2009, Issue 2

The Measurable News

The Magazine of the Project Management Institute's College of Performance Management

A Forecasting Application Using the Rayleigh Model

By Dan Davis, Gary Christle, and Wayne Abba

We have been doing research for the Center for Naval Analysis (CNA), a Federally Funded Research & Development Center. Under U.S. Navy sponsorship, we explored the use of the Rayleigh distribution to model the cumulative cost path over the course of the life of a research and development contract. We sought to use the model to assess the realism of a plan at the outset of a contract. We also wanted to be able to use the Rayleigh model to predict the ultimate cost and schedule performance of a development contract early in the life of that contract, using a limited number of data points. The model's predictive accuracy was to be compared to other predictions of contract performance. Finally, we wanted to use the predictions arising from the application of the Rayleigh model to assess the current vulnerability of a program to cost overrun and/or schedule slip. We believed this information would be valuable to decision-makers as they assess different options for timely fixes to a program. The goal was to create a tool that is useful for executives to implement forward-looking analysis with proactive decision making/oversight.

Project Complete with Useful Results

We have completed the project with very useful results. Using the non-linear Rayleigh distribution, we were able to do parametric estimation, using the actual data to date of an executing development contract. Interestingly, this model is only crucially dependent on actual cost data and a target contract cost in order to be implemented. We found that this procedure yields independent forecasts of final contract cost and schedule that are generally superior to other estimation techniques. These forecasts also give early warning to decision-makers of potential execution difficulties.

Continued on p. 4

See our VENDOR / SERVICES listing on page 23.

PMI-CPM GOVERNING BOARD 2008–2010

President
Susan Wood
850.892.3747
President@pmi-cpm.org

Executive Vice President
Ray Stratton
714.318.2231
ExecutiveVP@pmi-cpm.org

Vice President of Finance
Cathy Ahye
703.627.2022
VPFinance@pmi-cpm.org

Vice President of Administration
Marilyn McCauley
937.878.7923
VPAdministration@pmi-cpm.org

Vice President of Conference & Events
Barry Schuler
703.456.0707
VPConf-Events@pmi-cpm.org

Vice President of Education & Certification
Joe Houser
301.529.6697
VPED@pmi-cpm.org

Vice President of Research & Standards
Kym Henderson
61.414.428.537
VPResearch-Standards@pmi-cpm.org

Vice President of Communications
Robert Horrigan
703.923.6094
VPCommunications@pmi-cpm.org

Past President
Neil Albert
703.506.4600
PastPresident@pmi-cpm.org

Continued from p. 1

Overall contract cost and schedule risk can also be calculated. A forward-looking dynamic path showing future cost and schedule performance can also be graphed.

Performing 5,242 non-linear regressions, we rigorously tested and validated the model against 107 completed development contracts drawn from the DoD database. The comprehensive sample spanned 35 years. A Microsoft Excel® software application, consisting of 166 pages of programming and 10,149 lines of original code, was also developed to graphically portray trends and includes automated business insights based on the analysts' extensive experience. In addition, a plan assessment module was developed to evaluate plan realism. This module can be used to assess the realism of a contractor's offer during source selection and to assess plan realism early in contract execution, even before actual cost data are available — a valuable addition to the Integrated Baseline Review. The module may also be used to assess the realism of research and development program funding profiles.

Get the Report

Interested readers can request a hard copy of the research paper and the software application by calling CNA's production department at 703.824.2123. Ask for the paper titled "**Using the Rayleigh Model to Assess Future Acquisition Contract Performance and Overall Contract Risk (Volume I)"**. Alternatively, ask for document number CRM D0019289. A2/Final, January 2009. DoD personnel may obtain the paper through the Defense Technical Information Center.