WBS-Based Approach to Understanding and Predicting Program Risk

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Agenda

- History
- Process Overview
- Data Analysis & Risk Inputs
- Documenting & Reporting
- Future Development

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History

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History

- Early 2003
  - Concept / Goal: Assess risk in language meaningful to customer.
  - Provide lower level visibility than Customer has into the program
  - Researched various Risk methodologies
- Sept - Dec 2003
  - Initial methodology presented to PST
  - PST jointly refined the process/methodology
  - Notional data used to test risk tool & determine feasibility of process
- Jan 2004 – Dec 2004
  - January - Process baseline established
  - Real data used
  - Established process is viable
  - Identified opportunities for improvement
- 2005
  - Break Cost/Technical/Schedule risk out separately
  - Incorporate consequence factor into ratings

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Process Overview

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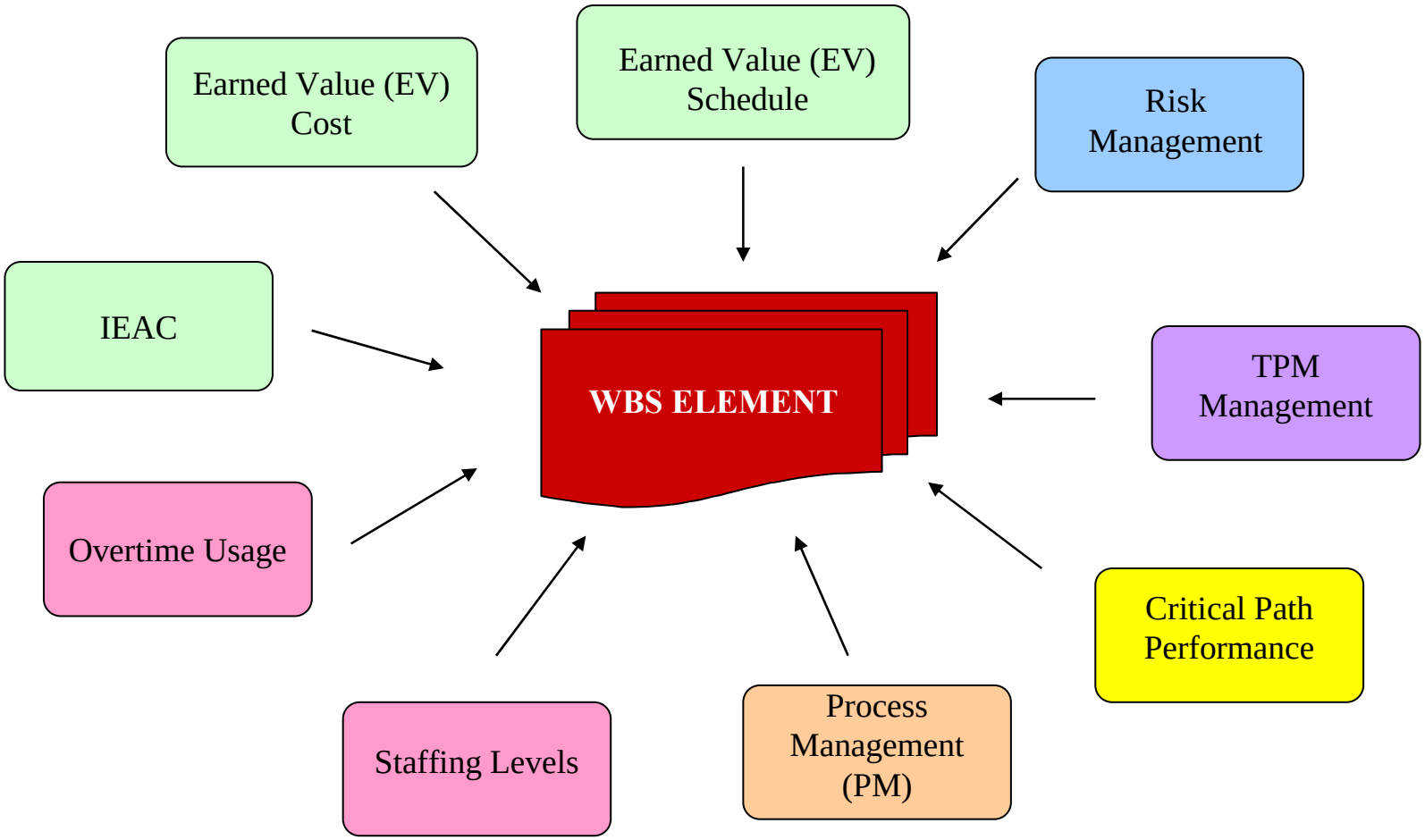
Process Overview

