RB

27th annual INCOSE international symposium

Adelaide, Australia

July 15 - 20, 2017

Fortune Telling, Estimating and Systems Engineering

Andy J Nolan
Rolls-Royce plc
Andy.Nolan@rolls-royce.com

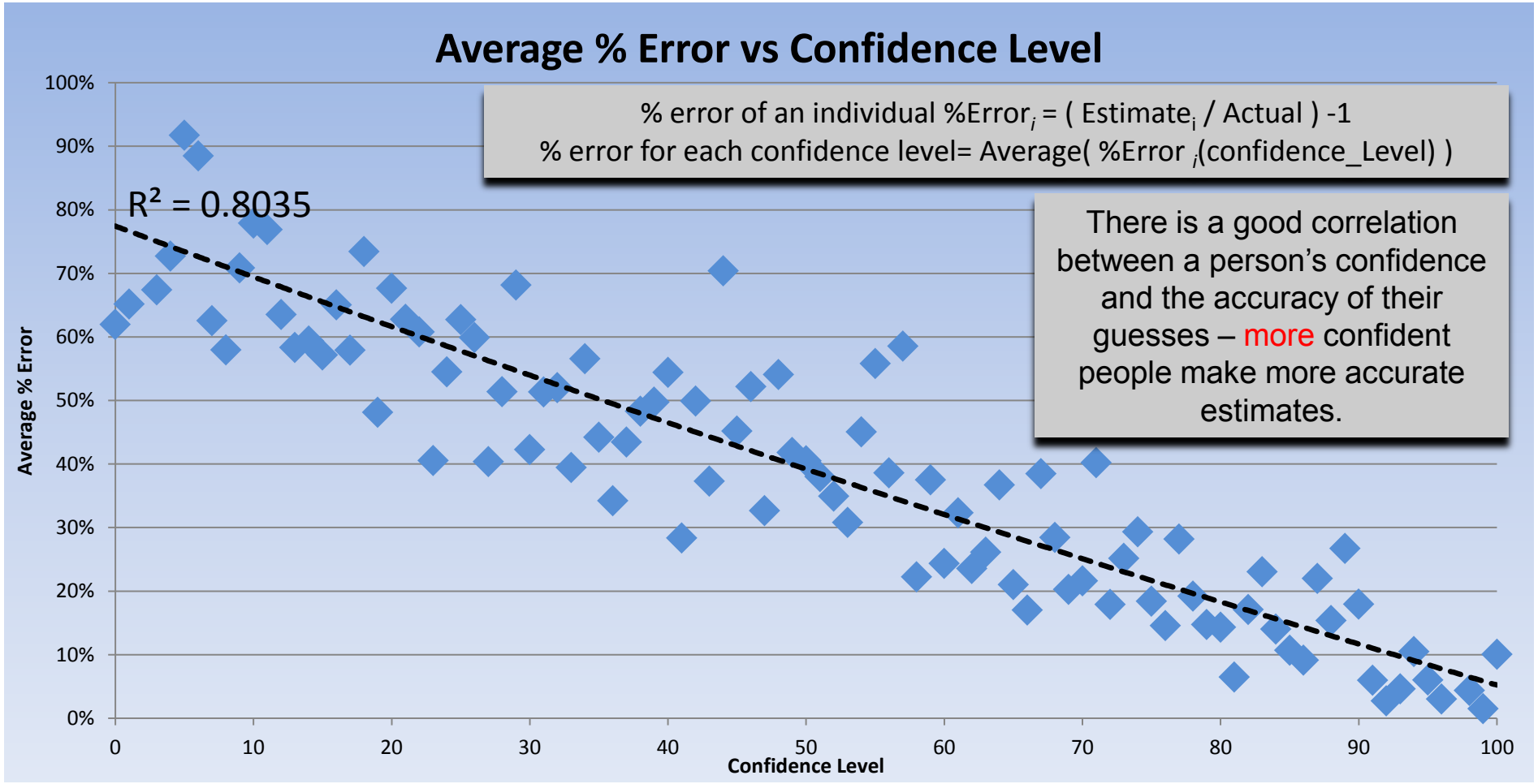
Olimpia Vlad
Rolls-Royce plc
Olimpia.Vlad3@rolls-royce.com

Andrew C Pickard
Rolls-Royce Corporation
Andrew.C.Pickard@rolls-royce.com

Richard Beasley
Rolls-Royce plc
Richard.beasley@rolls-royce.com
@richbsys

The detail can be found in the paper!

There is a good correlation between %Error & Confidence



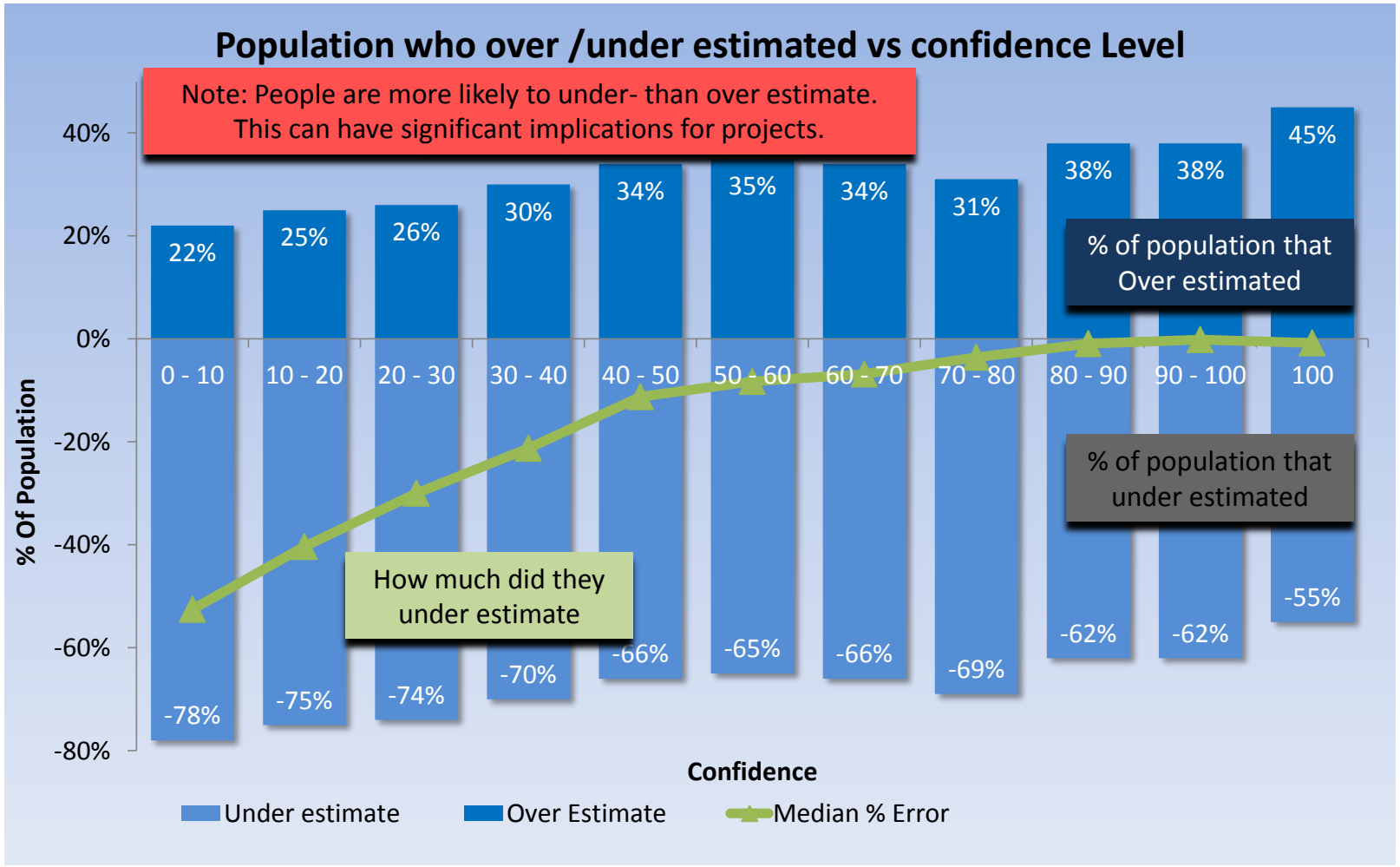
On the whole people are able to self-assess their own confidence

Confidence vs Accuracy			Confidence									
			0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Accuracy	ERL 9	-5% / +5%	20	19	31	27	41	59	54	93	86	116
	ERL 8	-9% / +10%	27	27	24	36	40	53	42	51	45	38
	ERL 7	-17% / +20%	49	30	39	40	48	67	39	37	18	11
	ERL 6	-29% / +40%	77	72	55	68	74	69	51	40	15	3
	ERL 5	-45% / +80%	114	88	56	59	70	70	32	24	7	4
	ERL 4	-62% / +160%	124	95	74	77	62	52	21	19	4	2
	ERL 3	-77% / +320%	140	93	70	39	35	44	17	15	6	2
	ERL 2	-87% / +640%	117	51	41	25	13	16	3	3	3	1
	ERL 1	-93% / +1280%	65	37	11	10	6	5	2	3	2	0

