

The Path to Successful Risk Analysis

The Acumen S1>S5™ Schedule Maturity Model

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Agenda

- ④ Acumen introductions
- ④ The path to successful risk analysis
 - ④ The need for improved project risk analysis
 - ④ Pitfalls to avoid
 - ④ Introduction to S1 > S5 framework



Acumen Introductions

- ④ Dr Dan Patterson, PMP,
Acumen Founder
 - ④ 15 yrs PPM experience,
risk/schedule analytics expert
 - ④ Pertmaster, Primavera
- ④ Acumen: Project analytics
 - ④ Headquartered in Austin, TX
 - ④ Risk analytics headed out of
our Houston office
 - ④ Oracle partner: accredited
Pertmaster trainer



Acumen Project Analytics

- 3rd party risk workshops: world renowned
- Project analytics: schedule analysis
- Project analytics tool: **Fuse**[®]
- Cost, schedule, risk** integration
- Pro-active** risk reduction
- Schedule **acceleration**
- Applied** to US\$120B project work to date



Clients

Petrobras	Kosmos	SNC Lavalin	Repsol
BG	Fluor	Dow Chemical	Bechtel
Marathon Oil	DHS	ConocoPhillips	
Anadarko	NASA	BHP Billion	
	Noble Energy	Oceaneering	
Shaw			
Benham			
Sonatrach			
Enbridge			

Acumen Fuse

- ✔ Metric **analysis & visualization** tool
- ✔ **Historic** and **predictive** analytics
 - ✔ Metric analysis
- ✔ Patented **Ribbons** for **visualization**
 - ✔ Slice and dice project data
- ✔ Full project **lifecycle** analysis
 - ✔ Improves scheduling quality/ performance
 - ✔ Provides better control during execution
- ✔ Extensive **reporting** capabilities
 - ✔ MS Word, Excel, PowerPoint, PDF
- ✔ Project **forensics**
 - ✔ Bid evaluation
 - ✔ Determine changes & modifications
 - ✔ Reduction in claims exposure



The Path to Successful Risk Analysis

- ④ Objectives
 - ④ To **understand & reduce risk exposure** yet maintain scope
 - ④ To **accelerate** schedule/reduce costs yet still achieve objectives
 - ④ To **increase confidence** & create realistic budget/schedule
- ④ Defendable & achievable **schedule basis**...
- ④ Points to Note
 - ④ All projects have risks! (planning is the science behind forecasting!)
 - ④ A Monte Carlo analysis <> successful risk analysis
 - ④ Risk analysis only as sound as it's basis
 - ④ Need to address the 3 moving parts of the model...

The Three Moving Parts of a Risk Model

Schedule/ Cost Basis

- Deterministic schedule
- Cost estimate

Uncertainties

- Scope
- Complexity of work

Risk Events

- Discrete risk events
- Threats & opportunities

Common Pitfalls & Challenges

- ✓ **All/most projects** have a cost estimate and schedule
 - ✓ Not so many have sound basis of schedule!
- ✓ **Many projects** carry an active risk register
 - ✓ Very few projects integrate risk registers into the schedule
- ✓ **Some projects** run a Monte Carlo risk simulation
 - ✓ Very few projects truly model & separate risk and uncertainty
- ✓ **Most projects** carry contingency
 - ✓ Contingency is an output from a risk analysis not an input!
- ✓ **Some projects** conduct risk workshops
 - ✓ Not all projects utilize 3rd party facilitation to drive objective outcome
- ✓ Risk reporting can be **complex**
 - ✓ Management doesn't know what you are talking about!!!!

Applying a Framework to the Risk Process

- ④ The key to successful risk analysis is not the analysis itself!
- ④ It's managing the three moving parts
 - ④ Schedule
 - ④ Uncertainty
 - ④ Risk events
- ④ **Repeatable** means of generating a
 - ④ **risk-adjusted**
 - ④ **optimized**
 - ④ **bought-into** schedule

Acumen S1 > S5™ Maturity Model

S1

- **Non-Critiqued**
- Non-validated, buffered?, questionable realism, target driven?

S2

- **Critiqued Schedule using Metric Analysis**
- Structurally sound, no built in contingency, sound logic

S3

- **Risk-Adjusted Schedule**
- Estimate uncertainty, risk events, calculated contingency

