The following presentation was given at:

Joint Workshop
"Affordability, Value for Money and Decision Making"

Tuesday 18th November 2014

BAWA, Filton, Bristol

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Requirements uncertainty

Analysis, defining, measuring, mitigating and optimising.

Andy Nolan – Project estimation specialist

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Do you have requirements uncertainty, volatility and late change?

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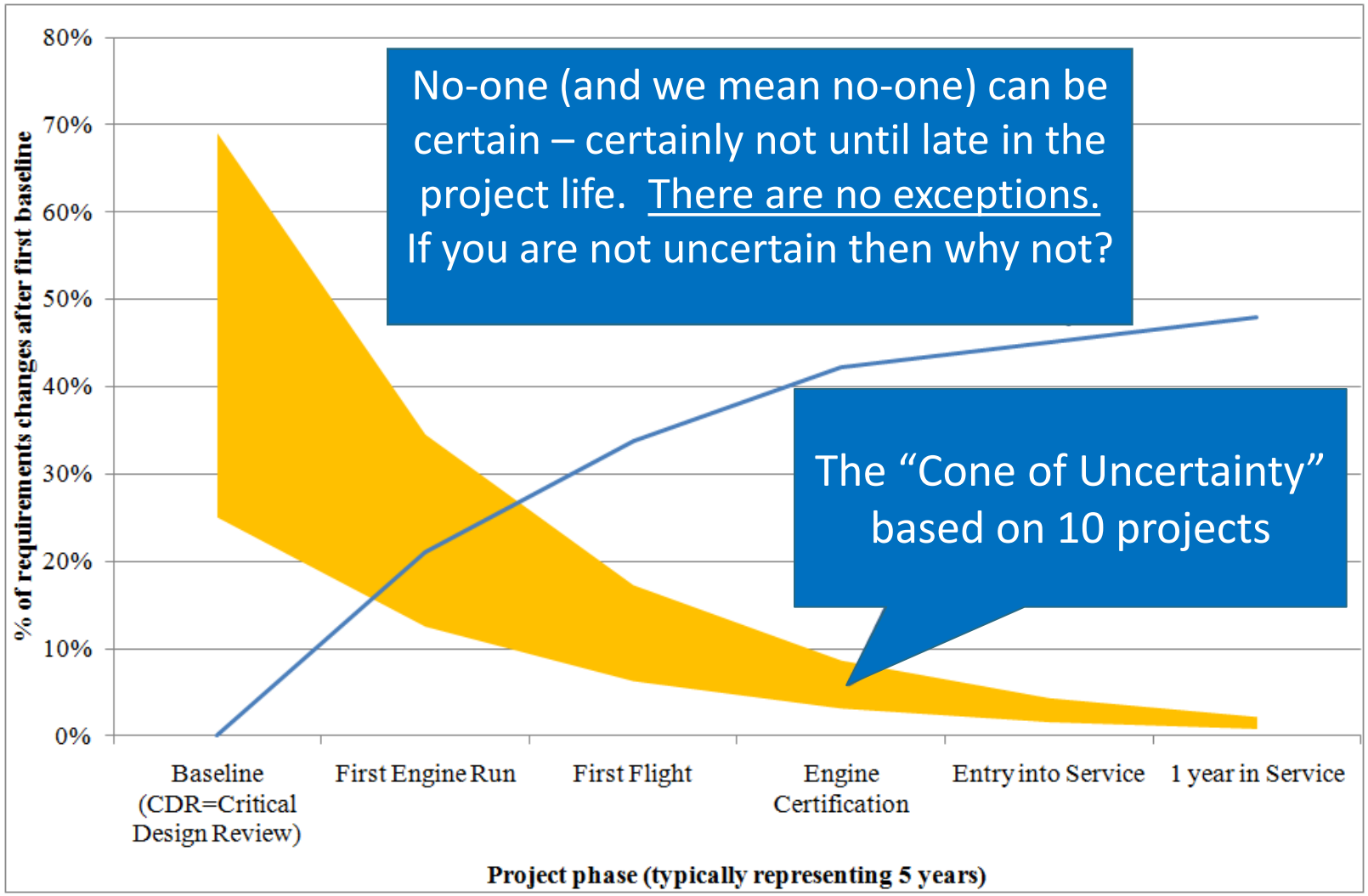
…so do we!