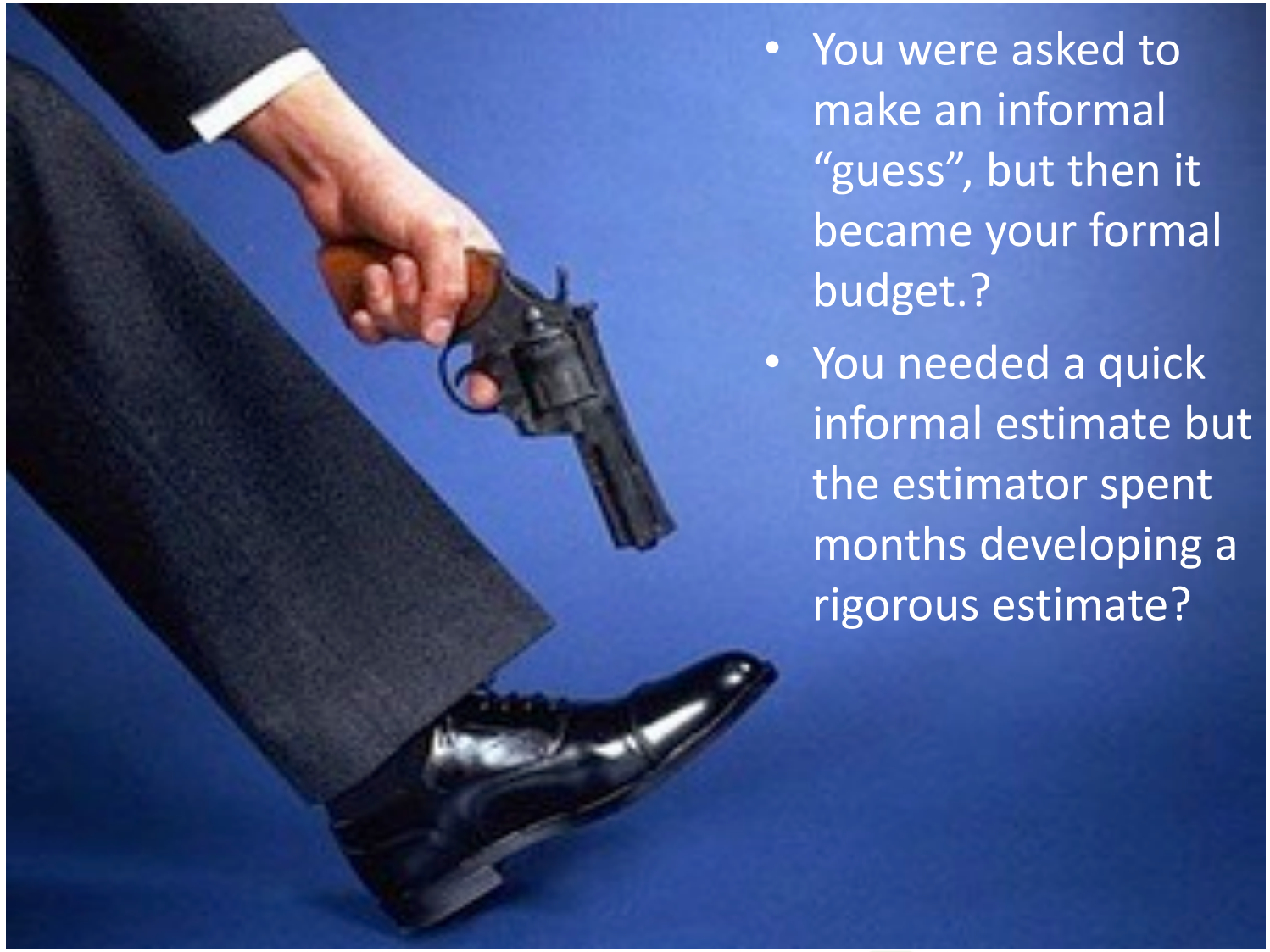
For 65% of the population, a persons confidence aligned with their estimate accuracy. But 1% of the population were overly confident. It seems that many estimators (28%) underestimated their abilities.

Key	Estimates	% of Population
Confidence higher than accuracy	24	1%
Confidence slightly higher than accuracy	237	6%
Confidence and accuracy align	2460	65%
Confidence slightly below the accuracy	708	19%
Confidence significantly lower than accuracy	331	9%
Total	3760	100%

As people become less confident, they tend to under estimate

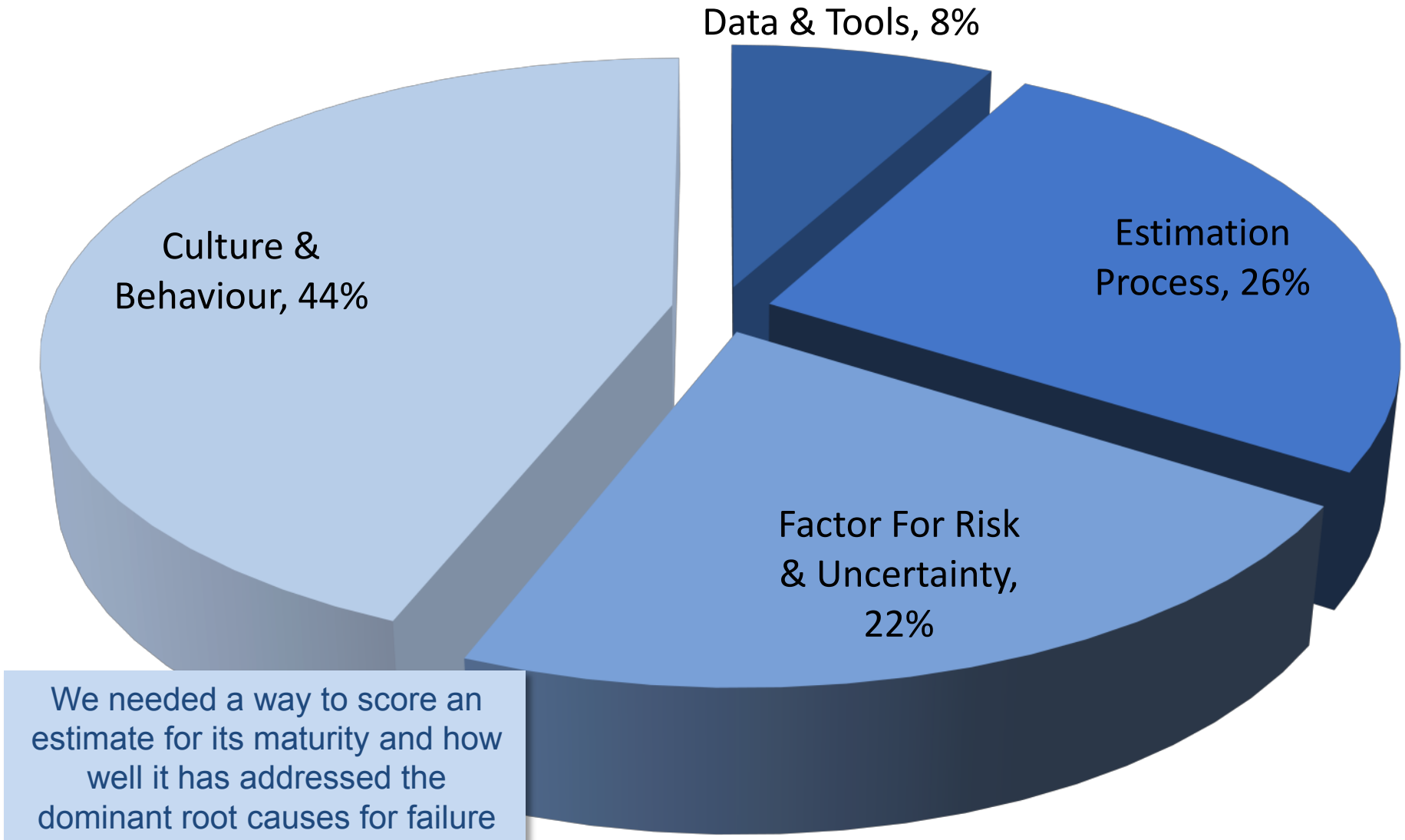


Has this ever happened to you?



- You were asked to make an informal “guess”, but then it became your formal budget.?
- You needed a quick informal estimate but the estimator spent months developing a rigorous estimate?

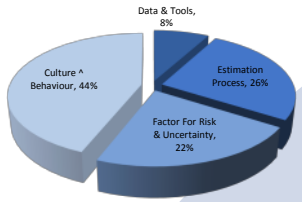
The source of estimate problems



We needed a way to score an estimate for its maturity and how well it has addressed the dominant root causes for failure

What matters rather than what we “moan” about!

The Journey



Root Cause + PFMEA analysis (>120 causes)

Estimation Standard intended to mitigate dominant root causes. 55 Factors grouped into 11 Themes

Assessed estimates for their compliance to the standards. 134 completed projects

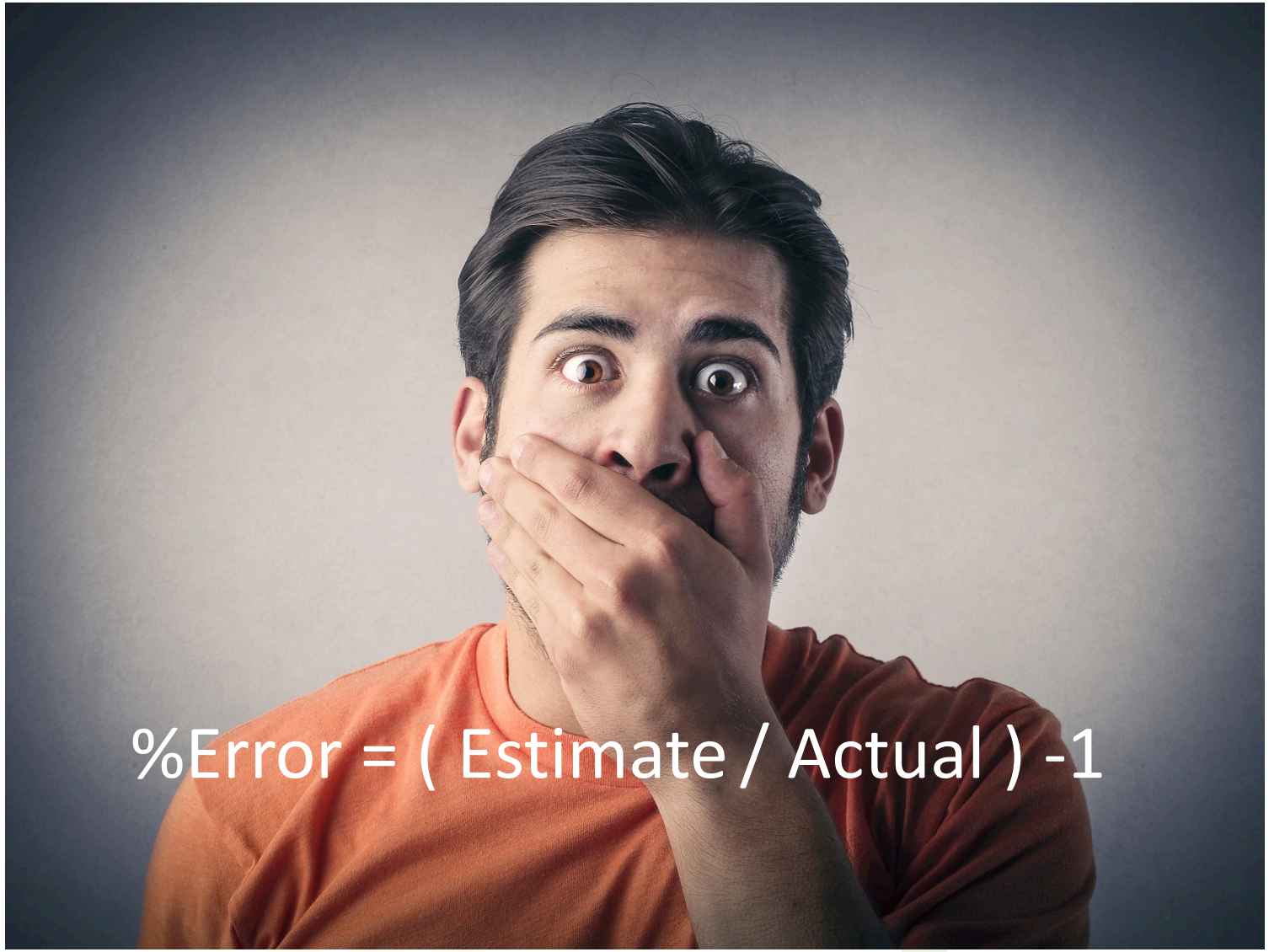
ERL assessment – a weighted assessment that can score an estimate for its maturity at mitigating the dominant root causes for estimate problems.

