Quantifying Project Risk Information To Guide Option Selection

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Presentation Objectives

- Assessing and documenting threats, opportunities and estimating uncertainty
- Methods of quantifying and analysing risk information, and
- Methods of reflecting risk in Investment Appraisals and Sensitivity Analysis

Scottish Parliament Building

Planned Completion 2001 – Completed 2004

Estimate £41M - Actual Cost **£431M**

Main Reasons Why Project Risk Management Failed

Projects did not get the right people involved in the project risk process

A structured and comprehensive project risk management approach was not adopted

In 30% of projects, key risks were first identified after contract signing

Blake Dawson Report – Scope for Improvement 2011

Determining Project Scope/Objective

Continually changing the project scope during project *development / delivery* increases the risk

Time spent Peer Reviewing the scope always benefits the project in the longer term

Significant increases in project delivery schedules often indicate scope additions/changes

Project Slippage = Scope Changes

SCHEDULE COMPLETION DATE REVIEW

Project Phase	Jun 14	Sep 14	Dec 14
Planning	Jun 14	Sep 14	Commenced
Design	Aug 14	Nov 14	Mar 15
Construction	Nov 14	Feb 15	May 15
Commission	Nov 15	Nov 15	Dec 15
Operation	Dec 15	Dec 15	Dec 15

