



decisions with confidence

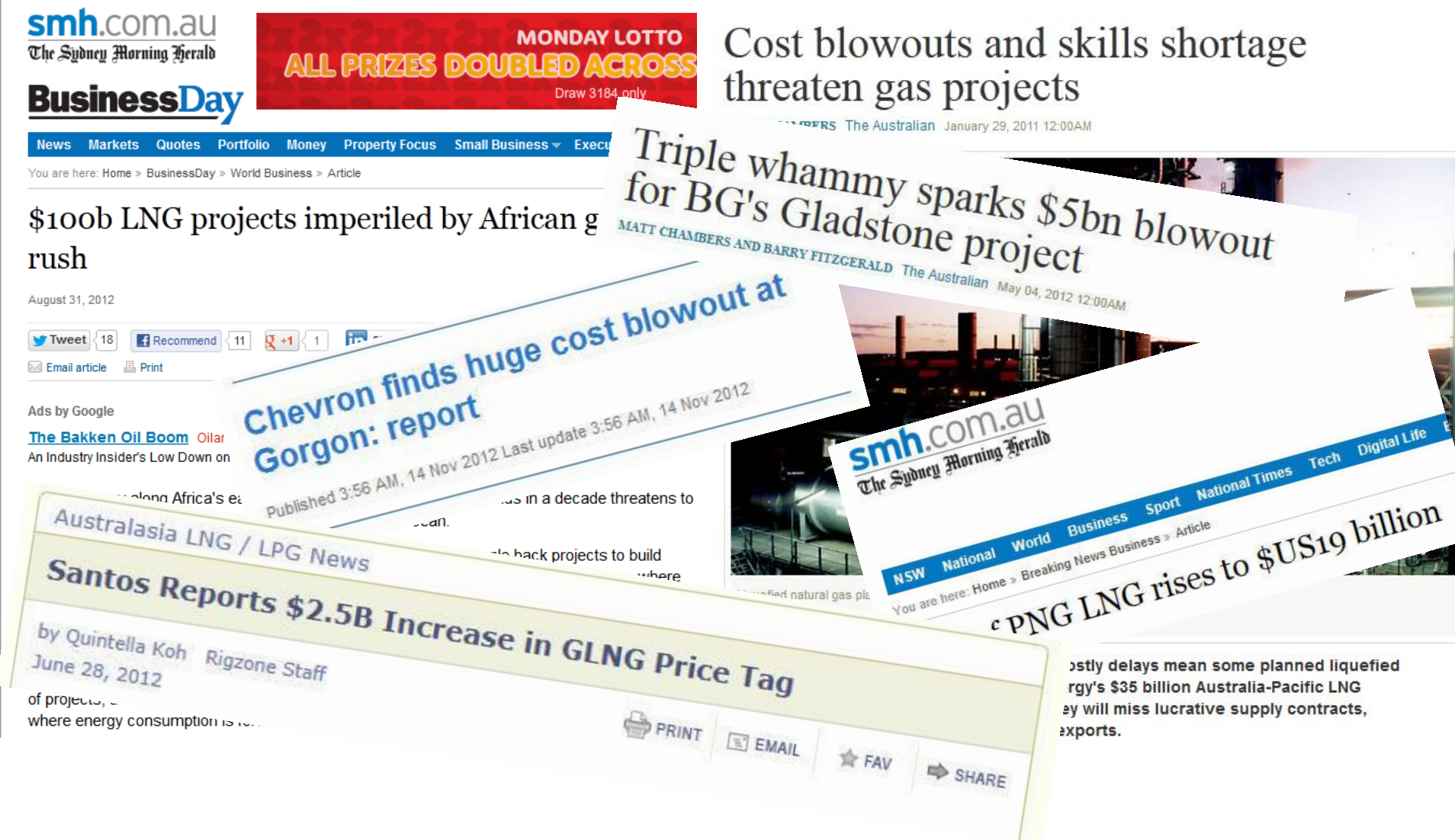
Project Performance Outcomes, Why? and How to Improve ?

Simon Whitaker

August 2017



What the headlines say



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\$100b LNG projects imperiled by African gas rush

August 31, 2012

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Cost blowouts and skills shortage threaten gas projects

MATT CHAMBERS The Australian January 29, 2011 12:00AM

Triple whammy sparks \$5bn blowout for BG's Gladstone project

MATT CHAMBERS AND BARRY FITZGERALD The Australian May 04, 2012 12:00AM

Chevron finds huge cost blowout at Gorgon: report

Published 3:56 AM, 14 Nov 2012 Last update 3:56 AM, 14 Nov 2012

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Australasia LNG / LPG News

Santos Reports \$2.5B Increase in GLNG Price Tag

by Quintella Koh Rigzone Staff
June 28, 2012

of projects, ...
where energy consumption is ...

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PNG LNG rises to \$US19 billion

ostly delays mean some planned liquefied
rgy's \$35 billion Australia-Pacific LNG
ay will miss lucrative supply contracts,
exports.