Estimate Readiness Levels

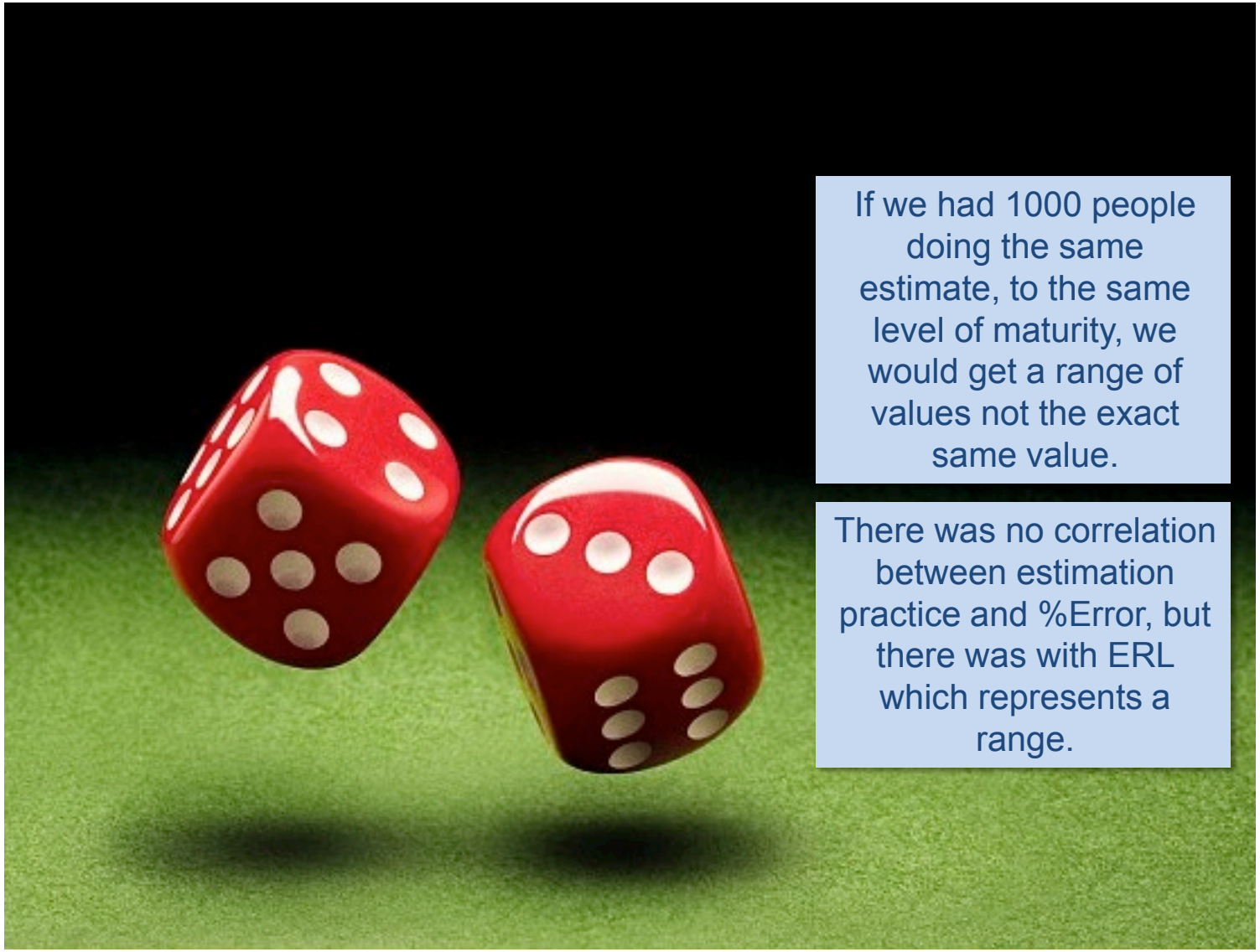
A score between 1 and 9 representing the "maturity" of the estimate and its readiness for use.

Level	Precision	Use
ERL9	-5% / +5%	Annual budgeting and post contract budget baseline
ERL8	-9% / +10%	Contract Signature / Memorandum of Understanding
ERL7	-17% / +20%	Request For Quotation
ERL6	-29% / +40%	Request For Proposal
ERL5	-44% / +80%	Request For Information
ERL4	-62% / +160%	Exploring Trade Options
ERL3	-76% / +320%	Exploring Strategy
ERL2	-86% / +640%	Exploring Expectations
ERL1	-93% / +1280%	Do not use this estimate

Measuring estimate accuracy (%=Error)



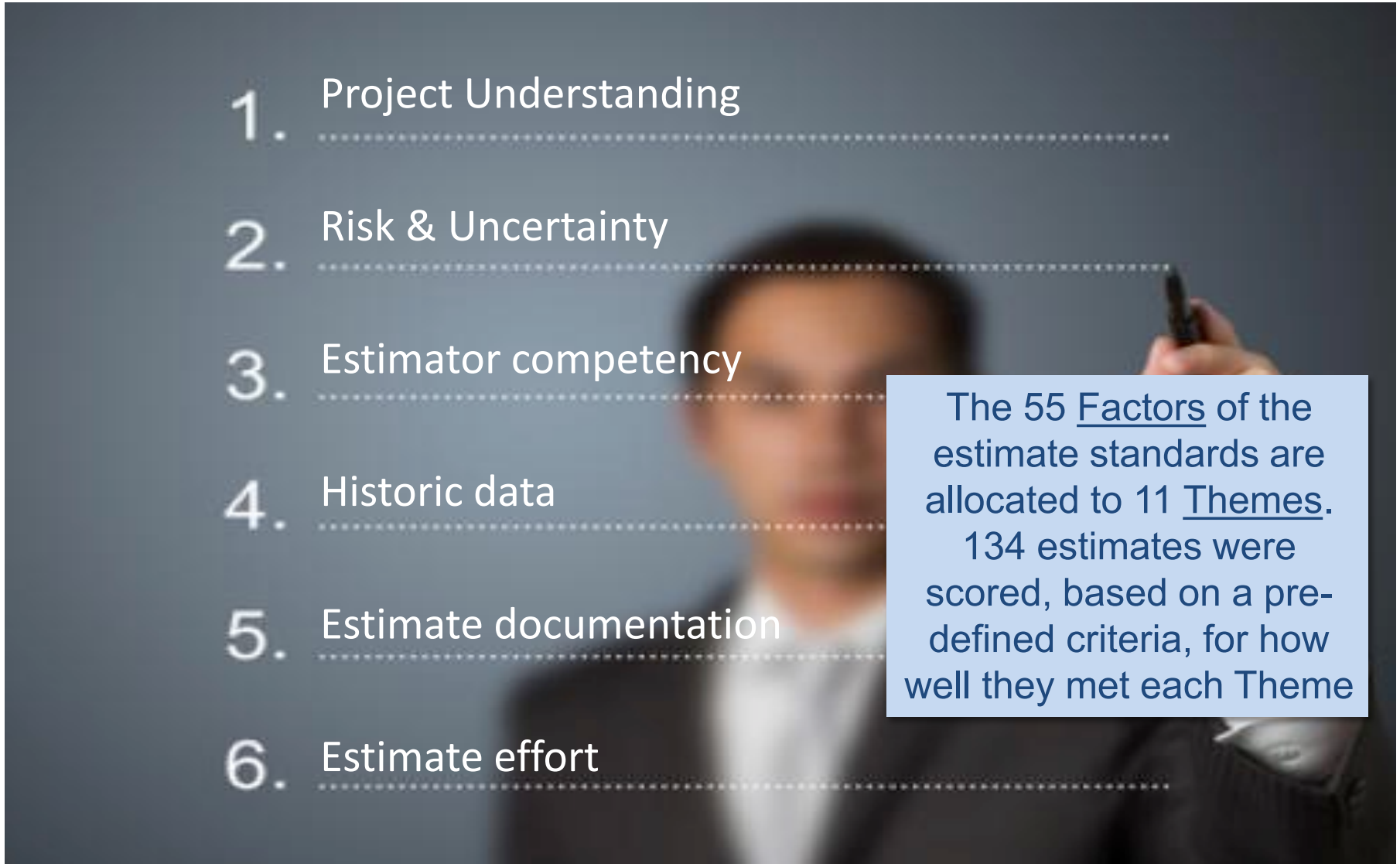
We had to correlate to ERL not to %-Error



If we had 1000 people doing the same estimate, to the same level of maturity, we would get a range of values not the exact same value.