Objective / Scope

Project that delivers ??? requirements

+

Highest + NPV or lowest – NPV

Delivered in less than X years

Payback period less than X years

IRR greater than X%

Project Risk Approach

Identify Options

Complete first risk workshop

Identify showstoppers

Identify top risks for all viable options

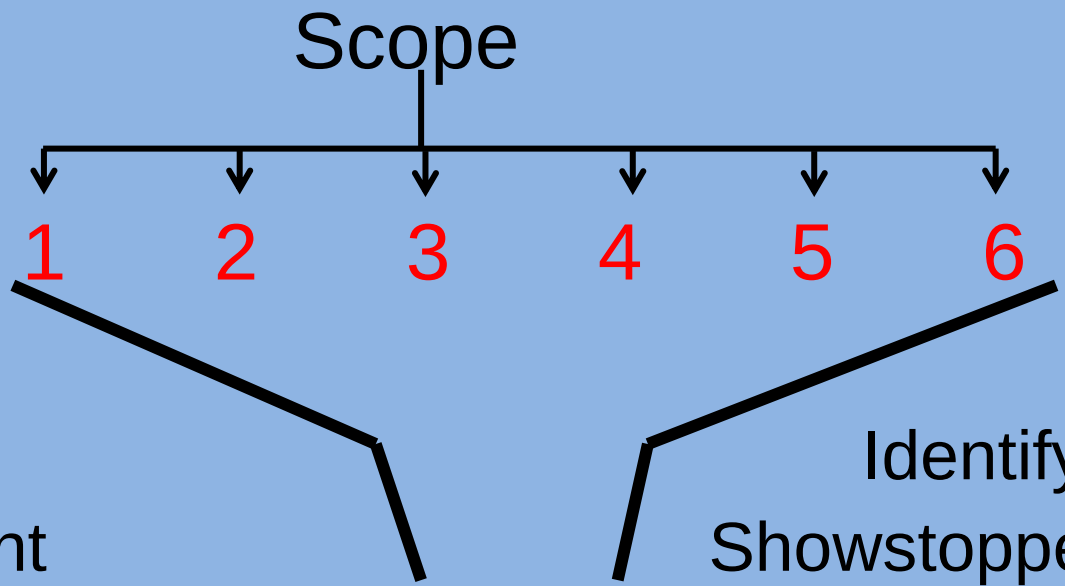
Separate risk register for each option*