- Work Scope Centric
  - WBS Element is evaluated
- Risk is assessed at Level 4
  - Performance Based Evaluation
  - Provides insight to lower level activity
  - Increases fidelity when rolled up to higher levels
- Common Categories & Criteria used
- Goal of process is to determine the likelihood of the WBS element work scope being successfully completed
  - On Schedule
  - On cost
  - Meets technical requirements
  - Predict future performance / risk

Process Overview



Integrating data at the lower level

Performance Factors / Criteria

FACTOR	DESCRIPTION	RATING CRITERIA
EVM-C	CPI performance	No variance = 1 Variance < 3% = 2 Variance 3 <7% = 3 Variance 7< 10% = 4 Variance > 10% = 5
EVM-S	SPI performance	No variance = 1 Variance < 3% = 2 Variance 3 <7% = 3 Variance 7 < 10% = 4 Variance > 10% = 5
EVM-EAC	BAC vs. DCMA IEAC	No variance = 1 Variance < 5% = 2 Variance 5 < 10% = 3 Variance 10 < 15% = 4 Variance > 15% = 5
CP	How well is the item performing relative to the Critical Path?	Not on Critical Path = 1 On Critical Path, able to meet key milestones = 2 Minor (< 1 wk) slip in key milestone = 3 Major (> 1 wk or multiple minor) slip in key milestone = 4 Cannot meet major milestone = 5
RK	How well is the contractor managing the identified risks?	All Mitigation events completed as planned = 1 Minor slip (< 1 wk) in mitigation event completion = 2 Major slip (> 1 wk) in mitigation event completion = 3 Multiple Minor or Major slips in mitigation event completion = 4 Risk events cannot be completed, or not planned = 5

Performance Factors / Criteria (cont.)

FACTOR	DESCRIPTION	RATING CRITERIA
PR	How are the processes performing?	Continues improvement / analysis of metrics used = 1 Processes are managed by metrics = 2 Defined process / Documented standards used = 3 Process management based on experience = 4 Lack of processes/processes uncontrolled = 5
TPM/PPM	How well are the measures performing relative to the Spec requirements or thresholds. ?	TPM will be met = 1 Acceptable with some reduction in margin = 2 Acceptable with significant reduction in margin = 3 Acceptable, no remaining margin = 4 Unacceptable = 5
ST	Staffing: Percent Under-manned	On plan = 1 Total < 3% = 2 Total 3 < 7% = 3 Total 7 < 10% = 4 Total > 10% = 5
OT	Amount of Overtime usage	No Overtime = 1 Total < 3% = 2 Total 3 < 7% = 3 Total 7 < 10% = 4 Total > 10% = 5

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Consequence Factors / Criteria

Performance	Schedule	Cost	Rating
Minimal or No Impact	Minimal or No Impact	Minimal or No Impact	1
Acceptable with some reduction in margin	Able to meet key dates	Budget increase or unit cost increase <5%	2
Acceptable with significant reduction in margin	Minor slip in key milestone; not able to meet key dates	Budget increase or unit cost increase 5-7%	3
Acceptable, no remaining margin	Major slip in key milestone or critical path impacted	Budget increase or unit cost increase >7-10%	4
Unacceptable	Cannot meet major milestone(s)	Budget increase or unit production cost increase >10%	5