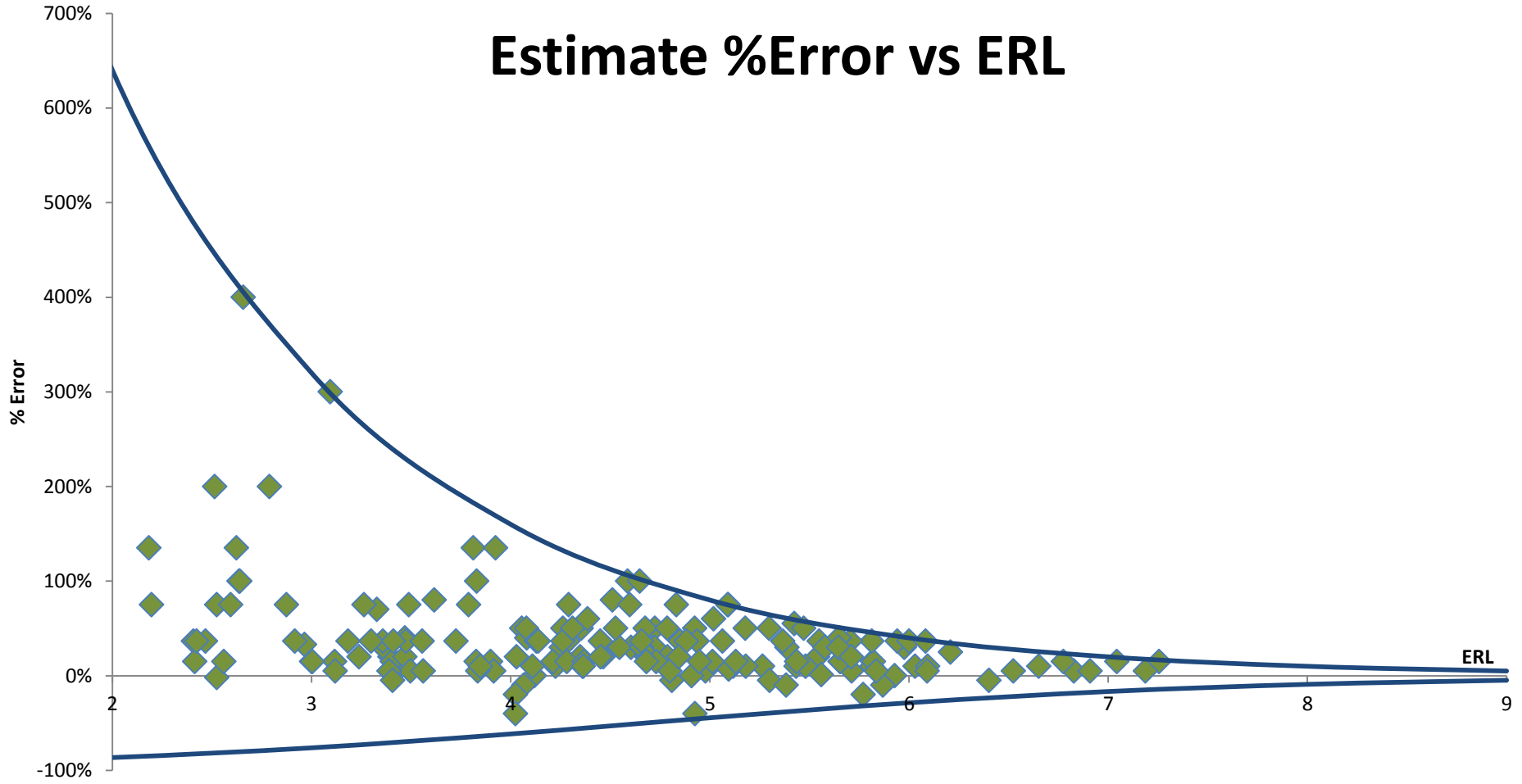
There was no correlation between estimation practice and %Error, but there was with ERL which represents a range.

Calibration

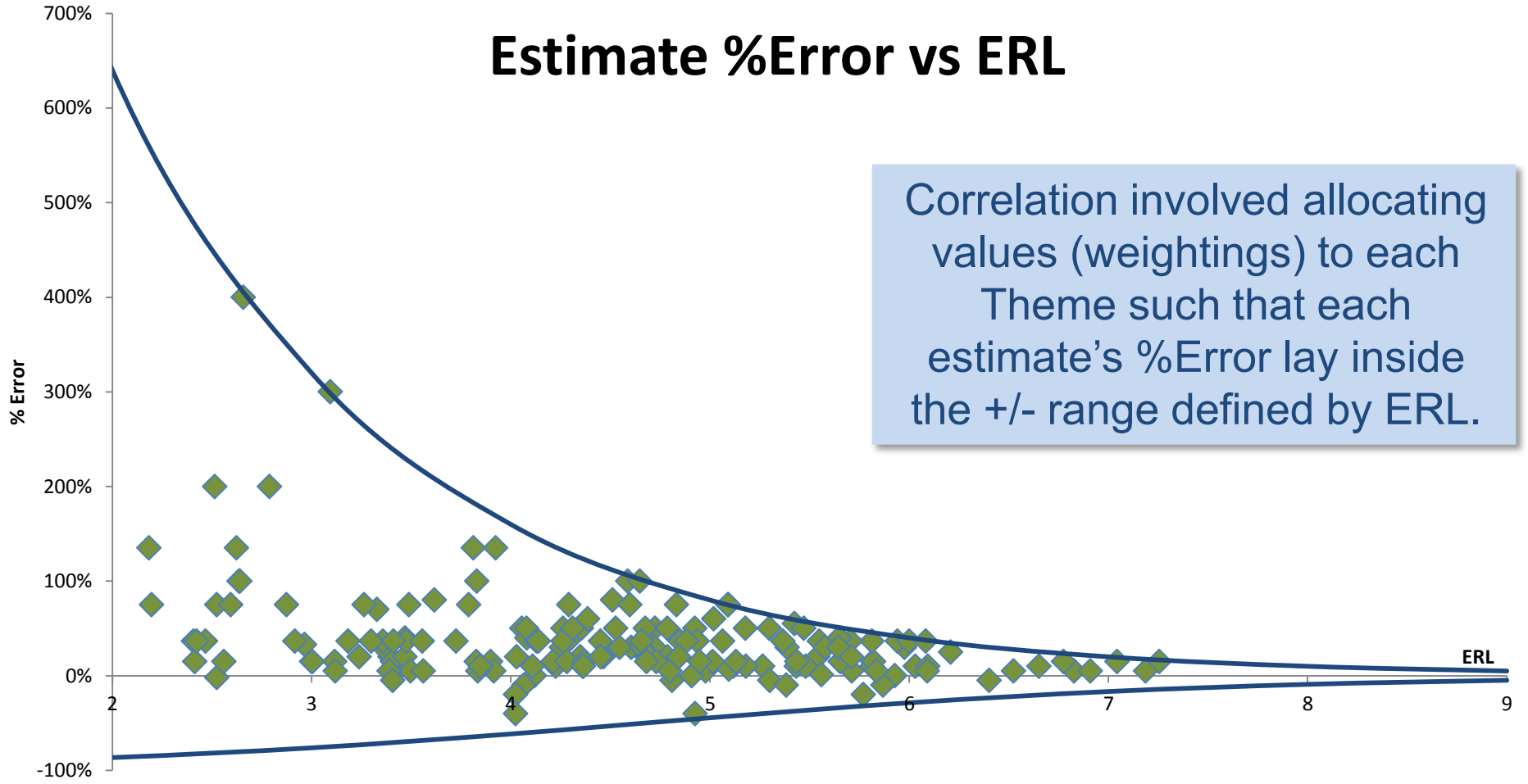


The 55 Factors of the estimate standards are allocated to 11 Themes. 134 estimates were scored, based on a pre-defined criteria, for how well they met each Theme

Estimate Accuracy vs ERL



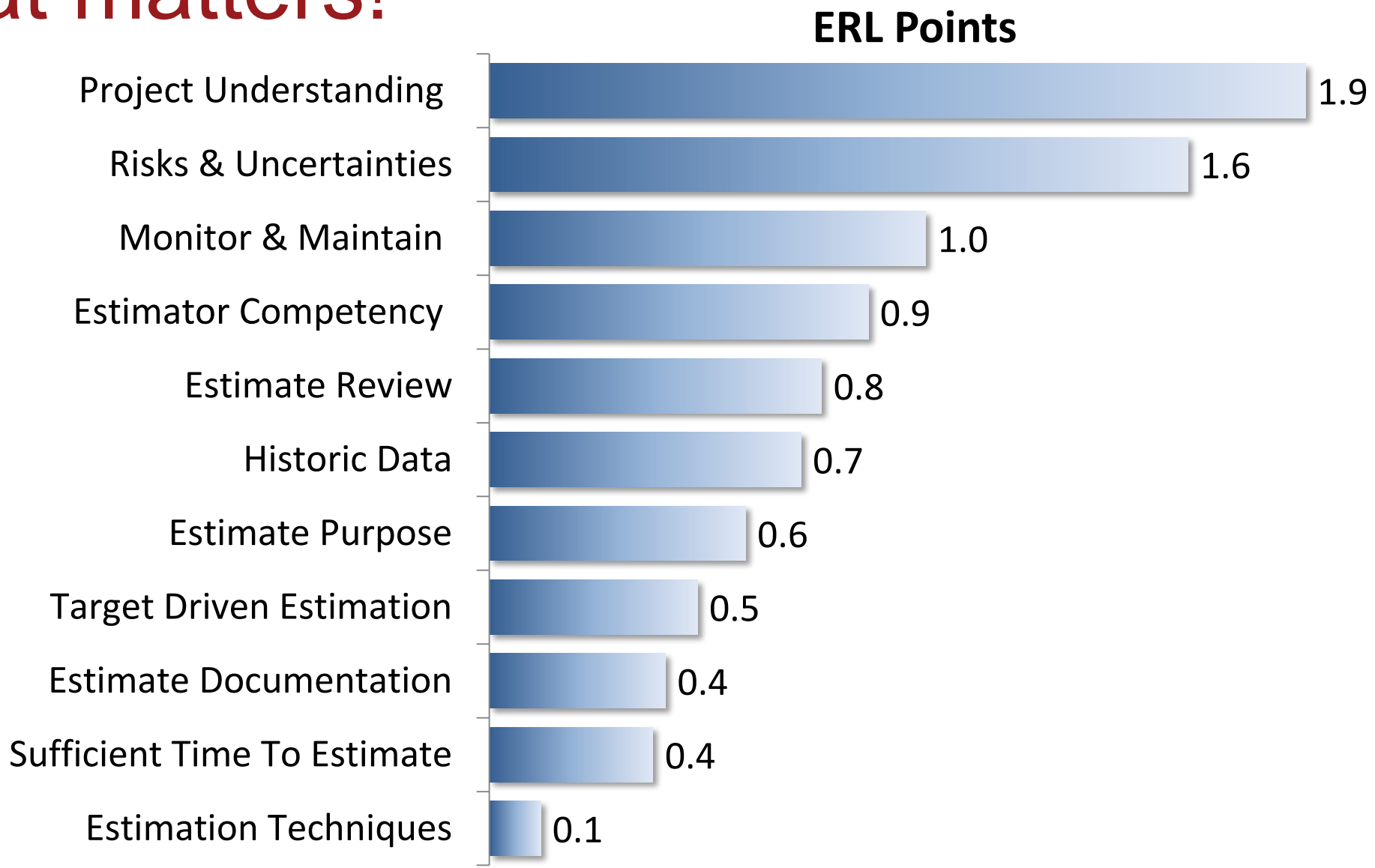
Estimate Accuracy vs ERL



Correlation involved allocating values (weightings) to each Theme such that each estimate's %Error lay inside the +/- range defined by ERL.

