PCOC: A COMPLETE, USER-TAILORED, INTERACTIVE COST ANALYSIS TOOL BASED ON COCOMO

Walker E. Royce
Eclectic Systems
Torrance, California
PCOC - PC COCOMO

- OVERVIEW
- HISTORY
- CAPABILITIES/MODES OF OPERATION
- PCOC OUTPUTS
- PCOC INPUTS
- USER TAILORING
- HUMAN ENGINEERING
PCOC ... AN ITERATIVE SOFTWARE COST ANALYSIS TOOL FOR THE IBM PC

- Based on the COCOMO method
- User tailorable for growth and calibration
- Human engineered for managers and software engineers

Environment Requirements
- IBM PC, XT, AT, or compatible
- 192 K RAM
- Single or dual disk
- Color or monochrome display
- Optional printer
PCOC HISTORY

1982

PROTOTYPING AND REQUIREMENTS ANALYSIS

1983

DEVELOPMENT AND TEST

1984

OPERATIONAL TEST AND UPGRADE

1985

PCOC PRODUCT

- PRIMARY PCOC REQUIREMENTS
  - HIGHLY INTERACTIVE OPERATION
  - EFFECTIVE USER FRIENDLINESS
  - MODULARITY FOR SIGNIFICANT UPGRADE
  - FLEXIBILITY TO HANDLE DIVERSE PROJECT SITUATIONS
  - ROBUSTNESS TO ACCOMMODATE USER-TAILORING

- PCOC DESIGN FEATURES
  - STRONG DATA TYPING
  - GENERIC SCREEN EDITOR
  - DATA BASE DRIVEN OPERATION
  - MENU/FUNCTION KEY CONTROL

- PCOC TEST ENVIRONMENT
  - DIVERSE PROJECT SITUATIONS
  - 7 TEST PROJECTS
  - UPGRADES AMOUNTED TO 60% OF THE INITIAL CODE VOLUME

- PCOC PRODUCT FEATURES
  - COMPLETE IMPLEMENTATION OF COCOMO METHOD
  - USER TAILORABLE MODEL/DATA BASE WITH COCOMO PROVIDED AS DEFAULT
  - FLEXIBLE COST ANALYSIS CAPABILITIES
  - HIGHLY RELIABLE, ROBUST OPERATION
PCOC PROVIDES DIVERSE COST ANALYSIS CAPABILITIES

- DEVELOPMENT COST ESTIMATION
  - ORGANIC MODE
  - SEMI-DETACHED MODE
  - EMBEDDED MODE
  - USER DEFINED MODE

\[ MM = \text{COEFFICIENT} \times \text{EAF} \times (\text{KDSI})^{\text{EXponent}} \]
\[ \text{SCHEDULE} = \text{COEFFICIENT} \times (\text{MM})^{\text{EXponent}} \]

- MAINTENANCE COST ESTIMATION
  - ANY MODE...FOLLOWS THE COCOMO ANNUAL CHANGE TRAFFIC METHOD

- OTHER COST ANALYSES
  - SOFTWARE CONVERSIONS (COCOMO DM, CM, IM METHOD)
  - DESIGN TO COST
  - COST TO COMPLETE
  - INCREMENTAL DEVELOPMENT
PCOC INPUT CAPABILITIES

THREE TYPES OF USER INPUT

- FUNCTION KEYS USED EXCLUSIVELY FOR
  - DISPLAY CONTROL (E.G. ENTER MODE, EXIT MODE)
  - PROGRAM EXECUTION
  - DISPLAY UNIQUE TOOLBAG
    (COMMONLY USED CONTEXT SPECIFIC TOOLS)
    EXAMPLES:
    - PRINT SCREEN
    - LOAD DEFAULTS
    - RECALCULATE CHECKSUMS
    - ESCALATE LABOR COSTS

- SIMPLE TO USE SCREEN EDITOR FOR TABLE DATA ENTRY
  - POSITIONING VIA CURSOR CONTROL ARROWS
  - STRONG DATA TYPING

- PROGRAM PROMPTS FOR SIMPLE SCALAR INPUTS
  - E.G. START MONTH/YEAR, HOURS/MM, COST MODE, ETC.
PCOC PRINTOUT CAPABILITIES

TWO TYPES OF USER OUTPUT

• INDIVIDUAL PRINT SCREEN
  - FORMAT AND PRINT CURRENT DISPLAY

• BULK PRINT
  - USER CAN SPECIFY ANY SET OF PCOC DISPLAYS FOR BATCH PRINT
PCOC AVAILABLE OUTPUTS

- SOFTWARE SUMMARY
  - KDSI TOTALS
  - WEIGHT AVERAGED EAFs, COMPLEXITIES

- SCHEDULE RECOMMENDATIONS

- EFFORT ESTIMATE SUMMARY
  - MAN MONTHS
  - PRODUCTIVITY
  - LABOR MIX
  - PHASE MIX

- COST EFFORT SUMMARY
  - TOTAL DOLLARS
  - AVERAGE COST OF MAN MONTH
  - AVERAGE PERSONNEL LOAD
  - PEAK PERSONNEL LOAD
  - FISCAL YEAR COST BREAKOUT ($/FY)
  - CALENDAR YEAR COST BREAKOUT ($/CY)
  - TOTAL LABOR PROFILE (HEADS/MONTH)
  - INDIVIDUAL LABOR CATEGORY PROFILES (HEADS/MONTH)
  - GRAPHICAL LABOR PROFILES (HEADS/MONTH)
  - SPENDING PROFILE ($$/MONTH)