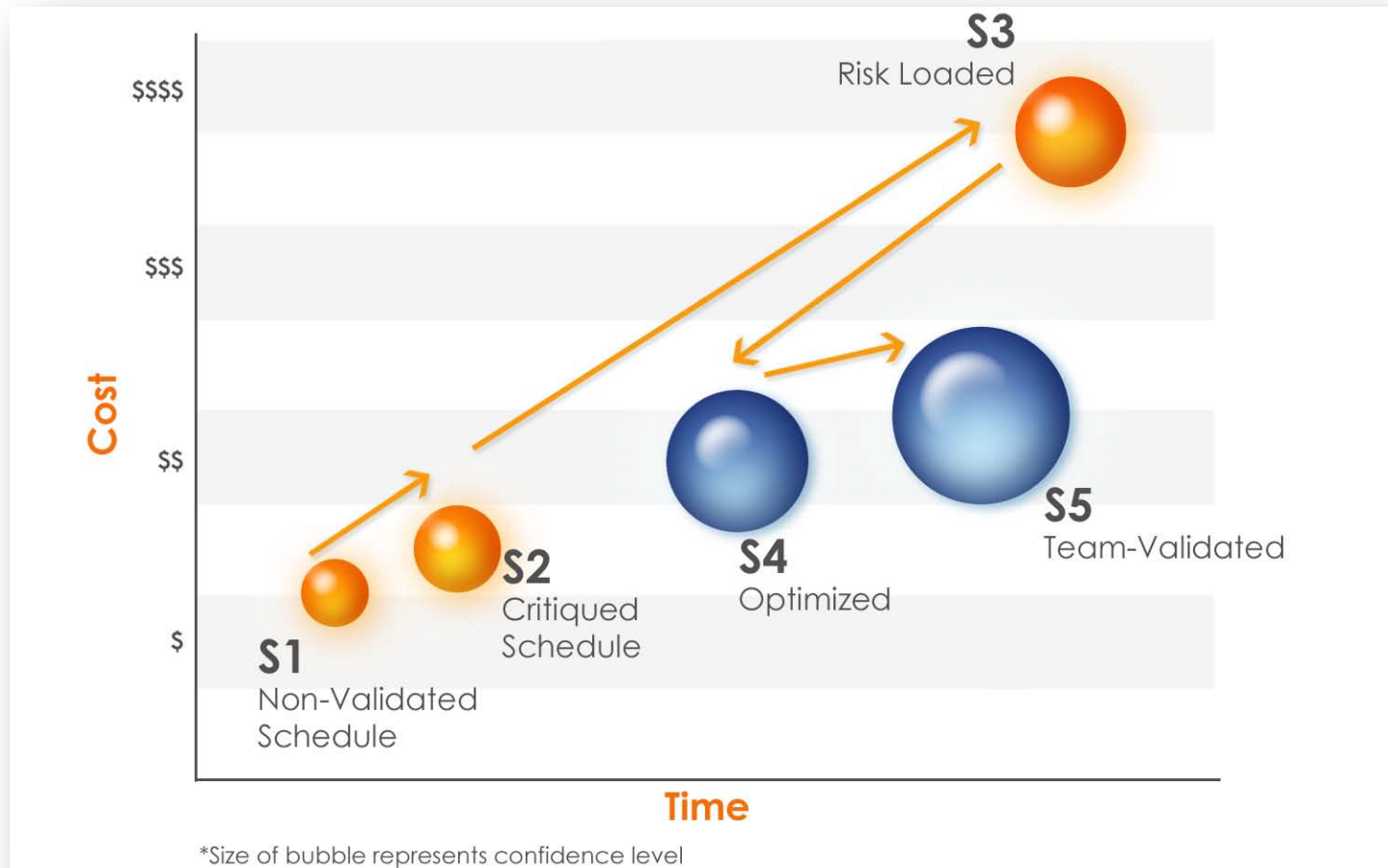
S4

- **Optimized Target Scenario**
- Reduced hot spots, lower criticality, higher confidence

S5

- **Team Validated Optimized Model**
- Buy-in on S4 optimized model

S1 > S5 Target Evolution



The S1 Scenario

ID	Description	Rem Duration	% Complete	Finish	Remaining Cost
- EPC271	Total	411	0%	29 Jul 11	\$33,229,594
EPC01	Project Start	0	0%	01 Jan 10	\$0
+ EPC11	Concept	55	0%	18 Mar 10	\$700,000
+ EPC51	Engineering	215	0%	30 Dec 10	\$8,107,804
+ EPC131	Procurement	287	0%	11 Jul 11	\$13,792,760
+ EPC171	Construction	387	0%	27 Jun 11	\$10,629,030
+ EPC231	Post Implementation	75	0%	29 Jul 11	\$0
EPC261	Project Completion	0	0%	29 Jul 11	\$0

- 🕒 Project completion: July 29, 2011
- 🕒 Total Project Cost: US\$33MM
- 🕒 Risk Range: Unknown...

S1 > S2: Schedule Critique

- ④ Objective
 - ④ To establish sound deterministic basis
 - ④ To address scheduling flaws
- ④ Key Checks
 - ④ Continuous & free flowing logic
 - ④ Not artificially constrained
 - ④ Established deliverables/milestones

[demo]

The S2 Scenario

ID	Description	Rem Duration	% Complete	Finish	Remaining Cost	2010												2011				2012							
						S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A				
- EPC271	Total	461	0%	07 Oct 11	\$38,229,594																								
EPC01	Project Start	0	0%	01 Jan 10	\$0																								
+ EPC11	Concept	55	0%	18 Mar 10	\$700,000																								
+ EPC51	Engineering	215	0%	30 Dec 10	\$8,107,804																								
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+ EPC171	Construction	387	0%	27 Jun 11	\$15,629,030																								
+ EPC231	Post Implementation	75	0%	07 Oct 11	\$0																								
EPC261	Project Completion	0	0%	07 Oct 11	\$0																								

- Project completion: October 7, 2011
- Total Project Cost: US\$38MM
- Risk Range: Unknown, but more realistic

Alternate Approaches to Building an S3 Risk Model

1) Risk Load only the (near) critical path

🔗 Pros

- 🔗 Focuses the team in a workshop
- 🔗 Based on actual schedule

🔗 Cons

- 🔗 Assumes known critical path
- 🔗 Risk events make this approach flawed
- 🔗 Dangerous approach to risk modeling
- 🔗 Doesn't give true picture of risk

Alternate Approaches to Building an S3 Risk Model

2) Create a summary schedule

🚀 Pros

- 🚀 Excellent means by which to facilitate a workshop
- 🚀 Easy to risk load/build risk model

🚀 Cons

- 🚀 Lose the logic integrity/calendars/detail of a schedule
- 🚀 Separate model to maintain to that of schedule

Alternate Approaches to Building an S3 Risk Model

3) The Post-It note/Excel approach

🕒 **Pros**

- 🕒 Easy brainstorming technique

🕒 **Cons**

- 🕒 Extremely high level
- 🕒 Not based on a CPM schedule
- 🕒 Very far removed from basis of schedule

Alternate Approaches to Building an S3 Risk Model

4) Risk ranging against the actual project schedule

🕒 Pros

- 🕒 Retains true integrity of the project schedule
- 🕒 Enables risk loading at summary yet analysis at detail level
- 🕒 Requires full schedule critique