Select Best Option

Represent options risk in IA

Investment Appraisal

Decide Options – First Assessment

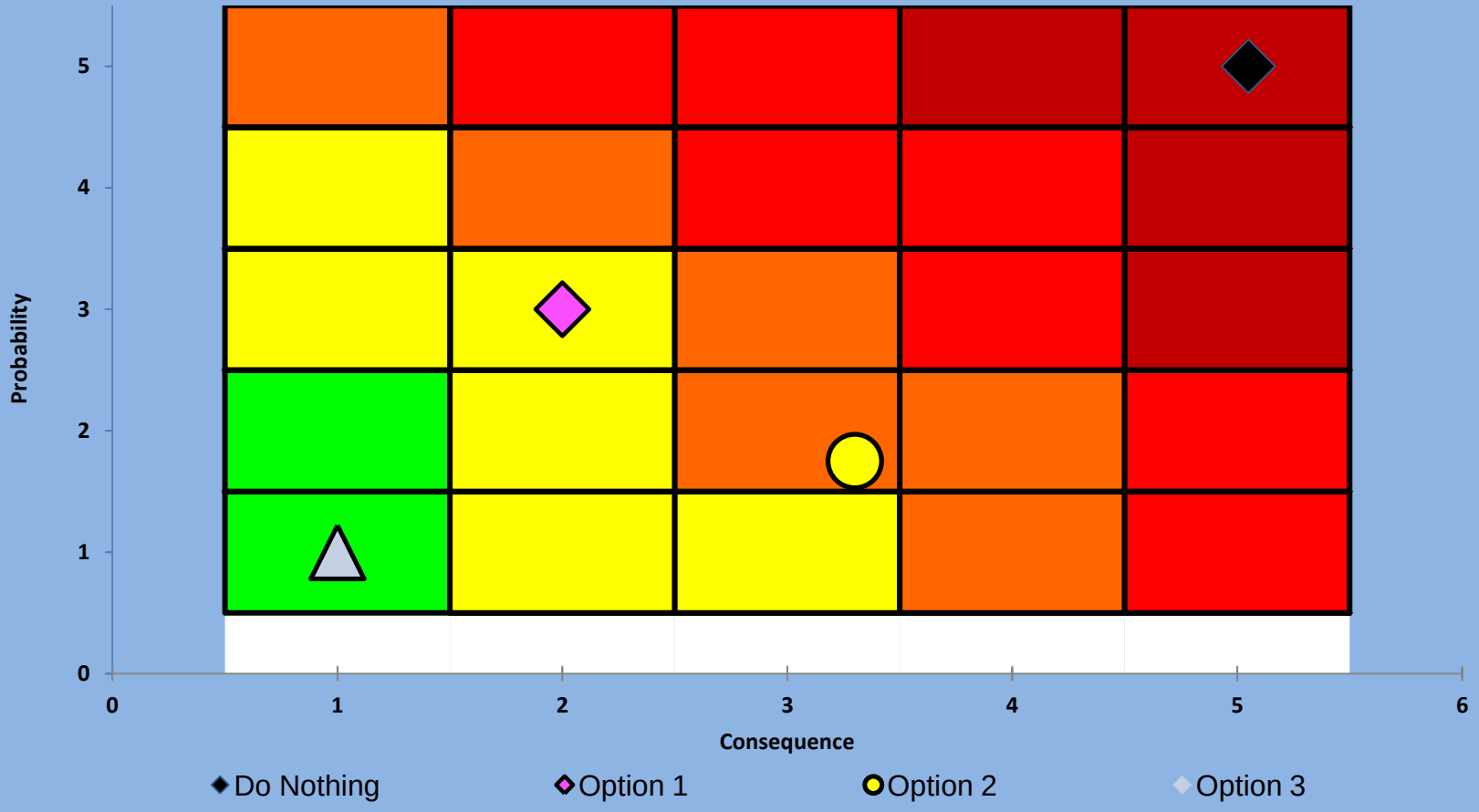


Complete first Risk Assessment

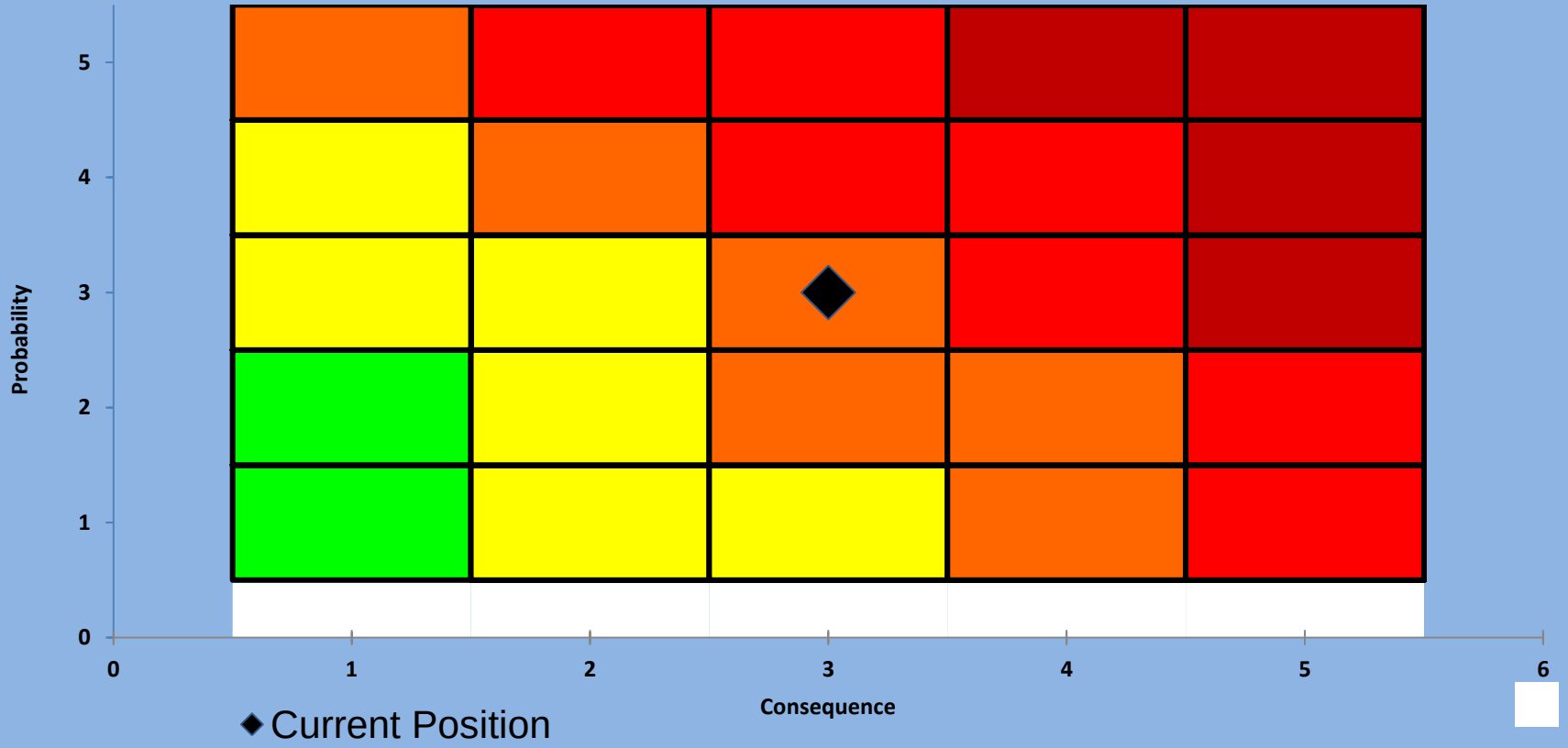
Identify Showstoppers

Viable Options: **1** **3** **6**

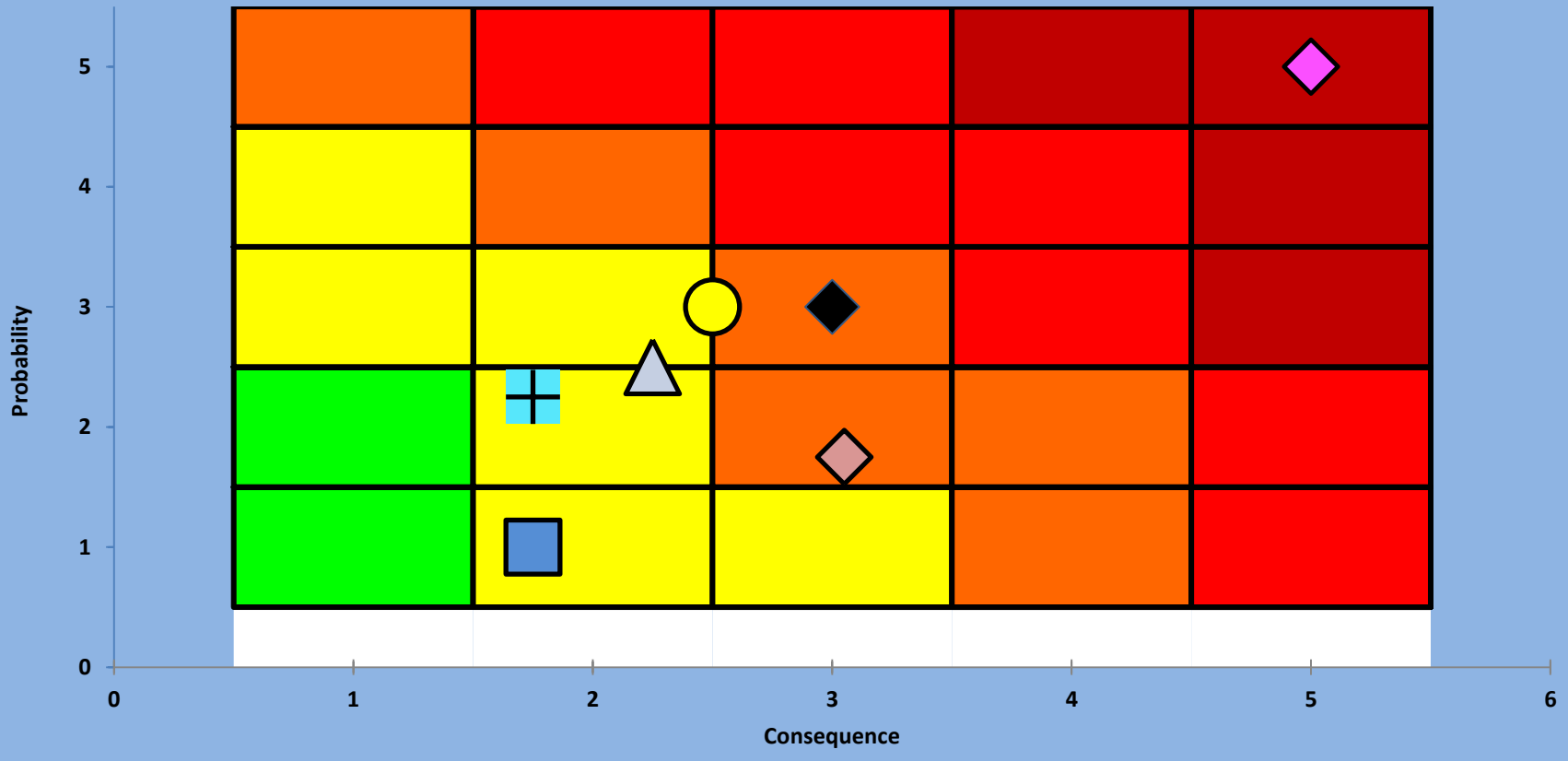
Developing Project Options



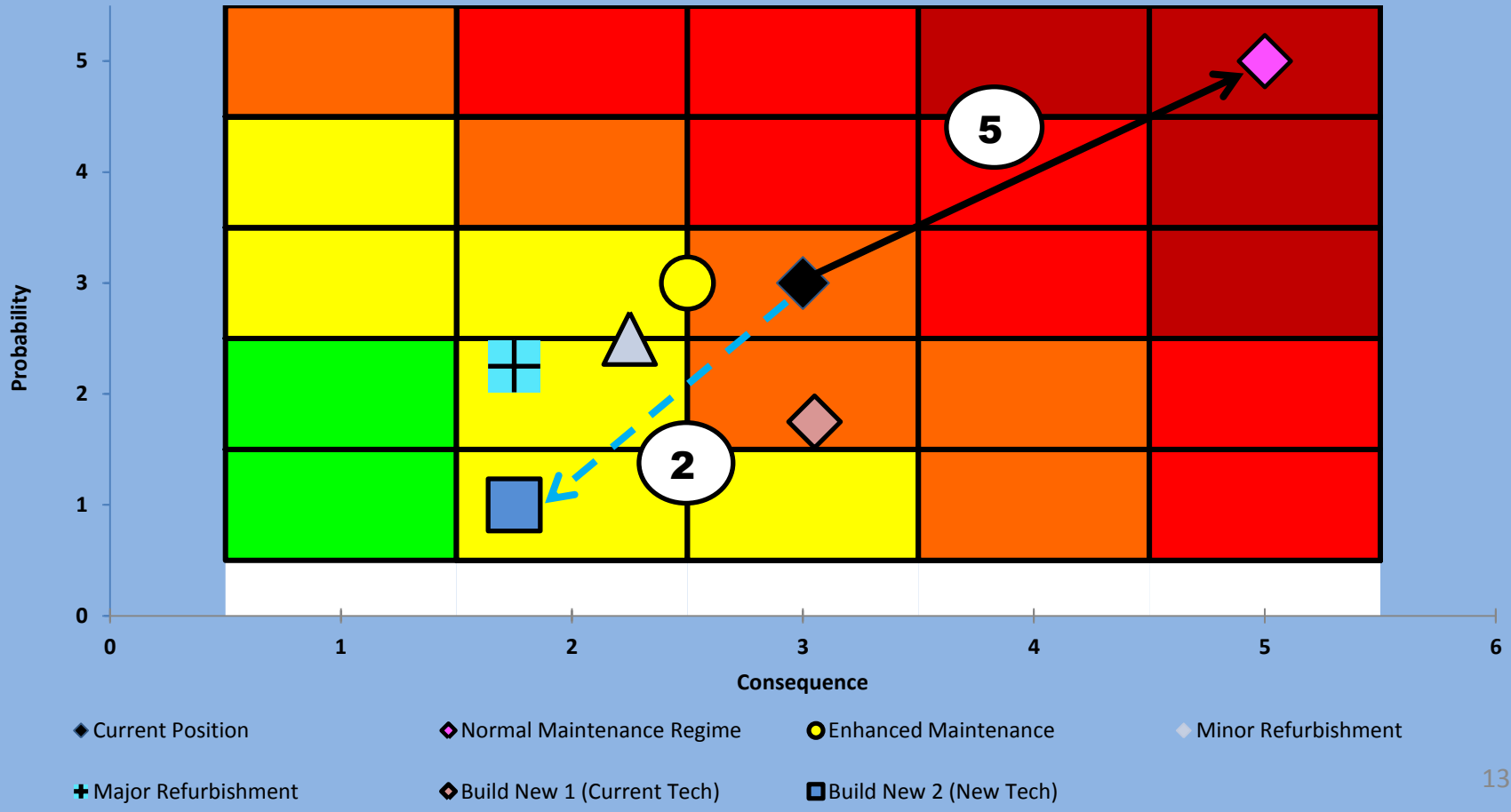
Current Risk Profile



