



Safran



**Include Past Project Performance in QRAs or AI will get you!**

Forum Safran 2023 Presentation by Colin Cropley

**RISK** Integration  
Management

# A LESSON FROM NATURE



## SIGHTINGS OF WILDLIFE - KANGAROOS

- We live within 10 minutes of several bush walks.
- Our favourite park abounds in Australian wildlife, including plentiful kangaroos.



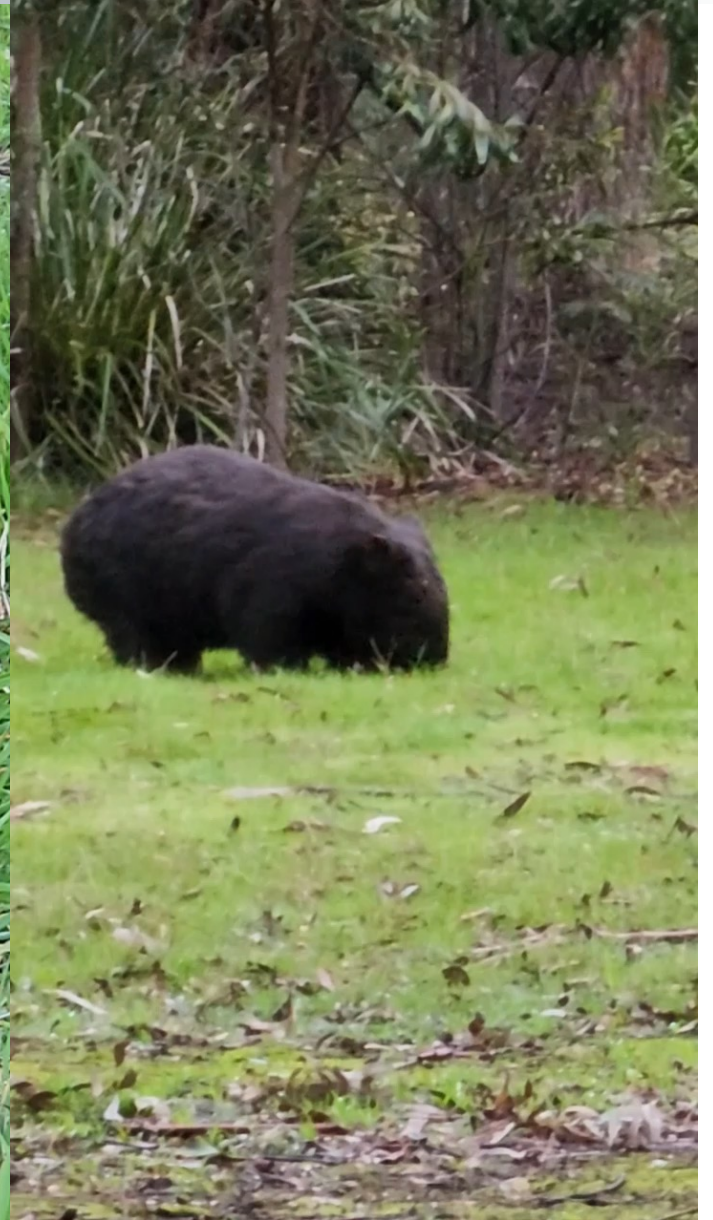
## SIGHTINGS OF WILDLIFE - BIRDLIFE

- Our favourite park also has birdlife, including:
  - Cockatoos,
  - Rosellas, lorikeets and king parrots
  - Kookaburras



## SIGHTINGS OF LESS COMMON WILDLIFE

- Also seen occasionally are:
  - Blue Tongue Lizards,
  - Echidnas
  - And very occasional wombats



