



# SOFTWARE SCHEDULE & RESOURCE PLANNING WITH AGILE DELPHI ESTIMATION

*ICEAA Conference 2017*

JUNE 2017

# AGENDA

BACKGROUND

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AGILE DELPHI ESTIMATING

ASSESSING PLANNED SCHEDULE & RESOURCES

SUMMARY

# BACKGROUND

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- Program analysts supporting Navy IT acquisition programs have been using a new estimating technique involving an agile-style Delphi process to provide the Basis of Estimate (BOE) for software development and integration costs
- Outputs of this process are well structured to inform uncertainty and trade space analysis
- Uncertainty-bounded effort estimates enable analysts to quantitatively assess realism of the project's planned schedule and resources

# AGENDA

BACKGROUND

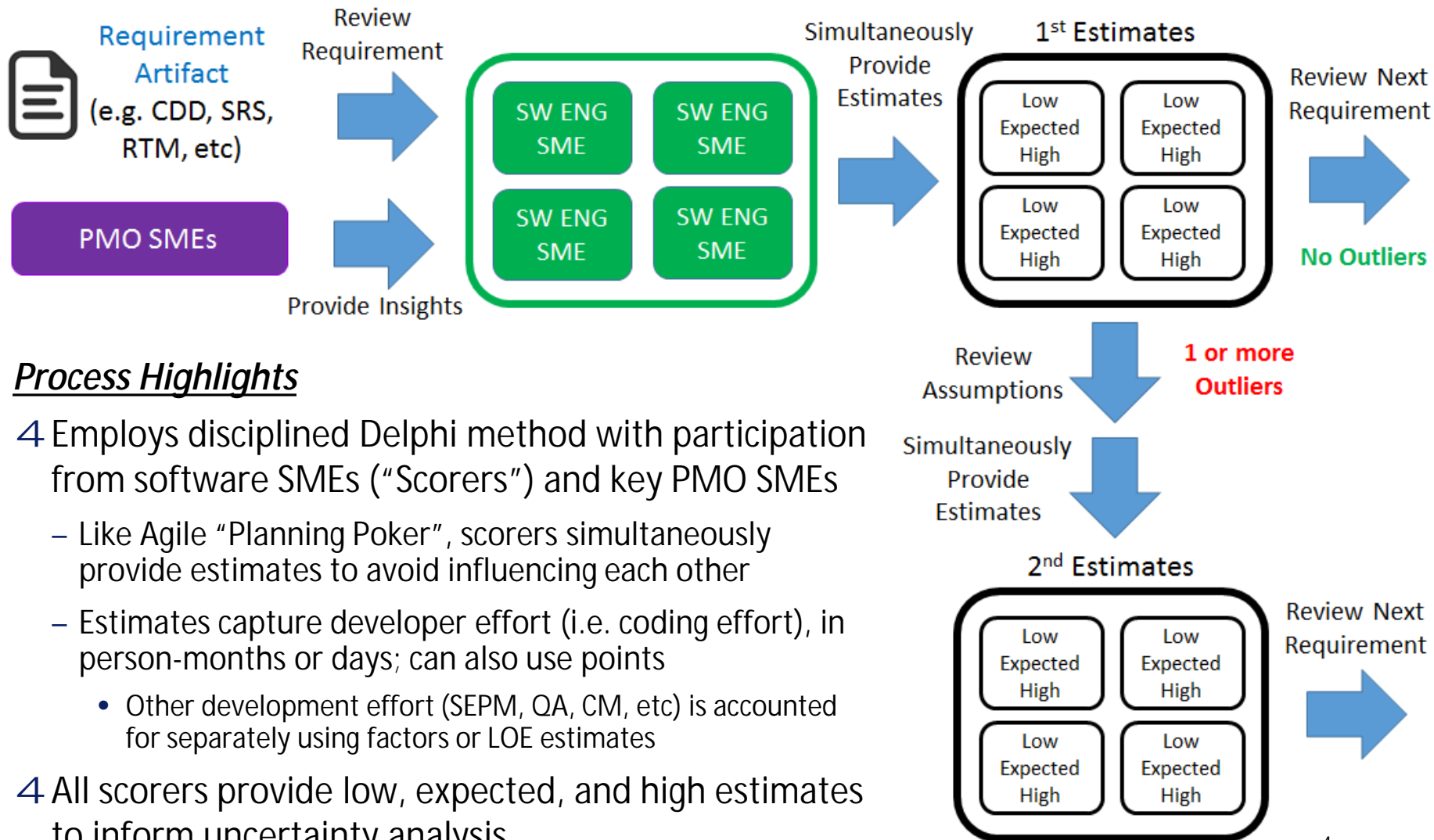
