



Software Development Cost Estimation

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TASK Problem



- ◆ Experience has shown that if a project's development costs are under-estimated then developers will be forced into many quality-threatening cost-cutting measures.
- ◆ A major reason for poor software cost estimation is that, all too often, NASA's software managers don't have information they need
 - ◆ Not enough relevant data
 - ◆ Current models are too complicated



APPROACH



- ◆ Identify 'simple' fully validated cost models that provide estimation uncertainty with cost estimate
 - ◆ Based on COCOMO variable set
- ◆ Use machine learning techniques to determine
 - ◆ Minimum number of cost drivers required for NASA domain based cost models
 - ◆ Minimum number of data records required
 - ◆ Estimation Uncertainty
- ◆ Build a repository of software cost estimation information
 - ◆ Coordinating with
 - ◆ Tasks funded by Office of the Chief Engineer
 - ◆ One NASA Database
 - ◆ Center level software improvement programs (planned)



IMPORTANCE/BENEFITS



- ◆ Data at JPL indicates that
 - ◆ flight software planned effort grows by
 - ◆ 75% from Initial Confirmation
 - ◆ 55% from Confirmation Review
 - ◆ Schedule slips by 20% from Confirmation Review
 - ◆ Allocated budgets are seriously out of line with software team estimates
- ◆ The products of this research task will enable the ability to improve our performance against these metrics



RELEVANCE to NASA



- ★ NASA even at the center level has very limited knowledge of its actual software cost performance and will be doomed to repeat the past if cannot learn the lessons from its past

- ★ NASA must establish the capability to
 - ★ Update estimates quickly as designs evolve
 - ★ Have sufficient basis of estimate to defend reasonable software cost estimates
 - ★ Understand the risk and uncertainty within our estimates and budgets



ACCOMPLISHMENTS



- ◆ Identified currently available datasets
- ◆ Verified analysis approach yields useful results
 - ◆ Completed initial analysis of 1980's NASA dataset to verify analysis approach
 - > Feature Subset Selection Can Improve Software Cost Estimation, PROMISE 05, May 15 2005, St Louis, MS.
 - > Simple Software Cost Analysis: Safe or Unsafe?, PROMISE 05, May 15 2005, St Louis, MS.
 - > Validation methods for calibrating software effort models, ICSE 2005 Proceedings, May2005, St Louis, MS.
- ◆ Processed and transferred contemporary flight software data to T. Menzies for analysis and model development
- ◆ Negotiated budget increase to speed up data collection from other centers
 - ◆ Identified potential data sources at GSFC and MSFC



NEXT STEPS



- ◆ Coordinate IVV&V task with OCE Analogy Based Software Cost estimation task
- ◆ Complete model development and analysis for Deep Space Software Cost model based on JPL data
- ◆ Finalize plans and collect available data from other NASA Centers
- ◆ Generate additional domain models as data becomes available
- ◆ Provide data to IV&V and One NASA Repositories
- ◆ Continue publishing and presenting results