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1

Decision Support Tools for Risk, Emergency and Crisis Management: An Overview and Aide Memoire

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Emergency Planning College Position Papers

At the EPC we use Position Papers to define, for the guidance and information of the practitioners we train, our institutional standpoint on good practice in the various disciplines of resilience, emergency and crisis management. These are evolving documents, which will be adapted and updated in accordance with the latest developments and emerging practice. As such, they are a way of identifying what the EPC's current position on a particular aspect of good practice is. This might range from relatively simple issues of nomenclature, where we feel the need to standardise terminology in our training materials, to more developed papers that lay out our particular approach to a specific discipline or function in resilience, emergency or crisis management. They are documents in various forms and formats. They are free downloads from the Knowledge Centre on the college website. As such they are a part of our Public Programme and a *pro bono* service to the resilience community.

Acknowledgements - *this piece of work reflects the critical - in both senses of the word - input of many past and present colleagues in Cabinet Office and the EPC, members of other government departments and agencies who have attended and contributed through the crisis training programme, and international colleagues in FEMA, DEMA and OECD.*

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Version 1

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Touchstones

Tell me what you know, tell me what you don't know, tell me what you think, make clear which is which (Colin Powell)

Thinking sometimes has to be made artificial and deliberate otherwise we take it for granted and assume that we do things when in fact we do not do them at all (de Bono)

If you have a bunch of guys in a room and they are all agreeing with each other, then at least one of them isn't thinking (attributed to Eisenhower)

There are naive questions, tedious questions, ill-phrased questions, questions put after inadequate self-criticism. But ... there is no such thing as a dumb question (Carl Sagan)

Start where you are, use what you have, do what you can (Arthur Ashe)



Introduction

While this may be useful as a stand-alone document, it is primarily intended as an aide memoire that is associated with training conducted by the EPC or by the Civil Contingencies Secretariat Training and Doctrine Team. **It is offered as an overview of relevant tools and neither it, nor its contents, are mandatory in any way.**

Tools included here are compatible with and support established and emerging good practice, including the British Standard BS11200 *Crisis Management, Guidance and Good Practice*, the 2015 SCG SITREP Template and the Central Government Emergency Response Training Programme (CGERT).

While the primary focus is crisis management, many of the tools are applicable to risk management more generally, and the title reflects that.

This document does not elaborate on concepts that are nonetheless central to it, such as information management, situational awareness, team cognition and the management of uncertainty. **For background on this please see MacFarlane and Leigh (2014) in the references.**

Finally, a health warning: the American psychologist Abraham Maslow commented in 1966 that *"if all you have is a hammer, everything looks like a nail"*. Different tools will suit different people, facing different problems, in different contexts, in different ways – select the ones that help and set aside the ones that don't. Following the principle of military doctrine, all of these tools, frameworks and approaches are offered as "handrails, not handcuffs".



Structure of the document

The document is *loosely* organised around the key questions that drive crisis decision making:

- *What?*
- *So what?*
- *What might?*
- *Where to?*
- *What now?*
- *What if?*

The decision tools, techniques and frameworks are organised into the following sections:

- *The basic framework: Situation – Direction - Action*
- *Thinking and collaboration tools*
- *Problem and issue decomposition tools*
- *Tools for managing uncertainty*
- *Tools for cause and impact analysis*
- *Forward Look Tools*
- *Option and choice tools*
- *Validation and challenge techniques*

For each section more general tools appear at the start, with more developed or complex techniques and frameworks following. An annotated list of references appear at the end, some of which are highlighted and recommended for next steps.

Formatting: the document is formatted to be printed on A4 and double sided. The last four sheets of the document comprise a 2-side aide memoire and a 2-side generic recording template for decision support. They are intended to be printed separately or ripped off the main document as required.



The Basic Framework

Situation – what is going on?

Direction – what are we trying to achieve?

Action – what are we doing to do about it?



The Basic Framework

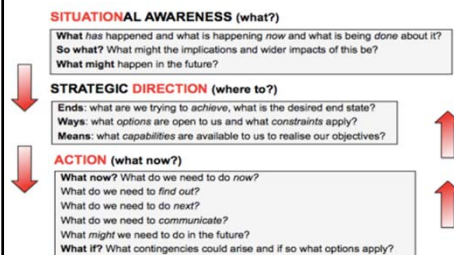
This document adopts a basic framework for crisis decision making that seeks to establish three key elements:

Situation – establishing shared situational awareness

Direction – determining strategic direction, ends, ways and means

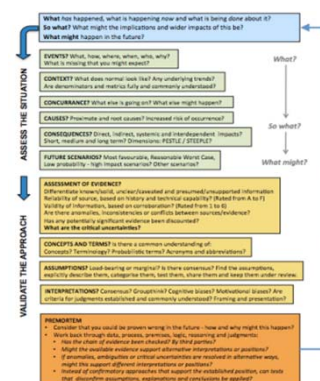
Action – ensuring that appropriate decisions and actions are implemented.

The basic framework structures the questions *What? So what? What might?* *Where to? What now?* and *What if?* questions that any rigorous approach to support risk, emergency and crisis decision making must get to grips with.



Answering these questions demands that many further questions must be asked, and answered. The aide memoire shown above and elaborated overleaf sets out a series of questions, considerations and challenges that will enable decision support staff and decision makers to confidently establish the best possible level of shared situational awareness.

The tools that follow in this document may assist decision support staff and decision makers in approaching these questions with rigour, confidence and an appropriate level of criticality.





THE QUESTIONS THAT DRIVE CRISIS DECISION MAKING

SITUATIONAL AWARENESS (what?)

What *has* happened and what is happening *now* and what is being *done* about it?
So what? What might the implications and wider impacts of this be?
What might happen in the future?



STRATEGIC DIRECTION (where to?)

Ends: what are we trying to *achieve*, what is the desired end state?
Ways: what *options* are open to us and what *constraints* apply?
Means: what *capabilities* are available to us to realise our objectives?



ACTION (what now?)

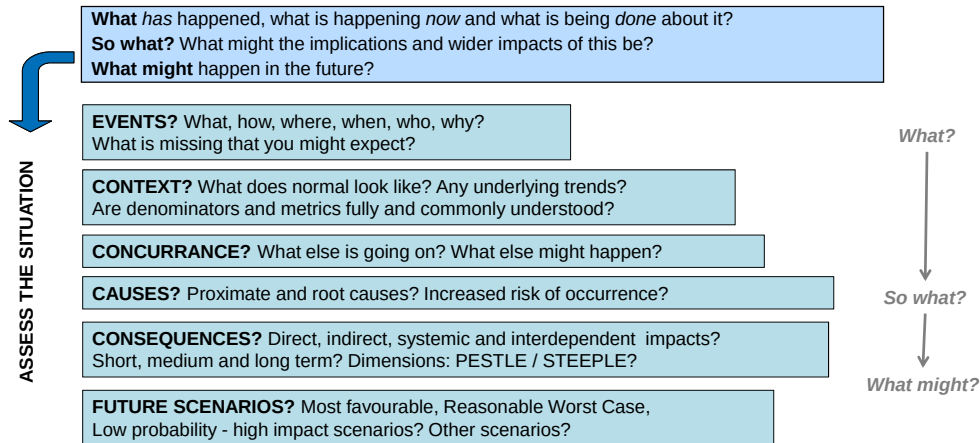
What now? What do we need to do *now*?
What do we need to *find out*?
What do we need to do *next*?
What do we need to *communicate*?
What *might* we need to do in the future?
What if? What contingencies could arise and if so what options apply?