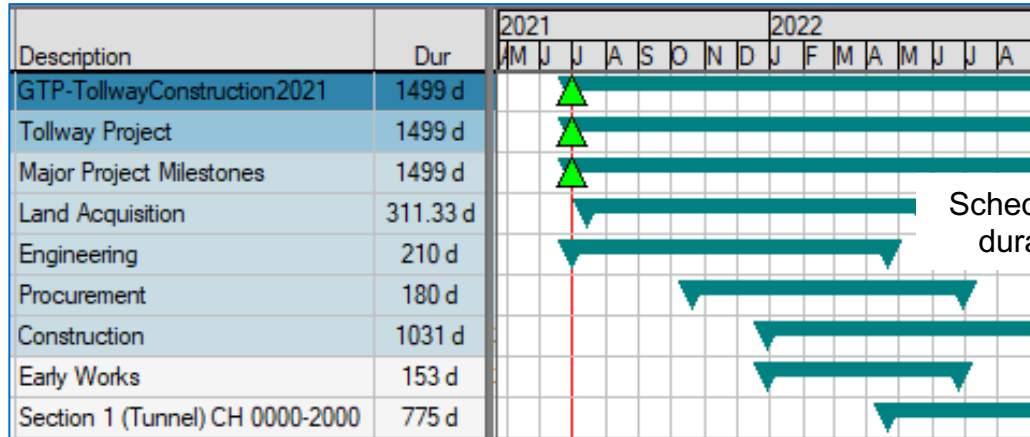
# RARE SIGHTINGS OF AN AUSTRALIAN ICON

- Also seen around once every 12 months for the last 3 years:
- A single koala
- Which sightings are the most prized?
- - It's obvious that the rarer the creature, the more highly valued sightings of it are
- A lesson I learned in my career was:
- **If you want to succeed and stand out, don't be one of many!**



# How most practitioners perform QRAs

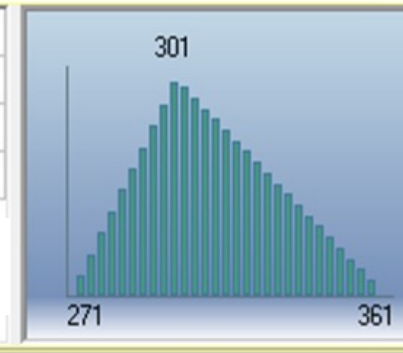
# COMPONENTS OF QRAs



Schedule with single duration tasks...

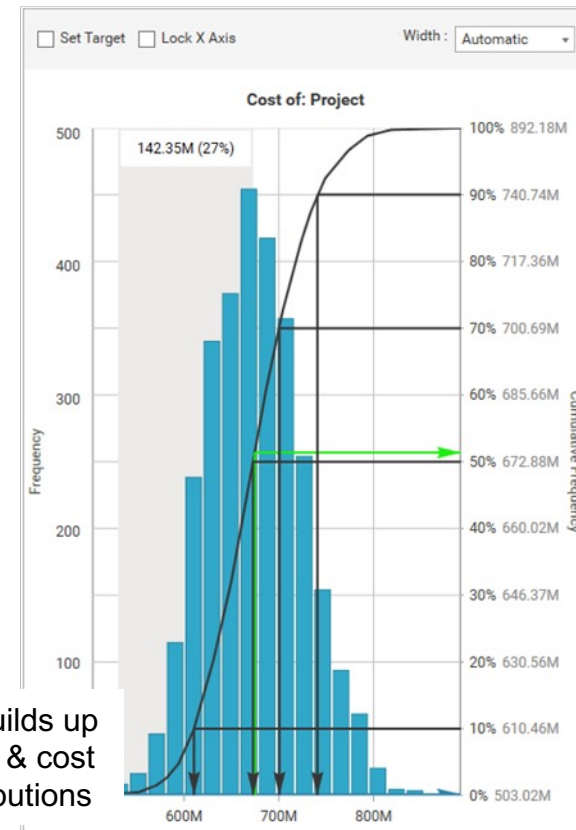
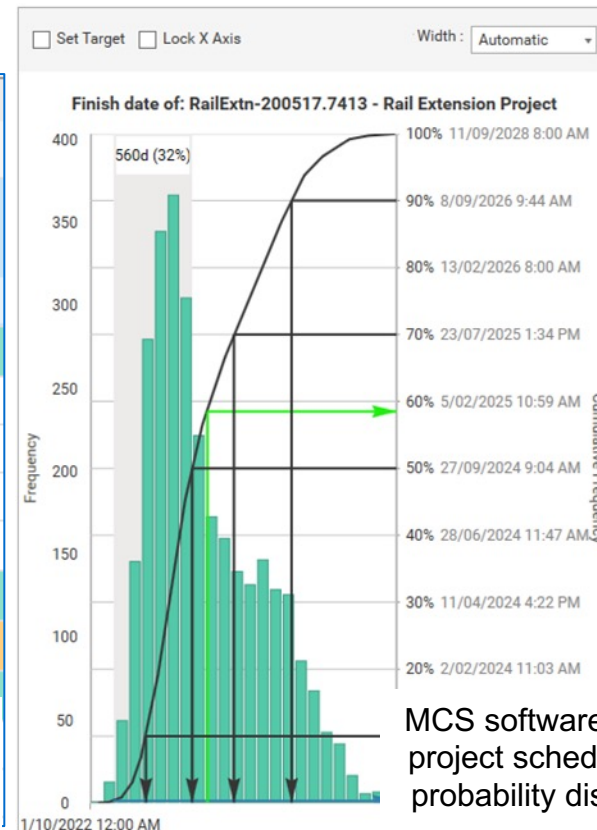
|              |          |
|--------------|----------|
| Distribution | Triangle |
| Minimum      | 271      |
| Most Likely  | 301      |
| Maximum      | 361      |