Super-major:

“Every one of our 10 most important projects failed to generate the desired return.”

Large independent:

“The actual performance of our key assets wasn’t even within the P1 to P99 range.”

CEO to manager:

“I want your guarantee that we will not spend more than the P50 on this project!”

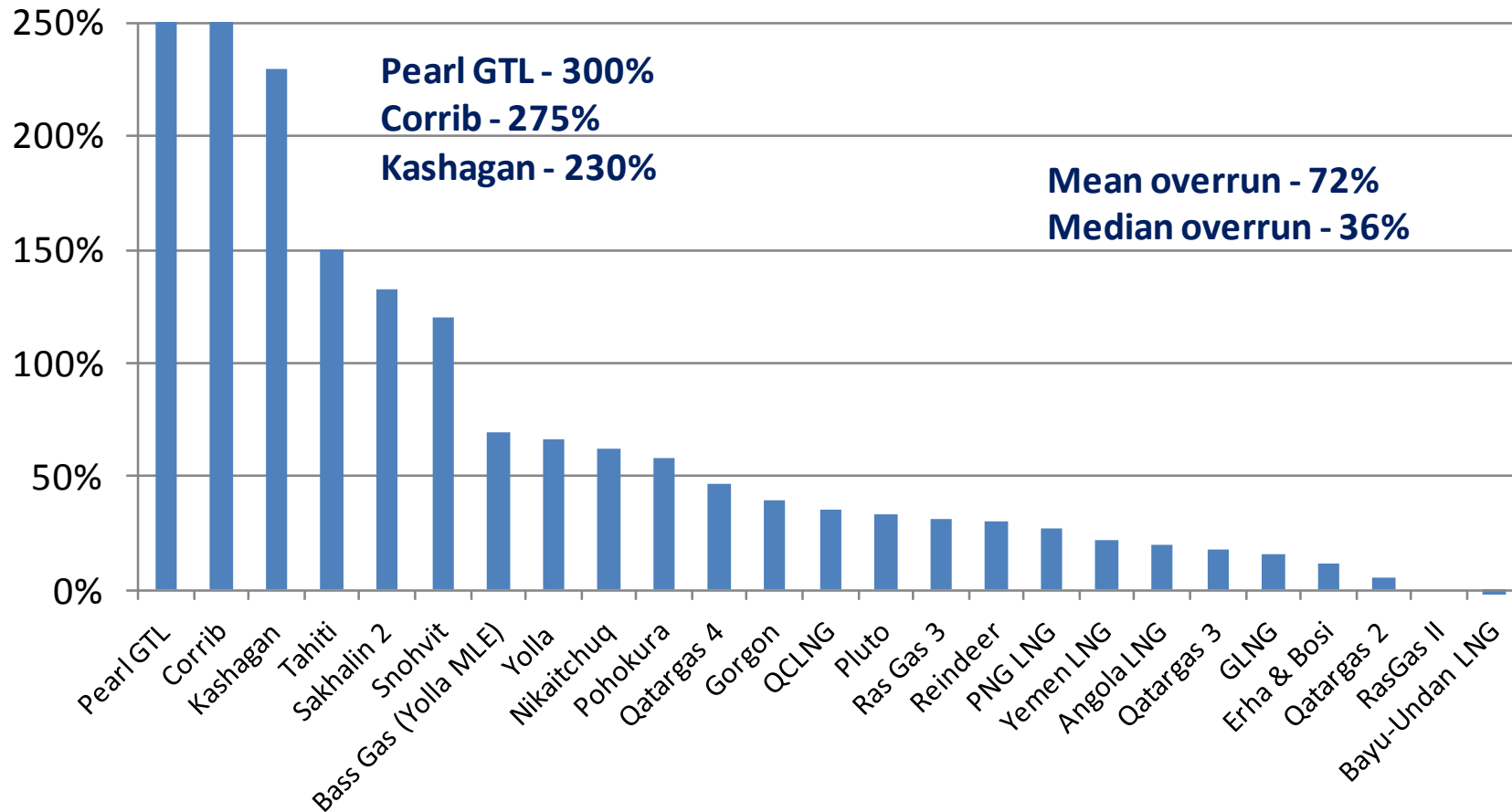
Lykos Line Shipping:

“What I need is an exact list of specific unknown problems we might encounter.”