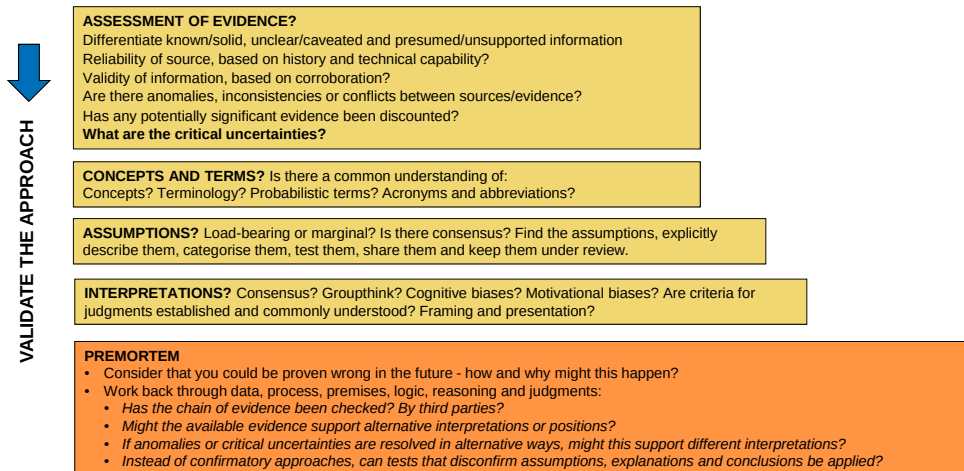
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THE QUESTIONS THAT DRIVE SITUATIONAL AWARENESS: SUMMARY OF CONSIDERATIONS: 1) ASSESS THE SITUATION



THE QUESTIONS THAT DRIVE SITUATIONAL AWARENESS: SUMMARY OF CONSIDERATIONS: 2) VALIDATE THE APPROACH





Thinking and Collaboration Tools

Mind maps
Mess mapping
Brainstorming
Idea spurring questions



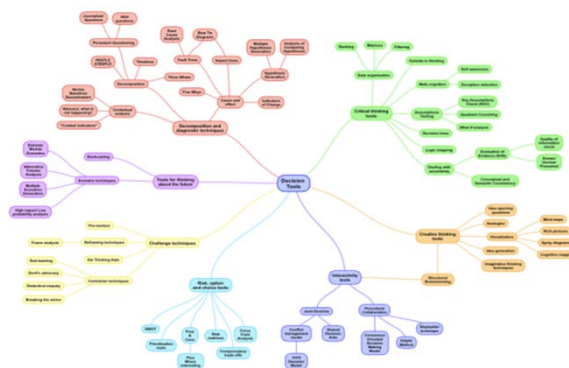
Mind Maps

Mind maps are based on the concept of 'radiant thinking' in which the human brain works through associating information, memories, concepts and other forms of knowledge, starting from a central concept, event or problem. Mind maps work by establishing a central concept and then activating links from this concept to other elements in a form of visual hierarchy, such as the very basic example below.

Mind maps are particularly effective as an exploratory tool as they both *disaggregate* an issue into constituent parts, while also *interlinking* the parts into a systems view of the whole.

They also lend themselves very well to collaborative working.

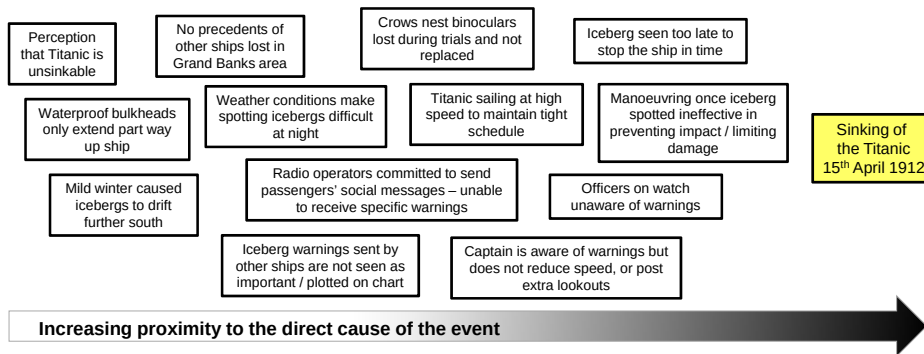
A raft of guidance materials has been published and is available free online (together with some effective mind mapping tools for computers and tablets), but they are intuitive and can be as basic or as complex as you want to make them.





Mess Mapping

Mess mapping is a simple, but effective technique to disaggregate an issue, for instance unpicking contributory and causal factors (see also *Fault Trees*, *Root Cause Analysis*, *Impact Mapping* and *Bow Tie Diagrams*). Buchanan and Denyer (2015) constructed a mess map for the sinking of the Titanic, abbreviated here:



In this mess map factors that are more closely linked are closer to the centre, underlying or more distant events in the cause-effect chain, are more peripheral.



Brainstorming

Brainstorming is typically used in a fairly generic way to describe processes of coming up with ideas through a group activity which relies on a mutually respectful and encouraging atmosphere where contributions are not influenced by grade or rank structure.

Adair (2007) proposes some guidelines for effective brainstorming:

Suspend judgment: the emphasis should be on coming up with and putting forward ideas without having them evaluated at this stage; do not interrupt the creative process with judgements.

Welcome free-wheeling: the analogy is free-wheeling downhill on a bike; maintain momentum and keep going with the process of creating ideas, options and perspectives.

Strive for quantity: many of the ideas you come up with are likely to be non starters but if there are plenty to choose from, the odds of here being several good ones are better.

Combine and improve: the process should not be an individual one and participants should feel free to progress, redirect or adapt the ideas of others.

Do not edit: ideas do not need to be defended and there should be no attempt to weed any out at this stage as even "bad" ideas can be the starting point for much "better" ones.



Idea-Spurring Questions

Sometimes creativity needs a bit of a shove and a set of 'Idea Spurring Questions' were presented by Osborn (1963) . They are intended to set trains of thought and so the approach should not be taken too literally. The 73 questions might appear to be a bit of a thrown-together jumble, but they were carefully chosen and can be useful, for example in giving a brainstorming session a kick-start.

Put to other uses? New ways to use as it? Other uses if modified?

Adapt? What else is like this? What other ideas does this suggest? Does the past offer a parallel? What could I copy? Whom could I emulate?

Modify? New twist? Change meaning, colour, motion, sound, odour, form , shape? Other changes?

Magnify? What to add? More time? Greater frequency? Stronger? Higher? Longer? Thicker? Extra value? Plus ingredient? Duplicate? Multiply? Exaggerate?

Minify? What to subtract? Smaller? Condensed? Miniature? Lower? Shorter? Lighter? Omit? Streamline? Split up? Understate?

Substitute? Who else instead? What else instead? Other ingredient? Other material? Other processes? Other power? Other place? Other approach? Other tone of voice?

Rearrange? Interchange components? Other pattern? Other layout? Other sequence? Transpose cause and effect? Change pace? Change schedule?

Reverse? Transpose positive and negative? How about opposites? Turn it backward? Turn it upside down? Reverse roles? Change shoes? Turn tables? Turn other cheek?

Combine? How about a blend, an alloy, an assortment, an ensemble? Combine units? Combine appeals? Combine ideas?

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Problem and Issue Decomposition Tools

Persistent questioning
PESTLE et al



Persistent Questioning

Open questions

The following are the basic open questions (i.e. the kind of questions that yield more detailed qualitative responses than yes/no responses) which are used in a huge range of investigative and analytic professions:

- What? • When? • Where? • Why?
- Which? • Who? • How?

Journalists' Questions

Journalists are taught six fundamental questions to extract the key features of events: who, what, when, where, how, why which can be elaborated as follows to expose and evaluate assumptions, structures and processes in both plans and response activities:

1. What is it that you do (and why)?
2. Who does it (and why them)?
3. When do you do it (and why then)?
4. Where do you do it (and why there)?
5. How do you do it (and why that way)?

Toyota's 'Five Whys'

In an attempt to get to the root causes of production line faults and inefficiencies Toyota implemented an approach of getting production line managers to ask 5 why questions following an adverse incident. It was extremely effective for them and can work very well in other contexts. It is however far from perfect and can potentially lead you up a blind alley but it remains a very useful technique if thoughtfully applied. Try it out in a professional context (e.g. why did X flood last year?)

Detectives' Principles

Assume nothing

Believe nobody

Check everything



PESTLE *et al.*

The framework that started out as PEST is one of the most widely known decision support tools, and it is the basic framework that underpins the UK National Risk Assessment. It has been developed over the years, as illustrated here. This approach is sometimes referred to as 'environmental scanning'.



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Tools for managing uncertainty

Known – Unclear – Presumed Source & Credibility Assessment Assumptions testing Frame analysis



K-U-P Analysis

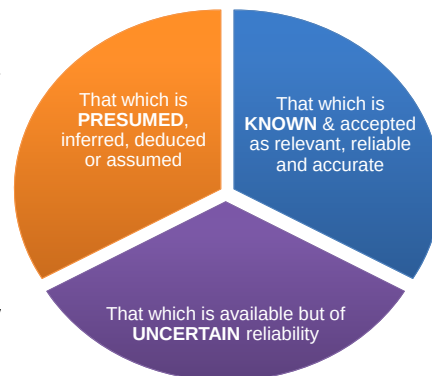
Critical uncertainties are unknowns which have a potentially significant impact on our understanding of an event or emergent situation, the resolution of which could profoundly change our understanding of a situation.

This framework gets you to sort the available facts into three broad divisions:

Known: information that is judged to be relevant, reliable and sufficiently accurate and timely to base decisions on under the current circumstances.

Unclear: information that is available, but is of uncertain reliability. This lack of clarity could be down to various factors including incompleteness, questionable sources, complexity where the implications of what is known is unclear, or ambiguity where the information has been framed in a way that lacks clarity. Further investigation might be able to 'shift' facts from unclear to known.