Realistic Options

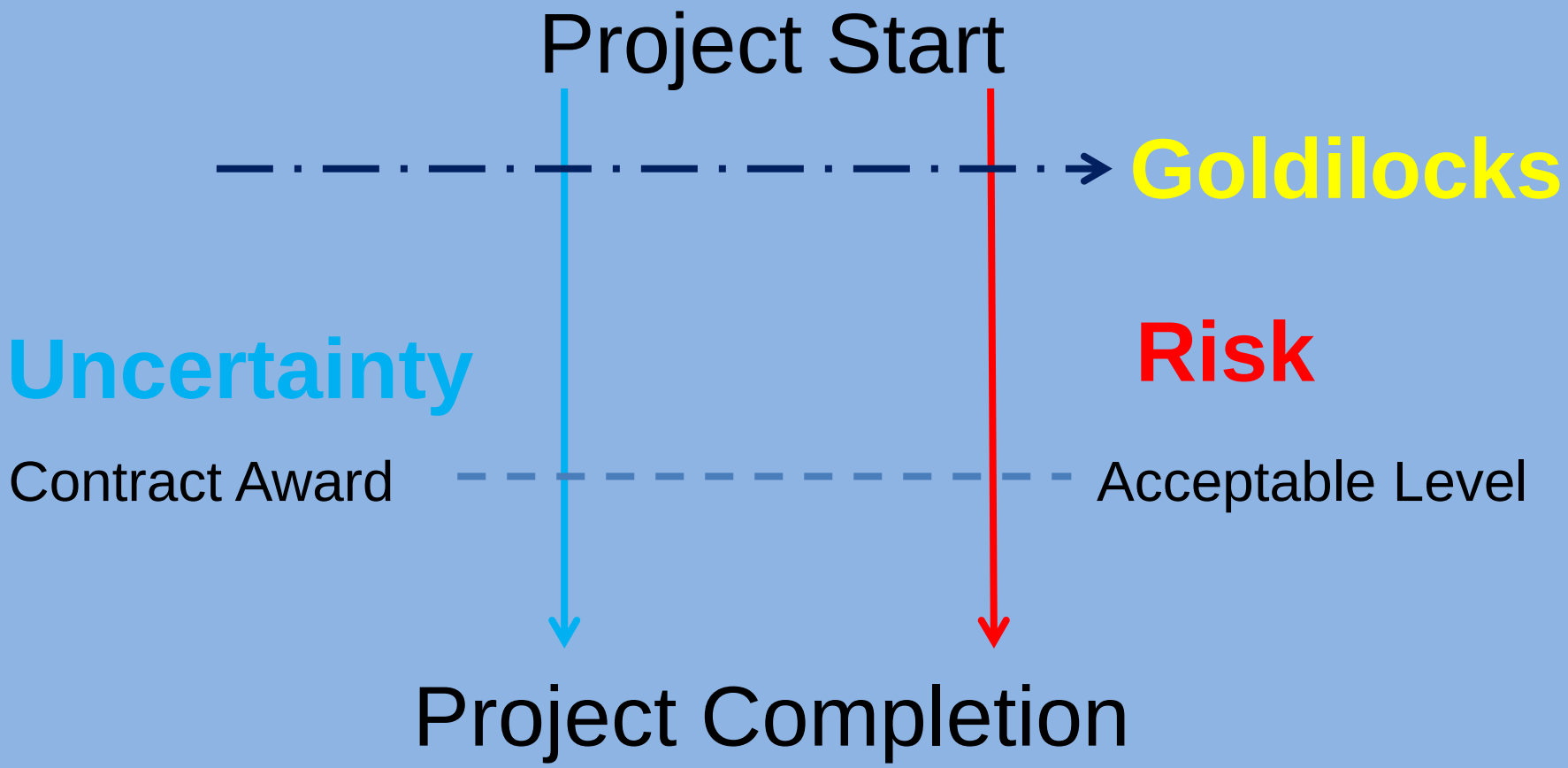


Consider Timeframes



Methods for Quantifying and Analysing Risk Information

Assessing Uncertainty and Risk



Definition of Risk

The effect of uncertainty on objectives

ISO 31000:2009
Risk management – Principles and guidelines

A Better Definition of Project Risk

A future uncertain event that could influence the achievement of Project Objectives

