.1 Risk and uncertainty

The purpose of managing risk and uncertainty relating to analysis is to ensure decision makers are aware of the implications of alternative options under different scenarios and assumptions, prior to making their decisions.

The commissioning and delivery of analysis should refer to the Orange Book for further guidance on the concept of risk management and basic introduction to its concepts, development and implementation [7].

Where possible, the analysis commissioner should define the consequences of different degrees of uncertainty, to enable the analysis to be conducted at a proportionate level. If this is not possible an alternative approach to analysis should be agreed which would enable this information to be derived.

Sources of risk and uncertainty should be identified and their impacts considered as part of the analysis. Uncertainty should be analysed at the level required to support decision-making and at a level of detail appropriate to the decision being made in the development of policy or other initiative. Options for managing risk and uncertainty should be developed and appropriate control and mitigation actions taken.

Uncertainty may be described in qualitative or quantitative terms. Where qualitative terms are used, each term should be described unambiguously. Where possible quantitative expressions of uncertainty should be used.

Sources of uncertainty where the impact on the policy outcome cannot be determined should be identified and precautionary and/or flexible strategies developed to manage them, coupled with evidence-gathering and monitoring of the emerging outcomes.

The following should be considered when communicating uncertainty:

- presenting a balanced view of the analysis covering what is known and what is uncertain
- focusing on communicating the level of confidence in the proposed decision
- explaining how a decision is justified by the quality of the analysis and by the measures that can be taken to address risk and uncertainty
- avoiding communicating certainty when there is uncertainty
- avoiding unwarranted confidence in outcomes.

6.2 Analytical verification and validation

The purpose of analytical verification and validation is to ensure that the analysis has been conducted properly (analytical verification) and that the right type of analysis has been used (analytical validation).

Verification and validation of data and analysis are aspects of analytical assurance (4.6) and should be considered separately:

- data should be documented so that it can be accepted by users of the analysis as fact
- analysis methods should be justified and challenged such that users can be confident in the results.

Note: quantitative expressions could include stating the range of possible outcomes, the percentage likelihood of a particular outcome or the outcome expected at a particular percentage of certainty.
Analytical verification and validation should be conducted through the analytical life cycle (5.0) and may be iterative in nature, with confidence growing as the analysis work progresses.

Analytical verification and validation effort should be proportionate to the purpose and constraints of the analysis. Analysts should provide proportionate documentation that outlines the verification and validation activities undertaken and the associated conclusion so that the utility and reliability of the analysis work can be assessed.

Conclusions of analysis shall be verified by a person who is independent of the analyst and their team.

### 6.3 Third party analysts

The purpose of using third party analysts is to either provide specialist services, which are not available in government, or to meet demand for analysts which government cannot fulfill with internal staff.

Third party analysts should work to this functional standard and be familiar with the models and tools for the types of analysis they are contracted to conduct.

The use of third party analysts should be undertaken in accordance with GovS008, Commercial.

### 6.4 Data and information management

Data management ensures all necessary data necessary for conducting an analysis (physical or electronic) is available and reliable.

The secure management of data should be undertaken in accordance with GovS007, Security.

The data which needs to be managed as part of the analytical work should be defined. Data should be recorded on a master data list, validated as correct, securely stored and distributed to, and retrievable by, those who need it. The record should include:

- origin of the data
- date received
- known accuracy and uncertainties
- assumptions relating to the data
- data format and handling requirements
- implications of any data dependencies or relationships to other analysis or methods are understood
- security classification.

If applicable parametric analysis should be undertaken to understand the consequences of missing or uncertain data and assumptions.

Business continuity measures should be in place in the event of a disruptive incident.

Data should be retained to meet statutory and contractual requirements and the requirements of the Data Ethics Framework [8].

### 6.5 Analytical best practices, models, methods and tools

To determine whether modelling outputs are reasonable, each best practice, model, method and tool should have:

- a named officer accountable for it
- a statement of its intended use
- up to date user documentation
- guidance on quality assurance
- confirmation from the accountable officer that it is suitable for its intended use.
6.5.1 Use of best practice, models, methods and tools in business critical situations

Business critical models in government should:

- have appropriate quality assurance of their inputs, methodology and outputs in the context of the risks their use represents. If unavoidable time constraints prevent this happening, then this should be explicitly acknowledged and reported.
- be managed within a framework that ensures appropriately specialist staff are responsible for developing and using the models as well as providing quality assurance.

6.5.2 Submission of results

Submissions using results from best practice, a model, method or tool should summarise the quality assurance that has been undertaken, including the extent of expert scrutiny and challenge. A statement should be included, confirming that the officer accountable for the model is content that:

- the quality assurance process is compliant and appropriate
- model risks, limitations and major assumptions are understood by users of the model
- use of the model output is appropriate.

6.5.3 Use of a model, method or tool for different purpose than originally intended

Reconfirmation of the sign-off from the officer accountable for the model, method or tool is required if the analysis or supporting model, method or tool has been used for a purpose other than that for which it was originally designed or if the circumstances surrounding its use have changed.

6.6 Learning from experience

Learning from experience avoids repeating the same mistakes and helps spread improved practices to benefit current and future work.