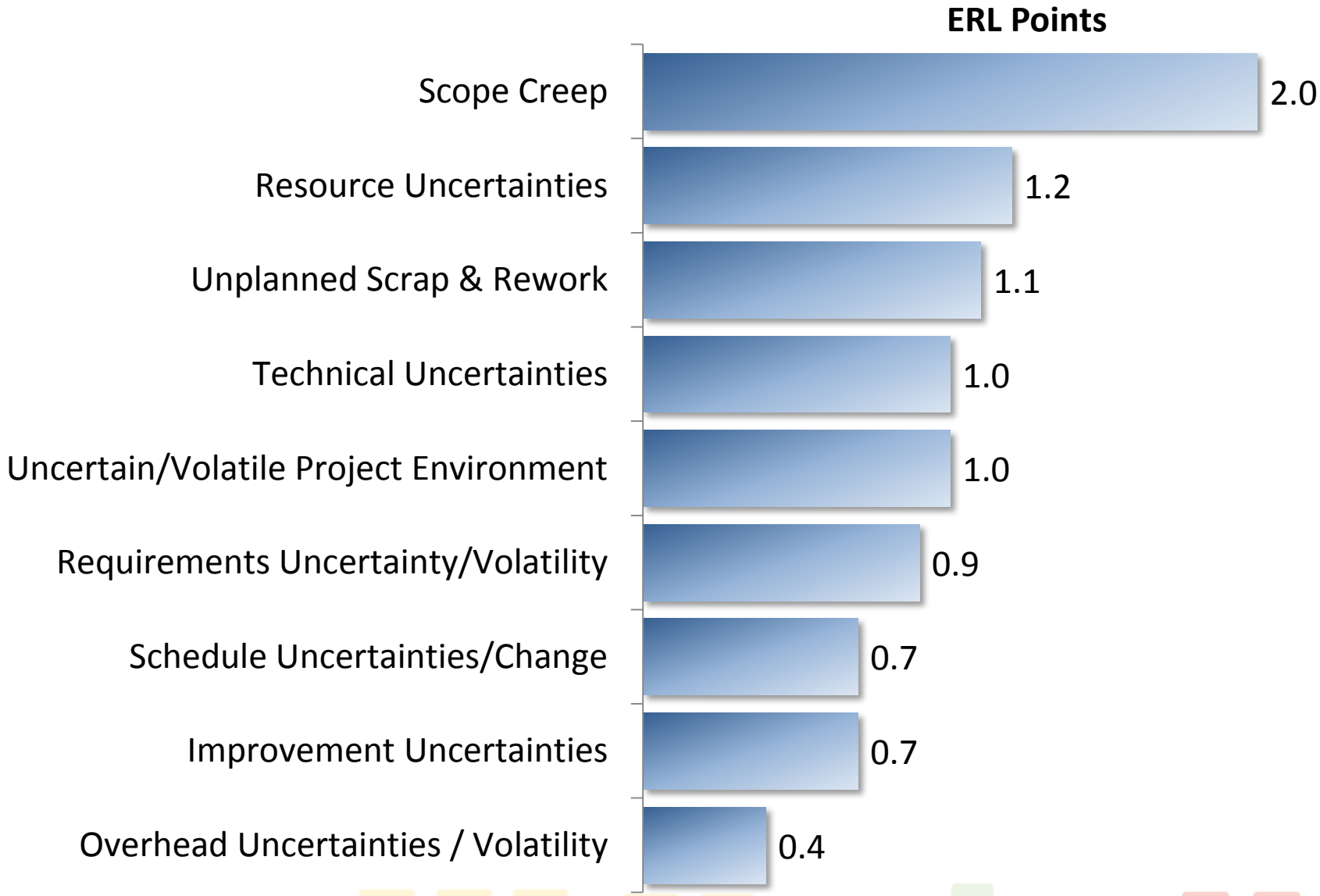
Ask the audience!

What matters!



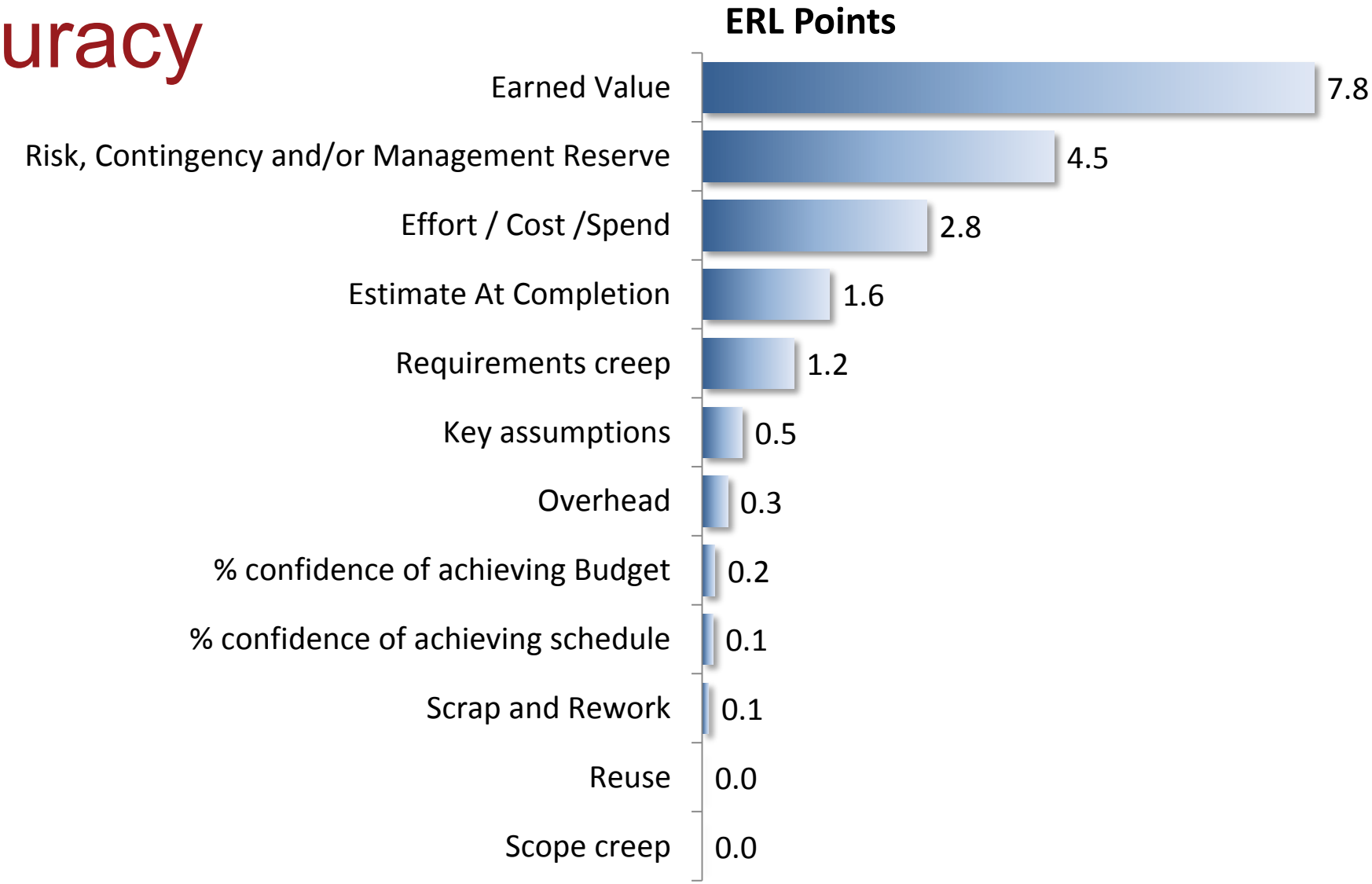
Ask the audience!