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So what can you do about it?

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1: Ignore it

Learn to look surprised/annoyed, blame the customer and go for the sympathy vote!

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2: Try and fix it

But the evidence from the audience (and the world) is that it's not easy to fix.

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3 Live with it

It is like living with the weather in England, nobody likes it but we have found ways to live with it.

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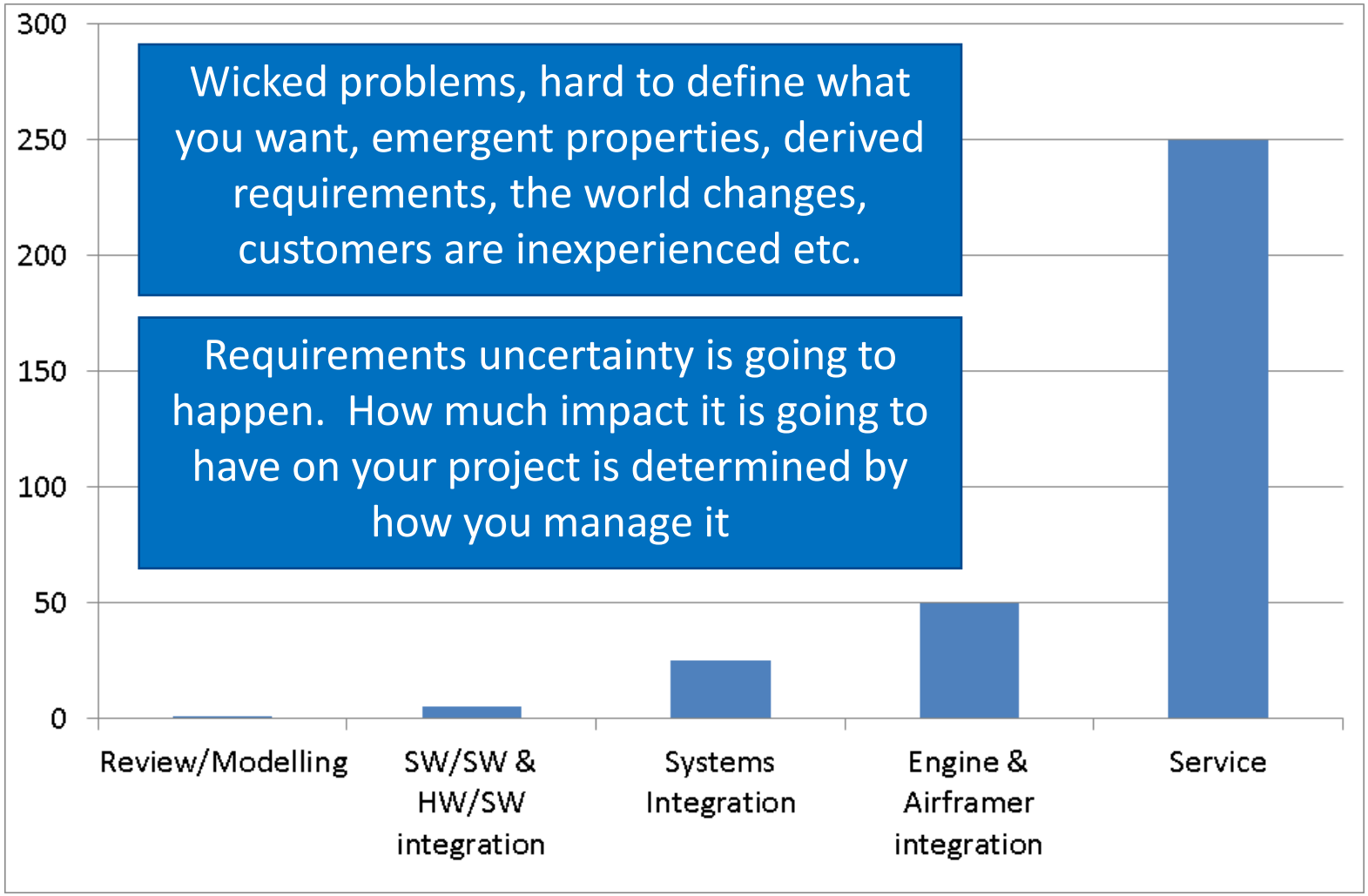
Why the change and why the impact