25 Projects - average cost overrun 72% or \$287 Bn



E&P Project Cost Overruns



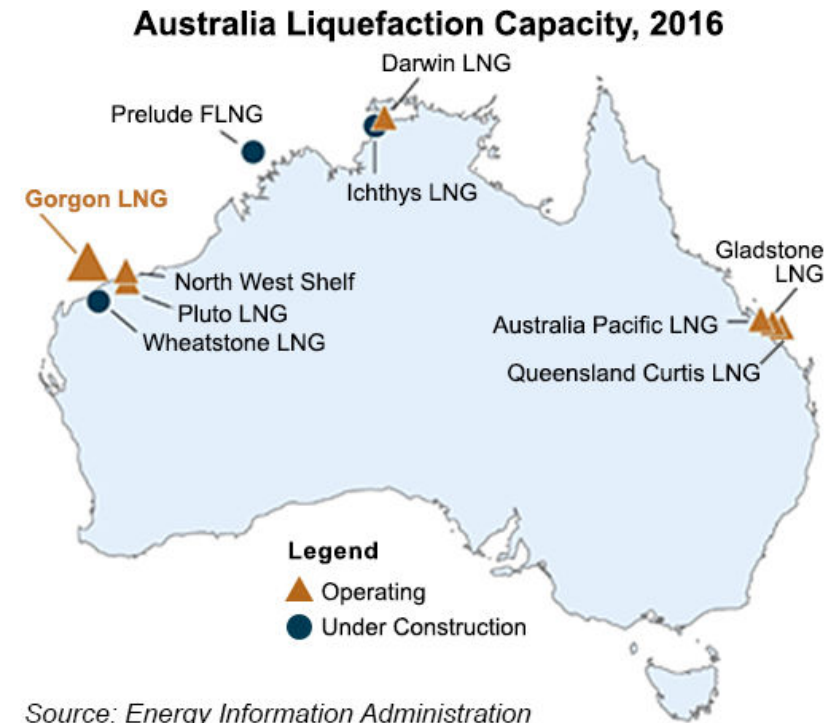
Source: Analysis of 25 projects compiled from RISC data spanning the last 10-15 years

North Sea Score Card*

- 87% of the fields studied had cost overruns.
 - 87% were late in achieving first production.
 - 87% failed to produce the volumes to the end of 1983 as originally expected.
 - 52% were not expected to achieve the peak level of production originally planned.
 - 83% spent more on operating costs to the end of 1983 than originally expected.
-
1. 26% of the fields would never achieve a positive pre tax and pre interest cash flow (on a cumulative basis, over the entire field life).
 2. Another 17% of the fields (in addition to those in 1 above) were expected to earn less than \$100 million of cumulative pre-tax and pre-interest cash flow.
 3. Only 4 fields of the sample of 23 earned a rate of return (before tax) higher than 25%.