Sources of Risk & Uncertainty



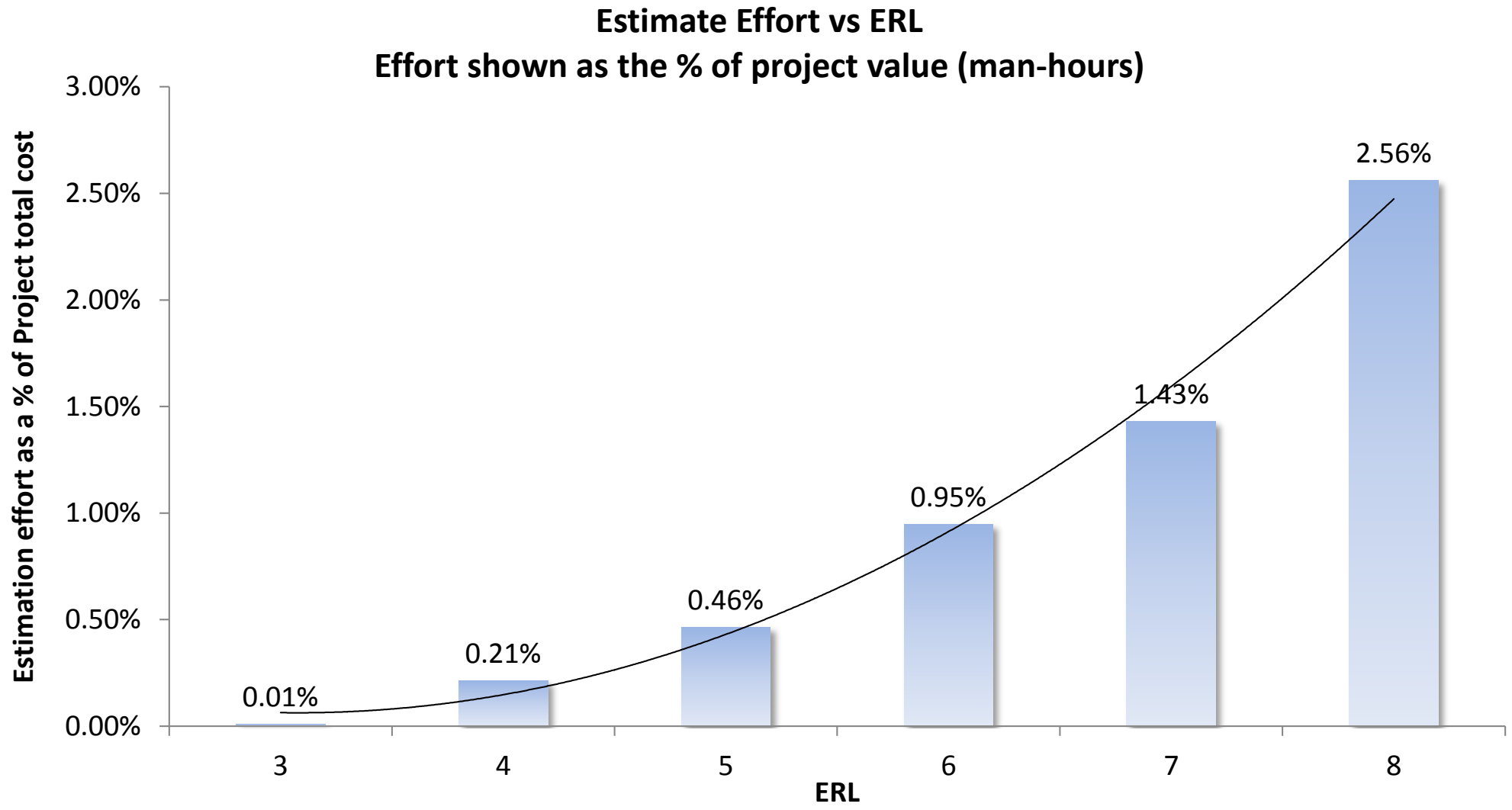
Ask the audience!

The Correlation Between Monitor & Estimate Accuracy



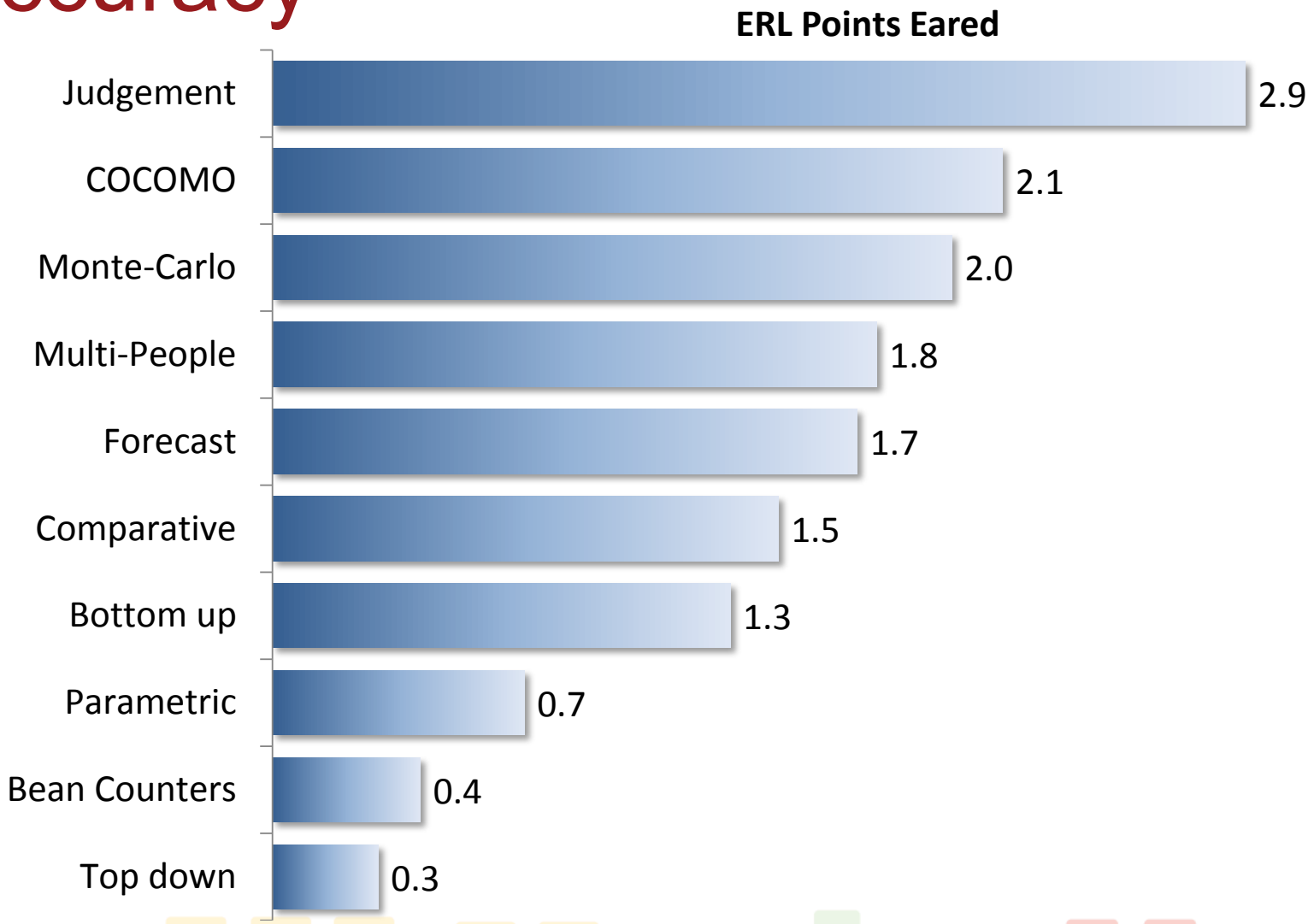
Ask the audience!

Estimation Effort vs ERL

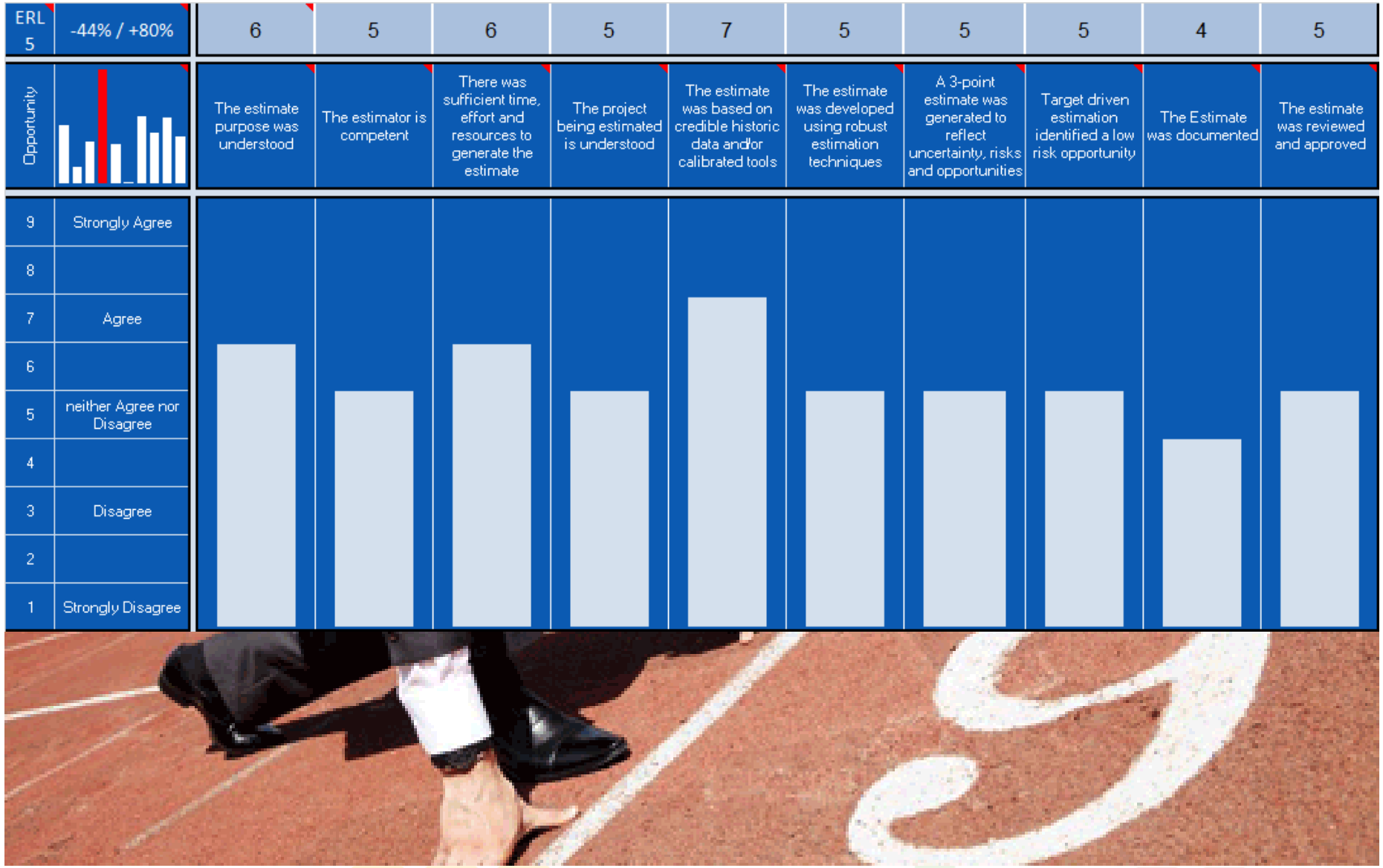


Ask the audience!