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Risk Level Definitions

Risk Range	Risk of Failure	Definition
21 - 25	Near Certainty	➢WBS element will not be successfully completed. ➢Severe Cost overruns: CV >1 0% and/or ➢Severe Schedule slippage: SV > 10%. ➢Slip to Level I milestones ➢Will not meet technical requirements (SOW) ➢Completing QA Findings, Schedule & Corrective Actions ≥ 60 days
16 - 20	Highly Likely	➢WBS element will probably not be successful. ➢Cost overruns: 7% < CV > 10% and/or ➢Schedule slippages: 7% < CV > 10% ➢Slip to Level II Milestones ➢May not meet all technical requirements (SOW) ➢Completing QA Findings, Schedule & Corrective Actions Late < 60 days
11 - 15	Likely	➢WBS element may not be successful. ➢Cost overruns: 3% < CV > 7% and/or ➢Schedule slippages: 3% < CV > 7% ➢Slip to Level III Milestones ➢Will probably meet technical requirements. (SOW) ➢Completing QA Findings, Schedule & Corrective Actions Late < 45 days
6 - 10	Unlikely	➢WBS element will probably be successful. ➢Cost overruns: < 3% and/or ➢Schedule slippages: < 3% CV ➢Loss of more then one month schedule margin. ➢Technical requirements met. (SOW) ➢Completing QA Findings, Schedule & Corrective Actions Late < 30 days
1 - 5	Improbable	➢WBS element will be successful. ➢On cost, on schedule (no variance) ➢Meets all technical requirements. (SOW) ➢Completing QA Findings, Schedule & Corrective Actions on time

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Data Analysis and Risk Inputs

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PST Assessment

- Assessment is done monthly
  - Each PST member is assigned specific WBS elements
  - PST member use the factors as an outline when writing monthly inputs
  - Provide an integrated picture of element performance
- Continuously monitor all WBS elements
  - Provide early warning of changing risk
  - Risk metrics tracked over a period of time (better, worse, staying the same)
- Predictive Analysis
  - Predict factor ratings for next 3 months
  - Track element performance over period of time
    - Is performance/risk improving, getting worse, or staying the same?
    - Relative to Milestone events
- Discuss cross-IPT impacts in PST Meetings

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PST Assessment

- Top 10 risk elements are tracked
  - These items will warrant closer and/or additional surveillance
    - Resource Focus
  - PST helps mitigate the risk and ensure the program office/end user is fully aware of the impacts to the program and make recommendations to the customer for options they may use.
- Tool provides a Quick Look
  - Where the risk is on the program.
  - What are the factors driving the risk

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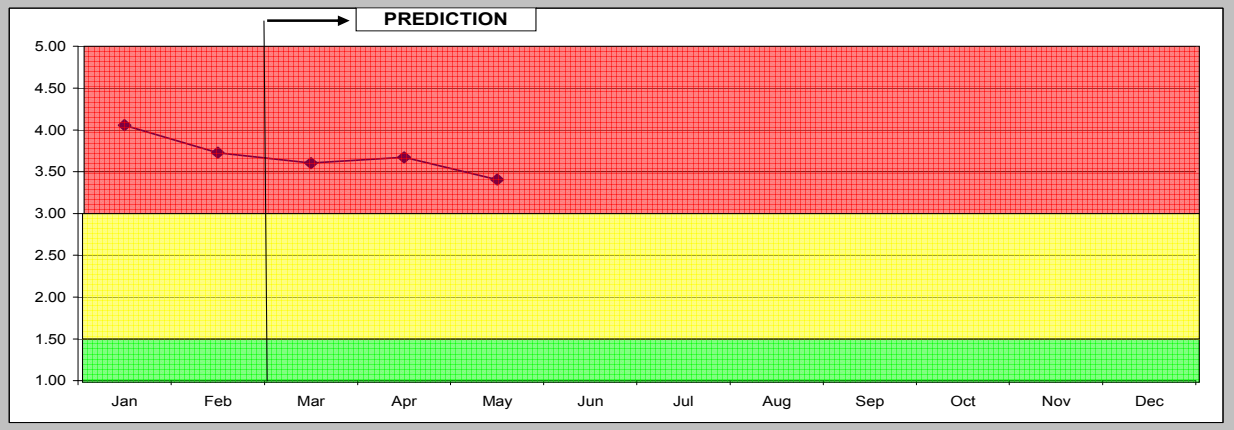
Old Process

- Process used up to May 2005.
- Consequence was not included in ratings. Consequence was interpreted via the PST members analysis.
- Attempted to incorporate Supplier Risk/Performance
  - Approach used (rating Suppliers separately) was not entirely successful.
- Roll up to program level done along WBS lines
  - Resulted in “masking” of lower level risks
  - Created a misconception of actual risk

Level 4 Risk Example (Old Process)