AGILE DELPHI ESTIMATING

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# AGILE DELPHI ESTIMATING PROCESS



## Process Highlights

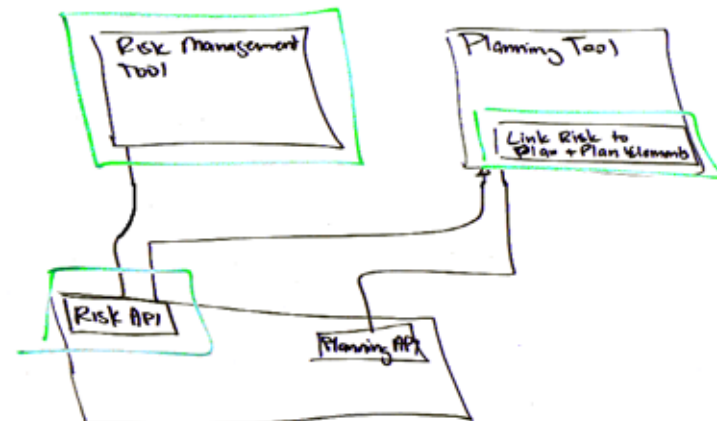
- 4 Employs disciplined Delphi method with participation from software SMEs (“Scorers”) and key PMO SMEs
  - Like Agile “Planning Poker”, scorers simultaneously provide estimates to avoid influencing each other
  - Estimates capture developer effort (i.e. coding effort), in person-months or days; can also use points
    - Other development effort (SEPM, QA, CM, etc) is accounted for separately using factors or LOE estimates
- 4 All scorers provide low, expected, and high estimates to inform uncertainty analysis

# AGILE DELPHI ESTIMATE OUTPUTS

- 3-5 effort estimates, with uncertainty ranges, for each requirement or capability