Presumed: it is important not to mix up inferences, deductions or assumptions with solid information ('knowns' in this approach). This is not to say that various types of presumption are not potentially necessary or valid elements of the decision making process, but rather that they should be explicitly and transparently separated from what is Known and Unclear to ensure that the more and less reliable elements of the decision basis are seen for what they are.





Assessing Source and Credibility

Validation is a fundamental element of information management, and the two-dimensional approach set out below is a framework to establish a first position, rating both the **reliability of the source** (based on historical experience) and the **credibility of the information** in question (assessed primarily by triangulation with other sources). It originates from the secret intelligence community, where its successful application depends on training, practice and common understanding.

The KUP framework is a more appropriate starting point if you have no prior experience of the A1/F6 framework.

Source reliability		Information credibility	
A	Completely reliable: a tried and tested source which can be depended on with confidence.	1	Confirmed by other sources: a different and separate source confirms the information under consideration.
B	Usually reliable: a source that has been successful in the past, but where there may be some grounds for doubt.	2	Probably true: the essential elements of a report or other form of information is confirmed by another source.
C	Fairly reliable: a source that has been used in the past and upon which some degree of confidence can be based.	3	Possibly true: no further information to triangulate or confirm the original source is available, but it is compatible with what is already known.
D	Not usually reliable: a source that has been used in the past but which has been unreliable more often than not.	4	Doubtful: the reported information tends to contradict previously reported and validated information.
E	Unreliable: a source that has been used in the past but has proved unworthy of confidence.	5	Improbable: the reported information positively contradicts previously reported and validated information.
F	Reliability cannot be judged: a source that has not been used in the past.	6	Credibility and truth cannot be judged: reported information cannot be compared with information from another source.



Dimensions of data and information quality

When assessing the quality of a dataset or individual elements of information, be aware of the following dimensions of data and information quality:

Core criteria:

- **Relevance** – to what degree does it meet the needs of end users?
- **Accuracy** – to what degree does it reflect the underlying reality?
- **Source** – based on past experience, how reliable and well trusted is the source?
- **Credibility** – to what degree is evidence supported or contradicted by other sources?
- **Timeliness** – how current is it?

Further criteria:

- **Completeness** – does it tell the whole story?
- **Coherence** – is it internally consistent?
- **Format** – is it accessible and appropriate?
- **Compatibility** – can it be combined to add value?
- **Security** – is it appropriately safeguarded?
- **Validity** – to what degree is it capable of being verified?

It is critical to note that there are no universal right answers to these questions and considerations – judgement is required, and this becomes more important under pressure in a crisis. However, judgement should be based on the most rigorous process possible under the prevailing conditions – it does **not** mean 'winging it'.

See also: DAMA UK (2013) in the references.



Assumption Testing

An assumption is something that is held to be the case or true, without evidence that confirms to be so. As risk and crisis management is inherently an exercise in the management of uncertainty assumptions of various types are necessary. They do however have the potential to cause all manner of difficulties if they fail, that is they prove to be wrong and thereby cause plans or activities to collapse, or have diminished value and effect. The following five questions (see Dewar, 2002 for the much more detailed version) can bring a level of rigour to the identification and handling of assumptions:

1. **Identify them:** identify all assumptions and bring them to the surface where they can be seen and evaluated. Even where assumptions appear to be long-established and 'safe' as a consequence, they should not go unchallenged. Assumptions about value also need to be 'surfaced' as they might not be shared or even acceptable.
2. **Make them explicit:** where assumptions have to be made they should be stated in explicit terms; where assumptions are hidden, or implicit, they are most dangerous.
3. **Categorise them:** not all assumptions are equally significant; to use an engineering analogy some assumptions are more 'load bearing' than others. It is important to establish which assumptions are central to a plan or other activity, the failure of which would have the greatest impact. Others will be relatively less significant and so do not merit exhaustive analysis. It is also important to be clear whether assumptions relate to the 'problem' (be that a risk or another stimulus requiring an organised response) or to the 'solution' (the set of actions required to address the problem as it is understood, including the readiness of required resources).
4. **Test them wherever possible:** some assumptions can be rigorously tested and where this is the case they should be. Other assumptions are much harder to test but all available evidence that may assist in testing them should be sought.
5. **Record and share them:** in the interests of audit and transparency what you find out about assumptions should be shared with the users and all those with an interest in the plan or activity. Remember that hidden equals dangerous and that exposed assumptions can be subjected to ongoing scrutiny as context and knowledge changes.

One useful technique in systematically challenging the validity of an assumption is to identify a *contrary assumption* – look at each one from a different point of view, possibly considering the inverse or opposite of each assumption under scrutiny.



A simple framework for exploring assumptions

A complementary framework that assists in the exploration of assumptions is set out below.

Once as comprehensive as possible a list of assumptions has been identified then each can be critically examined using the following questions as a starting point:

- If the assumption were false how much will that impact on the understanding / arrangements that are in place?
- How much confidence do you have in the assumption, and what evidence (historical and contemporary) supports this?

Following this each assumption can be scored on the basis of two criteria:

RELEVANCE (otherwise known as how 'load-bearing' the assumption is)

- Largely irrelevant to the task in hand (Score – 0)
- Important – the task in hand is based on an understanding that is likely to be flawed if the assumption is false (1)
- Essential – the task in hand is based on an understanding that cannot be true if the assumption is false (2)

SUPPORT

- Unsupported or very questionable (Score – 0)
- Correct with some caveats (1)
- Solid (2)

The table below is a useful template for recording this (but you're likely to need many more rows).

Assumption	Relevance	Support



Frame Analysis

Framing is the way in which information can be presented in ways intended to, or otherwise likely to, lead people to certain conclusions. Most problems can be framed in different ways but for various reasons we tend not to explicitly challenge the way things are being presented to us and go out of our way to look at the same situation, object, subject or evidence from one or more different perspectives.

It would of course be exhausting and hugely inefficient to do this as a matter of course, and we use trust and intuition to 'pass' a lot of things we are presented with. It still requires however a conscious and disciplined effort to apply frame analysis.

Frame analysis is a simple technique to stimulate other perspectives and possible interpretations. It could be done in an entirely 'freeform' way, but Wright (2001) proposes a number of questions to structure the analysis:

1. What aspects of the situation are downplayed?
2. What reference points are used to measure success?
3. What does the frame emphasise?
4. What does the frame minimise?
5. Do others think about the issue differently?
6. Is the decision one involving potential gains or losses?

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Tools for Cause and Impact Analysis

Fault Trees
Root Cause Analysis
Impact Trees
Bow Tie Analysis

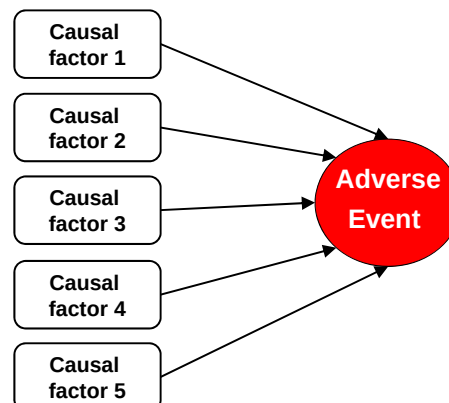


Fault Trees

Fault trees are a visually effective way, especially when done by a group of people, of identifying the potential causal and contributory factors that might lead to an adverse event.

In the very simple fault tree illustrated here no attempt has been made to prioritise the relative significance of the factors. More complex fault trees might introduce a commentary, either qualitative or quantitative, on the relative likelihood or causal strength of factors.

If it adds value to do so the fault tree can be extended to the left with additional 'layers' that set out further upstream causal or contributory factors. The analysis of deeper, underlying problems is the business of *Root Cause Analysis*.





Root Cause Analysis (RCA)

RCA is an approach founded in systems analysis to understand emergent risks, and the multiple, direct and contributory, causes adverse events and emergencies. Most causal factors in adverse events tend to not immediately apparent, and it takes a determined, sustained and well informed analysis to dig down to their underlying, or root causes. Fundamentally RCA drills down from **WHAT** happened to **HOW** it happened and then to **WHY** it happened.

Note that around 80% of the recommendations made following public inquiries between 1985 and 2006 related to human factors and organisational practices; only 20% related to equipment of various types. RCA therefore will be heavily concerned with 'soft systems' as well as factors relating to physical assets, equipment and technology.