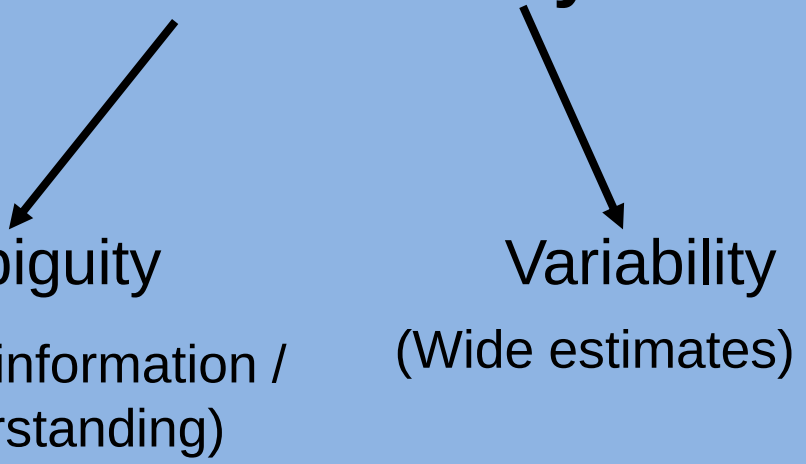
Risk may impact on:

Cost/Time /Quality

or a combination of these elements

Elements of Risk

Threats and Opportunities + Estimating Uncertainty



Are Risks, Opportunities and Uncertainty recorded on the same Register ?

NO!!! - Causes confusion

Provide **separate** registers to record and develop the different sets of information.