... Replaced with probability distributions



| Description                | Id        | Base       | Schedule Connection                 |                            | Day Rate |
|----------------------------|-----------|------------|-------------------------------------|----------------------------|----------|
|                            |           |            | Activity                            | Day Rate                   |          |
| ▲ Total Project Costs      | Project   |            | <input type="checkbox"/>            |                            |          |
| ▲ Time Dependent Costs     | Labour    |            | <input checked="" type="checkbox"/> |                            |          |
| ▲ Owners Costs             | TD.1      |            | <input checked="" type="checkbox"/> |                            |          |
| ○ TD Owner's PM Overheads  | TD.1.00   | 48,434,640 | <input checked="" type="checkbox"/> | 100% C110000 - Owners...   | 27,547   |
| ○ TD Land Acquisition      | TD.1.01   | 0          | <input checked="" type="checkbox"/> | 100% C111000 - Land ac...  | 0        |
| ○ TD Advance Works         | TD.1.02   | 26,317,916 | <input checked="" type="checkbox"/> | 100% C112000 - Advance...  | 73,309   |
| ○ TD Traction Power Supply | TD.1.03   | 11,499,991 | <input checked="" type="checkbox"/> | 100% C113000 - Traction... | 64,972   |
| ▶ Contractor Costs         | TD.2      |            | <input checked="" type="checkbox"/> |                            |          |
| ▲ Time Independent Costs   | Materials |            | <input type="checkbox"/>            |                            |          |
| ▲ Owners Costs             | TI.1      |            | <input type="checkbox"/>            |                            |          |
| ○ TI Traction Power        | TI.1.03   | 0          | <input type="checkbox"/>            |                            |          |
| ○ TI Advance works costs   | TI.1.02   | 5,777,104  | <input type="checkbox"/>            |                            |          |