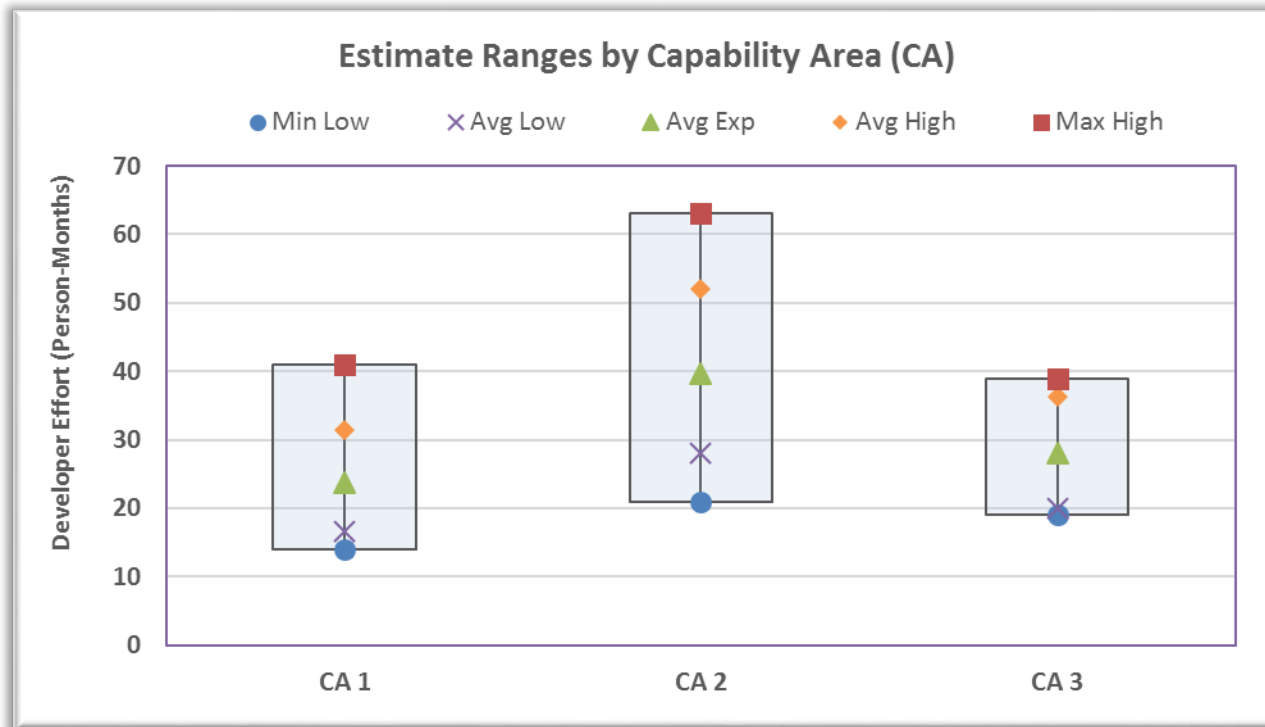
Req #	Req. Description	Round 1									Round 2			Comments
		Scorer 1			Scorer 2			Scorer 3			1	2	3	
		Exp.	Low	High	Exp.	Low	High	Exp.	Low	High	Exp.	Low	High	
1.1.1	The system shall enable the user to ...	8	6	10	8	6	10	6	4	8				Need to build API and widget XYZ
1.1.2	The system shall enable the user to ...	6	4	8	8	6	10	6	4	8				Need to edit data handling APIs
1.2.1	The system shall enable the user to ...	4	3	5	1	1	1	5	4	7				Need to build presentation widget
1.2.2	The system shall enable the user to ...	7	5	9	6	4	8	10	7	13				Need to integrate XYZ COTS tool
1.2.3	The system shall enable the user to ...	7	5	9	10	7	13	4	3	5				Need to implement XYZ interface
