
Analytical Program Management

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PMI Emerald Coast Florida Chapter Annual Symposium

April 18, 2015

Bio of Kai Lemay



- Degrees:
 - B.S. Business Administration, University of Central Florida
 - M.S Systems Engineering, George Washington University
- Years of Experience:
 - 9 years of professional Experience
- Professional Field: Booz Allen Hamilton
 - Product Management, Project Management, Consulting
- Hobbies:
 - Mountain biking, kiteboarding, flying

Analytical Program Management (APM) Outline

- Integration of Cost, Schedule, and Risk Management Activities
- What goes into APM Analysis?
- Questions Addressed by APM
- Analytical Program Management Modeling
- Actionable Analysis and Insights Provided by APM Modeling
- NASA's Approach to Analytical Program Management
- Oil and Gas use of APM
- Demonstration of APM Modeling

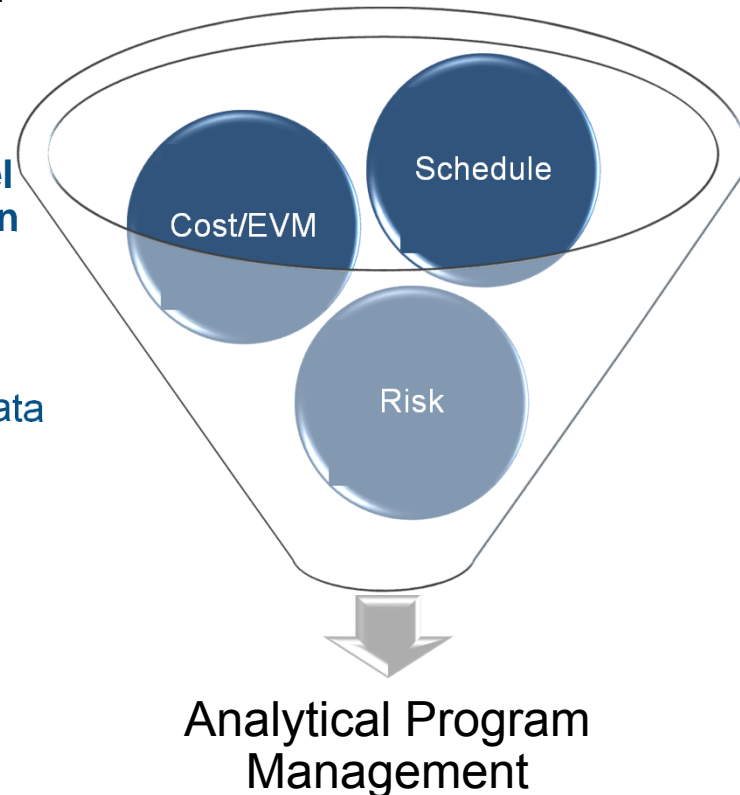
Cost, Schedule and Risk are Rarely Integrated on Programs

- Cost, schedule, and risk management activities are not typically integrated on programs; oftentimes these teams have little interaction outside of major program reviews
- This lack of integration has tangible consequences
- Cost growth almost always implies schedule growth, and vice versa
- Risks almost always imply both cost and schedule growth
- The lack of standard methodologies and tools for producing integrated artifacts has been a consistent roadblock for integration
- Analytical Program Management (APM) provides a framework for integrating cost, schedule and risk using existing artifacts to produce a cohesive analysis

APM produces actionable analysis allowing PMs to manage proactively

What Goes into Analytical Program Management?

- APM is performed by existing program staff using the following artifacts:
 - **The program schedule (Integrated Master Schedule (IMS) or higher-level schedule) with uncertainty bounds on task durations**
 - Uncertainty can be applied at the parent or child level and informed by Earned Value Management (EVM) data
 - **The cost estimate with uncertainty bounds maps to the schedule at any level**
 - **The quantified risk register (probabilities, cost and schedule impacts) with each risk mapped to a task**

