Department for Education

Quality Assurance Framework

Principles of QA of analysis

May 2025

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Summary

This publication provides non-statutory guidance from the Department for Education. It has been produced to help DfE analysts, external analysts and those who commission or are accountable for analysis at the DfE to understand the responsibilities and expectations around assuring the quality of analytical work. This area is known as Quality Assurance (QA) in DfE.

Who this publication is for

This guidance is for:

- DfE analysts, or external analysts working on behalf of the department
- those who commission or are accountable for analysis at the DfE (e.g. Senior Responsible Owners and policy/delivery commissioners)

Main points

Everyone in DfE uses data, analysis and evidence in their work and so have some responsibility to understand and reflect on the quality of the analysis they use. All staff should be aware of quality assurance, be able to ask basic questions around whether analysis has been quality assured, what key risks and uncertainties exist, and so on. As either the analyst or the individual who commissions or is accountable for it, there are specific responsibilities that you will have.

This framework encompasses all types of analysis whether quantitative or qualitative and the principles remain the same, though the specifics and terminology may differ. Some examples might include: finance spreadsheets, forecast models, analysis supporting business cases, research projects, statistics, figures, analysis and evidence used in submissions, etc.

In all cases, the Quality Assurance (QA) should be undertaken proportionately, agreed up front and set out in a QA plan.[1]

The AQUA Book is the cross-government guide to QA and contains broader information.

Document history

This document was first published in April 2020. Since then it has been updated to:

[1] The QA plan will set out what kind of QA will be done at a fairly high level and name those in key roles. It should be updated where necessary as work develops.

- emphasise the mandatory nature of QA logs for business cases with high spend
- broaden the scope of the framework from ‘models’ to ‘analysis’
- remove detailed tables
- include a section on uncertainty
- account for the recommendations in the National funding formula (NFF) 2024 to 2025: independent review.

This guidance has been developed with input from other Government Departments, in particular DESNZ and DfT. We thank the authors of those documents for making their work available.

Introduction

Quality Assurance (QA) is an integral part of all analytical work. It is much more than 'getting the numbers right'. Effective QA ensures that decisions are made with an appropriate understanding of the evidence, uncertainty and risks, and helps analysts ensure the integrity of the analytical output.

The key outcomes from any QA exercise are that the analytical output should be:

- fit for purpose[2], with purpose defined as part of the scoping process
- reliable and accurate, as far as this is possible
- transparent and accountable. The outputs should be fully approved, have a clear audit trail and be reproducible

The QA framework is structured around five pillars:

- Documentation and Governance – so that we manage the process and its risks and can transfer knowledge about the analysis to other users, developers and assurers. This includes putting in place arrangements for appropriate scrutiny of the analysis, i.e. a QA Plan
- Structure and Clarity – so that the analysis is easy to understand and assure, and so that changes can be made with confidence
- Verification – so that the analysis is carried out as specified
- Validation – so that the analysis is appropriately specified and contextualised
- Data and assumptions – so that these inputs are appropriately sourced, understood and signed off as fit for purpose

It is essential that QA is incorporated throughout the life cycle of an analytical project. It is not something that can be added at the end. The framework applies to all analytical activity in DfE, from smaller, relatively inconsequential analysis through to larger pieces of analysis that are critical to the Department's operations. The extent of QA required, however, will differ significantly across this range of analysis. In general terms, more QA will be required for analysis that is more complex, novel or important to key departmental

[2] The AQUA book defines fit for purpose as follows:
- The analysis undertaken aligns with its intended purpose and is relevant to the original problem
- The correct analysis has been performed
- The analysis has been conducted correctly and is safe
- The analytical output was provided in time to be useful and was presented in an accessible and clear manner
- The analysis is comparable and repeatable

decisions. Selecting appropriate quality assurance activities and Appendix B set out a suite of QA activities that could be used.

QA is not the sole responsibility of analysts but the shared responsibility of analytical and policy/corporate/delivery partners. There must be a joint understanding of what QA will and won't take place and the implications of the QA on how the analysis is used. Ultimately, those that commission the work are responsible for signing off the (minimum) level of QA undertaken and must understand the residual risks, while it is the responsibility of analysts to communicate what these risks are and their potential impacts.

