

COSYSMOR: COSYSMO RISK

John Gaffney
Lockheed Martin

j.gaffney@lmco.com 301-721-5710

PSM 2006 COSYSMO Workshop

July 26, 2006

1

Overview

- “COSYSMOR”, or “COSYSMO Risk” is being developed by Lockheed Martin in collaboration with Ricardo Valerdi.
- Rationale for creating COSYSMOR
 - Get away from doing just “point” estimates.
 - Provide probabilistic range estimates of effort/cost and schedule.
 - Provide more information for decision makers to make better informed decisions.
- Provides cost and schedule risk distributions,
 - Effort Risk= Probability [Actual>Target]
- Functions implemented in COSYSMOR will be rolled into the “official” COSYSMO.
- Enables the estimator to represent his uncertainty in the values of the size parameters and the cost drivers.
 - Also, the uncertainty of the two calibration parameters can be similarly represented. Probably, the individual estimator would not set these values.
- Uncertainty represented as three-point values; translates into a non-parametric probability distribution.

2

ENTER SIZE PARAMETERS FOR SYSTEM OF INTEREST

	Low			Likely*			High		
	Easy	Nominal	Difficult	Easy	Nominal	Difficult	Easy	Nominal	Difficult
# of System Requirements	9	10		10	11		11	12	
# of System Interfaces		10			11			13	
# of Algorithms		8	4		10			11	
# of Operational Scenarios					8				6
Equivalent Size		199			238			279	

SELECT COST PARAMETERS FOR SYSTEM OF INTEREST

	Low			Likely*			High		
	L	N	H	L	N	H	L	N	H
Requirements Understanding	L	1.35	N	1.00	VH	0.85			
Architecture Understanding	L	1.22	N	1.00	H	0.81			
Level of Service Requirements	L	0.76	N	1.00	N	1.00			
Mission Complexity	N	1.00	N	1.00	EH	1.92			
Technology Risk	L	0.38	N	1.00	H	0.35			
Documentation	L	0.91	N	1.00	VH	1.25			
# and diversity of installations/platforms	N	1.00	N	1.00	EH	1.28			
# of resource levels in the design	VL	0.65	N	1.00	H	0.41			
Stakeholder team cohesion	VL	1.42	N	1.00	H	0.81			
Personnel/team capability	VL	1.43	N	1.00	H	0.81			
Personnel experience/continuity	L	1.23	N	1.00	VH	0.97			
Process capability	L	1.71	N	1.00	VH	0.77			
Multisite coordination	L	1.15	N	1.00	VH	0.80			
Tool support	L	1.16	N	1.00	H	0.85			
Composite effort multipliers		3.52			1.00	6.93			

COSYSMO MODEL PARAMETERS

	Low	Likely	High	Nominal *
Equivalent Size, S	205	238	269	238
Constant, A	38.550	38.550	38.550	38.55
Size Exponent, E	1.000	1.060	1.100	1.06
Cost Parameter Product, D	0.363	1.202	3.752	1.00
SYSTEMS ENGINEERING PERSON MONTHS	18.91	190.71	448.41	83.7
SYSTEMS ENGINEERING PERSON HOURS	2865	15305	68162	12729

COSYSMO MODEL FORM

PM=A*(S ^E)*D
PM=Person Months
PH=Person Hours

Three Points Per Parameter Data Entry Mechanism

Expect that the person doing the estimate would not establish values for A & E, the parameters that capture the calibration of the tool for the organization

3

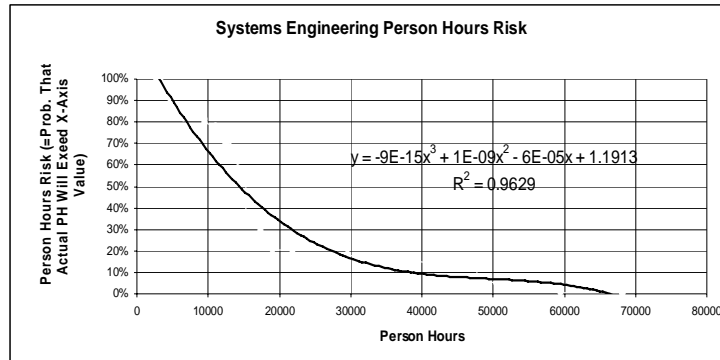
Systems Engineering Person Hours Risk

Person Hours	Person Hours Risk (%)
0	100
5000	85
10000	75
15000	55
20000	35
30000	20
40000	15
50000	10
60000	5
70000	5
80000	5

