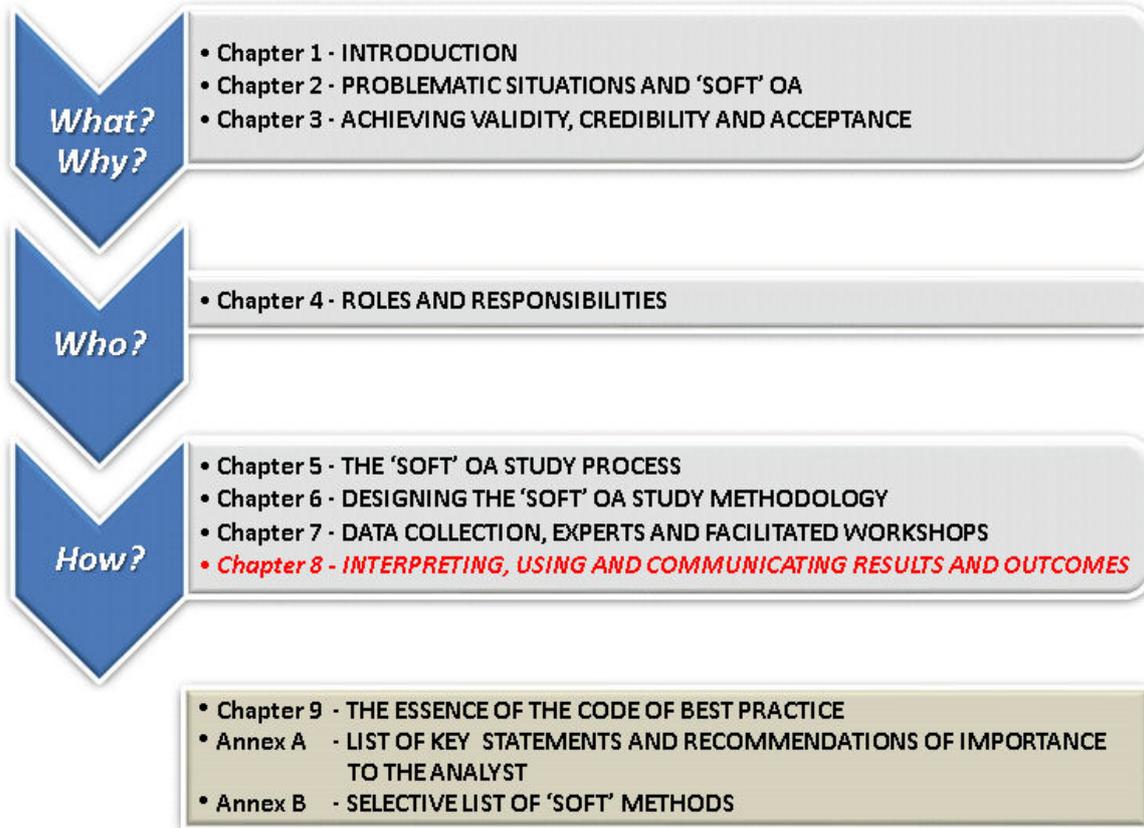


Chapter 8 – INTERPRETING, USING AND COMMUNICATING RESULTS AND OUTCOMES



- Document planned method(s) to provide a reference for later scrutiny of results.
- Conduct triangulation of judgement, using documentation and empirical data where possible to increase confidence in and evidence for judgement.
- Determine, in co-operation with the client, where bias should be controlled and where it should be measured to improve understanding.
- Use feedback as a tool to understand sensitivity and vested interests.
- Give careful consideration to the perceived independence of the analyst.
- Develop a clear lexicon by which outputs of the study can be described to the client community.
- Where possible include the client or his stake in the study process in order to generate ownership of the outcomes.
- Consider how learning from the study will take place iteratively, and provide outputs that support this.
- Provide capture and reporting as necessary to provide traceability and transparency in the methods used.

8.1 INTRODUCTION

This chapter will address issues concerning the results and outcomes of a study employing ‘soft’ methods: interpretation, usage and communication. Their credibility and acceptance depend to a large extent on the study’s elements that have been discussed in previous chapters (e.g. the study plan) but also depend on how results are dealt with and outcomes are communicated. Triangulation, sensitivity analysis and coping with bias all contribute to the validity of the results and will be discussed in this chapter (partly again but from a fresh perspective). The final sections will address how to communicate and report on the study, not only its results and outcomes but also how it was conducted as this contributes to its traceability and transparency, and thereby its auditability. Refer to Section 1.6 or the Glossary for definitions of the concepts of result and outcome of a study.