Definitions of analysis

'Analysis' refers to a range of activities carried out across the Department. It is a method of examining, or 'analysing', a process, structure or entity. Different types of QA will be required for different types of analysis. This framework aims to cover how we should approach this QA but does not give specific QA tasks for each type of analysis. Specific tasks should be decided between lead analysts and SROs.

Business critical models

Some models are so important to the Department that they are classified are business critical models (BCMs). A list of types of models is included in Appendix A.

An analytical model is deemed to be "business critical" if it forms a fundamental part of the development or implementation of policy, which:

- materially affects the quality of education provided in our schools or the health, safety and wellbeing of children and their families; or
- relates directly to the allocation of funding to schools, colleges or other providers, or would have implications for significant levels of future expenditure; or
- where an error could produce significant legal or reputational damage to the department.

The initial commissioner of the model must decide if it is business critical. There are particular requirements relating to BCMs:

- the model must be added to the Department's list of business critical models.

- a set of mandatory documentation must be kept, including use of a standardised QA log[3] and the commissioning of inputs via a formal specification. Appendix B contains a list of the mandatory documentation.

- governance requirements, including appointing a model Senior Responsible Owner (SRO) and Analytical Assurer who must provide formal sign off before the model output is used. Roles and responsibilities sets out detailed guidance on the role of the SRO and Analytical assurer and their responsibilities.

- where a BCM is reliant on a specific input, the production of that input should also be treated as business critical alongside any "off model adjustments". This means including them in the scope of QA covered by the QA activities and QA log. See more on verification for guidance on verification of input data.

The documentation and governance requirements represent good practice for other models and we strongly encourage their use more widely. However, we recognise that there is a certain amount of very low level modelling activity for which they would represent an unreasonable compliance cost.

[3] Contact the DfE Central QA Team via Education.QATEAM@education.gov.uk to access this internal guidance.

The five pillars of the QA Framework

Documentation and governance

"Are we doing the right analysis?"

Good governance is an essential part of quality assurance because it is the process by which risk is managed and the appropriate QA regime signed off. It is essential that all parties know and understand their responsibilities. All analysis will have a commissioner and lead analyst. Except for the most basic analysis, a separate analytical assurer is required. This may be a formal commission, but is often just an email exchange asking some questions, and this will define the commissioner and lead analyst. Either way, there should be some discussion of QA to check that the question is sensible, the analysis is appropriate, there are checks to make sure it's accurate, any sources, assumptions and calculated are explained, and key uncertainties, caveats and risks made clear. There may be a Senior Responsible Owner specifically appointed, or else it is implicitly the commissioner's line manager (or DD).[4]

Documentation is important because it allows us to transfer knowledge about the analysis. For example:

- documenting the scope makes it clear what the purpose of the analysis is.
- documenting the specification makes clear what the inputs and outputs of the analysis will be.
- an input specification sets out the expected data and format of inputs for business critical models.
- a technical specification makes clear the detail of how an analytical product, such as a model or a dashboard, operates.
- a user guide helps ensure that the analytical product can be operated as intended.

Other documentation is required to provide a thorough audit trail (e.g. QA Log, Input and Assumptions Log).

The extent of documentation should be proportionate to the size and scope of the analysis. For analysis that is very quick and simple, the documentation may be included as a separate worksheet tab or might be captured sufficiently in a simple email trail

[4] The direct involvement of the SRO will vary depending on the importance of the analysis. In particular, their role may be delegated to e.g. the commissioner, for less significant pieces of work, though they will remain the individual responsible. The SRO should always be named within the QA plan.

(which should be recorded). For larger, more complex or high profile analysis, particularly if it likely to be repeated or published, separate documentation is likely to required. A principle of good analysis is that it should be repeatable, and the documentation should capture sufficient information to allow that.

If an analytical product, such as a model or a dashboard, are expected to be used and developed regularly, more documentation is likely to be appropriate. The technical specification is particularly important to help other analysts maintain and develop the product. The user guide is likely to be particularly important where the product is used by analysts that did not develop it.