The following dimensions are considered in the RCA of an event, failure, or malfunction:

- 1. Condition:** an as-found (as distinct from as-should-be) state that may have safety, health, quality, security, economic, reputational, operational, or environmental implications.
- 2. Proximate cause:** event(s) or condition(s) that directly resulted in an adverse incident, the elimination of which would have prevented the incident. This may also be known as the **direct cause(s)**.
- 3. Intermediate cause:** event(s) or condition(s) which lie between root causes and proximate cause in the system of cause and effect that led to the adverse incident
- 4. Root cause:** One of multiple factors that contributed to or created the proximate cause and subsequent undesired outcome. Typically multiple root causes contribute to an undesired outcome.

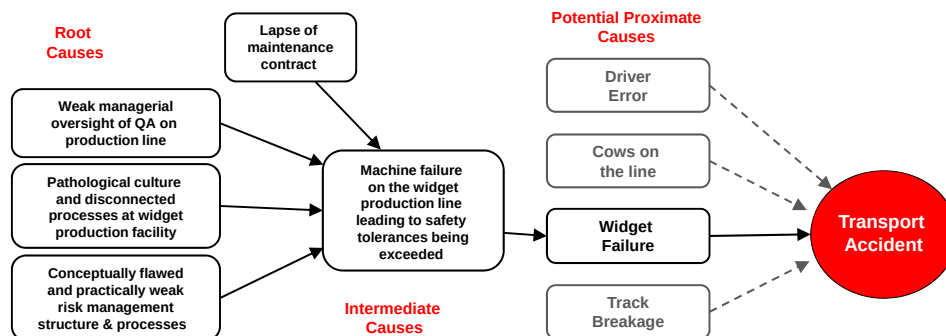
The details of RCA will depend to a certain degree on the context, but the key stages are set out below.

1. Gather as much specific and contextual information as possible to comprehensively establish **WHAT** happened .
2. Decompose your understanding of what happened into events and relevant conditions. Do not become concerned at this stage with narrowing in on likely causes and keep it broad; it might be that something highly unexpected or seemingly insignificant emerges as extremely important at a later stage.



3. Develop a timeline of what happened. Remember that this is most unlikely to be the final version.
4. Transform the timeline into a fault tree, fishbone diagram or similar to start to establish HOW events and conditions interrelated before and at the time of the adverse incident.
5. Your analysis of WHAT and HOW should lead you to identify proximate causes.
6. Keep asking WHY to identify root causes. Be sure that you delve beyond intermediate causes.
7. Keep checking your understanding, logic and information.
8. From your understanding of the factors involved identify potential control measures (see *Bowtie Diagrams*).

In this deliberately very simple and slightly flippant example, a range of potential proximate causes for a transport accident are 'drilled into' to identify intermediate and root causes.





Impact Trees

Impact trees have much in common with fault trees, and effectively they apply the same kind of approach to the 'downstream' side of the equation.

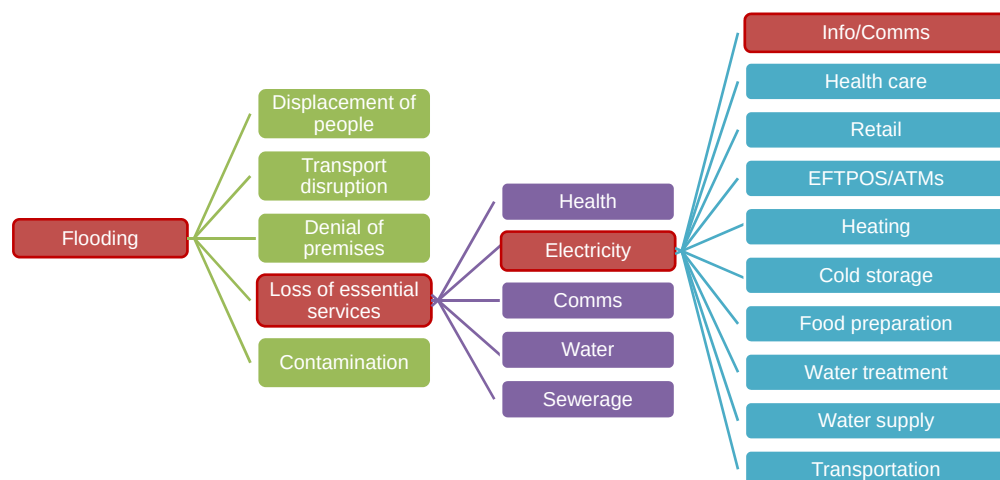
In common with fault trees they are very visual and consequently lend themselves well to group working. Individuals or groups using the technique should not get too focused at too early a stage on prioritising or qualifying the impacts.

In the example below some of the immediate consequences of flooding and wider and longer term impacts arising from interdependent systems are drawn out. However this is a partial analysis and only one of the essential services is identified (electricity) and no claim is made for a comprehensive analysis of all the impacts of loss of electricity. The acronyms used in the example overleaf stand for Automatic Teller Machine (ATM) and Electronic Fund Transfer at Point of Sale (EFTPOS).

Three 'layers' are used in this illustrative example, but this is in no way a limit and fishbone diagrams can get very big and complex very quickly and you might find you're going to need a bigger bit of paper!



Wider Impacts Analysis - Impact Trees





Bow Tie Diagrams

In their simplest form Bow Tie Diagrams bring together fault trees and impact trees. As such they are effective in looking simultaneously at 'both sides of a problem'.

Their greater value however comes when measures to prevent adverse events happening or measures to mitigate the impacts of adverse events are factored in. Very simply, and this is a simple but effective tool, for each potential causal factor (i.e. on the left of the diagram) a box is added to the line and measures that may prevent the cause or latent problem giving rise to an incident are noted in that box. The same is then applied to measures that may mitigate the impacts were an incident to occur.

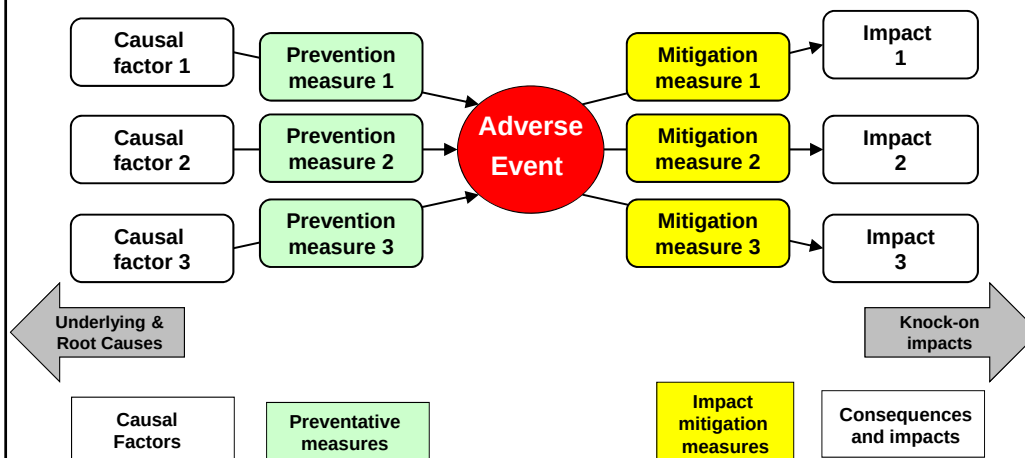
Bowties are highly effective in visualising problems and providing a framework for group work to address them. They can be made more sophisticated, and one potentially useful extension is to annotate prevention and mitigation measures with (i) a status indicator (e.g. Green = in place, Red = not started), or (ii) any risks that may bear on those measures (e.g. Public address systems that would fail in the event of power loss).

The basic example illustrated overleaf stops at a single 'layer' of causal factors and impacts, but in the same way that fault and impact diagrams can keep 'drilling into' such factors with multiple branches, bowtie diagrams can be complex if that adds insight and value to the process.

Note that one very useful extension that is not illustrated here is to consider risks to the preventative and mitigation measures identified: this has the clear benefit of preventing overly optimistic assumptions being accepted at face value.



Simple example of a Bow Tie Diagram with control measures





Forward Look Tools

Timeline Basic Scenarios



Forward Look Tools

The forward look provides answers to the third core question to build situational awareness – **What might** happen? It is important to bear in mind that this question is different to what you **want** to happen (the desired end state). Failing to distinguish between the desired end state and potential future outcomes is one manifestation of the 'one future problem' in which decision makers fail to make allowances for uncertainty. In a crisis uncertainty is typically high, so tools that enable decision makers to understand what might happen in more or less favourable outcomes, and the contingencies that might underpin those outcomes, are valuable.

Many of the tools presented in this document can support the forward look in various different ways, notably those that focus on impacts and consequences (e.g. impact trees and Bow Tie Diagrams). This section focuses on tools that explicitly take a temporal perspective in looking ahead, establishing what *might* happen at various points in the future, or in the case of timelines, what *should* happen at various times in a planning process.