Use This Graph To Portray Cost Risk Exposure

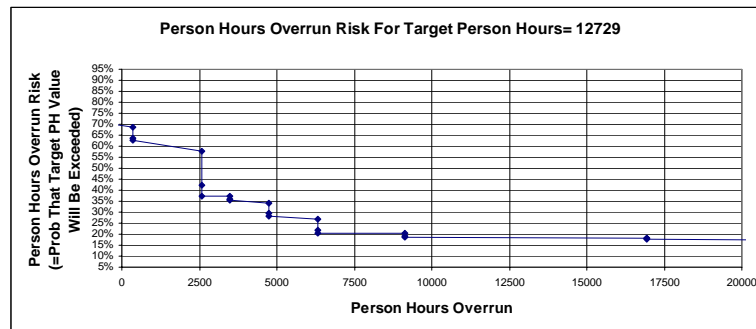
4

2



A Smoothed version of the previous graph obtained by passing a curve through the points of the distribution.

5



Use This Graph To Portray Cost Risk Exposure For A Given Cost Goal

6

**Summary COSYSMOR Person Hours/ Person Months
and Schedule Risk/Confidence Statistics**

Item	Effort		Ideal Schedule **
	Person Hours	Person Months*	
Minimum =	2877	18.9	6.6
Risk=	99.37%		
Confidence=	0.63%		
Most Likely=	15305	100.7	11.5
Risk=	37.50%		
Confidence=	62.50%		
Maximum =	68162	448.4	18.7
Risk=	0.00%		
Confidence=	100.00%		
20% Risk/ 80% Confidence=	21843	143.7	12.9
30% Risk/ 70% Confidence=	17463	114.9	12.0
50% Risk/ 50% Confidence=	15305	100.7	11.5
95% Risk/5% Confidence=	3959	26.0	7.3
5% Risk/95% Confidence=	50545	332.5	17.0
152	* Person Hours Per Person Month		

** Based on COCOMO Relationship, $T=a*(C^E)$;
T=Months; C=Effort in Person Months;

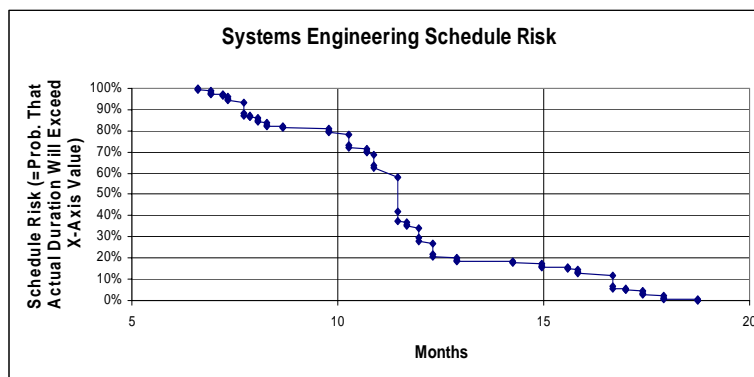
a=

0.33
2.5

Tabular Summation of Cost and Schedule Distributions/Uncertainties

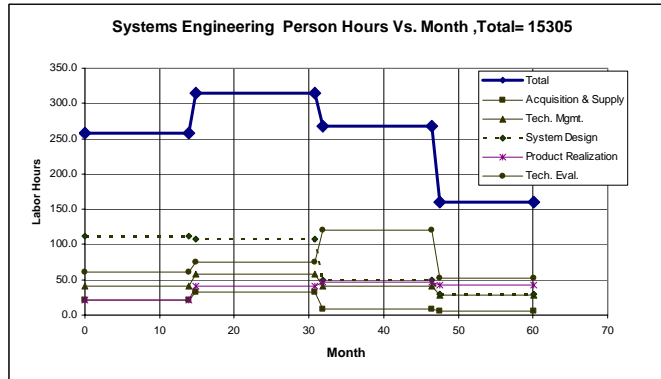
7

Systems Engineering Schedule Risk

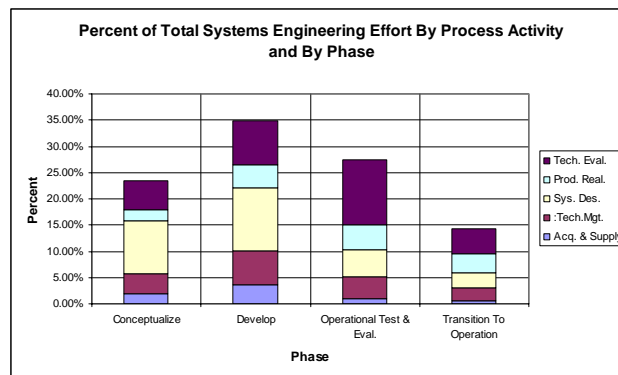


Represents schedule uncertainty

8



9



10