Cost estimate with probability distributions overlaid on schedule



MCS software builds up project schedule & cost probability distributions

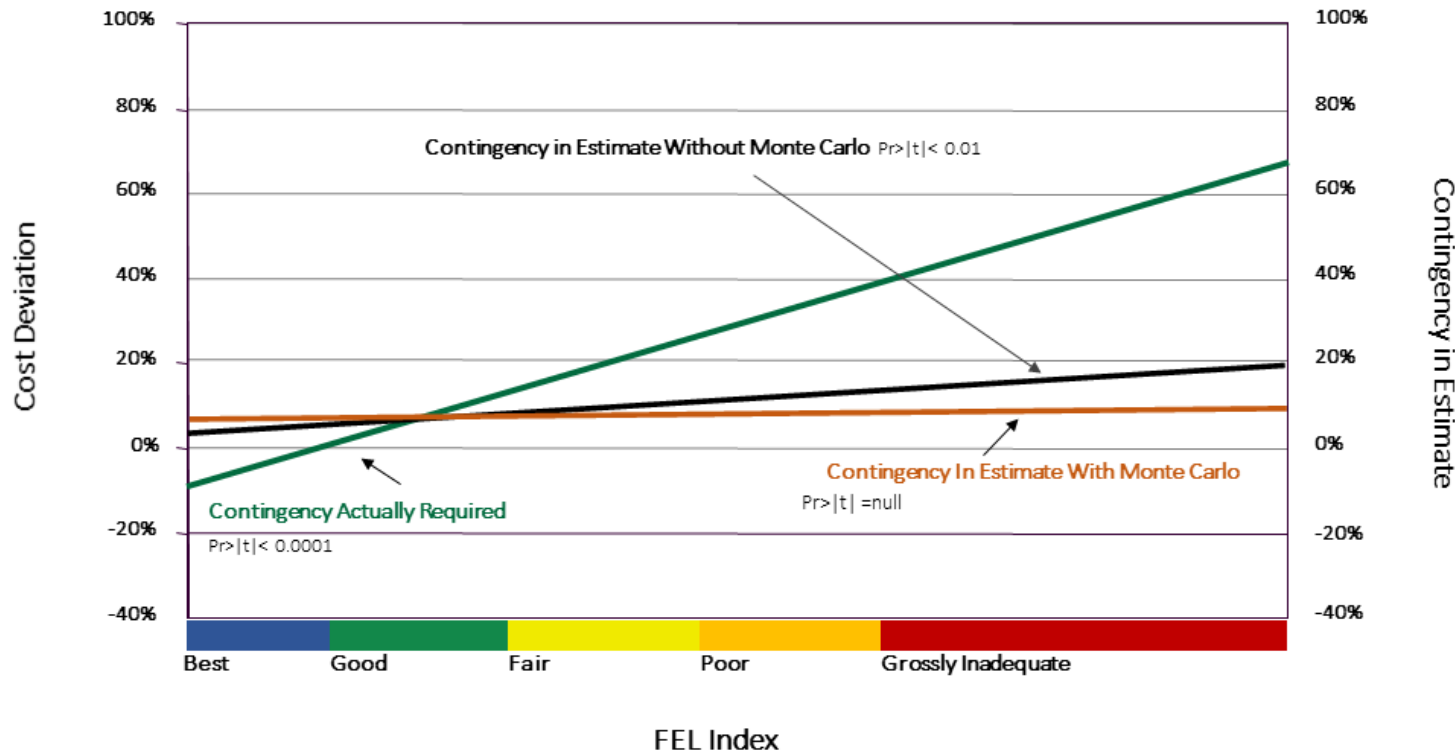


# Problems with QRAs as commonly performed

# POOR RECORD OF QRAS FORECASTING PROJECT OUTCOMES

Grattan Institute study of 836 Australian transport infrastructure projects costing > A\$20m since 2001, published in 2016, showed that the 17% of projects overran their promised cost by >50%, representing 90% of the \$28b cumulative overrun (24% of the cumulative announced costs).

## Monte Carlo Generated Cost Contingencies Are Unrelated to Risks\*



\*Control of Execution Risk, Megaprojects Course, IPA Institute



Globally, a 2002 study of 258 Public Works projects showed rail projects overran their estimated cost by 44.7%, tunnels & bridges by 33.8% and roads by 20.4%.

Independent Project Analysis, Inc., has shown that CRAs are dangerous for big projects because the assessed contingency does not reflect the risk.