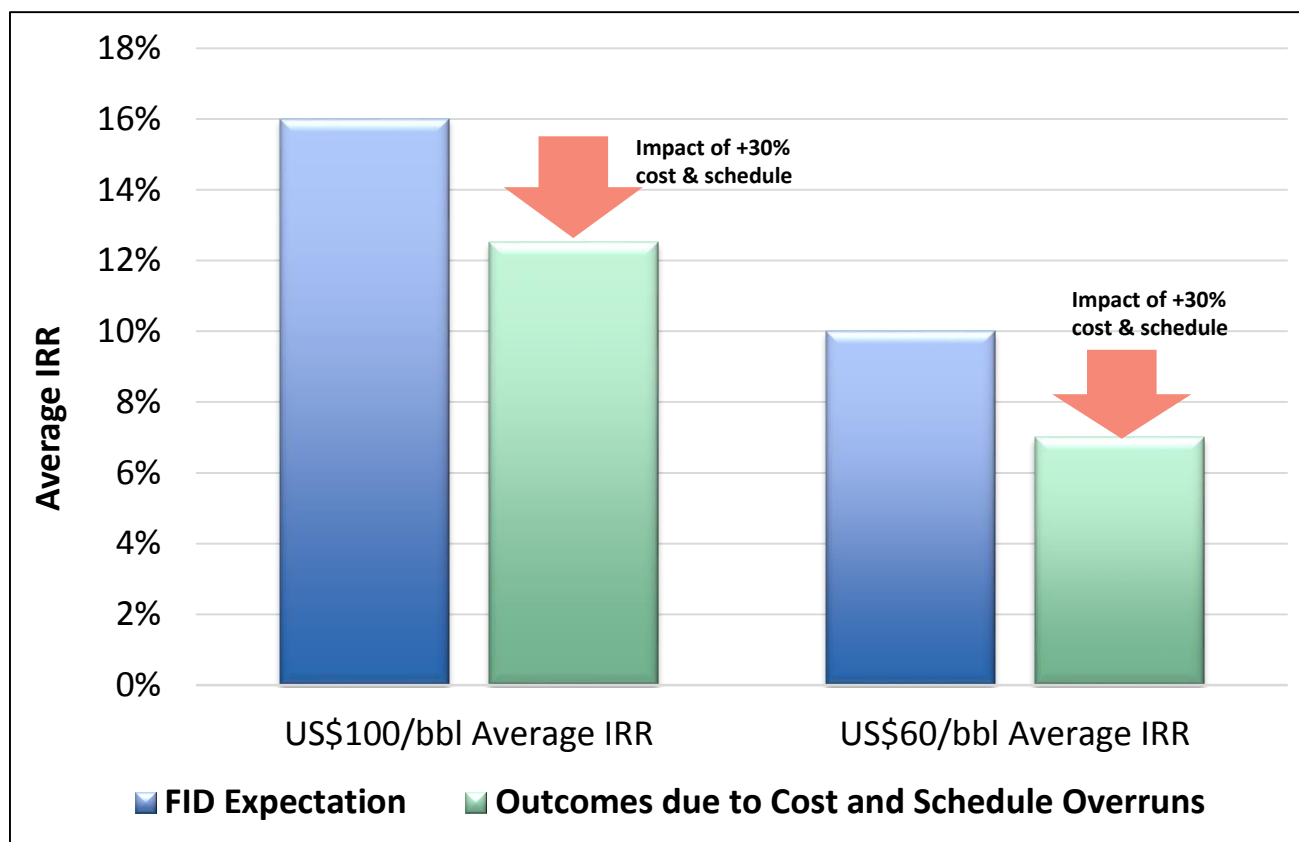
Value Erosion Example

- Over the last decade, Australia has seen over 200 billion dollars invested in complex oil and gas projects:
 - Most notably, 8 LNG projects, 5 of which have started production, 3 of which should start production within the next year or so
 - The projects are scattered across 3 states and have been undertaken by 7 different operators.
- We should be in a good position to step back and reflect on our performance relative to what we expected at final investment decision a number of years back.



How have the recent Australian LNG projects performed?

- Unfortunately... not very well with the average cost and schedule overrun being + 30 percent.



In NPV₁₀ terms – cost and schedule overruns
have eroded over US\$ 50 billion in value

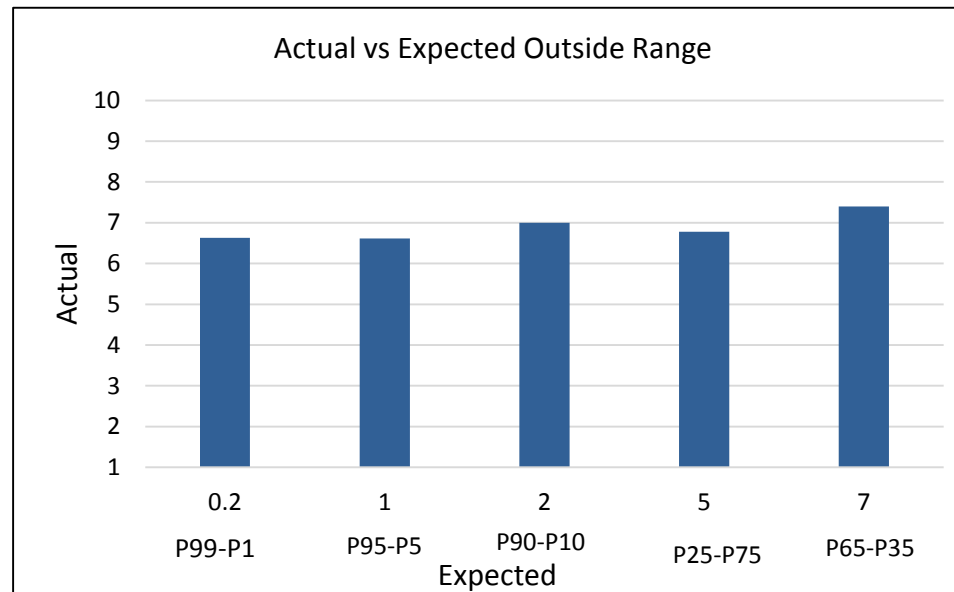
Why?



Historical recognition of this....1976

The Difficulty of Assessing Uncertainty; Ed Capen; SPE Paper August 1976

Paper refers to project delays, massive capital overruns and low industry returns



-
- People tend to think they know a lot more than they actually do.
 - People have no idea of the degree of uncertainty e.g. virtually the same number outside the range regardless of probability range assigned.
 - Even when people have been told that probability ranges tend to be too small they cannot bring themselves to make their ranges wide enough (even though they do a bit better).
 - The more people know about a subject the more likely they are to use a wide probability range / the less they know the smaller the range will be.

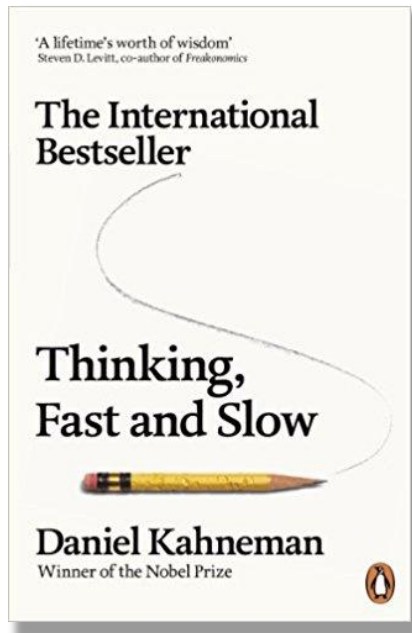
“...Is there some deep psychological phenomenon that prevents our doing better?”