🕒 Cons

- 🕒 Requires disciplined facilitation
- 🕒 Observation of Central Limit Theorem

Distinguishing Between Uncertainty & Risk Events

- ④ Separate out uncertainty & risk events
- ④ Results in much more accurate model
- ④ Estimate Uncertainty – typically due to scope/complexity
- ④ Uncertainty should diminish towards execution
- ④ Risk events – risk register
 - ④ Events going to carry larger impact than uncertainty



Accurately Modeling Uncertainty

- ④ Based on templated approach
 - ④ Risk factors
 - ④ Groupings of activities are categorized
 - ④ Focus on scope/complexity
 - ④ Typically a much smaller driver than events
- ④ Assume:
 - ④ Normal working conditions without events
 - ④ Focus on durations and not dates
- ④ Approach:
 - ④ Don't think about the knock-on effect
 - ④ Don't focus on critical path

Risk Loading: Uncertainty

- ④ Cost estimate & schedule uncertainty modeled using risk factors
- ④ Risk factors applied at the WBS level
- ④ Detailed exceptions (WBS & tasks) captured where necessary
- ④ CLT accounted for

Risk Factor	Best Case (optimistic)	Worst Case (pessimistic)
Very Conservative	50%	100%
Conservative	75%	105%
Realistic	90%	110%
Aggressive	95%	125%
Very Aggressive	100%	150%

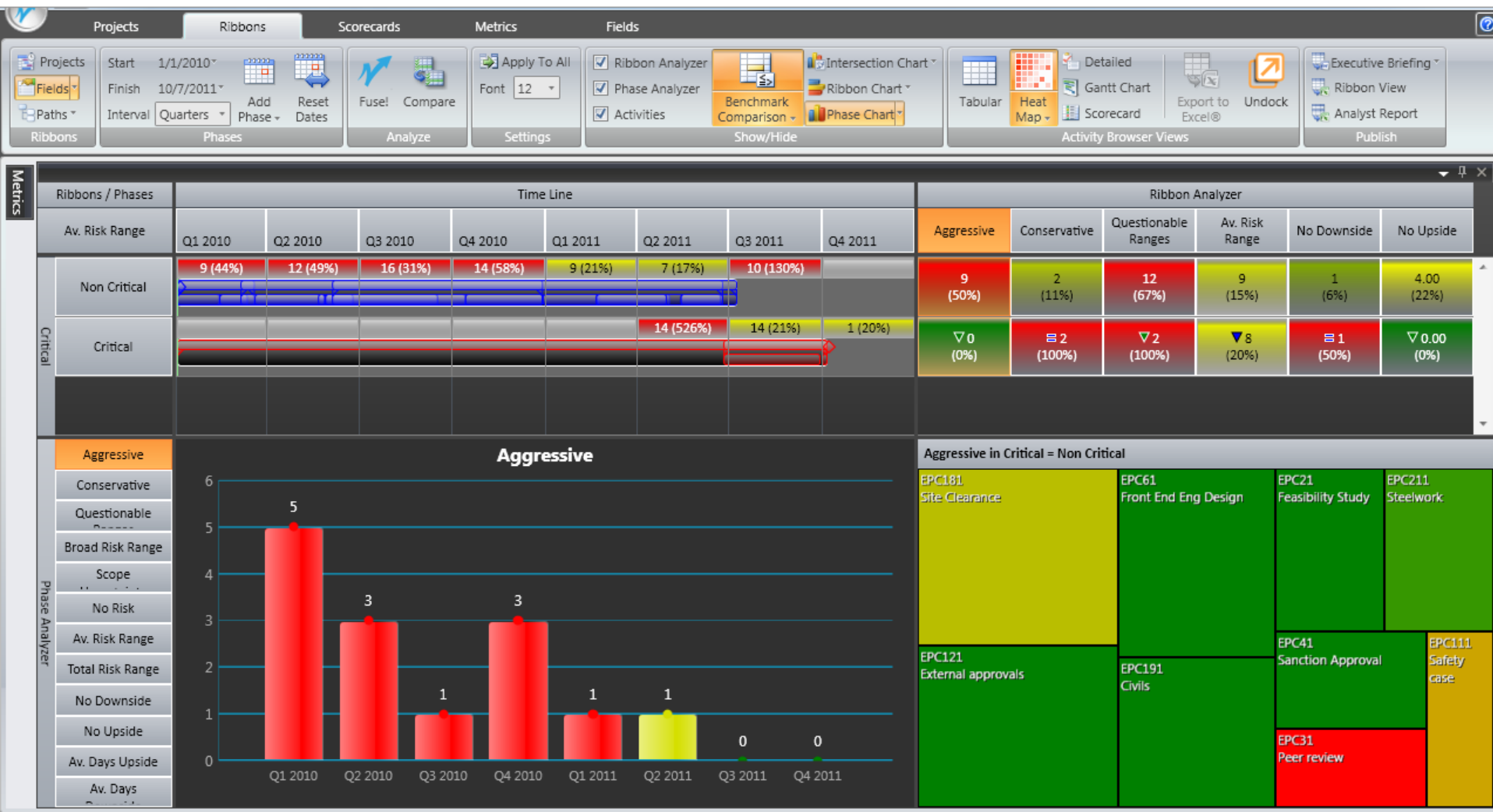
Templated based on phase/type of project

Accurately Capturing Risk Events

- ④ 4x4 risk matrix used for prioritization of events
- ④ Three thresholds overlaid onto risk matrix
 - ④ 'acceptable', 'requires review', 'unacceptable'
- ④ Risk matrix
 - ④ Prioritizes qualitative risk assessment of risks
 - ④ Does little for true risk assessment...
- ④ Capture current and post-mitigated states
- ④ Focus on the drivers NOT the result of risk