# WHY MOST QRAs ARE UNRELIABLE

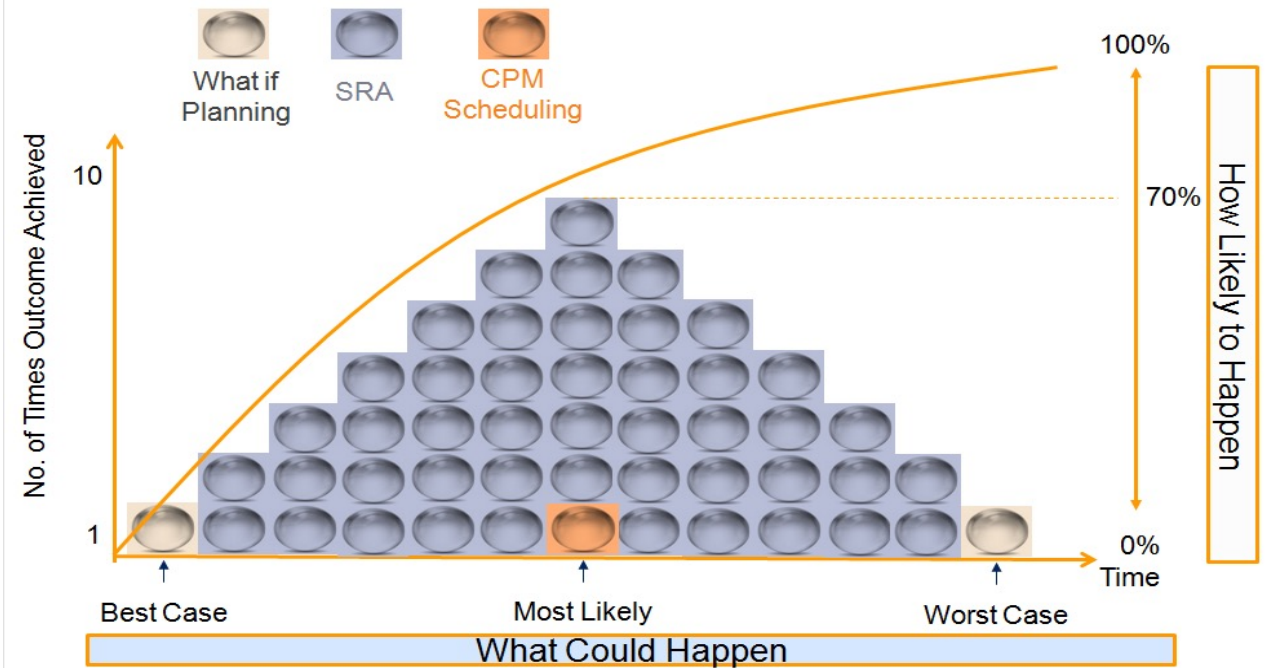


The pre-eminent global authority on QRAs



RP 40R-08 “Contingency Estimating – General Principles”.

There are 9 principles, including that the method should include empiricism.



Empiricism implies objectively capturing experience through measurement and analysis of past practices and outcomes.

Unfortunately, most QRAs do not include past project performance, usually relying on the opinions of Subject Matter Experts (SMEs).

# Recent QRA developments challenging current methods

## PROJECT RISK QUANTIFICATION

*A Practitioner's Guide to Realistic Cost and Schedule Risk Management*



JOHN K. HOLLMANN

PRQ shows how to produce realistic time and cost contingencies, breaking risk into two main types:

- Systemic Risk caused by systems especially to deliver the project, and
- Project specific risks arising from the unique aspects of the project

This methodology, Parametric + Expected Value (P+EV), has been in use for at least 40 years. It is being adopted by major organisations including BHP (covered in a presentation at Risk 2023 in Brisbane Australia in September).