Heuristics

- Simple rules of thumb, educated guesses and mental shortcuts.

Biases

- Systematic errors that can result from the use of heuristics.

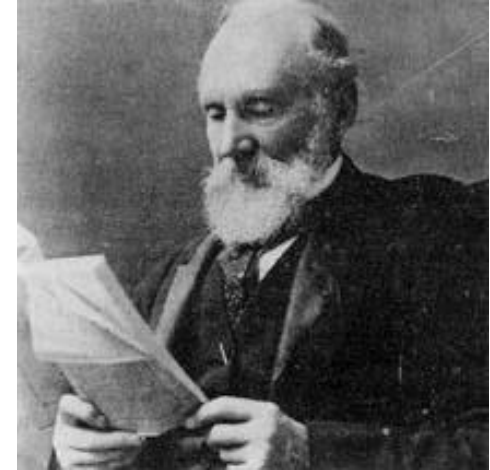


There are over 100 recognised and defined Cognitive Biases



“Heavier-than-air flying machines are impossible.”

Lord Kelvin, British mathematician, physicist, and President of the British Royal Society, spoken in 1895



“I think there is a world market for about five computers.”

Thomas J. Watson, Chairman of IBM, 1943

Expert / Unpacking example: Estimating time to drill a well



Four groups were asked to estimate completion times, in hours, for a real-world drilling scenario

- 3rd year Petroleum Eng. undergraduates (no decision-making training).
- 4th year Petroleum Eng. undergraduates (some decision-making training).
- “Conversion” Masters of Petroleum Eng. (little Petroleum Eng. knowledge).
- Industry petroleum engineers (with average 10 years experience).

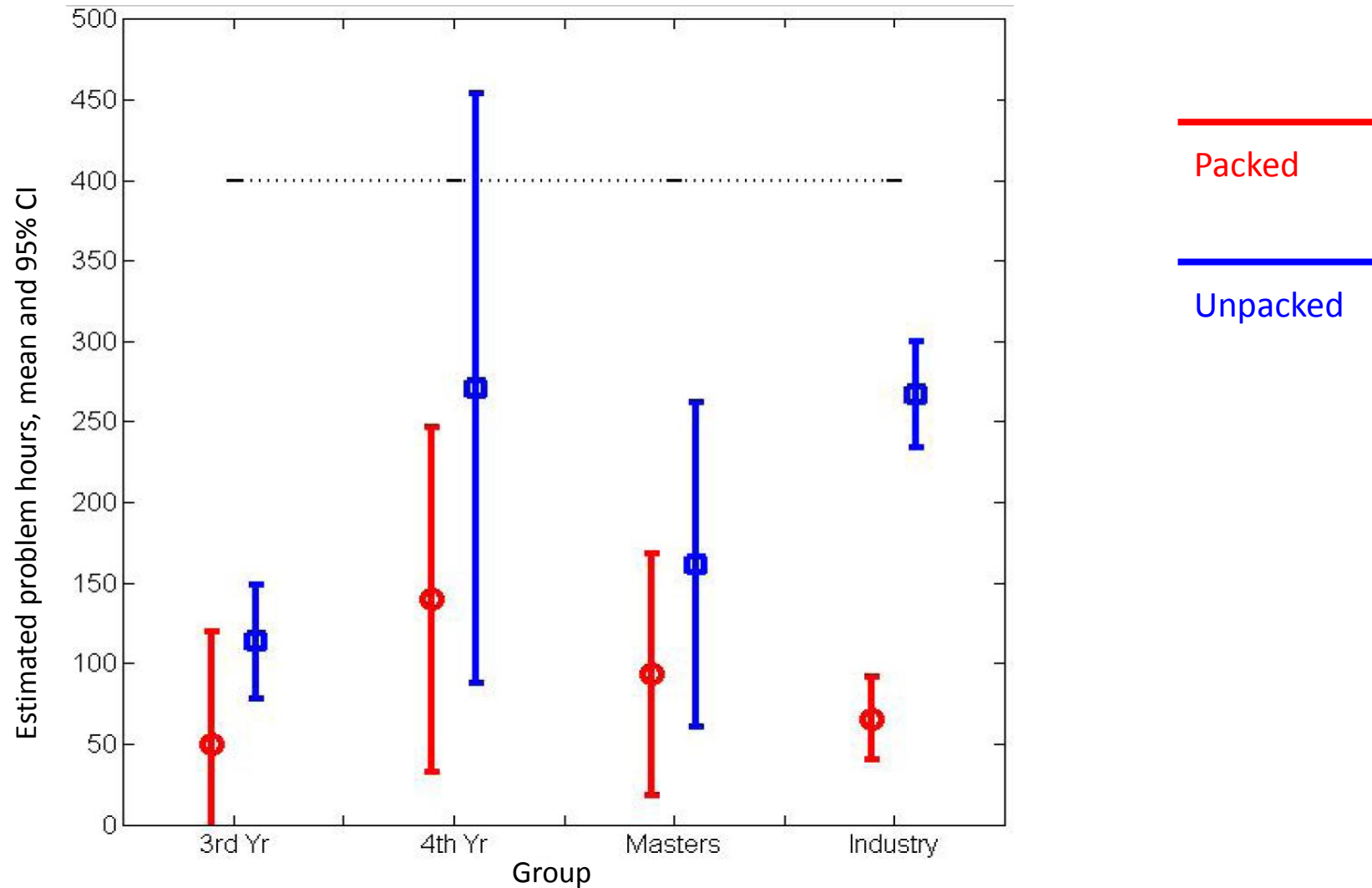
Approximately half were given a *Packed* version of the scenario which consisted of four components:

- Drilling
- Rigging
- Tripping
- All associated problems

The rest were given an version where “All associated problems” was *Unpacked* into six categories:

- All associated problems
 - Severe weather
 - Rig repair
 - Logistics delays
 - Mud conditioning
 - Well-control operation
 - Fishing operations

Unpacking Results: Number of hours of drilling problems

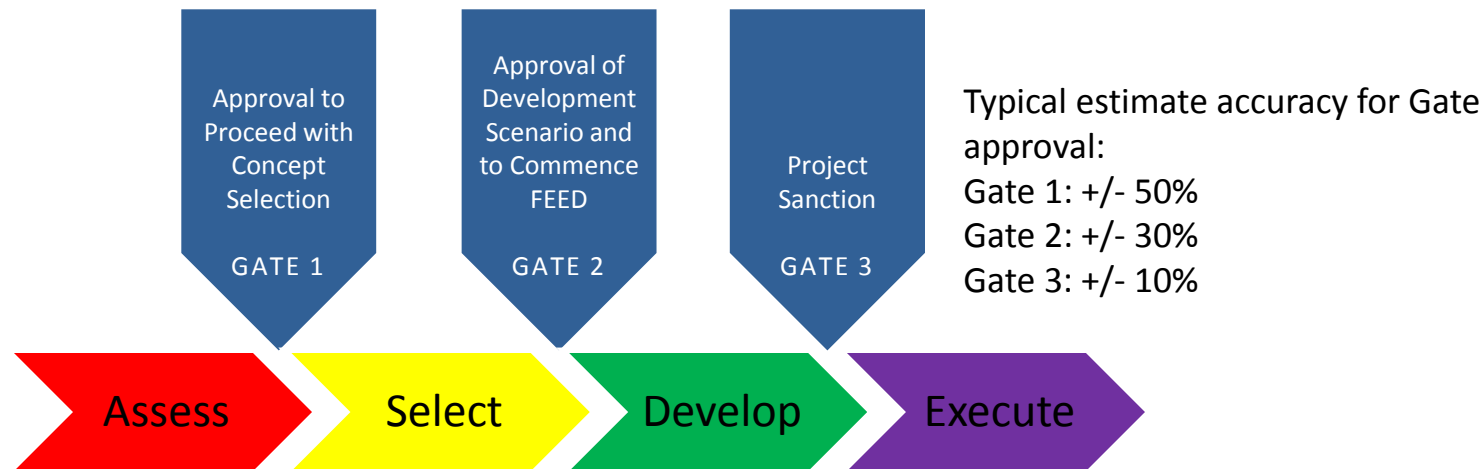


Major components of flawed thinking relevant to Project cost/time estimates

Social Bias

- Human tendency to conform to the views of our group.
- Compounded by strong corporate cultures especially if the views of the ultimate decision maker are known.
- Absence of dissent is a warning that social biases are at work.





Project teams and management teams are motivated to get their project accepted and sanctioned.

- Does this promote excessive optimism / gaming?
(e.g. I have to be optimistic because everyone else's project will be optimistic...)

- **Project 1** characteristics:
 - Medium sized project
 - New technology
 - Region with no prior experience
 - Operator has no experience
 - Well functioning labour market and supply chain

