COCOMO II / SEER
Rosetta Stone

Don Reifer
Ray Madachy

USC Center for Software Engineering

17th International Forum on COCOMO and Software Cost Modeling
October 24, 2002
Research Introduction

• Rosetta Stone devised in support of Army Future Combat Systems (FCS) project
  – crosscheck multiple estimation methods
• Model information from public sources
  – COCOMO II book
  – SEER User’s Manual
• USC runs USC COCOMO II
• SEER runs made by the prime contractor Boeing
Rosetta Stone Purposes

• Convert COCOMO II estimate inputs into corresponding SEER inputs

• Convert SEER project data files so they can be used with COCOMO II
  – use Boeing SEER data to calibrate COCOMO II for FCS

• Understand the differences in the models so that we can understand why estimates vary
Presentation Goals

• Overview model conversion issues
• Provide examples of cost driver mappings
• Give current status of research usage
Scope and Labor Categories

- Scope of two models is almost identical
- Some very minor differences in labor category definitions
- Both use base of 152 hours/staff month
- There is a major difference in how WBS formulas allocate effort

- Counting conventions
  - Do not include optional activities in estimates
  - Do not include QA and CM effort that is done outside of software organizations in estimate
  - Make sure that the base effort estimate has not been modified by the model as it allocates effort to WBS tasks
Sizing

• **SEER**
  - Counts deleted lines
  - Linear reuse model
  - Adjustments made for reuse in size math
    - Based on whether designed for reuse and language level
  - Permits proxy sizing
  - Feature point sizing used to size COTS

• **COCOMO II**
  - No deleted lines
  - Non-linear reuse model
  - Multiplier used to make design for reuse adjustments
  - COCOTF used for handling COTS
    - No feature point size adjustment
  - No proxies
Cost Drivers (Scale Factors)

• SEER
  – Has the following multiplier that is similar to PMAT:
    • Process Improvement
  – Driver rates impact of improvement instead of CMM level

Not comparable

• COCOMO II
  – PREC
  – FLEX
  – RESL
  – TEAM
  – PMAT

The size is raised to a power computed as the sum of the values for these factors
Scale Factor Ratings

- Must rate these factors uniquely when using COCOMO II

- Guidelines
  - Rate scale factors in COCOMO II at the project level
  - Develop default rating based on:
    - CMM level
    - Type of application involved (precedented/unprecedented)
    - Typical project of moderate size (100 KSLOC)
  - Use defaults to simplify data entry
Cost Driver Ratings

- Must convert SEER ratings to COCOMO II values for parameters that are similar
- Must rate the remaining COCOMO II drivers

Guidelines
- Convert similar parameters using the procedures that follow in this briefing
- Rate the remaining COCOMO II drivers
  - If have no knowledge of projects, rate them Nominal
- Treat the remaining drivers in SEER as a constant used to bias COCOMO II estimates to reflect SEER predictions
Cost Drivers - Product Factors

- **SEER**
  - Product Development Requirements
    - Requirements Volatility
    - Specification Level - Reliability
    - Test Level
    - Quality Assurance Level
    - Rehost from Development to Target
  - Product Reusability Requirements
    - Reusability Level Required
    - Software Impacted by Reuse

- **COCOMO II**
  - RELY
  - DATA
  - CPLX
  - RUSE
  - DOCU

*COCOMO handles requirements volatility via size adjustments, not driver ratings*
Variation in Comparable Parameters

RELY

RUSE

SEER

CCII
• **SEER**
  - VH = public safety
  - H = major financial loss
  - N = moderate loss
  - L = easy to recover from loss
  - VL = slight inconvenience

• **COCOMO II**
  - VH = risk to human life
  - H = high financial loss
  - N = moderate loss
  - L = easy to recover from loss
  - VL = slight inconvenience

*Models are consistent*
*Use Table that follows to convert from one to the other*
• **SEER (2 drivers)**
  - Reusability Level
    • XH = Across organization
    • VH = Across product line
    • H = Across project
    • N = No requirements
  - Software Impacted by Reuse (% reusable)
    • 100%
    • 50%
    • 25%
    • 0%

• **COCOMO II**
  - XH = Across multiple product lines
  - VH = Across product line
  - H = Across program
  - N = Across project
  - L = None

* Models are consistent
* Use Table that follows to convert from one to the other
SEER to COCOMO Conversion

• RELY
  – VH = use 1.22 in CCII
  – H = H in COCOMO II
  – N = N in COCOMO II
  – L = L in COCOMO II
  – VL = use 0.88 in COCOMO II

• RUSE
  – XH = XH in COCOMO II
    100% reuse level = 1.50
    50% reuse level = 1.40
    25% reuse level = 1.32
    0% reuse level = 1.25
  – VH = VH in COCOMO II
    100% reuse level = 1.32
    50% reuse level = 1.26
    25% reuse level = 1.22
    0% reuse level = 1.16
  – H = N in COCOMO II
  – N = L in COCOMO II
Other Attributes

• Similar SEER -> COCOMO II mappings created for Personnel, Platform and Project Factors

• Mappings also devised for COCOMO II -> SEER

• Still have unique factors in both models
Current Status

• Two-way conversions have been developed for all similar factors in models
• Still analyzing differences in initial effort and schedule estimates, and reviewing assumptions
• Three estimating iterations have brought initial estimates closer
  – process anchor points useful for comparing different lifecycle variations between tools
  – next iteration will attempt to subtract out SEER-unique factors
• Strong user desire for model conversion support