At the start of the analysis work, those involved and key stakeholders should identify and apply relevant lessons from previous experience when planning the work. Throughout the life cycle, lessons should be continually captured, evaluated and action should be taken to mitigate risk and facilitate continual improvement of the final outputs. Organisation leaders, (including ALBs) and owners of best practice, models, method and tools should update their knowledge sources and communicate learning as appropriate.
A. References

<table>
<thead>
<tr>
<th>ID</th>
<th>Description</th>
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</table>
| 1  | HM Treasury; Managing Public Money; updated 2018  
| 2  | UK Statistics Authority; Code of Practice for Statistics; updated 2018  
(https://www.statisticsauthority.gov.uk/code-of-practice/) |
| 3  | Institute and Faculty of Actuaries; The Actuaries’ Code; 2018  
| 4  | Institute and Faculty of Actuaries; Standards and Guidance; 2018  
| 5  | Financial Reporting Council; Technical Actuarial Standards; 2017  
(https://www.frc.org.uk/actuaries/actuarial-policy/technical-actuarial-standards) |
| 6  | HM Treasury; The Aqua Book: guidance on producing quality analysis for government; 2015  
| 7  | HM Treasury; The Orange Book; updated 2013  
| 8  | Department for Culture, Media & Sport; Data Ethics Framework; updated 2018  
## B. Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Analysis</td>
<td>Generation, processing and presentation of data, evidence and research, to inform choices and improve outcomes for the UK government and UK citizens.</td>
</tr>
<tr>
<td>Analyst</td>
<td>Anyone using research, evidence and data to conduct analysis or belonging to at least one of the seven analytical professions in government: actuaries, data scientists, economists, operational researchers, scientists &amp; engineers, social researchers and statisticians.</td>
</tr>
<tr>
<td>Analytically qualified</td>
<td>Any person fulfilling a role having received both sufficient training and experience to properly undertake the tasks at hand. This shall include possessing and applying the required knowledge. This may be demonstrated through relevant qualifications.</td>
</tr>
<tr>
<td>Analytical Best Practice</td>
<td>A tool, model or methodology that through experience and research has been critically proven to reliably lead to a desired result and has been adopted across analytical disciplines.</td>
</tr>
<tr>
<td>Analytical Model</td>
<td>A mathematical, simulation or forecasting model that uses equations to conceptualise characteristics and describe changes in a system.</td>
</tr>
<tr>
<td>Analytical Method</td>
<td>A process, combined with the scientific method, to enable analysts to examine complex relationships between variables.</td>
</tr>
<tr>
<td>Analytical Tool</td>
<td>The instrument with which analysis is carried out. It may be a concept, a theory, a hypothesis or a method.</td>
</tr>
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C. Key sources of guidance

A range of official government guidance exists, outlining the requirements for different kinds of analysis. The following sets out some key sources of guidance.

**Guidance on producing quality analysis for government: The aqua book**

The Aqua Book draws together existing quality assurance practice from departments and best practice from analysts across a variety of analytical professions within government. It sets out the appropriate governance frameworks to ensure quality analysis. The Aqua Book builds upon the “Review of quality assurance of government analytical models” and expands the principles to cover all types of analysis.

**Guidance on the principles and concepts of risk: The orange book**

HM Treasury’s Orange Book is used to establish the concept of risk management and provides a basic introduction to its concepts, development and implementation of risk management processes in government organisations.

It should be read and used in conjunction with the other publications such as the Green Book which provides specific advice on appraisal and evaluation.

**Guidance on appraisal and evaluation in central government: The green book**

HM Treasury’s Green Book guidance is used to understand proposals that concern public spending, taxation, changes to regulations, and changes to the use of existing public assets and resources. It covers how to develop, design and appraise alternative options for policies, programmes and projects based upon objective evidence. It is linked to the Magenta Book and requires that proposals contain proportionate provision for monitoring and evaluation before, during and after implementation.

The Green Book contains HM Treasury Business Case Guidance for Programmes, and for Projects, provide the framework, processes and tools for developing spending proposals into business cases to optimise value for money.

Analysis of agile, digital and IT projects should also take account of the most recent clarification of business case guidance.

**Designing evaluation: The magenta book**

The Magenta Book provides guidance on what to think about when designing an evaluation. It explains how results can be interpreted and presented, and what should be considered in this process. The Magenta Book outlines how thinking about evaluation before and during policy-making can improve the quality of results produced to evaluate that policy.

**Code of Practice for Statistics**

The Code provides producers of official statistics with the detailed practices they must commit to when producing and releasing official statistics. It is accompanied by guidance for statistics producers on how to apply the Code.
The Code ensures that the statistics published by government serve the public. When producers of official statistics comply with the Code, it gives users of statistics and citizens confidence that published government statistics are of public value, are high quality and are produced by people and organisations that are worthy of trust.

For further statistical guidance, the GSS Policy and Guidance Hub is a definitive repository for guidance for Statisticians working in Government. It includes policies and guidance on, for example, the safe handling and sharing of data, methods for analysis and the presentation and dissemination of statistics, and also on recruitment to the profession and development. Where appropriate the policies and guidance are approved by a responsible GSS-wide committee prior to publication. It also provides the three pillars of Trustworthiness, Quality and Value that analysts can voluntarily apply.

**Professional Science & Engineering Standards**

The Government Science and Engineering profession (GSE) vision and values are described on its webpage. The breadth of disciplines covered by its range of roles necessitates a range of specialist guidance and professional standards for each.

Where members of the GSE Profession are conducting work relevant to this Standard, they should have regard to the guidance contained in the document “Chief Scientific Advisers and their officials”. Where they are working with independent experts from outside the civil service they should also take into account The Principles of Scientific Advice to Government.

Where GSE professionals work in the policy or analytical space they follow the same principles and guidance as other analytical professionals.

**Actuarial Guidance**

In addition to standards set by regulators of the actuarial profession, actuaries employed by the Government Actuary’s Department (GAD) are subject to supplementary internal guidance. This guidance covers specific operational, technical and professional areas of actuarial work. GAD’s website describes the standards applied to its work.

**Digital Guidance**

The Government Digital Service (GDS) describes where to find and use open government data and a more specific set of criteria to help government design, build and buy technology in the Technology Code of Practice. The UK Data Service, funded by the Economic Research Council, also provides access to other open data hubs worldwide.