2.1.1	The system shall enable the user to ...	2	1	3	4	3	5	1	1	1				Need to implement XYZ function in data layer
2.1.2	The system shall enable the user to ...													Effort included in estimate above
2.1.3	The system shall enable the user to ...	3	2	4	1	1	1	3	2	4				Need to build presentation widget
X.X.X	The system shall enable the user to ...	2	1	3	7	5	9	9	6	12				Need to build API and widget XYZ

- Documentation and diagrams describing assumptions for each requirement or capability estimated



# SUMMARIZE ESTIMATES AT VARIOUS LEVELS

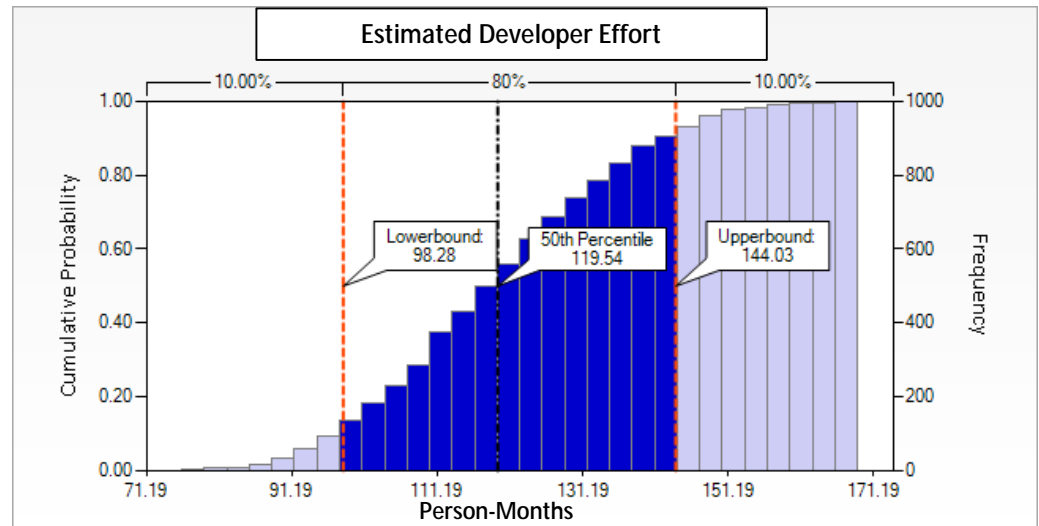
- Estimates can be summarized by any relevant grouping of the requirements/capabilities
  - Enables easy visualization of estimate size/uncertainty drivers