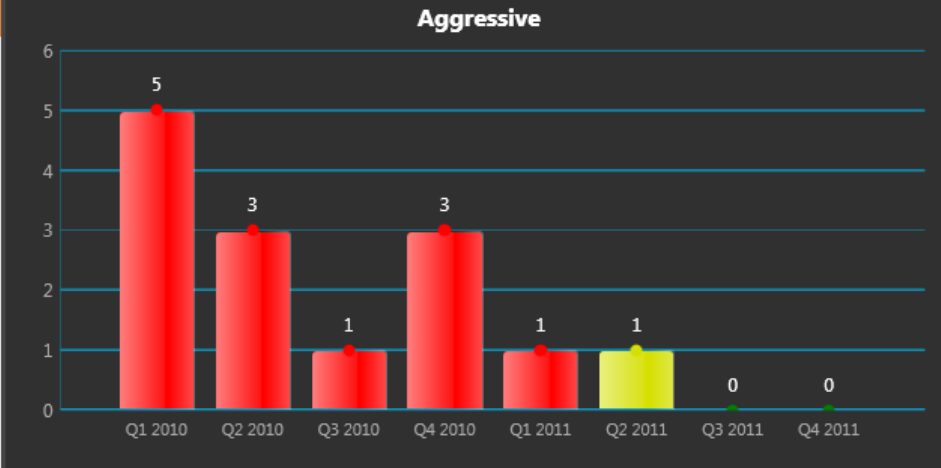
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Validating Risk Inputs



Ribbons / Phases	Time Line							
Av. Risk Range	Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011
Non Critical	9 (44%)	12 (49%)	16 (31%)	14 (58%)	9 (21%)	7 (17%)	10 (130%)	
Critical						14 (526%)	14 (21%)	1 (20%)

Ribbon Analyzer					
Aggressive	Conservative	Questionable Ranges	Av. Risk Range	No Downside	No Upside
9 (50%)	2 (11%)	12 (67%)	9 (15%)	1 (6%)	4.00 (22%)
▽ 0 (0%)	≡ 2 (100%)	▽ 2 (100%)	▼ 8 (20%)	≡ 1 (50%)	▽ 0.00 (0%)



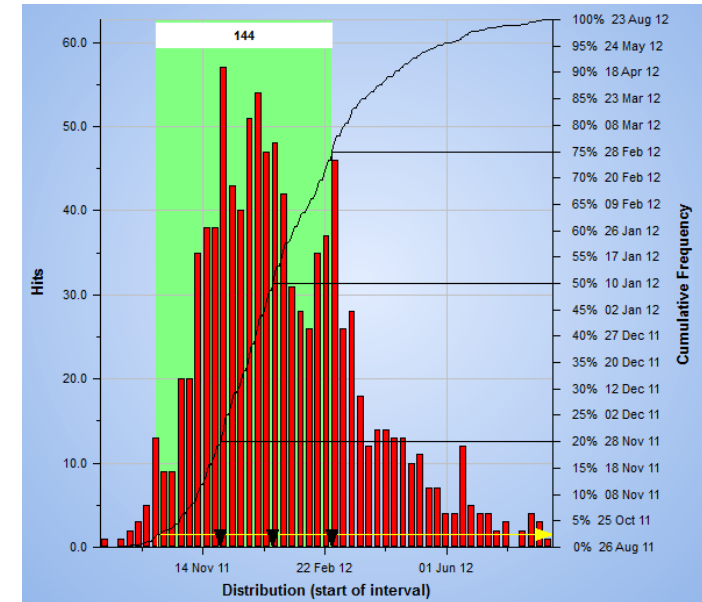
Aggressive in Critical = Non Critical

EPC181 Site Clearance	EPC61 Front End Eng Design	EPC21 Feasibility Study	EPC211 Steelwork
EPC121 External approvals	EPC191 Civils	EPC41 Sanction Approval	EPC111 Safety case
		EPC31 Peer review	