8.2 INTERPRETING THE RESULTS OF A ‘SOFT’ OA STUDY

Interpretation can be defined as ‘to explain or identify the meaning of ¹’ (the results of an OA study). The interpretation of the results of a piece of analysis will primarily be conducted based on the original objectives of the study. However when considering a study based predominantly on human judgement, a number of considerations raise themselves when interpreting results.

A method used for a ‘soft’ OA study may try to generate consensus, find common understanding or identify different distinct viewpoints on a topic of interest. Despite this there is the scope for different cognitive interpretations of the results from the study, based on the different personalities of stakeholders and their organisational and political stakes in the problem being investigated. It is therefore beholden on the analyst to utilise other evidence that may test competing judgements and provide where possible the most robust interpretation or interpretations. This can be done through the use of a technique known as ‘triangulation’.

8.2.1 Triangulation

When planning an operational analysis study more than one method can be employed in dealing with a problem. When using different methods some approach is required to synthesise the results. This process is known as triangulation, and can also be used to combine qualitative and quantitative results.

Patton [1] identifies four types of triangulation:

- *Data Triangulation* – The use of a variety of data sources in a study;
- *Investigator Triangulation* – The use of several different researchers or evaluators;
- *Theory Triangulation* – The use of multiple perspectives to interpret a single set of data; and
- *Methodological Triangulation* – The use of multiple methods to study a single problem or program.

Data triangulation will be familiar as a tool to operational analysts (and, in fact, to all scientists and engineers), the nuance being in this case that the data in question will primarily come in the form of human judgement. This then identifies the need to consider the breadth of judgement being used to support a ‘soft’ OA study.

In the use of ‘soft’ OA, where judgements are being collected as data, *investigator triangulation* is an important and useful tool. The assessment of the context within which particular observations are made may change from observer to observer, based on their background, experience and knowledge of the subject under study. The use of a number of observers or evaluators to assess a particular issue is important for avoiding bias. A further possibility is to conduct investigator triangulation as part of the writing of the final report, where the various observers will inform the deductions and conclusions presented to the client.

¹ Merriam-Webster Dictionary.

Using data and investigator triangulation is a process of applying logic and asking questions such as “Could both these statements be true, or are they mutually exclusive?” While triangulation does focus on asking questions about the validity of data, contradictions do not mean that a data set is invalid. Instead, contradictions provide greater understanding and should usually be the subject of further investigation (*theory triangulation*).

Methodological triangulation can be considered when designing a data collection plan, i.e. use of multiple methods to collect a particular piece of data, or when designing a study as a whole. The benefits of a multi-method approach are discussed in Chapter 6. *Theory triangulation* may actually be obtained through method triangulation if more than one ‘soft’ method, based on different underpinning theories, is used. In the case of PSMs, theory triangulation may be an integral part of the process, as the desired outcome may be an understanding of the various perspectives of a problem.

When an analyst is looking for further practical evidence that may substantiate or discredit competing judgements, he has two further sources against which he can triangulate; the real world and documented records of it. If an opinion about a subject can be underpinned by discernible observations in the real world then it may carry more weight. This could be gauged through an experiment on the issue in question. If the judgement cannot be underpinned by observations in the real world then supportive documentation may provide greater confidence in the judgement. This could be in the form of historical analysis, weight of professional or academic opinion or documentation of relevant policy, process and standards. In the military environment, doctrine or standards often provides a useful initial comparator.

8.3 SENSITIVITY AND BIAS

This section will discuss two other aspects of using judgement (i.e. sensitivity and bias) that could challenge the validity and thereby credibility and acceptance of the results and outcome of a ‘soft’ OA study.

One of the underpinning aspects of conducting OA within the military environment is that the analysis should be as *objective* as possible in support of the decisions being made based upon it. This is not the same thing as the data collected being objective rather than subjective in nature. Instead it means the objective analysis of subjective data; that the results of the study are based on rules grounded in theory or established practice and characterised by recorded argumentation and rationale and following an agreed and sound process accepted by all involved, and that these results are presented as objectively as possible alongside an understanding of the confidence in the results, their sensitivity to particular factors and the key assumptions underpinning them.