- OTHER OUTPUTS
  - ERRORS AND WARNING MESSAGES
  - DATA QUALITY INDICATORS
### PCOC Inputs Permit Extensive Sensitivity Analysis

<table>
<thead>
<tr>
<th>User Modifiable Parameters/Data</th>
<th>Defaults Available?</th>
<th>Default Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Names, Subunit Names</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Subunit Sizes, Complexities</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Subunit Conversion Percentages</td>
<td>Yes</td>
<td>100% (i.e., Newly Developed)</td>
</tr>
<tr>
<td>Software Cost Driver Settings</td>
<td>Yes</td>
<td>3:0 - Nominal 1 = Very Low 6 = Extra High</td>
</tr>
<tr>
<td>Software Cost Driver Effects</td>
<td>Yes</td>
<td>Cocomo Data Base</td>
</tr>
<tr>
<td>Spare Cost Driver Names, And Effects</td>
<td>Yes</td>
<td>(3) Spares Effect = 1 (None)</td>
</tr>
<tr>
<td>Development Schedule</td>
<td>Yes</td>
<td>Cocomo Recommendation</td>
</tr>
<tr>
<td>Effort Partition Between Milestones</td>
<td>Yes</td>
<td>Cocomo Data Base</td>
</tr>
<tr>
<td>Schedule Partition Between Milestones</td>
<td>Yes</td>
<td>Cocomo Data Base</td>
</tr>
<tr>
<td>Start Month/Year</td>
<td>Yes</td>
<td>1-1</td>
</tr>
<tr>
<td>Hours Per Man Month</td>
<td>Yes</td>
<td>152 Hrs/Man Month</td>
</tr>
<tr>
<td>Labor Category Titles/Cost Per Man Hour</td>
<td>Yes</td>
<td>Generic Labor Categories</td>
</tr>
<tr>
<td>Labor Partition Between Activities</td>
<td>Yes</td>
<td>Generic Labor Mix</td>
</tr>
<tr>
<td>Project Phase Names</td>
<td>Yes</td>
<td>SRR-PDR-CDR-CUT-FQT</td>
</tr>
<tr>
<td>Activity Partition Between Phases</td>
<td>Yes</td>
<td>Cocomo Data Base</td>
</tr>
<tr>
<td>Administrative Management Structure</td>
<td>Yes</td>
<td>No Admin Management</td>
</tr>
<tr>
<td>Automatic Schedule Constraint Switch</td>
<td>Yes</td>
<td>Off</td>
</tr>
<tr>
<td>Annual Change Traffic</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Integer/Exact Manloading Switch</td>
<td>Yes</td>
<td>Exact</td>
</tr>
<tr>
<td>Cost Mode Parameters</td>
<td>Yes</td>
<td>Embedded Development</td>
</tr>
</tbody>
</table>

*These default values are user tailorable (i.e., the default values can also be redefined)*
PCOC CAN BE TAILORED TO USER UNIQUE ENVIRONMENTS

- DEFAULT FILES ARE PROVIDED FOR
  - ALL COCOMO DATA BASE VALUES
  - MOST PARAMETERS WHICH DRIVE PCOC EXECUTION

- USERS GUIDE PROVIDES FILE FORMAT DESCRIPTIONS
  - PERMITS USER TO REPLACE THE FOLLOWING COCOMO DATA BASES:
    - SCHEDULE PARTITIONS
    - ACTIVITY PARTITIONS
    - DEVELOPMENT/MAINTENANCE DIFFERENCES IN SOFTWARE COST DRIVERS
    - DM, CM, IM VALUES
    - PHASE NAMES

- ON-LINE TAILORING IS PROVIDED FOR
  - COST MODEL (COEFFICIENTS, EXPONENTS, NAMES)
    - PERMITS COCOMO CALIBRATION TO A SPECIFIC FACILITY
  - SOFTWARE COST DRIVER EFFECTS (EFFECTS OF VERY LOW THRU EXTRA HIGH)
  - ADDITIONAL SOFTWARE COST DRIVERS (E.G. RVOL, SCRT, OR OTHERS)
ADDITIONAL PCOC FEATURES

ON-LINE, NON INTERFERING HELP
- Each display has access to corresponding users guide description
- Help files include display description and function key definitions (brief function key identifier always displayed in current context)

WARNING MESSAGES PROVIDED FOR DATA INCONSISTENCIES AS INFORMATION ONLY
- User may want to utilize the data in an inconsistent (with respect to expected values) manner

ERROR CHECKING AT ALL LEVELS PROTECTS USER FROM MAKING UNRECOVERABLE ERRORS
EXAMPLES:
- All PCOC division operations check for divide by zero
- PCOC saves current state of data upon exit to DOS to guard against unintentional exit