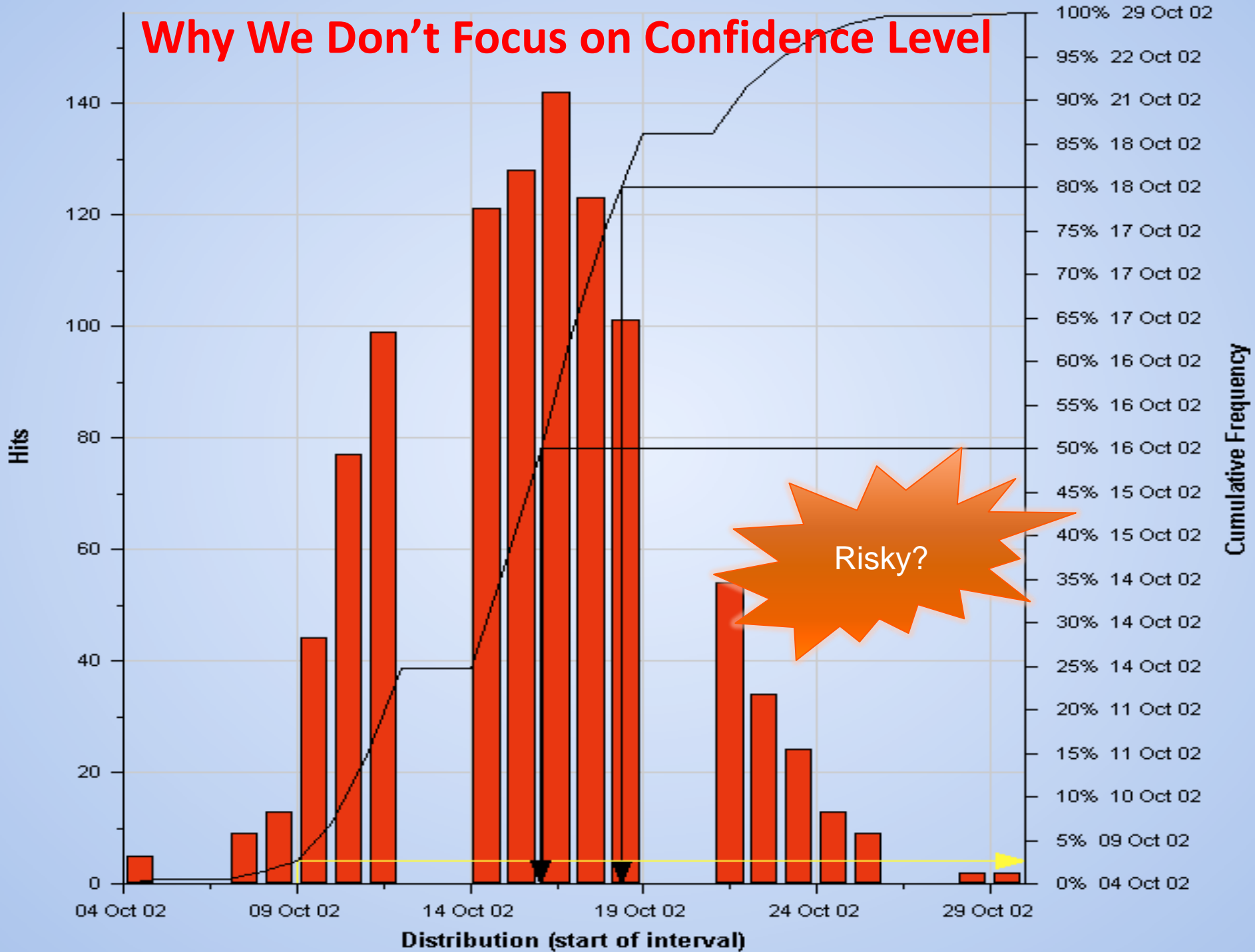
S3 – Risk Adjusted Scenario

- 🕒 P50 completion: 10 Jan 2012
- 🕒 P50 Cost: US\$42MM
- 🕒 Risk range: 12 months

Is this risky or realistic???

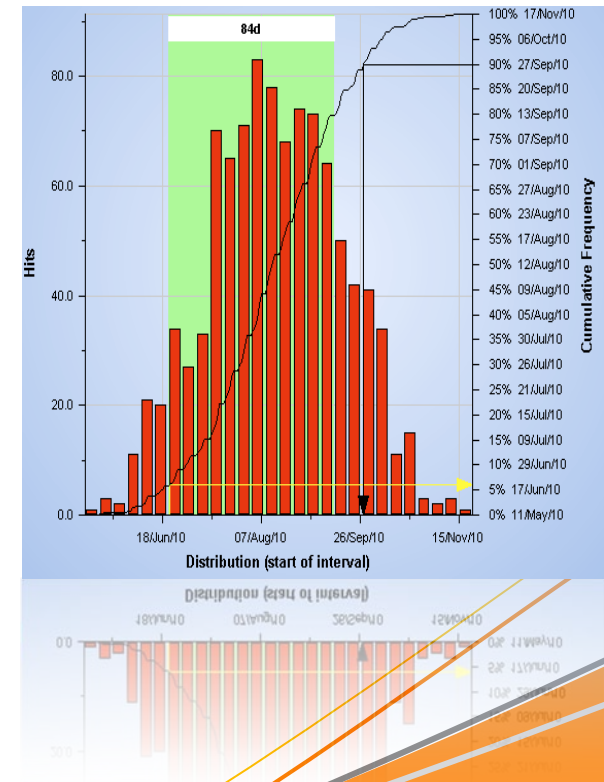


Why We Don't Focus on Confidence Level



Risk Exposure Metrics

- ☉ Confidence level
 - ☉ Schedules inherently have a low confidence level (*merge bias*)
 - ☉ Low confidence not necessarily indication of high risk
- ☉ Risk Range
 - ☉ Sound risk exposure indicator
- ☉ Risk Drivers
 - ☉ Key activities that need to be addressed
- ☉ Contingency
 - ☉ Determine required contingency
 - ☉ Difference between deterministic & confidence



Intelligent Risk Metrics

- ④ Hidden critical paths
- ④ Risk hot spots
- ④ Risk range factor
- ④ Paths carrying most risk exposure
- ④ Time phasing risk (front/back end loaded)
- ④ Correlation between poor planning & risk?
- ④ Discipline/location comparisons

True Insight into Risk Exposure

Ribbons / Phases		Time Line								Ribbon Analyzer				
Hidden Paths		Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	High Criticality	Hidden Paths	Risk Hot Spots	High Cost Drivers	Av. Criticality
Location		0	0	0	0	0	0	0	0	▽0	▽0	≡0	▽0	
	Calgary - Calgary	1 (50%)	2 (50%)	1 (50%)	1 (100%)	1 (100%)	1 (100%)	1 (100%)		▽3 (60%)	≡3 (60%)	▲1 (20%)	▽0 (0%)	▼48%
	Houston - Houston	1 (50%)	2 (100%)	1 (100%)	2 (67%)	0 (0%)	0 (0%)		0	▽4 (67%)	▲4 (67%)	▲2 (33%)	▽0 (0%)	▼50%
	NewOrleans - NewOrleans	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (50%)	3 (100%)	0	0	5 (56%)	3 (43%)	0 (0%)	1 (11%)	52%
Phase Analyzer	High Criticality	2 (33%)	4 (50%)	2 (50%)	3 (50%)	2 (50%)	5 (83%)	2 (100%)	1 (100%)	Hidden Paths in Location = NewOrleans - NewOrleans				
	Hidden Paths	2 (33%)	4 (50%)	2 (50%)	3 (50%)	2 (50%)	4 (80%)	1 (100%)	0	#	ID	Description	Start	
	Risk Hot Spots	1 (17%)	2 (25%)	0 (0%)	1 (17%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1	EPC201	Foundations	2/22/20	
	High Contingency	0 (0%)	3 (38%)	1 (25%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2	EPC221	Finishes	5/17/20	
	High Cost Drivers	1 (17%)	1 (13%)	1 (25%)	1 (17%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3	EPC211	Steelwork	5/17/20	
	Av. Criticality	29%	37%	37%	39%	46%	68%	86%	100%					
	Av. Cost Risk	14%	23%	35%	24%	11%	6%	3%	0%					