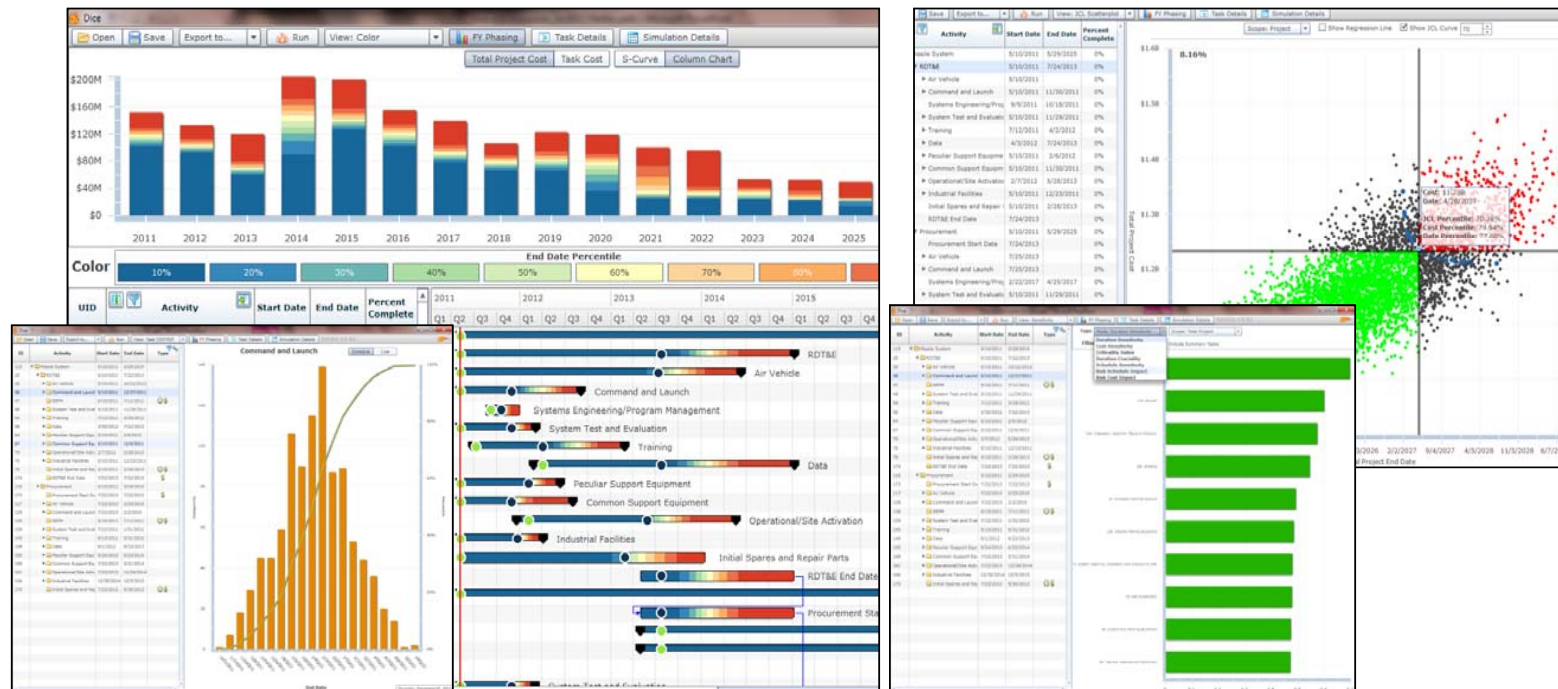


Questions Addressed by APM Analysis

- What risks have the greatest effect on my cost and schedule?
 - **What are the primary, secondary, tertiary... impacts of these risks?**
 - **What is my optimal mitigation strategy and how much will it decrease my cost and schedule risk?**
- How will schedule growth impact my costs? How will cost growth impact my schedule?
 - **What are my potential critical paths?**
 - **How can I manage the cost impacts of change orders on contracts/subcontracts?**
- How much management reserve do I need, where do I need it, and in what years?
- What actions can I take to reduce cost and schedule risk?
- How can I best manage my portfolio of programs? Which combination has the best chance of providing maximum capability on time and on cost?