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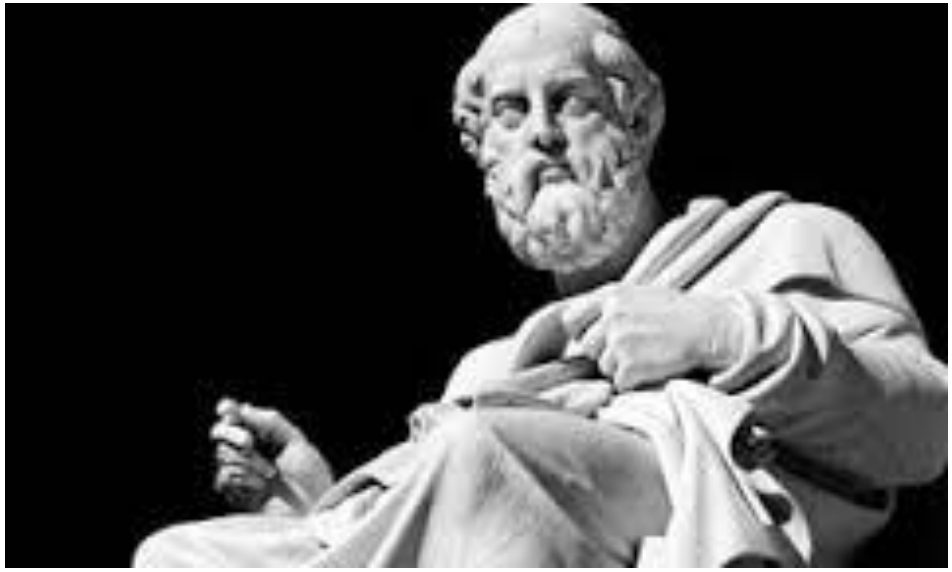
Philosophy

The impact of requirements uncertainty is made worst by assuming you do not have any and allowing it to manifest late on the project.



Requirements change may be “largely” someone else's fault but the impact of the change is “largely” yours!

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Requirements Uncertainty Analysis

Metric	Definition	Purpose and scoring
Impact (I)	Impact of the requirement changing outside the stated range	Determine the severity of change 1, 3, 9 values
Volatility (V)	Confidence Req will change outside the stated range	Measure of Uncertainty 1, 3, 5, 7, 9 values
Time Criticality (TC)	When do we need the requirement to be mature	Prioritize when specific requirements need to be defined 1, 3, 9 values
Precedence (P)	Heritage for the requirement in the specific context	Identify the possible areas of risk (novelty, supplier capability, complexity, etc.) 1, 3, 9 values

Technical Risk Equations

$$1)\ Risk\ \ Index\ (RI) = \frac{V*I*P*TC}{729}$$

$$2)\ Proportional\ RI\ = \frac{RI}{\sum RI}$$

Indication of the relative risk that single requirement contributes to the component or system specification

$$3)\ Immaturity\ Factor\ (IF) = \frac{((V-1)+(P-1))*(I-1)}{128}$$

$$4)\ Maturity\ \ Index\ (MI) = 100\% - Average(IF)$$

Indication of the outstanding risk on a component or system specification

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Maturity

Subsystem	MI
A	52.5%
B	69.2%
C	63.5%
D	37.9%
E	30.4%
F	51.0%
G	56.7%
H	34.9%
I	45.3%
J	73.3%
K	72.2%
L	72.8%
M	54.0%
N	72.4%
O	54.9%
Average	56.0%

- The maturity index is tracked per subsystem and for the whole project
- The maturity index is used to negotiate, prioritise, plan, estimate, etc.

