



CORADMO DELPHI EXERCISE
Data Collection Instrument (Round 1b)

Participant Information:

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Data Submission:

For your convenience a pre-addressed, stamped return envelope has been provided for the return of this form. Please send in this form as soon as possible. The return mailing address is:

COCOMO II Data Submission
Center for Software Engineering
Salvatori Hall Room 328
University of Southern California

Center for Software Engineering

Instructions:

CORADMO has six RAD Schedule and Effort drivers, which adjust the phase distributions of schedule and effort produced by the mainstream COCOMO II model* to reflect the different distributions of schedule and effort (and their totals) found in a RAD project.

For each of the six schedule and effort drivers, please indicate in the space provided how you would adjust the currently assigned Schedule Multiplier Range (SMR) and Effort Multiplier Range (EMR), based upon your best engineering judgment and experience, given the description of how to assign a *low*, *nominal*, *high*, etc. rating for each driver. Also please indicate in the space provided your rationale behind the change you made to the EMR or SMR.

In estimating the EMR or SMR for each driver, consider only the driver's unique contribution to increasing or decreasing project schedule and effort above/below COCOMO II's ratings and calculated effort, excluding the effects of other correlated drivers. If you do not agree with the assumption about the staff level, let us know in your comments.

COCOMO RAD MODEL (CORADMO)

The COCOMO RAD model has its roots in the results of a 1997 CSE Focused Workshop on Rapid Application Development¹. RAD is taken to mean an application of any of a number of techniques or strategies to reduce software development cycle time. There are six classes of strategies whose degree of implementation can be used to parameterize a schedule estimate given an effort and schedule estimate produced by COCOMO II-2000. These strategies are preferable to just adding people to the task. The six classes are the following: development process re-engineering (DPRS), re-use and very high level languages (RVHL), collaboration efficiency (CLAB), architecture investment and risk resolution (RESL), RAD capability of personnel (RCAP), and pre-positioning of assets (PPOS). RESL corresponds to the COCOMO II scale driver; the other five are new. All have their effects reflected as multipliers on effort (person months, PM), schedule (months, M) and/or number of personnel (P). Person months of effort can actually be increased because certain pro-active strategies, like pre-positioning of assets, are only possible with extra effort.

The CORADMO model utilizes the COCOMO phase distributions of effort and schedule, which are anchored at the LCO/LCA/IOC points in a development life cycle. A phased schedule and effort distribution is needed because the effects of the RAD strategies identified above are different for the different phases. Also, a new mathematical function is used to calculate (predict) the calendar months for a given amount of effort: the function is only radically different in low (under 16) person-month's efforts where it seems more normal have an equal number of people and months to accomplish the task. At the higher (greater than 64) person-month's efforts, the traditional COCOMO II-2000 function is used which is based on the traditional cube-root-like function of effort. A smooth curve is fit within these ranges.

The intent of the CORADMO model is to calculate/predict the schedule (months, M), personnel (P), and adjusted effort (person-months, PM) based on the distribution of effort and schedule to the various stages, and impacts of the selected schedule driver ratings on the M, P, and PM of each stage.

¹ B. Boehm, S. Chulani, and A. Egyed, "Knowledge Summary: USC-CSE Focused Workshop on Rapid Application Development", USC-CSE Technical Report, June 1997.

* with the mainstream COCOMO II Schedule Compression (SCED) factor excluded

Drivers

1) Reuse and VHLL's (RVHL) – Reuse and Very High Level Languages

The driver refers to the degree to which re-use of other than code and/or very high level languages are utilized. This driver reflects schedule compression in Inception and Elaboration stages due to faster prototyping or option exploration. For this driver, the effort compression is hypothesized to be the same as the schedule compression; that is, the team size would stay the same over a shorter period. The rating for this driver depends on the amount of Rapid Prototyping Experience the development team has had in the domain of the project being evaluated.

| Schedule Multipliers | |
|--|---------------------------------------|
| Inception Multiplier Range (Highest/Lowest = MR) | EMR = SMR = 1.04 / 0.90 = 1.16 |
| Inception Effort (PM) Multiplier Range | Your Adjusted EMR = _____ |
| Inception Schedule (M) Multiplier Range | Your Adjusted SMR = _____ |
| Elaboration Multiplier Range (Highest/Lowest = MR) | EMR = SMR = 1.0 / 0.8 = 1.25 |
| Elaboration Effort (PM) Multiplier Range | Your Adjusted EMR = _____ |
| Elaboration Schedule (M) Multiplier Range | Your Adjusted SMR = _____ |
| Construction Multiplier Range (Highest/Lowest = MR) | EMR = SMR = 1.00 / 1.00 = 1.00 |
| Construction Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Construction Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Rationale: | |
| Comments: | |