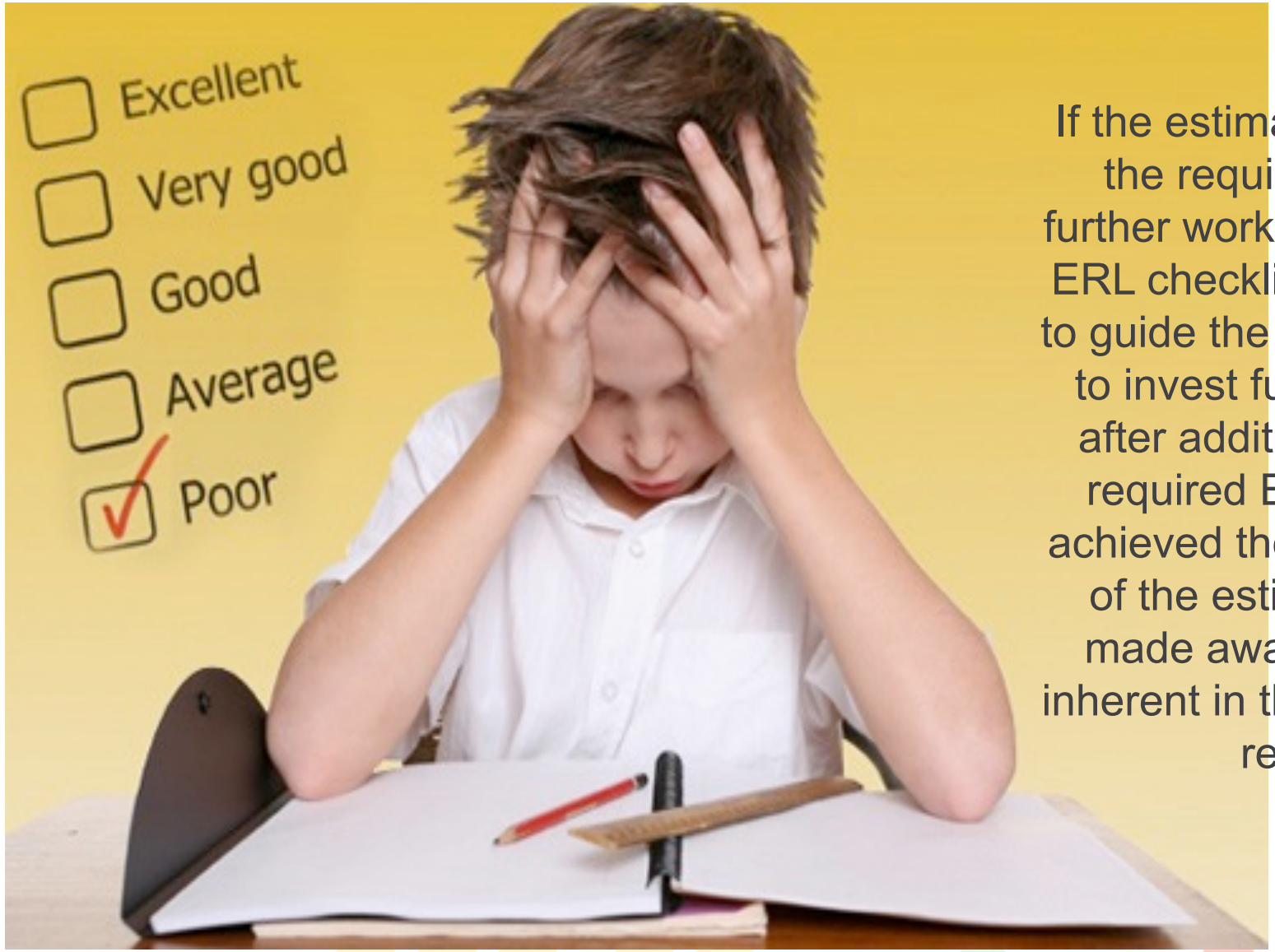
The Correlation Between Technique & Estimate Accuracy



The ERL Assessment

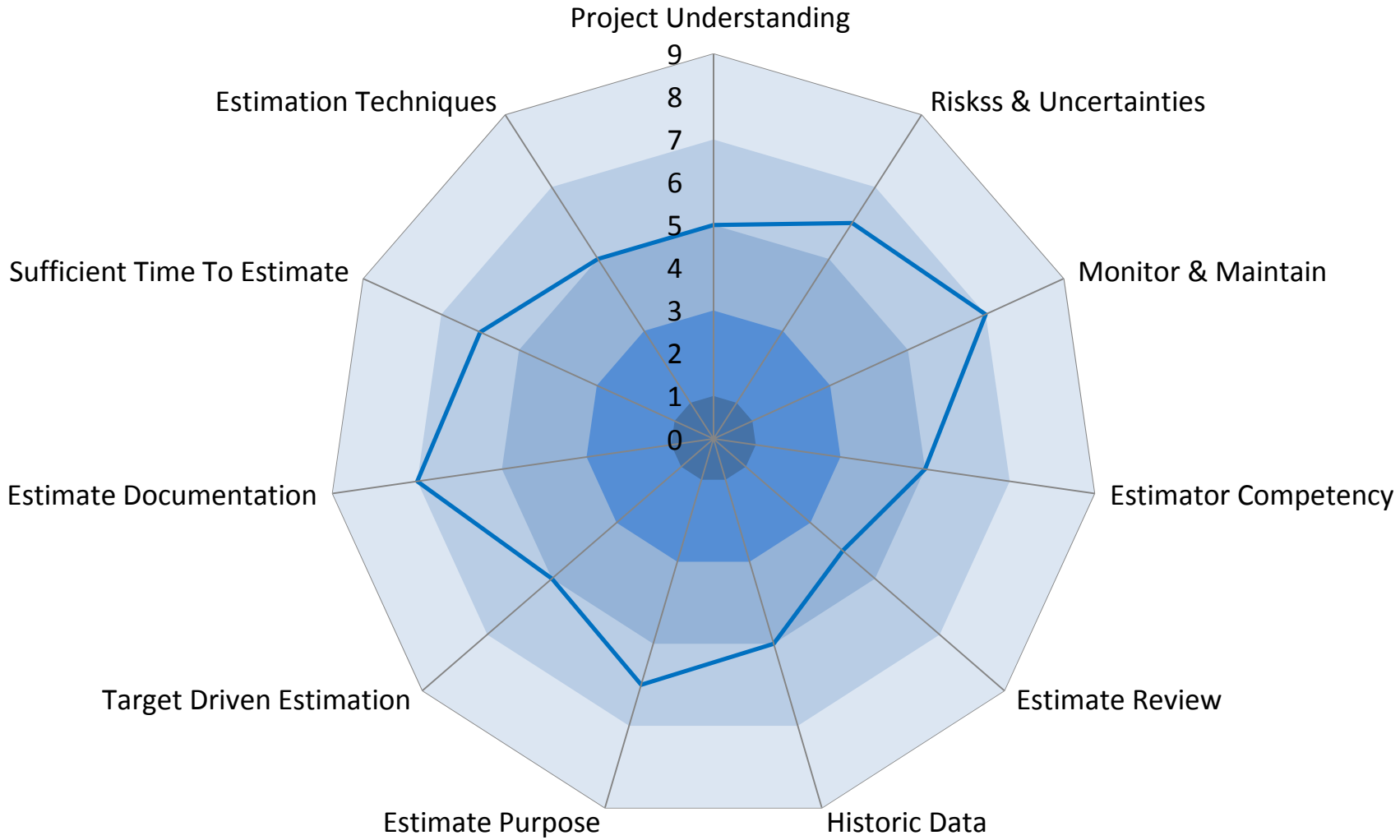


What happens if you can't make the grade?



If the estimate falls short of the required ERL then further work is required. The ERL checklist has a feature to guide the estimator where to invest further rigour. If after additional work, the required ERL cannot be achieved then the customer of the estimate must be made aware of the risks inherent in the estimate they receive.

Benchmark the business.