‘Soft’ OA based on human judgement should be treated no differently; assumptions made should be tested and thus should be subjected to debate and *sensitivity analysis*. The sensitivity of judgement given should be captured as part of the method used. There are a number of practical ways and methods for collecting data on the sensitivity of human judgement. Often these are based around asking those providing their judgement to also assess how confident they are in that judgement or trying to capture in some way the consensus or diversity of opinion about a particular factor.

As such one of the most useful and important practical tools when capturing and interpreting judgement is getting those participating to provide *feedback* on their judgements. Some ‘soft’ OA methods will build this in as part of the process, either as the individual providing feedback on their own judgements or on the judgements of the group as a whole: a good example is the Delphi technique. Feedback by participants, to provide sensitivity on judgements given should be built into any study relying on them.

If a ‘soft’ OA method includes quantification of some aspects of judgement, then it may also be possible to conduct sensitivity analysis by changing weightings or factors within the data. A good example of where this may be appropriate is Multi-Criteria Decision Analysis.

Another traditional underpinning value of military OA is that analysis should be *independent of vested interests* (i.e. ‘impartial’). However in some cases when using ‘soft’ OA, the family of Problem Structuring Methods (PSMs) in particular, this may not be wanted or the case. The purpose of the analysis study in itself may be to capture and better understand the vested interests at play. This is often the case when trying to structure a messy problem and where human perception defines both the problem and the potential solutions available.

In light of this, when designing a ‘soft’ OA study, the analyst must carefully reflect on and deal with *bias*. A decision will need to be made, based on the understanding of the desired outputs of the study with the client, where vested interests and bias should be mitigated and where it should be deliberately captured and understood.

The analyst should understand that he also (alongside those also involved in collecting data throughout the analysis study such as the facilitator; ref. Chapters 4 and 7) will introduce bias to the analysis. When collecting judgement-based data through the use of observers, for example, it is important to triangulate to avoid the views of one observer providing a potentially biased view.

Finally, in some ‘soft’ OA studies, and particularly in PSMs, the perceived stake of the analyst, be it by organisational identity or otherwise, may lead to the objectivity of the analyst being questioned by some within the wider client/stakeholder community. In an ideal world, data collection activities such as workshops would be facilitated and analysed by people truly independent of any party within the client system, however in reality this can be difficult to achieve.

In these cases participation of the analyst within the method can and should be carefully designed. Some alternates to having impartial analysts could be to form an analysis team with ‘trusted representation’ by all clients/stakeholders, or to allow a number of reports to be written by different stakeholders based on one set of data and analyses. In every case the relationship of the analyst with the clients and other stakeholders will be a large factor in both understanding and dealing with perceptions of the analyst’s impartiality.

8.4 USING AND COMMUNICATING RESULTS AND OUTCOMES

Methods based on judgement are quintessentially concerned with communication amongst the stakeholders. It is wise to ensure that the plan for application of ‘soft’ methods is well understood by participants and clients. The same goes for the outputs of the study and their utility. Good use should be made of opportunities for debate and sensitivity analysis, preferably with the involvement of all stakeholders. Whatever happens, the experience of stakeholders will be enhanced if they receive feedback on their involvement and they will be more likely to contribute further to both the current analysis and further studies. When reporting the results from analysis studies there are two primary aims:

- Communicating the results to the client system; and
- Providing a transparent record of the analysis for audit purposes.

The methods used for communicating both the results and providing a record of the study will differ from case to case, however the considerations for each stemming from judgement-based or ‘soft’ OA are highlighted below. If the primary audience for output is policy makers, the relevance, clarity, utility and applicability of the findings will be of the utmost importance.

8.4.1 Communicating Results and Outcomes to the Client(s)

One of the differences between judgement-based OA and ‘hard’ OA is that the results are primarily designed to improve understanding and support decision making rather than identify a unique or optimal

solution. This means that the clients and other stakeholders (or their proxies) will need to be willing to participate in any judgement elicitation process and must understand that they, not the analyst, will need to own the model and the results. *Inclusion*, or at least representation, of the client base is a prerequisite for success of a ‘soft’ OA study. It also means that the outcomes of the study will be influenced by the client and will not be generated purely by the analyst. Politics and personalities may prove to be significant factors in the refinement and communication of outcomes.