2) DPRS (Development Process Reengineering and Streamlining) Rating Scale

The driver refers to the degree to which the project and organization allow and encourage streamlined or re-engineered development processes: the current level of bureaucracy is a clear indicator. Again, the EMR = SMR hypothesis postulates that DPRS rating levels would not affect team size.

| Schedule Multipliers | |
|--|---------------------------------------|
| Inception Multiplier Range (Highest/Lowest = MR) | EMR = SMR = 1.20 / 0.90 = 1.33 |
| Inception Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Inception Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Elaboration Multiplier Range (Highest/Lowest = MR) | EMR = SMR = 1.15 / 0.95 = 1.21 |
| Elaboration Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Elaboration Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Construction Multiplier Range (Highest/Lowest = MR) | EMR = SMR = 1.15 / 0.95 = 1.21 |
| Construction Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Construction Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Rationale: | |
| Comments: | |

3) CLAB – Collaboration

Teams and team members who can collaborate effectively can reduce both effort and schedule; those that don't collaborate effectively have increased schedule and effort (due to wasted time). With this multiplier also, staff level does not change based on collaboration efficiency.

| Schedule Multipliers | |
|--|---------------------------------------|
| Inception Multiplier Range (Highest/Lowest = MR) | EMR = SMR = 1.21 / 0.80 = 1.51 |
| Inception Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Inception Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Elaboration Multiplier Range (Highest/Lowest = MR) | EMR = SMR = 1.15 / 0.86 = 1.24 |
| Elaboration Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Elaboration Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Construction Multiplier Range (Highest/Lowest = MR) | EMR = SMR = 1.10 / 0.93 = 1.82 |
| Construction Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Construction Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Rationale: | |
| Comments: | |

4) RESL – Architecture/Risk Resolution

This is the same as the COCOMO II RESL rating scale. The architecture portion enables parallel construction, thus reducing schedule during the construction phase assuming that staff level increases during construction while applying the same effort.

| Schedule Multipliers | |
|--|---|
| Inception Multiplier Range (Highest/Lowest = MR) | $EMR = SMR = 1.0 / 1.0 = 1.0$ |
| Inception Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Inception Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Elaboration Multiplier Range (Highest/Lowest = MR) | $EMR = SMR = 1.0 / 1.0 = 1.0$ |
| Elaboration Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Elaboration Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Construction Multiplier Range (Highest/Lowest = MR) | $EMR = 1.0 / 1.0 = 1.0$ $SMR = 1.0 / .75 = 1.33$ |
| Construction Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Construction Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Rationale: | |
| Comments: | |

5) PPOS – Prepositioning Assets

This concerns the degree to which assets are pre-tailored to a project and furnished to a project for use on demand. The pertinent issues are people skills and teambuilding, processes and tools, and architecture and componentry.

| Schedule Multipliers | |
|--|---|
| Inception Multiplier Range (Highest/Lowest = MR) | EMR = 1.1 / 1.0 = 1.10 SMR = 1.0 / .8 = 1.25 |
| Inception Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Inception Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Elaboration Multiplier Range (Highest/Lowest = MR) | EMR = 1.1 / 1.0 = 1.10 SMR = 1.0 / .8 = 1.25 |
| Elaboration Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Elaboration Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Construction Multiplier Range (Highest/Lowest = MR) | EMR = 1.1 / 1.0 = 1.10 SMR = 1.0 / .8 = 1.25 |
| Construction Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Construction Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Rationale: | |
| Comments: | |

6) RCAP – RAD Capability of Personnel

This accounts for the effects of personnel capability and experience in Rapid Application Development projects.

| Schedule Multipliers | |
|--|--|
| Inception Multiplier Range (Highest/Lowest = MR) | EMR = 1.20 / 0.80 = 1.50 SMR = 1.5 / 0.5 = 3.00 |
| Inception Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Inception Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Elaboration Multiplier Range (Highest/Lowest = MR) | EMR = 1.20 / 0.80 = 1.50 SMR = 1.5 / 0.5 = 3.00 |
| Elaboration Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Elaboration Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Construction Multiplier Range (Highest/Lowest = MR) | EMR = 1.20 / 0.80 = 1.50 SMR = 1.5 / 0.5 = 3.00 |
| Construction Effort (PM) Multiplier | Your Adjusted EMR = _____ |
| Construction Schedule (M) Multiplier | Your Adjusted SMR = _____ |
| Rationale: | |
| Comments: | |

This concludes the worksheet. Thank you for your assistance!