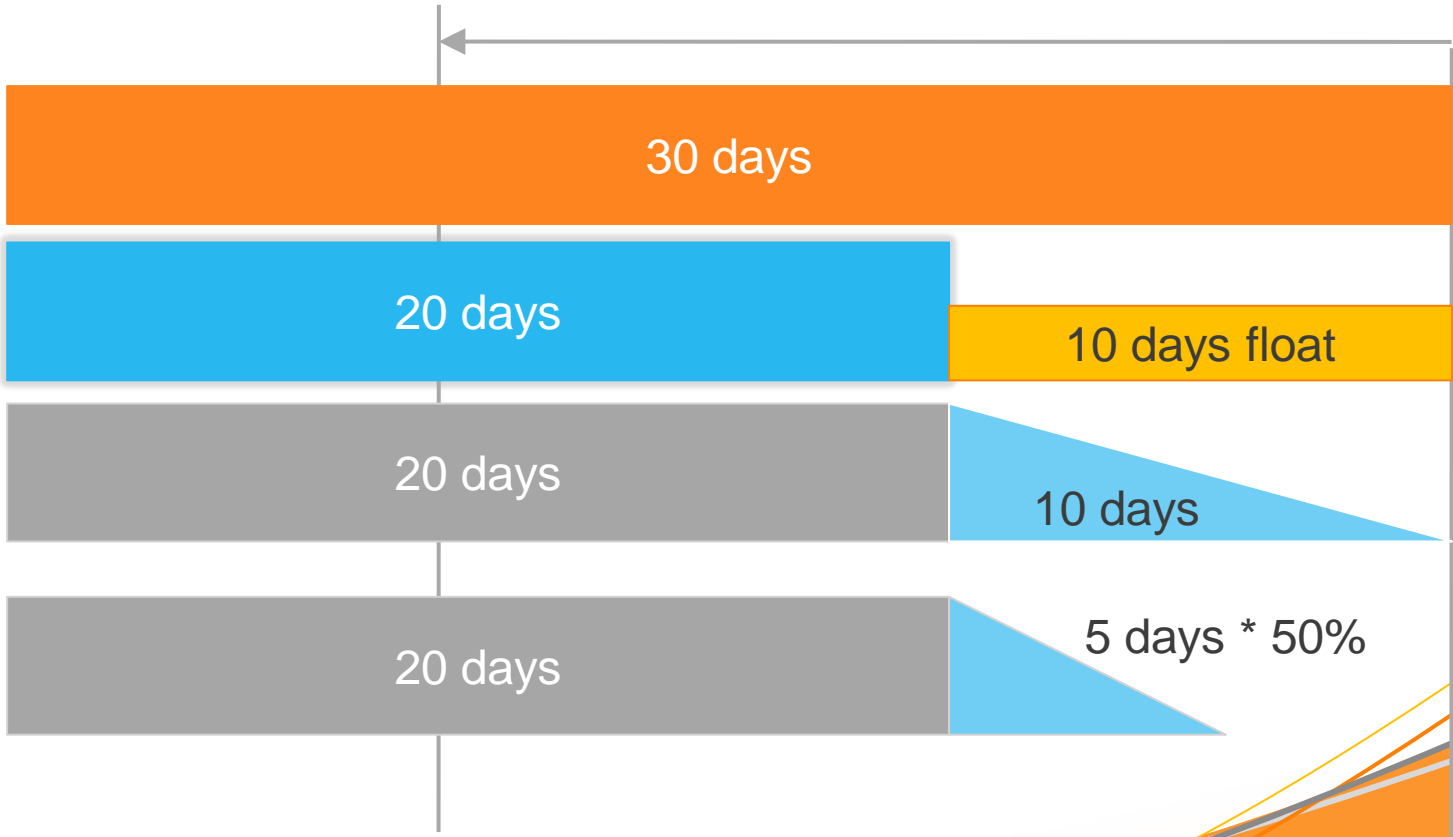
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S4: Optimization