This *perception of the validity* of the analysis amongst the stakeholders (including the client community and other participants) will be important for its successful use. Its *acceptability* for use in supporting a decision will determine whether it is seen as a successful piece of analysis. If there is ‘expectation failure’ with client doubt, whether reasonable or unreasonable, in the results analysis that is of high quality from a scientific perspective may go unexploited.

A history-based analysis of triggers, causes and events allowed forecasting of possible consequences of Australia’s deployment to East Timor, in particular the effect on the population. While the intent of the study was to identify possible situations thus allowing ‘what-if’ studies and to formulate campaign metrics, there was a notion that the results could be used to *predict actual* (rather than *forecast possible*) events in a statistical manner.

Resolution of this misinterpretation was however readily achieved after explanation of the role of a ‘soft’ OA study. This is an example of how too much may be made of ‘soft’ OA studies, particularly when it comes to the prediction of likely events.

There are a number of outcomes from a ‘soft’ OA study of which the analyst needs to remain cognisant ([2], [3]). Each will have different import for the different stakeholders:

- The *model* built of the situation, which contains the structuring of the problematic situation and/or the solutions suggested. The model will be used for performing analyses and drawing conclusions from its responses in the study itself, but will also have potential to assist in the analysis of other similar situations and to inform later decisions about the system under study.
- The *communication* between participants providing judgement in the study. ‘Soft’ OA methods have the ability to allow communicative exchanges between stakeholders that are more comprehensible, legitimate and accurate. With a structured method the ability to process information is improved allowing participants to focus more on the content and their arguments.
- Providing *increased and shared understanding* of the problematic situation. This is often the real underlying benefit of a ‘soft’ OA study. The participants and stakeholders should achieve together a better understanding of the problem, potential courses of action and others’ beliefs and positions about the situation.
- Strong *ownership* of the problem formulation and the actions being taken to address it. Improved shared understanding will hopefully lead to an improved common purpose in moving ahead, and promote ownership of the problem and actions being taken.

Although the model and the results of the study will likely be presented and clearly visible to the client the other outcomes identified in the bullet list above, unless articulated by the analyst, will likely remain invisible (ref. Figure 8-1). The benefits of communicating and shared understanding for the stakeholders and participants should be identified and clearly articulated by the analyst alongside the direct results and conclusions from the analysis. Likewise, the analyst should ensure the study method and process enhance the ownership of the problem and solution by particular stakeholders as well as articulate it directly to the client system when appropriate.

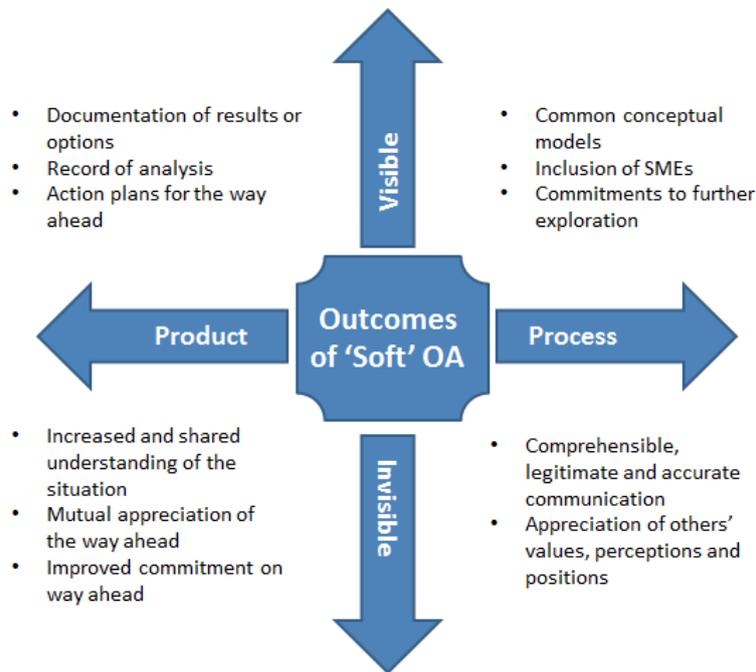


Figure 8-1: The Visibility of Outcomes of a 'Soft' OA Study (Adapted from [4]).