There is a wide variety of tools that can support a forward look, ranging from 'quick and dirty' techniques that take little time and limited expertise (but can very usefully serve as a focal point for the efforts of a team or wider group) to highly technical tools that take considerable time, effort, data and expertise to apply. The tools that follow are in the former general category.

You should bear in mind that projections, forecasts and predictions and scenarios are different things. The following definitions from the IPCC* are useful:

Projection – in general usage, a projection can be regarded as any description of the future and the pathway leading to it.

Forecast/Prediction - when a projection is branded "most likely" it becomes a forecast or prediction. A forecast is often obtained using deterministic models, outputs of which can enable some level of confidence to be attached to projections.

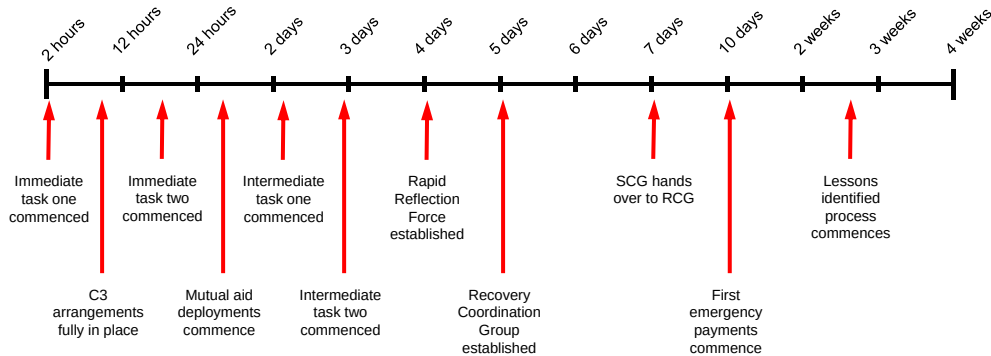
Scenario - a scenario is a coherent, internally consistent and plausible description of a possible future state of the world. It is not a forecast; rather, each scenario is one alternative image of how the future can unfold. A set of scenarios is often adopted to reflect, as well as characterise, the range of uncertainty in projections.

* Intergovernmental Panel on Climate Change - definitions at <http://www.ipcc-data.org/guidelines/pages/definitions.html>



Timeline

Timelines are a useful tool for projecting events, past, current and future, for the purposes of planning and communication. In the very basic example below the timeline illustrates tasks and events for the purposes of illustrating either what has happened (for the historical record) and/or what needs to happen at specific times for objectives to be realised. More sophisticated timelines can support project and programme management, for example in the form of Gantt Charts or Critical Path Analysis.



Basic Scenarios

Two basic scenario techniques are illustrated overleaf. The notes below relate to each in turn.

Basic scenarios (1): in a number of recent crises in the UK the Cabinet Office Civil Contingencies Secretariat has adopted the following three scenarios for thinking about potential future outcomes: 'most favourable', 'reasonable worst case' and 'low probability high impact'. Noting that these three phrases are generic and have to be articulated in specific and appropriately precise terms in the context of individual risks / crises, they are a very useful starting point in establishing, articulating and communicating a range of future scenarios for the purposes of decision-support, the analysis of alternative courses of action and the communication of uncertainty to decision makers.

Basic scenarios (2): in this approach, which has been used by the Danish Emergency Management Agency (DEMA), a series of generally defined crisis scenarios ('rapidly controlled, recovering crisis'; 'slowly controlled, recovering crisis'; 'initially controlled, then resurgent crisis'; 'stable, but not diminishing crisis'; 'escalating crisis') are used as the basis for collaborative thinking about potential future outcomes. Each of the 'crisis curves' reflects a general typology of crises, and they can be effective in forcing a group to consider a range of outcomes and the conditions and contingencies that might be associated with each.

While these are basic approaches to scenario thinking, they can be highly effective when time is tight to arrive at a first position in understanding potential future outcomes, the conditions and contingencies that may give rise to each, and to appreciate what this means for strategies, plans and tactics to intervene and influence events towards the desired end state.

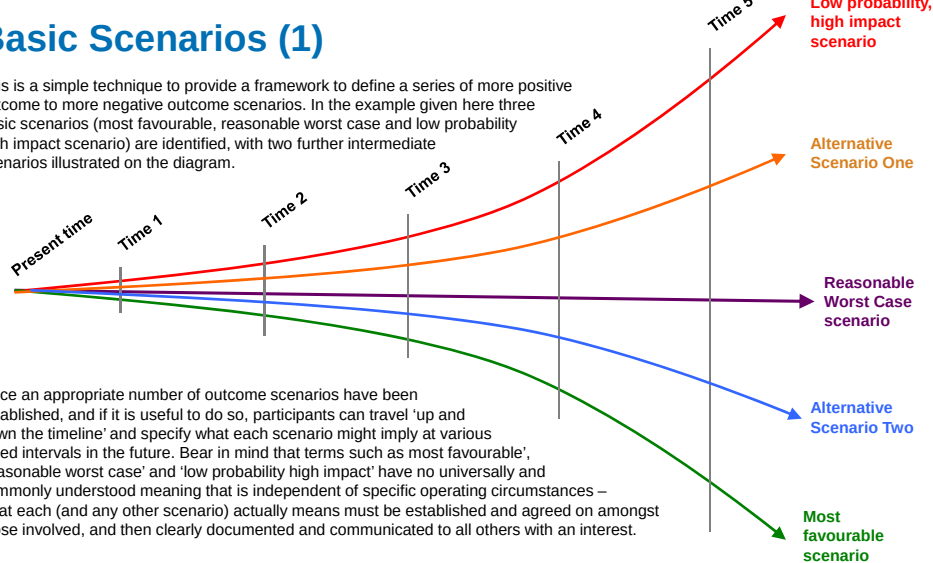
For further information about scenario thinking see Lindgren and Bandhold (2009) and Wright and Cairns (2011) in the references.



Cabinet Office

Basic Scenarios (1)

This is a simple technique to provide a framework to define a series of more positive outcome to more negative outcome scenarios. In the example given here three basic scenarios (most favourable, reasonable worst case and low probability high impact scenario) are identified, with two further intermediate scenarios illustrated on the diagram.



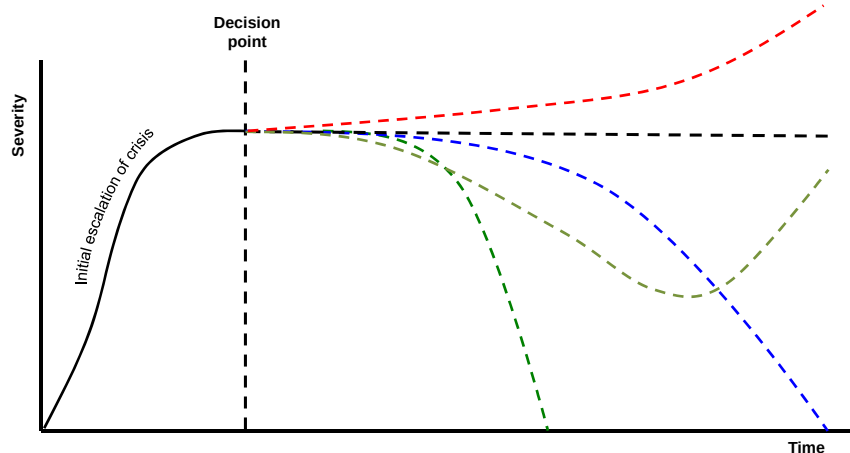
Once an appropriate number of outcome scenarios have been established, and if it is useful to do so, participants can travel 'up and down the timeline' and specify what each scenario might imply at various timed intervals in the future. Bear in mind that terms such as 'most favourable', 'reasonable worst case' and 'low probability high impact' have no universally and commonly understood meaning that is independent of specific operating circumstances – what each (and any other scenario) actually means must be established and agreed on amongst those involved, and then clearly documented and communicated to all others with an interest.

Decision Support Tools for Risk, Emergency and Crisis Management



Cabinet Office

Basic Scenarios (2)



General Crisis Scenarios

- Rapidly controlled, recovering crisis
- Slowly controlled, recovering crisis
- Initially controlled, then resurgent crisis
- Stable, but not diminishing crisis
- Escalating crisis

Decision Support Tools for Risk, Emergency and Crisis Management



Option and Choice Tools

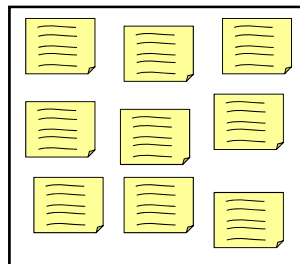
Pros and Cons Plus, Minus, Interesting
Force Field Analysis SWOT
Decision Trees
Prioritisation Tools
Making Trade-offs



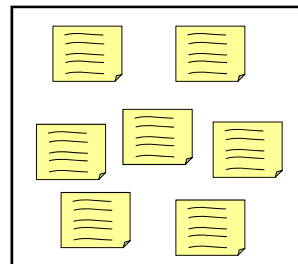
Weighing the Pros and Cons

In 1772 Benjamin Franklin advised a friend who was struggling to choose between two options to simply set down on paper two lists: (i) the advantages or 'pros' and (ii) the disadvantages or 'cons' of each option. You might get a bit more modern and collaborative with post-it notes and whiteboards, but the principle of setting down both sides in as explicit and as comprehensive a way as possible remains extremely powerful.