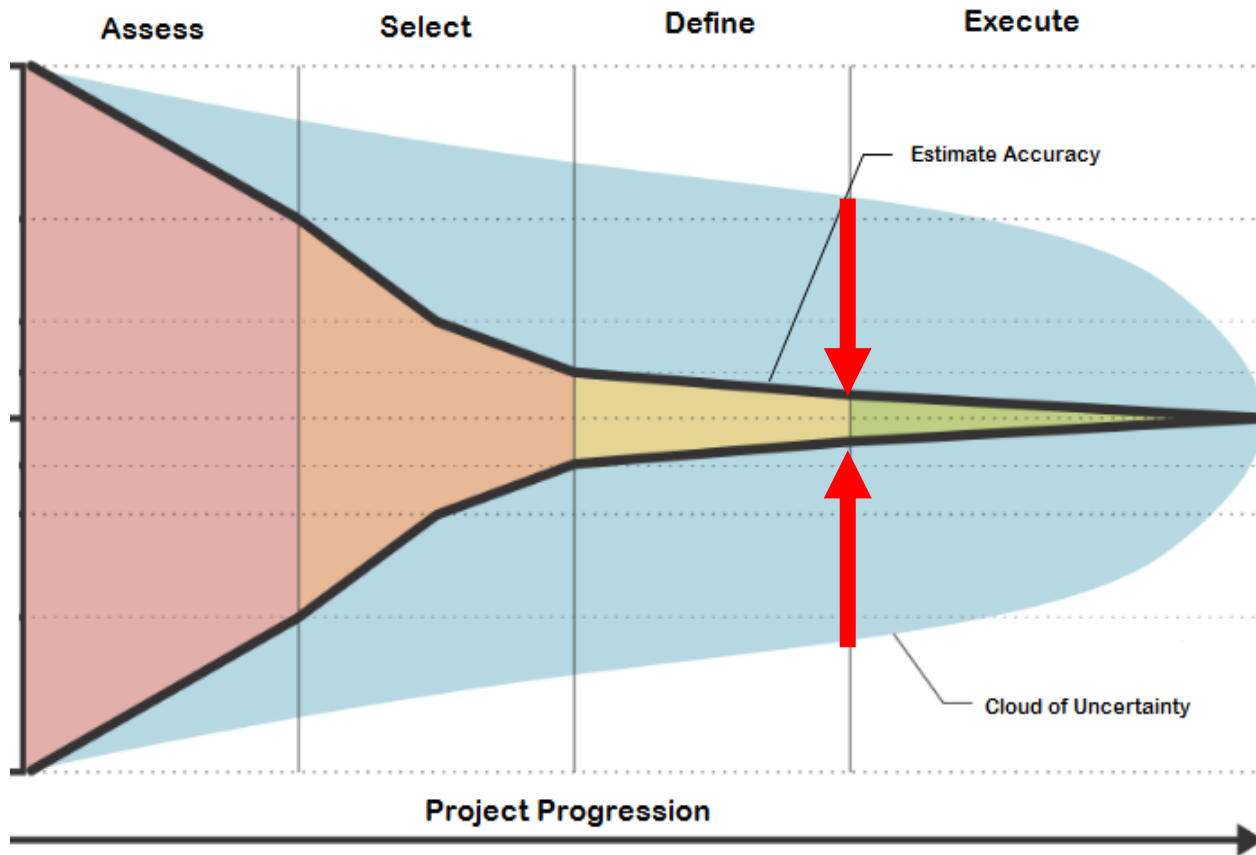
9% Contingency
Allocated
8% Contingency
Used

- **Project 2** characteristics:
 - Medium sized project
 - New technology
 - Region with no prior experience
 - Operator has no experience
 - Highly competitive labour market

14% Contingency
Allocated
30% Contingency
'Used'

What can we do about it?

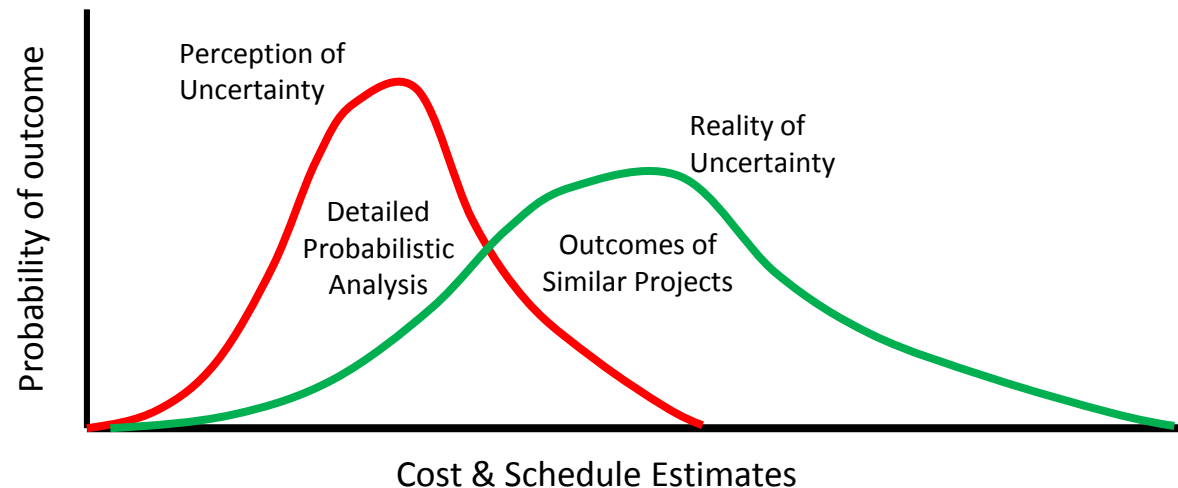




- Our accuracy expectations are part of the problem
- Need robust risk and uncertainty management procedures, which are in place to ensure that risk and uncertainty are appropriately captured in our estimates
- On a project that has a distinctly complex risk profile, we would expect our P10/P90 distribution to be much broader than +/-10 percent, and as a result adjust our expectations
- Unfortunately this doesn't appear to be happening
 - The outcomes of a process that should be independent of a predetermined accuracy range, often results in exactly the same answer
- As an industry, we appear to be anchored to a +/-10 percent accuracy range for decision making purposes