# UNCERTAINTY ANALYSIS

- Ranges from multiple scorers provide many possibilities for uncertainty bounds
  - Average of Expected
  - Min of Low
  - Max of High
- Uncertainty can be applied at whatever level in requirements desired

Req #	Req. Description	Round 1									Round 2		
		Scorer 1			Scorer 2			Scorer 3			1	2	3
		Exp.	Low	High	Exp.	Low	High	Exp.	Low	High			
1.1.1	The system shall enable the user to ...	8	6	10	8	6	10	6	4	8			
1.1.2	The system shall enable the user to ...	6	4	8	8	6	10	6	4	8			
1.2.1	The system shall enable the user to ...	4	3	5	1	1	1	5	4	7			
1.2.2	The system shall enable the user to ...	7	5	9	6	4	8	10	7	13			
1.2.3	The system shall enable the user to ...	7	5	9	10	7	13	4	3	5			
2.1.1	The system shall enable the user to ...	2	1	3	4	3	5	1	1	1			
2.1.2	The system shall enable the user to ...												
2.1.3	The system shall enable the user to ...	3	2	4	1	1	1	3	2	4			
X.X.X	The system shall enable the user to ...	2	1	3	7	5	9	9	6	12			





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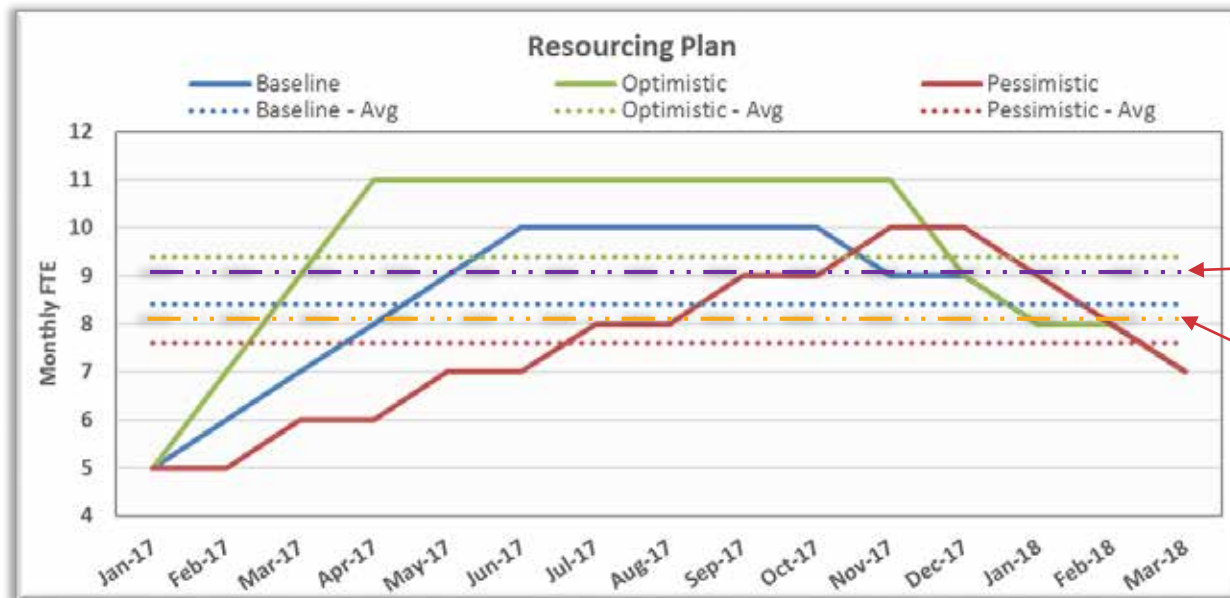
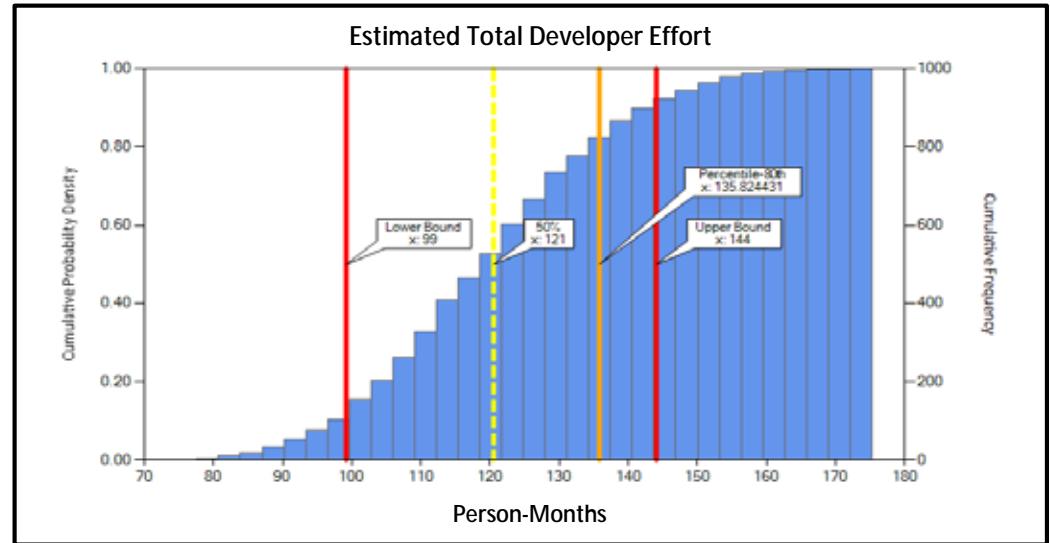
ASSESSING PLANNED SCHEDULE & RESOURCES

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SUMMARY

# ASSESSING RESOURCING PLANS

- After uncertainty analysis is conducted around scores, estimate ranges can be compared against resourcing plans