PROs



CONs





Plus Minus Interesting (PMI) Analysis

PMI is a slightly more elaborate approach than Pros and Cons, but it introduces the additional category of Interesting (in effect a kind of miscellaneous category for other factors that are relevant, but which don't fit neatly as simple plus (pro) or minus (con). In addition PMI uses numbers, positives for plus factors and negatives for minus factors, to establish a sense of their relative significance. There is of course no good reason why you shouldn't use numbers to indicate relative significance in pros and cons, if the Interesting category appears to you to add little value. The simple example below relates to a change of job.

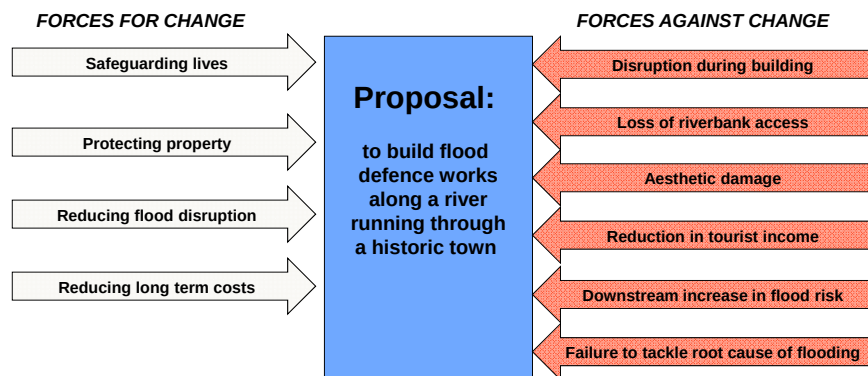
Plus		Minus		Interesting	
Positive Factor	Score	Negative Factor	Score		Score
Better pay	+5	Less interesting	-3	Overseas travel: interesting but time away from home	-1
Health insurance	+1	Fixed term contract	-2		
Company car	+2	Longer commute	-1	Possible catalyst to move house	+1
				Aggregate Score	+2

While a tool such as this is unlikely to be your sole point of reference for a significant decision, it can be useful in unpacking and crystallizing your thoughts, and when done in a group it is a potentially useful device in bringing forth different perspectives.



Force Field Analysis

Force-field analysis is a useful technique to capture factors that may support a proposal (forces for change) and factors that may operate against the proposal (forces against change). It is especially effective when used in a group setting, and is effectively a specific type of pros and costs listing. The relative significance of forces for and against change could be represented numerically, or by using larger arrows for more significant factors.





SWOT Analysis

The identification and cross-referencing of **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats is one of the best known of decision tools.

Definitions:

Strength: a resource or capability available to an individual, group or organisation that is relevant to the attainment of defined objectives.

Weakness: an actual or latent problem, constraint or fault within an individual, group or organisation in the organisation that might limit or prevent it from achieving defined objectives. It is important to note that weaknesses describe internal rather than external (contextual or environmental) problems.

Opportunity: a situation that provides real or potential scope for an individual, group or organisation to work towards defined objectives. These may arise from a change of some sort, or a recognition of a pre-existing opportunity. Bear in mind that opportunities describe aspects of the external environment, and should not be confused with strengths which are internal.

Threat: a situation in the individual, group or organisation's external environment that has the potential to impede, constrain or prevent the attainment of its objectives. Threats are contextual or environmental rather than internal.

A matrix such as that illustrated overleaf is the typical way of structuring the analysis.



Template for recording SWOT Analysis

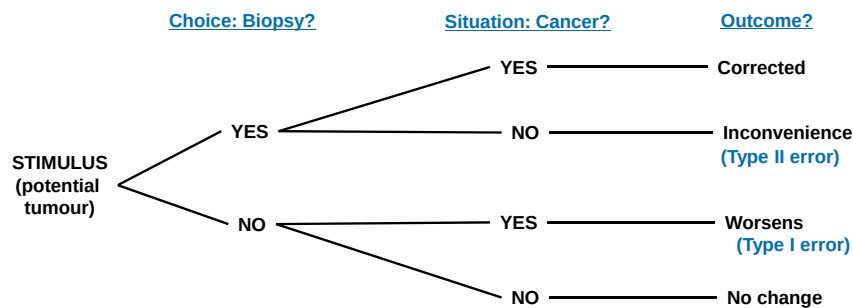
<i>This space can be used to record decisions and tasks</i>	Strengths	Weaknesses
Opportunities	<i>Record ideas to use internal strengths to take advantage of existing or emerging opportunities</i>	<i>Record ideas to offset or overcome weaknesses that might prevent exploitation of existing or emerging opportunities</i>
Threats	<i>Record ideas to utilise strengths to prevent the emergence of identified threats and/or mitigate their impact if experienced</i>	<i>Record ideas to limit, reconfigure or reverse weaknesses that make you vulnerable to threats from the external environment</i>



Decision Trees

Decision trees look like fishbone diagrams, but 'limbs' of a decision tree represent options. As with most of the tools and frameworks summarised here there are both simple and complex variants. The more complex variants assign weights, probabilities and costs to alternatives, but they are not covered here.

They are effective tools to make explicit, and visually so, alternatives and their potential consequences. In the example below someone has a potential tumour which stimulates the need to make a decision and the decision tree identifies both situations and outcomes.



Simple prioritisation tools

Explicitly defining your objectives is a necessary element of rigorous decision making. Facing competing priorities, or when otherwise considering the allocation of scarce resources, the MoSCoW approach offers as easy to remember framework for distinguishing between essential, optional and desirable objectives. It doesn't in itself help you to make the decision, but it can introduce structure and discipline to the process of sorting the essential from the non-essential.

MoSCoW stands for:

- **M**ust have
- **S**hould have
- **C**ould have
- **W**ould like to have

Focusing more explicitly on outcomes, the following three questions may help in evaluating alternative courses of action:

- What do I **want** to happen?
- What outcomes are **acceptable**?
- What outcomes are **unacceptable**?

Important and Urgent

A related and very simple tool that can help determine priorities is to consider requirements or activities on the basis of the importance/urgency matrix below. When used in the context of a defined aim it can be quick and useful.

Urgency	High	Urgent but not important	Urgent and important
	Low	Not urgent and not important	Not urgent but important
		Low	High
		Importance	



Making Trade-Offs

Decision analysts make an important distinction between **compensatory** and **non-compensatory choices**. **Compensatory choices** are those that have to be made between options where both are desirable but where having less of one thing can be compensated by having more of another. **Non-compensatory choices** are those between options where potential outcomes are so undesirable they simply cannot be compensated for by positive outcomes that may also be realised. It follows from this that trade-offs can only apply to compensatory choices where more of one variable will offset having less of another variable.

The six stages below (based on Wright, 2001) provide a structured approach for considering trade-offs in the context of compensatory choices:

- 1. Identify the choice alternatives:** explicitly and clearly state what alternatives the decision is to choose between.
- 2. Identify the attributes of relevance to decision problem:** identify the various considerations and dimensions of the decision problem that are relevant to the decision maker, stakeholders and other affected parties
- 3. Assign scores to measure the performance of alternatives on the basis of each attribute:** come up with and apply a scoring system (0-5, 1-10, etc) against which the alternatives can be measured
- 4. Determine a weight for each attribute to reflect how important that attribute is relative to other attributes:** not all dimensions under consideration are equally significant (e.g. in a trade-off between cash and reputation reputation may be judged to be three times as important) and this should be reflected in the relative weightings allocated.
- 5. Calculate the sum of the weighted scores:** this is the straightforward maths part
- 6. Conduct a sensitivity test to see how far you need to change the scoring and weightings to come up with a different order:** the sensitivity test requires you to go back to all scores and/or weights or just ones that you may have reservations about and tweak them. If the outcome remains the same then the decision process may be judged to be relatively robust.