Challenging uncertainty expectations: Top-down vs bottom-up

- A top-down approach to understanding project outcomes should be used along side our current bottom-up practices.
- The actual performance of projects with similar characteristics to ours should be used to calibrate our perception of risk and uncertainty.
- Process needs to be run by parties external to the business unit and project team.



The challenge once this analysis has been done is doing something about the results...

Challenging uncertainty expectations: What-if scenarios



- Another way to calibrate uncertainty is by asking a series of 'what-if' type questions.
- For example:
 - What if my enabling infrastructure is held up by 6 months due to site access issues?
 - What if I have to change my contracting strategy (or contractor) during execution?
 - What if I miss my sail away date and am forced into the next offshore installation window?
 - What if one of my fabrication yards gets into financial trouble mid-way through execution?
 - What if quality issues causes significant rework on modules delivered to site?
 - What if all of these occur (and more)?
- The above are all examples of events that have occurred on recent projects, so we now have a data set available to understand the impact that events like these can have on project outcomes.

Other Ways to Improve Performance

Recognise there is a Problem!

Training to drive awareness

- Appreciation of cognitive biases, heuristics and psychological effects and understanding we are all subject to them.
- Understanding Accuracy v Uncertainty

Improve the feedback loop and learning from previous estimates

- Most companies capturing lessons learned and root cause of cost and schedule outcomes
- How many actually use it?

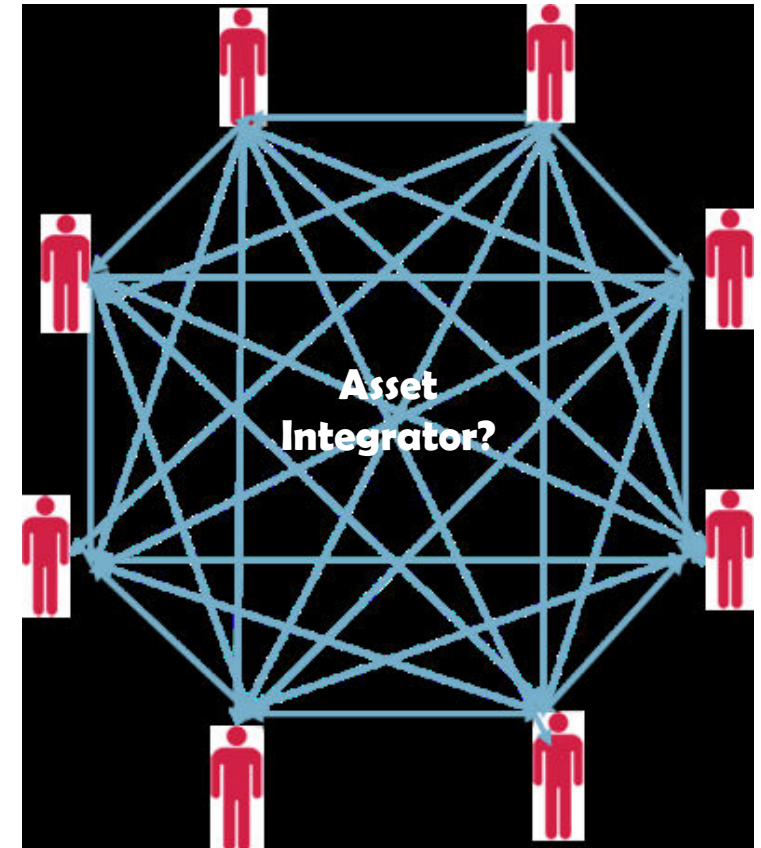
Genuinely Independent Reviews:

- Introduce genuine independence and attempt to de-bias decision making process by:
 - Red vs blue teams: two independent work streams running in parallel
 - Dedicated “Devil’s Advocate” assigned for key decisions to continuously challenge assumptions and create a healthy level of conflict.



Final Thought: The asset integrator

- Large and complex capital projects have to establish social and technical interfaces over months/years that may take decades to get right in large non-capital intensive environments.
- The Project Manager is critical to project success – who is the right type of person?
 - Almost no scientific way of ensure the right person is being selected for PM roles.
- If people with the required skills don't exist, they will need to be trained, maybe even from talent pools the industry don't typically access.



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