There are certain mandatory governance and documentation requirements applying to all analysis, with additional requirements for business critical models.[7] Appendix B contains a list of the QA documentation and indicates which are mandatory.

Structure and clarity

"Is the analysis easy to follow?"

All analysis should have a clear logical structure. Better structure means analysis is more likely to be completed without error. Well-structured analysis is much easier to understand, assure, maintain and develop. A map providing an overview of a model, code or spreadsheet is a very effective way of helping people to understand the structure. A map is also helpful to track when and how changes to inputs, assumptions or calculations affect the outputs of a model or piece of analysis and so is strongly recommended for business critical models. Enabling others to understand the analysis at this level also equips them better for other parts of the QA process such as verification and validation of the analysis.

There should be a clear distinction between inputs, assumptions, calculations and outputs. There should be appropriate comments throughout, taking users step by step through calculation functionality, and use a consistent format that allows other analysts to follow the logic.

Verification

“Has the analysis been done correctly?”

These are the set of processes to be carried out to ensure that the analysis is done correctly. Self-testing will always play a key role and all analysis should be checked by a second analyst that has not been directly involved in its production.

There are a wide range of possible verification activities, and we recommend using a combination of both manual sense-checks and automated checks. Where models or analysis are particularly large, complex or high profile, we would expect to see strong

verification checks, such as an independent parallel, dual or reverse build of a model (or appropriate alternatives) to verify outputs, but these are typically very resource-intensive so not appropriate in all cases. The extent of verification activity should be agreed with the analytical assurer to ensure it is a proportionate way to deliver the required assurance.

Input data must also undergo appropriate verification checks. After any transformation and load processes, the modelling team should run a range of comparative checks against the supplied data to provide assurance that no data has been lost. These checks should be a combination of auto and manual checks.

Validation

“Has the right analysis been done?”

These activities are to ensure that the analysis is appropriate and is a reasonable representation of the process under investigation.

It is a good idea for the methodology to be scrutinised by someone outside of the team early on in the process before too much time is spent trying to implement a particular method. It may be worth engaging with subject matter experts both within and outside the department.

Validation also looks to assure that the outputs are reasonable. Are they in the range or direction expected? Are they consistent with previous output? Are sensitivities to key inputs reasonable? Some of these checks double up as verification, i.e. analysis may behave in an unexpected way because the methodology itself is wrong (validation) or the implementation is wrong (verification).

As with verification, there are a wide range of possible activities and the extent of validation activity should be agreed with the analytical assurer to ensure it is a proportionate way to deliver the required assurance.

Data and assumptions

“What goes into the analysis?”

These are the key inputs to the analysis and can come from many sources. Data can be checked in many ways but it is unlikely that large data sets will ever be perfect. When requesting data from suppliers, it is essential that modellers communicate with suppliers on its intended use, so that changes and issues in the data are clearly flagged. Similarly assumptions can be scrutinised and validated but will remain uncertain. It is important to understand the quality and limitations of data sets and assumptions in order to understand their impact on analytical outputs. Uncertainty around data and assumptions,

and correspondingly to the outputs, must be clearly communicated to customers or commissioners.

QA through the analytical cycle

Quality assurance should be an integral part of any analytical process from the very beginning of a project. That means that good quality assurance is embedded throughout the analytical cycle from commissioning, through the development of the specification through design and delivery and into business as usual and review. QA should not be 'an after-thought' or something that is arranged at the last minute!