WBS Element: 1.1.2.4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
EVM-C	3	3	3	3	4							
EVM-S	2	2	2	3	4							
CP	5	5	5	5	5							
RK	5	5	5	5	5							
PR	2	2	2	2	2							
TPM	3	3	3	3	3							
ST	2	3	3	3	3							
OT	3	3	3	3	3							
EVM-EAC	5	5	5	5	5							
WR	3	3	5	5	5							
Boeing	3.35	3.45	3.45	3.60	3.90							
Supplier 1	5.00	5.00	5.00	5.00	3.00							
Supplier 2	5.00	4.00	3.50	3.50	3.50							
Supplier 3	5.00	5.00	4.50	4.50	4.50							
Supplier 4	5.00	2.50	3.00	3.00	3.00							
Supplier 5	4.00	3.00	2.50	2.50	2.50							
Risk Factor	4.06	3.73	3.60	3.67	3.41							

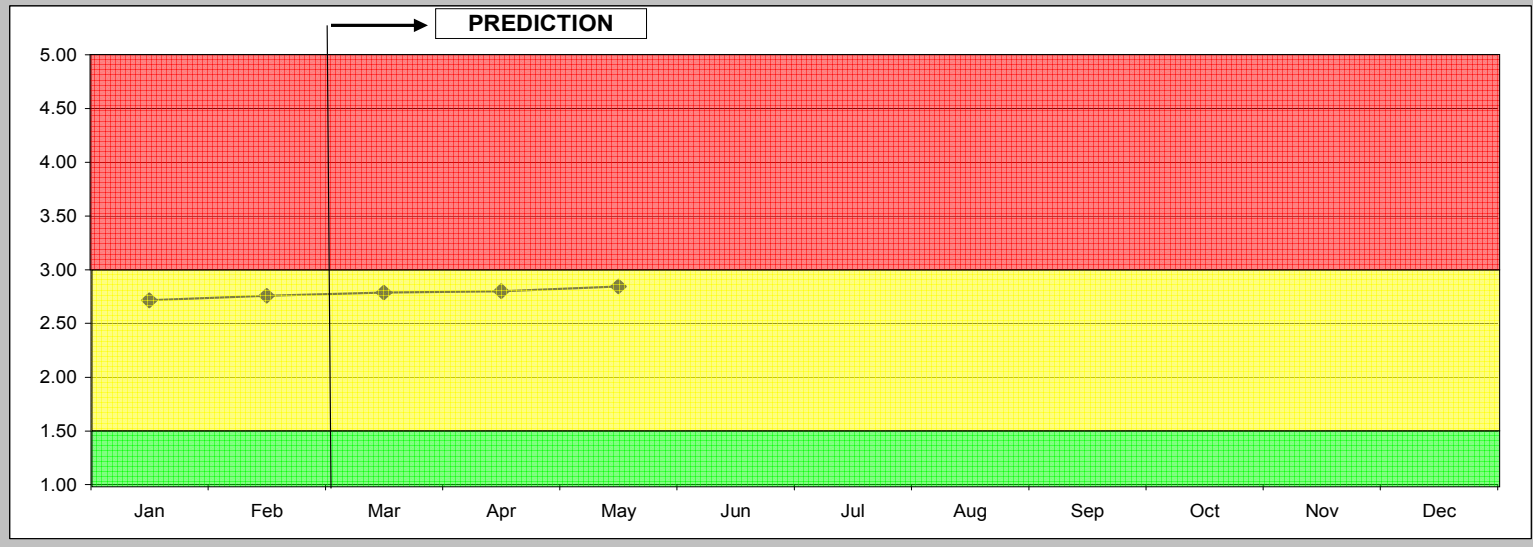


Note: This is Notional data.

Risk Roll-up Example (old Process)

WBS Element: 1.0

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.1	2.70	2.84	2.95	2.96	3.04							
1.2	2.70	2.55	2.55	2.60	2.60							
1.3	1.79	1.76	1.74	1.76	1.83							
1.4	3.20	3.20	2.95	2.90	2.90							
Risk Factor	**2.71**	**2.76**	**2.79**	**2.80**	**2.84**							



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New Process

- Tool calculates Risk based on Performance inputs and consequence inputs
  - Cost is based on EVM-C, EVM-EAC and Staffing factors
  - Schedule is based on EVM-S, Critical Path, and Overtime factors
  - Technical is based on TPM, Risk Management, and Process Management
- Supplier performance is now assessed as an integral part of program level performance
- For each category, the tool takes the average of the 3 inputs and multiplies by the Consequence to arrive at the overall risk for each element.
  - Overall risk factor is rated against the Risk Level Ratings/Definitions
- Roll-up of Risk to the Program Level is now done relative to the End Product delivered to the Customer