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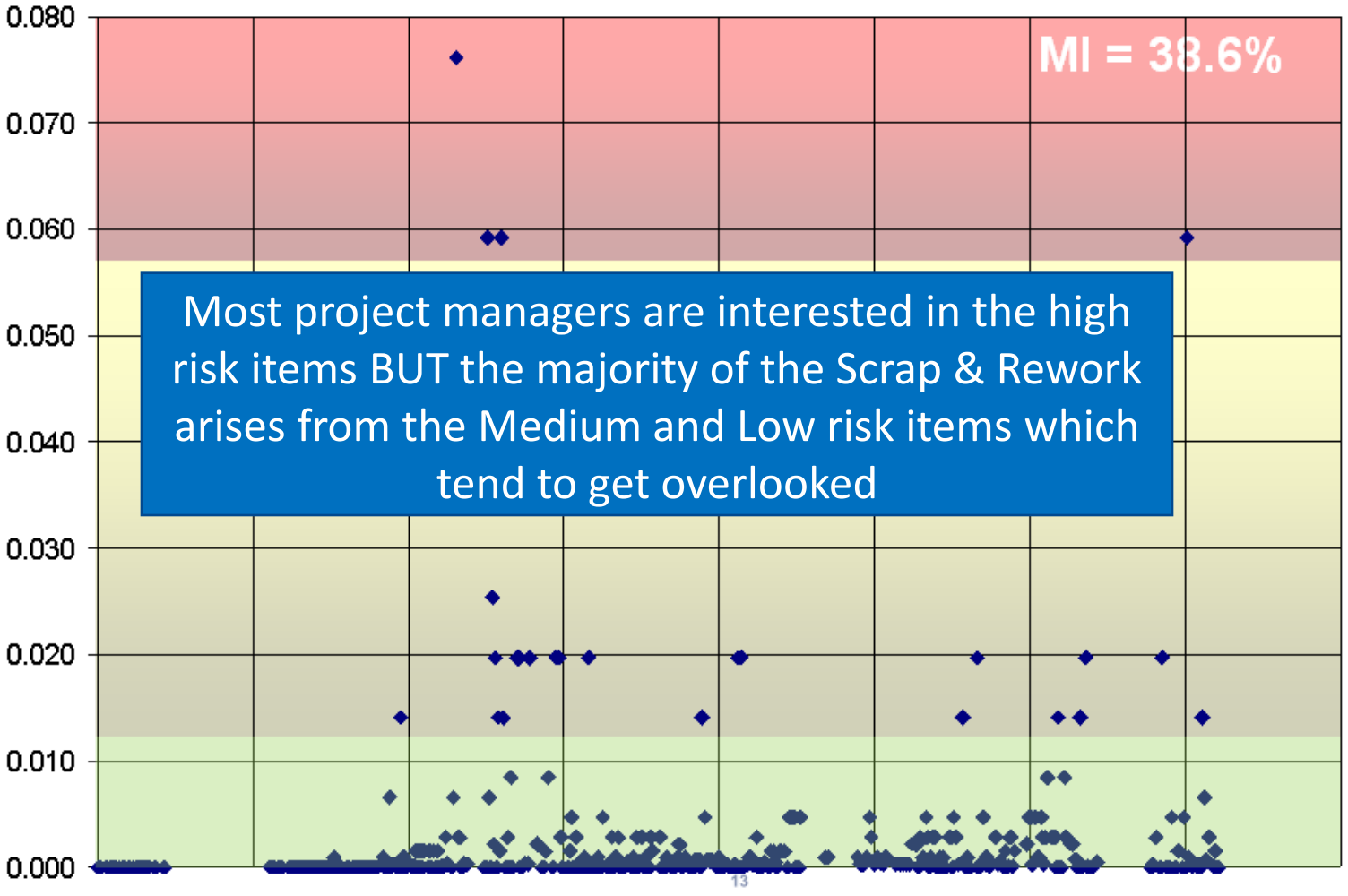
Requirement Risk