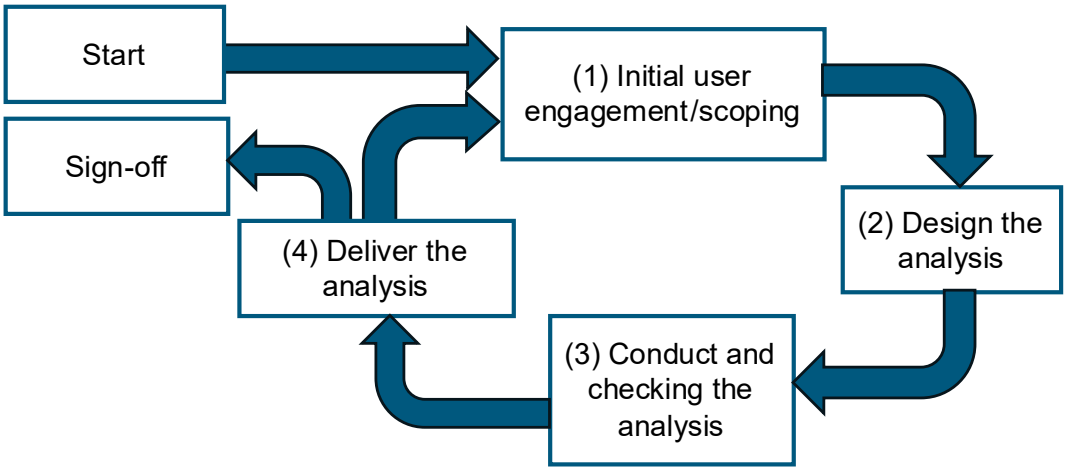

Figure 1: Stages of the analytical cycle

Scoping and specification

The aim of scoping and specification is that all parties (commissioners, analysts, wider stakeholders, analytical assurers) are sure that the problem has been well articulated and that the proposed outputs will provide the evidence or data needed to answer the original question or problem.

The process required to agree a scope and specification will vary greatly but can involve early analysis, using small-scale models or problem structuring methods to agree key objectives and priorities. It is as important to agree what is in scope as well as what is out of scope to avoid spending analytical resource on projects that do not contribute to the evidence base.

Clear scoping and specification documents enable analysts to summarise concisely what the analysis will cover and why. It is essential that analysts produce such documentation and gain sign-off from SROs or stakeholders before embarking upon a long-term or high-profile project. In particular, effective documentation can help prevent misunderstandings around what is required, what will be produced, and when it is needed to be produced by.

As the scoping and specification documents are produced at the start of a project, analysts should already be thinking about quality assurance. For example:

- What type of analysis are you likely to carry out? What type of analytical products are you likely to be producing? Are there individuals in your division, directorate, or department that have relevant experience?
- If so, are they likely to be available to assist with QA when you need them? Given QA may take a few days, it is important not to assume they will be available when you require their assistance.
- Are all relevant individuals involved in the project and aware of the analysis that you are undertaking? This could include data experts, policy stakeholders, and potential model customers.
- Do you have an analytical 'challenge' function or role within the scope of the project? This could be an analyst to provide objective challenge of the data, assumptions, and methodology that you are using.
- Are there particular risks associated with the project? If so, the scoping document should attempt to list them and outline some potential mitigation strategies.

As part of the scoping and specification documents you should seek to identify the level of QA needed and ensure that your SRO and stakeholders are content with this.

Designing the analysis

This is a key element of validating your analysis. Perfect analysis that produces the wrong outputs is of no value. There will often be several methods suitable for analysing the problem. In some cases, the specification will dictate the methodology but in others you will be selecting from a shortlist of techniques. Your approach(es) should be chosen with due consideration to the quality of the data in relation to its purpose in your analysis, and the purpose of the analysis itself. Avoid overcomplication in the name of 'precision' where this does not demonstrably and materially improve the analysis.

We recommend that you seek views from across the analytical community (internally or cross-government) before committing to a specific method. This stage of analytical development is often underplayed, with choices limited to techniques the analyst has already used, or a technique the analyst is keen to explore. A discussion with other analysts and your analytical assurer will help to challenge any biases as well as potentially introduce reasonable alternatives.

When choosing a methodology, you should consider:

- previous examples of this method being applied to the problem archetype

- available data to support the method, or if new data will need to be derived or collected
- available tools to support the method
- if the level of abstraction is appropriate for the analytical requirements
- any key person risks introduced by the method, for example relying on one person's specific expertise meaning if they are not around no-one else knows how to run or update the model. Consider what can be put in place to manage this risk
- analysts who will be able to carry out any independent quality assurance functions

Governance

Governance includes setting out roles and responsibilities, which are discussed later in the framework. As with other aspects of QA, governance should be proportionate to the risk and complexity of the analysis. Some examples include:

- Ad-hoc request: The commissioner sends an e-mail requesting small-scale analysis of an established dataset. The analyst agrees the specification by email and sets out what QA will be in place. The results of the analysis, along with modelling caveats and sign-off, are emailed to the commissioner with the AA copied in.
- Project Board: The SRO decides that governance falls within the scope of an existing project board that they chair. A sub board is formed to provide challenge and scrutiny and model outputs are presented to the main board along with any decisions or issues for discussion. This is advantageous as the board contains the main model users as well as the input data owners.
- Model-specific steering group: Whilst a model is being developed, it is overseen by a steering group that can provide challenge, clarification and feedback. Once the SRO and the Analytical Assurer have signed off the model and the final product is handed over, this group meets periodically for model review. Day to day the SRO is responsible for the use of the model.
- Analytical board: The model is part of a wider group of related models. The model SROs and analytical leads agree to form a board to oversee the development and use of all the models. This group is able to ensure that any common assumptions or inputs are used consistently and ensure that model development is complementary and efficient. This wider group of analysts is also well placed to discuss methodological approaches and tool selection.

Quality Assurance after delivery

The QA plan should extend to the intended use of the analysis once delivered. This could include:

- updating the data or assumptions on an ad hoc or regular basis
- support of the analytical product (where the product will be operated by other analysts / non-analysts)
- use of the analysis to answer policy questions or correspondence
- regular “major review”
- closing a model

There is a range of QA activities that support these post-delivery activities. Where the analytical product is to be operated by others, the caveats and protocol for using outputs must be agreed with the SRO and passed on with the product. The SRO remains responsible for uses of the product (for example where outputs are used to support recommendations in ministerial submissions or answer correspondence).

Major review should be planned at key points, for example prior to funding allocations or fiscal events, or in order to incorporate a change to the specification, or at regular intervals. It should at minimum include a review of the specification – is the current analysis still meeting the brief? Is the specification still relevant? Similarly, are the assumptions and the input data still relevant? Modellers should communicate with their data suppliers regularly to make sure that suppliers understand the criticality and use of their data and to give them the opportunity to flag any known issues or changes to the modelling team.

Models may have a fixed life span. For example, they may have been created to support a specific policy problem and have no wider application or a work stream may be shut down. In either case, a model should be properly archived with all the associated documentation with reference to departmental record keeping rules. If retained, it must be very clear that the model is no longer live in order to prevent inadvertent use.

Selecting appropriate Quality Assurance activities

The AQUA Book refers to “Analysis with RIGOUR” (see box). It is important that Quality Assurance activities are proportionate, relevant and support the overall purpose of the analysis. In this section, we suggest activities that can support quality assurance across the five pillars and discuss the documentation that will help you in communicating and recording the process.

Analysis with RIGOUR

Quality analysis needs to be Repeatable, Independent, Grounded in reality, Objective, have understood and managed Uncertainty, and the results should address the initial question Robustly (RIGOUR). In particular, it is important to accept that uncertainty is inherent within the inputs and outputs of any piece of analysis. It is important to establish how much we can rely upon the analysis for a given problem. (AQUA Book 1.10)

Deciding what QA to carry out

Analysis will often involve a trade-off between time, resource and quality. Discussions about desired and achievable levels of QA should take place at the very start of a project. The reality is that most analysis will be carried out under time and/or resource pressure and we will not be able to carry out all the QA activity we would ideally like to. In these circumstances, QA activities will need to be prioritised based on the risk of not carrying them out. Sometimes, it may not be possible to carry out what might be seen as the minimum reasonable QA. If this is the case, it is essential that decision makers are made aware of the consequences of the limited assurance on the reliability of analytical outputs.

Reflecting the rich variety of analysis that takes place within the department, this section is not prescriptive about the QA activities that should be undertaken. Analytical leads and SROs must agree what activity is appropriate to each project and the main QA activities should be planned in advance.

When undertaking QA one should begin by looking at the relevant departmental QA log.[5] The activities listed therein will help ensure that the analysis follows best practice.

There is, however, a mandatory set of QA activites that must be part of every piece of analytical work. These activities include:

[5] Contact the DfE Central QA Team via Education.QATEAM@education.gov.uk to access this internal guidance.