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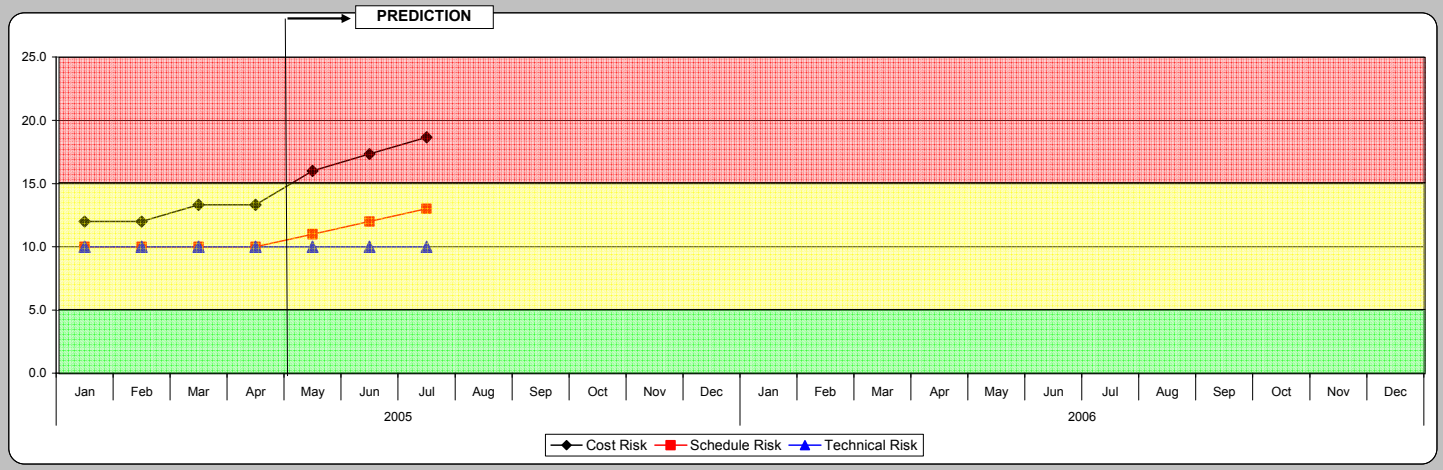
New Process (cont.)

- Roll-up is done relative to 8 groupings
  - Air Vehicle – Product
  - Air Vehicle – Non Product
  - Integration facilities
  - Program Management
  - Test & Eval
  - Production
  - Training
  - Logistics
- **Each group has a Cost, Schedule & Technical Category**
  - Each group is individually weighted (relative to 100%) in each category

Level 4 Risk Example (New Process)

WBS Element: 1.2.3.4

	2005												2006											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
EVM-C	3	3	3	3	4	4	5																	
EVM-EAC	4	4	4	4	4	5	5																	
OT	2	2	3	3	4	4	4																	
Consequence	4	4	4	4	4	4	4																	
Cost Risk	12.0	12.0	13.3	13.3	16.0	17.3	18.7																	
EVM-S	4	4	4	4	4	4	5																	
CP	3	3	3	3	4	5	5																	
ST	3	3	3	3	3	3	3																	
Consequence	3	3	3	3	3	3	3																	
Schedule Risk	10.0	10.0	10.0	10.0	11.0	12.0	13.0																	
RK	2	2	2	2	2	2	2																	
PR	3	3	3	3	3	3	3																	
TPM	1	1	1	1	1	1	1																	
Consequence	5	5	5	5	5	5	5																	
Technical Risk	10.0	10.0	10.0	10.0	10.0	10.0	10.0																	