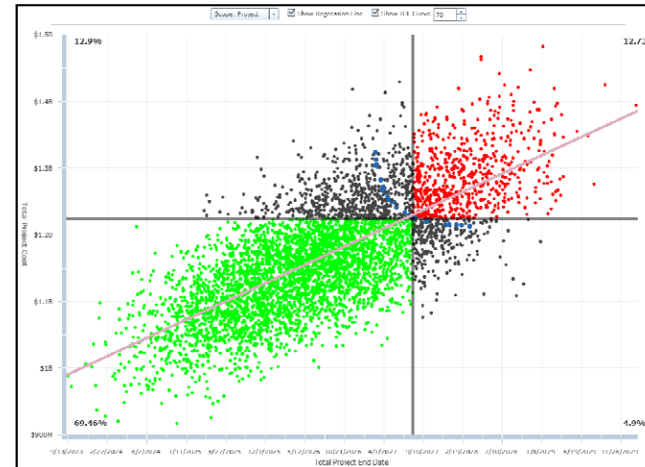
Analytical Program Management Modeling

- Collaboration with NASA built a standardized process and model
 - The result is an Adobe Flex-based decision tool called “Polaris”, which integrates cost, schedule and risk artifacts



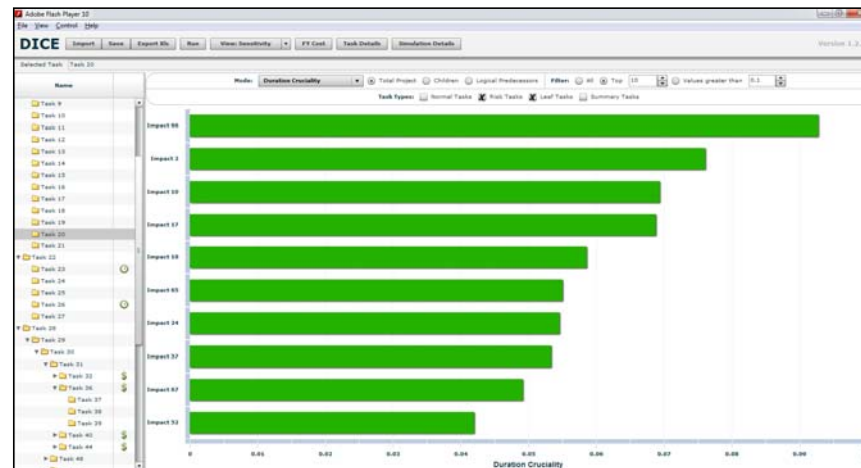
APM Provides Actionable Analysis for Program Controls

- APM provides a range of potential cost- schedule outcomes (phased by Fiscal Year)
- Allows Program Managers to set reserves based on *confidence levels*
 - **Standard requirement for many government agencies**
- All analysis is provided at every level of cost and schedule
- APM's standardized outputs allows combination of multiple programs into a portfolio-based analysis



APM Provides Unparalleled Insights into the Program

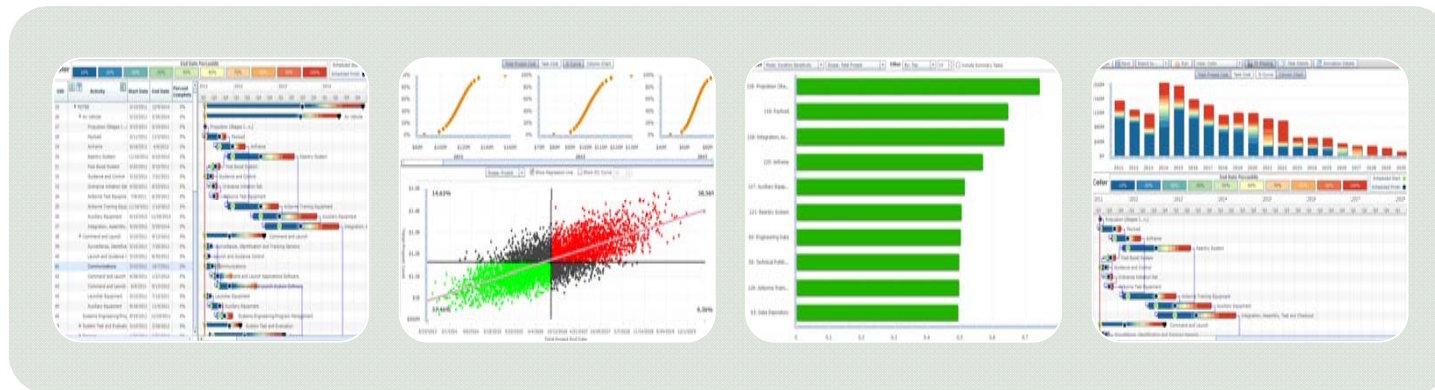
- Most risk management methods employ an overly simplistic “likelihood x impact” metric to rank risks
 - This ignores downstream risk effects
- APM shows the impact of each task and risk on cost/schedule
 - ...including secondary and tertiary risk impacts
 - E.g. risks creating a new critical path or causing standing-army cost impacts elsewhere in the schedule
- APM also details a probabilistic critical path
 - Calculates the probability that each task ends up on the critical path