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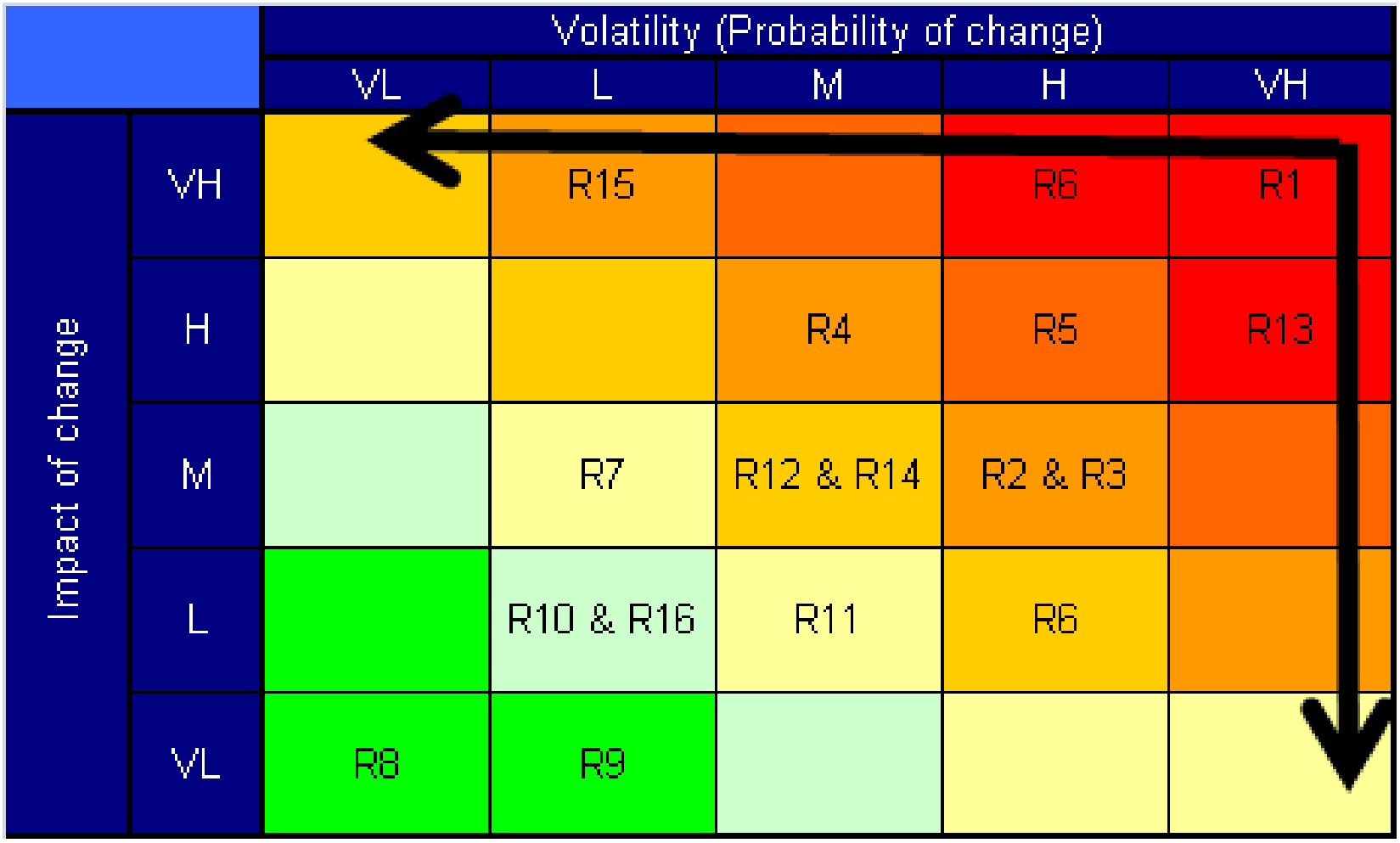
Risk Mitigation



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Risk Classes and Mitigation Classes

