Elements of a good report

Here we explain the reasoning elements from the Checklist, which good reports should address. Not all elements will be equally relevant to each problem, and some elements may overlap. Use your judgment about which elements are relevant and how best to present them.

See also

- *Report Essentials: Overview & Checklist*
- *Report Template & Quick How-to Guide* – The Quick How-to Guide shows an annotated ‘dummy’ report with examples of most elements
- *Annotated example of a real report*
- *Report writing glossary*

Remember:

- The purpose of your team's report is to communicate the arguments for your conclusion and explain your team’s reasoning to a reader who is familiar with the problem but hasn’t worked on it.
- In general, follow the BLUF (Bottom Line Up Front) principle whenever possible.

Conclusion(s)

Your conclusion is your team’s final answer to the question posed by the problem. If the problem poses multiple questions, you’ll have multiple conclusions.

When there’s a single, overarching conclusion, state it clearly and succinctly in your report’s title. You can elaborate further in the first paragraph. For example:

- If your conclusion is a hypothesis, you may describe the particular scenario you have in mind in greater detail.
- Note any caveats, qualifications, probabilities or uncertainties in relation to your conclusion.

When there are multiple conclusions (answers to multiple questions), state them as part of the ‘key judgments’ section (see below).
Probability (and expressions of uncertainty)

Some problems will require you to attach probabilities or other expressions of uncertainty to your judgments. Even when they don’t, it’s good practice to do so.

The Rules, to be followed strictly:

RULE 1: Always pay very close attention to the problem statement. Where the question explicitly asks for probabilities, provide them in the form suggested by the problem.

RULE 2: The probabilities of alternative hypotheses should be mathematically consistent. In particular, the chances of mutually exclusive and collectively exhaustive hypotheses should sum to 100%.

- Example: “It is likely (50-60%) that Yngve Dinnarsson was the instigator of the coup attempt. It is also possible but less likely that the instigator was Bjorn Andersen (25-45%) and even less likely (5-15%) that it was Erik Pedersen.” The mid-points of these ranges sum to 100.
- Tip: See A summary of the key consistency rules for more.
- Tip: If you omit hypotheses (i.e. don’t give probabilities for every conceivable hypothesis), the sum of the probabilities of the hypotheses you list must be less than 100%.

Additional Guidelines

Guideline 1: Include probabilities where there is uncertainty in your judgement. If you express these probabilities using common phrases such as “very likely”, always follow each such phrase with a numerical probability range.

- Example: If the question is “Who instigated the coup attempt?” and there are three main possibilities, indicate the most likely person and attach a probability. Say something like “It is likely (50-60%) that Yngve Gunnarsson was the instigator of the coup attempt.”
- Example: “The chance that a faulty actuator caused the crash is very low (0-10%).”
- Tip: Narrower intervals express greater certainty (more confidence). Wider intervals express greater uncertainty (less confidence).

Guideline 2: Within each report, use common phrases consistently, i.e., with similar probability ranges.

- Example: Don’t do this: “It is very likely (65-99%) that Sartoria provided weapons to the Northern Separatists… And it is very likely (60-80%) that the Northern Separatists will succeed.”

Guideline 4: Where feasible, provide explicit justifications for probability numbers.

- Example: “Billibistan is likely (52-86%) to have developed tactical nuclear weapons capability. This estimate is based on Monte Carlo simulation of the Billibistan development program under various scenarios.”
**Guideline 5:** If you want to emphasize the level of confidence you have in a probability statement, use a simple verbal scale of low-moderate-high, without numbers attached.

- **Example:** “It is likely (50-60%) that Yngve Dinnarsson was the instigator of the coup attempt. Due to the scarcity of evidence, we only have low confidence in this estimate.”
- **Tip:** Avoid attaching numerical confidence estimates to numerical probability ranges. Don’t say: “We are highly confident (85-95%) that it is very likely (60-80%) the Northern Separatists will succeed.”

**Key Judgments**

In keeping with the BLUF idea, follow your conclusion with a ‘key judgments’ section. Think of this as the ‘executive summary’ of your judgments. It can include any of the following:

- Where the problem asks multiple questions, your answers to those questions
- The ‘milestone’ judgments - important intermediate conclusions you drew - that enabled you to reach your final conclusion
- The most important points a reader needs to know about how you reached your conclusion
- The gist of the argument for your conclusion, to be fleshed out in the Reasoning section.

Identifying what should go into a ‘key judgments’ section is an art. For example:

- In some cases, your key judgments will relate only to the most likely hypothesis; in other cases, reporting on multiple scenarios will be important.
- If a case hinges on a single piece of evidence, outline your assessment of it.