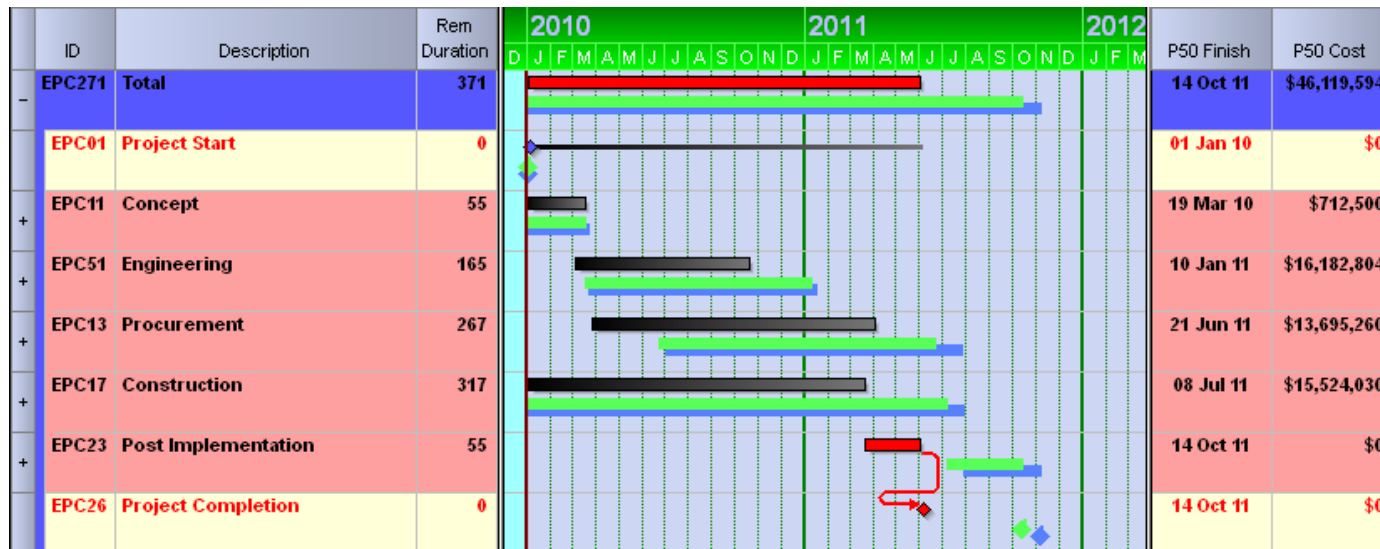
- ④ Objectives
 - ④ Accelerate schedule back to a given target/P
 - ④ Reduce cost
 - ④ Retain confidence level
- ④ Technique
 - ④ Targeted acceleration algorithm
 - ④ Identify path of **least resistance**
 - ④ **Optimization based on ROI**
 - ④ Consider activity durations as having
 - ④ Base duration
 - ④ Uncertainty
 - ④ Risk events

The Clever Bit...

S4 Target



The S4 Optimized Scenario



- Project completion: 14 Oct 11
- Total project cost: US\$46MM
- Risk Range: 4 months

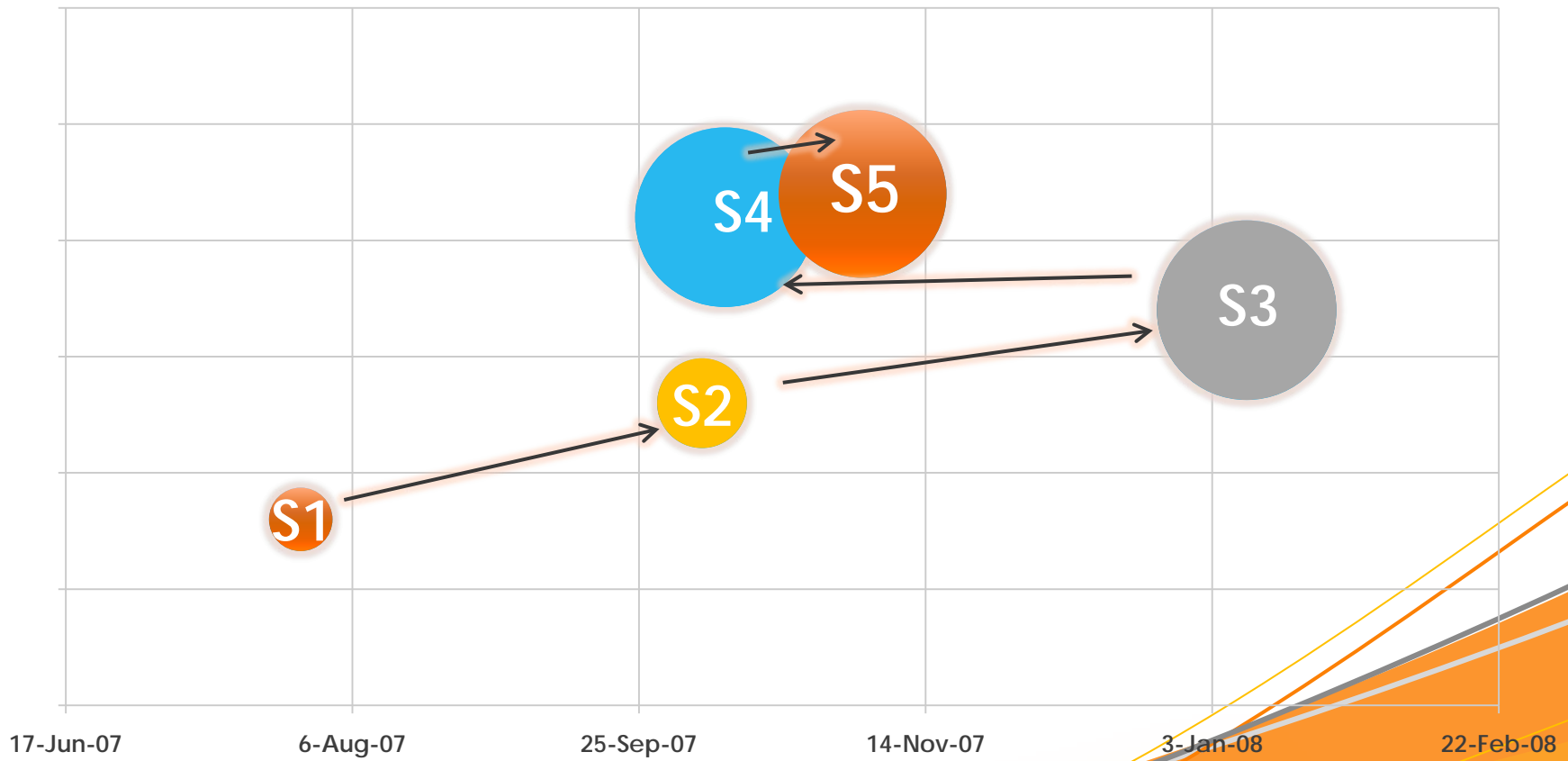
S5: Validation

- ④ S4 is optimized target scenario
- ④ S5 is team validation/adjustment of S4 accounting for:
 - ④ **Achievability**
 - ④ **Risk reduction** plans
- ④ Technique
 - ④ Team workshop
 - ④ Acceptance/defense/push back on optimizations (duration, risk, uncertainty)
 - ④ Compare risk reduction V acceleration