- scoping and specification
- a QA plan
- version control
- recording of inputs used and assumptions made
- use of coding, spreadsheet, dashboard etc. standards as appropriate
- self-checks[6] by lead analyst (the use of a combination of auto-checks and manual sense checks is recommended)
- testing by a second analyst
- communication of key limitations and uncertainty
- sign off and an appropriate audit trail

There are additionally some activities that are essential to all business critical models and to models for making financial allocations. Details of these mandatory requirements are indicated in Appendix B.

QA under time or resource pressure

Many of the mandatory activities are natural parts of any analytical process, so shouldn't represent a major compliance cost. However, we recognise that occasionally the analysis done in DfE is carried out under significant time pressure. The mandatory activities should not be seen as a barrier to producing analysis – it will usually be better to provide some analysis with appropriate caveat than none at all.

Where you haven't carried out all the mandatory activities, you must bring this to the attention of the SRO and Analytical Assurer so that they can consider the impact on whether they can sign off the outputs. In turn, they must ensure decision makers know the extent of the QA carried out and the risks involved in using the output.

Many of the activities can be carried out in various levels of detail. For example, the scope of a simple piece of analysis could be captured in a single email from commissioner to modeller. In contrast, a scope document for a more significant piece of analysis might run to several pages, e.g. including extensive background to the problem being considered and setting out the detailed requirements of all stakeholders. You should look to take a proportionate approach.

[6] These might include auto-checks, unit testing, and sense checking of both intermediate and final outputs.

Within your teams, you should adopt a standing QA plan for ad-hoc analysis. This plan should describe how you will approach quality assurance for ad-hoc analytical requests or analysis with a very limited scope or short development time. The plan should be agreed with the senior analyst in your area (usually a G6 or DD) and with regular commissioners. It should include all the elements above and set up what sign-off would be required before the outputs can be used.

Uncertainty

It is vital when making effective decisions to understand the possible outcomes and, ideally, have some understanding of their likelihood. This helps to steer us in the right direction and put in place mitigations to remove or minimise unintended consequences.

All analysis contains inherent uncertainties and this uncertainty should be acknowledged, understood and managed. Understanding the sources of uncertainty and the impact it has on the analysis will enable the decision-maker to apply appropriate weight to the results of the analysis.

Potential sources of uncertainty could include:

- resources available to implement the decision
- how the decision will be implemented and its immediate effects
- the wider or longer-term consequences of a decision
- the potentials for unexpected events
- inputs, including numerical data, evidence, intelligence and assumptions
- structural considerations, e.g. logical flow, choice of analytical techniques, use of models beyond defined scope
- external risks, influences and behaviours

When communicating with decision makers, stakeholders or commissioners, analysts should describe the extent to which outcomes are uncertain and the reasons for this. It is ideal to describe uncertainty in terms of range or likelihood of alternative outcomes.

Where any of this is difficult or impossible, sensible assumptions should be agreed between the analysts and the commissioner/SRO and these assumptions made clear.

When discussing the impacts of uncertainty on outputs, particular importance should be given to scenarios that might lead to making different decisions. Appropriate mitigations or alternative strategies should put in place in case these possibilities occur.

A resource on uncertainty that is useful to analysts and non-analysts alike is found at: Government Uncertainty Toolkit.

Roles and responsibilities

Roles in the DfE context

There are a variety of roles in any analytical project. These can include:

- commissioner, who sets out the required analysis
- lead analyst, who leads the development and operation of the analysis
- other analysts, who assists the lead analyst
- Senior Responsible Owner (SRO), who has overall accountability
- Analytical Assurer (AA), who provides the technical assurance
- policy assurer, who ensures policy intentions are incorporated
- end users, who will make decisions based on the output
- Finance Business Partners (FBP), who are an important group of users for some financial models

Further details of the responsibilities of some of these role holders are set out below.