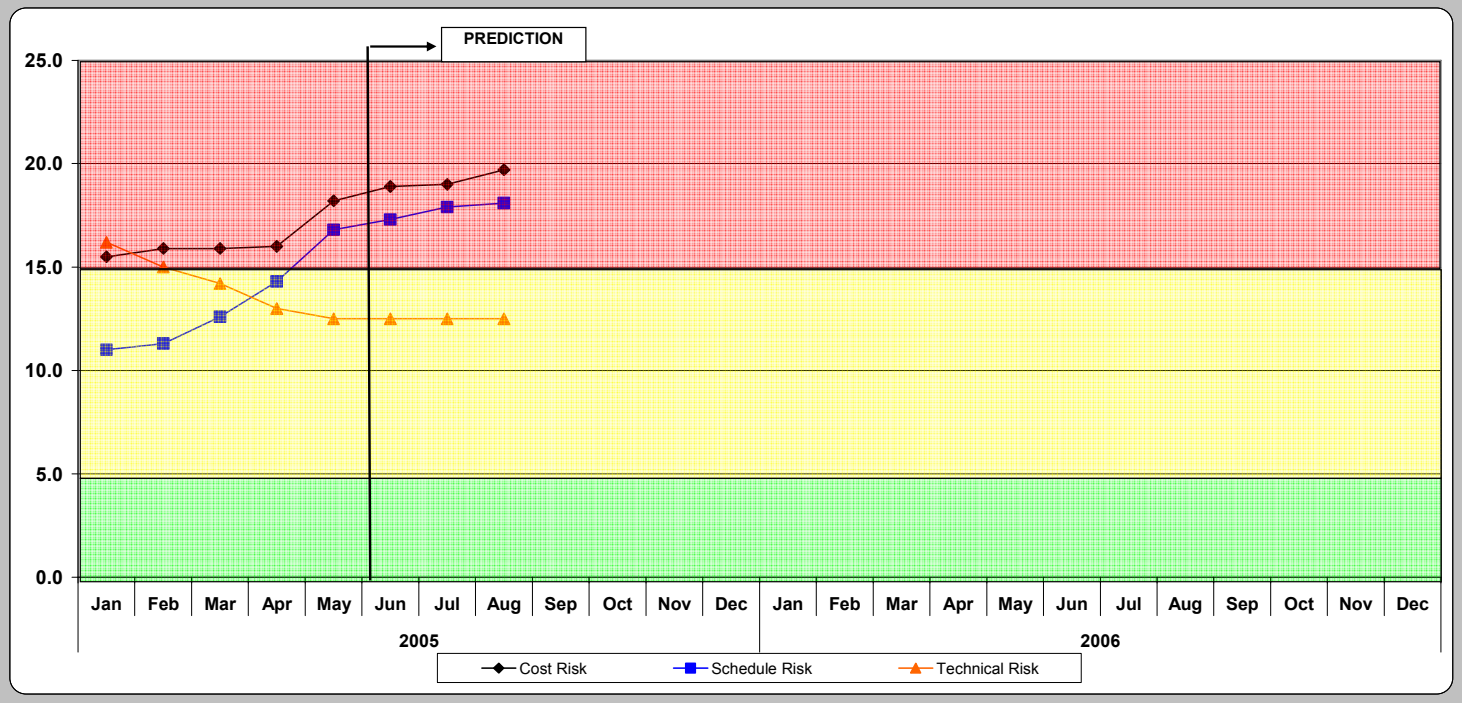


Note: This is Notional data.

Risk Roll-up Example (New Process)

Program "X"

	2005												2006											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cost Risk	15.5	15.9	15.9	16.0	18.2	18.9	19.0	19.7																
Schedule Risk	11.0	11.3	12.6	14.3	16.8	17.3	17.9	18.1																
Technical Risk	16.2	15.0	14.2	13.0	12.5	12.5	12.5	12.5																



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Documenting & Reporting

Documenting & Reporting

- Risk Tool provides a running metric on element risk
- Monthly Report
  - Narrative provided in Monthly Report to the customer
    - What are the factors driving risk in the WBS element
    - DCMA independent assessment of program performance
    - What are the real/potential impacts to the element
    - What actions are DCMA taking?
- DCMA Program Review (DPR)
  - WebEx session with all customers
  - Supporting DCMA offices/PSTs are tied in as well
  - Provide DCMA's independent assessment of program performance / risk
  - Forum for customer to ask questions pertaining to our assessment

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Future Development

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Future Development

- Other factors under consideration
  - Technology Maturity Level
  - Complexity Factors
  - CMMI
  - Other Earned Value Metrics
  - Quality Measurements

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Future Development (cont.)

- Alternative Risk Tool Formula
  - Are other calculations more appropriate?
    - Cost & Schedule relationship
    - Staffing & Overtime relationship
    - Example: (EVC*EVS)+CP+RK+PBM+TPM+(OT/ST)
- Develop additional risk metrics
- Continuously Refine Risk Definitions
- Convert Tool to Database Design