Uncertainty Format

WORK OR COST BREAKDOWN STRUCTURE	BASIS OF ESTIMATION	MINIMUM COST ESTIMATE $K	MOST LIKELY COST ESTIMATE $K	MAXIMUM COST ESTIMATE $K	LIKELIHOOD OF INCREASE ABOVE MOST LIKELY COST	REASON FOR COST INCREASE	COST ADDITION $K	PROPOSED COST ESTIMATE $K

Risk Register Format

Risk No.	Overall Rating	Probability	Consequence	Risk Title *	Project Phase	Risk Cause *	Risk Consequence *	Risk Treatment	Mitigation Action(s) *	Risk Owner	Due Date
	High	High	Medium					Treat			

Approaches To Costing Risks

Risk Number	Risk Title	Risk Treatment	Mitigation Action(s)	Probability	Financial Consequence $	Risk Cost (Probability x Financial Consequence) $	Mitigation Cost $	Risk Allowance $
R-001				25%	10,000	2,500	4,000	4,000

Information To Model Risk

Risk Number	Risk Title	Mitigation Action(s)	Probability %	Minimum Cost Estimate $K	Most Likely Cost Estimate $K	Maximum Cost Estimate $K

The Toms Project Opportunity (aka **10:1**) Rule

10 Risks : 1 Opportunity
(Threats)

For every **10** risks you will be lucky to get **1** opportunity and the benefits of this opportunity will only be realised if it is acted on in the **early stages** of the project

Methods of Reflecting Risk In Option Selection Decisions

Costing Approach: Smaller or Lower Risk Projects

Uncertainty – Simple mathematical calculation

Risk – Greater of:

Probability x Single Point Estimate

or

Mitigation cost (if known)

Costing Approach: Higher Value / Risk Projects

Uncertainty – Simulation of 3 Point Estimates

Risk – Simulation of probabilities and 3 point estimates

Can model uncertainty and risk <u>together</u>

Quantitative Assessment

More accurate information allows a QUANTITATIVE assessment of risk impacts to be completed

Actual values will replace ranges:

Probability = 25%

Impact = $2,500 or 3 days delay

Quantitative: 3 Point Estimates

Three Point Estimates can be calculated from Work Breakdown Structures etc.

Probability = 25%

Impact – Minimum -	$2,500	or	3 days delay
Most Likely -	$5,000	or	5 days delay
Maximum -	$7,500	or	7 days delay

Use of Confidence Limits and S Curves

Modelling:

Probabilities + 3 Point Estimates of Risk and Uncertainty

↓

Simulated

(Monte Carlo Simulation)

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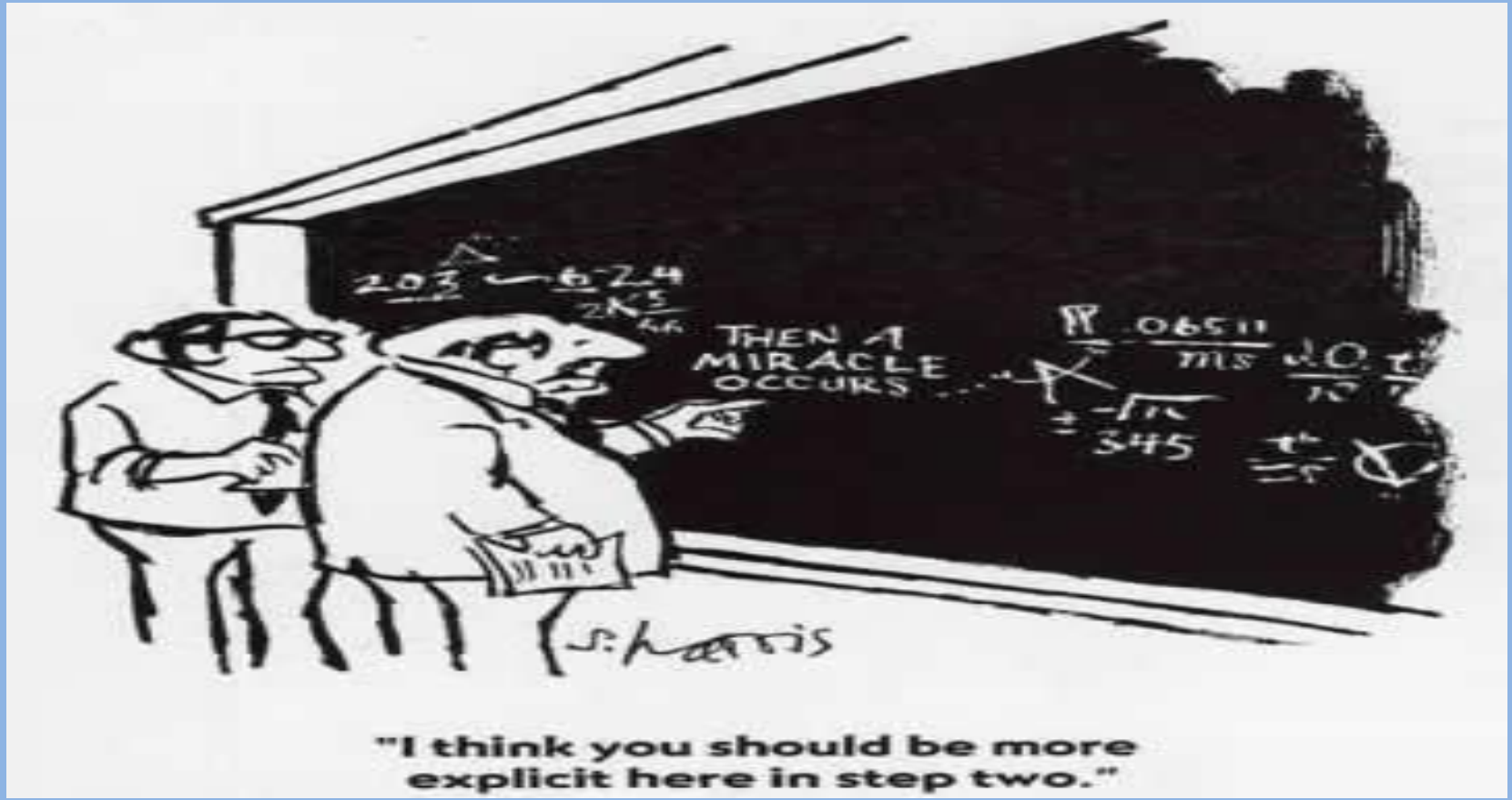
Overall Confidence Limits