Additional Benefits of APM Modeling

- Improves the quality of program artifacts (schedule, cost estimate, risk register)
 - **Flexing the schedule in APM reveals inherent weaknesses not uncovered by traditional schedule health check tools**
 - **Linking cost estimates to the schedule increases their *accuracy* and *precision***
- Predicts the effects of risks through integration with the cost/schedule estimate
 - **Ensures comprehensiveness of risk register and improves mitigation plans**
 - **Mitigates cost growth from change orders or subcontracts**
- Opens lines of communication between cost, schedule and risk staff
 - **Producing APM artifacts requires teams to work together, fosters relationships**
- APM leverages artifacts that should already exist for the program, and if artifacts don't already exist, APM acts as a catalyst for their creation

APM Modeling provides quality insight and analysis



Schedule Risk Analysis

- APM modeling includes schedule health check and schedule risk analysis features with industry leading run-times
- APM calculates the probabilistic critical path, providing insight into potential program choke points

Integrated Cost & Schedule Risk Analysis

- APM integrates schedules, cost estimates and risk registers into a single analysis
- APM quantifies the relationship between cost and schedule revealing the cost impacts of schedule growth and vice versa

Analytical Program Management

- APM performs real-time scope and requirements trade-off analysis allowing managers to design an architecture that fits into a constrained budget
- APM identifies lead sources of cost and schedule risk

Portfolio Optimization

- APM looks across a portfolio of programs and allows real-time program trade-off analysis enabling decision makers to quickly optimize their portfolio to provide maximum capability within a constrained budget

NASA's Approach to Analytical Program Management

- Integrated cost/schedule estimation has gained significant momentum recently
 - **NASA is leading the way in the development of this methodology, which they have labeled Joint Confidence Level (JCL) Analysis**
 - **NASA Policy Directive mandates that programs are baselined at the “70 percent confidence level” using a “joint cost and schedule probability distribution”¹**
 - **The goal was to provide stronger assurance that NASA can meet cost and schedule targets²**
 - **A recent GAO report cites the dramatic effects of NASA’s policy stating “Average development cost growth and schedule delay for the current portfolio have decreased to about a third of their 2009 level.”³**
- While the methodology has made substantial strides, the cost and schedule communities must overcome political and technical obstacles before full adoption

¹ – NPD 1000.5 - <http://www.hq.nasa.gov/office/codeq/doctree/10005.htm> - January 15, 2009

² – JCL Status Report - http://www.nasa.gov/pdf/421542main_JCL%20Status%20Report-2010%20Feb.pdf – February 2010

³ – GAO Report – “NASA – Assessments of Selected Large-Scale Projects” - <http://www.gao.gov/products/GAO-13-276SP> - April 2013

Oil and Gas

- Complex projects around the globe from \$500M to \$50B+
- Many of their projects are in harsh remote parts of the world
- Where Aerospace and defense is usually concerned with Technical risks, cost and schedule risks, O&G must also take Political risks into account when performing analysis
- Many different approaches
 - **Analysis level schedules**
 - **Full project schedules (8000+ lines) risk loaded with 250+ risks**
 - **Integrated Cost and Schedule models**
- Many of the analysis capabilities added in Polaris this past year were a direct result of collaborating with experts in the O&G industry
 - **Risk Prioritization, Schedule Cost Loading (cost estimate), Cost of Delay**

Demonstration of APM Modeling Sanitized Case Study