DELIBERATELY BLANK



Validation and Challenge Techniques

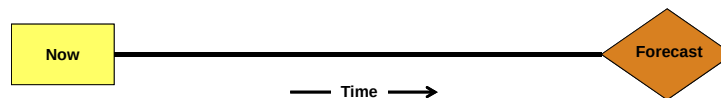
Back-casting
Pre-mortem
Devil's Advocacy
Red teaming



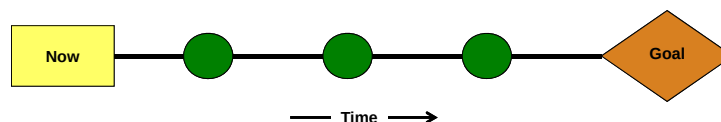
Back-casting

Backcasting is an approach that seeks to answer the question of **HOW** desired future states can be achieved. It is contrasted with forecasting, illustrated in simple form below.

Forecasting: starts with an analysis of current conditions and trends, and projects future conditions.



Backcasting: starts with a future goal, examines current conditions and trends, then determines necessary steps to bridge gaps and overcome obstacles to achieve the desired goal.

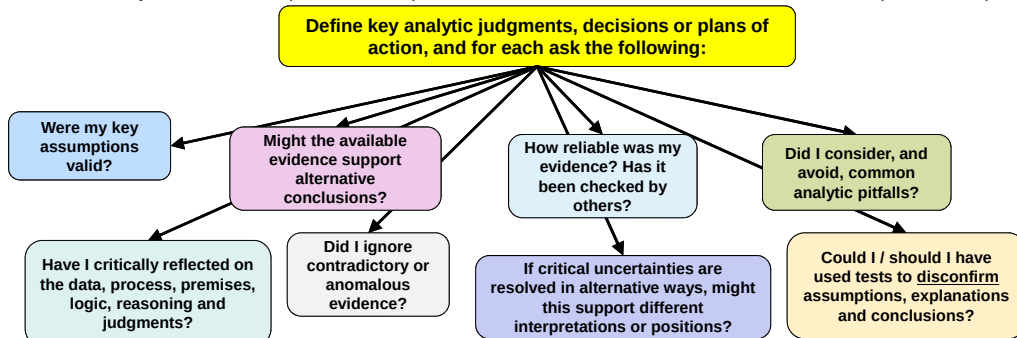


This is a very basic overview, and the approach can be developed to sophisticated levels if that adds value and has meaning. For a developed example see: Asian Development Bank (2013) *Investing in resilience: ensuring a disaster-resilient future*, Mandaluyong City, Philippines.



Pre-mortem

Lots of projects, plans, assessments and other activities that are based on prior foundations fail. In a medical context a post-mortem is an investigation to determine the cause of death, and other contributory and relevant factors. A pre-mortem is a structured approach to determine in what ways something might go wrong, and how and why, in order that risks to success are appropriately addressed. Pherson Associates (2008) describe a pre-mortem as 'a systematic assessment of how a key analytic judgement, decision or plan of action could go spectacularly wrong. It is conducted prior to finalising an analytic judgement or decision'. The following questions are a useful starter in setting up a pre-mortem, but you should develop and include questions that are relevant and useful to the task in hand (see overleaf).



Pre-mortem

Key issues to query, challenge, check and reflect on in a pre-mortem should include the following, although you may wish to add to this list:

- ☐ **Premises** – where were you starting from in terms of what you expected or wanted to see?
- ☐ **Evidence** – have you robustly validated all the evidence, using appropriate frameworks?
- ☐ **Unknowns** – have uncertainties been assessed and critical uncertainties been identified?
- ☐ **Assumptions** – have all assumptions been identified, shared, explored and tested?
- ☐ **Methods** – were analytic or other methods appropriately selected and correctly used?
- ☐ **Processes** – have relevant processes and procedures been adhered to?
- ☐ **Assessments and judgements** – can you defend all your assessments and judgements?
- ☐ **Conclusions** – can you defend and provide evidence for any conclusions you have drawn?
- ☐ **Communications** – is the means of communication appropriate to subject and audience?



Devil's Advocacy Approach

A Devil's Advocate is someone who deliberately takes on a position that they don't believe in to test the robustness of a position, evidence, inferences, decision process, logic and reasoning or recommendations. In simple terms it requires someone to step away from something they believe in and to try and break it. It can be described as a form of 'outside-in thinking' or 'breaking the mirror' of conformity with established positions, process and interpretations.

The broader principle is that a dialectical approach (that is one which promotes debate, discussion and constructive argument) will force positions, assumptions, etc. to be exposed, worked over and rigorously evaluated. This can be especially important under conditions that may lead, however inadvertently, to the problem of 'Groupthink'. This is where a group of people can begin to converge on a position or decision that an objective outsider would readily identify as unworkable, improper or otherwise unacceptable. Details on groupthink are readily available elsewhere (the Wikipedia page is a good starting point).

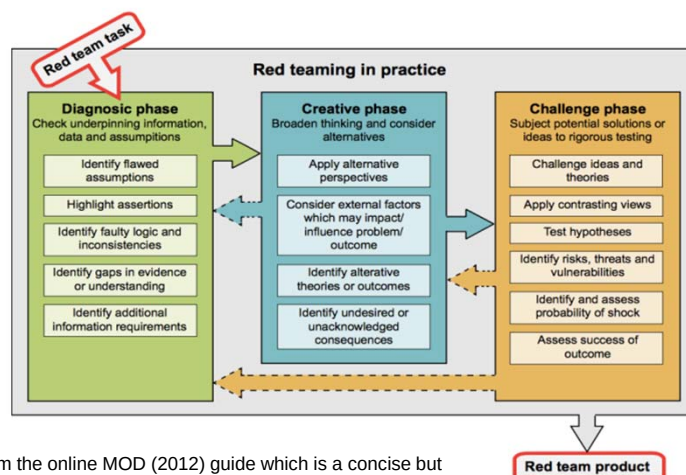
The basic point here is that constructive disagreement, even if forced through Devil's Advocacy, should be welcomed and accommodated if circumstances (especially time) permit it. It is a potentially powerful tool to winkle out dodgy evidence, alternative interpretations, weak reasoning and flawed logic or unsafe conclusions.



Red teaming

'Red teaming is the independent application of a range of structured, creative and critical thinking techniques to assist the end user make a better informed decision or produce a more robust product' (MOD, 2012).

It is an approach that allows organisations to challenge aspects, specific or more general, of their operations or the underpinning assumptions, plans and ways of working.

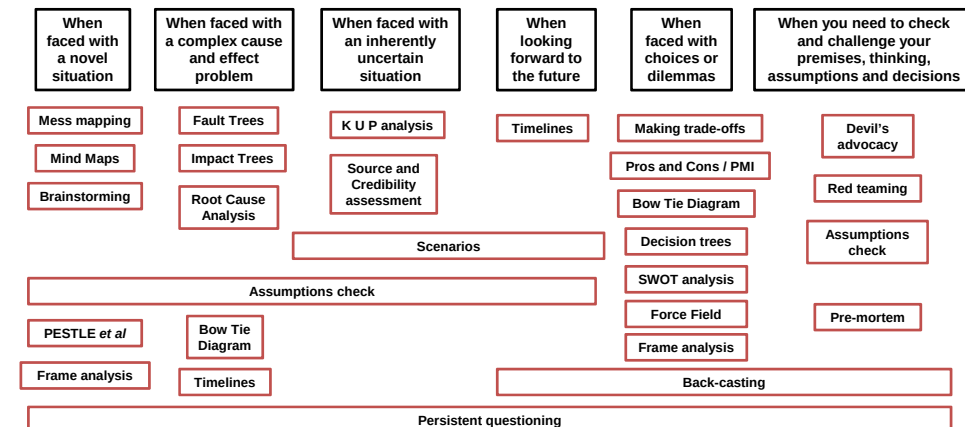


The diagram above is drawn from the online MOD (2012) guide which is a concise but thorough treatment of the subject – please see the references for the full title.



Complementary “Bundles” of Tools

Many of the tools summarised in this document can very effectively be used in association with others, and you are the best judge of what to use, and how, in specific contexts. The diagram below is therefore only a suggestion of circumstances under which tools may be complementary.



Decision Support Tools for Risk, Emergency and Crisis Management



Common Ground and Key Messages

Many of the tools summarised here are elaborated in much more detail elsewhere and if specific tools work for you then the references provided should point you in the right direction for further information. Better still, use them for real and see how they assist you in practice. The list below draws out some key messages from what has been covered here:

- be intolerant of sloppy reasoning and dodgy assumptions: look for them, they're probably hidden
- be sure that you are looking at the real problem: this might need digging and different viewpoints
- be sure that colleagues and partners share your understanding
- don't wait for priorities to present themselves; make a concerted and collaborative effort to agree them
- be robust with colleagues and partners and encourage others to look for problems in your work
- if it looks simple, keep looking: persistent questioning is the key to a sound understanding
- most problems have multiple dimensions and one person, one perspective can never see them all
- as a general rule "ambiguous/implicit/hidden = bad and clear/explicit/transparent = good" is pretty robust
- be honest about uncertainty and never resort to unjustified precision, especially with numbers
- language is a potential minefield: do all those involved have a common understanding of terminology?
- think about both the costs and the opportunity costs of options
- remember that decision making is ultimately about informed judgement and tools can only ever support this

You are urged to work with these tools, and in turn we would be very grateful for your feedback on this document and we will be happy to discuss these ideas and your experiences (contacts overleaf).