Issues ↓ / Mitigation Strategies →	Reduce the Uncertainty													Reduce the Impact					Plan for the Impact	
	Interviews	Involve all relevant stakeholders	Joint workshops	Independent reviews	Learn from past Projects	Use service experience to justify best practice	Go to the experts	Model the system	Prototype in a representative environment	Joint Risk Management sessions	Early integration and test	Propose "softer" requirements that have a range	Write test cases	Propose a requirement	Build robustness into the architecture/design	Build flexibility into the architecture/design	Isolate uncertainty to minimize the impact	Technical oversight	Proceed but plan for the volatility/iteration	Delay the work until requirements mature
Failing to get Stakeholder agreement			X			X	X								X	X	X		X	X
Late or immature customer requirements	X						X			X					X	X			X	X
Inexperienced customer or suppliers		X	X		X	X	X	X	X	X				X						
The supplier requirements are immature/prone to change			X							X		X			X	X	X		X	X
Issues with complying to requirements				X		X				X	X							X		
Missing requirements	X	X		X	X		X	X	X	X	X								X	
Poorly defined (or missing) interface definitions	X	X						X	X		X				X	X				
Requirements are not realistic or achievable					X		X	X	X	X	X						X		X	
Requirements are untestable				X	X		X				X		X							
Requirements are ambiguous				X			X													
Requirements are in conflict with "best practice" solutions			X	X	X	X	X			X				X						

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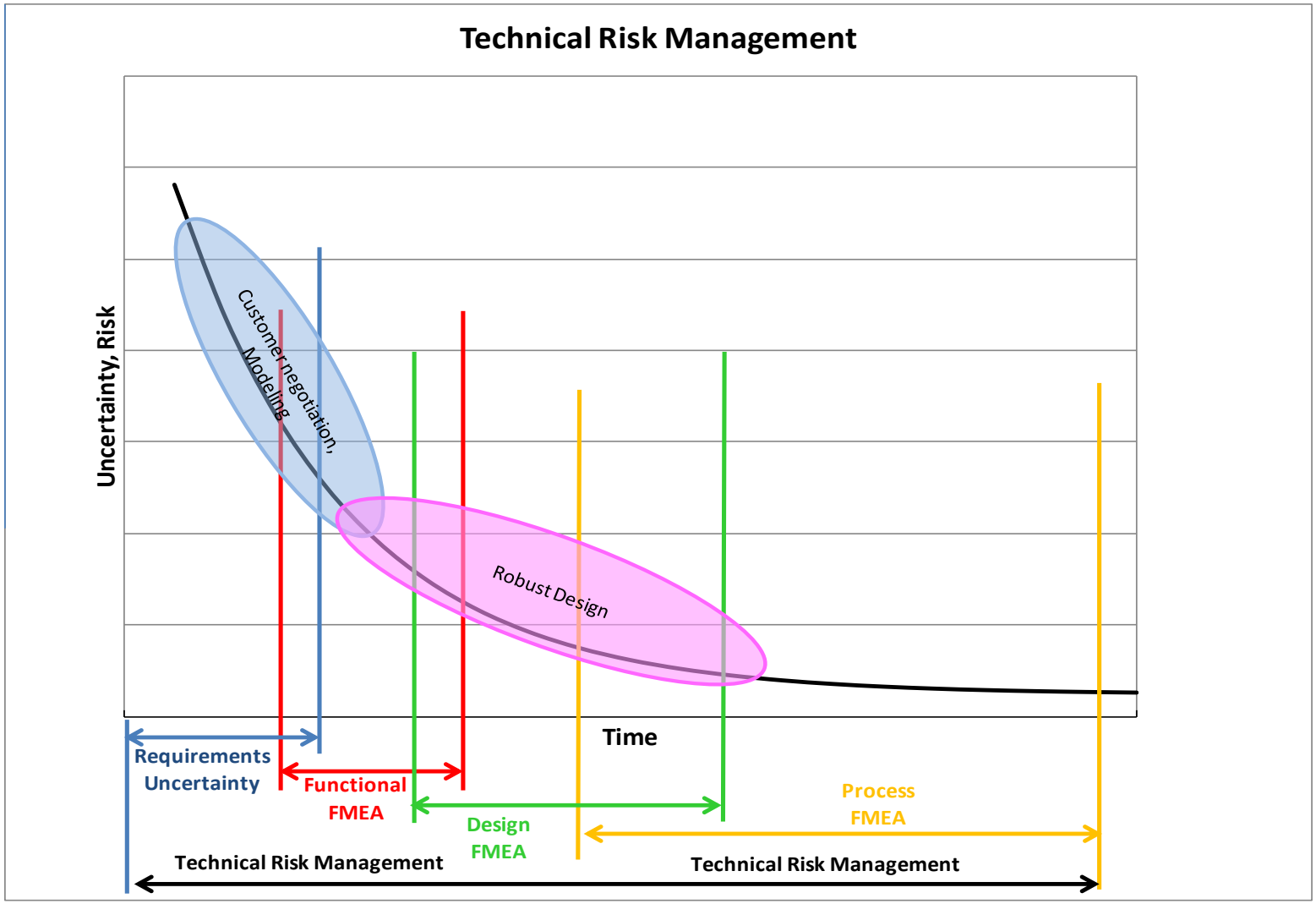
When to use requirements uncertainty