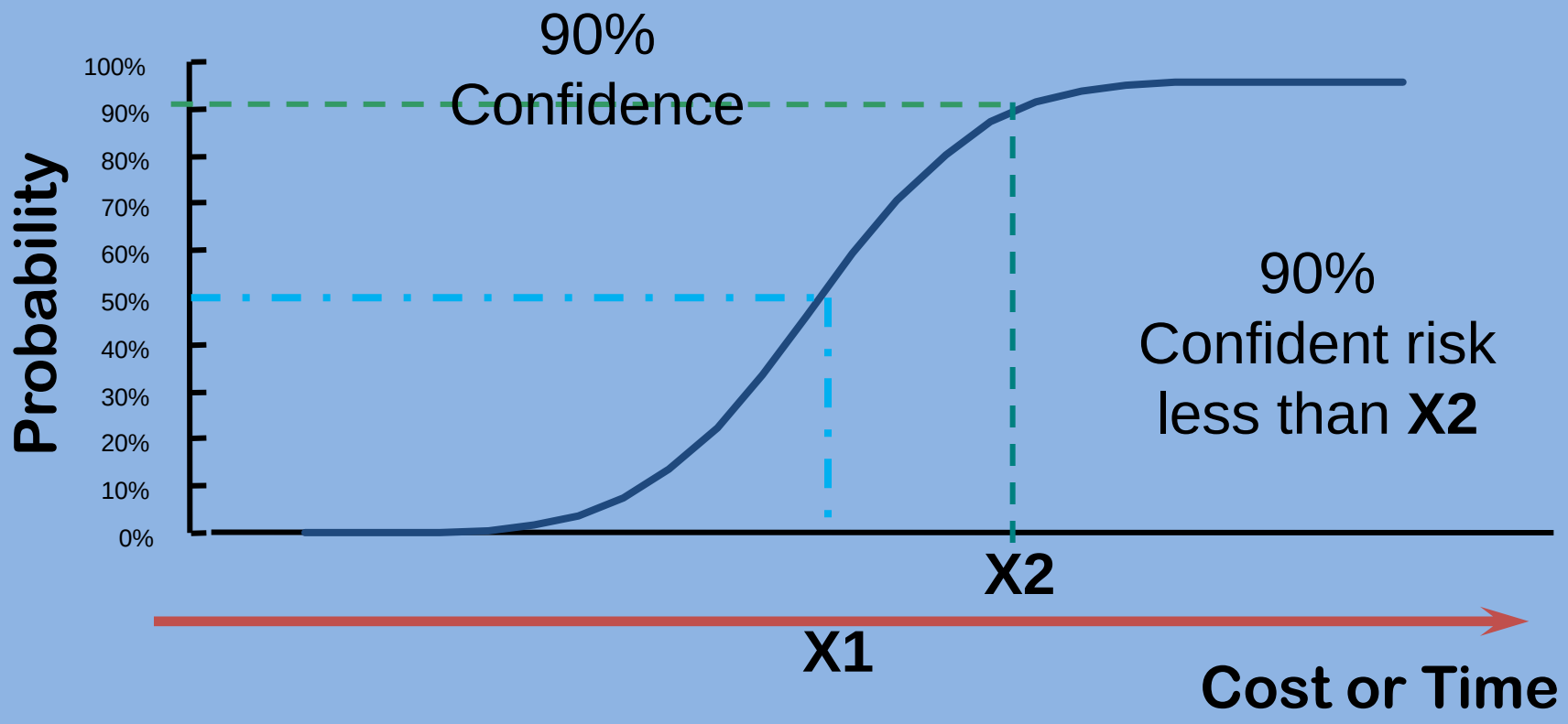
Cost and Time

} **S Curve <u>all</u> risks modelled <u>together</u>**



"I think you should be more explicit here in step two."