For all analysis, there will be a commissioner and an analyst. Most analysis will require direct involvement from a separate analytical assurer who is a senior analyst that is not directly delivering the analysis (the seniority required will vary but for BCMs usually the AA will be at least G6). The AA's role is to ensure that the QA plan is proportionate and appropriate. In order to provide sign off on the analysis, they will make sure the risks associated with the analysis have been understood, seek reassurance that notable changes in the data and assumptions have been accounted for in the analysis, and confirm that input data has been requested via a formal specification. For some routine or smaller modelling tasks, teams might wish to set up a standing QA plan under which the analytical assurer can delegate responsibilities and need not be directly involved.

The Senior Responsible Owner (SRO) takes responsibility for the model and how it is used. For business critical models, this role should be held at Deputy Director level or above. For non-business critical modelling, we recommend that there are always clear lines of accountability. Appointing a SRO is a good way of achieving this but is not mandatory.

In DfE, the SRO is typically the senior policy official in charge of the policy or programme that will use the analytical outputs. In this set up, the SRO will rely on the analytical assurer for technical sign off. However, the SRO can be from the analytical side (possibly the analytical assurer), in which case the SRO will rely on the commissioner and other

senior policy officials to ensure that policy intent and implications are fully understood within the analysis. It may be worth nominating a policy assurer who will formally sign off that the analysis meets the policy intent. (The policy assurance role would generally fall to the SRO under the usual policy ownership approach.)

The table below identifies the key responsibilities of those involved in modelling. See the AQUA Book for further details (in particular paras 2.11-2.23 and 6.16-6.19). Where a SRO is in place, a number of the Commissioner's responsibilities will transfer to the SRO. In some cases, the same person may hold both roles.

Analysis with multiple users

The sign off of any analysis is specific to its purpose. Where it is used for a separate purpose, a separate sign off is required. It is strongly recommended that a SRO is appointed where the analysis is used for multiple purposes. Further guidance on this situation can be found in the Macpherson Review (paras 2.55-2.58).

Analysis developed or maintained in Finance teams

This guidance applies to such analysis. Although 'analysts' in the traditional sense may not be involved, the roles and responsibilities should be assigned using similar principles. Those using spreadsheets should follow spreadsheet best practice and the DfE Finance QA log used when creating and updating their calculations.

Analysis developed or maintained by third parties

This guidance applies to such analysis. Where the analysis is business critical, a SRO from within DfE should be appointed to be accountable for the model. We strongly recommend that third parties use the standardised QA documentation. This makes it easier for suitable assurance to be achieved and also for the analysis to be brought in house if that is desirable in the future.

Responsibilities of key roles

Detailed guidance on SRO's and AA's responsibilities can be accessed by contacting the DfE QA Team.

Commissioner

The commissioner of the analysis has the responsibility to:

- communicate the question/problem to the analyst, including the criticality and the required accuracy
- determine whether the model is business critical
- actively engage with the analyst throughout
- identify stakeholders and their requirements

- consider and challenge emerging results and assist with the interpretation of results
- consider whether output meets requirements and provide feedback to analyst

The following are the responsibility of the SRO where that role exists, though the commissioner is likely to be involved:

- establish appropriate governance structure
- ensure appropriate time and resources are available for the analysis and QA
- agree the scope with the analyst
- sign off use of data sources and assumptions
- sign off that analytical output is fit for purpose
- ensure onward communication of outputs is appropriate, with appropriate commentary on accuracy, uncertainty, risks and limitations

(Lead) Analyst

The lead analyst's responsibilities are to:

- understand the question/problem and requirements
- complete documentation (scope, model specification, data specification, data and assumption logs)
- develop specification from scope
- develop QA plan
- deliver analysis
- collect data and understand quality, communicating with data suppliers to understand any known issues or changes to model inputs
- engage subject matter experts as appropriate
- carry out QA in accordance with plan
- record deviations from specification and/or QA plan and agree with commissioner and/or Analytical Assurer
- communicate the results of the analysis, with appropriate commentary on accuracy, uncertainty, risks and limitations

Senior Responsible Owner (SRO)

The SRO role is mandatory for business critical models. They have overall responsibility for the analysis throughout its life cycle and should:

- establish appropriate governance structure
- ensure appropriate time and resources are available for the analysis and QA
- agree level of QA and ensure appropriate time and resources are available for the modelling and QA
- agree the scope and specification with the analyst
- sign off the use of data sources and assumptions