# BHP

P+EV is defined in  
AACE RP 113R-20





## IPA Approach: Linking Inputs and Outputs

Inputs That Affect Performance



Parametric  
Statistical  
Techniques



Performance Outputs

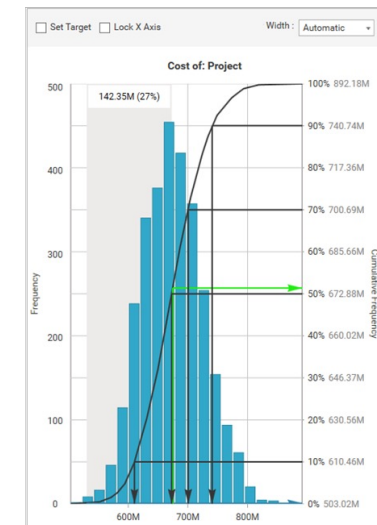
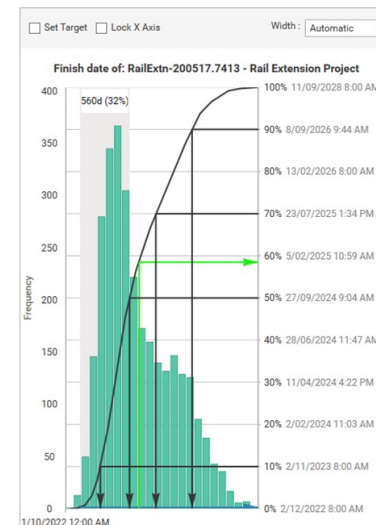
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IPA CSRA effectively combines parametric modelling, described by Hollmann, with C&SRA.

IPA's benchmarking of projects is built on parametric modelling of project, business and technical information, as shown in the following slide from a 2004 conference.



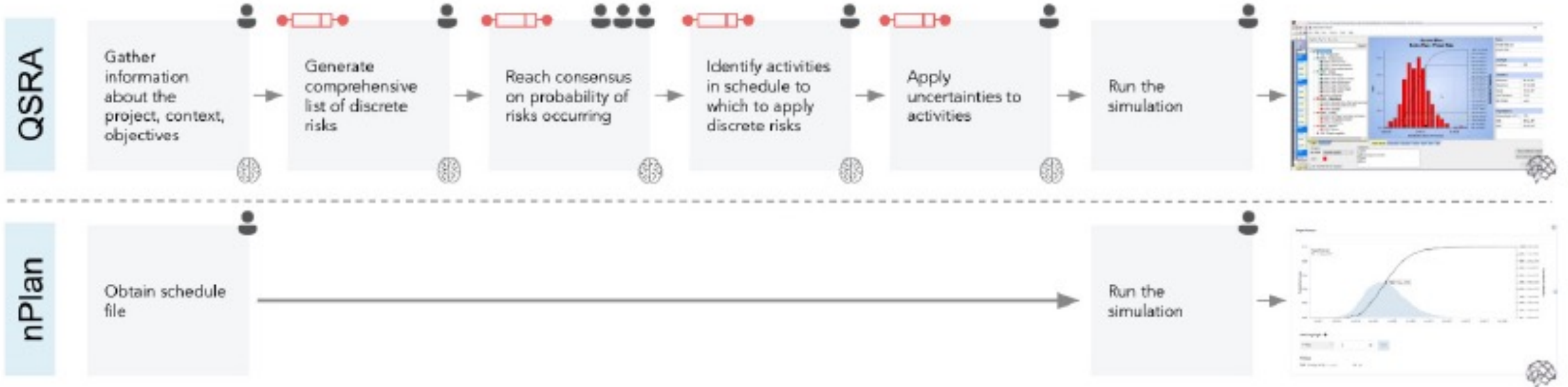
In 2022, IPA announced it was launching its own Cost & Schedule Risk Analysis, combined with its own parametric modelling of systemic risk and project-specific risks, to assess project cost & schedule contingencies\*



\* Munshi, Aditya, "Cost and Schedule Risk Analysis: Current State and Opportunities", IPA, <https://www.ipaglobal.com/news/article/cost-and-schedule-risk-analysis-current-state-and-opportunities/>

## nPlan

nPlan, an AI-based company, evaluates a project schedule against its database of a claimed >500,000 schedules covering as-planned and as-built states. It develops probability distributions for the durations of all activities and the total project duration.



- Time and effort
- Human processing
- Computer processing
- (Compounding) error

Criticisms can be aimed at nPlan’s approach, but it is clearly winning business.