In the defence sector, where 'hard' methods have been used for many years, it may be difficult for the client(s) of OA to understand the differences in product, output and expectation with judgement-based OA. In fact 'hard' and 'soft' OA may be understood better by particular clients depending on their background: an education in the physical sciences as opposed to, say, policy analysis or business studies may bias perspectives of utility or validity. To compound a lack of understanding of the outputs of judgement-based OA the client may also lack confidence in the same analyst to deliver those outputs as results from a more typical 'hard' OA study.

The consequence of all of this is that the analyst will need to be careful that the type of outcome sought by the client and that expected to be provided by the analyst are not different. The analyst will need to explain clearly to clients and other stakeholders what will constitute the output of a judgement-based OA study. As discussed in Chapters 4 and 5, the analyst will need to include the client in the definition of the problem space and then subsequent (if necessary) iterations of the problem statement and options so that this difference in expectation is avoided.

One of the difficulties with elicitation of judgement and the analysis based on that elicitation is that if a stakeholder has not participated in the process, he does not have the experience or 'buy in' for the results. Often results based on judgement will not be transferable to those who have not been part of the process, who will perceive that their views have not been taken into account and distrust the results. This underscores the importance of identifying key stakeholders and as much as possible including them in the judgement process, from problem formulation through discussions of solution options².

8.4.2 Reporting and Delivery

Based on the different outputs identified above, a 'soft' OA study will provide usable results throughout the study as well as at the end. As outlined in Chapter 5, 'soft' OA generally follows a dynamic and iterative process that looks to improve understanding as the problem space is investigated further. This means that

² Sections 4.3.3 and 6.4 discuss the possible ways in which to involve stakeholders.

delivery of results, through communication and reporting will need to be a continuous process throughout the study.

The iterative nature of the process, however, has the ability to cause tension with clients. Most OA studies in the defence sector will be part of a wider program of work that will be time and resource limited and likely managed using a standard project management framework³. To make ‘soft’ OA results credible they will need to produce outputs to meet deliverable timelines. The analyst will need to describe progress clearly to his clients, helping to map the outputs of the ‘soft’ OA study to the wider progress of the client’s work.

Traditionally, an analyst is often responsible for producing the final report (if agreed to as being a deliverable) and briefing interested parties on study recommendations and end products. Although formal closure and reporting of the study is needed, given the nature of ‘soft’ OA, it is likely that politically feasible agreements are made before analysis is complete and before the final report is finished. It is also likely that the analyst will need to provide continued support to the client in refining and delivering the identified outcomes from the study.

In the development of NATO maritime capability, user requirements for monitoring ‘white’ shipping were not well understood. To improve understanding, a cognitive task analysis was conducted using critical incident inquiry and concept mapping to identify operator strategies and reasoning as they worked with systems to complete tasks.

A turnover in the leadership of the project, for both the client and the lead nation, occurred between the completion of the experiment and the publication of the analysis. This happens frequently in a military environment. This resulted in a loss of momentum with the results of the experiment. The cognitive task analysis and concept maps should have probably been the most enduring parts of this work (rather than tool specific recommendations), but were never published and once staff had rotated they were less accessible to their replacements.

A senior decision maker will usually want to ‘deconstruct’ the analysis, in the sense that they will want to understand what particular features of the alternative options and scenarios presented are giving rise to the results. They may then wish to ‘repackage’ these insights to reach different conclusions about the preferred way ahead or to generate different outcomes. These may differ from those that the analyst or a lower-level customer might have identified, not least, of course, because the more senior the decision maker the more strategic the viewpoint tends to be and the more options become available.

It is quite right that decisions should be taken at an appropriate level; it is not for the analyst to usurp a policymaker’s own role in using judgement in their decision; but neither should he simply report the results of his analysis in a mechanistic way and wash his hands of any interpretation. The analyst’s task when delivering a study should therefore be to provide conclusions in a way which allows decision makers to carry through the thought processes in a structured, auditable way and which inter alia facilitates:

- *Identification* of the issues that have been resolved by the analysis and how they interact with those that have not;
- *Isolation* of the key judgements that have been made and the factors on which they depend;
- *Resolution* of ‘what-if’ questions in real time; and
- *Negotiation* of a rational path through a complex problem to a final decision.