- signs off that the model output is fit for purpose
- ensure onward communication of outputs is appropriate, with appropriate commentary on accuracy, uncertainty, risks and limitations
- sign off use of analytical output

Analytical Assurer (AA)

The Analytical Assurer works with the lead analyst and the SRO. They have the responsibility to:

- assure scope meets requirements
- assure specification is appropriate and meets scope
- assure QA plan is appropriate to support decision making
- assure that the QA plan has been followed, including an appropriate audit trail
- confirm that input data has been requested via a formal specification
- seek reassurance that notable changes in the data and assumptions have been accounted for in the analysis
- make sure the risks associated with the analysis have been understood
- provide analytical sign off that the model is fit for purpose, clarifying the risks associated with the analysis

Policy Assurer

The policy assurer is often the SRO. They have the responsibility to:

- assure policy requirements are captured in the scope
- assure policy intent has been implemented in the model

Finance Business Partner

The finance business partner role is optional, and mostly needed for forecast models and high spend business cases. They have the responsibility to:

- feed in financial requirements
- understand uncertainty of output

Appendix A: AQUA Book types of model

Policy simulation: to better understand policy options that drive government decisions. Ministers make policy decisions based on assessments of the likely cost and impact of policy choices. For example, the Intra Government Tax Benefit Model is used to analyse the distributional impact of tax and benefit changes.

Forecasting: to predict the future and inform today's policy choices. For example, demographic projections are essential to understand future cost pressures for education and healthcare. Equally, DECC use the updated Energy and Emissions Model to forecast the energy demand and emissions by fuel type and business sector under existing firm and funded policies.

Financial evaluation: to better understand future liabilities or costs. For example, modelling to understand the future cost implications of current pension commitments or the future cost of decommissioning existing nuclear energy plants.

Procurement and commercial evaluation: for the letting and management of large contracts, and to ensure value for money – for example, where a key service is to be contracted out as in the case of railway franchises or where a major IT upgrades or new system is being introduced.

Planning: to make workforce decisions which affect the delivery of future services. For example, these models may be used to assess the number of trainee teachers, doctors and nurses required to deliver education and healthcare into the future.

Science based: to better understand and simulate the physical environment, in order to evaluate possible solutions or to mitigate potentially devastating impacts – for example, climate change and flood risk.

Allocation of funds: to determine how funds allocated to departments are then distributed to, for example: local authorities, schools or across the health service. These models are essential to ensure funds are allocated properly across the country to underpin local service delivery.

Conceptual: to help understand the key influences that are important to a system being modelled. A variety of problem-structuring techniques are used to develop conceptual models.

Appendix B: QA documentation

There is no mandatory format, other than the standardised QA log which must be used for all analysis deemed high risk / high impact, or for analysis supporting business cases going to Investment Committee (InvestCo). In particular, they need not be standalone documents. Mandatory for all analysis

QA log: Records QA activity and feedback on QA outcomes

Record of QA: Can include QA log. Details of the QA work carried out throughout the process. Should be kept up to date throughout the project

QA plan: An overview of the QA activities to be carried out at each stage, including timescales and likely assurers

Scope and specification: Makes clear the purpose of the analysis and outlines the inputs and outputs of the work.

User guide: Helps ensure that the analytical product can be operated as intended.

Input and assumptions log: Outlines scope of inputs and any assumptions being fed into the model

SRO and Analytical Assurer sign off: Provides a record of analysis/model sign-off by both the Senior Responsible Officer (SRO) and Analytical Assurer (AA).

Mandatory for all BCMs

In addition to the documents listed above, the following are mandatory for all BCMs.

Technical guide/specification: Makes clear the detail of how an analytical product, such as a model or a dashboard, operates

Input data specification: Sets out the expected data and format of inputs for business critical models when requesting data from suppliers

Analytical Assurer statement: A statement from the analytical assurer on the level of assurance that can be given to the model.

Risk log: Captures the risks relating to a modelling project. Your risk log might be specific to the model or sit within a wider programme.

Department for Education

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