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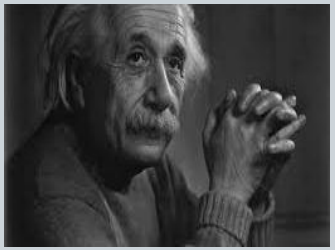
The effect of competency on requirements change

Manager	Low Change	High Change
Strong 	High performance	Might still be able to succeed but at worst will be controlled
Weak 	Might get lucky	Significant problems

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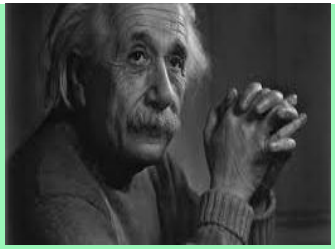
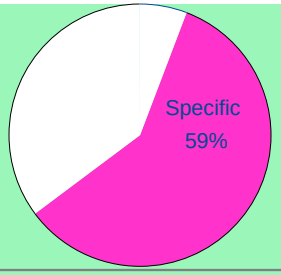
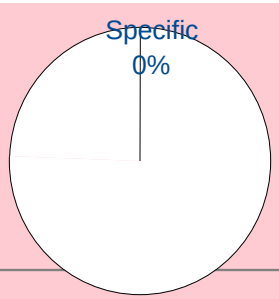
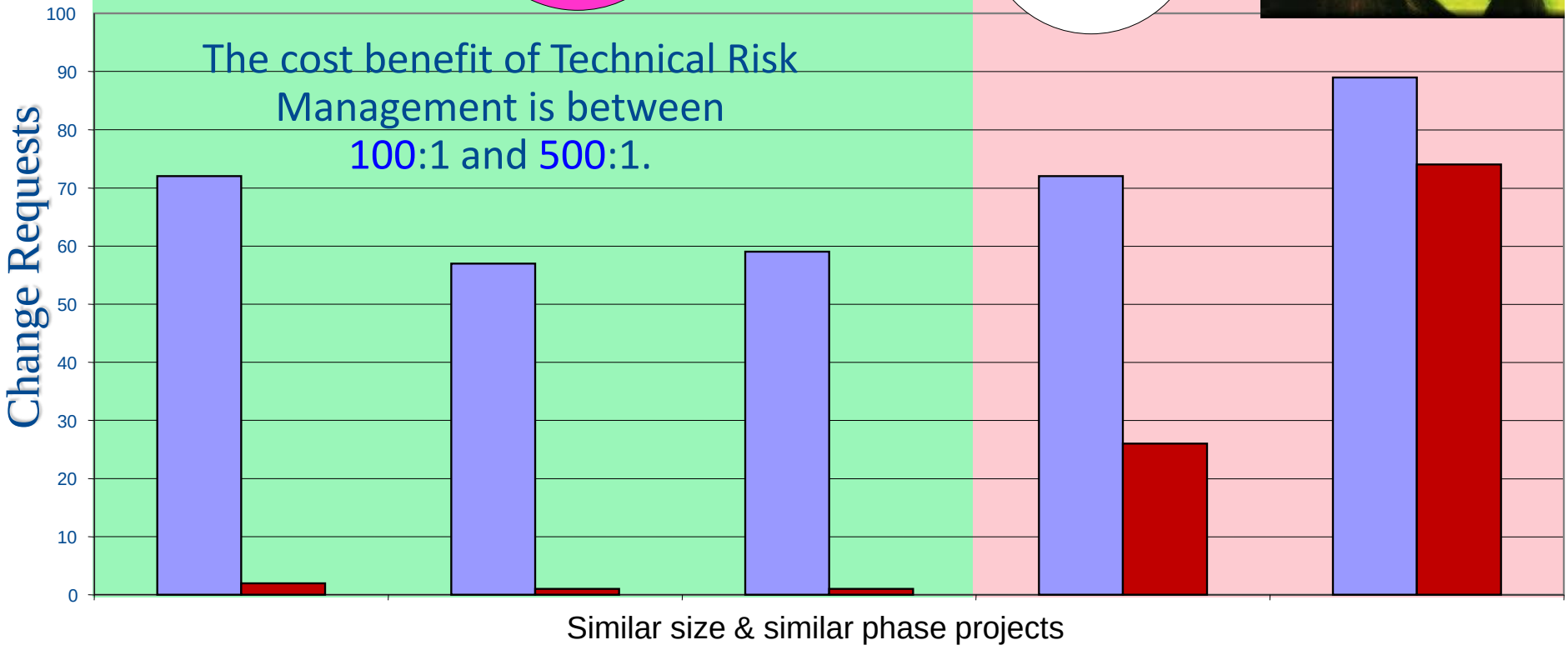