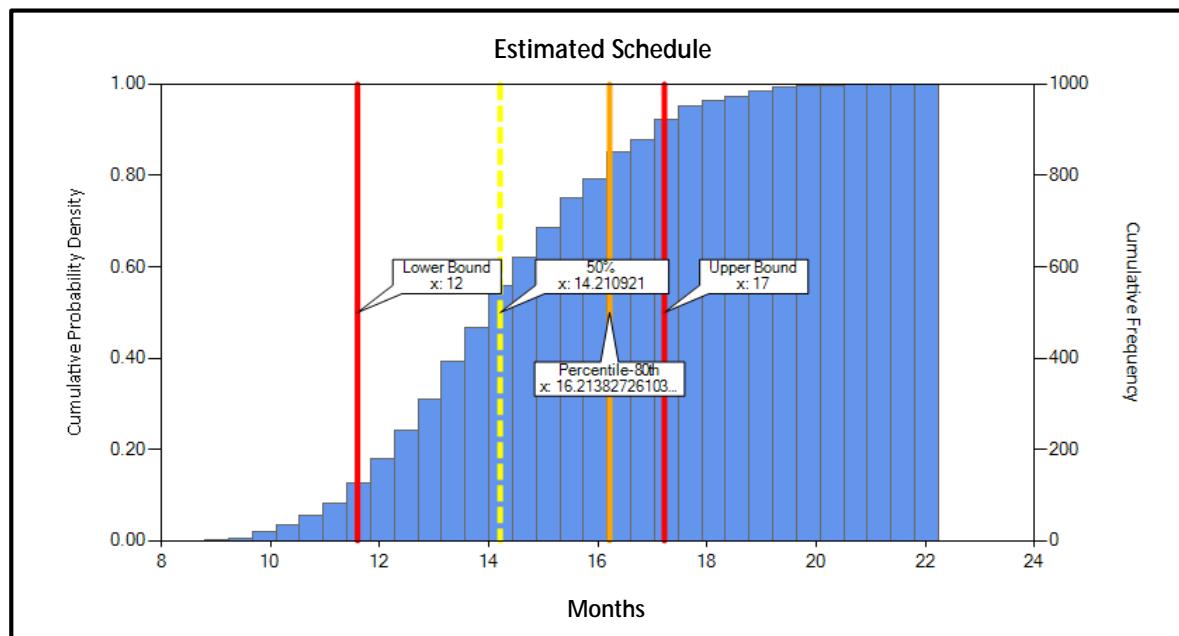
80<sup>th</sup> Percentile

50<sup>th</sup> Percentile

# ASSESSING SCHEDULE REALISM

- Uncertainty-adjusted effort estimates can be compared to planned resources and schedule to evaluate schedule realism


$$\text{Schedule (months) [Monte Carlo result]} = \frac{\text{Scored Effort Estimates (total person-months) [Monte Carlo variable]}{\text{Planned Resources (Avg. FTEs per month) [Monte Carlo variable]}}$$



# SCOPE TRADE-OFF ANALYSIS

- Given firm resource and schedule constraints, uncertainty-adjusted estimates enable CAIV-like scope trade-off analysis at lower levels of the requirement/capability hierarchy

Requirements ordered by priority (highest to lowest)



Req #	Req. Description	Uncertainty-Adjusted Estimate	Cumulative
1.1.1	The system shall enable the user to ...	5.5	5.5
1.1.2	The system shall enable the user to ...	5.0	10.4
1.2.1	The system shall enable the user to ...	11.4	21.8
1.2.2	The system shall enable the user to ...	6.9	28.8
1.2.3	The system shall enable the user to ...	6.4	35.2
2.1.1	The system shall enable the user to ...	3.0	38.2
2.1.2	The system shall enable the user to ...	0.0	38.2
2.1.3	The system shall enable the user to ...	8.9	47.1
2.1.4	The system shall enable the user to ...	8.9	56.0
2.1.5	The system shall enable the user to ...	5.9	62.0
2.2.1	The system shall enable the user to ...	7.4	69.4
2.2.2	The system shall enable the user to ...	7.4	76.8
2.2.3	The system shall enable the user to ...	8.4	85.3
2.2.4	The system shall enable the user to ...	8.9	94.2
3.1.1	The system shall enable the user to ...	5.9	100.1
3.1.2	The system shall enable the user to ...	8.4	108.6
3.1.3	The system shall enable the user to ...	10.9	119.5
3.2.1	The system shall enable the user to ...	6.9	126.4
3.2.2	The system shall enable the user to ...	9.4	135.8

## Conclusion:

PM can reasonably expect to:

- Complete 1.1.1 – 3.1.3
- Possibly complete 3.2.1
- Not likely complete 3.2.2

Resourcing at 50<sup>th</sup> Percentile

Resourcing at 80<sup>th</sup> Percentile

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- Agile-style Delphi process can provide the Basis of Estimate (BOE) for software development and integration costs
- Outputs of this process are well structured to inform uncertainty and trade space analysis
- Uncertainty-bounded effort estimates enable analysts to quantitatively assess all aspects of the project plan
  - Resource Planning
  - Schedule Realism
  - Scope Tradeoff Analysis

# THANK YOU

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For more information, contact . . .

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