Another way to approach the key judgments section is to ask yourselves, ‘**What would make a strong case for this conclusion?**’ That would give you the outline of an ideal, ‘high level’ argument, which can form the basis of your key judgments. (See also ‘Essence of your case’ below.)

- For example, a high-level argument for the conclusion that ‘Ms Scarlett murdered Mr Black’ might be that Ms Scarlett was the only person who had motive, means and opportunity to murder Mr Black, being the only person with access to his study. You would outline this in your key judgments and then flesh out and justify those claims in the body of your report.

Consider including **probabilities** or otherwise indicating your degree of uncertainty in your key judgments.
Question Interpretation/Clarification

If the task or question was unclear or ambiguous, explain the ambiguity and how you resolved it. How you interpret the question will influence your approach. (If you and your readers assume different interpretations of the question, your response won’t make sense to them!) Consider also:

- Justifying your interpretation or decision
- Explaining how different interpretations would impact the analysis.

The Arguments Supporting Your Conclusion(s)

You must provide detailed arguments supporting your conclusion. Why do you think it’s the right (or best) answer, or the most likely hypothesis? This is the bulk of your report, and where you get to spell out your reasoning and the bases for all your judgments.

Make sure your arguments are spelt out so a reader can follow your reasoning without having to interpret. For example, don’t just list information and say it provides evidence for your conclusion. Explain why or how it does so. This usually means spelling out inference assumptions (see the ‘Key Assumptions’ section below).

The Essence of your case

There are four benefits to articulating the essence of your case (your arguments) for your conclusion, outlining the ‘big picture’ before delving into the details. It can help you

1. check that your report has consistently covered all the key parts of your case
2. shape the rest of your report, in both content and structure
3. judge how strong your case is
4. orient your readers.

A good approach is to step back from the details and ask yourselves, ‘What would it take to make a strong case for this conclusion? What would we have to show? Have we actually shown it?’ E.g.

- To make a strong case that Scarlett killed Mr Black, you’d have to show that Scarlett was the only person with both capability and intent.
- To make a strong case that X caused Y you’d have to show that nothing else could have caused Y.
- To make a strong case that Bill committed a particular crime you’d have to address all of the elements of that crime (as specified in law).
- To make a strong case for a recommendation you’d have to show that it meets all of the criteria set out in the brief.

Figuring out the essence of your case can be challenging, but it’s both good thinking and good communication.
Evaluation of information and sources

Sometimes you can take the truth or credibility of information contained in a problem for granted. At other times, ascertaining the credibility of information will be part of the challenge. Such judgments will depend on further judgments about, e.g.

- How plausible a piece of information is
- Whether it’s independently corroborated (i.e. whether it’s confirmed by at least one other, independent source)
- How competent, reliable or otherwise trustworthy the source of the information is
- Whether the information could be deliberately intended to mislead, deceive or misdirect.

Explain and justify such judgments. If there’s a lot of information to be evaluated, you may want to use an evidence table. See Working with Evidence and Sources

Significance of information and diagnosticity of evidence

Your detailed arguments should show how the evidence supports your judgments. This usually means specifying why information is significant - how it connects to a judgment or conclusion.

- For example, the fact that the dog didn’t bark is evidence that the intruder was a regular visitor. Why does it constitute such evidence? Because the dog would have barked at a stranger.

Explaining the significance of information in this way often helps us articulate assumptions lurking in our inferences. (See ‘inference assumptions’ in ‘Key Assumptions’ below.)

Closely related to the significance of information is the diagnosticity of evidence.

Evidence is diagnostic if it clearly favors one hypothesis over another. If a piece of information is equally consistent with all your hypotheses, it’s not diagnostic - and doesn’t really constitute evidence for or against any of them. (It’s not really ‘evidence’, it’s just information.) Explain whether you thought information was diagnostic and why. Identifying evidence that is diagnostic will be the key to many cases.

Distinguishing judgments from information

Many claims or ‘facts’ feature in your reasoning. Sometimes it will be important to clarify for the reader whether a particular claim or ‘fact’ is

- a piece of information contained in the problem description, or
- a judgment you have made, such as
  - an assumption
  - something you’ve concluded from information contained in the problem.
For example, if a report says, ‘We know that JB did not catch the 09:35 flight’ or ‘The Ruritanian government doesn’t want war with Urbania’, are these ‘facts’ given in the problem information or are they judgments you made? If they are judgments, you must justify them.

Rebuttals of prominent objections

What are the strongest, most likely, or most persuasive objections to your conclusion, key judgments, hypotheses or assumptions? If they’re reasonable arguments (not ‘straw men’), describe their grounds and strength, and explain how you refute them.