S Curve – Project Confidence Limits



Using Simulated Information

Investment Appraisal		Option 1			
Year	2014	2015	2016	2017	2018
Cash Costs	1500	2000	2500	1000	500
Opportunities	0	-500	0	0	0
Risk @ 50% Confidence	500	400	350	100	50
DCF @ 3.5%	0	0.966	0.934	0.902	0.871
Total					

Sensitivity Analysis		Option 1			
Year	2014	2015	2016	2017	2018
Cash Costs	1700	2200	2900	1200	600
Opportunities	0	-300	0	0	0
Risk @ 90% Confidence	700	600	550	150	100
DCF @ 3.5%	0	0.952	0.907	0.864	0.823
Total					

Reflecting Risk in IAs

Vary the position in the Sensitivity Analysis:

Higher possible inflation – increase the DCF

Higher market risk – lower the Payback Period

Higher interest rates – set higher IRR

Higher costs / lower returns – increase NPV

Compare Options and Make Selection

Option 1	IA Result	Sensitivity Result
1	3rd	3rd
2	**1st**	2nd
3	2nd	**1st**

Summary

Objectives / Scope must be clear

Options must be realistic

Sufficient detail to produce quantitative information

Risks costed, simulated and included in the IA / Sensitivity Analysis

Questions

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Creating the Risk Budget

Agree the overall risk budget for the project
= based on revised 50% confidence level

Use quantitative risk information to apportion the risk budget to individual project risks

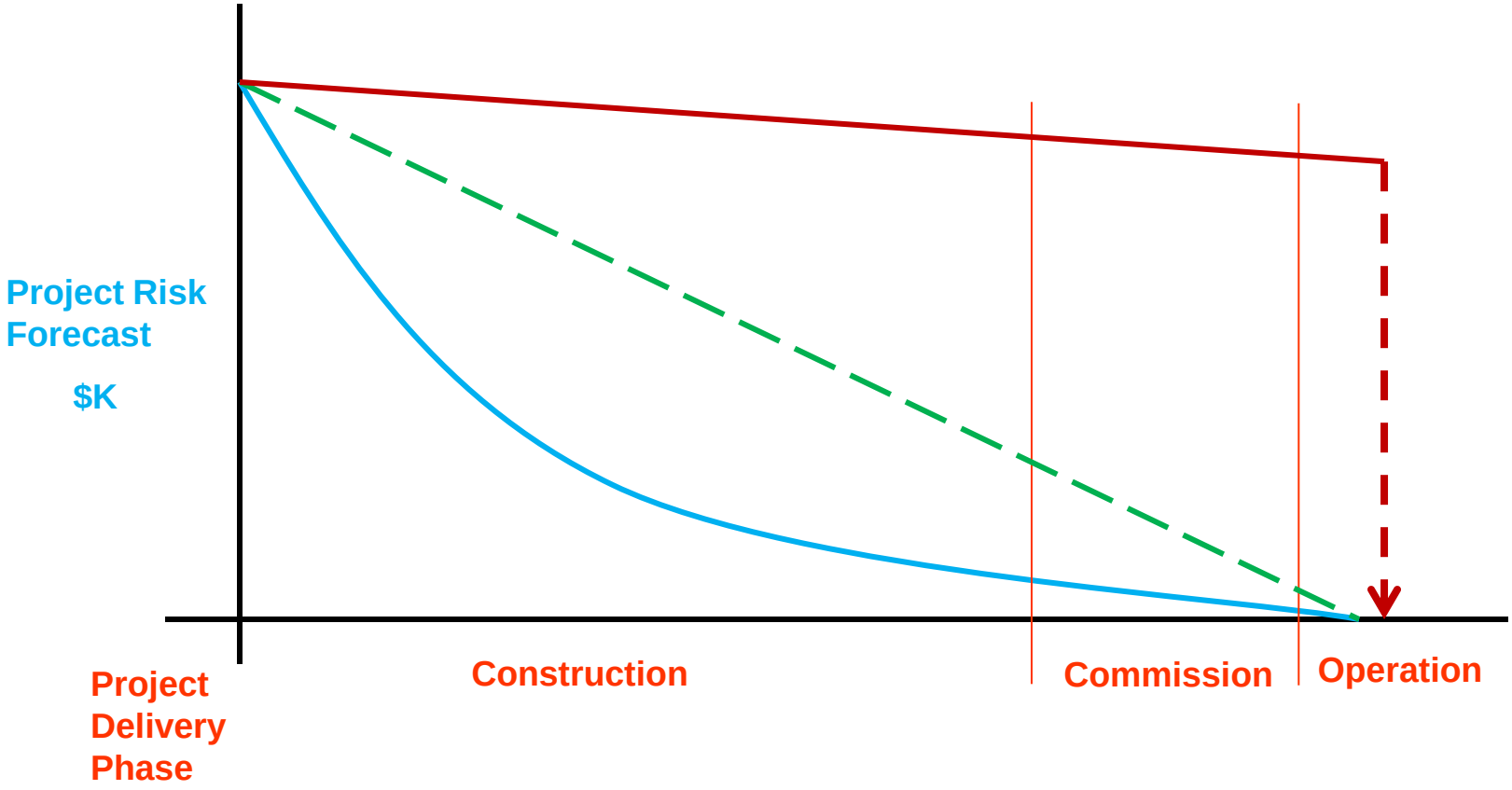
Align risks with the project delivery schedule

Remove from forecast after phase completes

Risk Forecasting

Month	January	March	May	July	August	September
Delivery Phase	1	2	3	4	5	Complete
Related Risk Number	1 , 2 , 3	4, 5	6, 7	8	9	
Risk Funding $K	450	250	150	100	50	0
Cumulative Forecast $K	**1000**	**550**	**300**	**150**	**50**	**0**

Likely Financial Project Risk Profile During Delivery



Where Project Risk Management has the most benefits