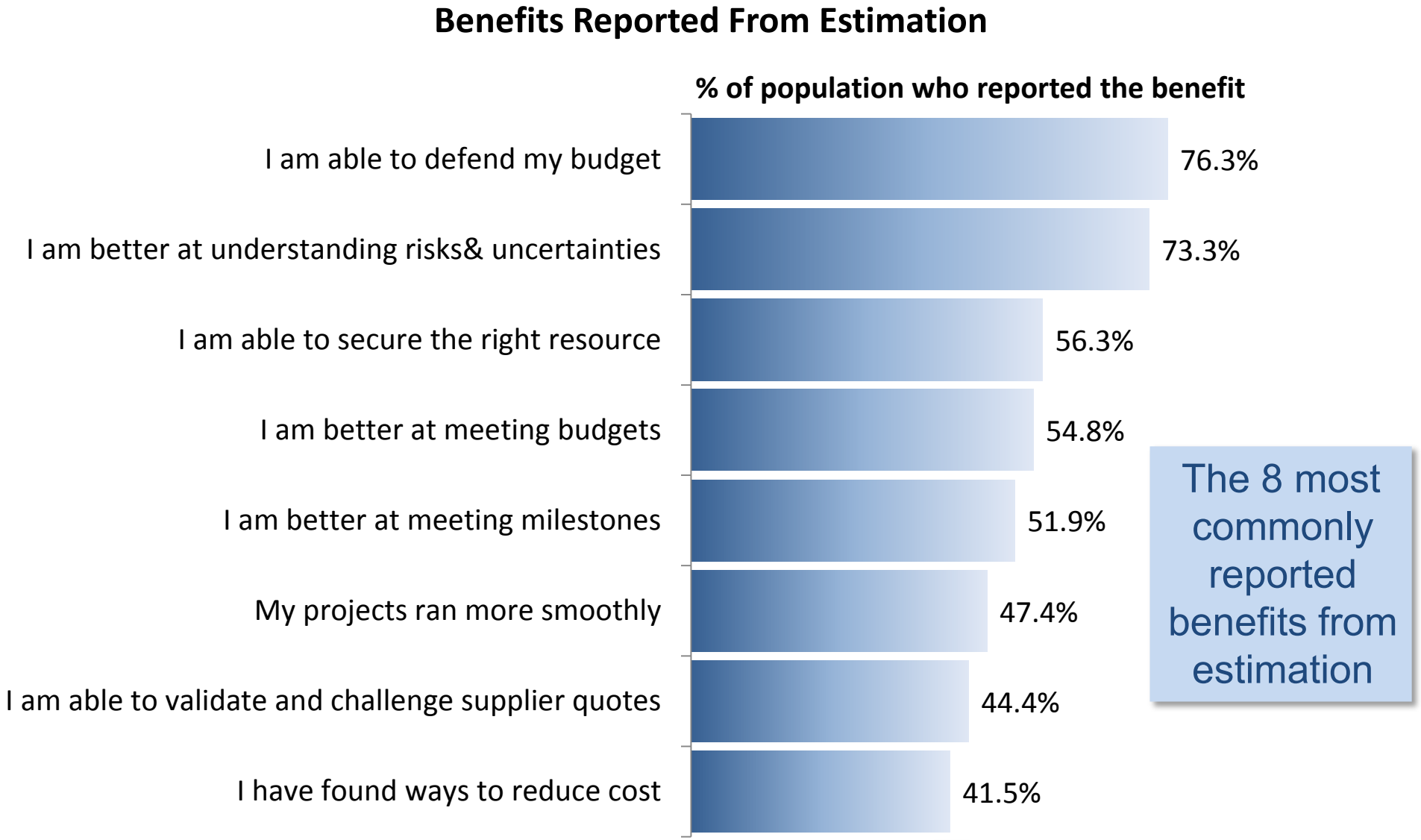


Shocks & Surprises

It may not be possible to prevent a bad estimate, but it is possible to prevent it from being a surprise.

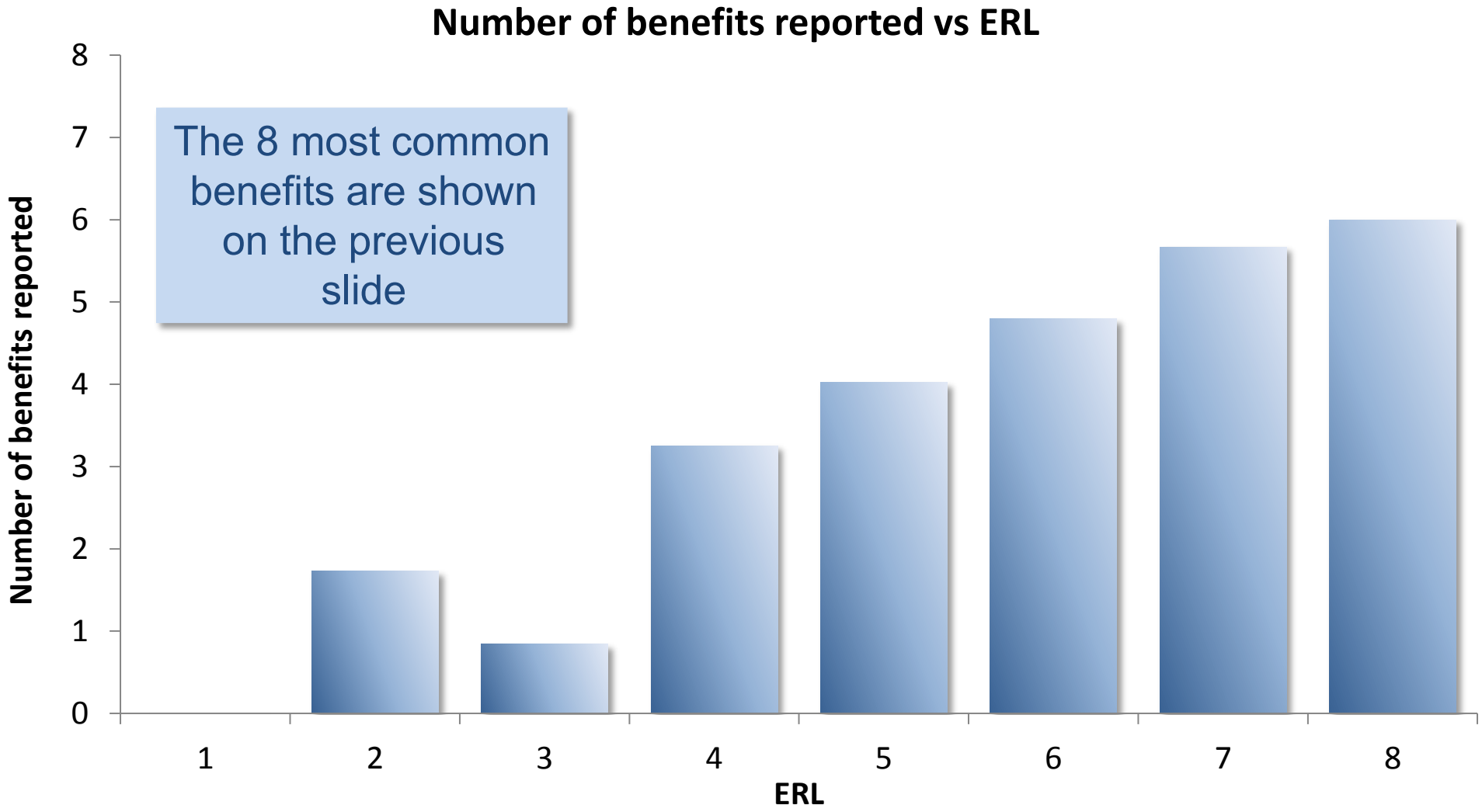
ERL is simple enough for most managers to understand

Estimation brings benefits!

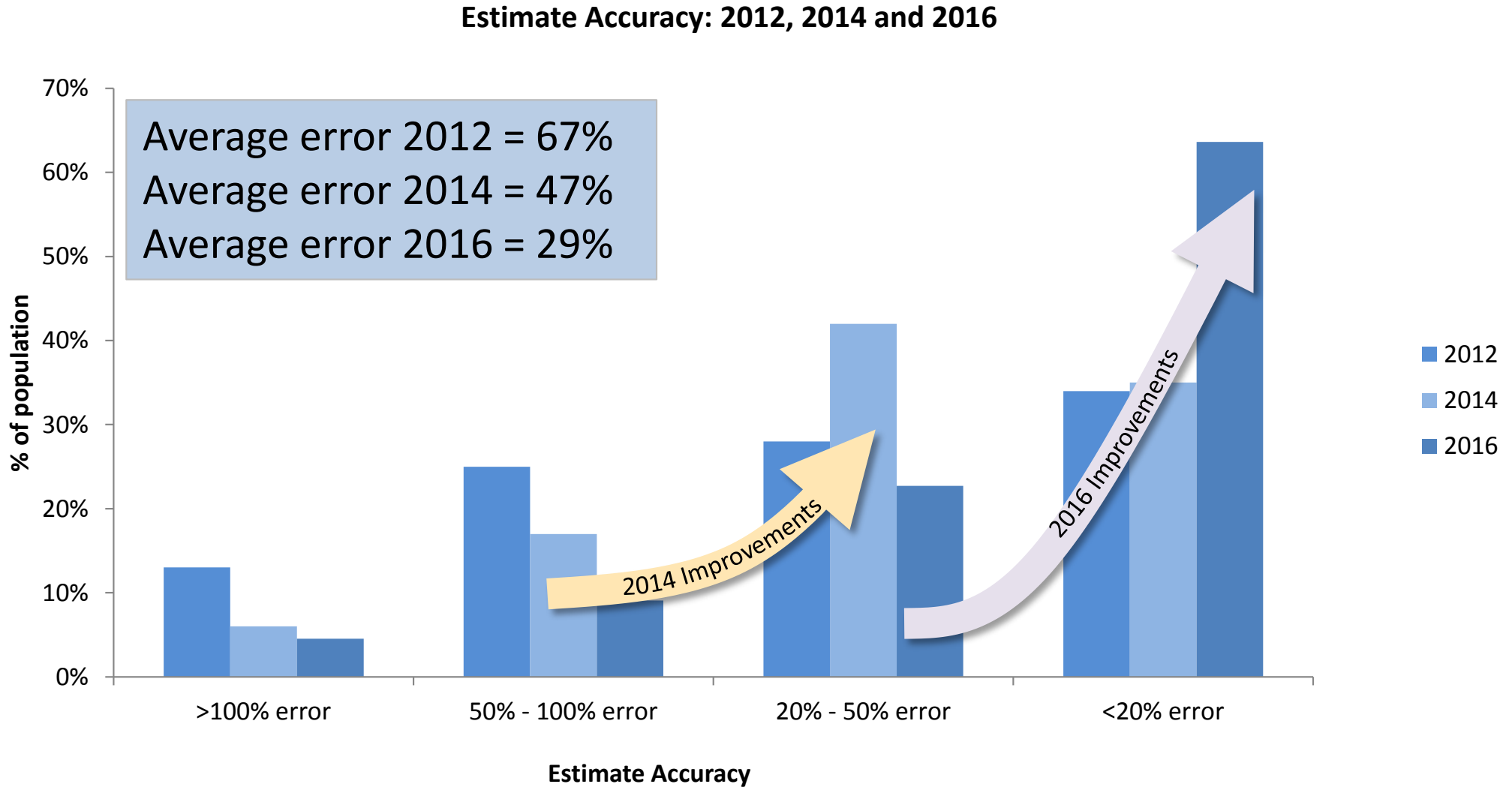


The 8 most commonly reported benefits from estimation

ERL vs number of benefits reported



Estimate accuracy is at all time high!



Conclusions

- Estimate accuracy is no accident.
- Maturity is a continuum, not binary.
- ERL is easy to score and communicate.
- Higher ERL scores bring additional benefits
- Bad estimates should no longer be a surprise!

Questions?

27th annual INCOSE international symposium

Adelaide, Australia

July 15 - 20, 2017

www.incose.org/symp2017