# Recommended responses of QRA Practitioners to threats to their careers



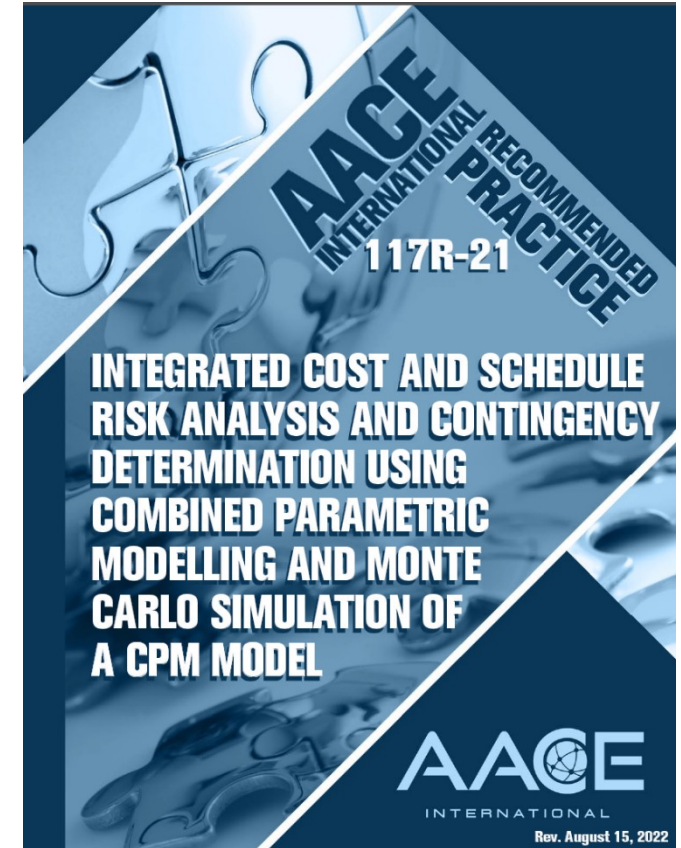
# MODEL SYSTEMIC RISK IN YOUR QRAs



1. Include Parametric modelling of Systemic Risk in your QRAs

2. By using AACE RP117R-21 (Detailed Methodology for P+IRA). Applies to SRAs and ICSRAs.

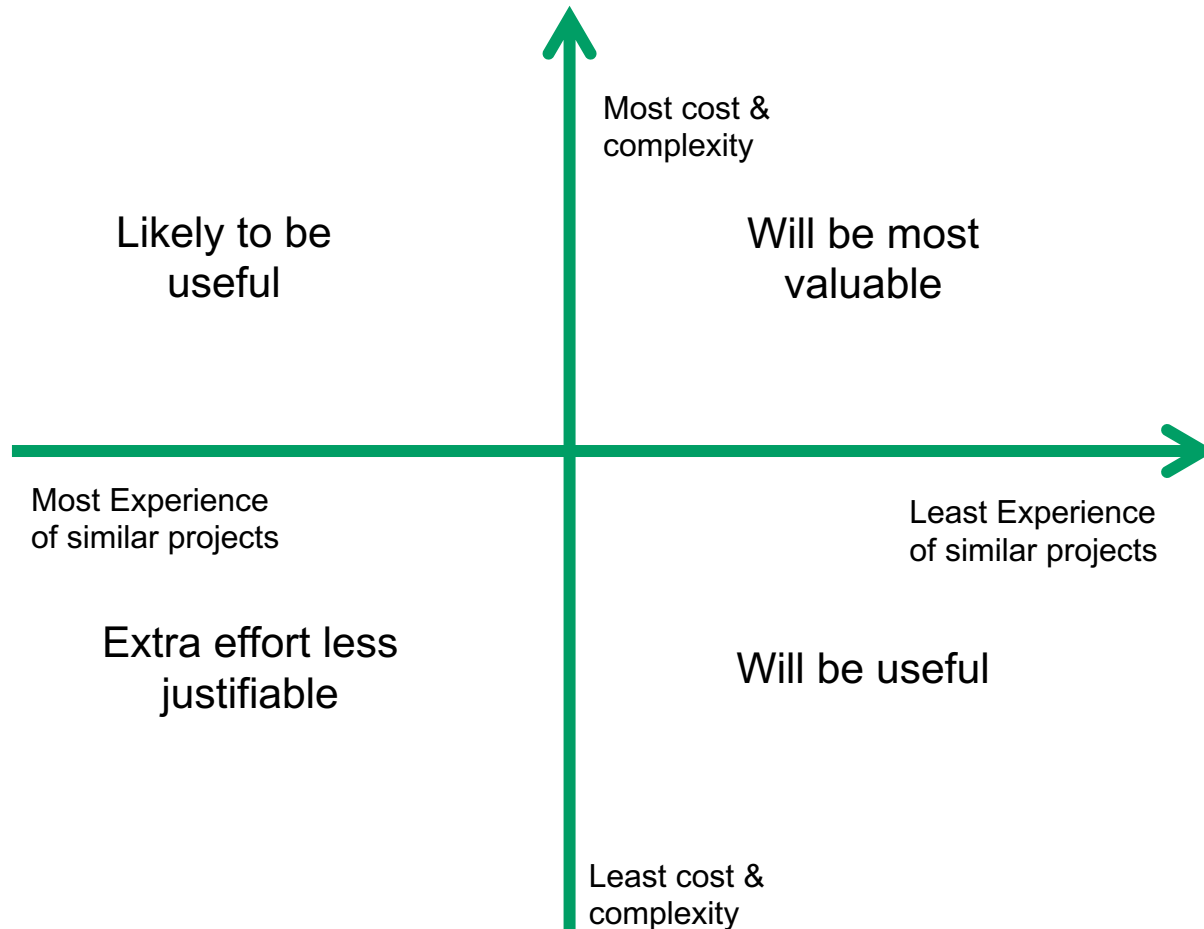
3. The addition of parametric modelling of net systemic risk provides a safety net, adding contingency where needed.



- A White Paper elaborating the need, methodology and benefits of P+IRA is available\*.

\* Cropley, Colin H, "Modelling Project Cost and Time Outcomes Realistically using Safran Risk", October 2022  
<https://www.riskinteg.com/knowledge-base/papers-articles#h.bt6cnpwfy036>

## USE OF P + SRA, P+IRA



This combined methodology adds complexity but removes the fatal flaw and ensures realistic contingencies are assessed.