Theoretically from a systems perspective, even after action is taken, the flux of events, ideas, learning and the need to cope continues indefinitely. It is for this reason that the intangibles produced during the study continue to provide value even after the study is formally ended. When considering the output and reporting of ‘soft’ OA an analyst should consider how they can support this further organisational learning, through the presentation of models and data and pursuing strong ownership of the way ahead.

³ For example: Projects In Controlled Environments or PRINCE2 as used by the UK government <http://www.prince-officialsite.com/>.

The typical models and subjective data that come from a ‘soft’ OA study may also be considered more difficult to present and understand than some of the outputs of ‘hard’ OA studies. Diagrammatic outputs, such as rich pictures, cognitive maps and causal maps may not have been seen before by a client, and without participation in building them, may be difficult to grasp and understand. Furthermore over time, the utility and understanding in these products may decrease as those who worked on them are increasingly unavailable to describe them first hand. These are considerations when reporting results that are expected to have use for a prolonged period. The analyst will also need to consider ways of dealing with qualitative data, such as grouping by theme and colour coding outcomes.

8.4.3 Traceability and Transparency

Judgement-based analysis, just as with any form of OA should be *trustworthy*. The analyst should aim to be as independent and objective as possible whilst results should be reported with no undeclared assumptions or unstated simplifications to the model developed. As a member of a scientific community, analysts have an obligation to monitor and report their own analytical processes so that they may be subjected to scrutiny.

In contrast to scrutiny of ‘hard’ OA, the reason for transparency in judgement-based OA may not only be so that results are repeatable – although, in theory, this is a desirable goal. Indeed, working with the inherent variability of opinions and judgements of humans, there will be limited ability to repeat a method with a different group of experts and produce the same result⁴. However, the analysis methodology should still be documented alongside the results so that an external scrutineer can understand the methodological framework, and what it aimed to achieve. This will help to demonstrate the legitimacy of the processes undertaken during the analysis as well as the legitimacy of the results. Methods used should be shown to be based on solid theoretical and philosophical grounds. Furthermore, a list of the participants and SMEs who have provided judgement to support the study should be captured and reported. This will help those who wish to scrutinise the study to understand where data in the form of judgement has come from. Although it may be inappropriate to report the names of individual participants, information about their expertise or organisational stake should be recorded and presented.

A sound elicitation of judgement should therefore be preceded by thorough preparation, including the building of a sound analysis plan. This should include considerations for dealing with bias, being able to conduct sensitivity analysis and building confidence in the credibility and acceptability of the results. Practical ways of doing so are explored further below.

The methods selected and the level of validation needed will depend on the level of risk and importance of the decision being supported. There is always the need for this to be agreed and understood between the analyst and the client. When conducting judgement-based analysis, particularly when using PSMs it should be recognised that this may not be clear at the beginning of the analysis process, in fact it is something that will have to be iteratively developed along with the exploration of the problematic situation.

The documentation of an analysis plan also plays another key role. When looking at the validity of the results, particularly of PSMs, it provides a reference for scrutiny purposes. The plan outlines in advance the methodological framework, in terms of which something will be defined that counts as ‘knowledge to be gained from the analysis’. Through this an external person can recover the mental processes used throughout the analysis which led to the conclusions reached, helping to prevent different interpretations of the results by a scrutiniser and the analyst.

A good plan will address most of the issues identified in the preceding chapters of the CoBP. The plan should also recognise the potential for introducing biases into the analysis process, and identify how to

⁴ This may rather be regarded as a strength of ‘soft’ OA: repetition with different groups leading to different results may open up and even extend, for example, the option space.

understand them if not how to control them (they may be a fundamental part of the outcome wanted in a 'soft' OA study).

Practically, the traceability of the analysis will normally be provided by a full and detailed study report. Other tools that can help: an analyst can keep a logbook of their progress with judgement-based analysis just as they might when running a simulation. This can be used to note observed bias, political viewpoints as well as the iterative development of both problem and solution space. As with other OA studies, results and method(s) can be exposed to peer group professionals through conferences, journals and papers.

8.5 REFERENCES

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