The cost benefit of Technical Risk Management is between 100:1 and 500:1.



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Scrap & Rework

CDR Actions 46%

3%

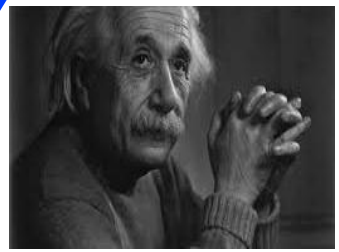
Scrap & Rework

Maturity

The gap between Perceived Certainty and Reality determines the level of unplanned change = scrap & rework

5%

Risk Log



3%

CDR Actions

59%

Risk Log

Time

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Many “major” problems manifest as technical issues but their root cause is weak project management

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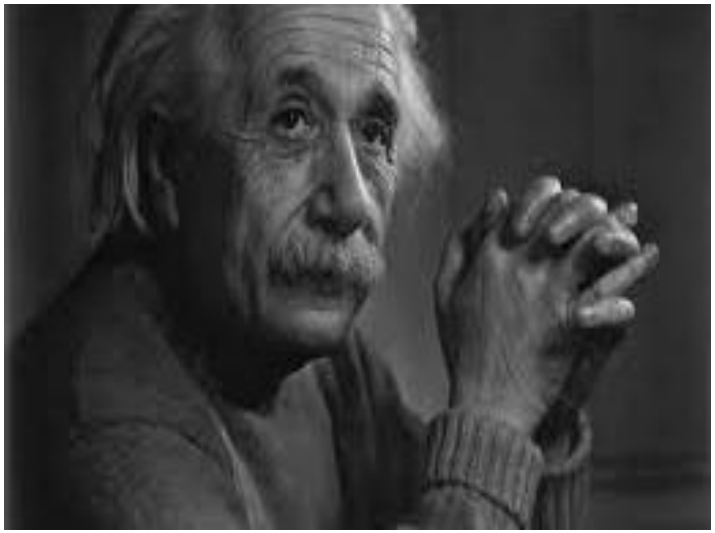
- Requirements change is normal but its impact is determined by how you manage the change
- We can predict the uncertainty with an R^2 of 0.9 – its reasonably deterministic
- The ROI for requirements uncertainty analysis is between 100:1 and 500:1



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