In a complex case, there are likely to be many possible objections. Don’t go crazy listing everything you can think of! You’ll have to judge what’s most important to include. Would an objection readily spring to a reader’s mind? If so, include and rebut it.

Key Assumptions

To solve most problems you’ll have to make assumptions. You should identify assumptions that are critical to your overall assessment, justify them, and discuss the implications for your conclusion or key judgments if they turn out to be wrong.

There are many things we call ‘assumptions’, but you should concentrate on three types:

1. **Background assumptions**, which frame how we understand or interpret information, including a question or task. Background assumptions are inevitable in our thinking, and we’re often unaware of them; but they can skew or limit our thinking, so it’s useful to bring them out into the open to test if they’re justified.
   - Example: ‘We understand “nuclear weapons program” to mean Iran’s nuclear weapon design and weaponization work and covert uranium conversion-related and uranium enrichment-related work, as distinct from Iran’s declared civil work related to uranium conversion and enrichment’.
   - Example: What stops us solving the ‘nine dots’ puzzle is the assumption that we must stay within the implicit outline of the nine dots.
   - Example: ‘In predicting what Kim is likely to do we assume that he is rational and would seek to maximize utility.’

2. **Questionable ‘facts’**, which you accept or reject. If you can’t confidently determine whether a potentially significant ‘fact’ presented in a problem is reliable, you’ll have to decide whether or not to accept it and factor it into your analysis. In other words, you essentially must decide whether you’ll assume it to be true, or to be false. Explain your decision, and the consequences for your analysis if your assumption is wrong.

3. **Inference assumptions**, which are premises implicit in an inference or argument. Again, we are often unaware that we’re making them; but if they’re wrong, they will render our inference invalid.
   - Example: Suppose I argue as follows: ‘The fact that Ruritania has Olmi-5 missiles means that Ruritania obtained missiles from Urbania’. What am I
assuming? That only Urbania manufactures Olmi-5 missiles? That Urbania is the most likely country to have given/sold Olmi-5 missiles to Ruritania? How confident should I be that my assumption true and why? Making all this explicit helps a reader understand the argument and assess its soundness.

In general, communicate important inference assumptions when you’re spelling out the arguments in which they feature, because they help the reader understand the argument. Significant background assumptions and decisions on questionable facts can go into a ‘Key Assumptions’ section or in a ‘Question interpretation’ section.

Arguments for & against other important hypotheses

For many problems you will have to generate hypotheses. For example:

- Who are the possible perpetrators?
- What could explain a particular event?
- What are the possible outcomes of an action?

You should consider multiple hypotheses before judging which is the most likely. In such cases, your report should not confine itself only to the hypothesis you thought was right or most likely; it should also describe the most plausible hypotheses you considered and compare their respective strengths and weaknesses. This means laying out the strongest arguments in their favor, but also the reasons you rejected them.

Don’t include implausible hypotheses simply for the sake of satisfying this criterion. Report hypotheses with low probability only if they are ‘high impact’. If the probability of a hypothesis is low but its consequences are significant, make that clear in your report.

- Example: An informant says that a coup is imminent. Is the information true or false? Will there be a coup? You judge the information as very unlikely to be credible; but if it turns out to be true, the consequences will obviously be huge. In these circumstances, it may be wise to include this ‘low probability, high impact’ scenario in your report.

Pitfalls you avoided

There’s a raft of pitfalls to avoid, such as cognitive biases and faulty patterns of reasoning. For example:

- It’s easy to conflate probabilities with consequences, particularly when those consequences are severe; e.g. people often think the probability of shark attack is higher than it actually is, because it’s such a dreaded outcome.
- It’s easy to overestimate the probability of an event if instances of it come readily to mind (see, for example, the Availability heuristic, and Recency effects).
While we don’t suggest you crow every time you avoid a potential pitfall, if you spot a trap in a problem or in a proposed solution, it may be worth mentioning in your report.

You can find more information about pitfalls in the Lens Kit. You can also search ‘cognitive biases’ and ‘fallacies’ on the web.

Limitations/Key Unknowns

Identify any irreducible uncertainties, alternative assumptions, or other limitations of your analysis that might influence the validity of your key judgments or conclusion, and describe how they might do so.

For example, sometimes your uncertainty would be dramatically reduced if only you had one specific piece of diagnostic information.

To identify such key pieces of missing evidence, ask:

- ‘What would I expect to see only if this hypothesis was true?’
- ‘What would I not expect to see if this hypothesis was true?’

Ask these questions of all important hypotheses, not only of the one you think is most likely.

If you identify such diagnostic missing information:

- Report it, and
- Explain its significance and impact in relation to your key judgments about the probability of each hypothesis.

Limit this to truly diagnostic information and important hypotheses. Avoid the trap of listing everything you’d like to know!