Decision Support Tools for Risk, Emergency and Crisis Management



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Decision Support Tools for Risk, Emergency and Crisis Management: An Aide Memoire

Version 1, September 2015

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The following two double sided sheets are intended to be printed separately or ripped off for use as an aide memoire.



CRISIS MANAGEMENT AIDE MEMOIRE FOR DECISION SUPPORT

THE KEY QUESTIONS THAT DRIVE CRISIS DECISION MAKING:

SITUATIONAL AWARENESS (what?)



What has happened and what is happening *now* and what is being *done* about it?
So what? What might the implications and wider impacts of this be?
What might happen in the future?

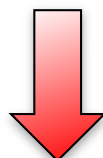
STRATEGIC DIRECTION (where to?)



Ends: what are we trying to *achieve*, what is the desired end state?
Ways: what *options* are open to us and what *constraints* apply?
Means: what *capabilities* are available to us to realise our objectives?



ACTION (what now?)



What do we need to do *now*?
 What do we need to *find out*?
 What do we need to do *next*?
 What do we need to *communicate*?
 What *might* we need to do in the future?
What if? What contingencies could arise and if so what options apply?



RECORDING

Have interpretations, conclusions and decisions made (or not made) been recorded?
 Has the evidence and reasoning behind these choices and decisions been recorded?

KEY CONSIDERATIONS IN SITUATIONAL REPORTING:

Information Assurance: Technical Dimensions

- Relevance – *it meets the needs of end users*
- Accuracy – *it reflects the underlying reality*
- Timeliness – *it is still current*
- Completeness – *it tells the whole story*
- Coherence – *it is internally consistent*
- Format – *it is accessible and appropriate*
- Compatibility – *it can be combined to add value*
- Security – *it is appropriately safeguarded*
- Validity – *it is capable of being verified*
- Provenance – *level of trust in the source*
- Remember information management is like a supply chain – each step should add value and every step can contaminate the product (Garbage In – Garbage Out)
- When reporting bear the principle of 'less is (usually) more' in mind

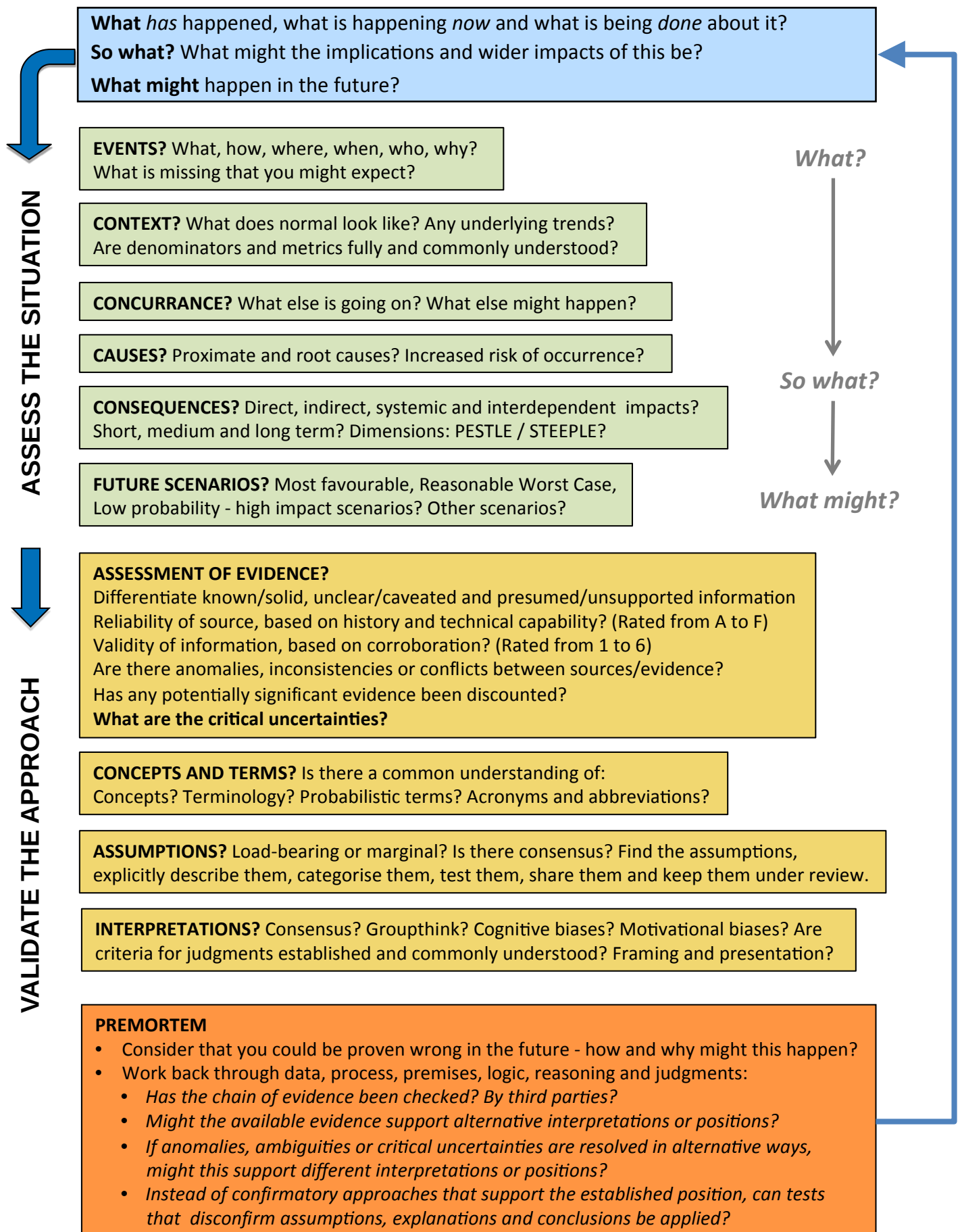
Human Factors: Making Sense of Information

- Think ahead – *you need to understand and track events, developments, dynamics, impacts and potential outcomes to achieve the desired end state*
- Be clear on the audience and think from the end user's perspective – *why are you doing what you are doing?*
- Keep strategic reports strategic - *append relevant operational detail where necessary, but do not obscure or distract from the key points*
- Coherence matters more than personal preference in info mgmt, especially when working across boundaries
- There is no merit in 'talking up' situations or taking an overly optimistic view of events or interventions

Persistently Challenge three key dimensions:

- **Evidence** – see 'technical dimensions' (left)
- **Thinking** – see 'considerations' overleaf
- **Behaviour** – yours, others, groups and across boundaries; balance divergence with convergence

QUESTIONS THAT DRIVE SITUATIONAL AWARENESS: SUMMARY OF CONSIDERATIONS



NOTE: this is a generic template, intended for development or adaptation as required. Local standard templates may exist, notably the SCG SITREP template for UK local emergency responders. Where local best practice or standards exist you should start with them.

Generic Decision Support Recording Template (1)

Summary of situation				
What?	Has happened?		Is happening now?	Is being done about it?

So what?		Short-term	Medium term	Long term
	Direct impacts			
	Indirect / interdependent impacts			

What might?	Most favourable scenario		Reasonable Worst Case Scenario	Low Probability High Impact Scenario

Strategic Issues and Risks Arising

Foreseeable capability and capacity issues

Critical Uncertainties	Key Assumptions

NOTE: this is a generic template, intended for development or adaptation as required. Local standard templates may exist, notably the SCS SITREP template for UK local emergency responders. Where local best practice or standards exist you should start with them.

Generic Decision Support Recording Template (2)

DIRECTION / STRATEGY			
TEXT			

Courses of Action (COAs)		
OPTION 1	DEPENDENCIES AND ASSUMPTIONS	ASSOCIATED RISKS
OPTION 2	DEPENDENCIES AND ASSUMPTIONS	ASSOCIATED RISKS
OPTION 3	DEPENDENCIES AND ASSUMPTIONS	ASSOCIATED RISKS

Potential constraints on COAs and decision making

WHAT NEXT? Decisions to be taken by your organisation or sector (define timescales used below)			
NOW	SOON	LATER	WHAT MIGHT WE NEED TO DO IN THE FUTURE?

What if? (CONTINGENCIES)

What do we need to communicate?