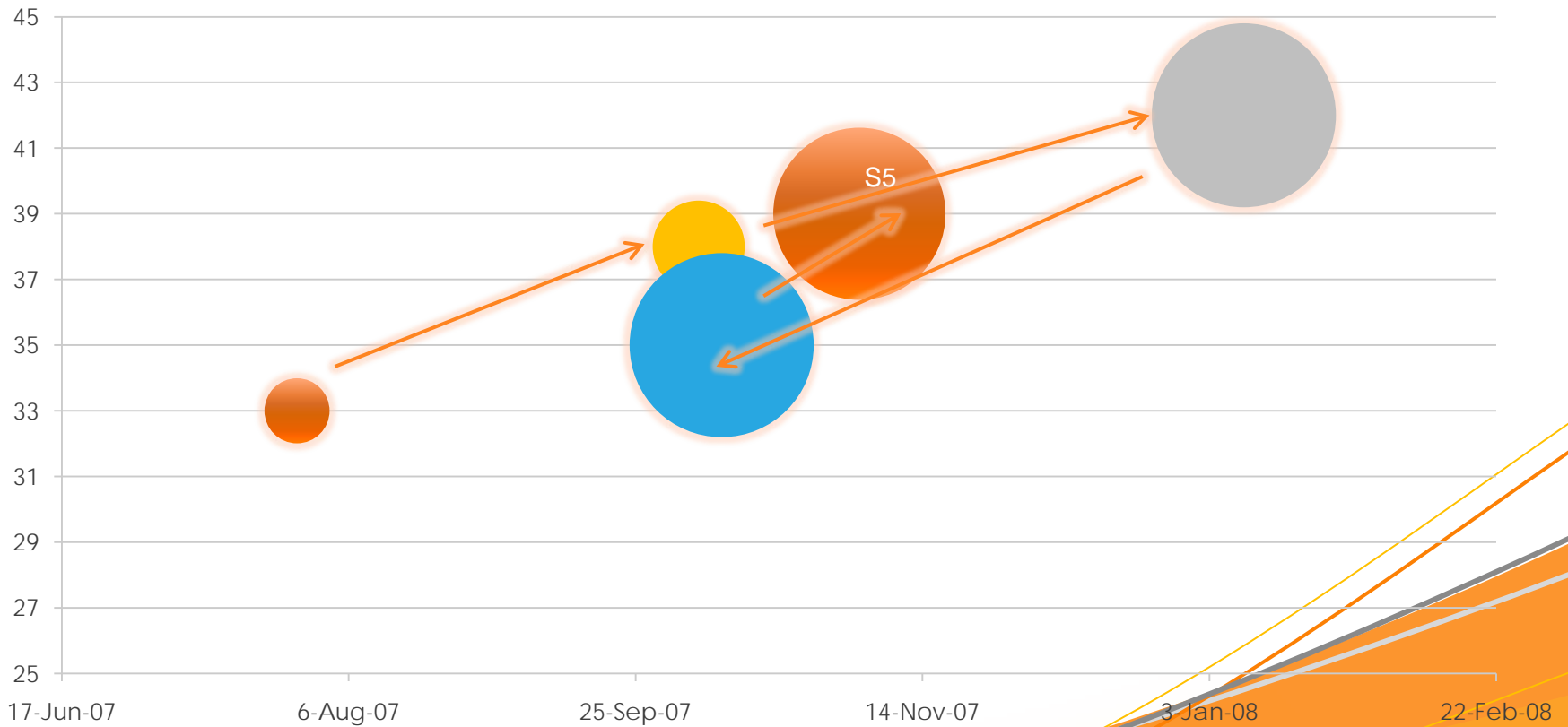
S1 > S5 Comparison

	S1	S2	S3	S4	S5
Finish Date	29 Jul 11	7 Oct 11	10 Jan 12	11 Oct 11	4 Nov 11
Cost	\$33MM	\$38MM	42MM	\$46MM	\$47MM
Risk Range	?	?	12 months	4 months	5 months

S5 Scenario



S5 Alternate Scenario



Benefits of the S1>S5 Approach

- ④ **Structurally sound**: well built using appropriate CPM scheduling techniques
- ④ **Realistic**: accounting for known scope as well as unknown potential risks and opportunities.
- ④ **Optimized**: thoroughly reviewed for potential cost/schedule acceleration candidates.
- ④ **Validated**: buy-in obtained from the project team, subject matter experts and the management team for the project.

Top Considerations

- ④ Schedule basis more important than risk
 - ④ Ensure the schedule is sound
- ④ Separation of risk/uncertainty
 - ④ Don't merge the two
 - ④ Focus on risk events
- ④ Report what matters...
 - ④ Intelligent risk metrics
 - ④ Confidence level reporting is dangerous...

When to Conduct a Risk Assessment

	Pre-FEED / Appraise	FEED / Select	Define	Execution	Operations
Characteristics:	Value proposition, Feasibility studies	Concept development, alternate scenarios	Long lead placement, EPC, Major contracts	Project delivery	Revenue generation
Risk Model:	Initial Risk Appraisal	Capital Value Analysis	Project Risk Analysis	Risk Performance Analysis	Asset Lifecycle Analysis
Acumen Phase:	Risk Register Development	S1 > S3	S1 > S5	S1 > S5	NPV, Probabilistic cashflow
Value-Add:	Qualitative basis	Decision support	Baseline Analysis	Ongoing risk exposure	Strategic risk value

Q&A

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