You will stand out!

# SUGGESTED NEXT STEPS TO STAND OUT FROM THE CROWD

UNDERSTAND how Parametric modelling of systemic risk works:

Read Project Risk Quantification (PRQ) by John Hollmann

<https://www.decisions-books.com/PRQ.html>.

(Includes simplified method of performing Parametric modelling).

PERFORM parametric modelling of systemic risk

Request the worked examples and files for P+EV and P+IRA – contact

[info@riskinteg.com](mailto:info@riskinteg.com)

Safran Risk required for P+IRA Risk Factors example, plus PRQ parametric model.

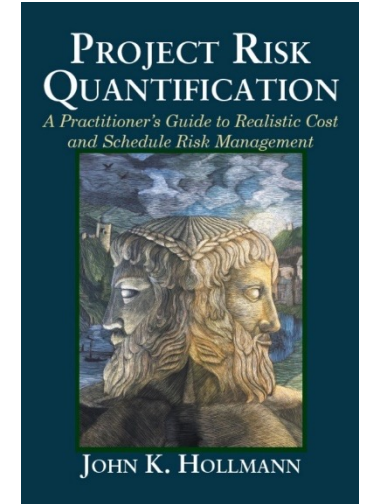
Commercial software for P+EV is necessary for consulting work.

It can be trialed and licensed from <https://www.validrisk.com/>.



ValidRisk

Software Solutions



**BE AN OUTSTANDING PERFORMER!**

BE AN OUTSTANDING PERFORMER!

RISK Integration  
Management

